2011 Fiesta
Workshop Manual

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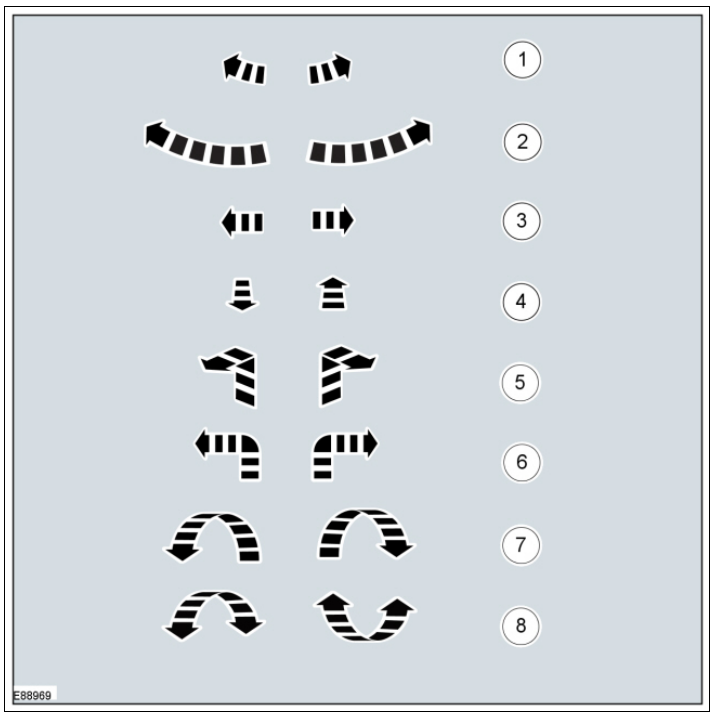
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Symbols Glossary

Symbols are used inside the graphics and in the text area to enhance the information.

Movement Symbols

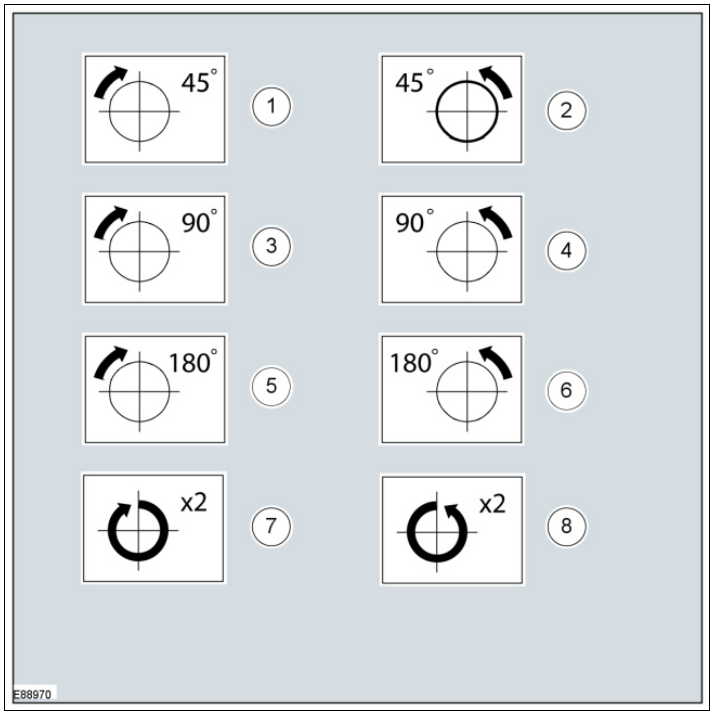
Movement symbols provide detailed information to a required component movement. These component movements can be rotational or 1-3 dimensional movements.



Item	Description
1	Minor component movement clockwise/counterclockwise
2	Major component movement clockwise/counterclockwise
3	Component movement to the left/right/up/down
4	Component movement towards/away
5	3 dimensional component movement
6	2 dimensional component movement
7	3 dimensional component rotation
8	3 dimensional component cycling

Turn Symbols

Turn symbols are used to provide further information on the direction or angle of component turns.

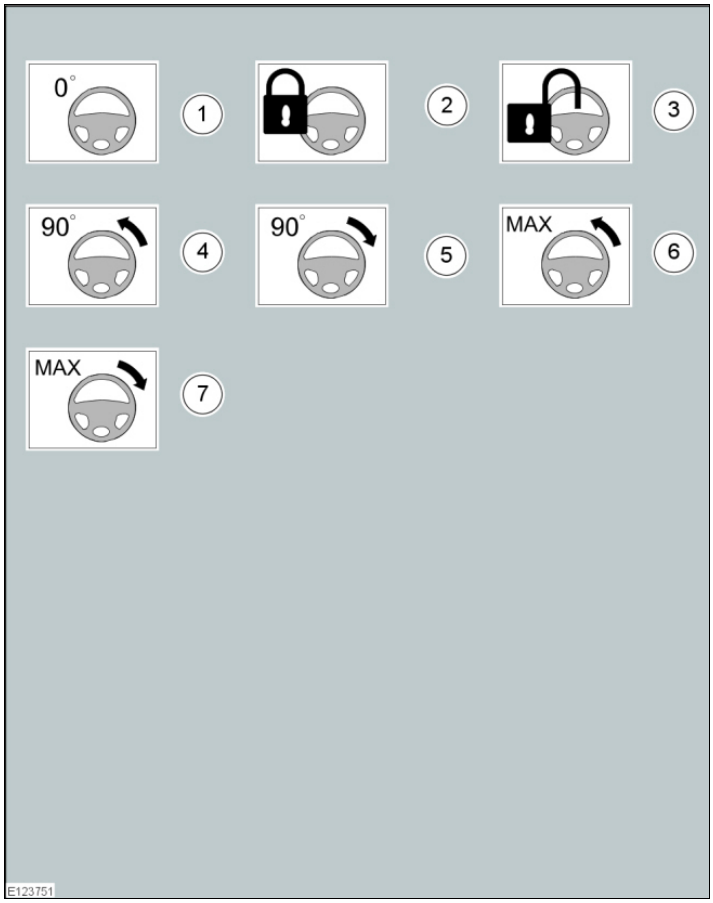


Item	Description
1	Turn the component clockwise through 45°
2	Turn the component counterclockwise through 45°
3	Turn the component clockwise through 90°
4	Turn the component counterclockwise through 90°
5	Turn the component clockwise through 180°
6	Turn the component counterclockwise through 180°
7	Turn the component clockwise through 2 complete turns
8	Turn the component counterclockwise through 2 complete turns

Steering Wheel Symbols

Steering wheel symbols are used to provide further information to a required steering wheel position or steering column lock status.

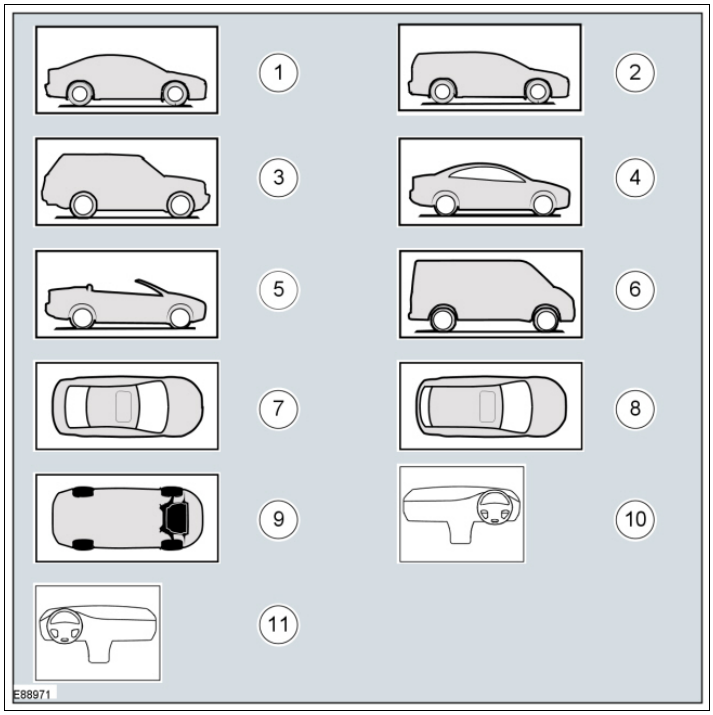
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Item	Description
1	Steering wheel in straight ahead position
2	Steering coock locked
3	Steering column lock unlocked
4	Turn the steering wheel to the 90° left position
5	Turn the steering wheel to the 90° right position
6	Turn the steering wheel to the left-hand end position
7	Turn the steering wheel to the right-hand end position

Body Types

Body type symbols are used to identify different body configurations.

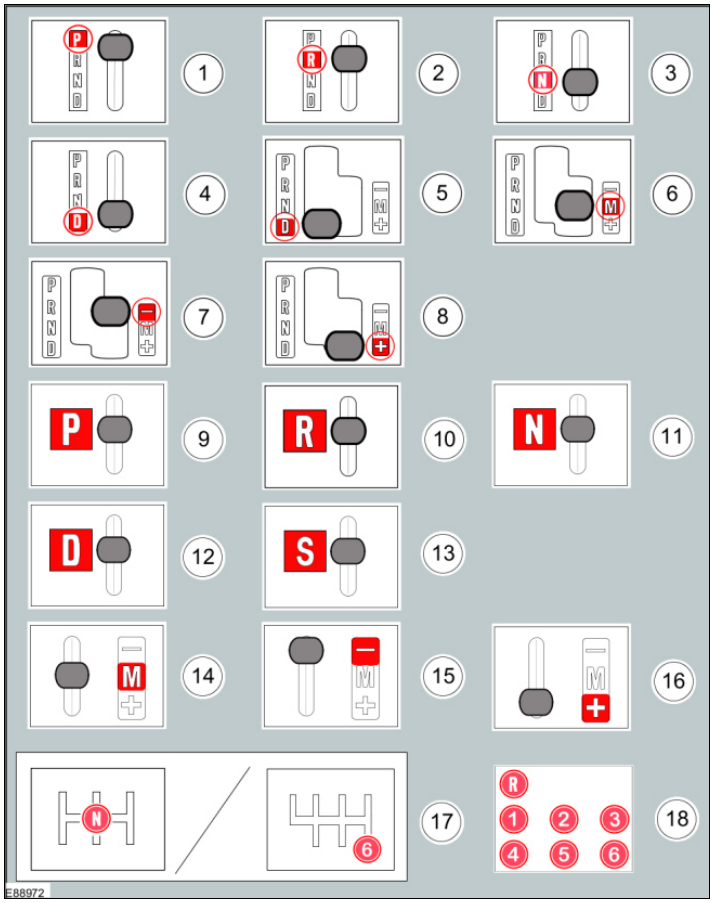


Item	Description
1	3, 4, 5-door body style
2	Wagon body style
3	Sport utility vehicle body style
4	Coupe body style
5	Convertible body style
6	Van body style
7	3, 4, 5-door body style - Top ew
8	Wagon body style - Top View
9	Underbody view
10	Right-hand drive (RHD) vehicle
11	Left-hand drive (LHD) vehicle

Gearshift lever and selector lever position symbols

Gearshift lever and selector lever position symbols are used to show the lever position that is required to be selected to carry out a procedure step.

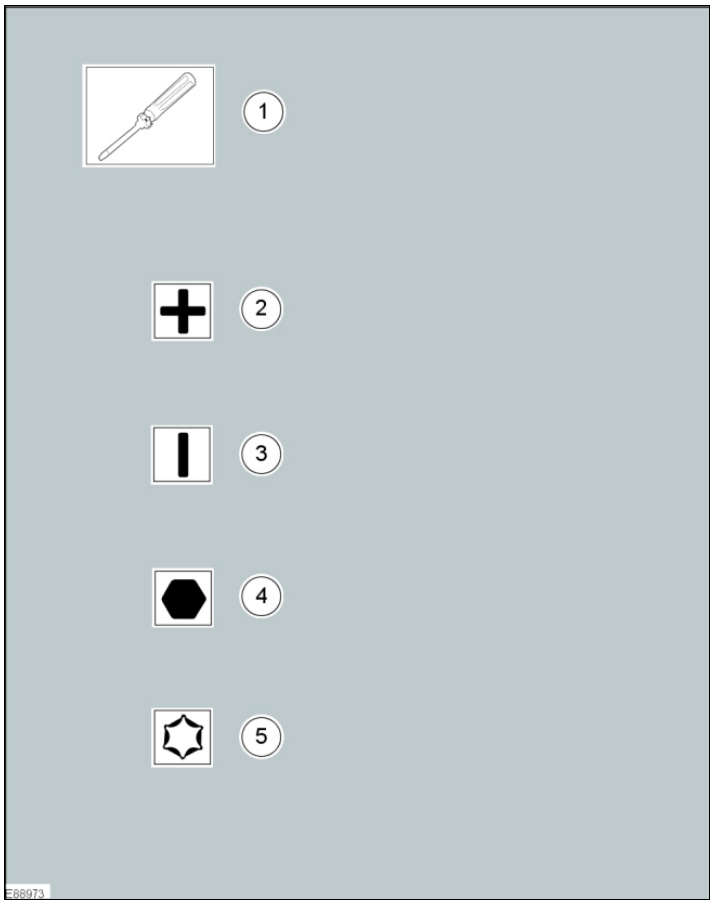
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Item	Description
1	Replaced by symbol 9
2	Replaced by symbol 10
3	Replaced by symbol 11
4	Replaced by symbol 12
5	Replaced by symbol 12
6	Replaced by symbol 14
7	Replaced by symbol 15
8	Replaced by symbol 16
9	Set the selector lever to the park (P) position
10	Set the selector lever to the reverse (R) position
11	Set the selector lever to the neutral (N) position
12	Set the selector lever to the drive (D) position
13	Set the selector lever to the drive (S) position
14	Set the selector lever to the drive (M) position
15	Set the selector lever to the drive (-) position
16	Set the selector lever to the drive (+) position
17	Set the gearshift lever to the neutral (N) position
18	Further gearshift lever positions that may appear in Illustrations

Screwdriver symbols

The screwdriver symbols are used to show which screwdriver bit is recommended to carry out a procedure step.

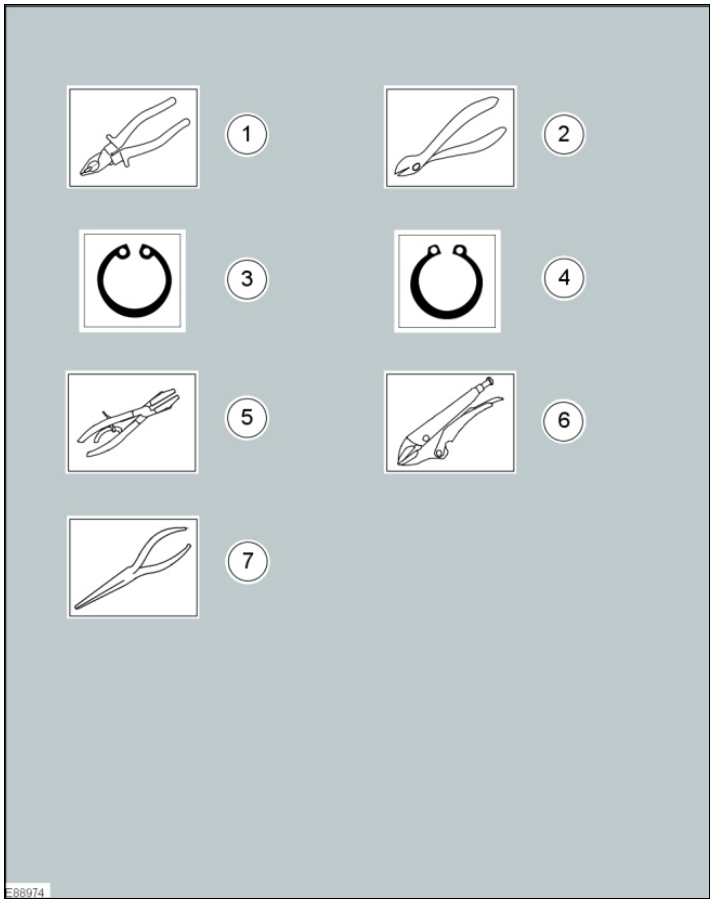


Item	Description
1	Screwdriver
2	Cross bladed screwdriver
3	Flat-bladed screwdriver
4	Hexagonal screwdriver
5	TORX screwdriver

Pliers Symbols

The plier symbols are used to show which pliers is recommended to carry out a procedure step.

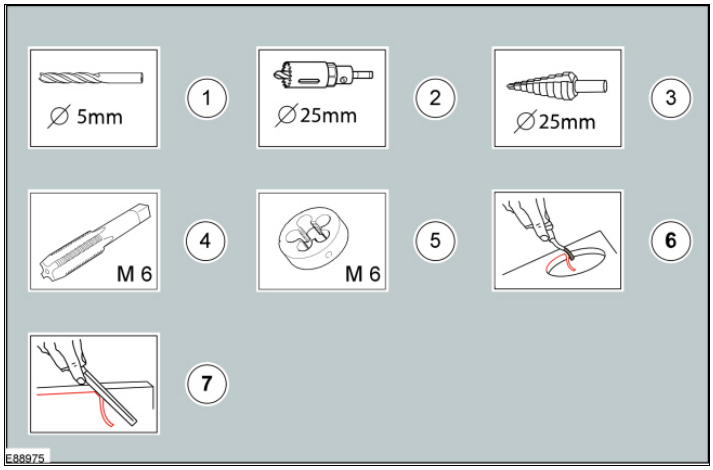
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Item	Description
1	Combination pliers
2	Side cutter pliers
3	Securing ring - inner
4	Securing ring - outer
5	Hose clamp pliers
6	Locking pliers
7	Long nose pliers

Drill Symbols

The drill symbols are used to show which type and size of drill bit is recommended to carry out a procedure step.

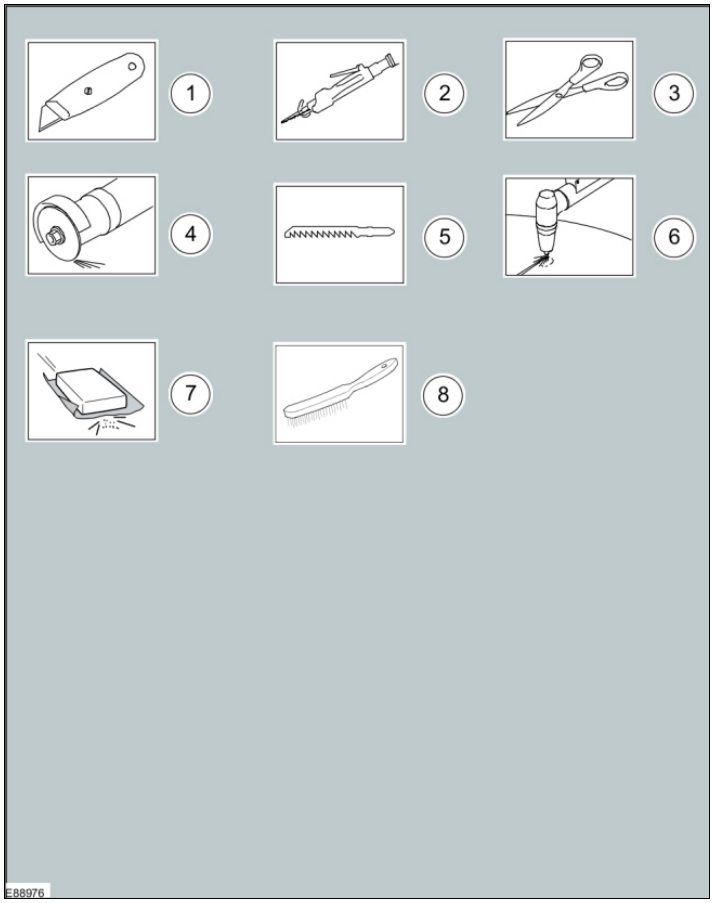


Item	Description
1	Drill bit with a specified diameter
2	Hole saw with a specified diameter
3	Stepped drill bit with a specified diameter
4	Tap with a specified diameter
5	Die with a specified diameter
6	Scraper for circular holes
7	Scraper for straight edges

Cutting Tool Symbols

The cutting tool symbols are used to show which type of cutting tool is recommended to carry out a procedure step.

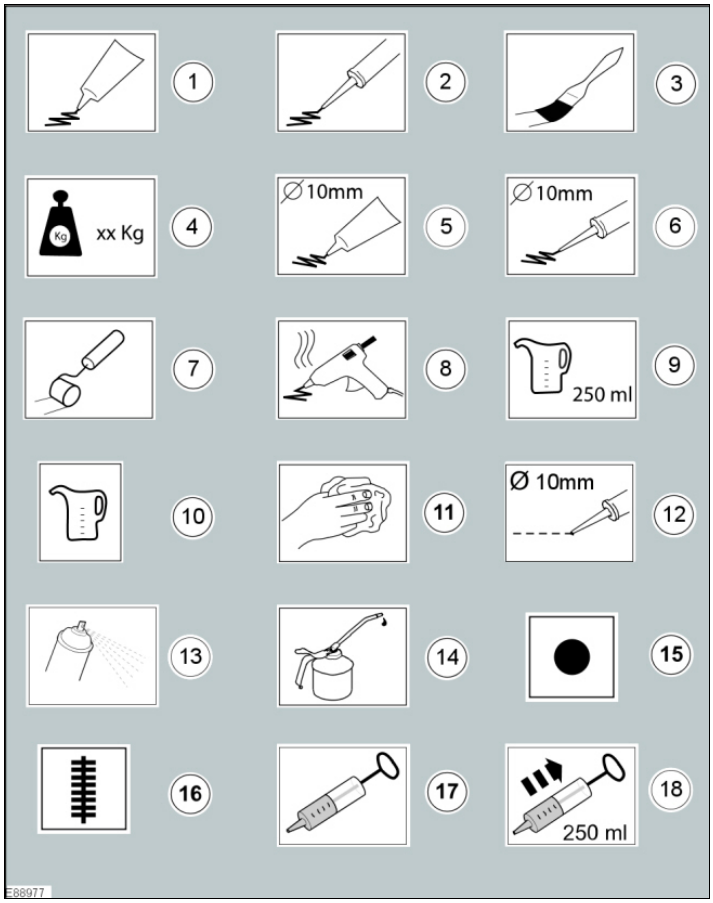
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Item	Description
1	Cutting knife
2	Air body saw
3	Scissors
4	Grinder
5	Jig saw
6	Plasma cutter
7	Sanding Paper
8	Wire brush

Apply Chemical or load symbols

The apply chemical or load symbols are used to show where to apply which type of chemical or load to carry out a procedure step.

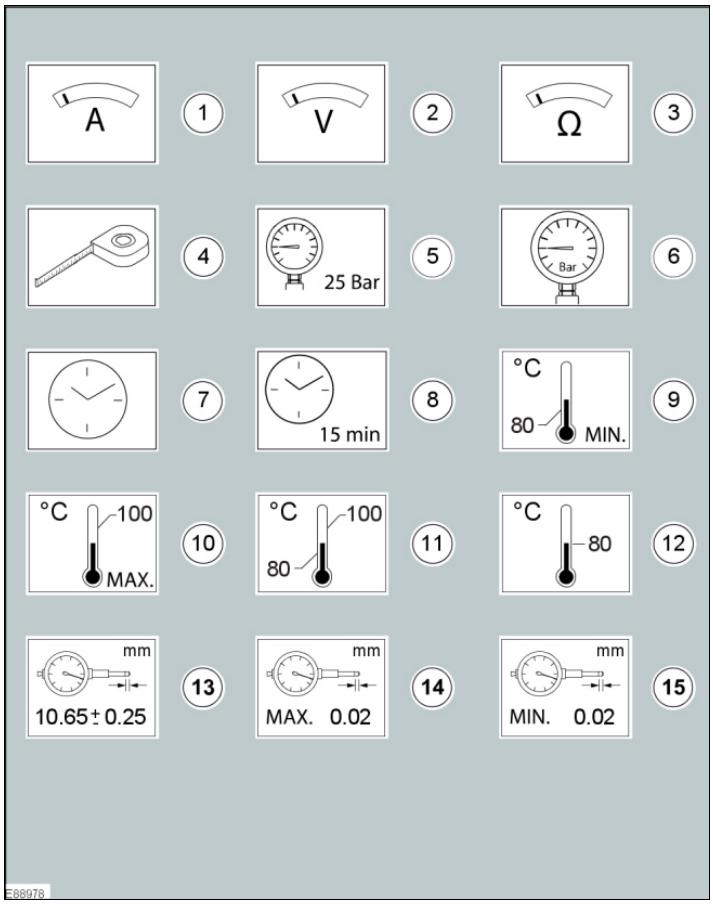


Item	Description
1	Apply the substance from the specified tube
2	Apply the substance from the specified cartridge
3	Apply the specified chemical with a brush
4	Apply the specified load to the specified component
5	Apply a bead with a specific diameter from the specified tube
6	Apply a bead with a specific diameter from the specified cartridge
7	Apply the specified chemical with a roller
8	Apply hot glue to the specified component
9	Apply the specified amount of fluid from the fluid can
10	Apply fluid from the fluid can
11	Clean the specified component with the specified material
12	Apply a broken bead from the specified tube
13	Apply the specified chemical from a spray can
14	Apply the specified lubricant to the specified component
15	Apply spot welds to the specified component
16	Apply a continuous weld to the specified component
17	Handle the fluid using a syringe
18	Extract the specified amount of fluid using a syringe

Measurement Symbols

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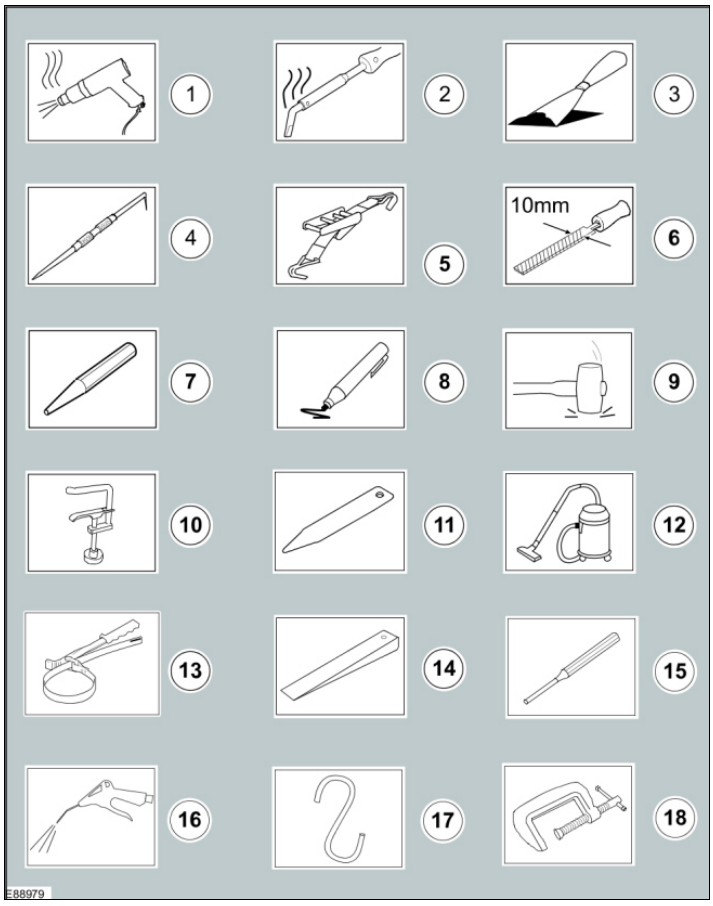
The measurement symbols are used to show where to measure which type of measurement to carry out a procedure step.



Item	Description
1	Measure the current using a digital multimeter
2	Measure the voltage using a digital multimeter
3	Measure the resistance using a digital multimeter
4	Measure the length/distance
5	Check that the specified pressure is available using a suitable pressure gauge
6	Measure the pressure at the specified port using a suitable pressure gauge
7	Measure the time using a suitable stopwatch
8	Wait for the specified period of time
9	The specified task requires the specified minimum temperature
10	The specified task requires the specified maximum temperature not to be exceeded
11	The specified task requires the specified temperature range
12	The specified task requires the specified temperature
13	Measure and check for the specified value using a dial indicator gauge
14	Measure and check for the specified MAX value using a dial indicator gauge
15	Measure and check for the specified MIN value using a dial indicator gauge

General equipment symbols

The general equipment symbols are used to show where to use which type of general equipment to carry out a procedure step.

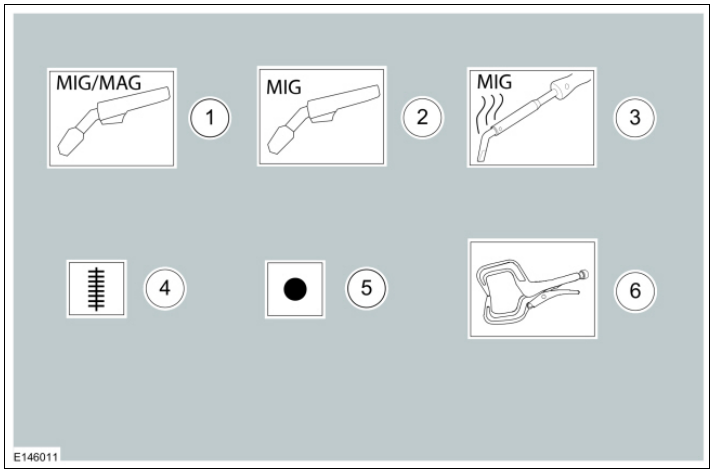


Item	Description
1	Hot air gun
2	Soldering iron
3	Scraper
4	Scriber
5	Securing strap
6	File with specified size
7	Center punch
8	Marker
9	Mallet
10	Hose clamp
11	Interior trim remover
12	Vacuum cleaner
13	Strap wrench
14	Wedge
15	Pin punch
16	Air blow gun
17	Relocate and support the component

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Welding Symbols

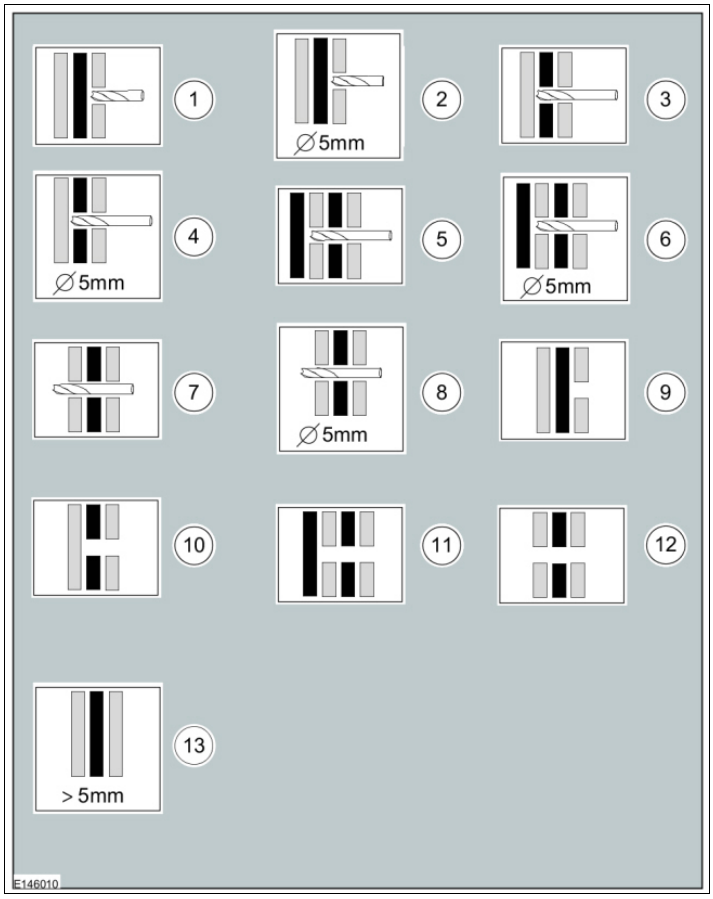
These symbols indicate the type of welding to be used.



Item	Description
1	Metal inert gas (MIG) / Metal active gas (MAG) welding equipment
2	Metal inert gas (MIG) welding equipment
3	Metal inert gas (MIG) brazing equipment
4	Apply a continuous weld to the specified component
5	Apply spot welds to the specified component
6	C-clamp

Drilling and grinding symbols

These symbols indicate the type of drilling or grinding to be used.

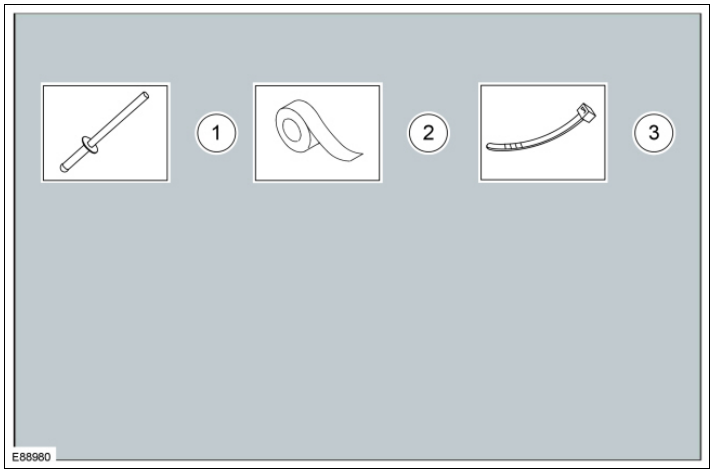


Item	Description
1	Drill through first body layer with a suitable diameter
2	Drill through first body layer with the specified diameter
3	Drill through the indicated number of body layers with a suitable diameter
4	Drill through the indicated number of body layers with the specified diameter
5	Drill through the indicated number of body layers with a suitable diameter
6	Drill through the indicated number of body layers with the specified diameter
7	Drill through all body layers with a suitable diameter
8	Drill through all body layers with the specified diameter
9	Grind one layer
10	Grind two layers
11	Grind to last layer
12	Grind all layers
13	Material thickness > Xmm

Material Symbols

The material symbols are used to show where to use which type of material to carry out a procedure step.

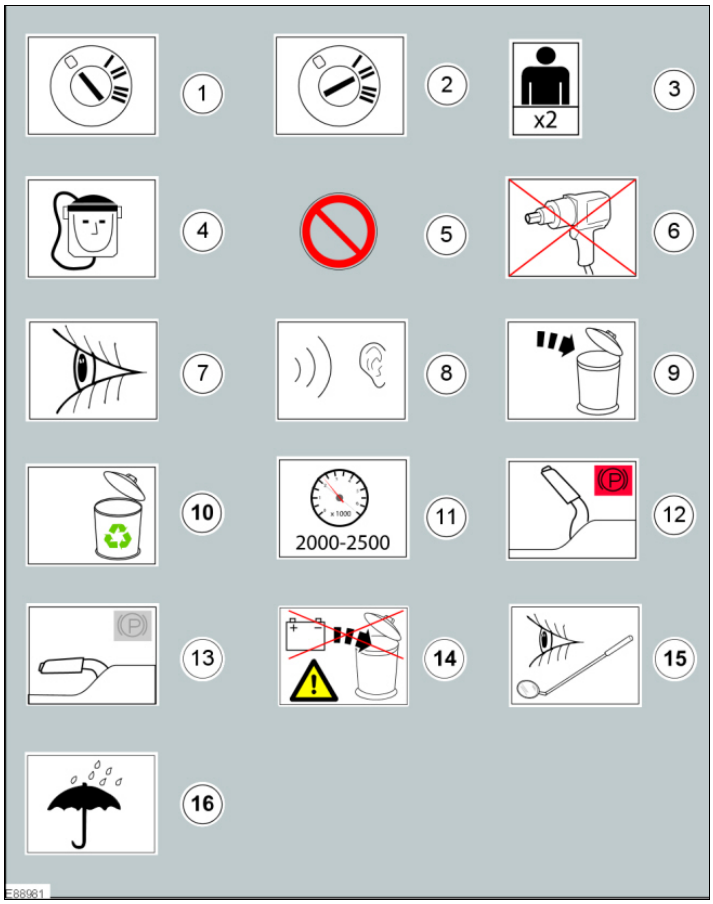
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Item	Description
1	Remove/Install the specified blind rivet
2	Apply tape to the specified component/area
3	Remove/Install the specified cable tie

Miscellaneous Symbols

These symbols provide further information that is required to carry out a procedure step.

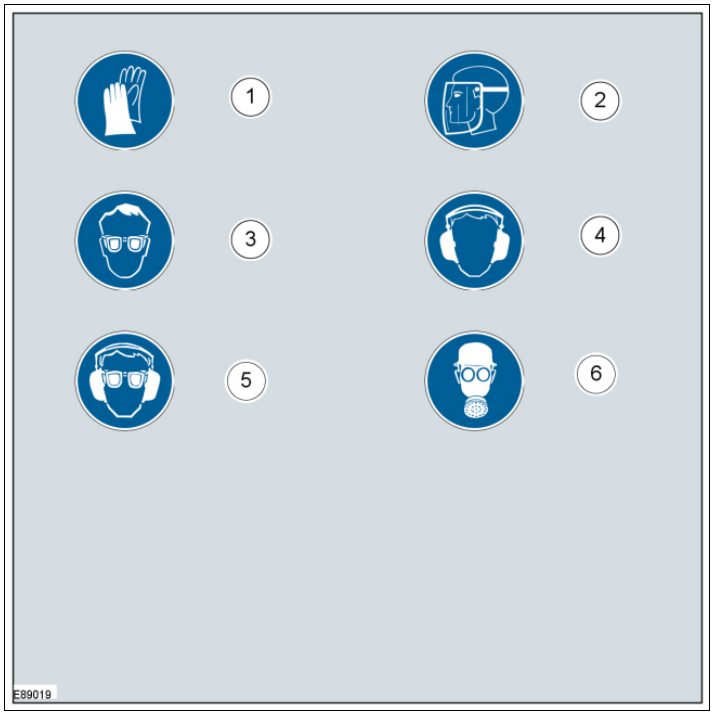


Item	Description

1	Set the ignition switch to the 0 position
2	Set the ignition switch to the II position
3	The procedure step requires the aid of the specified number of supporting technicians
4	Self contained breathing apparatus
5	General prohibition used in combination with another symbol
6	Do not use power tools
7	Visual check
8	Noise check
9	Dispose the specified component
10	Replaced by item 9 (Dispose the specified component)
11	Set the engine speed to the specified value
12	Fully apply the parking brake lever
13	Fully release the parking brake lever
14	Do not dispose of batteries into the waste bin
15	Visual check using a mirror
16	Area/component must be dry

Mandatory Protective Equipment - Health and safety symbols

The protective equipment symbols advise to use a mandatory protective equipment to avoid or at least reduce possible health and safety risks.



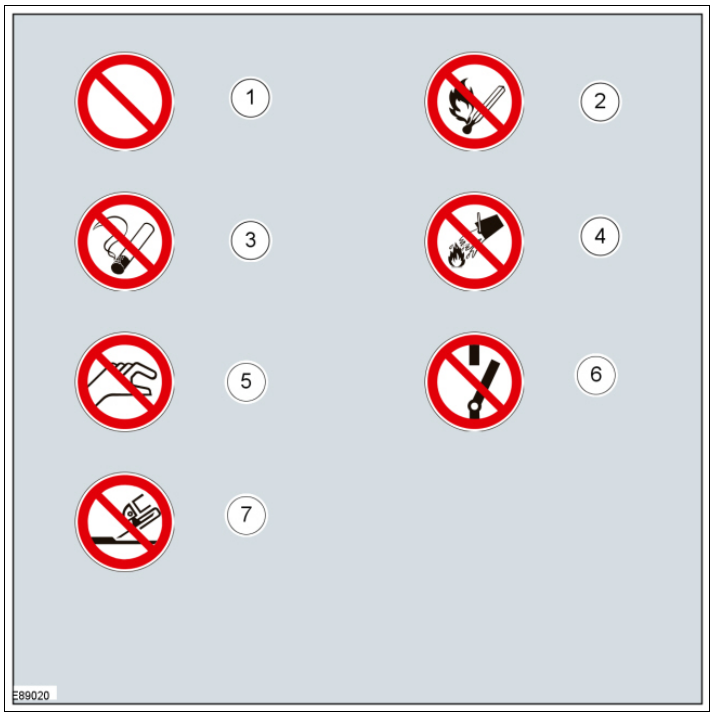
Item	Description
1	Wear protective gloves
2	Wear face guard
3	Wear safety goggles

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4	Wear ear protectors
5	Wear safety goggles and ear protectors
6	Wear a respirator

Prohibition - Health and safety symbols and component damage

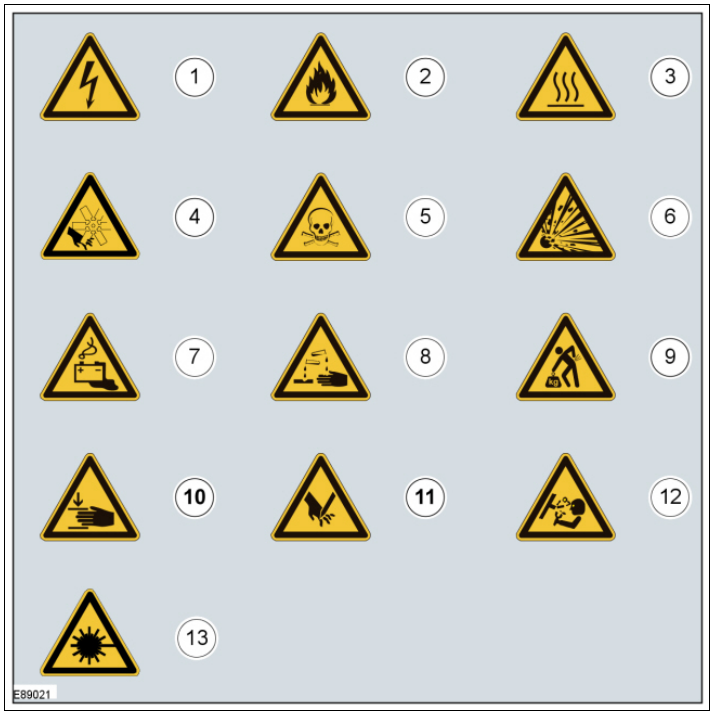
The prohibition symbols are used to prohibit the specified actions to avoid or at least reduce possible component damage and health and safety risks.



Item	Description
1	General Prohibition symbol
2	No naked flames
3	No smoking
4	No water
5	Do not touch
6	Do not switch
7	No grinding

Warning Symbols - Health and Safety Warnings and Component damage

The warning symbols are used to advise on hazardous conditions to avoid or at least reduce possible component damage and health and safety risks.

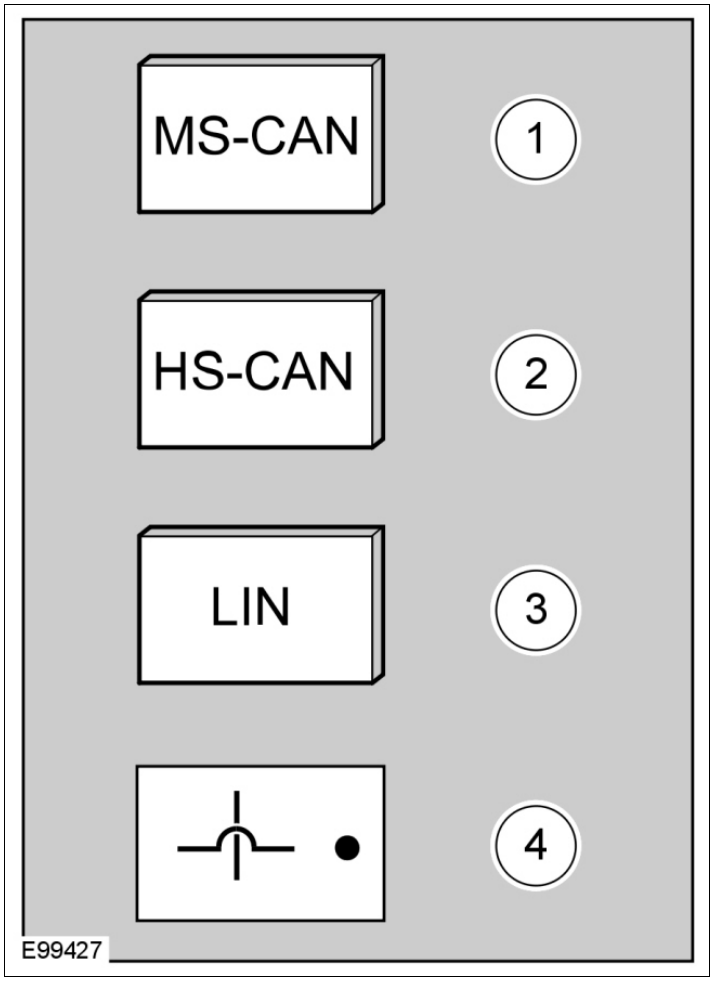


Item	Description
1	Hazardous voltage/Electrical shock/Electrocution
2	Fire hazard/Highly flammable
3	Burn hazard/Hot surface
4	Automatic start-up
5	Toxic
6	Explosive material
7	Battery hazard
8	Corrosive material
9	Lifting hazard
10	Hand crush/Force from above
11	Cutting of fingers or hand
12	Pressure hazard
13	Invisible laser radiation. Do not view directly with optical instruments (magnifiers). Class 1M laser product

Control Diagram symbols - Description and Operation procedures

These symbols provide further information on the type of connectivity, direction of flow or type of data bus of a system.

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Item	Description
1	Medium Speed Controller Area Network
2	High Speed Controller Area Network
3	Local Interconnect Network
4	Wires cross but are not connected

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Using This Manual

Introduction

This manual describes and directs repair procedures for this vehicle model year. It includes diagnostics for all vehicle systems except driveability and emission control. Refer to the separate Powertrain Control/Emissions Diagnosis (PC/ED) manual for driveability and emission control diagnostics.

Information is organized into groups, with sections that have subsections dividing them.

Warnings, Notices, and Notes in This Manual

Warnings provide information to avoid personal injury and to make sure service actions on critical safety systems are performed correctly.

Notices provide information to avoid damage to the vehicle or a component.

Notes provide information critical for a complete and effective repair.

Warnings that apply to an entire system or workshop manual section are located in section 100-00 Description and Operation Safety Warnings .

Warnings, Notices, or Notes that apply to an entire procedure will be placed at the beginning of the procedure.

Warnings, Notices, or Notes that apply to a single step are placed at the beginning of the step. Those that apply to a group of steps will be placed at the first step requiring it.

Vehicle and Engine Orientation Identifiers

LH and RH vehicle designations are oriented from the driver's seat position looking forward. LH and RH engine designations are oriented from the flywheel position looking towards the crankshaft pulley.

How to Use Diagnostic Information

DTC and Symptom Charts

Module DTC Charts are used to begin and direct the diagnosis of a DTC. Symptom Charts contain concern symptoms and direct solutions either in the chart or in a linked Diagnostic Routine. Both DTC and Symptom Charts may provide the solution within the chart, or provide a link to the appropriate Diagnostic Routine.

In some sections, the Symptom Chart is preceded by a Preliminary Inspection which must be followed prior to using the Symptom Chart

Using Module DTC Charts

This Workshop Manual contains diagnostics for DTCs set by vehicle modules. Driveability and emission DTCs are covered in the separate Powertrain Control/Emissions Diagnosis (PC/ED) manual. If a PCM-set DTC is not listed in the Workshop Manual, it is serviced in the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

DTC diagnostics are found in both on-line and printed publications and are used as follows:

- On-line publications: Using the left side menu, click on the Master DTC Chart link to view the vehicle module DTC charts. Each module has a chart with links or in-chart solutions for all DTCs diagnosed in the Workshop Manual.
- Printed publications: Use the DTC index in the rear of the book.

Diagnostic Methods

Diagnostic Methods provides information to support diagnosing Ford vehicles. Diagnostic strategies, diagnostic tool support information, and advanced circuit testing methods are included. REFER to Diagnostic Methods .

Diagnostic Routines

Diagnostic Routines provide information to determine the root cause of concerns addressed in either a DTC Chart or Symptom Chart. Each Diagnostic Routine contains:

- Diagnostic Overview
  - ♦ Wiring Diagram References (as applicable)
  - ♦ Normal Operation and Fault Conditions
  - ♦ Visual Inspection and Diagnostic Pre-checks
- Tool Table (as applicable)
- Material Table (as applicable)
- Pinpoint Test Steps

Component Tests

Component Tests are used to separately analyze a single common component in a system. The test will determine if the part is functioning correctly.

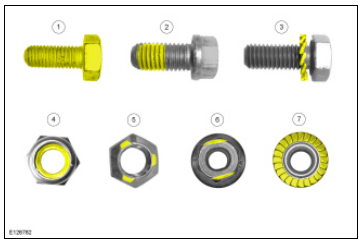
Mechanical Procedures Such As Removal and Installation

Reuse Of Fasteners, Seals, Or Gaskets

The following is a list of assumptions made in the reuse of fasteners, seals, or gaskets.

- Seals and gaskets must be replaced unless otherwise specified.
- Standard fasteners are reused unless otherwise specified.
- Fasteners with self-locking features must be replaced unless otherwise noted. Reminder text may or may not be included with the procedure step. Examples of fastener coatings or fasteners with mechanical locking (with the locking features highlighted yellow) are shown in illustration 1.
- Torque to yield bolts (bolts with more than one stage of tightening torque and a final torque angle specification) must be discarded and new torque to yield bolts installed unless otherwise stated within the procedure.

Illustration 1 - self-locking coatings or locking feature are highlighted yellow



Graphics

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Illustrations in this manual may be used to replace written step instructions. Color-coding (see color scheme in this document) is used to communicate the required step action or actions. Service action icons (see Symbols Glossary) are used to add additional information regarding the required action.

- The color scheme in a step graphic (an illustration used in removal or installation steps) indicates servicing information as follows:
  - ♦ Fasteners (including panel retainers) or electrical connectors - Magenta (Purple)
  - ♦ Target component that is to be removed - Blue
  - ♦ Components that must be removed prior to the target component shown in blue - Brown or Green
  - ♦ Components placed aside for access, but not removed; highlighted areas such as inspection areas, adjustments or measurements - Yellow
  - ♦ Essential Special Service Tools (ESSTs) and other tools - Pale Blue
  - ♦ Chemical or Sealer apply areas - Alternating blue and white dashes (see illustration 4)
  - ♦ Sectioned or cut-away areas - Red
  - ♦ Remaining components - Grey

Callouts in graphics indicate removal (or tightening) order, or identify individual instructions in substeps of the same number (such as different torque values).

Arrows containing x numbers (Illustration 2) indicate the number of identical fasteners or connectors to be removed or installed in the graphic.

In Illustration 2, two identical fasteners are indicated by the x2 arrow, with another arrow illustrating a third fastener of a different type. Because the different fasteners require different torques, callouts are used to identify those two torque values in the associated step text. The hose clamp is another fastener to be removed. The yellow coloring of the hose indicates it is to be moved aside (not removed).

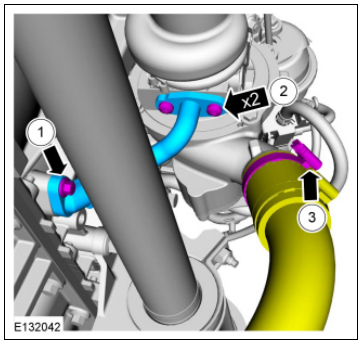
The following written steps would be necessary if the illustration did not have color coding:

1. Remove the engine oil pipe fastener at the engine connection.

2. Remove the two engine oil pipe fasteners from the turbocharger and remove the pipe.

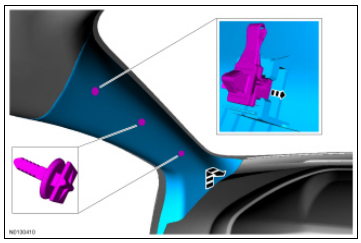
3. Remove the air inlet hose from the turbocharger and position aside.

Illustration 2



Hidden fasteners, such as panel retainers, are identified in the illustration by a magenta disc. An inset detail view illustrating the fastener type may be included (Illustration 3).

Illustration 3 - Note motion arrow at panel bottom; it indicates to lift panel up, then move inward to remove



Symbols

Symbols may be used inside graphics or in the text area to communicate service actions. The following examples demonstrate the use of some of these symbols. REFER to Symbols Glossary for a complete symbols list with explanations.

In the Illustration 4 example, service action symbols are shown as used to direct the application of sealer, lubricant, weight, tape or cleaning detergent to a component. In this example a bead diameter of "xx" millimeters is prescribed. The blue and white dashes indicate where the material is applied.

Illustration 4

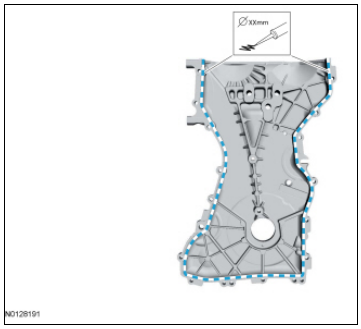


Illustration 5 is an example of location symbols used to show the location of a component tem within the vehicle.

Illustration 5

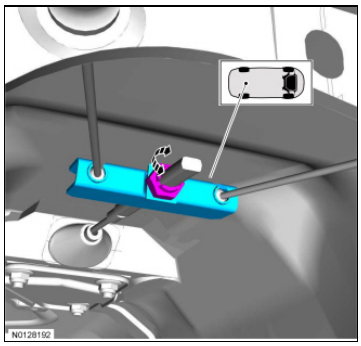
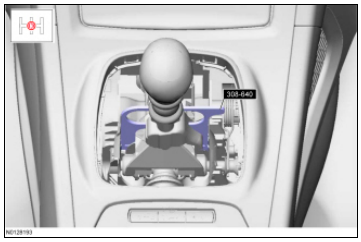


Illustration 6 shows how gearshift lever or selector lever position symbols may be used to indicate the gearshift lever or selector lever position required. The required Essential Special Service Tool to align the shift mechanism is shown in pale blue and identified by ESST number.

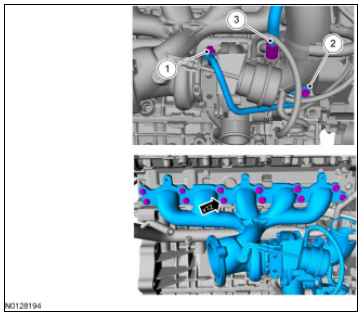
Illustration 6

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Callouts or arrows may be used to identify components for supporting special information, such as a required sequence or to indicate a number of identical components. Illustration 7 shows a removal order in the top graphic and the bottom graphic indicates 12 identical bolts.

Illustration 7



Standard tool symbols direct the use of standard tools to perform a service action, such as the cutting of carpet shown in Illustration 8. Tool symbols may include dimensional values (for example, a drill with a specified diameter).

Illustration 8

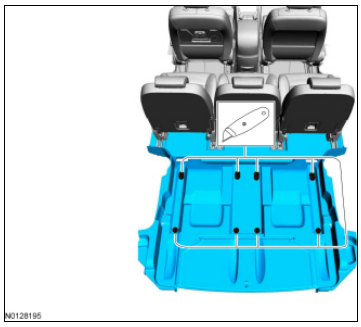


Illustration 8

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Safety Warnings

Review carefully the General Service Health and Safety Precautions below before beginning any repair. Following these general service warnings are specific system warnings that must be carefully reviewed before beginning work on any listed system.

General Service Health and Safety Precautions

⚠ 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.

⚠ WARNING: Do not work under the hood of a vehicle with a damaged cooling fan, as it can separate during operation. With the ignition OFF, inspect all cooling fans for damage, cracks or separation and replace with a new fan as necessary. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Vehicles with engine auto start-stop technology may start automatically with the ignition on. Make sure the ignition is off when servicing or working in close proximity to rotating engine parts. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Before raising the vehicle on a hoist, make sure the hoist capacity is adequate for the vehicle weight, including any vehicle cargo or modifications. Always position the hoist lift arms as shown in the illustration. Do not use the engine to power the drive wheels unless all drive wheels are elevated off the ground. Incorrect hoist arm positioning or drive wheels in contact with the ground can cause unintended vehicle movement. Failure to follow these instructions may result in serious personal injury or death.

⚠ WARNING: Before lifting the vehicle with a jack, make sure the jack capacity is adequate for the vehicle weight, including any vehicle cargo or modifications. Identify the correct jacking points as shown in the illustration. Position the vehicle on a hard, level surface. After jacking, always support vehicle with jack stands. Never get under a vehicle supported only by a jack. Set the parking brake and block all wheels remaining on the ground. Failure to follow these instructions may result in unintended vehicle movement and serious personal injury or death.

⚠ WARNING: Turn off (disable) the power running boards (if equipped) before jacking, lifting or placing any object under the vehicle. Never place your hand between the power running board and the vehicle. Extended power running boards will retract when doors are closed. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Never support an engine by the intake or exhaust manifolds. The engine may drop suddenly. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Disconnect the window regulator motor connector before working inside the vehicle doors. Service actions inside the door (such as door latch, handle or lock cylinder service) or operating the remote keyless entry (RKE) fob may activate the windows on vehicles equipped with global open/close. Serious injury to hands or arms may occur if a window motor is activated during service. Failure to follow these instructions 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.

⚠ WARNING: Keep solvents away from ignition sources. Solvents may be flammable and can ignite or explode if not handled correctly. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Use only a type-D fire extinguisher to extinguish magnesium fires. Never attempt to use a type-A, -B, -C extinguisher, or water, as these items are ineffective and may accelerate a magnesium fire. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Always secure transmission, transfer case, and axle assemblies to their service jack. Avoid obstructions while lowering and raising the jack. Improperly secured assemblies or contact with obstructions may cause the assembly to fall off the jack, which could result in serious personal injury.

⚠ WARNING: Always verify that the lockpin on a bench-mounted holding fixture is correctly secured to help prevent unexpected component rotation. Failure to follow this instruction may result in 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.

⚠ 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.

Carefully review the following system safety warnings before beginning any service or repair work.

High Voltage System Health and Safety Precautions

⚠ WARNING: To prevent the risk of high-voltage shock, always follow precisely all warnings and service instructions, including instructions to depower the system. The high-voltage system utilizes approximately 300 volts DC, provided through high-voltage cables to its components and modules. The high-voltage cables and wiring are identified by orange harness tape or orange wire covering. All high-voltage components are marked with high-voltage warning labels with a high-voltage symbol. Failure to follow these instructions may result in serious personal injury or death.

⚠ WARNING: Never install the service disconnect plug when a high-voltage service cover is removed. Always install the cover prior to connecting the service disconnect plug. The cover prevents inadvertent contact with the high voltage which is present at several points under the cover. Failure to follow these instructions may result in serious personal injury or death.

⚠ WARNING: Turn OFF the ignition switch for a minimum of 5 minutes before removing high-voltage cables. High-voltage cables and wiring are orange in color. The nominal high-voltage traction battery voltage (HVTB) is 330 V DC. Failure to follow these instructions may result in serious personal injury or death.

Climate Control System Health and Safety Precautions

⚠ WARNING: Air conditioning R-134a liquid refrigerant is capable of harming eyes or freezing skin. Always wear safety goggles and avoid contact with liquid refrigerant. Failure to follow these

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instructions may result in serious personal injury.

⚠ WARNING: Air conditioning R-134a refrigerant gas is capable of displacing the air necessary for breathing in a confined space and can produce toxic gasses if burned at high temperatures. Do not release a large quantity of R-134a gas within a confined space or allow it to be exposed to a high temperature flame (such as a torch). Consult the Material Safety Data Sheet for further information. Failure to follow these instructions may result in serious personal injury or death.

⚠ WARNING: Use extreme care and observe all safety and service precautions related to the use of refrigerants as outlined on refrigerant tank and on recovery and charging equipment. Failure to follow these instructions may result in serious personal injury.

⚠ 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.

⚠ WARNING: The electric booster heater may become hot during use and can burn unprotected skin. Allow enough time for the heater to cool before servicing. Failure to follow this instruction may result in serious personal injury.

Battery and Battery Charging System Health and Safety Precautions

⚠ 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.

⚠ 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.

Brake System Health and Safety Precautions

⚠ 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: Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.

Body Repair Health and Safety and General Precautions

⚠ 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: 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).

⚠ 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: All safety belt components must be inspected and corrected as part of any collision repair. Inspect all safety belt components as prescribed by Safety Belt Inspection and Repair After a Collision found in Section 501-20A General Procedures of this manual. Failure to follow this instruction may result in incorrect operation of the safety belt system and increase the risk of serious personal injury or death in a crash.

⚠ 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.

Engine Cooling System Health and Safety Precautions

⚠ 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.

Gasoline and Gasoline-Ethanol Fuel System Health and Safety Precautions

⚠ 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: 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: 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

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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.

⚠ 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: Remove the fuel filler cap slowly. The fuel system may be under pressure. If the fuel filler cap is venting vapor or if you hear a hissing sound, wait until it stops before completely removing the fuel filler cap. Otherwise, fuel may spray out. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Avoid contact with fuel during a visual inspection for fuel leaks with the engine running. Do not work on the fuel system until the pressure has been released and the engine has cooled. Fuel in the high-pressure fuel system is hot and under very high pressure. High-pressure fuel may cause cuts and contact with hot fuel may cause burns. Failure to follow these instructions may result in serious personal injury.

Diesel Fuel System Health and Safety Precautions

⚠ WARNING: Contact with exposed fuel injector wiring, if energized, may result in electric shock. Use care when working on or around energized fuel injector wiring. Fuel injector wiring supplies high voltage to operate the fuel injectors. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Do not work on the fuel system until the pressure has been released and the engine has cooled. Fuel in the high-pressure fuel system is hot and under very high pressure. High-pressure fuel may cause cuts and contact with hot fuel may cause burns. Failure to follow these instructions may result in serious personal injury.

Safety Belt and Supplemental Restraint System (SRS) Health and Safety Precautions

⚠ 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: Deploy all supplemental restraint system (SRS) devices (air bags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9 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.

⚠ 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.

⚠ 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: All safety belt components must be inspected and corrected as part of any collision repair. Inspect all safety belt components as prescribed by Safety Belt Inspection and Repair After a Collision found in Section 501-20A General Procedures of this manual. Failure to follow this instruction may result in incorrect operation of the safety belt system and increase the risk of serious personal injury or death in a crash.

⚠ WARNING: Anytime the Safety Canopy or side air curtain module has deployed, a new headliner and new A-, B-, C-, and/or D-pillar upper trim panels and attaching hardware must be installed. Make sure the headliner includes the word AIRBAG where it meets each B-pillar trim panel. Remove any other damaged components/hardware, and install new components/hardware as required. Always use new torque-prevailing type J-nuts when installing the Safety Canopy. Failure to follow these instructions may result in the Safety Canopy or side air curtain module deploying incorrectly and increases the risk of serious personal injury or death in a crash.

⚠ WARNING: Do not repair or service restraint component connector terminals. If restraint connector terminals need repair, replace with the service connector pigtails. Failure to follow this instruction may result in incorrect operation of the vehicle safety restraint, which increases the risk of serious personal injury or death in a crash.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

⚠ WARNING: Never tamper with, repair, or modify a Restraints Control Module (RCM) or any other Supplemental Restraint System (SRS) component. Failure to follow this instruction may result in incorrect operation of the Supplemental Restraint System (SRS), which increases the risk of serious personal injury or death in a crash.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety Canopy® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Do not handle, mov or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety Canopy® and cause serious personal injury or death.

⚠ WARNING: Do not obstruct or place objects in the deployment path of the Safety Canopy or side air curtain assembly. Never insert any type of fastener or tie strap around any portion of the Safety Canopy, side air curtain assembly, or related interior trim panel. Failure to follow this instruction may result in the Safety Canopy or side airbag curtain module deploying incorrectly and increases the risk of serious personal injury or death in a crash.

⚠ 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.

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⚠ WARNING: Never allow oil, grease, water or foreign contaminants to get on/in the occupant classification system (OCS) components or electrical connectors. 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.

⚠ 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.

⚠ 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: Always carry out the Zero Seat Weight Test whenever the passenger seat has been removed from the vehicle or any seat component has been removed from the seat. Never drive a vehicle withany seat components removed from an occupant classification system (OCS) equipped seat. Failure to follow these instructions may result in incorrect operation of the occupant classification system (OCS), which increases the risk of serious personal injury or death in a crash.

⚠ WARNING: Do not paint any airbag trim covers or deployment doors. Paint may cause the airbag to deploy incorrectly. Failure to follow this instruction may increase the risk of serious personal injury or death in a crash.

Wheel and Tire Health and Safety Precautions

⚠ WARNING: Never inflate a tire that has been run flat without first removing the tire from the wheel to inspect for damage. A damaged tire can fail during inflation. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Do not mount tube-type tires on tubeless wheels or tubeless tires on tube-type wheels. Incorrect combinations could result in tire separation from wheel and may result in serious injury to vehicle occupant(s).

⚠ WARNING: Cracked wheels can be dangerous. Deflate tires on cracked wheels prior to removal of wheels from the vehicle. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Retighten wheel nuts within 160 km (100 mi) after a wheel is reinstalled. For dual rear wheel (DRW) only, a second retightening is required within 800 km (500 mi). Wheels can loosen after initial tightening. Failure to follow this instruction may result in serious injury to vehicle occupant(s).

⚠ 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: Do not weld or peen wheels. A wheel needing such repairs must have a new wheel installed. Failure to follow these instructions may result in wheel failure and serious personal injury.

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Diagnostic Methods

Effective Diagnostic Techniques

The following diagnostic process is critical for consistently successful diagnoses. Random methods work inconsistently and often lead to multiple repairs and the accompanying frustration.

- Understand and verify the **symptom** .
  - Understanding a symptom requires understanding normal operation.
  - Duplicate the concern. Re-create the same conditions that demonstrated the original concern (road testing may be necessary).
- Determine the responsible **system** .
  - Gather data, such as a visual inspection and an OASIS report.
  - Perform system tests, such as pressure tests or DTC retrieval.
- Identify the responsible **component** .
  - Test the suspect component and related parts.
- Determine the root **cause**
  - Examine related components (wiring faults, misalignments, incorrect adjustments) that may be the actual cause or may have caused the component failure.
  - Repair all related faults to avoid repeat failures.
  - Verify the repair has corrected the concern (and not created any new ones) using the identical conditions that demonstrated the original concern.

Diagnostic Scan Tool Testing

Network Test

Performing a network test is always recommended for analysis of electronic system concerns. Always solve network issues before addressing individual symptoms or DTCs.

Recommended Practice: REFER to Symptom Chart in Section 418-00 to diagnose a network outage or no response from an individual module (or modules).

DTC Retrieval

Generally, a good diagnostic strategy is to resolve all on-demand codes related to the system concern. Retrieving all continuous DTCs can also be beneficial to understand historic issues or issues outside of the suspect system that may be affecting your concern. On-demand testing should be done to ensure the fault represented by a continuous DTC is still present.

Continuous Memory Diagnostic Trouble Codes (CMDTCs)

Modules that produce diagnostic trouble codes have a program that evaluates system conditions, normally while the vehicle or system is in use. Module inputs can be checked for values indicating an electrical fault with the monitoring circuit or component. Module outputs can be monitored for correct function. Codes are stored when predefined limits are exceeded and retained even if the ignition is turned off (generally DTC-retention is for 40+ ignition cycles). Not all continuous codes have a matching on-demand code - and vice versa; this varies with different modules. For example, some network communication codes are continuous only. It is important to note that the presence of a continuous DTC does not guarantee that the fault currently exists.

Ford On-Demand DTCs

Ford Motor Company modules have a unique feature that performs a special diagnostic program at the request of the technician (using a scan tool). This "On-demand" diagnostic program can exercise system outputs not normally running when the car is parked and record observed faults. These diagnostic codes are communicated to the scan tool; they are not recorded in module memory. An on-demand test is an effective tool for evaluating real input and output conditions during module activity - activity that might not normally be occurring during service bay conditions. For example, an air suspension module on-demand test can run the compressor, vent the system, and observe the report from the height sensor even when the car is already at correct trim height and not requiring height adjustment.

Network Communication DTCs

Network DTCs (U-prefix 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 or diagnostics with modules disconnected) often set network DTCs. Replacing a module to resolve a network DTC is unlikely to resolve the concern. To prevent recurrence of intermittent network concerns, inspect all network wiring, especially in-line and module connectors; test the vehicle battery.

Recommended practice: Clear the DTC and retest. If the DTC repeats, test the vehicle communication network.

DTC Nomenclature (SAE J2012 and ISO 14229)

Many modules use 5-character DTCs followed by a 2-character failure-type code. The failure-type (sometimes called "fault byte") digits provide information about specific fault conditions such as opens or shorts to ground. Continuous memory DTCs have an additional 2-character DTC status code suffix to assist in determining DTC history.

Integrated Diagnostic System (IDS) Scan Tool Usage

If The IDS Scan Tool Does Not Communicate With The VCM

1. Check the VCM power; examine the connectn to the vehicle.
   - The VCM LED illumination prove-out confirms power and ground from the DLC are provided to the VCM .
   - **Recommended Practice:** REFER to Section 418-00 , No Power to the Scan Tool, to diagnose no power to the VCM .

2. Check the scan tool connection to the VCM .

3. Follow scan tool instructions to retry.

If The IDS Scan Tool Does Not Communicate With The Vehicle

The IDS 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.

1. Verify the scan tool operation with a known good vehicle.

2. Verify the ignition is ON.

3. If an IDS session cannot be established with the vehicle (IDS may state "No communication can be established with the PCM"):

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- Choose "NO" when the scan tool prompts 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 can be determined from OASIS -- choose "HVBoM" from the OASIS page and search for the PCM part number
    - The PCM part number and 4-character tear tag are printed on the PCM label.
- Establish a session based on the PCM information (above).

4. Using the tool box menu, run the network test.
    - Determine if all modules on the network are unresponsive or if only the PCM does not communicate.
    - **Recommended practice:** REFER to Symptom Chart in Section 418-00 to diagnose the network outage or no response from the PCM.

Measuring Automotive Circuits

Wiring Pin (Terminal) Fit And The Use Of Rotunda Flex Probes

- To avoid wiring pin (terminal) damage, Rotunda Flex Probes NUD105-R025D or equivalent must be used to connect test equipment or jumper wires to pins (terminals).
- Male to female pin (terminal) fit is critical for correct connection and durability.
    - Pin (terminal) fit may be checked by using the mating pin (terminal) to test for normal separation force (a damaged pin or terminal will have very low separation force from the mating pin or terminal)
    - Correctly checking the separation force of small pins (terminals) may require removal of the connector terminal guide/retainer if it adds drag to the pin (terminal) insertion or removal
- Replace damaged connectors or pins (terminals).
    - Use the Wiring Diagram connector view (cell 150) to identify the correct replacement connector with pigtail.
    - Use the Wire Harness Terminal Repair Guide to identify and order the correct replacement pin and pigtail. Available through Ford Dealers, REFER to FMC dealer website, or REFER to www.fcs.dealerconnection.com/wire .

Checking Power-Providing Circuits

- Measuring a power wire with the intended load disconnected using a DMM will only find open circuits (open fuse or wire).
- **Recommended practice:** Circuits carrying approximately 200-1000 mA* may be loaded with the specified test light SGT27000. Measure circuit voltage with a DMM while the test light is connected and illuminated. A reduction in the voltage present during test-light-loading indicates excessive circuit resistance.
- **Recommended practice:** Circuits carrying more than one ampere* should be loaded with a device requiring similar current (e.g., a headlamp bulb may be effective). A reduction in the voltage present during loading indicates excessive resistance.
- *Circuit current is matched to wire gauge/size; Examples:
    - Conductor sizes of 24 gauge (.5 mm) or smaller are generally used to carry approximately 1 ampere (1000 mA) or less. Use of the test light to load these circuits is appropriate.
    - Conductor sizes of 20 gauge (.8 mm) or larger are generally used to carry approximately 5 amperes (5000 mA) or more. Match the substitute load (measure substitute load current first as necessary) to this current level.

Checking Ground-Providing Circuits

- The best method of checking ground circuits is to measure the circuit voltage drop during component

operation (or attempted operation).
- An ohmmeter may be accurately used if the battery has been disconnected.
- **Recommended practice:** Expect less than 2 ohms for most small diameter (18 gauge and smaller) wires.
- Ohmmeter accuracy is limited to circuits carrying less than approximately 5 amperes (this is due to the fact that very small resistances, undetectable by a DMM , cause significant voltage loss in higher current circuits).
- DMM ohmmeter readings are easily corrupted by the normal voltage present (battery connected) in many ground circuits.
    - **Recommended practice:** Reverse the leads and check for changes in the measurement. Reversing the DMM lead connections should never change the resistance measurement (unless the circuit contains a semi-conductor). Measurement (non-semi-conductor) differences when leads are interchanged at the test points indicate invalid test results. The presence of voltage corrupts the reading, and causes the meter reading to change when the leads are reversed.

Checking Circuit Continuity

- **Recommended practice:** Expect less than 2 ohms of resistance for most wires.
- Ohmmeter low-resistance resolution (approximately 0.1 ohm) limits its use to circuits carrying less than approximately 5 amperes. This is due to the fact that very small resistances, below the resolution of a DMM , cause significant voltage loss in higher current circuits.
- The DMM applies a small amount of voltage to the circuit or component to calculate resistance. As a result, DMM ohmmeters are very sensitive to any level of voltage present. Voltage present in the circuit will corrupt the DMM reading.

Checking For Unintended Continuity (Shorts) To Other Circuits

- A DMM ohmmeter may be used to detect undesired circuit connections to:
    - Ground
    - Other unpowered circuits
- **Recommended practice:** Expect greater than 10,000 ohms of resistance between two separate circuits; the best result is an open circuit DMM ohmmeter indication (no detected resistance).
- Shorts to voltage are checked with a DMM voltmeter
- **Recommended practice:** Turn ignition on (with battery connected) and measure the circuit for any voltage present (none should be present)

Checking Circuits By Back-Probing A Connector

- Back-probing should be a testing method of last resort. It should only be employed where a diagnostic step requires a circuit to be tested under actual operating conditions. Back-probing is a risky testing method due to the uncertainty of the probe connection and the possibility of damaging terminals.
- 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.
    - Use Rotunda Back-Probe Pins POMA6411 to assist in making a good test connection and to prevent connector or terminal damage during back-probing.
- Do not test for the presence of voltage at a single point where zero volts is a possible result (you cannot tell the difference between a bad probe contact and a zero volt result).
- Do not test for continuity/opens (using a DMM ohmmeter) between two points (you cannot tell the difference between bad probe contacts and an open circuit).
- Back-probing may be used where the circuit must be analyzed with the voltage-drop method (if the circuit carries greater than 5 amperes and no other means of testing will definitively eliminate circuit

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resistance as a possible fault). A zero-volt result indicates incorrect test conditions (no current flow) or bad back-probe connections.
- Occasionally, module failure mode behavior will change the operation of a circuit when it is opened for testing. Back-probing is an acceptable remedy for these testing dilemmas.

Circuit Analysis Using Jumper Wires (Creating Substitute Circuits)

- Jumper wires may be employed for circuit analysis.
- **Cautions:**
  - ♦ Always use fused jumper wires - the recommended universal-testing jumper wire fuse is 2-5 amperes; larger fuse ratings should be used only in special circumstances.
  - ♦ Use flex probes or equivalent to prevent connector terminal damage (flex probes are not intended to carry higher currents necessary to operate motors such as a cooling fan or blower motor).
  - ♦ Follow workshop manual testing directions when using jumper wires to avoid component or harness damage due to incorrect jumper connections.
  - ♦ Never repair a circu by adding a new wire in parallel to the old one (overlaying the circuit) without fully understanding what caused the circuit to fail. Always find, examine, and repair the fault to correct the root cause and to repair any adjacent wiring that has been damaged.

Checking Modules

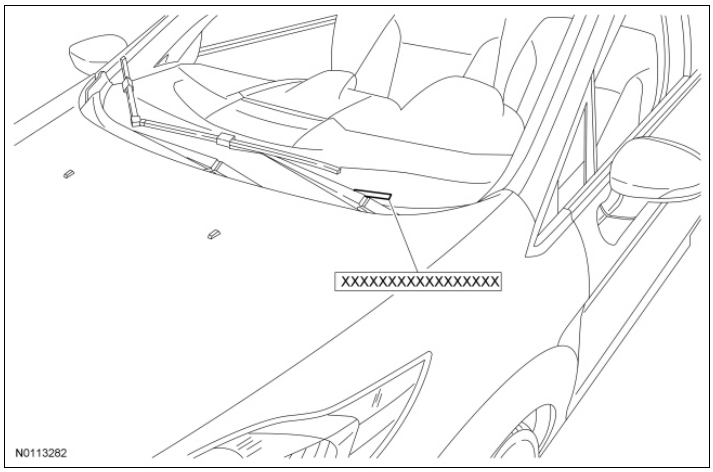
- Generally, module failure rate is very low and therefore replacement modules usually do not resolve the root cause. Incorrect replacement of a module is often the result of inadequate testing.
  - ♦ Understand the correct module function.
  - ♦ Make sure programmable parameters are set correctly for the function in question (see the list in Section 418-01).
  - ♦ Resolve DTCs first - as directed by Diagnostic Routines.
  - ♦ Test all inputs, both hard-wired and networked.
  - ♦ Test outputs (see "Checking module switching circuits" below).
  - ♦ Check applicable TSBs for module software changes (flash programming).
- Checking module switching circuits.
  - ♦ Using the scan tool module-output command function (e.g., IDS Output State Control) to activate components is a fast way to confirm an output is capable of being switched on by the module. Testing that reveals normal module-output function confirms the need to analyze the module inputs.
  - ♦ Don't apply ground or power directly to module-switched components with jumper wires (unless directed by a workshop manual procedure), as the component can be damaged by a direct connecon to ground/power.

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Identification Codes

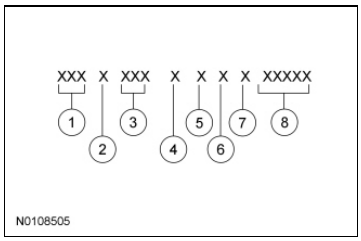
Vehicle Identification Number (VIN)

Vehicle Identification Number (VIN) Locator



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 dash. 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, series, body-type code
4	Engine-type code
5	Computer-generated 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).

- 3FA - Ford Motor Company, Cuatitlian, Mexico, passenger car

Restraint Type

The fourth VIN position is the vehicle restraint type code.

- D - Active safety belts - all positions, driver and front passenger air bags with driver and front passenger side impact air bags
- K - Active safety belts - all positions, no air bags (Mexico only)

Vehicle Line, Series and Body Type

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

- P4A - 4-door sedan - S
- P4B - 4-door sedan - SE
- P4C - 4-door sedan - SEL
- P4E - 5-door hatchback - SE
- P4F - 5-door hatchback - SES

Engine Type

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

- J - 1.6L, in-line 4-cylinder, SIGMA
- K - 1.6L, in-line 4-cylinder, SIGMA (flex-fuel)

Additional engine information can be obtained from the engine tag. Refer to Section 303-01 .

Check Digit

The ninth VIN position is a government-assigned, computer-generated check digit.

Model Year

The tenth VIN position is the model year code.

- B - 2011

Assembly Plant

The eleventh VIN position is the assembly plant code.

- M - Cuautitlan Assembly, Cuautitlan, Mexico

Production Sequence Number

The last 6 VIN positions are a numeric code for the vehicle build sequence. This is also the vehicle serial and warranty number.

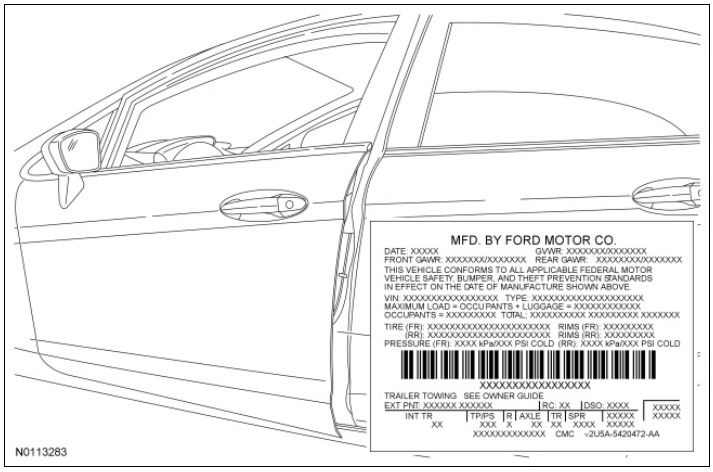
The serial number can also be found on the engine block, transmission and frame.

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- 100001-999999 - Ford Motor Company vehicle

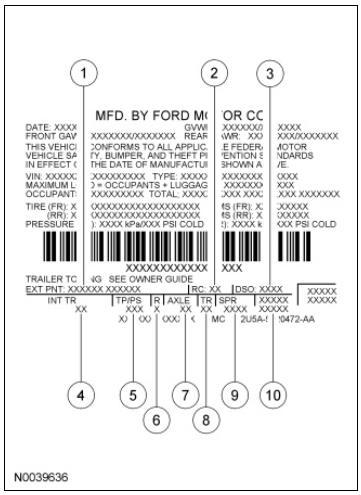
Vehicle Certification (VC) Label

Vehicle Certification (VC) Label Locator



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) and tire information.

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 code
2	Region code
3	Domestic special order code
4	Interior trim code
5	Tape/paint stripe code

6	Radio code
7	Axle code
8	Transmission code
9	Spring code
10	Powertrain calibration code

Paint Code

Paint codes may be listed as a 2-part code. The first set of paint code numbers/letters indicate the vehicle primary body color. The second set of letters/numbers (if applicable) indicate a 2-tone or accent body color. All paint codes are a base coat/clear coat finish.

- L7 - Bright Magenta
- NQ - Yellow Blaze (tri-coat)
- SQ - Lime Squeeze Metallic
- SZ - Blue Flame Metallic
- T9 - Monterrey Gray
- U6 - Red Candy Tint
- UH - Tuxedo Black Metallic
- UX - Ingot Silver Metallic
- YZ - Oxford White

Interior Trim Codes

The interior trim codes are listed as a 2-part code. The first digit listed indicates the seat and fabric style. The second digit listed indicates the interior trim color.

Trim Codes

- C - Greenwich cloth
- D - Crossroad cloth
- L - Soho leather

Interior Trim Color Codes

- B - Black/Black
- C - Black/Cashmere Tan
- L - Charcoal Black/Light Stone
- R - Ebony/Red
- U - Black/Blue

Tape/Paint Stripe Codes

Tape and paint stripe codes do not apply.

Radio Codes

Available radio codes are as follows.

- A - AM/FM stereo with CD player and MP3 enabled
- D - Electronic AM/FM stereo

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Axle Codes

Available axle ratios are as follows.

- GG - 4.07 ratio (automatic transmission)
- MM - 4.07 ratio (manual transmission)

Additional axle information can be obtained from the axle tag. Refer to Section 205-00 .

Transmission Codes

Available transmission type codes are as follows.

- A - 6-speed automatic
- C - 5-speed manual

Additional transmission information can be obtained from the transmission tag. Refer to Section 307-11 or Section 308-00 .

Spring Codes

Spring codes are listed as a 2-part code. The first set of characters identify the front springs. The second set of characters identify the rear springs.

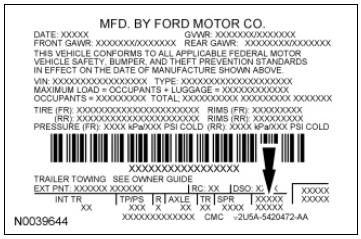
Front Springs

- Base part number - 5310

Rear Springs

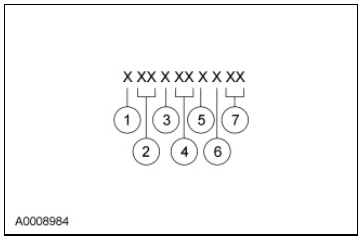
- Base part number - 5560

Powertrain Calibration Information



NOTE: Powertrain calibration information is limited to a maximum of 5 characters per line on the VC label. Because of this, 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 obtained through a scan tool using the most current software revision.



Item	Description
1	Model year (year in which the calibration strategy was first introduced).
2	Vehicle code
3	Transmission code
4	Unique calibrations (designates different hardware to similar vehicles), example: tires or drive ratios
5	Fleet code (describes fleet to which the vehicle belongs), example: 6 - Evaporative Emission (EVAP)
6	Ceification 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

Model Year

- B - 2011

Vehicle Code

- CH - Fiesta

Transmission Code

- A - Automatic transmission
- C - Manual transmission

Unique Calibration

The Emission/Corporate Average Fuel Economy/CO2 Compliance Department is responsible for assigning these calibration numbers. Unique 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 chosen 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 Coding

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

Certification Region

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- 5 - US 50 states
- A - US federal, including altitude, may include Canada and/or Mexico
- B - US California standard, includes US green states
- C - Canada
- D - China
- E - European Community (Austria, Belgium, Denmark, Finland, France, Germany,rlands, Portugal, Spain, Sweden and United Kingdom)
- F - European Extended Community (E-plus Croatia, Czech Republic, Estonia, Hungary, Norway, Poland, Romania, Russian Federation, Slovakia, Slovenia, Switzerland and Yugoslavia)
- G - Gulf Cooperative Council (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates)
- 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 regions)
- V - Vietnam
- X - Rest Of World (ROW)
- Y - Military
- Z - Israel

Revision Level (not printed on label)

- 91-99 - Hardware and certification levels
- 01-04 - Preliminary levels
- 00 - Job 1 production (initial certification)
- 05-09 - Pre-job 1 revisions to calibrations
- 10-89 - Post-job 1 revisions to calibrations
- 0B - Durability test level
- BD - OBD intermediate level (pre-05)

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Jacking and Lifting

⚠ 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.

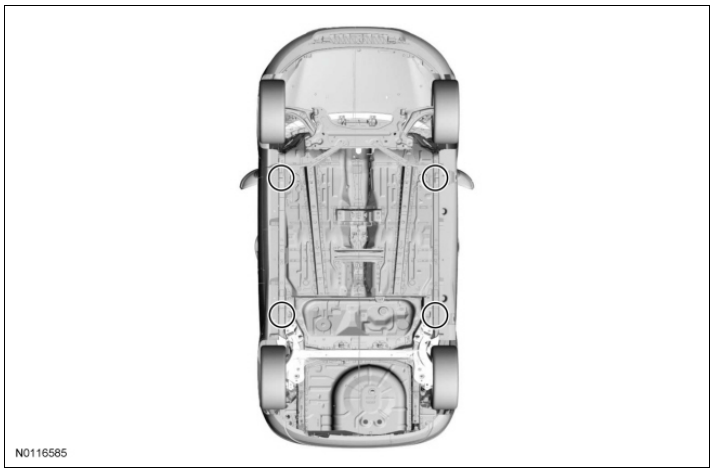
⚠ WARNING: Position the hoist lift arms as shown in the illustration. Incorrect positioning could result in vehicle slipping or falling from the hoist. Failure to follow this instruction may result in serious personal injury.

⚠ 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: **It is not recommended that the vehicle is jacked or lifted on the rear suspension crossmember. If the vehicle must be lifted on the crossmember, make sure that the jack or lift is positioned centrally. Failure to follow these instructions will result in deformation of the closing plate which will weaken the crossmember.**

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 Locations



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Maintenance Schedules - Gasoline Engines

For Maintenance Schedule information, refer to the Scheduled Maintenance Guide chapter in the Owner's Guide.

Also available at:

- www.motorcraftservice.com and select Owner Guides.

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/Buffeting

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.

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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.

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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)

 ST2311-A	Electronic Vibration Analyzer (EVA) 100-F027 (014-00344) or equivalent
 ST2312-A	EngineEAR 107-R2100 or equivalent
 ST2048-A	EngineEAR/ChassisEAR 107-R2102 or equivalent
 ST3025-A	Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix) 257-00018 or equivalent
 ST3108-A	Squeak and Rattle Repair Kit 164-R4900
 ST2314-A	Ultrasonic Leak Detector 134-R0135 or equivalent

Diagnostic Theory

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

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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 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's 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 tfrequencies 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.

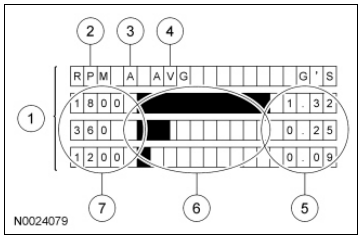
The second is for noise diagnosis. This mode measures noise from 1 or 2 microphones simultaneously. All noise measurements are in decibels (dBs). All frequency bands used for noise measurements are the same as for the vibration measurements, up to 1,000 Hz.

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

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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, oes 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 ChassisEARs 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

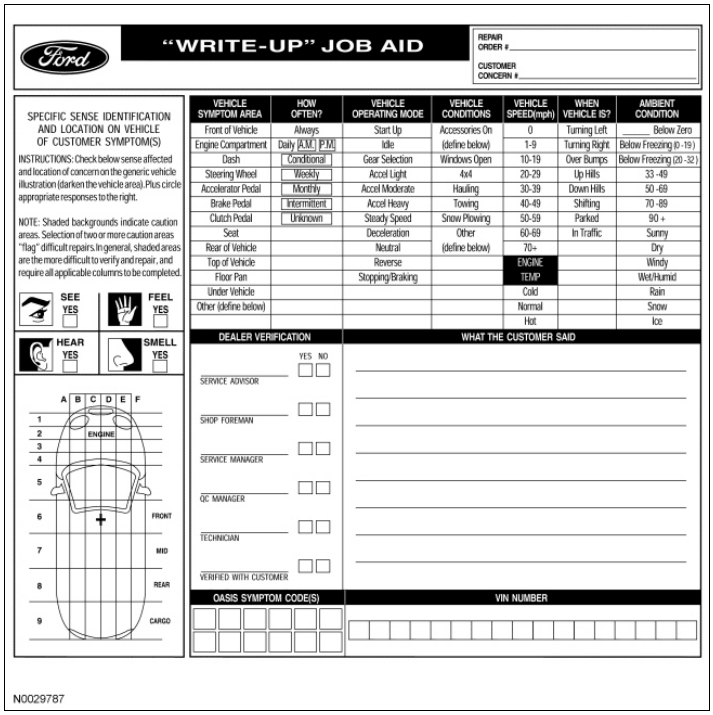
Ultrasonic Leak Detector

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.

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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 vibration/noise. 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 vibration/noise.
    - ♦ 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) 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

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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.

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- Place the vehicle in PARK on Front Wheel Drive (FWD) vehicles with automatic transmissions, or in NEUTRAL for all other vehicles.
- Slowly increase the engine rpm from idle to fuel cutoff or redline. When the symptom occurs, 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 Engine 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 slowly increase and decrease the engine rpm between an idle to approximately 2,000 rpm. When the symptom occurs, 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).
- Slowly increase the engine rpm to where the symptom occurs.

- If the vibration/noise is duplicated when carrying out this test, the belt(s) and accessories are not sources.
- If the vibration/noise 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 vibration/noise 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 vibration/noise by carefully listening. Move around the vehicle while listening to find the general location of the vibration/noise. 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, determine 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, follow the vibration diagnostic path.

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 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

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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; think of Hz as cycles per second. There are 60 seconds in a minute, therefore multiply Hz reading by 60 to get rpm. Conversely, divide rpm 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

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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 performing 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 2.93:1.
- Multiply the tire and wheel frequency of 7 Hz (calculated previously) with the rear axle ratio of 2.93:1. This results in a driveshaft frequency of 21 Hz at a vehicle speed of 64 km/h (40 mph).

The calculated frequency of 21 Hz is the first order driveshaft frequency; the second order frequency of the driveshaft is twice this number, or 42 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 performing 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).

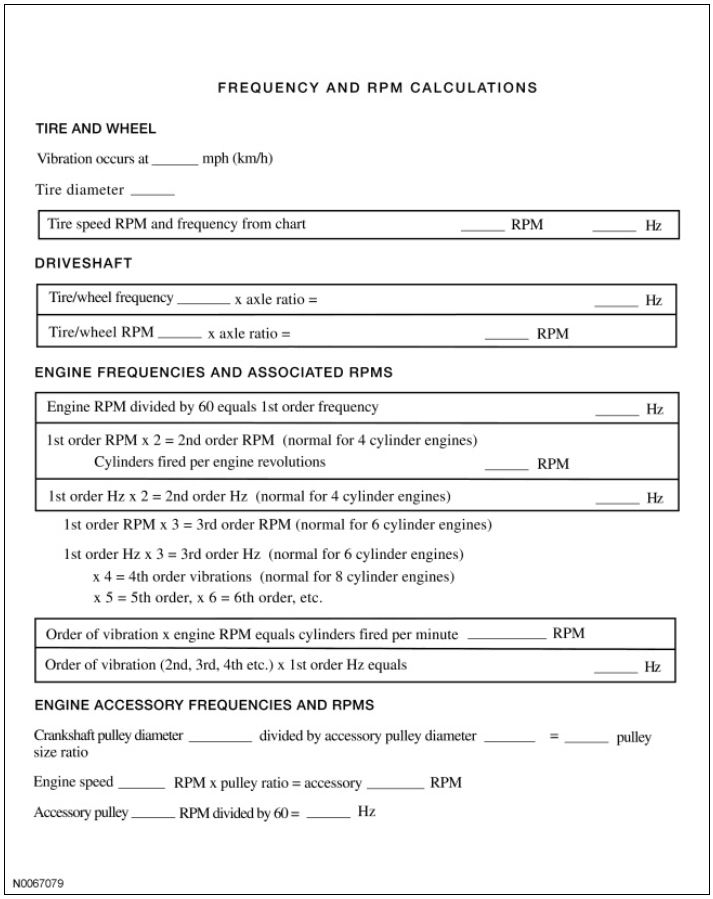
Calculating Engine Firing Frequency

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 performing 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

TIRE AND WHEEL

Vibration occurs at _____ mph (km/h)

Tire diameter _____

Tire speed RPM and frequency from chart	_____ RPM	_____ Hz

DRIVESHAFT

Tire/wheel frequency _____ x axle ratio =		_____ Hz
Tire/wheel RPM _____ x axle ratio =	_____ RPM	

ENGINE FREQUENCIES AND ASSOCIATED RPMS

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

ENGINE ACCESSORY FREQUENCIES AND RPMS

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

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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.

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.

ConditionPossible SourcesAction

- First order driveshaft vibration

- Driveshaft i>
- REFER to Section 205-00 .
- Rear drive axle/differential
- REFER to Section 205-00 .
- Second order driveshaft vibration
- U-joint
- REFER to Section 205-00 .
- Output shaft bushing in transmission/transaxle
- Refer to the appropriate section in Group 307 for the procedure. Refer to the appropriate section in Group 308 for the procedure. GO to the Symptom Chart in the appropriate section.
- Third order driveshaft vibration
- Rear drive axle/differential
- 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/transaxle

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- Refer to the appropriate section in Group 307 for the procedure. Refer to the appropriate section in Group 308 for the procedure. GO to the Symptom Chart in the appropriate section.
- Engine mounts
- REFER to Section 303-00 .
- Transmission/transaxle mounts
- Refer to the appropriate section in Group 307 for the procedure. Refer to the appropriate section in Group 308 for the procedure. GO to the 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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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 /td>	-	-

Insulation

Body insulation is comprised of urethane, Polyvinyl Chloride (PVC), foam and recycled felt. Insulation is used as a sound deadener to reduce exterior road and powertrain noises from the interior of the vehicle. Baffles are located in the bottom of the A-, B- and C-pillars. Mastic insulators are also used as insulation. For information on the location of the mastic insulators, refer to Section 501-35 . Insulation is installed:

- above and below the instrument panel.
- at the cowl side panels.
- over the front and rear floor pan areas.
- over the luggage compartment floor.

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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 spification 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.

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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 incorrectly 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 to HIGH.
  - ♦ Turn the air recirculation to OFF.
  - ♦ 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 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 ticle.
- 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. Drive the vehicle in 4 different directions, with all of 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. Detect the source of the noise by stopping movement of the suspect part by hand or 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.

ConditionPossible SourcesAction

- 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 trim panel installed incorrectly
- REINSTALL the scuff plate trim panel.
- Seal or seal pushpins damaged
- INSTALL a new seal/pushpins.
- Sheet metal joints in door or door opening
- SEAL leaks with sealant.
- Draft/wind noise and water leak around glass run
- Door glass misaligned
- ADJUST door glass.
- Glass run installed incorrectly
- REINSTALL glass run.
- 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.

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- 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
- 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 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

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- 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.
- Draft noise at cowl
- Cowl seal misaligned/damaged
- REALIGN or INSTALL a new seal as necessary.
- Draft/water leak or noise from roof opening panel
- Roof opening panel/components
- REFER to Section 501-17 for diagnosis.
- 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 (body vent)
- Air extractor housing seated incorrectly
- REINSTALL air extractor housing.
- Air extractor housing or flaps damaged

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- 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.
- Draft/wind noise and water leak around liftgate perimeter
- Loose fit seal
- PINCH seal carrier to improve retention on seal flange or INSERT foam in carrier.
- Seal misaligned or installed incorrectly
- REINSTALL seal.
- Seal misaligned or installed incorrectly
- REINSTALL seal.
- Liftgate misaligned
- REALIGN liftgate. CHECK liftgate fit in body opening and ADJUST as necessary.
- Scuff plate misaligned
- REINSTALL scuff plate.
- Seal or seal pushpins damaged
- INSTALL a new seal.

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Torque Specifications

Description	Nm	lb-ft	lb-in
Fender bolts	6	-	53
Hood hinge-to-body bolts	25	18	-
Hood hinge-to-hood nuts	11	-	97
Front bumper-to-radiator support bolts	9	-	80
Radiator support front bracket-to-front bumper bolt	9	-	80
Radiator support upper bolts	25	18	-
Radiator support rear bracket bolts	9	-	80

Hood Alignment

1. **NOTE:** To adjust the hood, the hood latch must be removed.

   Remove the hood latch. For additional information, refer to Section 501-14 .

2. **NOTE:** It is not possible to adjust the rear of the hood to the height of the fender.

   Loosen the 4 hood hinge-to-hood nuts and the 4 hood hinge-to-body bolts until the hood will slightly move.

3. Adjust the hood to align the hood-to-fender gaps. For additional information on body margins, refer to Section 501-35 .

4. Tighten the 4 hood hinge-to-body bolts.
   - Tighten to 25 Nm (18 lb-ft).

5. Tighten the 4 hood hinge-to-hood nuts.
   - Tighten to 11Nm (97 lb-in).

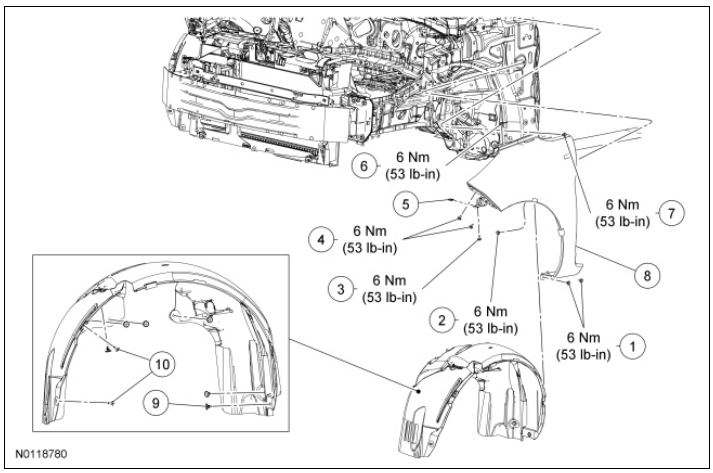
6. **NOTE:** NOTE: The clearances and edge alignment must be correct before the hood latch is installed.

   Install the hood latch. For additional information, refer to Section 501-14 .

   - The hood latch must be installed so that the hood engages without stress and the clearances on the LH and RH sides are not changed.

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Front End Body Panels - Exploded View



Item	Part Number	Description
1	W702704	Front fender lower bolts (2 required)
2	W702704	Front fender inner rear bolt
3	W702704	Front fender front middle bolt
4	W702704	Front fender front outer bolts (2 required)
5	W702704	Front fender front middle nut
6	W702704	Front fender upper front bolt
7	W702704	Front fender upper rear bolt
8	16005/ 16606	Front fender (RH/LH)
9	W715537	Front fender splash shield pin-type retainer (7 required)
10	W706169	Front fender splash shield retainers

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

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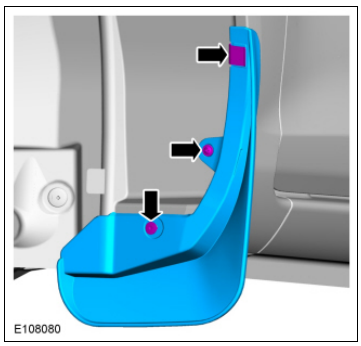
Fender Splash Shield

Removal and Installation

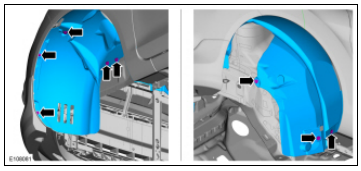
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the wheel and tire. For additional information, refer to Section 204-04 .

3. If equipped, remove the front mudflaps.



4. Remove the 8 front fender splash shield retainers and the front fender splash shield.



5. To install reverse the removal procedure.

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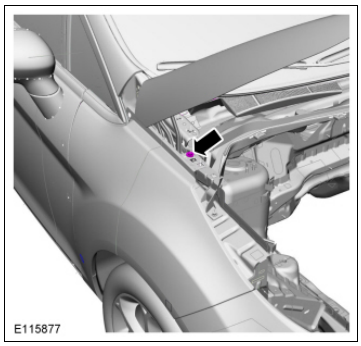
Fender

Removal

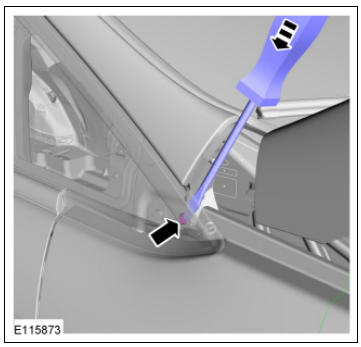
1. With the vehicle in NEUTRAL, position it on the hoist. For additional information, refer to Section 100-02 .

2. Remove the headlamp assembly. For additional information, refer to Section 417-01 .

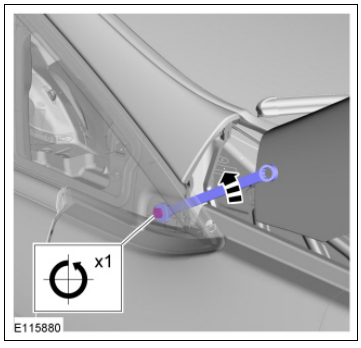
3. Remove the front fender upper bolt.
   - To install, tighten to 6 Nm (53 lb-in).



4. Gently pry out on the fixed front corner glass to gain access to the front fender upper rear bolt.

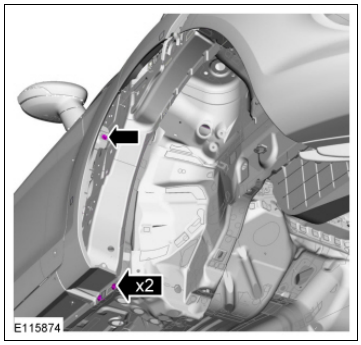


5. Loosen the front fender upper rear bolt.
   - Calculate the correct torque wrench setting for the following torque. Refer to the Torque Wrench Adapter Formulas in the Appendix.
   - To install, tighten to 6 Nm (53 lb-in).

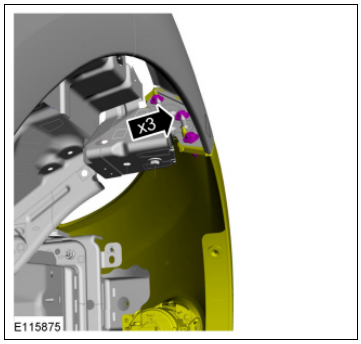


6. Remove the front fender splash shield. For additional information, refer to Fender Splash Shield in this section.

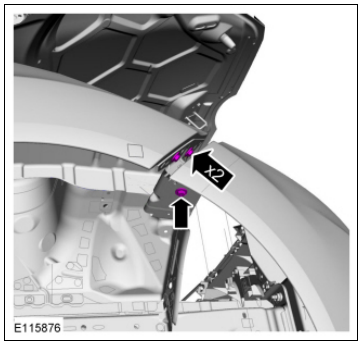
7. Remove the front fender inner rear bolt and the 2 front fender lower bolts.
    - To install, tighten to 6 Nm (53 lb-in).



8. Remove the 3 front bumper cover-to-front bumper cover bracket upper bolts and disconnect the front bumper cover from the front fender.
    - To install, tighten to 8 Nm (71 lb-in).

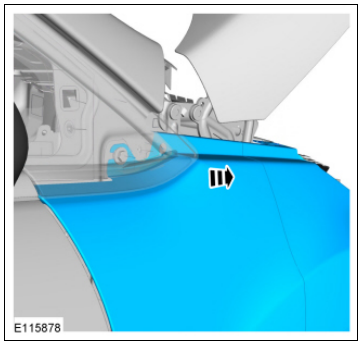


9. Remove the 3 front fender bracket bolts.
    - To install, tighten to 6 Nm (53 lb-in).



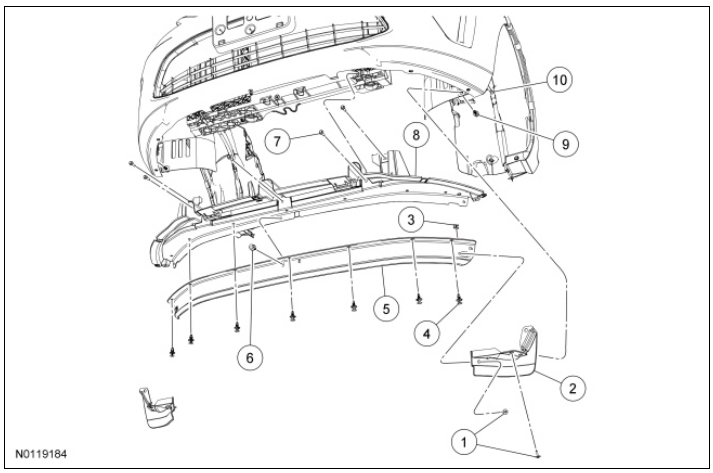
10. Slide the front fender towards the front of the vehicle and remove.

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11. To install, reverse the removal procedure.

Air Deflector - Lower, Radiator

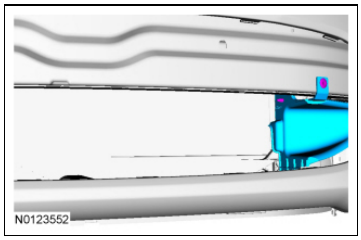


Item	Part Number	Description
1	W710763	Front stone deflector extension bolts (4 required)
2	16184/ 16185	Front stone deflector extension (RH/LH)
3	W704277	Front stone deflector extension nut (2 required)
4	W712196	Front stone deflector-to-lower radiator air deflector pin-type retainer (6 required)
5	17808	Front stone deflector
6	W712196	Front stone deflector-to-lower radiator air deflector pin-type retainer
7	W500214	Lower radiator air deflector bolt (5 required)
8	8327	Lower radiator air deflector
9	-	Front fender splash shield retainer (2 required and serviced as part of the front fender splash shield)
10	W701054	Front fender splash shield pin-type retainer (2 required)

Removal and Installation

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

2. If equipped, remove the 2 scrivet retainers and both front lower side radiator air deflectors.



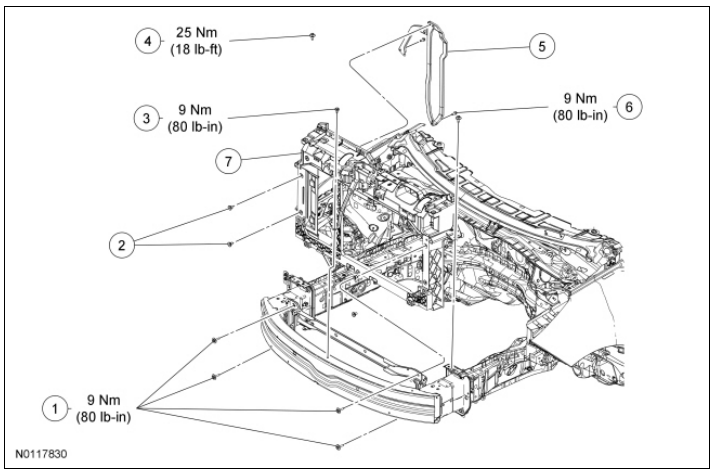
3. Remove the 5 lower radiator air deflector bolts and the lower radiator air deflector.

4. To install, reverse the removal procedure.

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- Transfer parts as necessary.

Radiator Grille Opening Panel Reinforcement



Item	Part Number	Description
1	W701121	Front bumper-to-radiator grille opening panel reinforcement (4 required)
2	-	Radiator grille opening panel reinforcement nut (part of 16138)
3	W702928	Radiator grille opening panel reinforcement support-to-front bumper bolt
4	W713533	Radiator grille opening panel reinforcement upper bolt (2 required)
5	54101A02	Radiator grille opening panel reinforcement rear support bracket
6	W500213	Radiator grille opening panel reinforcement rear support bracket bolt (2 required)
7	16138	Radiator grille opening panel reinforcement

Removal and Installation

1. Remove the radiator lower air deflector. For addition information, refer to Air Deflector - Lower, Radiator in this section.

2. Drain the cooling system. For additional information, refer to Section 303-03 .

3. Remove both headlamp assemblies.
    1. Remove the 3 headlamp assembly bolts.
        - ♦ To install, tighten to 5 Nm (44 lb-in).
    2. Disconnect and remove both headlamp assemblies.

4. Disconnect the hood relecable at the hood latch and position aside.

5. Release the degas bottle hose from the upper right side of the radiator grille opening panel reinforcement.

6. Recover the refrigerant. For additional information, refer to Section 412-00 .

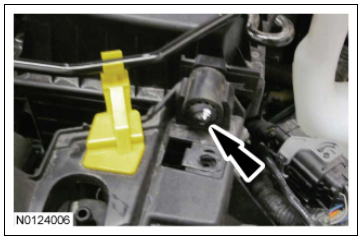
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7. Remove the A/C condenser inlet and outlet line nuts and disconnect both lines.
    - To install, tighten to 8 Nm (71 lb-in).

8. Disconnect the A/C pressure transducer electrical connector and disconnect the wiring harness from the radiator grille opening panel reinforcement.

9. If equipped, remove the 2 scrivets and both side radiator air deflectors.

10. Remove the air cleaner housing-to-radiator grille opening panel reinforcement retainer.



11. Remove the 4 front bumper-to-radiator grille opening panel reinforcement bolts.
    - To install, tighten to 9 Nm (80 lb-in).

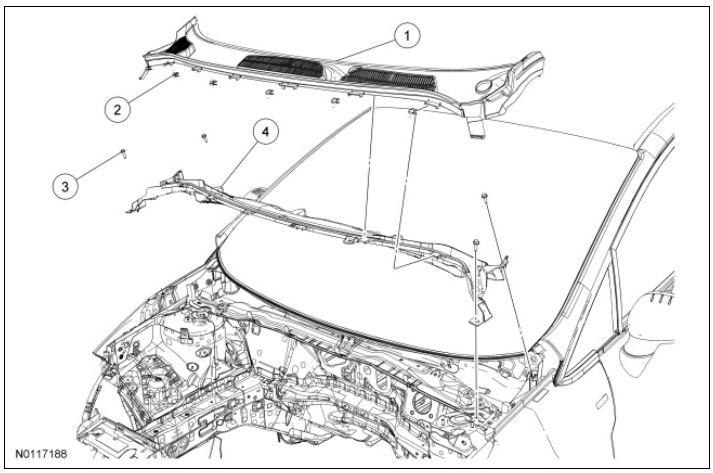
12. Remove the radiator grille opening panel reinforcement support-to-front bumper bolt.
    - To install, tighten to 9 Nm (80 lb-in).

13. Remove the 2 radiator grille opening panel reinforcement upper bolts.
    - To install, tighten to 25 Nm (18 lb-ft).

14. Remove the radiator grille opening panel reinforcement.

15. To install, reverse the removal procedure.
    - Transfer parts as necessary.

Cowl Panel Grille



Item	Part Number	Description
1	018A16	Upper cowl panel
2	14197	Upper cowl panel-to-lower cowl panel clip (6 required)
3	W700133	Lower cowl panel bolt (4 required)
4	016B26	Lower cowl panel

Removal and Installation

Upper Cowl Panel and Lower Cowl Panel

1. Remove the wiper blade arms. For additional information, refer to Section 501-16 .
2. Remove the 6 upper cowl panel-to-lower cowl panel clips.
3. Remove the upper cowl panel.

Lower Cowl Panel

4. Remove the headlamp assemblies. For additional information, refer to Section 417-01 .
5. Remove the 4 lower cowl panel bolts.
6. Release the brake booster vacuum hose from the clip on the lower cowl panel.
7. Remove the lower cowl panel.

All

8. To install, reverse the removal procedure.

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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
Door check arm-to-body bolts	25	18	-
Door check arm-to-door nuts	10	-	89
Door hinge-to-body bolts	24	18	-
Door hinge-to-door bolts	24	18	-
Lifgate hinge bolts	11	-	97
Luggage compartment hinge-to-luggage compartment lid bolts	11	-	97

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Luggage Compartment Lid Alignment

1. Loosen the 4 luggage compartment lid bolts.

2. Adjust the luggage compartment lid as necessary. For additional information on body margins, refer to Section 501-35 .

3. Tighten the 4 luggage compartment lid hinge bolts.
   - Tighten to 11Nm (97 lb-in).

Liftgate Alignment

1. Loosen the 4 liftgate hinge-to-liftgate bolts just enough to permit movement of the liftgate.

2. **NOTE:** The liftgate should be adjusted for even and parallel fit with the liftgate opening and the surrounding panels.

   Adjust the liftgate as necessary. For additional information on body margins, refer to Section 501-35 .

3. Tighten the 4 liftgate hinge-to-liftgate bolts.
   - Tighten to 11 Nm (97 lb-in).

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Striker Adjustment

Material

Item	Specification
Multi-Purpose Grease XG-4 and/or XL-5, or equivalents	ESB-M1C93-B

NOTE: Before adjusting the door latch striker plate, verify that the door can be closed easily and fits tightly.

1. Loosen the door latch striker bolts.

2. Reposition the door latch striker plate from side to side or up and down as necessary.

3. Tighten the door striker plate bolts.
   - Tighten to 25 Nm (18 lb-ft).

4. Check the adjustment of the door. For additional information on body margins, refer to Section 501-35 .
   - Repeat the procedure as necessary.
   - Lubricate the door latch using the specified lubricant.

Door Alignment - Front

Material

Item	Specification
Multi-Purpose Grease XG-4 and/or XL-5, or equivalents	ESB-M1C93-B

All alignments

1. Remove the door latch striker plate.

Front door in and out, up and down alignment

2. Loosen, but do not remove, the front door hinge-to-front door fasteners enough to allow door alignment.

Front door fore, aft and tilt alignment

3. Loosen, but do not remove, the front door hinge-to-body fasteners enough to allow door alignment.

All alignments

4. Adjust the door. For additional information on body margins, refer to Section 501-35 .

5. Tighten the door fasteners.
   - Tighten the front door hinge-to-front door fasteners to 24 Nm (18 lb-ft).
   - Tighten the front door hinge-to-body fasteners to 25 Nm (18 lb-ft).

6. Install and adjust the door striker as necessary. For additional information, refer to Striker Adjustment in this section.
   - Lubricate the door latch using the specified lubricant.

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Door Alignment - Rear

Material

Item	Specification
Multi-Purpose Grease XG-4 and/or XL-5, or equivalents	ESB-M1C93-B

All alignments

1. Remove the door latch striker plate.

Rear door in and out, up and down alignment

2. Loosen, but do not remove, the rear door hinge-to-door fasteners enough to allow door alignment.

Front door fore, aft and tilt alignment

3. Loosen, but do not remove, the rear door hinge-to-body fasteners enough to allow door alignment.

All alignments

4. Adjust the door. For additional information on body margins, refer to Section 501-35 .

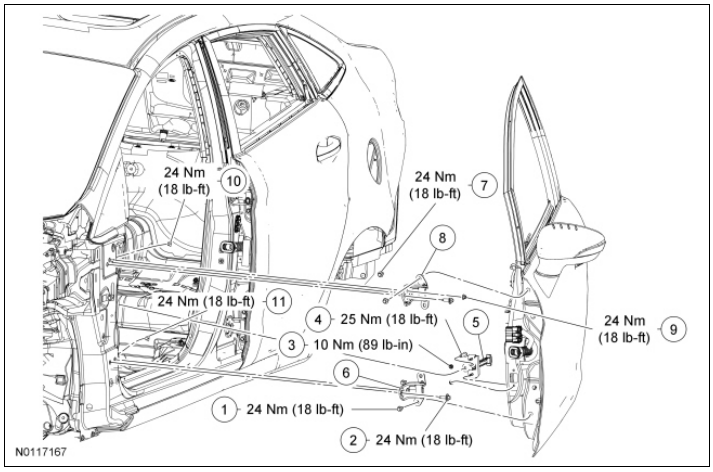
5. Tighten the door fasteners.
   - Tighten the rear door hinge-to-door fasteners to 24Nm (18 lb-ft).
   - Tighten the rear door hinge-to-body fasteners 25 Nm (18 lb-ft).

6. Install and adjust the door striker as necessary. For additional information, refer to Striker Adjustment in this section. ul type="disc">
7. Lubricate the door latch using the specified lubricant.

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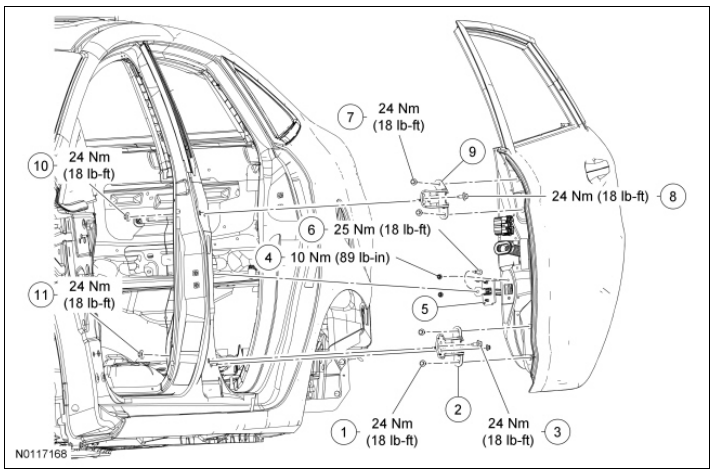
Door

Front Door



Item	Part Number	Description
1	W713332	Front door lower hing-to-door bolt (4 required)
2	W711806	Front door lower hinge-to-body bolt (2 required)
3	W520101	Front door check nut (4 required)
4	W713778	Front door check bolt (2 required)
5	23504	Front door check
6	22810/ 22811	Front door lower hinge (RH/LH)
7	W713332	Front door upper hinge-to-door bolt (4 required)
8	22810/ 22811	Front door upper hinge (RH/LH)
9	W711806	Front door upper hinge-to-body bolt (2 required)
10	W709923	Front door upper hinge nut (2 required)
11	W709923	Front door lower hing nut (2 required)

Rear Door



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Item	Part Number	Description
1	W713332	Rear door lower hinge-to-door bolt (4 required)
2	26810/ 26811	Rear door lower hinge (RH/LH)
3	W702368	Rear door lower hinge-to-body bolt (2 required)
4	W520101	Rear door check nut (4 required)
5	27204	Rear door check
6	W713778	Rear door check bolt (2 required)
7	W713332	Rear door upper hinge-to-door bolt (4 required)
8	W702368	Rear door upper hinge-to-body bolt (2 required)
9	26800/ 26801	Rear door upper hinge (RH/LH)
10	W709923	Rear door upper hinge nut (2 required)
11	W709923	Rear door lower hinge nut (2 required)

Removal and Installation

1. Disconnect the door bulk head connector at the body.
    1. Carefully pull the rubber grommet around the bulk head connector back away from the body to gain access to the 3 clips on the bulk head connector.
    2. Release the upper clip and the 2 lower clips and pull the door bulk head connector from the body.
    3. Disconnect the electrical connectors from the door bulk head connector.

2. Remove the door check arm-to-body bolt.
    - To install, tighten to 26 Nm (19 lb-in).

3. Remove the 2 upper hinge-to-door bolts.
    - To install, tighten to 24 Nm (18 lb-ft).

4. **NOTE:** The aid of an assistant is required to hold the door up while removing the lower hinge-to-door bolts.

   Remove the 2 lower hinge-to-door bolts.

    - To install, tighten to 24 Nm (18 lb-ft).

5. To install, reverse the removal procedure.
    - If necessary, adjust the door. For additional information, refer to Door Alignment - Front or Door Alignment - Rear in this section.

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Door Check Arm

Removal and Installation

NOTE: Front and rear door check arms are removed in the same manner. For additional information on location, refer to the exploded view in Door in this section.

1. Remove the door check arm-to-body bolt.
   - To install, tighten to 26 Nm (19 lb-ft).

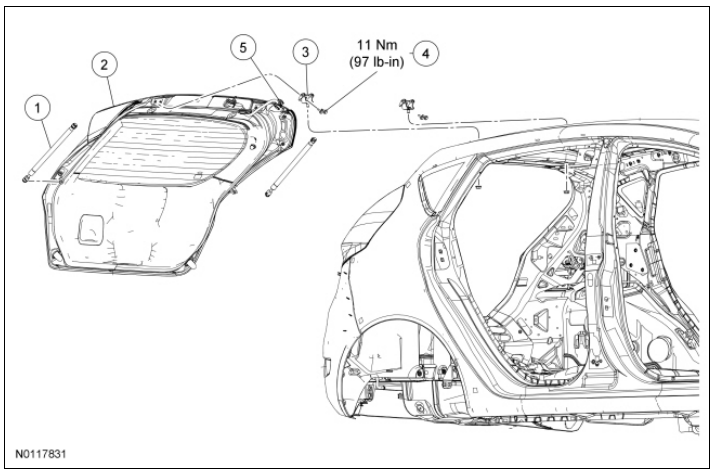
2. Remove the 2 door check arm-to-door nuts.
   - To install, tighten to 10 Nm (89 lb-in).

3. Remove the door speaker. For additional information, refer to Section 415-00 .

4. Remove the front door check arm.

5. To install, reverse the removal procedure.

Liftgate



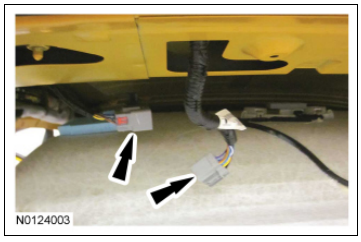
Item	Part Number	Description
1	406A10	Rear liftgate shock (RH/LH)
2	40110	Rear liftgate
3	42900	Rear liftgate hinge (RH/LH)
4	W702434	Rear liftgate hinge bolt (4 required)
5	-	Liftgate electrical connector (part of 14B562A)

1. Remove both upper B-pillar trim panels. For additional information, refer to Section 501-05 .

2. Remove both upper C-pillar trim panels. For additional information, refer to Section 501-05 .

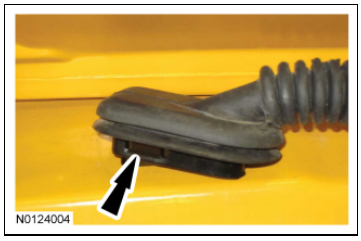
3. Gently drop down the headliner in the rear to access the liftgate bulkhead electrical connector and the rear washer hose.
    1. Remove the 2 rear headliner pin-type retainers.
    2. Release the headliner from the liftgate weather strip and gently let drop down.

4. Disconnect the liftgate bulkhead connector located under LH rear of headliner.



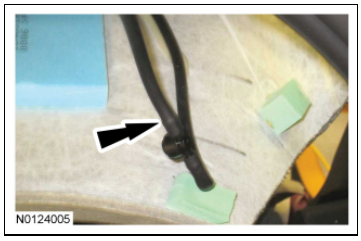
5. Release the wiring harness locator and position the harness outside of the vehicle.

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6. ***NOTICE:*** **Plug washer hose after disconnecting. Failure to do so will result in damage to headliner due to fluid leakage.**

   Disconnect the rear washer hose located under the right rear of headliner.



7. Release the washer hose grommet and position outside of the vehicle.

8. With the help of an assistant, disconnect both liftgate shocks at the liftgate.

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

   With the help of an assistant, mark the position of each hinge with a wax pencil or suitable non staining marker and remove the 4 liftgate hinge-to-liftgate bolts.

   - To install, tighten to 11 Nm (97 lb-in).

10. To install, reverse the removal procedure.
    - If necessary, adjust the liftgate. For additional information, refer to Liftgate Alignment in this section.

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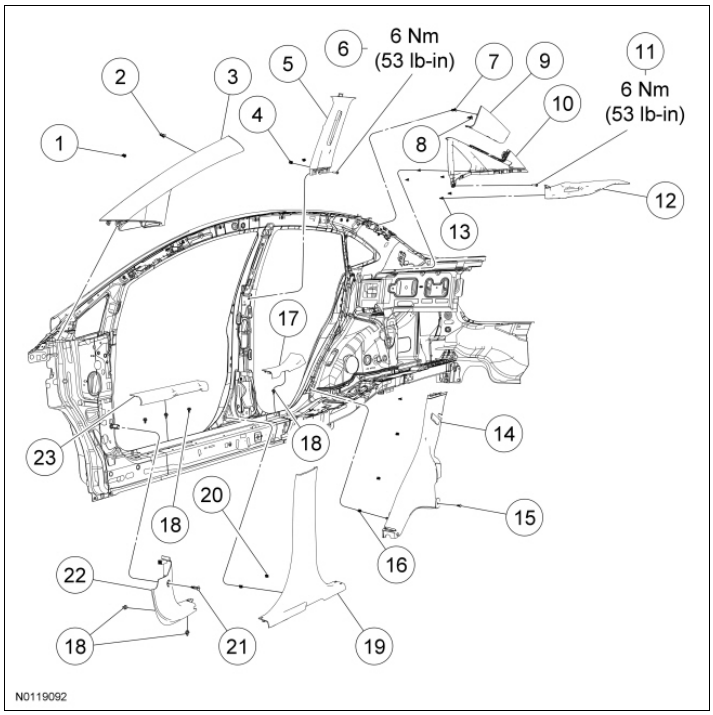
Torque Specifications

Description	Nm	lb-ft	lb-in
Front safety belt D-ring bolt	40	30	-
Rear door pull handle screw	3	-	27
Rear safety belt lower anchor bolt	48	35	-
Upper B-pillar trim panel screw	6	-	53
Upper C-pillar trim panel screw - 4 door sedan	6	-	53

Interior Trim - Exploded View

4 Door Sedan

NOTE: RH side shown, LH side similar.



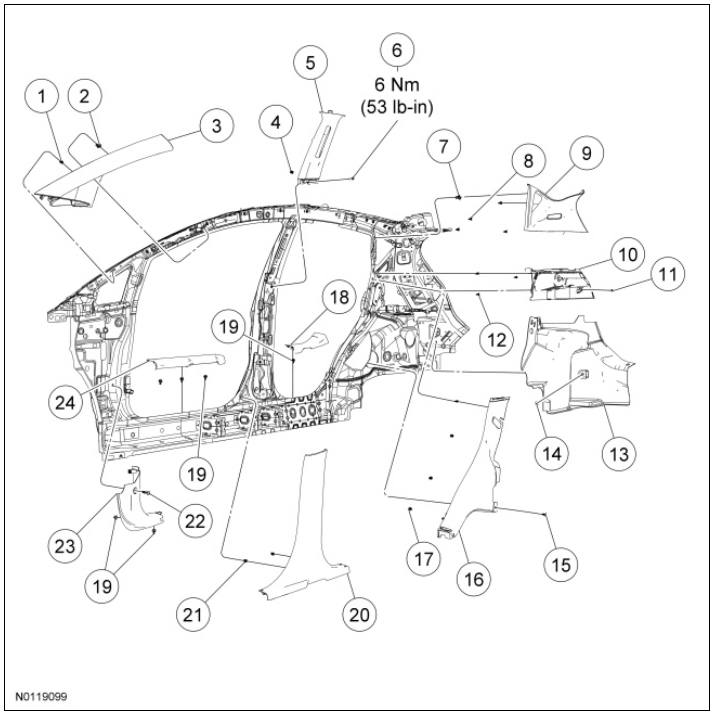
Item	Part Number	Description
1	W713688	A-pillar trim panel retaining clip
2	W715667	A-pillar trim panel 2-stage high-retention retaining clip
3	03598 (RH)/ 03599 (LH)	A-pillar trim panel
4	W713688	B-pillar upper trim panel retaining clip (2 required)
5	24356(RH)/ 24357 (LH)	B-pillar upper trim panel
6	W712518	B-pillar upper trim panel bolt
7	W715667	C-pillar upper trim panel 2-stage high-retention retaining clip
8	W713688	C-pillar upper trim panel retaining clip (4 required)

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9	-	C-pillar upper trim panel cover (part of 31004 (RH)/ 31005 (LH))			
10	31004 (RH)/ 31005 (LH)	C-pillar upper trim panel			
11	W712518	C-pillar upper trim panel bolt			
12	46808 (RH) / 46809 (LH)	Parcel shelf upper trim panel	13	W710338	Retaining clip (5 required) (2 required)
14	31012 (RH) / 31013 (LH)	C-pillar lower trim panel			
15	W703198	Pushpin			
16	W710338	C-pillar lower trim panel retaining clip (4 required)			
17	13288 (RH) / 13289 (LH)	Rear scuff plate			
18	W714848	Pushpin with foam seal (6 required)			
19	24346 (RH) / 24347 (LH)	B-pillar lower trim panel			
20	W713688	B-pillar lower trim panel retaining clip (2 required)			
21	-	Cowl side trim panel retainer pin (part of 02344 (RH) / 02345 (LH))			
22	02344 (RH) / 02345 (LH)	Cowl side trim panel			
23	13208 (RH) / 13209 (LH)	Front scuff plate			

5 Door Hatchback

NOTE: LH side shown, RH side similar.



Item	Part Number	Description
1	03598 (RH)/ 03599 (LH)	A-pillar trim panel
2	W713688	A-pillar trim panel retaining clip
3	W5667	A-pillar trim panel 2-stage high-retention retaining clip
4	W713688	B-pillar upper trim panel retaining clip (2 required)
5	24356(RH)/ 24357 (LH)	B-pillar upper trim panel
6	W712518	B-pillar upper trim panel bolt
7	W715667	C-pillar upper trim panel 2-stage high-retention retaining clip
8	W710338	C-pillar upper trim panel retaining clip (4 required)
9	31010 (RH) / 31011 (LH)	C-pillar upper trim panel
10	46808 (RH) / 46809 (LH)	Cargo cover support panel
11	W701303	Cargo cover support panel screw
12	W713688	Cargo cover support panel retaining clip
13	31148 (RH) / 31149 (LH)	Quarter trim panel
14	W701380	Pushpin
15	31012 (RH) / 31013 (LH)	C-pillar lower trim panel
16	W703198	Pushpin
17	W710338	C-pillar lower trim panel retaining clip (4 required)
18	13228 (RH) / 13229 (LH)	Rear scuff plate
19	W714848	Pushpin with foam seal (6 required)
20	24346 (RH) / 24347 (LH)	B-pillar lower trim panel
21	W713688	

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		B-pillar lower trim panel retaining clip (2 required)
22	-	Cowl side trim panel retainer pin (parof 02344 (RH) / 02345 (LH))
23	02344 (RH) / 02345 (LH)	Cowl side trim panel
24	13208 (RH) / 13209 (LH)	Front scuff plate

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

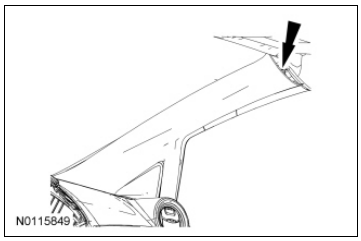
A-Pillar Trim Panel

Removal and Installation

NOTICE: **To avoid damage to the A-pillar trim panel, remove any retaining clips from the body and attach them to the A-pillar trim panel before installing.**

1. Position the door opening weatherstrip aside.

2. Gently pull the upper A-pillar trim panel toward the center of the vehicle to release the A-pillar trim panel retaining clips.



3. To install, reverse the removal procedure.

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B-Pillar Trim Panel

Removal and Installation

Lower and upper

1. Position the front and rear weatherstrips aside.
2. Remove the front scuff plate trim panel. For additional information, refer to Scuff Plate Trim Panel - Front in this section.
3. Remove the rear scuff plate trim panel. For additional information, refer to Scuff Plate Trim Panel - Rear in this section.
4. Position the seats in the full forward position.
5. Gently pull the B-pillar lower trim panel toward the center of the vehicle to release the 2 B-pillar lower trim panel retaining clips.
6. ***NOTICE:*** **To avoid damage to the B-pillar lower trim panel, remove any retaining clips from the body and attach them to the B-pillar lower trim panel before installing.**

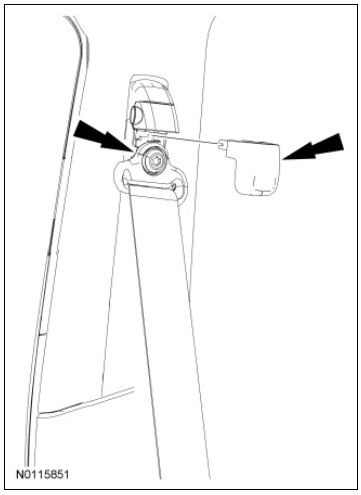
   Remove the B-pillar lower trim panel.

Upper

7. **NOTE:** Inspect the safety belt D-ring cover for damage and replace D-ring cover if damaged.

   Remove the bolt cover and safety belt D-ring bolt and position the safety belt aside.

   1. To install, tighten to 40 Nm (30 lb-ft).



8. Remove the B-pillar upper trim panel bolt.
9. Remove the B-pillar upper trim panel.

- Pull the B-pillar upper trim panel toward the center of the vehicle to release the 2 B-pillar upper trim panel retaining clips.

10. ***NOTICE*** **To avoid damage to the B-pillar upper trim panel, remove any retaining clips from the body and attach them to the B-pillar upper trim panel before installing.**

    To install, reverse the removal procedure.

    - To install, align the trim panel retaining clips to the retaining clip holes in the body.

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C-Pillar Trim Panel - 4-Door Sedan

Removal and Installation

Upper

1. Position the rear seat backrest down.

Lower and upper

2. Position the rear door opening weatherstrip aside.

3. Gently pull the parcel shelf upper trim panel toward the center of the vehicle to release the 4 parcel shelf upper trim panel retaining clips and position the parcel shelf upper trim panel aside.

Upper

4. Gently pull the C-pillar upper trim panel cover toward the center of the vehicle to release the 4 C-pillar upper trim panel cover retaining clips.
   - Remove the C-pillar upper trim panel cover.

5. Gently pull the C-pillar lower trim panel toward the center of the vehicle to release the 3 C-pillar upper retaining clips.

6. Remove the C-pillar upper trim panel screw.
   - To install, tighten the screw to 6 Nm (53 lb-In).

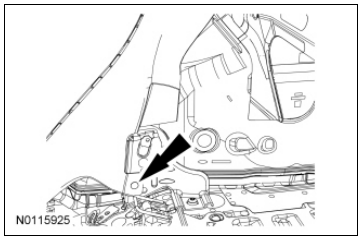
7. Remove the C-pillar upper trim panel.
   - Pull the C-pillar upper trim panel toward the center of the vehicle to release the 4 C-pillar upper trim panel retaining clips.

Lower

8. Remove the rear seat cushion. For additional information, refer to Section 501-10 .

9. Remove the rear door scuff plate.

10. Remove the C-pillar lower trim panel pushpin.
    - L the rear seat back as necessary for access to pushpin.



11. Gently pull the C-pillar lower trim panel toward the center of the vehicle to release the 4 C-pillar upper retaining clips and remove the C-pillar lower trim panel.

Lower and upper

12. ***NOTICE:*** **To avoid damage to the trim panels, remove any retaining clips from the body and attach them to the trim panels before installing.**

    To install, reverse the removal procedure.

    - To install, align the trim panel retaining clips to the retaining clip holes in the body.

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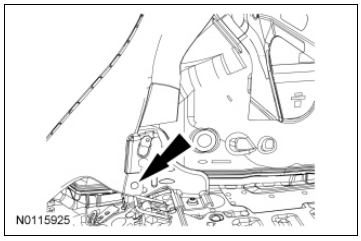
C-Pillar Trim Panel - 5-Door Hatchback

Upper and lower

1. Position the rear door opening weatherstrip aside.

2. Remove the rear seat cushion. For additional information, refer to Section 501-10 .

3. Remove the C-pillar lower trim panel pushpin.
   - Lower the rear seat back as necessary for access to pushpin.



4. Remove the rear door scuff plate.

5. Gently pull the C-pillar lower trim panel toward the center of the vehicle to release the 4 C-pillar lower retaining clips.

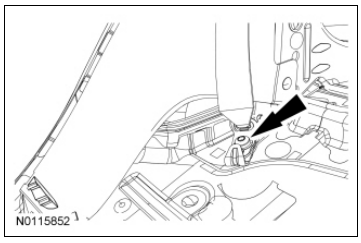
6. *NOTICE:* **To avoid damage to the C-pillar lower trim panel, remove any retaining clips from the body and attach them to the C-pillar lower trim panel before installing.**

   Remove the C-pillar lower trim panel.

Upper

NOTE: The rear seat is removed for clarity.

7. Remove the safety belt anchor bolt.
   - To install, tighten to 48 Nm (35 lb-ft).



8. Remove the C-pillar upper trim panel.
   - Pull the C-pillar upper trim panel toward the center of the vehicle to release the 5 C-pillar upper trim panel retaining clips.
   - Route the shoulder safety belt through the C-pillar upper trim panel.

Upper and lower

9. ***NOTICE:*** **To avoid damage to the C-pillar lower trim panel, remove any retaining clips from the body and attach them to the C-pillar lower trim panel before installing.**

   To install, reverse the removal procedure.

   - To install, align the trim panel retaining clips to the retaining clip holes in the body.

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Quarter Trim Panel - 5-Door Hatchback

Removal and Installation

1. Remove the C-pillar upper and lower trim panel. For additional information, refer to C-Pillar Trim Panel - 5-Door Hatchback in this section.

2. ***NOTICE:*** **To avoid damage to the rear hatch scuff plate trim panel, remove any retaining clips from the body and attach them to the rear hatch scuff plate trim panel before installing.**

   Remove the rear hatch scuff plate trim panel.

   - Remove the 2 pushpin retainers.
   - Pull the rear hatch scuff plate trim panel upwards to release the retaining clips.
   - To install, align the rear hatch scuff plate trim panel retaining clips to the holes in the body.

3. Position the rear hatch weatherstrip aside.

4. Remove the rear package tray trim panel.

5. Remove the cargo cover support panel screw.

6. Gently pull the cargo cover support panel toward the center of the vehicle to release the 3 cargo center support panel retaining clips.

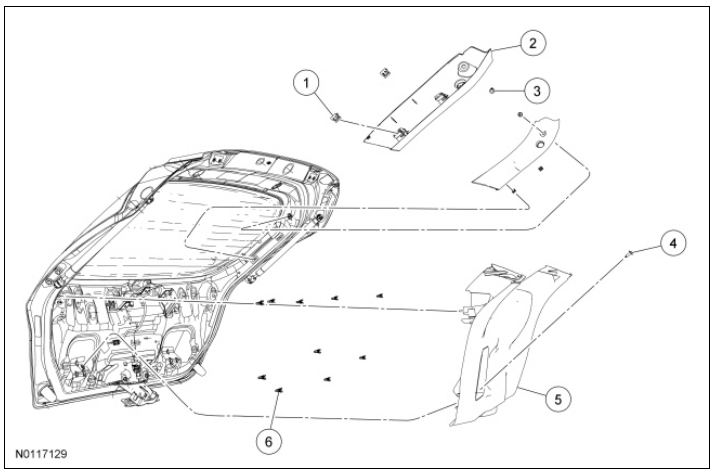
7. Remove the cargo cover support panel.
   - Disconnect the cargo panel light.

8. Remove the pushpin retainer.

9. Remove the quarter trim panel.

10. To install, reverse the removal procedure.

Liftgate Trim Panel



Item	Part Number	Description
1	W712474	Upper liftgate trim panel retaining clip (4 required)
2	42906 (RH) / 42907 (LH)	Upper liftgate trim panel
3	W700426	Upper liftgate trim panel screw (2 required)
4	W700426	Lower liftgate trim panel screw
5	46404	Lower liftgate trim panel
6	W712474	Lower liftgate trim panel retaining clip (10 required)

Upper liftgate trim panel

1. Remove the upper liftgate trim panel retaining screw.

2. Remove the upper liftgate trim panel.
   - Pull the upper liftgate trim panel toward the center of the vehicle and release the 2 upper liftgate trim panel retaining clips.

3. ***NOTICE:*** **To avoid damage to the upper liftgate trim panel, remove any retaining clips from the body and attach them to the upper liftgate trim panel before installing.**

   To install, reverse the removal procedure.

   - To install, align the upper liftgate trim panel retaining clips to the retaining clip holes in the body

Lower liftgate trim panel

4. Remove the lower liftgate trim panel.
   - Remove the lower liftgate trim panel retaining screw.
   - Pull the lower liftgate trim panel toward the front of the vehicle and release the 10 lower liftgate trim panel retaining clips.

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5. ***NOTICE:*** **To avoid damage to the lower liftgate trim panel, remove any retaining clips from the body and attach them to the lower liftgate trim panel before installing.**

   To install, reverse the removal procedure.

   - To install, align the lower liftgate trim panel retaining clips to the retaining clip holes in the body

Scuff Plate Trim Panel - Front

NOTICE: **To avoid damage to the front scuff plate trim panel, remove any pushpins from the body and attach them to the front scuff plate trim panel before installing.**

1. Pull the front scuff plate trim panel upwards to release the pushpins. For additional information on the pushpin location, refer to Interior Trim - Exploded View in this section.
    - To install, align the trim panel pushpins to the pushpin holes in the body.

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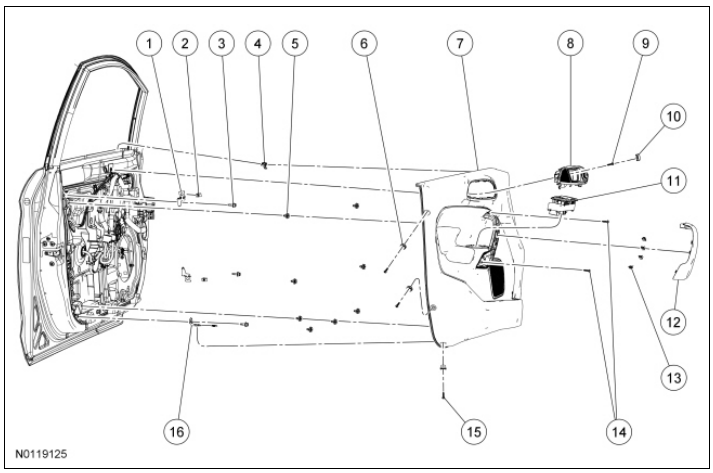
Scuff Plate Trim Panel - Rear

Removal and Installation

NOTICE: **To avoid damage to the rear scuff plate trim panel, remove any pushpins from the body and attach them to the rear scuff plate trim panel before installing.**

1. Pull the rear scuff plate trim panel upwards to release the pushpins. For additional information on the pushpin location, refer to Interior Trim - Exploded View in this section.
    - To install, align the trim panel pushpins to the pushpin holes in the body.

Door Trim Panel - Front



Item	Part Number	Description
1	23834 RH/ 23835 LH	Front door panel bracket
2	W707291	Front door panel bracket nut (3 required)
3	W709931	Front door module bolt (3 required)
4	W790227	Front door panel clip
5	-	Pushpin (8 required)
6	219B00	Grommet (3 required)
7	23942 RH/23943 LH	Front door trim panel
8	22600 (RH)/22601 (LH)	Front door latch inside handle assembly
9	4605B01	Front door latch inside handle assembly screw
10	W10A02	Door latch inside handle assembly screw cover
11	14529 (RH)/14A132 (LH)	Window switch assembly
12	24184 (RH) / 24185 (LH)	Grab handle cover
13	-	Grab handle cover S-clips (4 required)
14	W719311	Door pull handle screw (2 required)
15	W710836	Front door trimcrew (3 required)
16	23834 RH/ 23835 LH	Front door panel bracket (2 required)

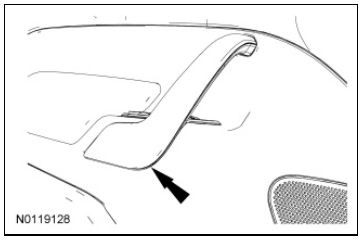
Removal and Installation

All vehicles

1. ***NOTICE:*** **To avoid damage to the grab handle cover, remove any grab handle cover S-clips from the front door trim panel and attach them to the grab handle cover before installing.**

   Using a suitable tool, pry from the lower corner and remove the grab handle cover.

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2. Remove the 2 door pull handle screws.

3. Remove the screw cover, screw and remove the front door latch inside handle assembly.
    - Disconnect the door latch cable.

Manual windows

4. Using a suitable tool, pry the window regulator handle and remove the window regulator handle.
    - When installing the window regulator handle, fully close the window and install handle in the 6 o'clock position.

All vehicles

5. Remove the 3 front door trim panel screws.

6. ***NOTICE:*** **To avoid damage to the front door trim panel, remove any pushpins from the front door module and attach them to the front door trim panel before installing.**

   Working from the bottom of the front door trim panel, Disengage the 8 pushpins from the door.

    - Using a pushpin removal tool, pull the front door trim panel outward to release the retaining pushpins.

7. Lift the front door trim panel and remove the front door trim panel.

Power Windows

8. Disconnect the power window switch.

All Vehicles

9. If required, remove the front door panel clip from the front door trim panel.

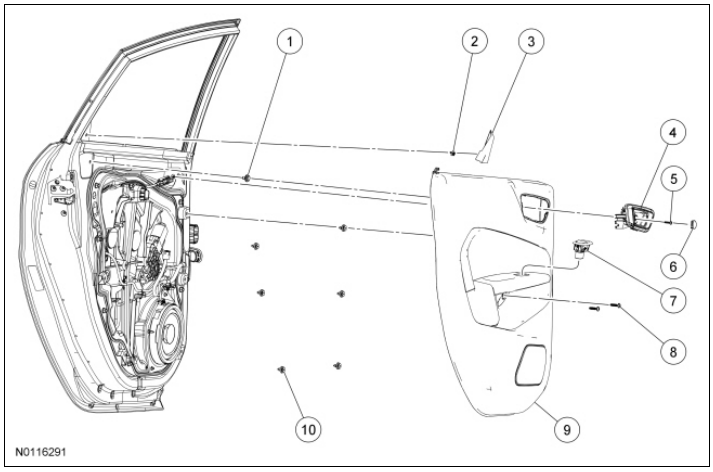
10. To install, reverse the removal procedure.

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Door Trim Panel - Rear

NOTE: Click here or refer to the on-line Workshop Manual to view this illustration as an interactive exploded view, requires Adobe® Acrobat® 8.0 or higher.

NOTE: LH side shown, RH side similar.



Item	Part Number	Description
1	W713651	Pushpin
2	W709011	Pushpin
3	254K06 RH/ 254K07 LH	Rear door sail panel (5 door hatchback)
3	254K05 RH/ 254K06 LH	Rear door sail panel (4 door sedan)
4	22600 RH/ 22601 LH	Rear door latch inside handle assembly
5	05B01	Rear door latch inside handle assembly screw
6	W10A02	Screw cover
7	14529	Rear window control switch
8	W713911	Rear door trim panel screw (2 required)
9	27406 RH7 LH	Rear door trim panel
10	-	Pushpin (6 required)

All vehicles

1. ***NOTICE:*** **To avoid damage to the rear door sail panel, remove the pushpin from the rear door and attach them to the rear door sail panel before installing.**

   Remove the rear door sail panel.

2. Remove the door handle screw cover and screw.

3. Remove the 2 rear door trim panel screws.

Manual windows

4. Use a suitable tool to pry the window regulator handle to remove the window regulator handle.
    - When installing the window regulator handle, fully close the window and install handle in the 6 o'clock position.

Power windows

5. Remove the window control switch. For additional information, refer to Section 501-11 .

All vehicles

6. ***NOTICE:*** **To avoid damage to the rear door trim panel, remove any pushpins from the rear door module and attach them to the rear door trim panel before installing.**

   Working from the bottom of the rear door trim panel, disengage the 7 pushpins from the door.

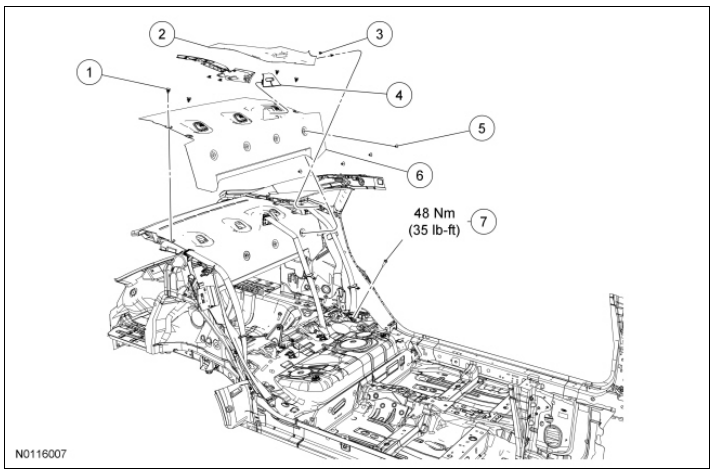
7. Pull the rear door trim panel away from the door to release the rear door trim panel retaining clips and rear door trim panel.
    - Disconnect the door latch cable.

8. To install, reverse the removal procedure.
    - To install, align the tripanel pushpins to the pushpin holes in the rear door module.

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Parcel Shelf - 4-Door Sedan



Item	Part Number	Description
1	F46668	Retaining clip (4 required)
2	46808 (RH) / 46809 (LH)	Parcel shelf upper trim panel
3	W710338	Parcel shelf side clip (4 required)
4	611B90	Center safety belt bezel
5	W700673	Pin-type retainers (4 required)
6	46668A	Parcel shelf trim panel
7	W703708	Safety belt anchor bolt (3 required)

Removal and Installation

1. Remove the rear seat cushion. For additional information, refer to Section 501-10 .

2. Remove the 3 safety belt anchor bolts.
   - To install, tighten to 48 Nm (35 lb-ft).

3. Remove the RH and LH parcel shelf upper trim panels.
   - Gently pull the parcel shelf upprim panel toward the center of the vehicle to release the 4 parcel shelf upper trim panel retaining clips.
   - Pull the RH and LH safety belts through the parcel shelf upper trim panel openings.
   - Remove the parcel shelf upper trim panel.

4. Remove the RH and LH C-pillar trim panels. For additional information, refer to C-Pillar Trim Panel - 4-Door Sedan in this section.

5. Remove the safety belt retractor bezel.
   - Pull the safety belt retractor bezel toward the front of the vehicle.
   - Remove the safety belt retractor bezel from the safety belt.

6. Remove the 4 parcel shelf pin-type retainers.

7. Remove the parcel shelf.
   - Pull the parcel shelf toward the front of the vehicle.
   - Pull the center safety belt rearward through the center retractor opening.

8. ***NOTICE:*** **To avoid damage to the parcel shelf upper trim panel, remove any retaining clips from the body and attach them to the parcel shelf upper trim panel before installing.**

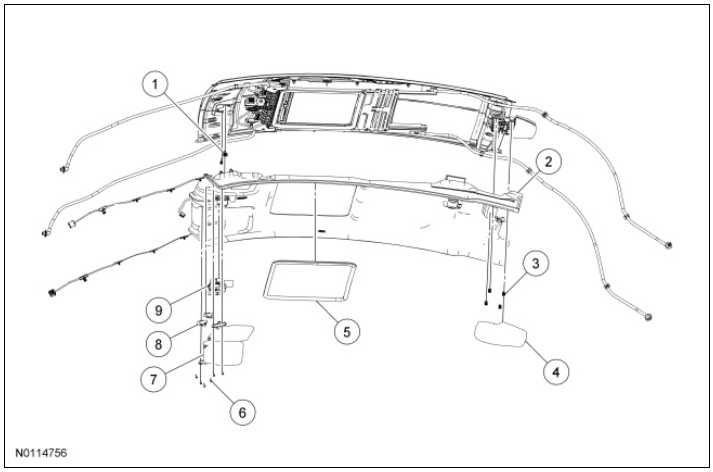
   To install, reverse the removal procedure.

   - To install, align the trim panel retaining clips to the retaining clip holes in the body.

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Headliner - 4-Door Sedan

NOTE: Headliner with roof opening panel shown, all others similar.



Item	Part Number	Description
1	W711521	Trim pin (2 required)
2	51916	Headliner
3	W712427	Retaining clip (4 required)
4	040A06	Center high mounted stop lamp (CHIMSL) cover
5	52124	Headliner retainer (if equipped)
6	W502660	Screw (6 required)
7	04104 (RH)/04104 (LH)	Sun visor assembly
8	04132	Sun visor clip (2 required)
9	519A70	Overhead console assembly (if equipped)

Removal and Installation

1. Remove the front passenger seat. For additional information, refer to Section 501-10 .

2. Remove the LH RH sun visors.
   - Remove the 4 sun visor screws.

3. Remove the LH and RH sun visor clips.
   - Remove the 2 sun visor clip screws.

4. Remove the LH and RH A-pillar trim panels. For additional information, refer to A-Pillar Trim Panel in this section.

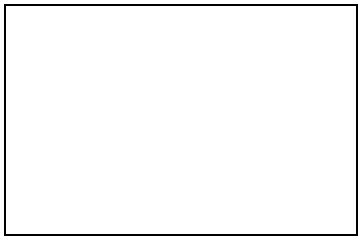
5. Remove the LH and RH B-pillar trim panels. For additional information, refer to B-Pillar Trim Panel in this section.

6. Remove the LH and RH C-pillar upper trim panels. For additional information, refer to C-Pillar Trim Panel - 4-Door Sedan in this section.

7. Remove the CHIMSL cover.
8. Remove 2 screws and the CHIMSL retainer plate.
9. **NOTE:** RH A-pillar shown, LH A-pillar similar.

   Disconnect the 2 electrical connectors located at the A-pillars.

   - Detach the 8 wire harness pin-type retainers.



10. If equipped, release the 2 wiring harness guides from the roof opening panel drain tubes.
11. If equipped, remove the roof opening panel headliner retainer.
12. Disconnect the rear view mirror electrical connector.
13. If equipped, disconnect the roof opening panel motor electrical connector.
14. ***NOTICE:*** **An assistant is required when removing the headliner from the vehicle to avoid damage to the headliner.**

    Remove the headliner.

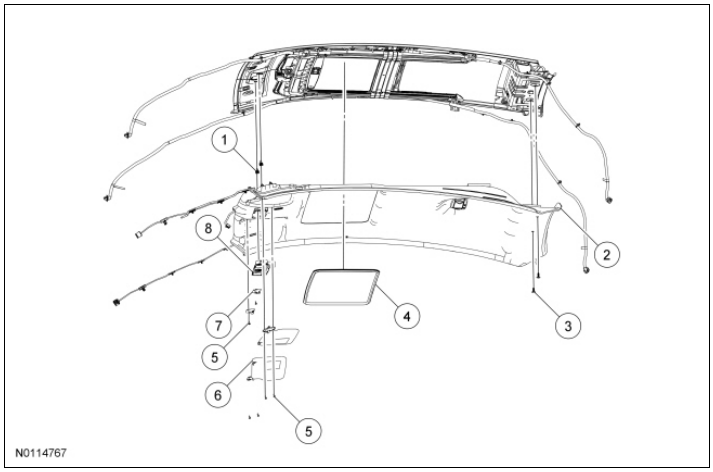
    - Remove the headliner through the RH front door opening.

15. To install, reverse the removal procedure.

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Headliner - 5-Door Hatchback

NOTE: Headliner with roof opening panel shown, all others similar.



Item	Part Number	Description
1	W711521	Trim pin (2 required)
2	51916	Headliner
3	W709571	Trim pin (2 required)
4	52124	Headliner retainer (if equipped)
5	W502660	Screw (6 required)
6	04104 (RH) / 04105 (LH)	Sun visor assembly
7	04132	Sun visor clip (2 required)
8	519A70	Overhead console assembly (if equipped)

Removal and Installation

1. Remove the LH and RH sun visors.
   - Remove the 4 sun visor screws.

2. Remove the LH and RH sun visor clips.
   - Remove the 2 sun visor clip screws.

3. Remove the LH and RH A-pillar trim panels. For additional information, refer to A-Pillar Trim Panel in this section.

4. Remove the LH and RH B-pillar upper and lower trim panels. For additional information, refer to B-Pillar Trim Panel in this section.

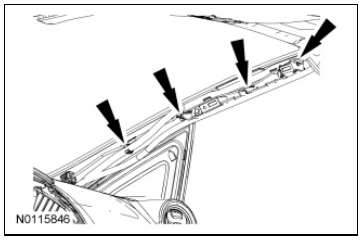
5. Position aside the LH and RH C-pillar upper trim panels.

6. **NOTE:** RH A-pillar shown, LH A-pillar similar.

   Disconnect the 2 electrical connectors located at the A-pillars.

   - Detach the 8 wire harness pin-type retainers.
   - Disconnect the rear glass washer hose at the LH A-pillar.

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7. If equipped, release the 2 wiring harness guides from the roof opening panel drain tubes.
8. If equipped, remove the roof opening panel headliner retainer.
9. Disconnect the rear view mirror electrical connector.
10. If equipped, disconnect the roof opening panel motor electrical connector.
11. Disconnect the rear glass washer hose at the RH C-pillar.
12. Lower the rear seat backs.
13. ***NOTICE:*** **An assistant is required when removing the headliner from the vehicle to avoid damage to the headliner.**

    Remove the headliner.

    - Remove the 2 pushpins.
    - Remove the headliner through the rear hatch opening.

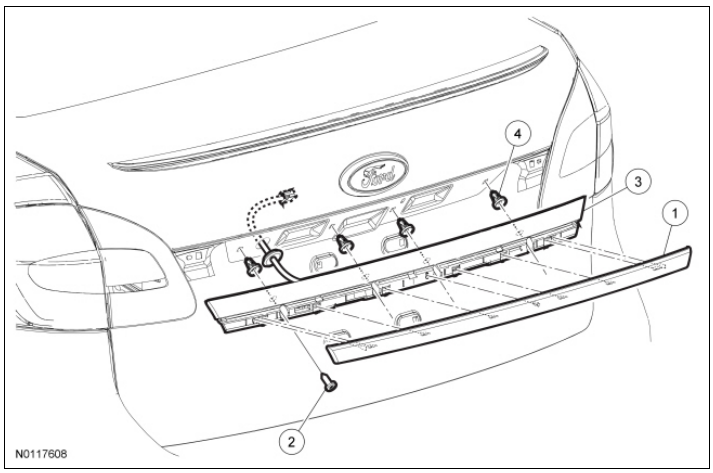
14. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-in
Roof-mounted spoiler bolts	8	71

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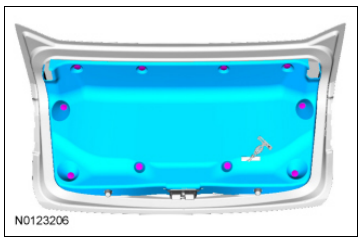
Applique - Decklid



Item	Part Number	Description
1	5442512	Decklid lower applique
2	W713090	Decklid upper applique retainers (4 required)
3	5443400	Decklid upper applique
4	W707977	Decklid upper applique nut (4 required)

NOTE: A new decklid lower applique must be installed.

1. Remove the 10 pin-type retainers and the decklid trim panel.



2. ***NOTICE:*** **Use care not to damage the paint when prying on the decklid applique.**

   NOTE: A new decklid lower applique must be installed.

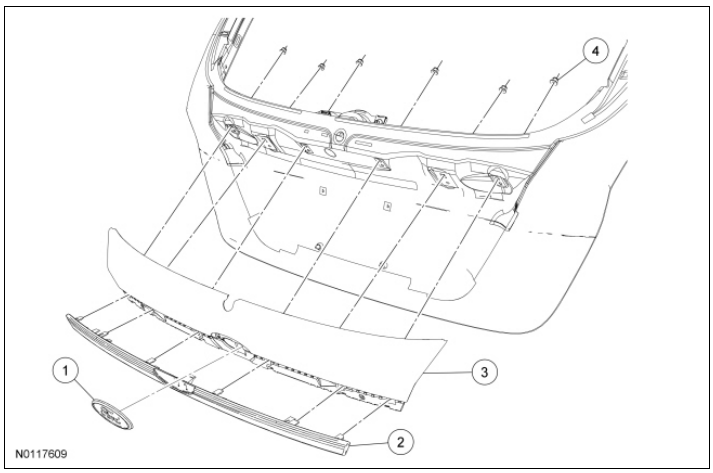
   Use a non-marring tool, and pry the decklid lower applique off.

3. Remove the decklid upper applique.
   1. Remove the 4 decklid upper applique screws.
   2. Disconnect the decklid latch electrical connector and remove the decklid upper applique.

1. To install, reverse the removal procedure.

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Applique - Liftgate



Item	Part Number	Description
1	V425A52	Rear liftgate emblem
2	5825510	Lower liftgate applique
3	5843400	Upper liftgate applique
4	W520201	Liftgate applique nut (6 required)

1. Remove the liftgate trim panel. For additional information, refer to Section 501-05 .

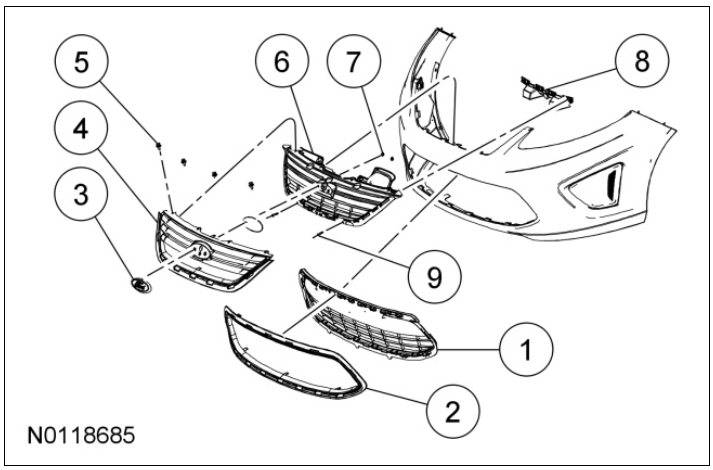
2. Remove the 6 liftgate applique nuts.

3. Remove the liftgate applique.
   - Remove the license plate lamp bulbs.
   - Disconnect the luggage compartment lid/liftgate latch switch and disconnect the wiring harness from the liftgate applique.

4. To install, reverse the removal procedure.

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Radiator Grille



Item	Part Number	Description
1	8200	Lower radiator grille
2	8200	Lower radiator grille outer frame
3	8213	Emblem
4	8200	Upper radiator grille
5	N807389	Upper radiator grille pin-type retainer (4 required)
6	8A284	Upper radiator grille reinforcement
7	W520822	Emblem nut (2 required)
8	8A284	Upper radiator grille lower reinforcement bracket
9	W706737	Upper radiator grille lower reinforcement bracket rivet (4 required)

Removal and Installation

Upper Radiator Grille and Lower Radiator Grille

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

Upper Radiator Grille

2. Remove the 4 upper radiator grille pin-type retainers.

3. Disconnect the upper radiator grille reinforcement from the front bumper cover and remove the upper radiator grille and reinforcement.

4. Disconnect the upper radiator grille from the reinforcement and remove.

Lower Radiator Grille

5. From the back side of the front bumper cover disconnect the lower radiator grille and remove.

6. Disconnect the outer frame from the bumper cover and remove.

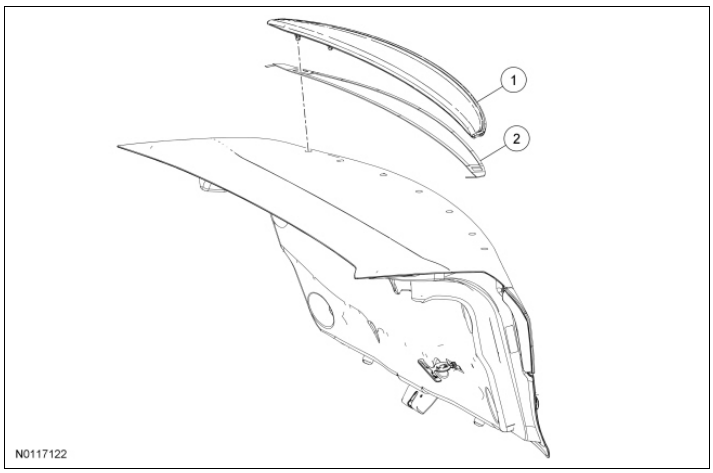
Upper Radiator Grille and Lower Radiator Grille

7. To install, reverse the removal procedure.
    - Transfer parts as necessary.

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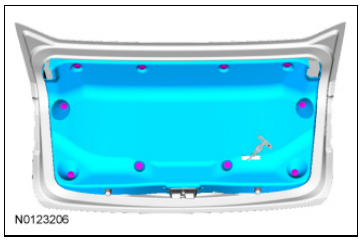
Spoiler - Decklid



Item	Part Number	Description
1	5444210	Spoiler
2	-	Foam tape (part of 5444210)

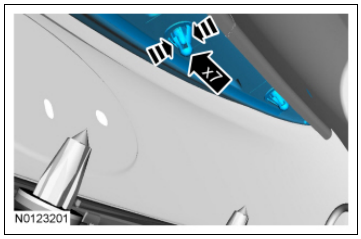
Removal and Installation

1. Remove the 10 pin-type retainers and the decklid trim panel.



2. **NOTE:** Use an 11mm, 12 point socket or wrench to compress the 2 locking tabs on the clips.

   Release the 7 clips and remove the decklid spoiler.

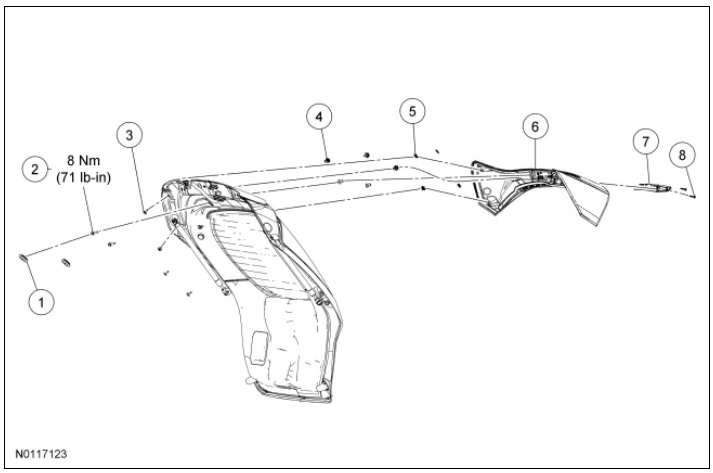


Installation

1. Clean the rear spoiler mounting surfaces.
2. Install the decklid spoiler and connect the 7 clips.
3. Install the decklid trim panel and the 10 pin-type retainers.>

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Spoiler - Roof

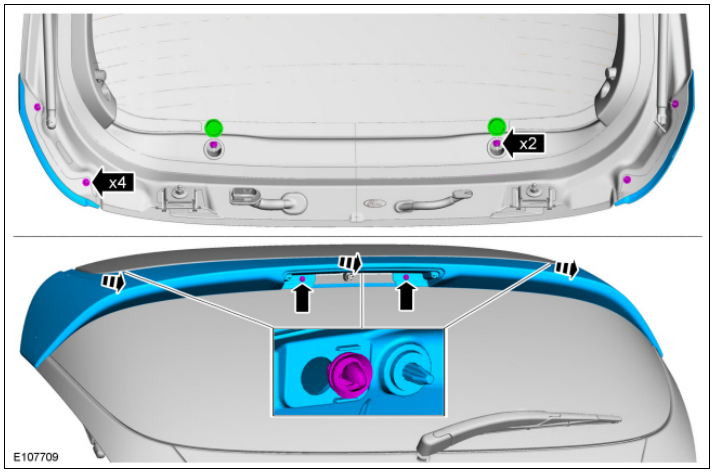


Item	Part Number	Description
1	W702351	Roof-mounted spoiler bolt cover (2 required)
2	W500213	Roof-mounted spoiler bolt (2 required)
3	W706169	Roof-mounted spoiler screw (4 required)
4	W713489	Roof-mounted spoiler clip (3 required)
5	W714205	Roof-mounted spoiler nut (4 required)
6	44210	Roof-mounted spoiler
7	13A613	High mounted stop lamp
8	46058	High mounted stop lamp screws (2 required)

Removal and Installation

1. Remove the high mounted stoplamp. For additional information, refer to Section 417-01 .

2. Remove the roof mounted spoiler.
    1. Remove the roof mounted spoiler bolt covers.
    2. Remove the 2 roofnted spoiler bolts.
        - To install, tighten to 8 Nm (71 lb-in).
    3. Remove the 4 roof mounted spoiler screws.
    4. Remove the 2 roof mounted spoiler screws behind the high mounted stoplamp.
    5. Disconnect the 3 roof mounted spoiler clips and remove the roof mounted spoiler.
        - Press down slightly on the front corner of the roof mounted spoiler to cause the rear corner to raise up slightly.
        - With your fingers behind the raised corner release the pressure on the front corner and pull gently out towards the rear of the vehicle to disconnect the clips and remove the spoiler.



3. To install, reverse the removal procedure.

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Torque Specifications

Description	Nm	lb-in
Exterior mirror nuts	14	124

Rear View Mirrors

Exterior Mirror

The exterior mirror consists of the following serviceable components:

- Exterior mirror glass (heated glass optional)
- Exterior mirror cover
- Exterior mirror housing
- Exterior mirror control switch
- Exterior mirror motor
- Turn signal (if equipped)

Exterior Heated Mirror (If equipped)

The exterior heated mirrors self actuate when the ambient air temperature is less than 5° C (41° F) and engine coolant temperature is less than 60° C (140° F). The rear window defroster LED indicator does not illuminate when the exterior heated mirrors self actuate.

Interior Mirror

This vehicle is equipped with either a non-dimming or auto-dimming interior rear view mirror.

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Rear View Mirrors - Exterior

Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent

Principles of Operation

LH and RH exterior rear view mirror glass movement is controlled by the exterior rear view mirror switch and the LH and RH exterior rear view mirror motors. Adjusting the exterior rear view mirror switch to the LH or RH position determines which exterior rear view mirror motor to control.

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 voltage is supplied by the rear defrost relay output from the Body Control Module (BCM) and Central Junction Box (CJB) fuse 25 (7.5A), which isolates the heated exterior rear view mirrors from the rear window defrost system in the event of a fault.

Inspection and Verification

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

Visual Inspection Chart

Mechanical	Electrical
• Exterior rear view mirror • Exterior rear view mirror switch • Exterior rear view mirror glass	• Battery Junction Box (BJB) fuse 26 (7.5A) (vehicles built up to 1/14/2011) • Central Junction Box (CJB) fuse 16 (7.5A) (vehicles build after 1/14/2011) • CJB fuse 25 (7.5A) • Exterior rear view mirror switch • Exterior rear view mirror motor • Exterior rear view mirror • Heated exterior rear view mirror glass

	• Loose or corroded connections

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 - 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 topoint 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 rear view mirror vibrates/loose
- Exterior rear view mirror mounting nuts loose
- TIGHTEN the exterior rear view mirror fasteners to the specified value located in the Specifications table.
- Exterior rear view mirror glass loose
- PRESS the center of the exterior rear view mirror glass up, down, left and right to make sure the glass is seated correctly. If the glass is still loose, REMOVE the glass and INSPECT the exterior rear view mirror backing plate for damage. If the backing plate is damaged, INSTALL a new exterior rear view 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 rear view mirror and door frame is missing or damaged

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

Pinpoint Tests

Pinpoint Test A: The Exterior Rear View Mirrors are Inoperative

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

Normal Operation

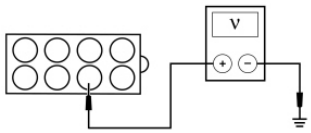
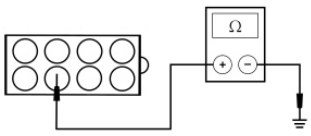
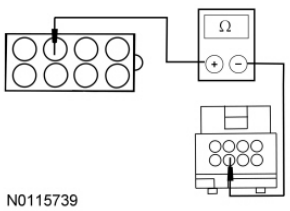
The exterior rear view mirror switch receives voltage at all times from the Battery Junction Box (BJB) (vehicles built up to 1/14/2011) or CJB (vehicles built after 1/14/2011). The exterior rear view mirror switch has only one ground circuit. The exterior rear view mirrors share a common circuit for both up/down and right/left movements.

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- Exterior rear view mirror switch

PINPOINT TEST A: THE EXTERIOR REAR VIEW MIRRORS ARE INOPERATIVE

Test Step	Result / Action to Take
A1 CHECK FOR VOLTAGE TO THE EXTERIOR REAR VIEW MIRROR SWITCH	
• Disconnect: Exterior Rear View Mirror Switch C527. • Measure the voltage between exterior rear view mirror switch C527-6, circuit SBB26 (YE/RD) (vehicles built up to 1/14/2011) or SBP16 (VT/RD) (vehicles built after 1/14/2011), harness side and ground.	**Yes** GO to A2 . **No** VERIFY that BJB fuse 26 (7.5A) (vehicles built up to 1/14/2011) or CJB fuse 16 (7.5A) (vehicles built after 1/14/2011) 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.

 N0115735 • **Is the voltage greater than 10 volts?**	
A2 CHECK FOR GROUND TO THE EXTERIOR REAR VIEW MIRROR SWITCH	
• Measure the resistance between exterior rear view mirror switch C527-4, circuit GD143 (BK/VT), harness side and ground.  N0115736 • **Is the resistance less than 5 ohms?**	**Yes** GO to A3 . **No** REPAIR the circuit for an open. TEST the system for normal operation.
A3 CHECK THE EXTERIOR REAR VIEW MIRRORS COMMON CIRCUIT FOR AN OPEN	
• Disconnect: LH Exterior Rear View Mirror Switch C521. • Measure the resistance between exterior rear view mirror switch C527-3, circuit CPM18 (GN/BN), harness side and LH exterior rear view mirror C521-6, circuit CPM18 (GN/BN) harness side.  N0115739 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new exterior rear view mirror switch. REFER to Exterior Mirror Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit for an open. TEST system for normal operation.

Pinpoint Test B: A Single Exterior Rear View Mirror is Inoperative

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

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Normal Operation

Under normal operation, the exterior rear view mirror switch uses a common circuit to control the up/down and right/left movements of both exterior rear view mirrors.

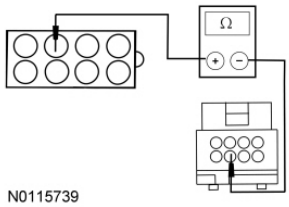
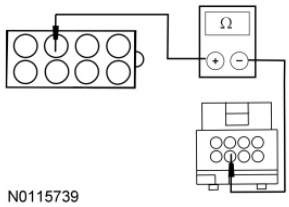
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Exterior rear view mirror switch
- Exterior rear view mirror motor
- Exterior rear view mirror

PINPOINT TEST B: A SINGLE EXTERIOR REAR VIEW MIRROR 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
B1 CHECK THE LH EXTERIOR REAR VIEW MIRROR OPERATION	
• Operate the LH exterior rear view mirror using the exterior rear view mirror switch. • **Does the LH exterior rear view mirror operate?**	**Yes** GO to B2 . **No** GO to B4 .
B2 CHECK THE EXTERIOR REAR VIEW MIRROR SWITCH	
• Ignition OFF. • Disconnect: Exterior Rear View Mirror Switch C527. • Carry out the exterior rear view mirror switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Did the exterior mirror control switch pass the component test?**	**Yes** GO to B3 . **No** INSTALL a new exterior rear view mirror switch. REFER to Exterior Mirror Control Switch in this section. TEST the system for normal operation.
B3 CHECK THE EXTERIOR REAR VIEW MIRRORS COMMON CIRCUIT FOR AN OPEN	
• Disconnect: RH Exterior Rear View Mirror C601. • Measure the resistance between exterior rear view mirror switch C527-3, circuit CPM18 (GN/BN), harness side and RH exterior rear view mirror C601-6, circuit CPM18 (GN/BN), harness side.	**Yes** INSTALL a new exterior rear view mirror motor. REFER to Exterior Mirror Motor in this section. TEST the system for normal operation. **No** REPAIR the circuit for an open. TEST the system for normal operation.

 • **Is the resistance less than 5 ohms?**	
B4 CHECK THE EXTERIOR REAR VIEW MIRROR SWITCH	
• Ignition OFF. • Disconnect: Exterior Rear View Mirror Switch C527. • Carry out the Exterior Rear View Mirror Switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Did the exterior mirror control switch pass the component test?**	**Yes** GO to B5 . **No** INSTALL a new exterior rear view mirror switch. REFER to Exterior Mirror Control Switch in this section. TEST the system for normal operation.
B5 CHECK THE EXTERIOR REAR VIEW MIRRORS COMMON CIRCUIT FOR AN OPEN	
• Disconnect: LH Exterior Rear View Mirror Switch C521. • Measure the resistance between exterior rear view mirror switch C527-3, circuit CPM18 (GN/BN), harness side and LH exterior rear view mirror C521-6, circuit CPM18 (GN/BN), harness side.  • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new exterior rear view mirror motor. REFER to Exterior Mirror Motor in this section. TEST the system for normal operation. **No** REPAIR the circuit. TEST the system for normal operation.

Pinpoint Test C: A Single Exterior Rear View Mirror Does Not Operate Correctly with Switch Logic

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

Normal Operation

Under normal operation, the exterior rear view mirror switch supplies voltage and ground to the LH and RH exterior rear view mirrors to control movement. Each mirror contains a horizontal and a vertical motor. The exterior rear view mirror switch controls movement by reversing polarity of the voltage and ground circuits being supplied to each motor.

This pinpoint test is intended to diagnose the following:

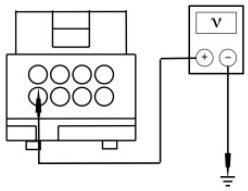
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- Wiring, terminals or connectors
- Exterior rear view mirror switch
- Exterior rear view mirror motor
- Exterior rear view mirror

PINPOINT TEST C: A SINGLE EXTERIOR REAR VIEW MIRROR DOES NOT FUNCTION WITH SWITCH LOGIC

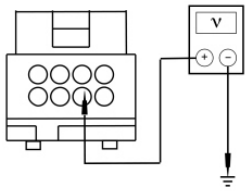
NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

Test Step	Result / Action to Take
C1 CHECK THE EXTERIOR REAR VIEW MIRROR MOVEMENT (LEFT/RIGHT)	
• Operate the RH and LH exterior rear view mirrors in the right and left direction using the exterior rear view mirror switch. • **Do the exterior rear view mirrors move left and right?**	**Yes** GO to C2 . **No** GO to C3 .
C2 CHECK THE EXTERIOR REAR VIEW MIRROR MOVEMENT (UP/DOWN)	
• Operate the RH and LH exterior rear view mirrors in the up and down direction using the exterior rear view mirror switch. • **Do the exterior rear view mirrors move up and down?**	**Yes** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. TEST the system for normal operation. **No** GO to C4 .
C3 CHECK THE VOLTAGE TO THE INOPERATIVE EXTERIOR REAR VIEW MIRROR LEFT/ RIGHT CIRCUIT	
• Disconnect: Inoperative Exterior Rear View Mirror C521 (LH) or C601 (RH). • **NOTE:** Position the exterior rear view mirror switch to the LH or RH position. • **LH exterior rear view mirror:** While operating the exterior rear view mirror switch in the rightward position, measure the voltage between the LH exterior rear view mirror C521-5, circuit CPM18 (GN/BN), harness side and ground.	**Yes** INSTALL a new exterior rear view mirror motor. REFER to Exterior Mirror Motor in this section. TEST the system for normal operation. **No** GO to C5 .



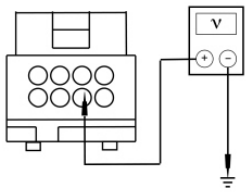
N0115904

- **RH exterior rear view mirror:** While operating the exterior rear view mirror switch in the rightward position, measure the voltage between the RH exterior rear view mirror C601-7, circuit CPM17 (BU/GN), harness side and ground.

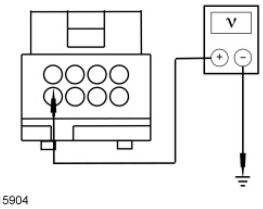
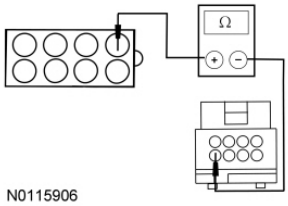
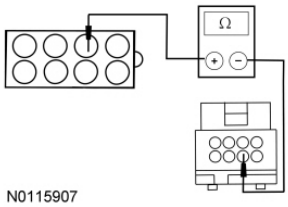


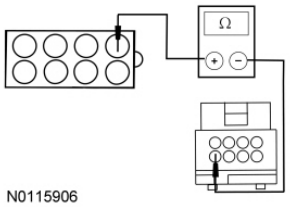
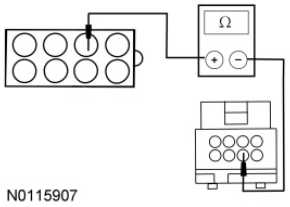
N0115905

- **Is the voltage greater than 10 volts?**

C4 CHECK THE VOLTAGE TO THE INOPERATIVE EXTERIOR REAR VIEW MIRROR UP/DOWN CIRCUIT	
• Disconnect: Inoperative Exterior Rear View Mirror C521 (LH) or C601 (RH). • **NOTE:** Position the exterior rear view mirror switch to the LH or RH position. • **LH exterior rear view mirror:** While operating the exterior rear view mirror switch in the upward position, measure the voltage between the LH exterior rear view mirror C521-7, circuit CPM21 (YE/VT), harness side and ground.  N0115905 • **RH exterior rear view mirror:** While operating the exterior rear view mirror switch in the upward position, measure the voltage between the RH exterior rear view mirror C601-5, circuit CPM14 (GY/BN), harness side and ground.	**Yes** INSTALL a new exterior rear view mirror motor. REFER to Exterior Mirror Motor in this section. TEST the system for normal operation. **No** GO to C6 .

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 N0115904 • **Is the voltage greater than 10 volts?**	
C5 CHECK THE INOPERATIVE EXTERIOR REAR VIEW MIRROR LEFT/RIGHT CIRCUIT FOR AN OPEN	
• Disconnect: Exterior Rear View Mirror Switch C527. • **LH exterior rear view mirror:** Measure the resistance between exterior rear view mirror switch C527-7, circuit CPM18 (GN/BN), harness side and LH exterior rear view mirror C521-5, circuit CPM18 (GN/BN), harness side.  N0115906 • **RH exterior rear view mirror:** Measure the resistance between exterior rear view mirror switch C527-5, circuit CPM17 (BU/GN), harness side and RH exterior rear view mirror C601-7, circuit CPM17 (BU/GN), harness side.  N0115907 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new exterior rear view mirror switch. REFER to Exterior Mirror Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit. TEST the system for normal operation.
C6 CHECK THE INOPERATIVE EXTERIOR REAR VIEW MIRROR UP/DOWN CIRCUIT FOR AN OPEN	
• Disconnect: Exterior Rear View Mirror Switch C527. • **LH exterior rear view mirror:** Measure the resistance between exterior rear view mirror switch C527-1, circuit CPM21 (YE/VT), harness side and LH exterior rear view mirror C521-7, circuit CPM21 (YE/VT), harness side.	**Yes** INSTALL a new exterior rear view mirror switch. REFER to Exterior Mirror Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit. TEST the system for normal operation.

 N0115906 • **RH exterior rear view mirror:** Measure the resistance between exterior rear view mirror switch C527-2, circuit CPM14 (GY/BN), harness side and RH exterior rear view mirror C601-5, circuit CPM14 (GY/BN), harness side.  N0115907 • **Is the resistance less than 5 ohms?**	

Pinpoint Test D: The Heated Exterior Rear View 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

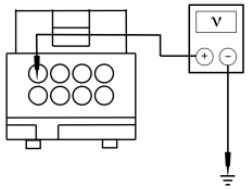
Under normal operation, when the rear window defrost switch is pressed to the ON position, the rear window defrost relay closes and voltage is supplied to Central Junction Box (CJB) fuse 25 (7.5A) to power the LH and RH exterior rear view mirrors. The exterior rear view mirrors do not share a common ground.

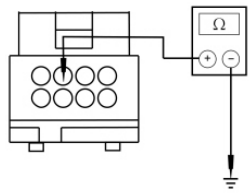
This pinpoint test is intended to diagnose the following:
- Fuse
- Wiring, terminals or connectors
- Exterior rear view mirror glass

PINPOINT TEST D: THE HEATED EXTERIOR REAR VIEW MIRROR IS INOPERATIVE

Test Step	Result / Action to Take
D1 CHECK THE OPERATION OF THE REAR WINDOW DEFROST SYSTEM	
• With the engine running, activate the rear window defrost switch to the ON position. • Using a infrared temperature gun or equivalent measure the temperature of the rear window glass for approximately 30 seconds noting changes in temperature.	**Yes** GO to D2 . **No** REFER to Section 501-11 to diagnose the rear window defrost system.

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• **Does the temperature of the rear window glass rise?**	
D2 CHECK THE OPERATION OF THE HEATED EXTERIOR REAR VIEW MIRRORS	
• With the rear window defrost switch in the ON position, using a infrared temperature gun or equivalent measure the temperature of the RH and LH exterior rear view mirror glass for approximately 30 seconds noting changes in temperature. • **Does at least one heated mirror glass operate correctly?**	**Yes** GO to D3 . **No** VERIFY that CJB fuse 25 (7.5A) is OK. If OK, REPAIR circuit CRD06 (BN/YE) for an open. If not OK, REPAIR circuit CBP25 (WH/OG) harness side for a short to ground. TEST the system for normal operation.
D3 CHECK THE VOLTAGE TO THE INOPERATIVE HEATED EXTERIOR REAR VIEW MIRROR GLASS	
• Ignition ON. • Disconnect: Inoperative Heated Exterior Rear View Mirror C521 (LH) or C601 (RH). • **NOTE:** The rear window defrost system activates for 10 minutes. • With the engine running, press the rear window defrost switch to the ON position. • Measure the voltage between: ♦ **LH exterior rear view mirror** C521-1, circuit CBP25 (WH/OG), harness side and ground. ♦ **RH exterior rear view mirror** C601-1, circuit CBP25 (WH/OG), harness side and ground.  N0115908 • **Is the voltage greater than 10 volts?**	**Yes** GO to D4 . **No** REPAIR the circuit for an open. TEST the system for normal operation.
D4 CHECK THE INOPERATIVE EXTERIOR REAR VIEW MIRROR GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between: ♦ **LH exterior rear view mirror** C521-2, circuit GD143 (BK/VT), harness side and ground. ♦ **RH exterior rear view mirror** C601-2, circuit GD145 (BK/BU), harness side and ground.	**Yes** INSTALL a new exterior rear view mirror glass. REFER to Exterior Mirror Glass in this section. TEST the system for normal operation. **No** REPAIR the circuit for an open. TEST the system for normal operation.



N0115909

- **Is the resistance less than 5 ohms?**

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Rear View Mirrors - Interior

Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent

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. Voltage is supplied to the interior auto-dimming mirror when the ignition is in the RUN or ACC position. The auto-dimming feature is disabled when the vehicle is in REVERSE.

The interior auto-dimming rear view mirror has 2 photoelectric sensors, a forward facing sensor and a rearward facing sensor, that detect forward and rearward light conditions. Based on these inputs, the automatic dimming feature 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 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 automatically returns to a high retance mode whenever the vehicle is in REVERSE.

If the forward or rearward sensors are blocked, the interior auto-dimming rear view mirror might not work correctly.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Interior rear view mirror	• Central Junction Box (CJB) fuse 2 (10A)

	• Interior auto-dimming rear view mirror • Loose or corroded connections • Wiring harness

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

&sp;

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 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
- If the mirror is still on the windshield **do not remove.** ATTEMPT to fully seat the mirror first. If the mirror is still loose or vibrates, REMOVE and REINSTALL the mirror. REFER to Interior Rear View Mirror in this section. If the condition still exists, INSTALL a new mirror.

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 contains 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 auto-dimming feature may not operate correctly. Always verify both sensors are not physically blocked before attempting to

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diagnose auto-dimming mirror concerns. Whenever the gear selector lever is placed in REVERSE, the interior auto-dimming mirror temporarily disables the auto-dimming feature. The auto-dimming feature is enabled again when the gear selector lever is moved out of REVERSE.

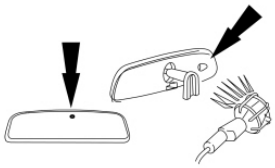
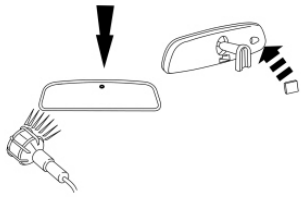
This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- Obstructed rearward facing sensor
- Obstructed forward facing sensor
- Interior auto-dimming mirror

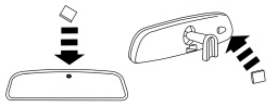
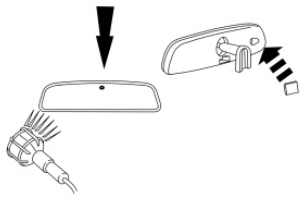
PINPOINT TEST E: THE AUTO-DIMMING MIRROR DOES NOT OPERATE CORRECTLY

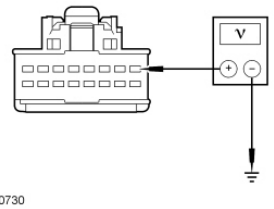
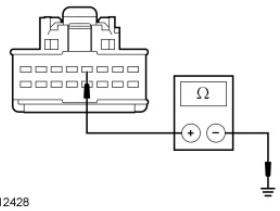
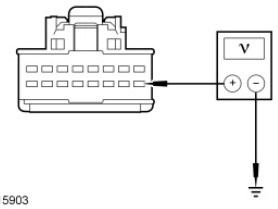
NOTE: If the Transmission Range (TR) sensor is malfunctioning and the backup lamps are on all the time or do not turn on, the interior auto-dimming mirror will not darken or return to normal view.

Test Step	Result / Action to Take
E1 CHECK THE OPERATION OF THE BACKUP LAMPS	
• Ignition ON. • Move the selector lever through the entire range. • **Do the backup lamps illuminate and only in REVERSE?**	**Yes** GO to E2 . **No** REFER to Section 417-01 to diagnose the backup lamps.
E2 VERIFY THE FORWARD AND REARWARD FACING SENSORS ARE NOT BLOCKED	
• Visually verify the forward and rearward facing sensors are not blocked. Sources of blockage can include: ♦ stickers, window decals or tags. ♦ non-OEM window tinting. • **Were either of the sensors blocked?**	**Yes** If possible, REMOVE the blockage. TEST the system for normal operation. If it is not possible to remove the blockage, REVIEW the operation of the interior auto-dimming mirror with the customer. **No** GO to E3 .
E3 CHECK OPERATION OF THE INTERIOR AUTO-DIMMING MIRROR - DAYLIGHT CONDITIONS	
• Ignition ON. • Use a bright lamp to illuminate the forward facing sensor. The mirror should adjust to a hi reflectance mode (mirror will be clear).	**Yes** GO to E4 **No** INSTALL a new interior auto-dimming mirror. REFER to Interior Rear View Mirror in this section. TEST the system for normal operation.

 N0116951 • **Does the mirror adjust to the high reflectance (clear) mode?**	
E4 CHECK OPERATION OF THE INTERIOR AUTO-DIMMING MIRROR - NIGHTTIME CONDITIONS WITH GLARE	
• Ignition ON. • **NOTE:** Covering the sensor with a finger or hand is not adequate. • Simulate nighttime conditions with glare: ♦ cover the forward sensor with black electrical tape or other dark material. ♦ illuminate the rearward facing sensor. The mirror should darken to a lower reflectance mode.  N0115902 • **Did the mirror darken to a lower reflectance (darker) mode?**	**Yes** GO to E5 . **No** GO to E7 .
E5 CHECK OPERATION OF THE INTERIOR AUTO-DIMMING MIRROR - NIGHTTIME CONDITIONS WITHOUT GLARE	
• Ignition ON. • **NOTE:** Covering the sensor with a finger or hand is not adequate. • Simulate nighttime conditions without glare: ♦ cover the rearward facing sensor. The mirror should adjust to the high reflectance mode.	**Yes** GO to E6 . **No** GO to E7 .

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 N0116353 • **Did the mirror adjust to the high reflectance (clear) mode?**	
E6 CHECK OPERATION OF THE INTERIOR AUTO-DIMMING MIRROR - NIGHTTIME CONDITIONS WITH THE VEHICLE IN REVERSE	
• Ignition ON. • **NOTE:** Covering the sensor with a finger or hand is not adequate. • Simulate nighttime conditions with glare: ♦ cover the forward sensor with black electrical tape or other dark material. ♦ illuminate the rearward facing sensor. (mirror should darken at this time)  N0115902 • Select REVERSE. • **Did the mirror adjust to a high reflectance (clear) mode?**	**Yes** The system is operating normally at this time. REVIEW operation of the interior auto-dimming mirror feature with the customer. **No** GO to E7 .
E7 CHECK FOR VOLTAGE TO THE INTERIOR AUTO-DIMMING MIRROR	
• Ignition OFF. • Disconnect: Interior Auto-Dimming Mirror C911. • Ignition ON. • Measure the voltage between interior auto-dimming mirror C911-1, circuit CPB02 (GN), harness side and ground.	**Yes** GO to E8 . **No** VERIFY that Central Junction Box (CJB) fuse 2 (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.

 N0070730 • **Is the voltage greater than 10 volts?**	
E8 CHECK FOR GROUND TO THE INTERIOR AUTO-DIMMING MIRROR	
• Ignition OFF. • Measure the resistance between interior auto-dimming mirror C911-4, circuit GD143 (BK/VT), harness side and ground.  N0112428 • **Is the resistance less than 5 ohms?**	**Yes** GO to E9 . **No** REPAIR the circuit for an open. TEST the system for normal operation.
E9 CHECK FOR VOLTAGE TO THE INTERIOR AUTO-DIMMING MIRROR REVERSE CIRCUIT	
• Ignition ON. • Select REVERSE. • Measure the voltage between interior auto-dimming mirror C911-9, circuit CET47 (BU), harness side and ground.  N0115903 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new interior auto-dimming mirror. REFER to Interior Rear View Mirror in this section. TEST the system for normal operation. **No** REPAIR the circuit. TEST the system for normal operation.

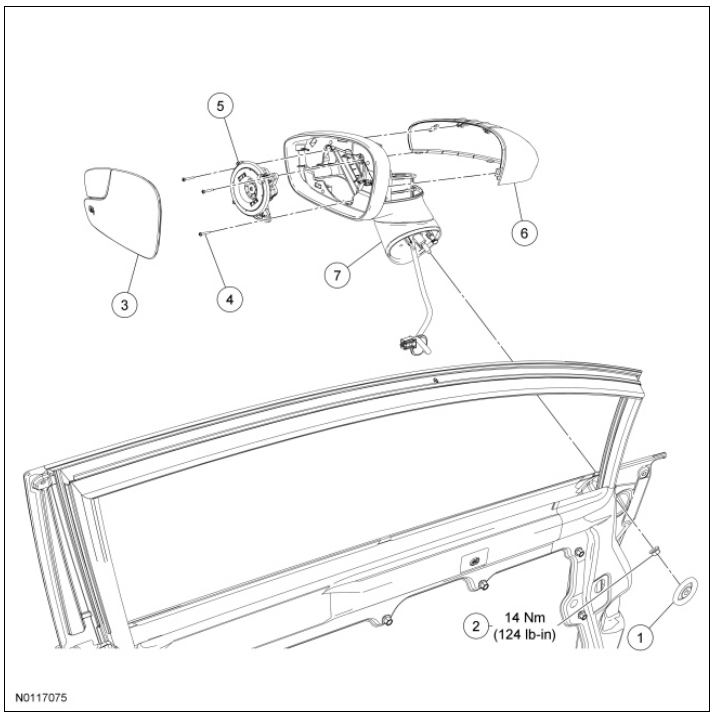
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Exterior Mirrors - Exploded View

NOTE: Click here or refer to the on-line Workshop Manual to view this illustration as an interactive exploded view, requires Adobe® Acrobat® 8.0 or higher.

NOTE: Click here or refer to the on-line Workshop Manual to learn about using an Interactive Illustration.

NOTE: LH side shown, RH side similar.



Item	Part Number	Description
1	-	Exterior mirror nut cover
2	W520202	Exterior mirror nut
3	17K707	Exterior mirror glass
4	-	Exterior mirror motor screw (3 required) (part of 17D696)
5	Exterior mirror motor	
6	17D742 RH/ 17D743 LH	Exterior mirror cover
7	17682 RH/ 17683 LH	Exterior mirror

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

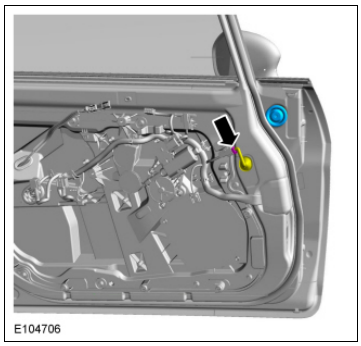
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Exterior Mirror

Removal and Installation

1. Remove the door speaker. For additional information, refer to Section 415-00 .

2. Disconnect the electrical connector.

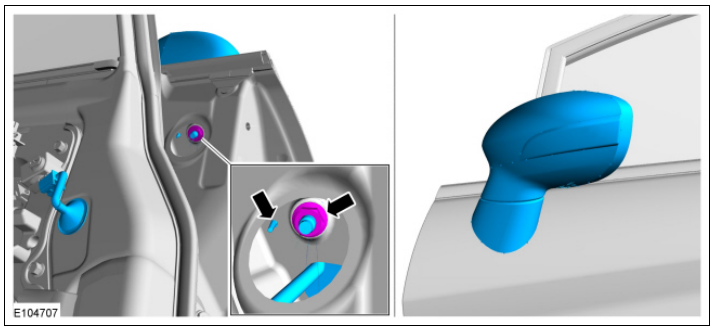


3. Remove the exterior mirror nut cover.

4. **NOTE:** When installing the mirror, make sure to align the locating pin to the locating hole.

   Remove the exterior mirror nut.

   - To install, tighten to 14 Nm (124 lb-in).



5. Remove the exterior mirror.
   - Route the electrical wiring harness through the door.

6. To install, reverse the removal procedure.

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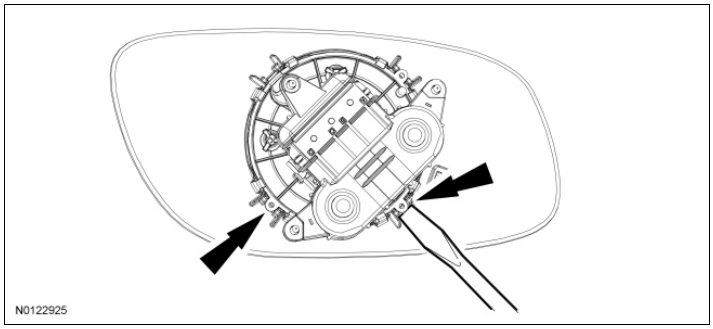
Exterior Mirror Glass

Removal

1. **NOTE:** Exterior mirror glass and motor removed from the housing and viewed from the back to show location of clips and placement of screwdriver.

   Disengage the exterior mirror glass from the exterior mirror motor in the following sequence:

   1. Position the exterior mirror glass to the full upper outboard position.
   2. Insert a flat-blade screwdriver between the lower inboard retaining tab and the exterior mirror glass backing plate.
   3. Twist the flat-blade screwdriver to release the retaining tab from the exterior mirror glass backing plate.
   4. Position the exterior mirror glass to the full upper inboard position.
   5. Insert a flat-blade screwdriver between the upper outboard retaining tab and the exterior mirror glass backing plate.
   6. Twist the flat-blade screwdriver to release the retaining tab from the exterior mirror glass backing plate.



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.**

   Remove the exterior mirror glass from the exterior mirror motor by gently pulling the exterior mirror glass outward

   - If equipped, disconnect the electrical connectors.

Installation

1. If equipped, connect the electrical connectors.

2. Position the exterior mirror glass onto the exterior mirror motor.

3. ⚠ **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.**

   NOTICE: **Apply hand pressure directly over the center of the mirror. Failure to follow this instruction may result in glass breakage.**

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Install the exterior mirror glass by pressing firmly in the center of the exterior glass until it snaps onto the exterior mirror motor.

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 3 exterior mirror motor screws.
3. Disconnect the exterior mirror motor electrical connector.
4. Remove the exterior mirror motor.
5. To install, reverse the removal procedure.

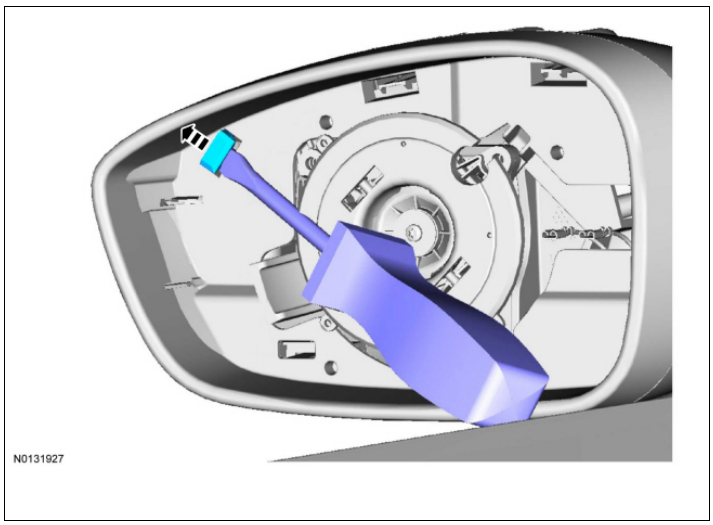
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Exterior Mirror Cover

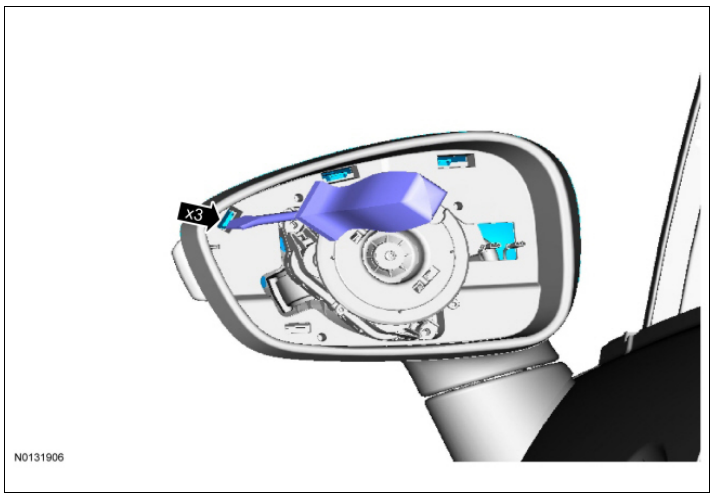
Removal

1. Remove the exterior mirror glass. For additional information, refer to Exterior Mirror Glass In this section.

2. If equipped, remove the exterior mirror cover retainer.

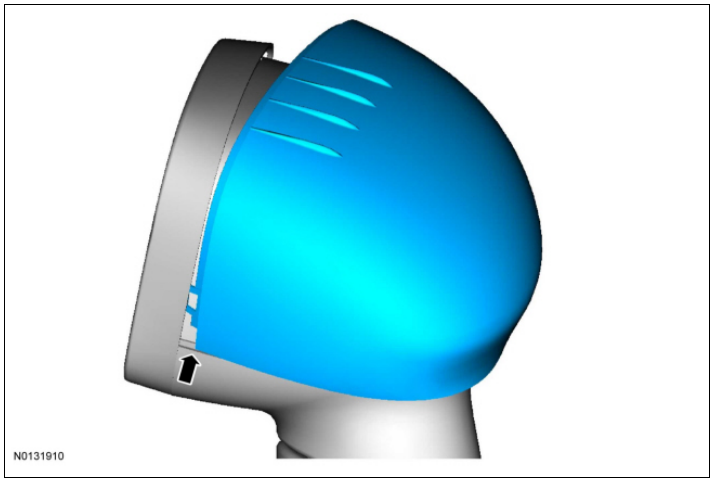


3. Remove the exterior mirror cover.
   - Using a flat-blade screwdriver, release the 3 retaining tabs while pulling the exterior mirror cover toward the front of the vehicle.

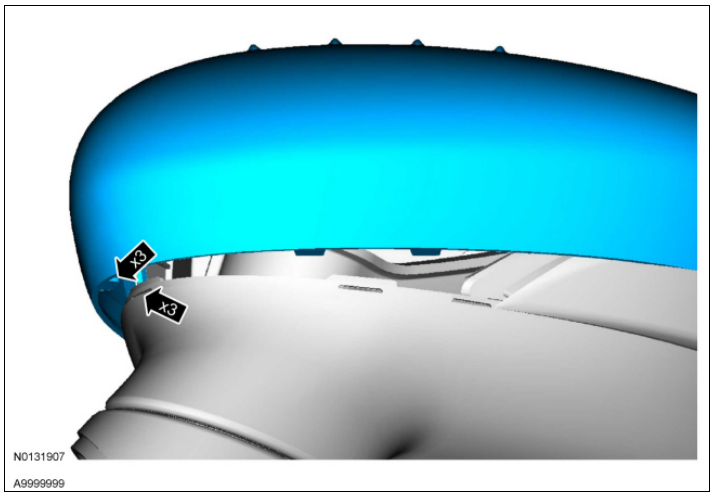


Installation

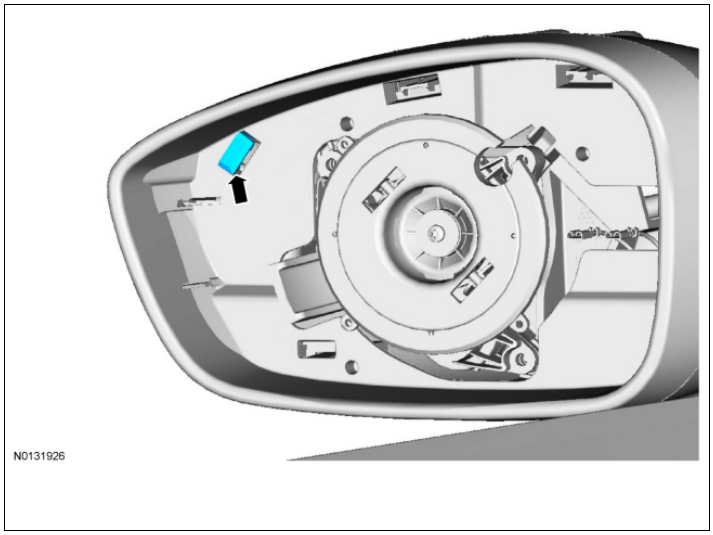
1. Align the inner lower corner of the mirror cover with the groove in the mirror frame.



2. Align the 3 mirror cover tabs with the slots on the mirror frame and install the mirror cover.
    - Press the mirror cover into place and the 3 lock tabs are fully seated.



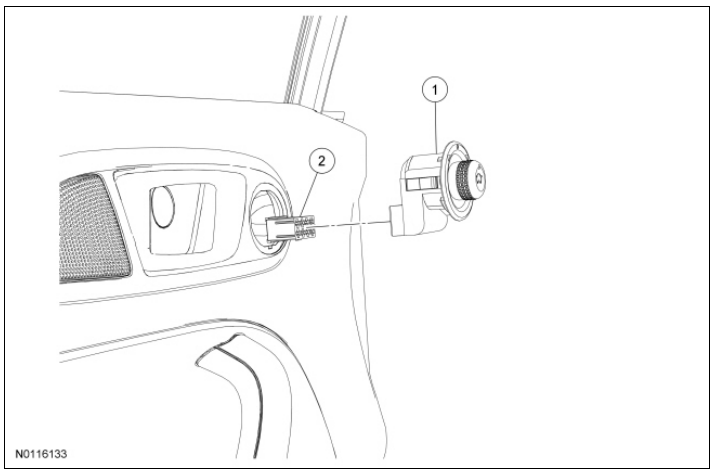
3. If equipped, install the exterior mirror cover retainer.



4. Install the exterior mirror glass. For additional information, refer to Exterior Mirror Glass In this section.

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Exterior Mirror Control Switch



Item	Part Number	Description
1	17B676	Exterior mirror control switch
2	-	Exterior mirror control switch electrical connector (part of 14631)

Removal and Installation

1. *NOTICE:* **Make sure to use a non-marring tool when removing the exterior mirror switch. Otherwise, damage to the door trim panel may occur.**

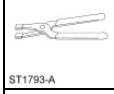
   Remove the exterior mirror control switch.

   - Insert a non-marring tool between the door trim panel and the exterior mirror control switch and gently pry outward.

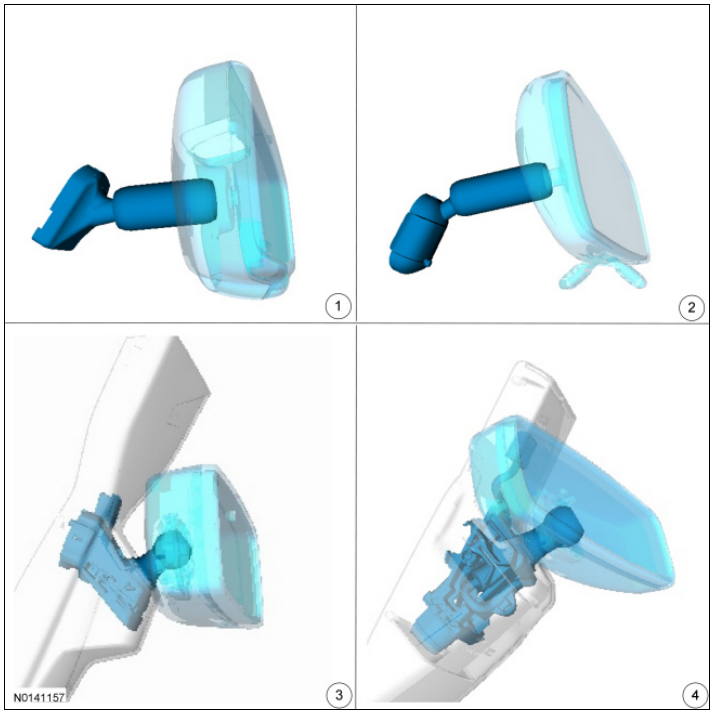
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Interior Rear View Mirror

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

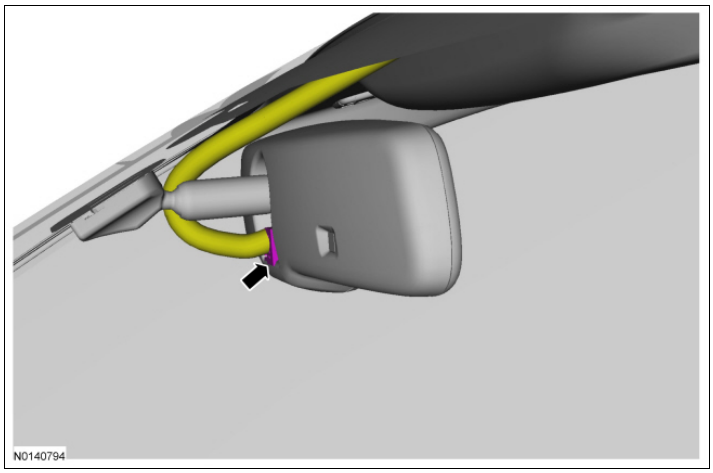
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Mirror Type 1

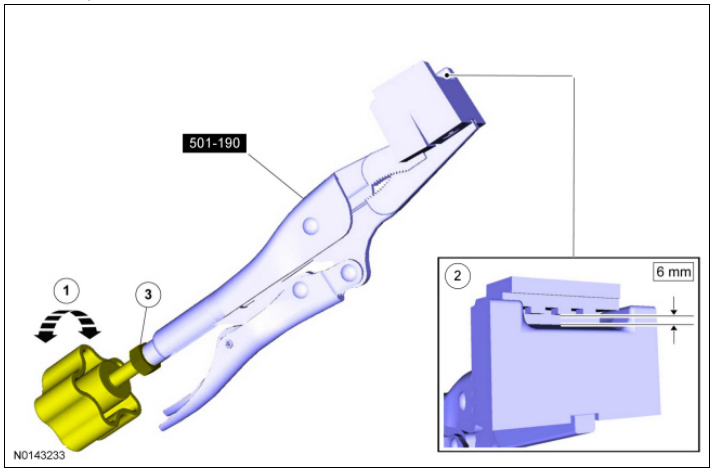
NOTICE: **The windshield must be at room temperature. Otherwise, damage to the windshield glass may occur.**

NOTE: Click here to view a video version of this procedure.

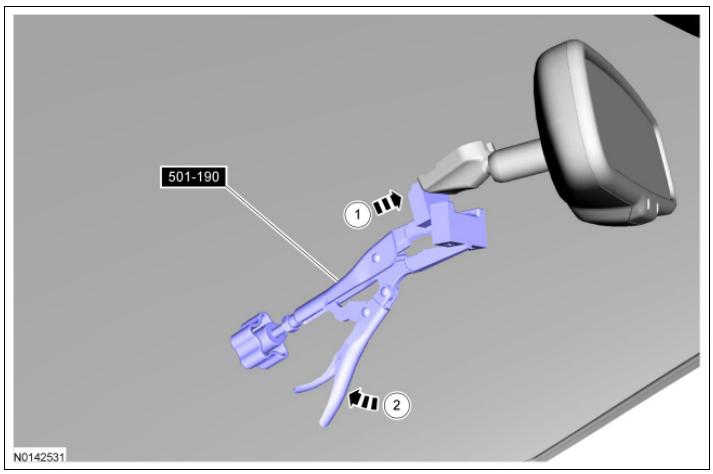
1. If equipped.



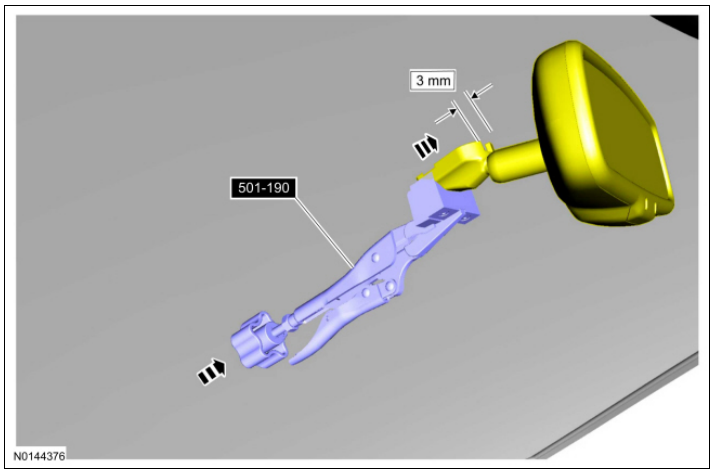
2.



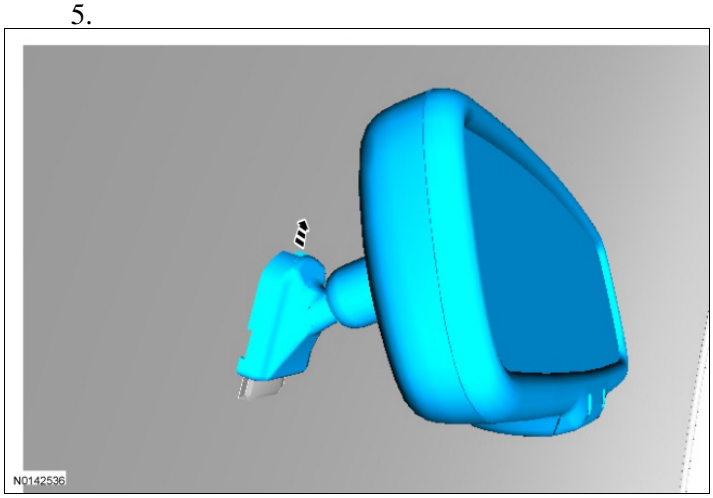
3. ***NOTICE:*** **Make sure the Mirror Remover is fully insertthe interior rear view mirror mount access hole. Otherwise, damage to the windshield glass may occur.**



4. Using a closed hand, bump the adjustment handle of the Mirror Remover to slide the mirror upward on the mirror mount.

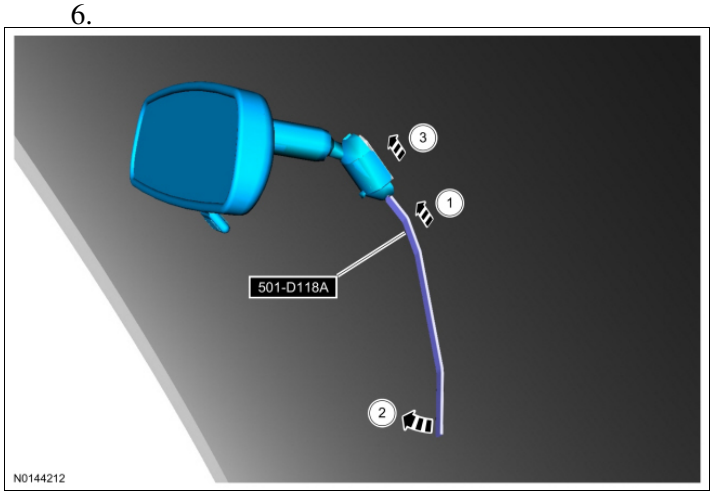


5.



Mirror Type 2

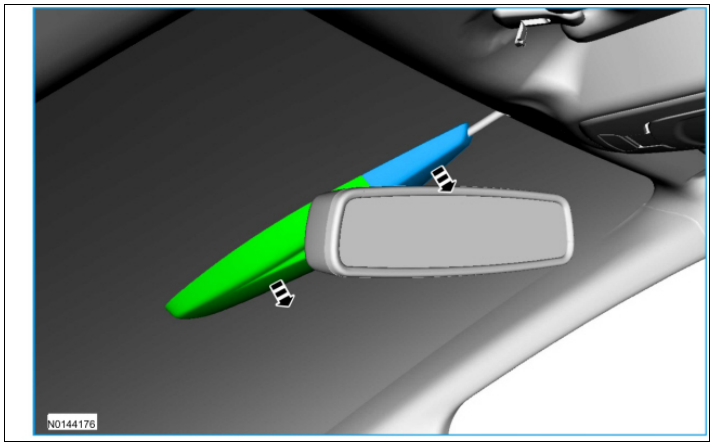
6.



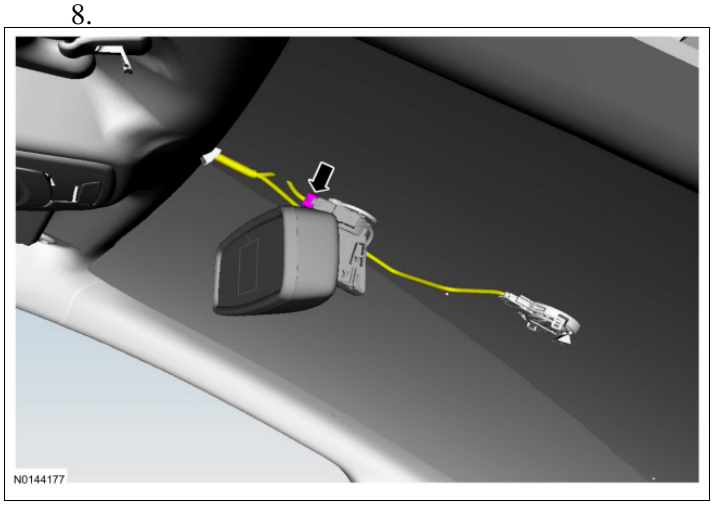
Mirror Type 3

7.

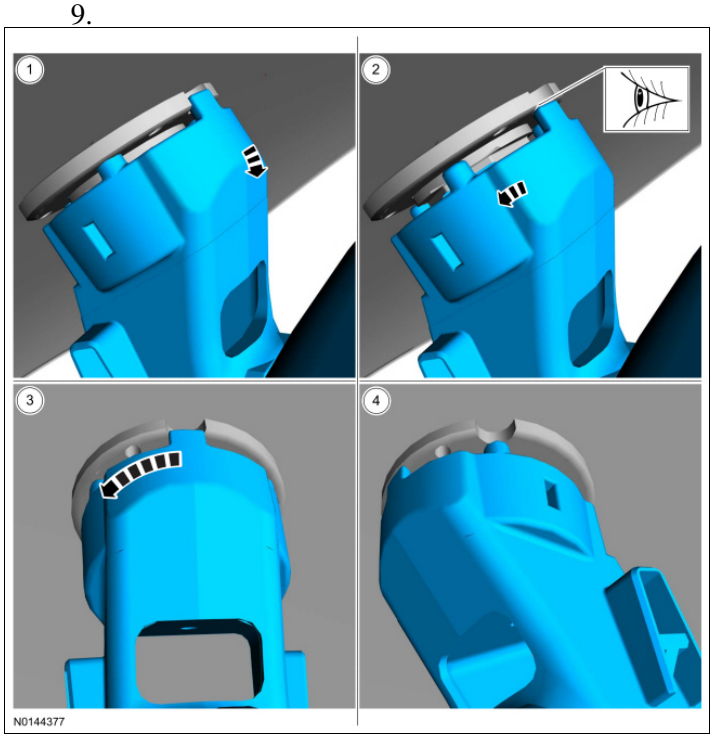
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8.

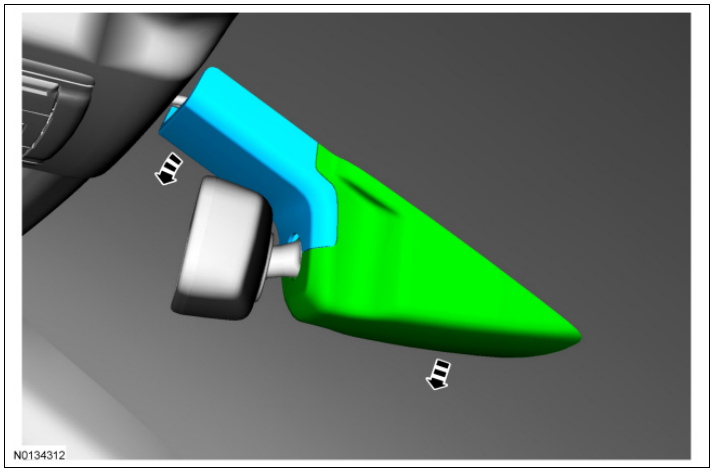


9.

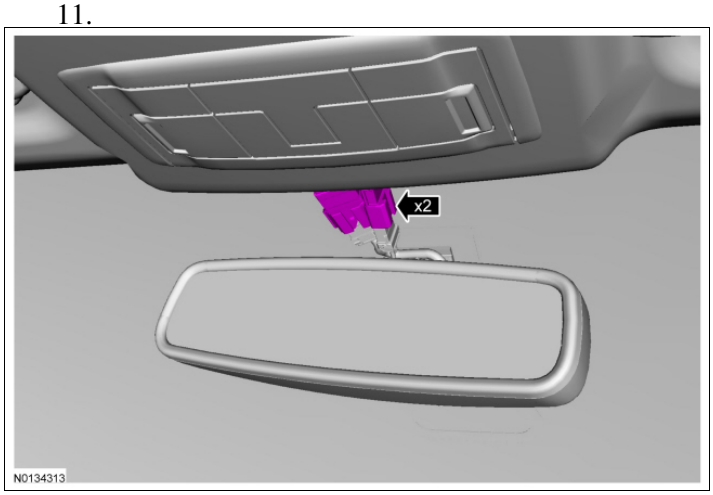


Mirror Type 4

10.

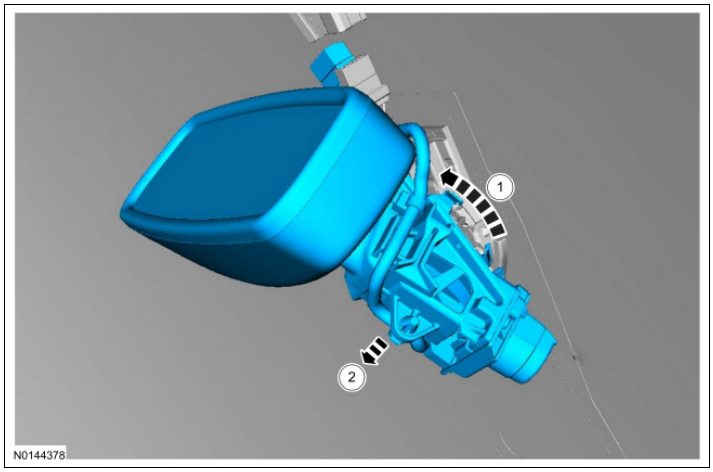


11.



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.**



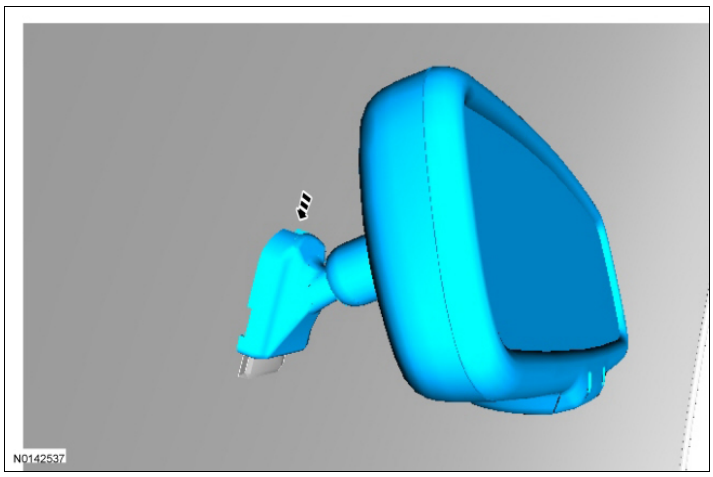
Installation

Mirror Type 1

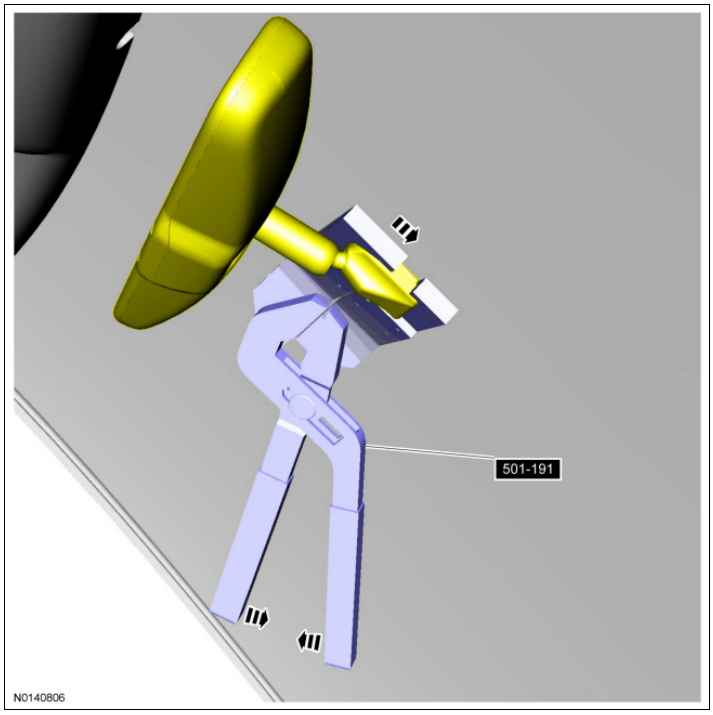
NOTE: Click here to view a video version of this procedure.

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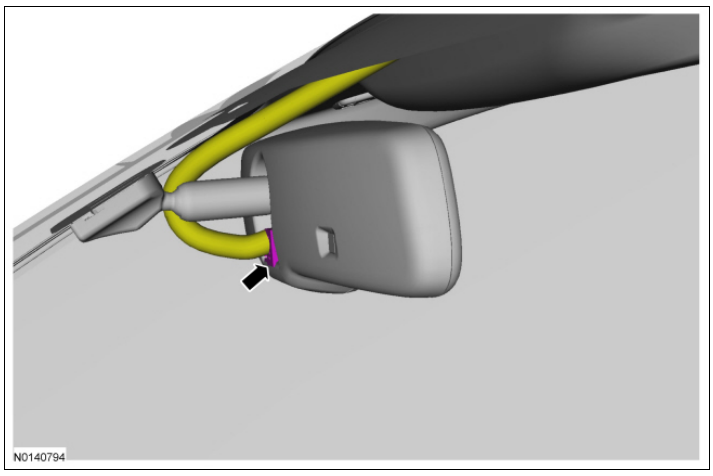
1. Slide the interior rear view mirror mount over the windshield bracket from the top.



2. **NOTE:** An audible click will be heard as the mirror fully seats.



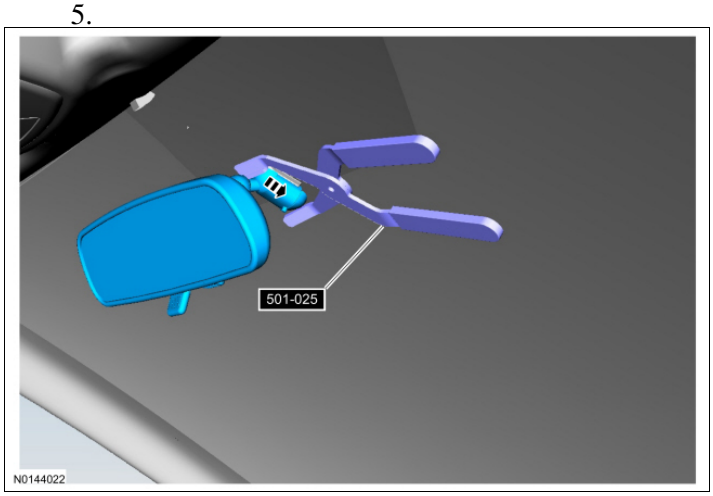
3. If equipped.



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.

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Torque Specifications

Description	Nm	lb-ft	lb-in
Front Seat			
Cushion pan screws [a]	-	-	-
Occupant Classification System Module (OCSM) bracket screws [a]	-	-	-
Occupant Classification System Module (OCSM) screws [a]	-	-	-
Recliner-to-seat track bolts [a]	-	-	-
Seat track-to-floor bolts [a]	-	-	-
Rear Seat			
Backrest hinge bolt	40	30	-
Backrest latch bolt	24	18	-
Backrest striker bolt	25	18	-
Hinge pin bolt	38	28	-
Rear safety belt anchor bolt	48	35	-
48	35	-	

[a] Refer to the procedure in this section.

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Seats

Front Seats

The front seats are equipped with the following serviceable systems:

- 2-way seat track (passenger only)
- 4-way seat track (driver only)
- Manual recliners (serviced with backrest frame)
- Heated seats (if equipped)
- Occupant Classification System (OCS) (passenger seat only, if equipped)
- Seat side air bags (in seat backrests) (if equipped)
- Safety belt buckles
- Seat track position sensors (if equipped)

Seat Backrests

The recliner mechanism is part of the seat backrest frame and is not serviced separately.

Seat Tracks

Front seats are equipped with a 2-way manual passenger seat track and 4-way manual driver seat track which includes a height adjust handle that ratchets to raise and lower the seat. Both seat tracks are serviced as complete assemblies which include the cushion frames and seat mounting feet.

Heated Seats

The heated seat system includes the following serviceable components:

- Cushion heater mats (attached to seat cushion foam pads)
- Heated seat relays (located in the Central Junction Box (CJB))
- Heated seat switches (located on the instrument panel)
- Thermostats (serviced only as part of each cushion heater mat)
- Body Control Module (BCM)

NOTE: If a new heater mat is needed on a front passenger seat cushion equipped with an Occupant Classification System (OCS) system, install a new OCS service kit with a heater mat already adhered to the cushion foam pad.

The cushion heater mats are serviceable separately. A heater mat can be peeled away from a foam pad and a new one adhered in its place providing excessive foam is not removed from the foam pad. If excessive foam is removed during removal, a new foam pad must be installed. A heater mat cannot be reused; the 2-way tape adhesive will no longer hold the heater mat position on the foam pad causing it to shift or bunch up.

Occupant Classification System (OCS) System

NOTE: OCS system components [seat wiring harness, 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. If new OCS system components are needed, an OCS system service kit must be installed as an assembly.

For information on diagnosing or servicing the OCS system, refer to Section 501-20B .

Seat Side Air Bags

Driver and passenger seat side air bags are attached to the seat backrest frame. For diagnostic information, or if the seat side air bag has deployed, refer to Section 501-20B .

Rear Seats

The rear seat cushion and 60/40 fold flat backrests are equipped with the following serviceable components:

- Backrest and cushion trim covers and foam pads
- Backrest hinges (attached to floor pan)
- Backrest latches (attached to backrest frame)
- Backrest latch strikers (attached to quarter panel)
- Cushion latches (located underneath cushion front edge attached to floor pan)
- Head restraints and head restraint guides (attached to the backrests)

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Seats

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD105-R025D 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 - Heated Seats

Heated Seats

The heated seat system only operates when the engine is running. When the heated seat switch(es) (located on the instrument panel) is activated, it supplies a ground signal to the Body Control Module (BCM). When the BCM receives the heated seat switch signal, it activates the appropriate (driver or passenger) heated seat relay, (located in the Central Junction Box (CJB). When the heated seat relay is activated, voltage is supplied to the cushion heater mat. The cushion heater mats are directly connected to ground to complete the electrical circuit to heat the seat.

Each cushion heater mat contains a non-serviceable internal thermostatic switch that closes when cold to complete the heater grid circuit and heat the seat. When hot, the thermostatic switch opens the heater grid circuit and allows the seat to cool. During normal operation, several minutes may be required before seat temperature is increased and several more minutes of cooling before the heater mats continue with heating. The heated seat indicator illuminates continuously while the thermostatic switch cycles between open and closed.

The seat should be occupied to correctly test for normal operation. Temperature measuring devices do not provide an accurate method for testing heated seat operation as surface temperatures are subject to human and environmental characteristics. Correct testing requires heater mat resistance measurements which have tight tolerances affecting heat cycle time length.

The heated seat system does not time-out. A heated seat remains on until it is turned off by the heated seat switch or the ignition is switched OFF.

Inspection and Verification

1. Verify the customeconcern by operating the heated seat functions.

2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Seat cushion trim cover damaged (heated seat heater mats)	• Central Junction Box (CJB) fuse 17 (7.5A) • Wiring harness • Loose or corroded connector(s) • Heated seat switch (located on the instrument panel) • Heated seat relay • Cushion heater mat • Body Control Module (BCM)

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 concern is with the heated seat and 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 is ON.
   - 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).

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

9. If the DTCs retrieved are related to the concern, go to the Body Control Module (BCM) 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

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NOTE: Refer to Description and Operation, Intelligent Access with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states on vehicles with this feature.

NOTE: This module utilizes a 5-character DTC followed by a 2-character failure type code. The failure type code provides information about specific fault conditions such as opens or shorts to ground. Continuous Memory Diagnostic Trouble Codes (CMDTCs) have an additional 2-character DTC status code suffix to assist in determining DTC history.

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B1034:12	Left Front Seat Heater Element: Circuit Short To Battery	GO to Pinpoint Test B .
B1034:14	Left Front Seat Heater Element: Circuit Short To Ground or Open	If the heated seat is inoperative, GO to Pinpoint Test B . If the heated seat is on all the time, GO to Pinpoint Test D .
B1036:12	Right Front Seat Heater Element: Circuit Short To Battery	GO to Pinpoint Test C .
B1036:14	Right Front Seat Heater Element: Circuit Short To Ground or Open	If the heated seat is inoperative, GO to Pinpoint Test C . If the heated seat is on all the time, GO to Pinpoint Test D .
B115A:23	Front Passenger Seat Heater: Signal Stuck Low	GO to Pinpoint Test C .
B115B:23	Front Driver Seat Heater: Signal Stuck Low	GO to Pinpoint Test B .
All Other DTCs	-	REFER to the Master DTC Chart in Section 419-10 .

Symptom Chart

Symptom Chart
NOTE: Refer to Description and Operation, Intelligent Access with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states on vehicles with this feature.

ConditionPossible SourcesAction

- The heated seats are inoperative - driver and passenger

- Fuse
- Wiring, terminals or connectors
- BCM

- GO to Pinpoint Test A .

- The heated seat is inoperative/does not operate correctly - driver

- Heated seat relay
- Heated seat switch
- Wiring, terminals or connectors
- Heater mat
- BCM

- GO to Pinpoint Test B .

- The heated seat is inoperative/does not operate correctly - passenger

- Heated seat relay
- Heated seat switch
- Wiring, terminals or connectors
- Heater mat
- BCM

- GO to Pinpoint Test C .

- The heated seat does not operate correctly - driver or passenger seat heats when the system is off

- Heated seat relay
- Wiring, terminals or connectors
- BCM

- GO to Pinpoint Test D .

- The heated seat does not operate correctly - driver seat does heat but the heated seat indicator does not illuminate when pressed

- Heated seat switch
- Wiring, terminals or connectors

- The driver heated seat switch LED is powered from the same circuit providing the voltage for the heater mat. CHECK circuit CHS11 (VT/GN) for an open between the driver heated seat relay and the driver heated seat switch. If the circuit is OK, INSTALL a new driver heated seat switch. TEST the system for normal operation.

- The heated seat does not operate correctly - passenger seat does heat but the heated seat indicator does not illuminate when pressed

- Heated seat switch
- Wiring, terminals or connectors

- The passenger heated seat switch LED is powered from the same circuit providing the voltage for the heater mat. CHECK circuit CHS12 (YE/GN) for an open between the passenated seat relay and the passenger heated seat/ambient lighting switch. If the circuit is OK, INSTALL a new passenger heated seat/ambient lighting switch. TEST the system for normal operation.

Pinpoint Tests

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.**

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Refer to Inspection and Verification and the Symptom Chart for direction to the appropriate Pinpoint Test.

Pinpoint Test A: The Heated Seats are Inoperative - Driver and Passenger Seats

Refer to Wiring Diagrams Cell 119 , Climate Controlled Seats for schematic and connector information.

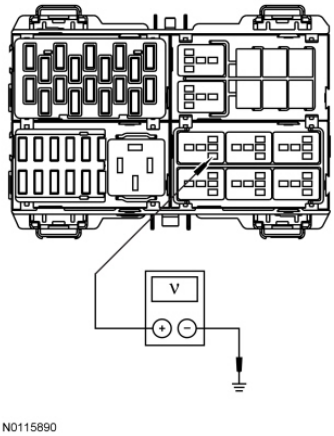
Normal Operation

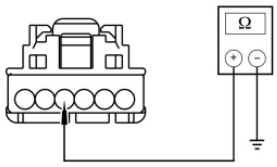
The heated seat system only operates when the engine is running. When the driver or passenger heated seat switch (located on the instrument panel) is activated, it supplies a ground signal to the Body Control Module (BCM). When the BCM receives the heated seat switch signal, it activates the appropriate (driver or passenger) heated seat relay (located in the Central Junction Box (CJB). When the heated seat relay is activated, voltage is supplied to the cushion heater mat. The cushion heater mats are directly connected to ground to complete the electrical circuit to heat the st.

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- BCM

PINPOINT TEST A: THE HEATED SEATS ARE INOPERATIVE - DRIVER AND PASSENGER SEATS

Test Step	Result / Action to Take
A1 CHECK FOR VOLTAGE TO THE DRIVER HEATED SEAT RELAY	
• Disconnect: Driver Heated Seat Relay. • Ignition ON. • Measure the voltage between driver heated seat relay socket pin 1, circuit CBP17 (BN/GN), and ground.  N0115890 • **Is the voltage greater than 10 volts?**	**Yes** GO to A2 . **No** VERIFY Central Junction Box (CJB) fuse 17 (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.

A2 CHECK THE HEATED SEAT SWITCH GROUND CIRCUIT	
• Ignition OFF. • Disconnect: Driver Heated Seat Switch C2400. • Measure the resistance between driver heated switch C2400-4, circuit GD115 (BK/GY), harness side and ground.  N0115868 • **Is the resistance less than 5 ohms?**	**Yes** GO to A3 . **No** REPAIR the circuit. TEST the system for normal operation.
A3 CHECK THE BCM FOR CORRECT OPERATION	
• Disconnect all of the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all of the BCM 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 BCM . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Pinpoint Test B: The Heated Seat is Inoperative/Does Not Operate Correctly - Driver

Refer to Wiring Diagrams Cell 119 , Climate Controlled Seats for schematic and connector information.

Normal Operation

The heated seat system only operates when the engine is running. When the driver heated seat switch (located on the instrument panel) is activated, it supplies a ground signal to the Body Control Module (BCM). When the BCM receives the heated seat switch signal, it activates the driver heated seat relay (located in the Central Junction Box (CJB)) by grounding the relay control circuit. When the heated seat relay is activated, voltage is supplied to the driver cushion heater mat. The driver cushion heater mat is directly connected to ground to complete the electrical circuit to heat the seat.

- DTC B1034:12 (Left Front Seat Heater Element: Circuit Short To Battery) - if the driver heated seat relay drive circuit CHS02 (YE/BU) is shorted to voltage and the BCM attempts to activate the driver heated seat relay, this DTC sets and the seat fails to heat.
- DTC B1034:14 (Left Front Seat Heater Element: Circuit Short To Ground or Open) - if the driver heated seat relay drive circuit CHS02 (YE/BU) is open or shorted to ground and the BCM attempts to activate the driver heated seat relay, this DTC sets and the seat fails to heat (circuit open) or may be on at all times (circuit shorted to ground) until the ignition is turned OFF.

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- DTC B115B:23 (Front Driver Seat Heater: Signal Stuck Low) - sets when the BCM detects the driver heated seat switch is active during on-demand self-test or has been active for more than 2 minutes.

This pinpoint test is intended to diagnose the following:
- Heated seat relay
- Heated seat switch
- Wiring, terminals or connectors
- Heater mat
- BCM

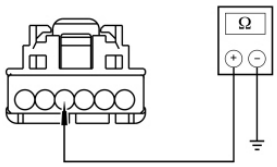
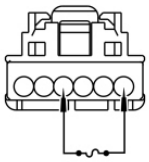
PINPOINT : THE HEATED SEAT IS INOPERATIVE/DOES NOT OPERATE CORRECTLY - DRIVER

NOTE: If a seat equipped with a seat mounted side air bag is being serviced, depower the Supplemental Restraint System (SRS). Refer to Section 501-20B .

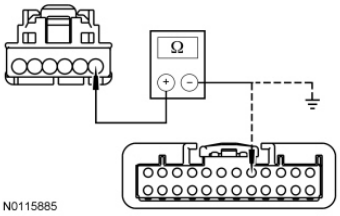
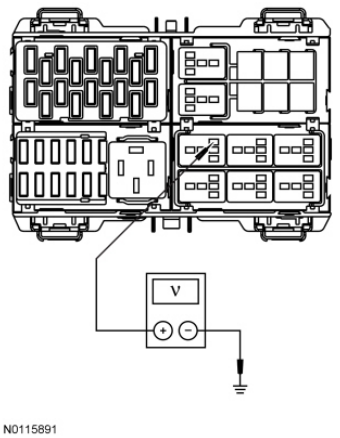
NOTE: The air bag warning lamp illuminates when the Restraints Control Module (RCM) fuse is removed and the ignition switch is ON. This is normal operation and does not indicate an SRS fault.

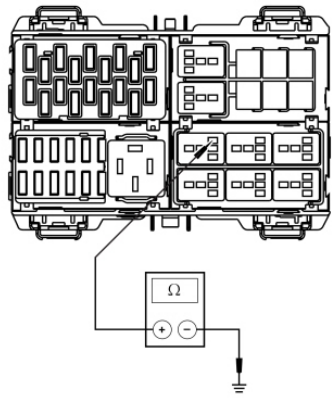
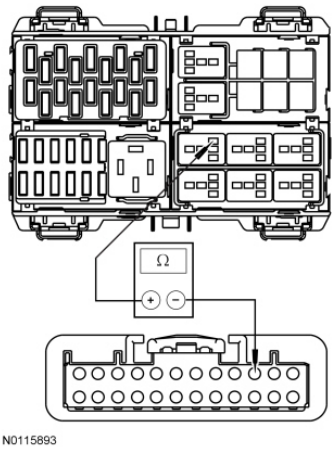
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
B1 CHECK THE BCM FOR DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - BCM . • **Is DTC B1034:12, B1034:14 or B115B:23 retrieved?**	**Yes** If DTC B1034:14 is present,to B7 . If DTC B1034:12 is present, GO to B6 . If DTC B115B:23 is present, GO to B4 . For all other BCM DTCs, REFER to the Master DTC Chart in Section 419-10 . **No** GO to B2 .
B2 CHECK THE BCM DRIVER HEATED SEAT (CC_SW_D_HSEATS) PID OPERATION	
• Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • While monitoring the BCM CC_SW_D_HSEATS PID, press and release the driver heated seat switch. • **Does the PID agree with the driver heated switch status?**	**Yes** GO to B9 . **No** GO to B3 .
B3 CHECK THE DRIVER HEATED SEAT SWITCH GROUND CIRCUIT FOR AN OPEN	

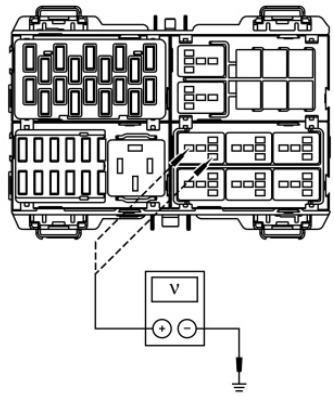
• Ignition OFF. • Disconnect: Driver Heated Seat Switch C2400. • Measure the resistance between driver heated seat switch C2400-4, circuit GD115 (BK/GY), harness side and ground.  N0115868 • **Is the resistance less than 5 ohms?**	**Yes** GO to B4 . **No** REPAIR the circuit. TEST the system for normal operation.
B4 CHECK THE BCM DRIVER HEATED SEAT (CC_SW_D_HSEATS) PID OPERATION	
• Ignition OFF. • Disconnect: Driver Heated Seat Switch C2400. • Connect a fused jumper wire between driver heated seat switch C2400-4, circuit GD115 (BK/GY), harness side and driver heated seat switch C2400-1, circuit CHS32 (BN), harness side.  N0115869 • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • Observe the BCM CC_SW_D_HSEATS PID status. • Remove the fused jumper wire. • Observe the BCM CC_SW_D_HSEATS PID status. • **Did the PID state change when the fused jumper wire was removed?**	**Yes** INSTALL a new driver heated seat switch. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to B5 .
B5 CHECK THE DRIVER HEATED SWITCH SIGNAL CIRCUIT FOR AN OPEN OR SHORT TO GROUND	

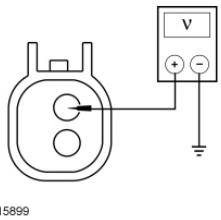
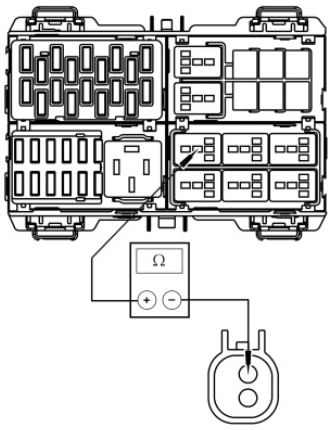
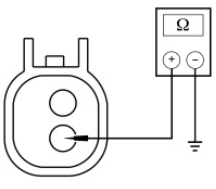
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• Ignition OFF. • Disconnect: BCM C2280G. • Measure the resistance between driver heated seat switch C2400-1, circuit CHS32 (BN), harness side and BCM C2280G-8, harness side; and between driver heated seat switch C2400-1, circuit CHS32 (BN), harness side and ground.  • **Is the resistance less than 5 ohms between the heated seat switch and the BCM ; and greater than 10,000 ohms between the heated seat switch and ground?**	**Yes** GO to B13 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B6 CHECK THE RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: Driver Heated Seat Relay. • Ignition ON. • Measure the voltage between driver heated seat relay socket pin 2, circuit CHS02 (YE/BU), harness side and ground.  • **Is any voltage present?**	**Yes** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** INSTALL a new driver heated seat relay. RECONNECT all connectors and REPEAT the self-test. If the DTC is retrieved again, GO to B13 .
B7 CHECK THE RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND	

• Ignition OFF. • Disconnect: Driver Heated Seat Relay. • Disconnect: BCM C2280D. • Measure the resistance between driver heated seat relay socket pin 2, circuit CHS02 (YE/BU), harness side and ground.  N0115892 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to B8 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B8 CHECK THE RELAY CONTROL CIRCUIT FOR AN OPEN	
• Measure the resistance between driver heated seat relay socket pin 2, circuit CHS02 (YE/BU), harness side and BCM C2280D-10, circuit CHS02 (YE/BU), harness side.  N0115893 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new driver heated seat relay. RECONNECT all connectors and REPEAT the self-test. If the DTC is retrieved again, GO to B13 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B9 CHECK FOR VOLTAGE TO THE DRIVER HEATED SEAT RELAY	

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• Ignition OFF. • Disconnect: Driver Heated Seat Relay. • Ignition ON. • Measure the voltage between driver heated seat relay socket pin 1, circuit CBP17 (BN/GN) and ground; and between driver heated seat relay socket pin 3, circuit CBP17 (BN/GN) and ground.  N0115894 • **Is the voltage greater than 10 volts for both measurements?**	**Yes** GO to B10 . **No** VERIFY Central Junction Box (CJB) fuse 17 (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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B10 CHECK THE HEATER MAT CIRCUIT FOR VOLTAGE	
• Ignition OFF. • Connect: Driver Heated Seat Relay. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B . • Disconnect: Driver Seat Side Air Bag Module C367. • Disconnect: Driver Seat Cushion Heater C364. • ⚠ **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. Refer to Section 414-01 . • Start the engine. • Activate the driver heated seat switch and measure the voltage between driver seat cushion heater C364-1, circuit CHS11 (VT/GN), harness side and ground.	**Yes** GO to B12 . **No** GO to B11 .

 N0115899 • **Is the voltage greater than 10 volts?**	
B11 CHECK THE HEATER CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Driver Heated Seat Relay. • Measure the resistance between driver heated seat relay socket pin 5, circuit CHS11 (VT/GN), harness side and driver seat cushion heater C364-1, circuit CHS11 (VT/GN), harness side.  N0115897 • **Is the resistance less than 5 ohms?**	**Yes** GO to B14 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. DISCONNECT the battery ground cable. CONNECT driver seat side air bag module C367. REPOWER the SRS . REFER to Section 501-20B .
B12 CHECK THE HEATER MAT GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between driver seat cushion heater C364-2, circuit GD143 (BK/VT), harness side and ground.  N0115898 • **Is the resistance less than 5 ohms?**	**Yes** CHECK for loose or damaged connector pins and wiring damage. If OK, INSTALL a new driver seat cushion heater mat. REFER to Seat Cushion - Front in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. DISCONNECT the battery ground cable. CONNECT driver seat side air bag module C367. REPOWER the SRS . REFER to Section 501-20B .

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	No REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. DISCONNECT the battery ground cable. CONNECT driver seat side air bag module C367. REPOWER the SRS . REFER to Section 501-20B .
B13 CHECK THE BCM FOR CORRECT OPERATION	
• Ignition OFF. • Disconnect all of the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all of the BCM 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 BCM . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B14 CHECK THE BCM FOR CORRECT OPERATION	
• Ignition OFF. • Disconnect all of the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all of the BCM 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 BCM . REFER to Section 419-10 . TEST the system for normal operation. DISCONNECT the battery ground cable. CONNECT driver seat side air bag module C367. REPOWER the SRS . REFER to Section 501-20B . **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. DISCONNECT the battery ground cable. CONNECT driver seat side air bag module C367. REPOWER the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Pinpoint Test C: The Heated Seat is Inoperative/Does Not Operate Correctly - Passenger

Refer to Wiring Diagrams Cell 119 , Climate Controlled Seats for schematic and connector information.

Normal Operation

The heated seatystem only operates when the engine is running. When the passenger heated seat switch (located on the instrument panel) is activated, it supplies a ground signal to the Body Control Module (BCM). When the BCM receives the heated seat switch signal, it activates the passenger heated seat relay (located in the Central Junction Box (CJB)) by grounding the relay control circuit. When the heated seat relay is activated, voltage is supplied to the passenger cushion heater mat. The passenger cushion heater mat is directly connected to ground to complete the electrical circuit to heat the seat.

- DTC B1036:12 (Right Front Seat Heater Element: Circuit Short To Battery) - if the passenger heated seat relay drive circuit CHS07 (GY/BU) is shorted to voltage and the BCM attempts to activate the passenger heated seat relay, this DTC sets and the seat fails to heat.
- DTC B1036:14 (Right Front Seat Heater Element: Circuit Short To Ground or Open) - if the passenger heated seat relay drive circuit CHS07 (GY/BU) is open or shorted to ground and the BCM attempts to activate the passenger heated seat relay, this DTC sets and the seat fails to heat (circuit open) or may be on at all times (circuit shorted to ground) until the ignition is turned OFF.
- DTC B115A:23 (Front Passenger Seat Heater: Signal Stuck Low) - sets when the BCM detects the passenger heated seat switch is active during on-demand self-test as been active for more than 2 minutes.

This pinpoint test is intended to diagnose the following:

- Heated seat relay
- Heated seat switch
- Wiring, terminals or connectors
- Heater mat
- BCM

PINPOINT TEST C: THE HEATED SEAT IS INOPERATIVE/DOES NOT OPERATE CORRECTLY - PASSENGER

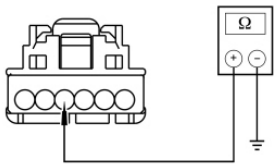
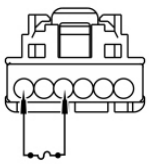
NOTE: If a seat equipped with a seat mounted side air bag is being serviced, depower the Supplemental Restraint System (SRS). Refer to Section 501-20B .

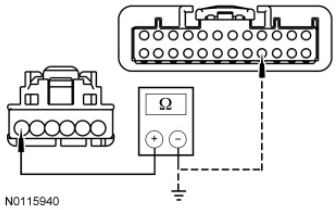
NOTE: The air bag warning lamp illuminates when the Restraints Control Module (RCM) fuse is removed and the ignition switch is ON. This is normal operation and does not indicate an SRS fault.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

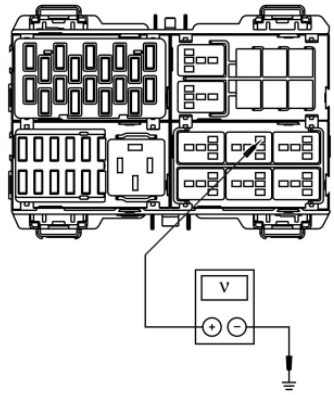
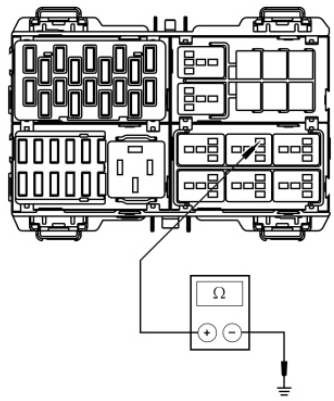
Test Step	Result / Action to Take
C1 CHECK THE BCM FOR DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - BCM . • **Is DTC B1036:12, B1036:14 or B115A:23 retrieved?**	**Yes** If DTC B1036:14 is present, GO to C7 . If DTC B1036:12 is present, GO to C6 . If DTC B115A:23 is present, GO to C4 . For all other BCM DTCs, REFER to the Master DTC Chart in Section 4110 .

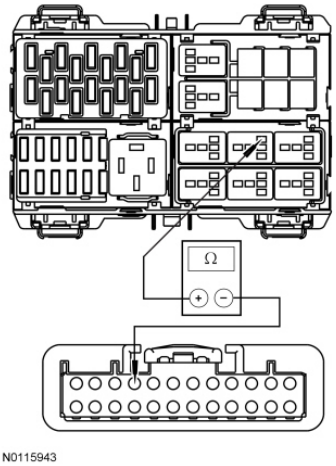
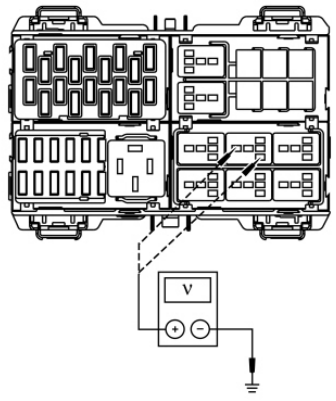
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	No GO to C2 .
C2 CHECK THE BCM PASSENGER HEATED SEAT (CC_SW_P_HSEATS) PID OPERATION	
• Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • While monitoring the BCM CC_SW_P_HSEATS PID, press and release the passenger heated seat switch. • **Does the PID agree with the passenger heated switch status?**	**Yes** GO to C9 . **No** GO to C3 .
C3 CHECK THE PASSEER HEATED SEAT SWITCH GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Passenger Heated Seat/Ambient Lighting Switch C2401. • Measure the resistance between passenger heated seat/ambient lighting switch C2401-4, circuit GD115 (BK/GY), harness side and ground.  N0115868 • **Is the resistance less than 5 ohms?**	**Yes** GO to C4 . **No** REPAIR the circuit. TEST the system for normal operation.
C4 CHECK THE BCM PASSENGER HEATED SEAT (CC_SW_P_HSEATS) PID OPERATION	
• Ignition OFF. • Disconnect: Passenger Heated Seat/Ambient Lighting Switch C2401. • Connect a fused jumper wire between passenger heated seat/ambient lighting switch C2401-4, circuit GD115 (BK/GY), harness side and passenger heated seat/ambient lighting switch C2401-6, circuit CHS30 (GY/YE), harness side.  N0115939	**Yes** INSTALL a new passenger heated seat/ambient lighting switch. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to C5 .

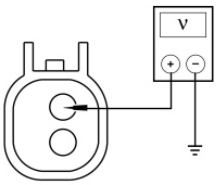
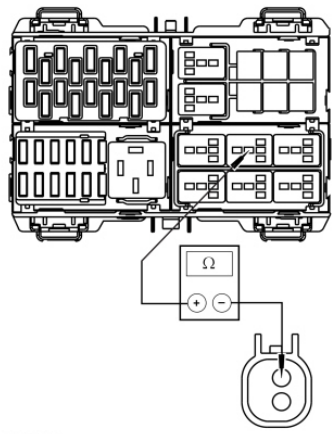
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • Observe the BCM CC_SW_P_HSEATS PID status. • Remove the fused jumper wire. • Observe the BCM CC_SW_P_HSEATS PID status. • **Did the PID state change when the fused jumper wire was removed?**	
C5 CHECK THE PASSENGER HEATED SWITCH SIGNAL CIRCUIT FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280G. • Measure the resistance between passenger heated seat/ambient lighting switch C2401-6, circuit CHS30 (GY/), harness side and BCM C2280G-21, harness side; and between passenger heated seat/ambient lighting switch C2401-6, circuit CHS30 (GY/YE), harness side and ground.  N0115940 • **Is the resistance less than 5 ohms between the heated seat switch and the BCM ; and greater than 10,000 ohms between the heated seat switch and ground?**	**Yes** GO to C13 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C6 CHECK THE RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: Passenger Heated Seat Relay. • Ignition ON. • Measure the voltage between passenger heated seat relay socket pin 2, circuit CHS07 (GY/BU), harness side and ground.	**Yes** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** INSTALL a new passenger heated seat relay. RECONNECT all connectors and REPEAT the self-test. If the DTC is retrieved again, GO to C13 .

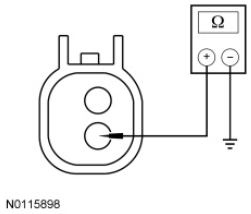
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 N0115941 • **Is any voltage present?**	
C7 CHECK THE RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: Passenger Heated Seat Relay. • Disconnect: BCM C2280D. • Measure the resistance between passenger heated seat relay socket pin 2, circuit CHS07 (GY/BU), harness side and ground.  N0115942 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to C8 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C8 CHECK THE RELAY CONTROL CIRCUIT FOR AN OPEN	
• Measure the resistance between passenger heated seat relay socket pin 2, circuit CHS07 (GY/BU), harness side and BCM C2280D-4, circuit CHS07 (GY/BU), harness side.	**Yes** INSTALL a new passenger heated seat relay. RECONNECT all connectors and REPEAT the self-test. If the DTC is retrieved again, GO to C13 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 N0115943 • **Is the resistance less than 5 ohms?**	
C9 CHECK FOR VOLTAGE TO THE PASSENGER HEATED SEAT RELAY	
• Ignition OFF. • Disconnect: Passenger Heated Seat Relay. • Ignition ON. • Measure the voltage between passenger heated seat relay socket pin 1, circuit CBP17 (BN/GN) and ground; and between passenger heated seat relay socket pin 3, circuit CBP17 (BN/GN) and ground.  N0115944 • **Is the voltage greater than 10 volts for both measurements?**	**Yes** GO to C10 . **No** VERIFY Central Junction Box (CJB) fuse 17 (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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C10 CHECK THE HEATER MAT CIRCUIT FOR VOLTAGE	
• Ignition OFF. • Connect: Passenger Heated Seat Relay. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .	**Yes** GO to C12 . **No** GO to C11 .

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• Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: Passenger Seat Cushion Heater C334. • ⚠ **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. Refer to Section 414-01 . • Start the engine. • Activate the passenger heated seat switch and measure the voltage between passenger seat cushion heater C334-1, circuit CHS12 (YE/GN), harness side and ground.  N0115899 • **Is the voltage greater than 10 volts?**	
C11 CHECK THE HEATER CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Passenger Heated Seat Relay. • Measure the resistance between passenger heated seat relay socket pin 5, circuit CHS12 (YE/GN), harness side and passenger seat cushion heater C334-1, circuit CHS12 (YE/GN), harness side.  N0115947 • **Is the resistance less than 5 ohms?**	**Yes** GO to C14 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. DISCONNECT the battery ground cable. CONNECT passenger seat side air bag module C337. REPOWER the SRS . REFER to Section 501-20B .

C12 CHECK THE HEATER MAT GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between passenger seat cushion heater C334-2, circuit GD145 (BK/BU), harness side and ground.  N0115898 • **Is the resistance less than 5 ohms?**	**Yes** CHECK for loose or damaged connector pins and wiring damage. If OK, INSTALL a new passenger seat cushion heater mat. REFER to Seat Cushion - Front in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. DISCONNECT the battery ground cable. CONNECT passenger seat side air bag module C337. REPOWER the SRS . REFER to Section 501-20B . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. DISCONNECT the battery ground cable. CONNECT passenger seat side air bag module C337. REPOWER the SRS . REFER to Section 501-20B .
C13 CHECK THE BCM FOR CORRECT OPERATION	
• Ignition OFF. • Disconnect all of the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all of the BCM 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 BCM . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C14 CHECK THE BCM FOR CORRECT OPERATION	
• Ignition OFF. • Disconnect all of the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all of the BCM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present.	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. DISCONNECT the battery ground cable. CONNECT passenger seat side air bag module C337. REPOWER the SRS . REFER to Section

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• **Is the concern still present?**	501-20B . **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. DISCONNECT the battery ground cable. CONNECT passenger seat side air bag module C337. REPOWER the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Pinpoint Test D: The Heated Seat Does Not Operate Correctly - Driver or Passenger Seat Heats When the System is Off

Refer to Wiring Diagrams Cell 119 , Climate Controlled Seats for schematic and connector information.

Normal Operation

The heated seat system only operates when the engine is running. When the driver or passenger heated seat switch (located on the instrument panel) is activated, it supplies a ground signal to the Body Control Module (BCM). When the BCM receives the heated seat switch signal, it activates the appropriate (driver or passenger) heated seat relay (located in the Central Junction Box (CJB)). When the heated seat relay is activated, voltage is supplied to the cushion heater mat. The cushion heater mats are directly connected to ground to complete the electrical circuit to heat the seat.

- DTC B1034:14 (Left Front Seat Heater Element: Circuit Short To Ground or Open) - if the driver heated seat relay drive circuit CHS02 (YE/BU) is open or shorted to ground and the BCM attempts to activate the driver heated seat relay, this DTC sets and the seat fails to heat (circuit open) or may be on at all times (circuit shorted to ground) until the ignition is turned OFF.
- D1036:14 (Right Front Seat Heater Element: Circuit Short To Ground or Open) - if the passenger heated seat relay drive circuit CHS07 (GY/BU) is open or shorted to ground and the BCM attempts to activate the passenger heated seat relay, this DTC sets and the seat fails to heat (circuit open) or may be on at all times (circuit shorted to ground) until the ignition is turned OFF.

This pinpoint test is intended to diagnose the following:

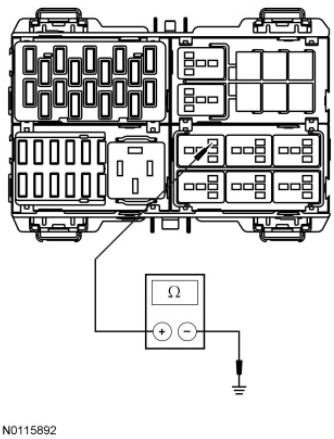
- Heated seat relay
- Wiring, terminals or connectors
- BCM

PINPOINT TEST D: THE HEATED SEAT DOES NOT OPERATE CORRECTLY - DRIVER OR PASSENGER SEAT HEATS WHEN THE SYSTEM IS OFF

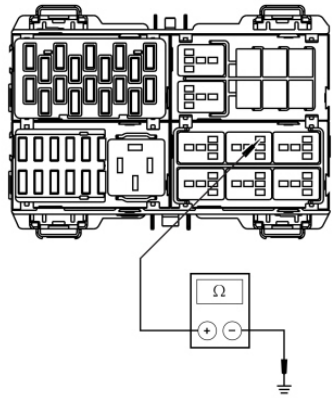
NOTE: If a seat equipped with a seat mounted side air bag is being serviced, depower the Supplemental Restraint System (SRS). Refer to Section 501-20B .

NOTE: The air bag warning lamp illuminates when the Restraints Control Module (RCM) fuse is removed and the ignition switch is ON. This is normal operation and does not indicate an SRS fault.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
D1 CHECK THE AFFECTED HEATED SEAT OPERATION WITH THE RELAY REMOVED	
• Ignition OFF. • Disconnect: Driver or Passenger Heated Seat Relay. • Ignition ON. • Observe the affected driver or passenger heated seat switch. • **Is the affected driver or passenger heated seat switch indicator illuminated?**	**Yes** REPAIR circuit CHS11 (VT/GN) (driver seat) or CHS12 (YE/GN) (passenger seat) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to D2 .
D2 CHECK THE RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280D. • For driver heated seat, measure the resistance between driver heated seat relay socket pin 2, circuit CHS02 (YE/BU), harness side and ground.  N0115892 • For passenger heated seat, measure the resistance between passenger heated seat relay socket pin 2, circuit CHS07 (GY/BU), harness side and ground.	**Yes** INSTALL a new driver heated seat relay or passenger heated seat relay. RECONNECT all connectors. TEST the system for normal operation. If the concern is still present, GO to D3 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

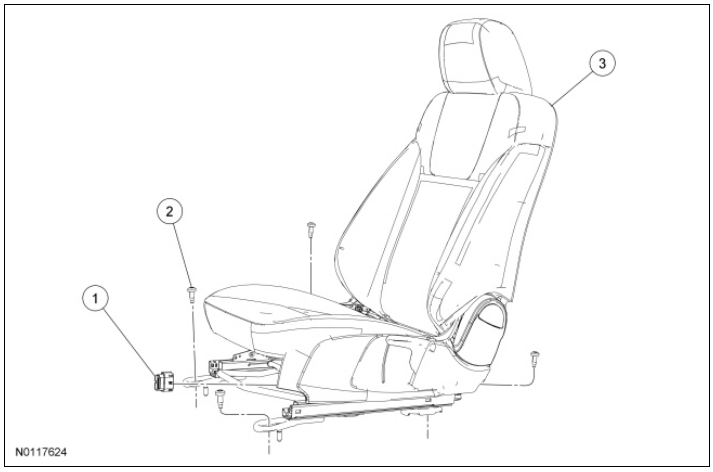
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 N0115942 • **Is the resistance greater than 10,000 ohms?**	
D3 CHECK THE BCM FOR CORRECT OPERATION	
• Disconnect all of the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all of the BCM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Seat - Front

NOTE: Refer to the installation steps in this procedure for seat track-to-floor retainer tightening sequence and specification.

NOTE: Always install new seat track-to-floor bolts.



Item	Part Number	Description
1	-	Electrical connector (part of 14A005)
2	W700883	Seat track-to-floor bolt (4 required)
3	-	Seat assembly

Removal and Installation

⚠ 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 is ON.

NOTE: The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. De SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .

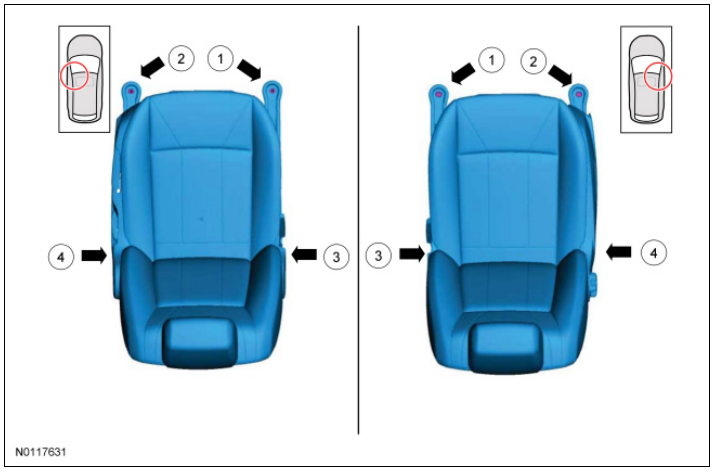
2. Complete the removal by referring to the exploded view.
   - Note the wire harness routing and retainer locations.
   - Discard the seat-to-floor bolts.

Installation

1. Install 4 new seat-to-floor bolts by hand.

2. Install the new seat-to-floor bolts in the sequence shown.
   - Tighten to 35 Nm (26 lb-ft).

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3. Connect the wire harness.
    - Route the wire harness as noted in removal.
    - Attach the retainers.

4. 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

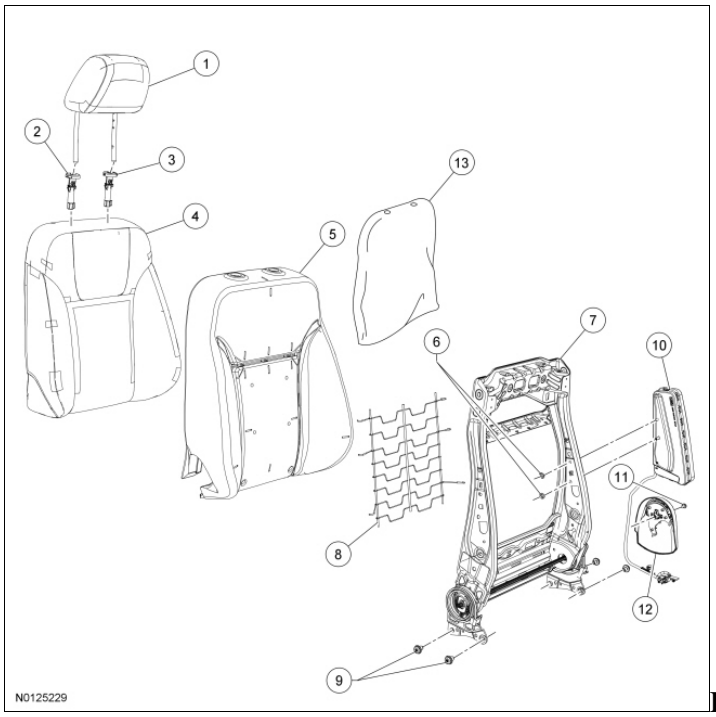
Seat Backrest

NOTE: Driver side shown, passenger similar.

NOTE: Refer to Seat Backrest - Front in this section for recliner-to-seat track bolt and side air bag module nut tightening sequence and torque specification.

NOTE: Click here or refer to the on-line Workshop Manual to view this illustration as an interactive exploded view, requires Adobe® Acrobat® 8.0 or higher.

NOTE: Click here or refer to the on-line Workshop Manual to learn about using an Interactive Illustration.



ItemPart NumberDescription1611A08Head restraint2610A18Head restraint guide sleeve (non-lockable)3610A16Head restraint guide sleeve (lockable)464416/RH 64417/LHBackrest cover564810/LH 64811/RHBackrest foam pad6W790242Side air bag module nut (2 required)761018/RH 61019/LHBackrest frame864842Static lumbar9W790240Recliner-to-seat track bolt (4 required)10611D10/RH 611D11/LHSide air bag module11W790244Recliner handle screw1261198/RH 61199/LHRecliner handle and screw cover13-Anti-squeak bag

Seat Cushion - Driver

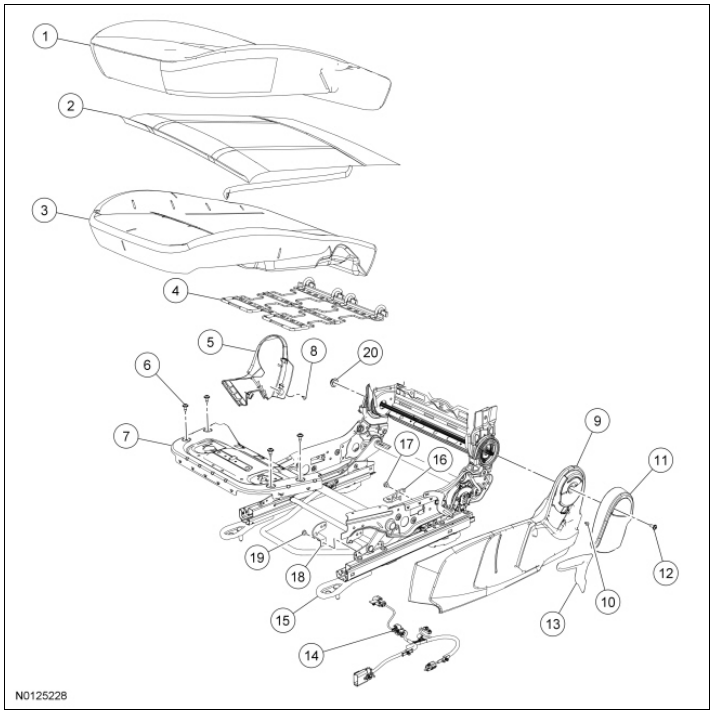
NOTICE: **The heater mats are serviceable separately. A heater mat can be peeled away from a foam pad and a new one adhered in its place providing the foam is not damaged. If foam is removed during removal, a new foam pad must be installed. A heater mat cannot be reused; the 2-way tape adhesive will no longer hold the heater mat position on the foam pad causing it to shift or bunch up.**

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NOTE: Refer to Seat Cushion - Front in this section for tightening sequence and torque specifications.

NOTE: Click here or refer to the on-line Workshop Manual to view this illustration as an interactive exploded view, requires Adobe® Acrobat® 8.0 or higher.

NOTE: Click here or refer to the on-line Workshop Manual to learn about using an Interactive Illustration.



Item	Part Number	Description
1	62901	Cushion cover
2	14D696	Heater mat
3	632A23	Cushion foam pad
4	64646	Cushion support ng
5	62187	Recliner cover
6	W790245	Cushion pan bolts (4 required)
7	60326	Cushion pan
8	W790246	Recliner cover screw
9	62187	Cushion side shield
10	W790246	Cushion side shield screw
11	61199	Recliner handle and screw cover
12	W790244	Recliner handle screw
13	61753	Seat height adjust handle
14	14A699	Seat wiring harness
15	61705	Seat track
16	610E34	Seat track position sensor bracket
17	W790243	Seat track position sensor bracket screw
18	60328	Wire harness bracket
19	W790243	Wire harness bracket screw
20	W623455	Push nut

Seat Cushion - Passenger

NOTE: Refer to Seat Cushion - Front in this section for tightening sequence and torque specifications.

NOTE: For passenger seat cushion Occupant Classification System (OCS) system components, refer to Section 501-20B .

NOTE: The heater mats are serviceable separately. A heater mat can be peeled away from a foam pad and a new one adhered in its place providing the foam is not damaged. If foam is removed during removal, a new foam pad must be installed. A heater mat cannot be reused; the 2-way tape adhesive will no longer hold the heater mat position on the foam pad causing it to shift or bunch up.

NOTE: Click here or refer to the on-line Workshop Manual to view this illustration as an interactive exploded view, requires Adobe® Acrobat® 8.0 or higher.

NOTE: Click here or refer to the on-line Workshop Manual to learn about using an Interactive Illustration.

Item	Part Number	Description
1	62900	Cushion cover
2	632A22	OCS (with and without heat)
3	64646	Cushion support spring
4	W790241	Occupant Classification System Module (OCSM) bracket screws (2 required)
5	W790245	Cushion pan bolts (4 required)
6	60326	Cushion pan
7	W790246	Recliner cover screw
8	610E34	OCSM bracket
9	-	OCSM (part of 632A22)
10	-	OCSM screws (part of 632A22)
11	62186	Recliner cover
12	61704	Seat track
13	62186	Cushion side shield
14	61198	Recliner handle and screw cover

15W790244Recliner handle screw16W790246Cushion side shield screw17-Seat wiring harness (part of 632A22)18610E34Seat track position sensor bracket19W790243Seat track position sensor bracket screw2060328Wire harness bracket21W790243Wire harness bracket screw22W623455Push nut

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

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Seat Backrest - Front

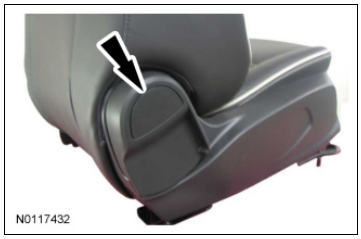
Removal

NOTE: For parts identification and location, refer to Seat - Exploded View, Front in this section.

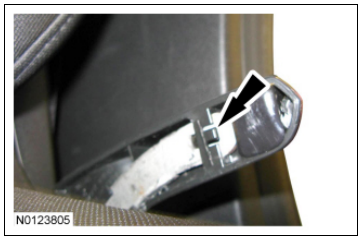
NOTE: Note all harness routing for correct installation.

1. Remove the seat. For additional information, refer to Seat - Front in this section.
2. **NOTE:** Passenger seat shown, driver seat similar.

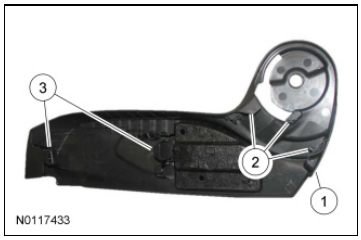
   Remove the recliner handle bolt cover, the bolt and the recliner handle.



3. If equipped, release the tab and remove the height adjust handle.
   - Lift height adjust handle.
   - Release the tab and slide the handle from the lever.



4. Remove the cushion side shield.
   1. Remove the screw at the rear of the cushion side shield.
   2. Pull out at the back of the cushion side shield to release the locator pins and tab.
   3. Slide the cushion side shield forward to disengage the brackets and remove the cushion side shield.

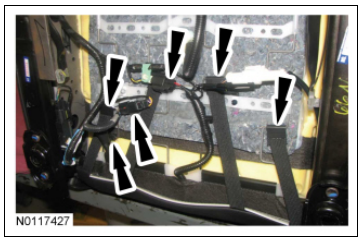


5. Remove the screw and the inner recliner cover.
6. **NOTE:** Passenger seat shown, driver seat similar.

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From under the seat, carry out the following.

- Disconnect the side air bag module electrical connector and detach the wire harness retainer.
- Disengage the 4 backrest cover elastic strap retainers attached to the bottom rear of the seat.



7. Remove the 4 recliner-to-seat track bolts and the backrest.

Installation

1. Position the backrest to the cushion frame and install the 4 backrest mounting bolts.
   - Tighten to 48Nm (35 lb-ft).

2. From under the seat, carry out the following.
   - Engage the 4 backrest cover elastic strap retainers attach to the bottom rear of the seat.
   - Connect the side air bag module electrical connector and attach the wire harness retainer.

3. Install the cushion side shield in the following sequence.
   1. Position and slide the cushion side shield rearward to engage the brackets.
   2. Install the screw at the rear of the cushion side shield.

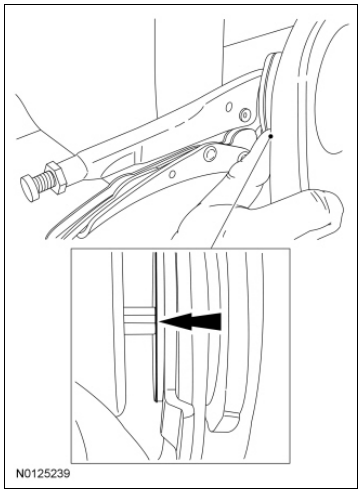
4. If equipped install the height adjust handle.

5. Install the recliner handle and bolt.

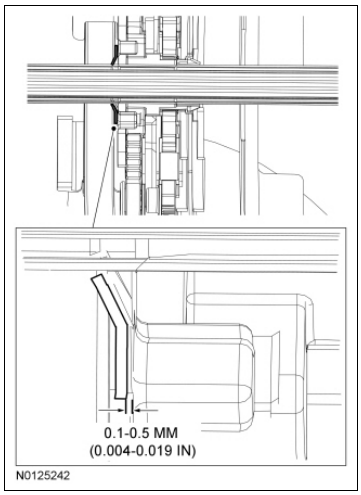
6. Push the recliner handle fully toward the inboard side of the seat then release the pressure on the recliner handle.

7. **NOTE:** RH recliner plate is shown, LH recliner plate is similar.

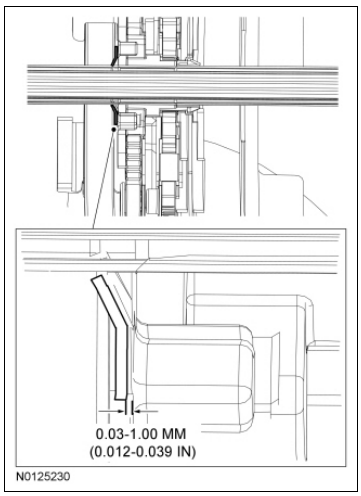
   Immobilize the recliner shaft by using 2 long nose locking pliers clamped to the shaft, flush to the inside edges of both recliner plates.



8. Measure the clearance between the inboard push nut and bushing.
    - If the clearance between the inboard push nut and the bushing exceeds 0.5 mm (0.019 in), install a 0.5 mm (0.019 in) feeler gauge or shim between the inboard push nut and the bushing and slide the inboard push nut tight against the feeler gauge or shim.



9. Remove the feeler gauge or shim.
10. Remove the recliner handle.
11. Push the outboard push nut (located behind the recliner handle) flush to the outboard bushing.
12. Remove the long nose locking pliers.
13. Slide the recliner shaft outward until the inboard push nut contacts the bushing.
14. Verify the clearance between the outboard push nut and bushing is between 0.3 mm and 1.0 mm (0.011 in and 0.039 in).



15. Install the recliner handle and bolt.
16. Install the inner recliner cover and screw.
17. Install the seat. For additional information, refer to Seat - Front in this section.

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Seat Backrest Cover - Front

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Removal

⚠ 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.

⚠ 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.

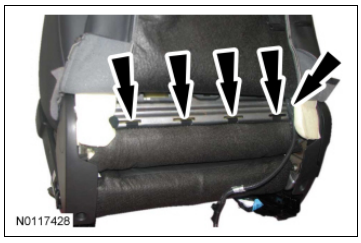
NOTE: For parts identification ocation, refer to Seat - Exploded View, Front in this section.

NOTE: Note all harness routing for correct installation.

1. Remove the front seat backrest. For additional information, refer to Seat Backrest - Front in this section.

2. Remove the 2 head restraint guide sleeves. For additional information, refer to Head Restraint Guide Sleeve in this section.

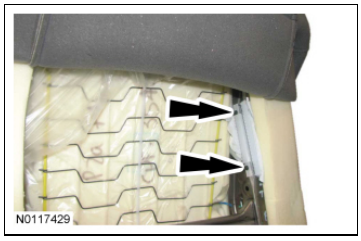
3. Detach the backrest cover retainers.


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4. Invert the backrest cover up enough to expose the side air bag deployment chute.

5. Remove the rivets from the deployment chute J-clip retainers.
   - From the back of the rivet, push the rivet send in and pull the head out from the other side.

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6. Slide the 2 deployment chute J-clip retainers apart.

7. Pull the side air bag module deployment chute and J-clips through the opening in the backrest foam pad.
   - Note positioning of the deployment chute for correct installation.

8. Invert the backrest cover and remove row of hog rings.

9. Release the J-clip from the backrest frame.

10. Remove the backrest cover.

Installation

1. Install the backrest cover. Roll down the cover and install 3 hog rings.

2. Attach the J-clip to the backrest frame.

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.

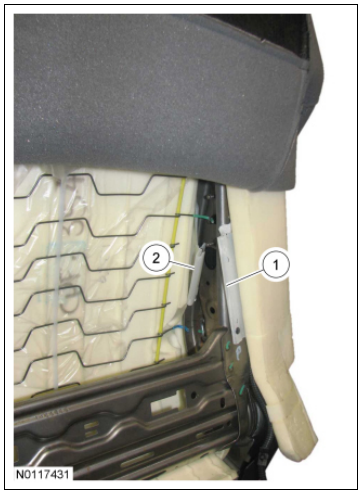
   Failure to follow these instructions may result in the seat side air bag deploying incorrectly, which increases the risk of serious personal injury or death in a crash.

   ⚠ **WARNING: 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.**

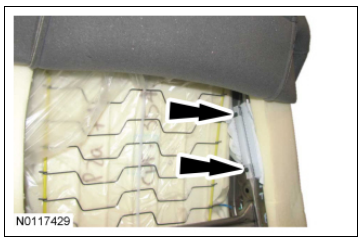
   ⚠ **WARNING: If the seat side air bag module deployment chute is not correctly positioned and closed, the seat side air bag module may not deploy correctly. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increases the risk of serious personal injury or death in a crash.**

   Wrap the deployment chute around the side air bag module and backrest frame.

   1. Position the outboard side of the air bag deployment chute around the outboard side of the backrest frame and pad.
   2. Insert the inboard side of the air bag deployment chute between the seat backrest frame and pad.



4. Engage the deployment chute J-clip retainers and install plastic rivets at the top and bottom of the J-clip retainers.



5. Roll the backrest cover down around the backrest frame.

6. Attach the backrest cover retainers to the rear of the backrest frame.

7. Install the 2 head restraint guide sleeves. For additional information, refer to Head Restraint Guide Sleeve in this section

8. Install the head restraint.

9. Install the front seat backrest. For additional information, refer to Seat Backrest - Front in this section.

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Seat Cushion Cover - Front

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Removal and Installation

⚠ **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, it is necessary to carry out the Occupant Classification System (OCS) reset when a front passenger seat cushion is disassembled, a new trim cover installed or an OCS service kit is installed. A scan tool is used to carry out the OCS system reset command.**

NOTE: For component identification and locations, refer to Seat - Exploded View, Front .

All seats

1. Remove the seat. For additional information, refer to Seat - Front in this section.

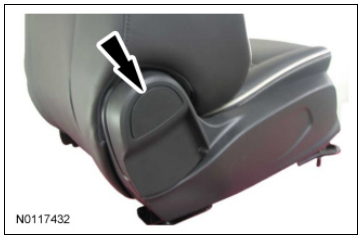
Passenger seat with a service kit Occupant Classification System (OCS)

2. Remove the Occupant Classification System (OCS) sensor. For additional information, refer to Section 501-20B .

Driver seat and passenger seat with Original Equipment (OE) OCS

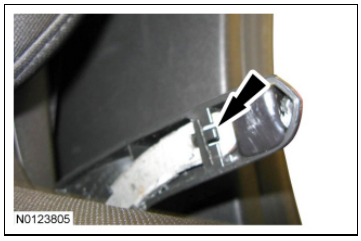
3. **NOTE:** Passenger seat shown, driver seat similar.

   Remove the recliner handle bolt cover, the bolt and the recliner handle.

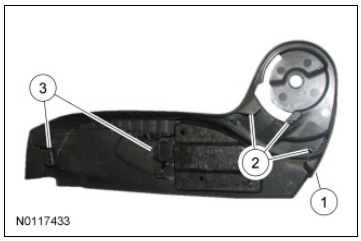

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4. If equipped, release the tab and remove the height adjust handle.
   - Lift height adjust handle.
   - Release the tab and slide the handle from the lever.

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5. Remove the cushion side shield.
    1. Remove the screw at the rear of the cushion side shield.
    2. Pull out at the back of the cushion side shield to release the locator pins and tab.
    3. Slide the cushion side shield forward to disengage the brackets and remove the cushion side shield.

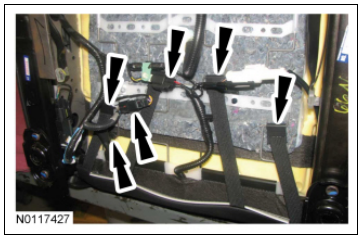


6. Remove the screw and the inner recliner cover.

7. **NOTE:** Passenger seat shown, driver seat similar.

    From under the seat, carry out the following.

    - Disconnect the side air bag module electrical connector and detach the wire harness retainer.
    - Disengage the 4 backrest cover elastic strap retainers attached to the bottom rear of the seat.



8. Remove the cushion and cover from the seat track and seat cushion frame.

All seats

9. Remove the cushion cover.
    - Release the hook -and-loop strip.
    - Remove the hog rings and the cushion cover.

Installation

All seats

1. Attach the cushion cover to the cushion.
    - Secure using new hog rings.
    - Secure the hook -and-loop strip.

Passenger seat with a service kit OCS

2. Install the Occupant Classification System (OCS) sensor. For additional information, refer to Section 501-20B .

Driver seat and passenger seat with OE OCS

3. Install the cushion and cover as an assembly.

4. From under the seat, carry out the following.
   - Engage the 4 backrest cover elastic strap retainers attach to the bottom rear of the seat.
   - Connect the side air bag module electrical connector and attach the wire harness retainer.

5. Install the inner recliner cover and screw.

6. Install the cushion side shield in the following sequence.
   1. Position and slide the cushion side shield rearward to engage the brackets.
   2. Install the screw at the rear of the cushion side shield.

7. If equipped install the height adjust the handle.

8. Install the recliner handle, bolt and cover.

All seats

9. Install the seat. For additional information, refer to Seat - Front in this section.

Passenger Seat

10. ⚠ **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.** ***NOTICE:*** **To prevent system failure, take the following precautions before carrying out the Occupant Classification System (OCS) system reset:**

    - Make sure the voltage to the Occupant Classification System Module (OCSM) is greater than 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 between 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 and during the OCS system reset process.
    - Prior to carrying out the OCS system reset, make sure a minimum of 8 seconds has elapsed after cycling the ignition switch ON.

    Carry out the OCS system reset.

11. 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 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.

12. **NOTE:** Cycle the ignition switch after the OCS system reset.

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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 System in Section 501-20B .

13. Prove out the SRS as follows:
    Turn the ignition switch from ON to OFF. Wait 10 seconds, then turn the ignition switch back to ON and visually monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will illuminate 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 at a 5 Hz rate (RCM not configured).
    The air bag warning indicator may not illuminate until approximately 30 seconds after the ignition switch 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 sounds in a pattern of 5 sets of 5 beeps. If this occurs, diagnose and repair the air bag warning indicator and any SRS fault discovered.
    Use a scan tool and clear all continuous DTCs from the RCM and Occupant Classification System Module (OCSM).

Seat Cushion Heater Mat

Removal

NOTE: For parts identification and location, refer to Seat - Exploded View, Front in this section.

Passenger seat

1. ***NOTICE:*** **Do not install a new heater mat on a front passenger seat cushion. If a new cushion heater mat is needed on the front passenger seat, an Occupant Classification System (OCS) service kit equipped with a heater mat must be installed. Failure to follow this instruction may result in incorrect operation of the OCS .**

   Install a new OCS service kit. For additional information, refer to Section 501-20B .

Driver seat

2. Remove the driver seat cushion cover. For additional information, refer to Seat Cushion Cover - Front in this section.

3. ***NOTICE:*** **Do not reinstall any heater mat after removal. The adhesive will not adhere correctly to the foam pad, causing it to bunch up or shift out of place. A new heater mat must be installed. Failure to follow these instructions can result in heated seat component damage and system failure.**

   Carefully peel and remove cushion heater mat from the seat cushion foam pad and route the wire harness through the cushion foam pad opening.

   - It is acceptable for a thin layer of foam to peel away with the old heater mat. The new heater mat will adhere to the foam pad, but if foam tearing occurs or if any pieces of foam are removed, install a new foam pad.

Installation

1. Install a new heater mat straight on the foam pad and without any wrinkles that may show through the cover after installation.

2. Install the seat cushion cover. For additional information, refer to Seat Cushion Cover - Front in this section.

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Seat Track

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Disassembly and Assembly

NOTICE: **To prevent system failure, it is necessary to carry out the Occupant Classification System (OCS) system reset when a front passenger seat cushion is disassembled, a new cushion cover is installed or an OCS service kit is installed.**

NOTICE: **Do not install a new heater mat on a front passenger seat cushion, it is not serviceable separately. If a new cushion heater mat is needed on the front passenger seat, an Occupant Classification System (OCS) service kit equipped with a heater mat must be installed. Failure to follow this instruction may result in incorrect operation of the OCS . Refer to Section 501-20B for the OCS removal and installation.**

NOTE: Occupant Classification System (OCS) 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 components are not to be installed separately. If a new OCS , OCS component or seat cushion foam pad are needed, a new OCS service kit (seat cushion foam pad, bladder with pressure sensor and OCSM) must be installed as an assembly.

NOTE: For component identification and locations, refer to Seat - Exploded View, Front in this section.

All seats

1. Remove the backrest. For additional information refer to Seat Backrest - Front in this section.

Passenger seat

2. Remove the OCS sensor. For additional information, refer to Section 501-20B .

Driver seat

3. Remove seat cushion and cover from the seat track and seat cushion frame.

4. **NOTE:** Note the wire harness routing for installation.

   Remove the seat wire harness.

   - Release the retainers.

Passenger seat

5. Remove 2 screws and the OCSM bracket.

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All seats

6. Remove the safety belt buckle.
    - Disconnect the safety belt buckle electrical connector.
    - Remove the bolt and the safety belt buckle assembly.

7. Remove the seat positsensor.
    - Remove the retaining clip.
    - Slide sensor rearward to remove.

8. Remove the screw and the wire harness bracket.

9. Remove the screw and the seat track position sensor bracket.

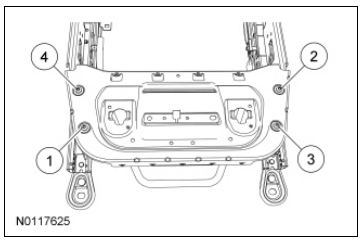
10. Remove the cushion support spring.
    - Release the cushion spring from the seat track and cushion pan.

11. Remove the 4 retainers and the cushion pan.

Assembly

All seats

1. Position the cushion pan and install the 4 screws in the sequence shown.
    - Tighten to 4 Nm (35 lb-in).



2. Install the cushion support spring.

3. Position the seat track position sensor bracket and install the screw.

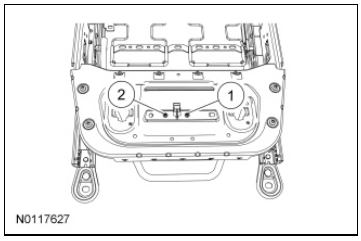
4. Position the wire harness bracket and install the screw.

5. Install the seat position sensor.
    - Secure the lock tab.

6. Position the safety belt buckle and install the bolt.
    - Tighten to 48 Nm (35 lb-ft).

Passenger seat

7. Position the OCSM bracket and install the 2 screws in the sequence shown.
    - Tighten to 3 Nm (27 lb-in).



8. Install the OCS . For additional information, refer to Section 501-20B .

Driver seat

9. Install the seat wire harness.
   - Attach retainers.

10. Install seat cushion and cover from the seat track and seat cushion frame.

All seats

11. Position the backrest to the cushion frame and install the 4 backrest mounting bolts.
    - Tighten to 48Nm (35 lb-ft).

12. From under the seat, carry out the following.
    - Engage the 4 backrest cover elastic strap retainers attach to the bottom rear of the seat.
    - Connect the side air bag module electrical connector and attach the wire harness retainer.

13. Install the cushion side shield in the following sequence.
    1. Position and slide the cushion side shield rearward to engage the brackets.
    2. Install the screw at the rear of the cushion side shield.

14. If equipped install the height adjust handle.

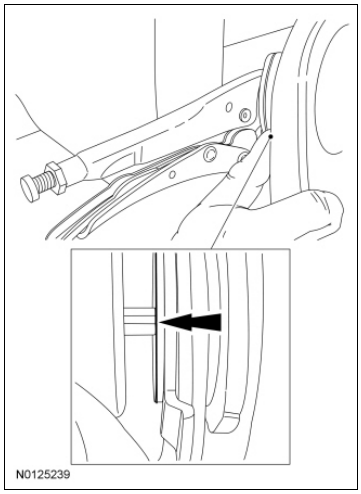
15. Install the recliner handle and bolt.

16. Push the recliner handle fully toward the inboard side of the seat then release the pressure on the recliner handle.

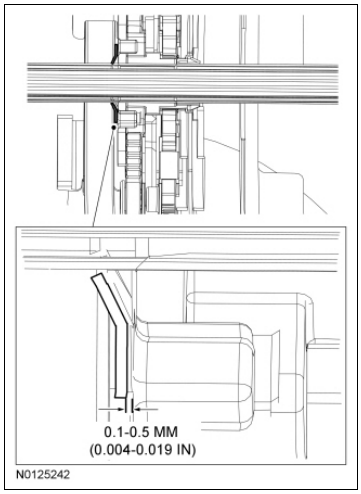
17. **NOTE:** RH recliner plate is shown, LH recliner plate is similar.

    Immobilize the recliner shaft by using 2 long nose locking pliers clamped to the shaft, flush to the inside edges of both recliner plates.

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18. Measure the clearance between the inboard push nut and bushing.
    - If the clearance between the inboard push nut and the bushing exceeds 0.5 mm (0.019 in), install a 0.5 mm (0.019 in) feeler gauge or shim between the inboard push nut and the bushing and slide the inboard push nut tight against the feeler gauge or shim.
    - If the clearance between the inboard push nut and the bushing is less than 0.5 mm (0.019 in), remove and discard the push nut. Install a new push nut, using a 0.5 mm (0.019 in) feeler gauge or shim between the inboard push nut and the bushing, slide the inboard push nut tight against the feeler gauge or shim.



19. Remove the feeler gauge or shim.

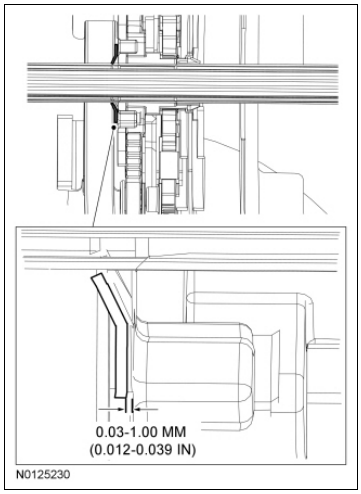
20. Remove the recliner handle.

21. Push the outboard push nut (located behind the recliner handle) flush to the outboard bushing.

22. Remove the long nose locking pliers.

23. Slide the recliner shaft outward until the inboard push nut contacts the bushing.

24. Verify the clearance between the outboard push nut and bushing is between 0.3 mm and 1.0 mm (0.011 in and 0.039 in).



25. Install the recliner handle and bolt.

26. Install the inner recliner cover and screw.

Passenger seat with an OCS

27. ⚠ **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.**

    NOTICE: **To prevent system failure, take the following precautions before carrying out the Occupant Classification System (OCS) system reset:**

    - Make sure the voltage to the Occupant Classification System Module (OCSM) is greater than 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 between 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 and during the OCS system reset process.
    - Prior to carrying out the OCS system reset, make sure a minimum of 8 seconds has elapsed after cycling the ignition switch ON.

    Carry out the OCS system reset.

28. 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 and wiring for damage.
    - Pressure sensor hose for kinks and/or damage.

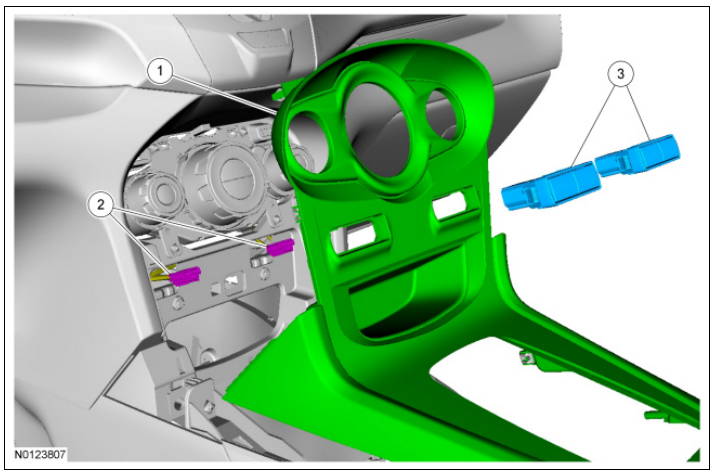
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    - Seat-related wiring harness and body wiring harness terminals and connectors for damage.

29. **NOTE:** Cycle the ignition switch after the OCS system reset.

    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 System in Section 501-20B .

30. Prove out the SRS as follows:
    Turn the ignition switch from ON to OFF. Wait 10 seconds, then turn the ignition switch back to ON and visually monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will illuminate 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 at a 5 Hz rate (RCM not configured).
    The air bag warning indicator may not illuminate until approximately 30 seconds after the ignition switch 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 sounds in a pattern of 5 sets of 5 beeps. If this occurs, diagnose and repair the air bag warning indicator and any SRS fault discovered.
    Use a scan tool and clear all continuous DTCs from the RCM and Occupant Classification System Module (OCSM).

Heated Seat Switch



Item	Part Number	Description
1	5404644	Lower finish panel
2	-	Connector (part of 14401)
3	14D694	Heated seat switch

Removal and Installation

1. Remove the lower instrument panel finish panel. For additional information, refer to Section 501-12 .
2. Release the tabs and remove the heated seat switch.

Installation

1. Install the heated seat switch.
2. Install the lower instrument panel finish panel. For additional information, refer to Section 501-12 .

Head Restraint Guide Sleeve

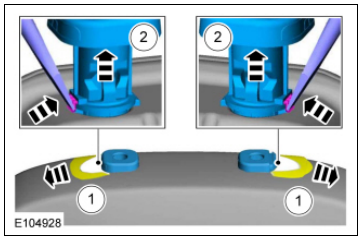
Removal

NOTE: Typical head restraint guide sleeve shown, others similar.

1. Push in on the 2 head restraint guide sleeve release buttons and remove the head restraint.

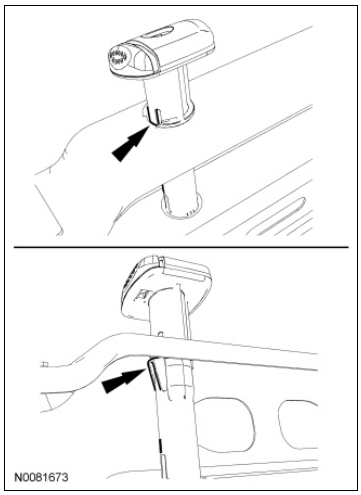
2. Obtain a flat-head screwdriver with a width of 4 mm (0.157 in) to 7 mm (0.275 in) and a thickness of approximately 1 mm (0.039 in).

3. Locate the lock feature on the head restraint guide sleeve.
    1. Position the screwdriver between the head restraint guide sleeve neck and backrest trim cover and foam pad.
    2. Locate the screwdriver on the lock feature and position at a 45-degree angle.

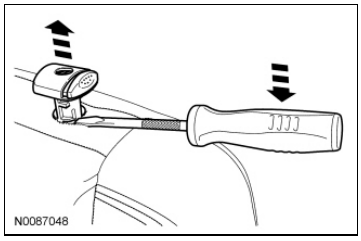


4. **NOTE:** For retainer clarity, backrest trim cover and foam pad are removed.

   Push in the screwdriver, bending the lock feature on the head restraint guide sleeve in.



5. While bending the lock feature in, push down on the screwdriver handle, prying the head restraint guide sleeve up and disengaging it from the backrest frame crossmember.



6. Remove the head restraint guide sleeve.
    - Discard the head restraint guide sleeve.

7. Repeat these steps for the head restraint guide sleeve on the opposite side.

Installation

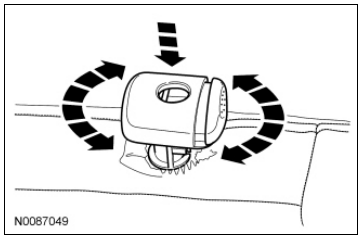
NOTICE: **Always install new head restraint guide sleeves. Difficult adjustment of the head restraint may occur. Failure to follow these instructions may result in component failure.**

NOTICE: **The head restraint guide sleeves are not interchangeable. Failure to install the correct head restraint guide sleeve at the correct position may result in component failure.**

1. Make sure the holes in the backrest foam pad and backrest trim cover are aligned to the holes in the backrest frame.

2. **NOTE:** The guide sleeve will only fit into the backrest frame when the guide sleeve alignment tabs align with the keyway opening in the backrest frame.

   To allow the head restraint guide sleeve to slide freely through the backrest foam pad and backrest trim cover, twist the head restraint guide sleeve to align the keyway tabs while pushing it into the backrest frame hole as far as it will go with hand pressure.



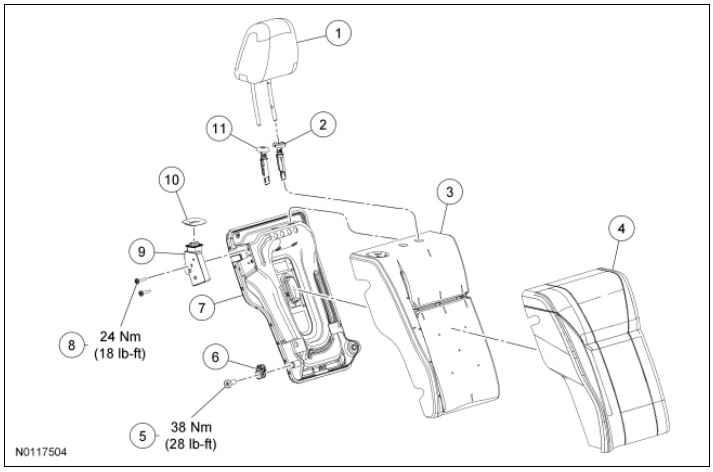
3. Inspect the head restraint guide sleeve.
    - Pull the head restraint guide sleeve out by hand, making sure it is locked in place. If the head restraint guide sleeve can be removed by hand, repeat the installation procedure. If the head restraint guide sleeve can be removed again after installing a second time, install a new head restraint guide sleeve.

4. Repeat these steps for the head restraint guide sleeve on the opposite side.

5. After installation of 2 new head restraint guide sleeves, install the head restraint in the following sequence.
    1. Position the head restraint rods to the head restraint guide sleeve holes.
    2. Push the head restraint down, guiding the rods into the head restraint guide sleeve holes.
    3. Make sure the head restraint adjusts without excessive effort and locks in place.

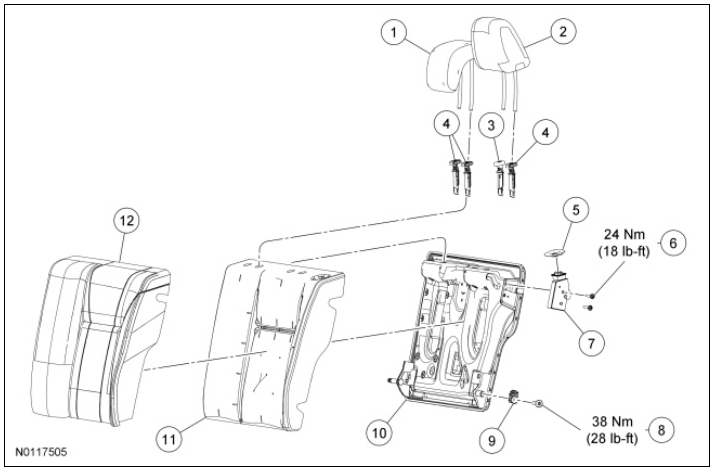
Seat - Exploded View, Rear

Seat Backrest - 40 Percent



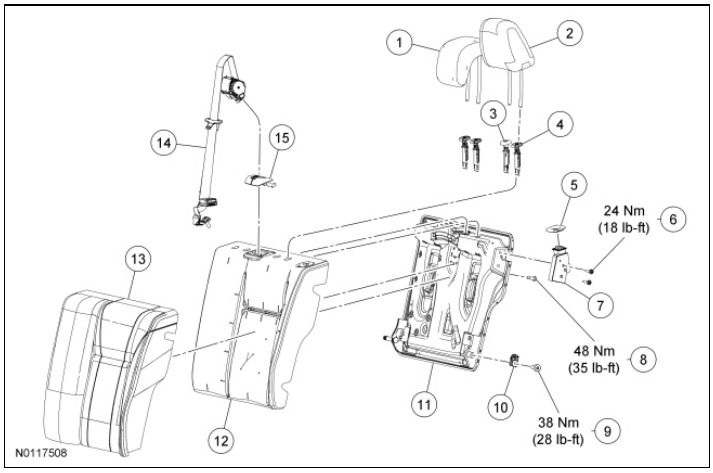
Item	Part Number	Description
1	611A08	Head restraint
2	610A16	Head restraint guide sleeve (lockable)
3	66800	Backrest foam pad
4	66600	Backrest cover
5	-	Hinge pin bolt (part of 613B48)
6	613B48	Hinge pin
7	60508	Backrest frame
8	W790247	Backrest latch bolt (2 required)
9	61382	Backrest latch
10	624A08	Backrest latch bezel
11	610A18	Head restraint guide sleeve (non-lockable)

Seat Backrest - 60 Percent, 4-Door Sedan



Part Number	Description	
1	611A08	Head restraint (center)
2	611A08	Head restraint (LH)
3	610A18	Head restraint guide sleeve (non-lockable)
4	610A16	Head restraint guide sleeve (3 required) (lockable)
5	624A08	Backrest latch bezel
6	W790247	Backrest latch bolt (2 required)
7	61383	Backrest latch
8	-	Hinge pin bolt (part of 613B48)
9	613B48	Hinge pin
10	60509	Backrest frame
11	66801	Backrest foam pad
12	66601	Backrest cover

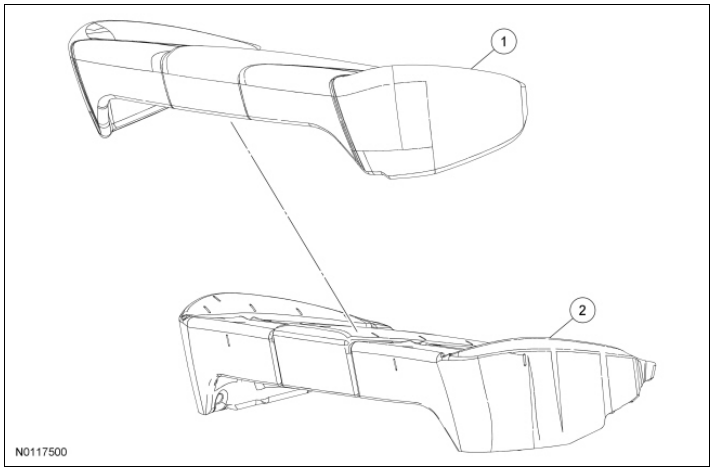
Seat Backrest - 60 Percent, 5-Door Hatchback



Item	Part Number	Description
1	611A08	Head restraint (center)
2	611A08	Head restraint (LH)
3	610A18	Head restraint guide sleeve (non-lockable)
4	610A16	Head restraint guide ve (3 required) (lockable)
5	624A08	Backrest latch bezel
6	W790247	Backrest latch bolt (2 required)
7	61383	Backrest latch
8	-	Safety belt retractor bolt (part of 611B66)
9	-	Hinge pin bolt (part of 613B48)
10	613B48	Hinge pin
11	60509	Backrest frame
12	66801	Backrest foam pad
13	66601	Backrest cover

14	611B66	Safety belt retractor
15	611A70	Safety belt retractor bezel

Seat Cushion



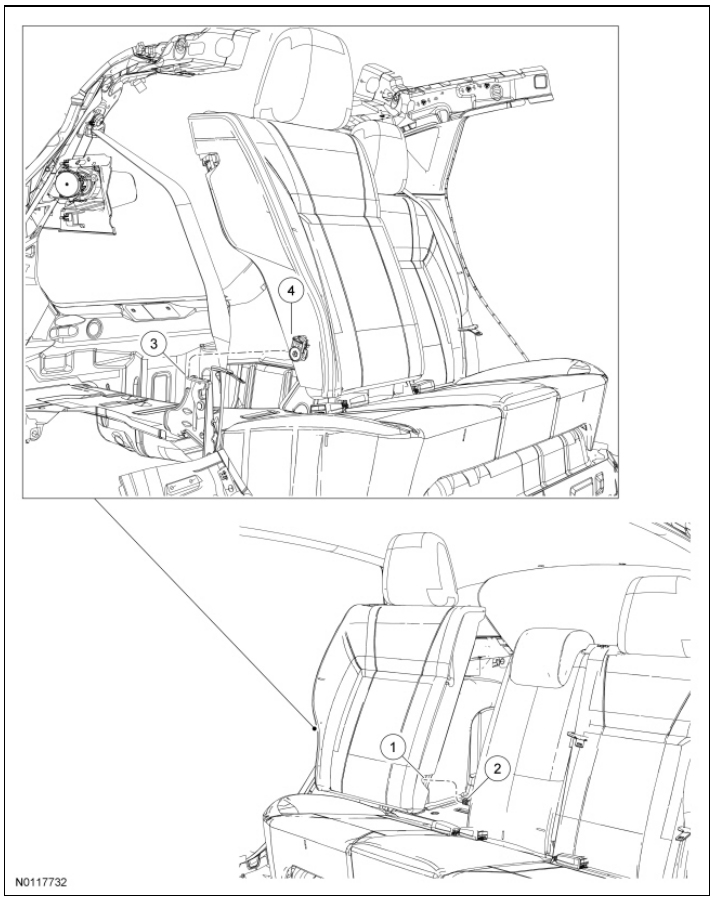
Item	Part Number	Description
1	63804	Cushion cover
2	63840	Cushion foam pad

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

Seat Backrest - Rear

Seat Backrest - Rear, 40 Percent

NOTE: Some parts removed for clarity.



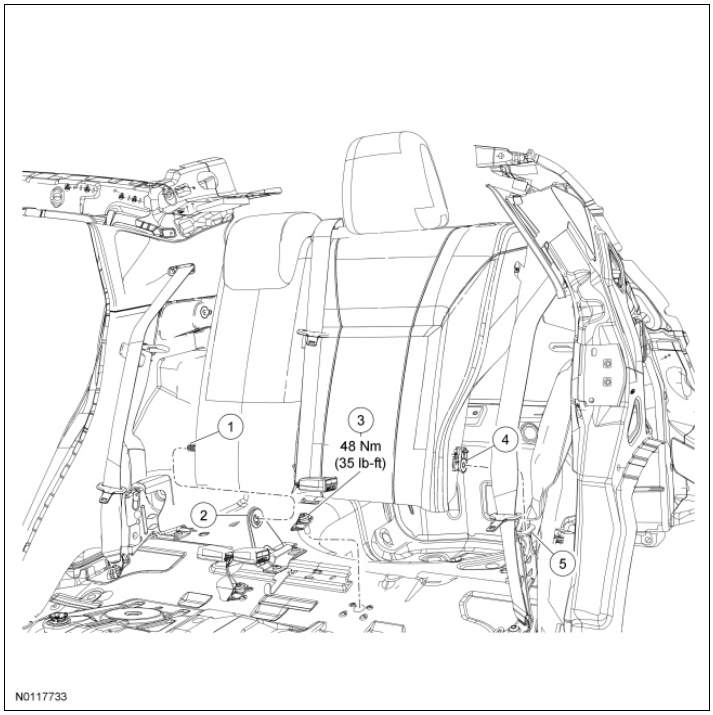
Item	Part Number	Description
1	60508	Backrest frame, 40 percent
2	-	Backrest frame mounting pin, 60 percent (part of 60509)
3	613B90	RH outboard backrest hinge
4	613B48	Hinge pin and bolt

Seat Backrest - Rear, 60 Percent

NOTE: The 40 percent backrest must be removed before the 60 percent backrest can be removed.

NOTE: 5 door hatchback is shown, 4 door sedan is similar.

NOTE: Some parts removed for clarity.

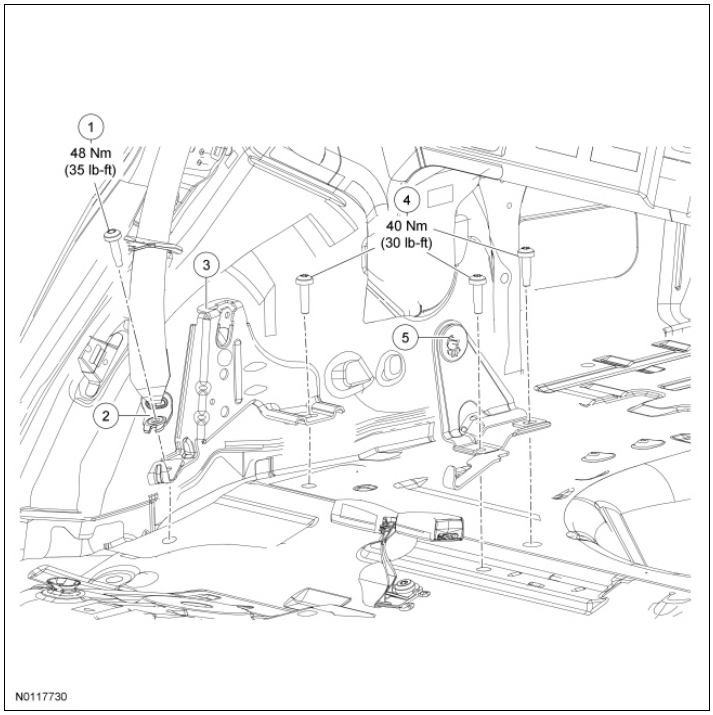


Item	Part Number	Description
1	-	Backrest frame mounting pin, 60 percent (part of 60509)
2	60615	Centernge
3	-	Safety belt anchor bolt (part of 611B66) (5-door hatchback only)
4	613B48	Hinge pin and bolt
5	613B91	Outboard backrest hinge

Seat Backrest Hinges - Rear

NOTE: RH outboard backrest hinge shown, LH similar.

NOTE: Always install new backrest hinge and safety belt anchor bolts.



Item	Part Number	Description
1	W703708	Safety belt anchor bolt
2	-	Safety belt anchor (part of 611B68/RH 611B69/LH)
3	613B90 (RH) / 613B91 (LH)	Outboard backrest hinge
4	W707941	Backrest hinge bolt (3 required)
5	60615	Center backrest hinge

Removal and Installation

5 - Door hatchback - 60 Percent backrest

1. Remove the rear seat cushion assembly. For additional information, refer to Seat Cushion - Rear

2. Remove the safety belt anchor bolt.
   - Tighten to 48 Nm (35 lb-ft).

All backrests

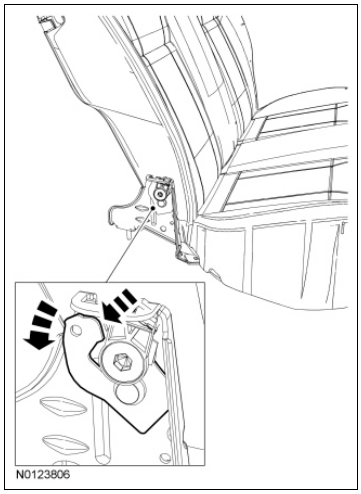
NOTE: The 40 percent seat backrest has to be removed before the 60 percent seat backrest.

3. Push the backrest release button at the top of the seat backrest and fold the seat down.

4. **NOTE:** The latch hook is identified with a white paint mark.

   Tap the latch to unlock the outboard hook latch.

   - Pivot the outboard latch hook rearward to disengage.
   - To install, push the seat backrest hinge into the latch bracket until the hook latch is fully seated.



5. Remove the seat backrest.
    1. Pull the outboard side of the backrest up out of the latch bracket.
    2. Position the 40 percent outboard backrest hinge pin bolt to the rear of the outboard backrest hinge.
    3. Pull the seat backrest outward and slightly twist forward while removing from the center mounting bracket.

All hinges

6. Remove the rear seat cushion assembly. For additional information, refer to Seat Cushion - Rear in this section. li>

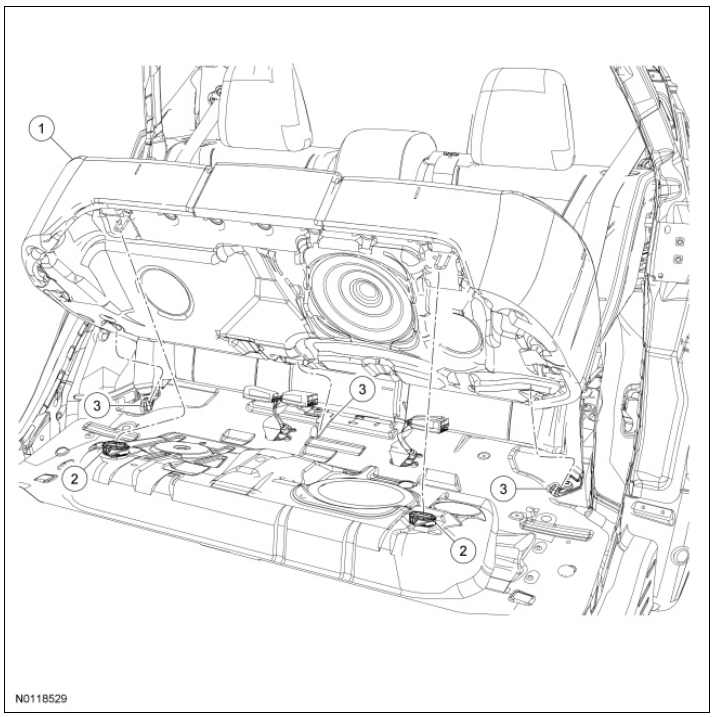
7. Remove the seat backrest(s) for the affected hinge.

8. Remove and discard the bolts of the affected hinge.
    - Install a new backrest hinge bolt(s) and tighten to 40 Nm (30 lb-ft).
    - Install a new safety belt anchor bolt and tighten to 48 Nm (35 lb-ft), if equipped.

All brackets and hinges

9. To install, reverse the removal procedure.

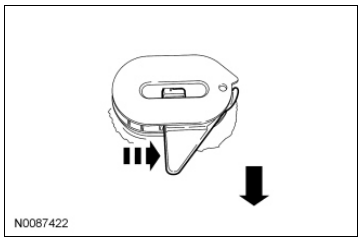
Seat Cushion - Rear



Item	Part Number	Description
1	-	Cushion assembly
2	624A14	Seat cushion anchors (2 required)
3	-	Retainer hooks (3 required) (part of 613B90/RH, 613B91/LH and 60615/center)

Removal and Installation

1. From under the front of the cushion assembly, push the 2 seat cushion anchor latch release levers toward the driver side, while lifting up to disengage the front of the cushion assembly.



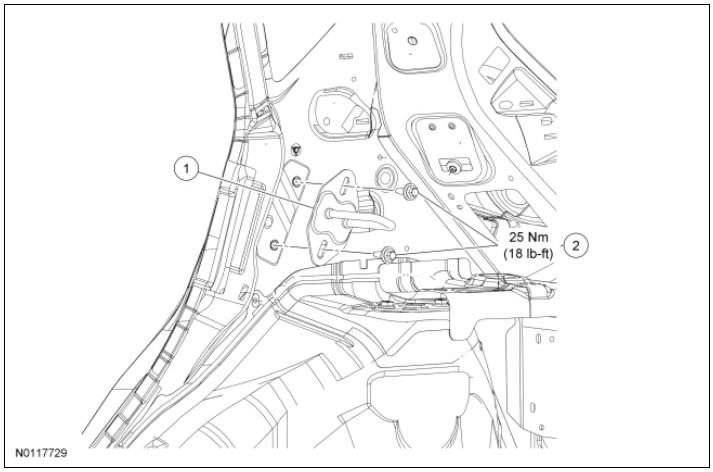
2. Remove the cushion assembly in the following sequence.
    1. Push the cushion back as far as possible.
    2. Lift up and pull forward at the rear outboard ends of the cushion, disengaging the wires from the retainer hooks.
        - Remove the cushion.

3. **NOTE:** Before installation, make sure the safety belts and buckles are accessible to the occupants.

    To Install, reverse the remoedure.

Seat Latch Striker - Rear

NOTE: RH shown, LH similar.



Item	Part Number	Description
1	62542 RH/62543LH	Backrest striker
2	W701802	Backrest striker bolts (2 required without backrest retractor, 3 required with backrest retractor)

Removal and Installation

1. Remove the lower C-pillar trim panel. For additional information, refer to Section 501-05 .

2. Remove the bolts and the backrest striker.
   - To install, tighten to 25 Nm (18 lb-ft).

3. To install, reverse the removal procedure.

Seat Backrest - Front

Disassembly

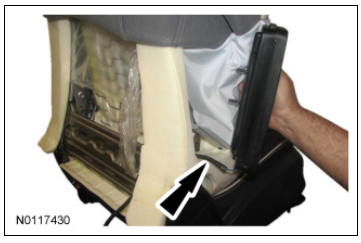
NOTE: For component identification and locations, refer to Seat - Exploded View, Front in this section.

1. Remove the front seat backrest. For additional information, refer to Seat Backrest - Front in this section.
2. Remove the front seat backrest cover. For additional information, refer to Seat Backrest Cover - Front in this section.
3. Detach the side air bag module wire harness retainer from the rear of the backrest frame.
4. Remove the 2 side air bag module nuts.
5. Remove the side air bag module in the following sequence:
    1. Pull the side air bag module mounting studs back through the backrest frame.
    2. Position the side air bag module away from the backrest frame.
    3. Route out the wire harness.
6. Remove the backrest f
7. Remove the anti-squeak bag from the backrest frame.
8. Remove the 2 backrest foam retainer clips from the backrest frame.
9. Remove the static lumbar support.

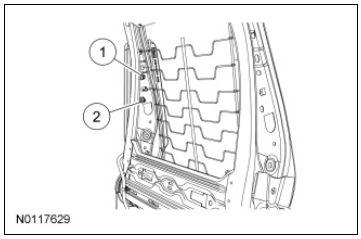
Assembly

1. Install the static lumbar support.
2. Install the 2 backrest foam retainer clips to the backrest frame.
3. Install the anti-squeak bag to the backrest frame.
4. Install the backrest foam pad.
5. **NOTE:** Passenger seat shown, driver seat similar.

   Route the side air bag module wire harness through the backrest foam pad opening.



6. Position the side air bag module studs through the backrest frame holes and install the nuts in the sequence shown.
    - Tighten to 9 Nm (80 lb-in).



7. Attach the side air bag module wire harness retainer to the rear of the backrest frame.

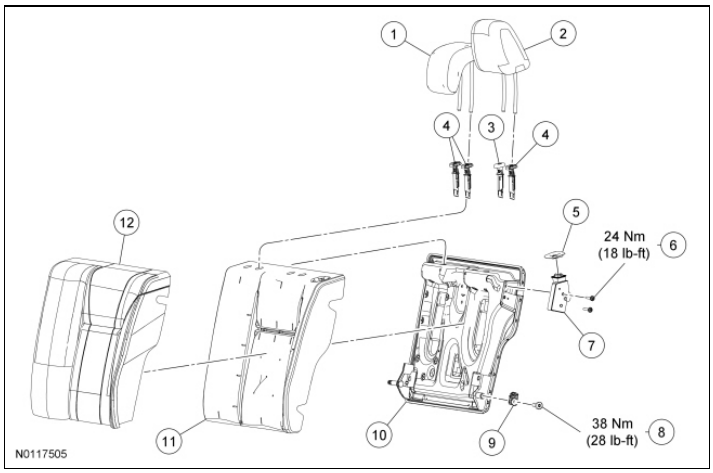
8. Install the seat backrest cover. For additional information, refer to Seat Backrest Cover - Front in this section.

9. Install the front seat backrest. For additional information, refer to Seat Backrest - Front in this section.

Seat Backrest - Rear, 60 Percent

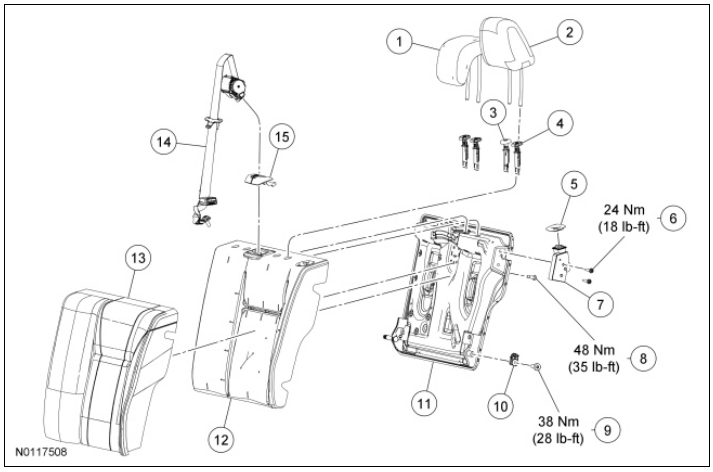
Disassembly

Seat Backrest - 60 Percent, 4-Door Sedan



Item	Part Number	Description
1	611A08	Head restraint (center)
2	611A08	Head restraint (LH)
3	610A18	Head restraint guide sleeve (non-lockable)
4	610A16	Head restraint guide sleeve (3 required) (lockable)
5	624A08	Backrest latch bezel
6	W790247	Backrest latch bolt (2 required)
7	61383	Backrest latch
8	-	Hinge pin bolt (part of 613B48)
9	613B48	Hinge pin
10	60509	Backrest frame
11	66801	Backrest foam pad
12	66601	Backrest cover

Seat Backrest - 60 Percent, 5-Door Hatchback



Item	Part Number	Description
1	611A08	Head restraint (center)
2	611A08	Head restraint (LH)
3	610A18	Head restraint guide sleeve (non-lockable)
4	610A16	Head restraint guide sleeve (3 required) (lockable)
5	624A08	Backrest latch bezel
6	W790247	Backrest latch bolt (2 required)
7	61383	Backrest latch
8	-	Safety belt retractor bolt (part of 611B66)
9	-	Hinge pin bolt (part of 613B48)
10	613B48	Hinge pin
11	60509	Backrest frame
12	66801	Backrest foam pad
13	66601	Backrest cover
14	611B66	Safety belt retractor
15	611A70	Safety belt retractor bezel

⚠ WARNING: After a crash, the following safety belt components and attaching hardware must be inspected and tested toify correct function:

- Retractors
- Buckles
- Child safety seat tether bracket assemblies
- Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)
- Belt tension sensor (BTS) (if equipped)
- Front safety belt buckle support assemblies (slide bar) (if equipped)
- Safety belt shoulder belt height adjusters (if equipped)

Components that do not operate correctly or pass all Functional Tests in the Component Tests of this section must be replaced with new components.

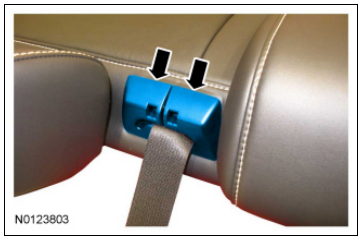
Safety belt assembly attaching areas must be inspected. Damaged or distorted attaching areas must be restored to their original structural integrity and a new safety belt assembly with new attaching hardware must be installed.

After deployment of the front safety belt pretensioners, a new safety belt system (including retractors, buckles and height adjusters) must be installed.

Failure to follow this instruction may result in incorrect operation of the safety belt system and increases the risk of serious personal injury or death in a crash.

1. Remove the rear seat backrest. For additional information, refer to Seat Backrest - Rear in this section.

2. Detach the safety belt retractor bezel from the backrest frame wire and remove the bezel.
   - Pull where shown to unsnap the safety belt bezel from the backrest frame wire.

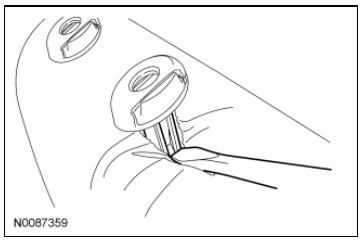


3. Push the buttons on the head restraint guide sleeves and remove the head restraint(s).

4. **NOTE:** If the locking tab on the head restraint guide is damaged during removal, a new head restraint guide must be installed.

   Remove the headrest guide sleeves.

   - Insert an appropriate flat-blade screwdriver along side the head restraint guide below the backrest cover and release button.
   - Release the locking tab and pry upward to remove.



5. Detach the backrest latch bezel from the backrest latch and remove the bezel.

6. Remove the hinge pin and bolt.

7. Detach the backrest cover retainer from the backrest frame at the rear of the backrest.

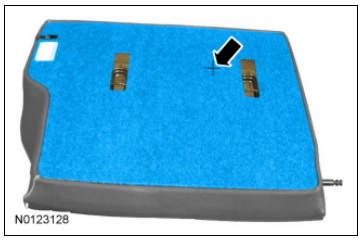
8. Remove the backrest cover and foam pad as an assembly.
   - Route the safety belt and tongue out of the backrest cover.

9. Remove the backrest cover.
   - Remove the hog rings and separate the foam pad from the Backrest cover.

10. Mark the backrest latch alignment prior to removing the backrest latch to assist in installing and aligning the backrest latch.

11. Remove the backrest latch.
    - Remove the 2 retainers and the backrest latch.

12. Make a small cross cut into the carpet above the safety belt retractor bolt.
    - Push into the carpet on the rear of the backrest and feel for the safety belt retractor bolt.



13. Remove the safety belt retractor.
    1. Remove the safety belt retractor bolt.
    2. Route the safety belt and tongue out of the backrest cover.
    3. Remove the safety belt retractor.

Assembly

1. Install the safety belt retractor.
    1. Install the safety belt retractor.
    2. Route the safety belt and tongue through the backrest cover.
    3. Install the safety belt retractor bolt.
        - ♦ Tighten to 48 Nm (35 lb-ft).

2. Position the backrest latch to the marks in the backrest frame and install the bolts.
    - Tighten to 24 Nm (18 lb-ft).

3. Install the backrest cover.
    - Assemble the foam pad to the Backrest cover, secure using hog rings.

4. Install the backrest cover and foam pad as an assembly.
    - Route the safety belt and tongue through the backrest cover.

5. Attach the backrest cover retainer to the backrest frame at the rear of the backrest.

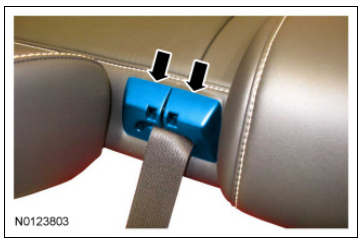
6. Install the hinge pin and bolt.
    - Tighten to 38 Nm (28 lb-ft).

7. Attach the backrest latch bezel to the backrest latch.

8. **NOTE:** If the locking tab on the head restraint guide is damaged during removal, a new head restraint guide must be installed.

   Install the headrest guide sleeves.

9. Attach the safety belt retractor bezel to the backrest frame wire.



10. Install the rear seat backrest. For additional information, refer to Seat Backrest - Rear in this section.

Seat Cushion - Front

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Disassembly and Assembly

NOTICE: **To prevent system failure, it is necessary to carry out the Occupant Classification System (OCS) system reset when a front passenger seat cushion is disassembled, a new cushion cover is installed or an OCS service kit is installed.**

NOTICE: **Do not install a new heater mat on a front passenger seat cushion, it is not serviceable separately. If a new cushion heater mat is needed on the front passenger seat, an Occupant Classification System (OCS) service kit equipped with a heater mat must be installed. Failure to follow this instruction may result in incorrect operation of the OCS . Refer to Section 501-20/a> for the OCS removal and installation.**

NOTE: Occupant Classification System (OCS) 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 components are not to be installed separately. If a new OCS , OCS component or seat cushion foam pad are needed, a new OCS service kit (seat cushion foam pad, bladder with pressure sensor and OCSM) must be installed as an assembly.

NOTE: For component identification and locations, refer to Seat - Exploded View, Front in this section.

All seats

1. Remove the seat backrest. For additional information refer to Seat Backrest - Front in this section.

Passenger seat

2. Remove the OCS sensor. For additional information, refer to Section 501-20B .

Driver seat

3. Remove seat cushion cover. For additional information, refer to Seat Cushion Cover - Front in this section.

4. **NOTE:** Note the wire harness routing for installation.

   Remove the seat wire harness.

   - Release retainers.

Passenger seat

5. Remove 2 screws and the OCSM bracket.

All seats

6. Remove the safety belt buckle.
    - Disconnect the safety belt buckle electrical connector. <
    - Remove the bolt and the safety belt buckle assembly.

7. Remove the seat position sensor.
    - Remove the retaining clip.
    - Slide sensor rearward to remove.

8. Remove the screw and the wire harness bracket.

9. Remove the screw and the seat track position sensor bracket.

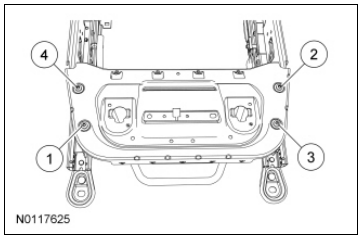
10. Remove the cushion support spring.
    - Release the cushion spring from the seat track and cushion pan.

11. Remove the 4 retainers and the cushion pan.

Assembly

All seats

1. Position the cushion pan and install the screws in the sequence shown.
    - Tighten to 4 Nm (35 lb-in).



2. Install the cushion support spring.

3. Position the seat track position sensor bracket and install the screw.

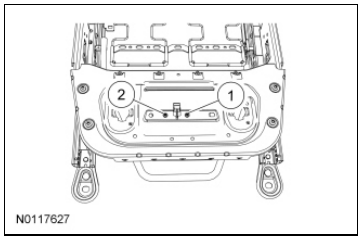
4. Position the wire harness bracket and install the screw.

5. Install the seat position sensor.
    - Secure the lock tab.

6. Position the safety belt buckle and install the bolt.
    - Tighten to 48 Nm (35 lb-ft).

Passenger seat

7. Position the OCSM bracket and install the screws in the sequence shown.
    - Tighten to 3 Nm (27 lb-in).



8. Install the OCS . For additional information, refer to Section 501-20B .

Driver seat

9. Install the seat wire harness.
    - Attach retainers.

10. Install the seat cushion cover. For additional information, refer to Seat Cushion Cover - Front in this section.

All seats

11. Position the backrest to the cushion frame and install the 4 backrest mounting bolts.
    - Tighten to 48 Nm (35 lb-ft).

12. From under the seat, carry out the following.
    - Engage the 4 backrest cover elastic strap retainers attach to the bottomear of the seat.
    - Connect the side air bag module electrical connector and attach the wire harness retainer.

13. Install the cushion side shield in the following sequence.
    1. Position and slide the cushion side shield rearward to engage the brackets.
    2. Install the screw at the rear of the cushion side shield.

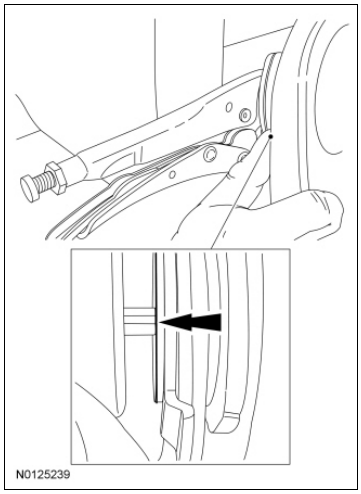
14. If equipped install the height adjust handle.

15. Install the recliner handle and bolt.

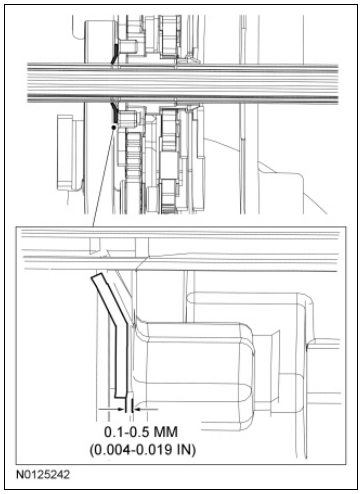
16. Push the recliner handle fully toward the inboard side of the seat then release the pressure on the recliner handle.

17. **NOTE:** RH recliner plate is shown, LH recliner plate is similar.

    Immobilize the recliner shaft by using 2 long nose locking pliers clamped to the shaft, flush to the inside edges of both recliner plates.



18. Measure the clearance between the inboard push nut and bushing.
    - If the clearance between the inboard push nut and the bushing exceeds 0.5 mm (0.019 in), install a 0.5 mm (0.019 in) feeler gauge or shim between the inboard push nut and the bushing and slide the inboard push nut tight against the feeler gauge or shim.
    - If the clearance between the inboard push nut and the bushing is less than 0.5 mm (0.019 in), remove and discard the push nut. Install a new push nut, using a 0.5 mm (0.019 in) feeler gauge or shim between the inboard push nut and the bushing, slide the inboard push nut tight against the feeler gauge or shim.



19. Remove the feeler gauge or shim.

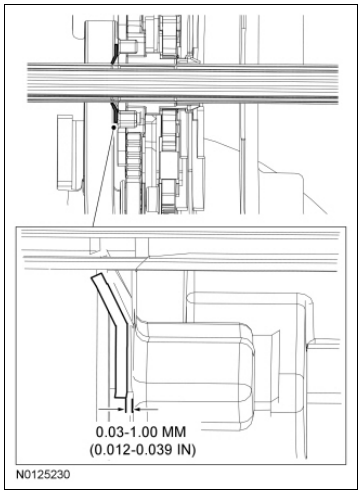
20. Remove the recliner handle.

21. Push the outboard push nut (located behind the recliner handle) flush to the outboard bushing.

22. Remove the long nose locking pliers.

23. Slide the recliner shaft outward until the inboard push nut contacts the bushing.

24. Verify the clearance between the outboard push nut and bushing is between 0.3 mm and 1.0 mm (0.011 in and 0.039 in).



25. Install the recliner handle and bolt.

26. Install the inner recliner cover and screw.

Passenger seat with an OCS

27. ⚠ **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.**

    NOTICE: **To prevent system failure, take the following precautions before carrying out the Occupant Classification System (OCS) system reset:**

    - Make sure the voltage to the Occupant Classification System Module (OCSM) is greater than 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 between 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 and during the OCS system reset process.
    - Prior to carrying out the OCS system reset, make sure a minimum of 8 seconds has elapsed after cycling the ignition switch ON.

    Carry out the OCS system

28. 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 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.

29. **NOTE:** Cycle the ignition switch after the OCS system reset.

    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 System in Section 501-20B .

30. Prove out the SRS as follows:
    Turn the ignition switch from ON to OFF. Wait 10 seconds, then turn the ignition switch back to ON and visually monitor the air bag warning indicator with the air bag modules installed. The air bag

warning indicator will illuminate 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 at a 5 Hz rate (RCM not configured).

The air bag warning indicator may not illuminate until approximately 30 seconds after the ignition switch 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 sounds in a pattern of 5 sets of 5 beeps. If this occurs, diagnose and repair the air bag warning indicator and any SRS fault discovered.

Use a scan tool and clear all continuous DTCs from the RCM and Occupant Classification System Module (OCSM).

Material

Item	Specification	Fill Capacity
Dow Urethane Adhesive BetasealTM Express	-	-
Dow Urethane One Step Glass Primer BetaprimeTM 5500 / 5500A / 5500SA	-	-
Motorcraft® Lacquer Touch-Up Paint (match color to exterior grid wire) PMP-19500-XXXXX	ESR-M2P100-C	-
Rear Window Defroster Repair PM-11 (US); CPM-11 (Canada)	-	-
Seam Sealer TA-2	-	-
Sika Urethane Adhesive Sika Tack ASAP	-	-
Sika Urethane Metal and Glass Primer Sika 206 G+P	-	-
Motorcraft® Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A	-

General Specifications

Item	Specification
Polypropylene Film Fine Line Tape (commercially available)	-

Torque Specifications

Description	Nm	lb-in
Door carrier bolts	9	80
Door window glass clamp bolts	9	80

Glass, Frames and Mechanisms

The glass, frames and mechanisms consist of the following:

- Body Control Module (BCM)
- Door glass top run
- Door window glass
- Door window regulator
- Door window regulator motor
- Rear quarter glass
- Rear window defrost switch (integral to the HVAC module)
- Rear window glass
- Window control switches
- Windshield glass

The power window system only operates if the ignition is in the RUN position.

The master window control switch:

- disables operation of the rear passenger windows when the lock-out switch is in the UNLOCK position.
- automatically raises/lowers the driver window when activated momentarily to the second detent position.

The power window system can be operated from either the master window control switch or from the window control switches located on each door panel.

Rear Window Defrost

The engine must be running for the rear window defrost system to operate. The rear window defrost system is controlled by the BCM . When the rear window defrost switch (integral to the HVAC module) is pressed, the BCM supplies voltage to the rear window defrost grid. An LED indicator illuminates when the rear window defrost is activated. The rear defrost self actuates when the ambient air temperature is less than 5° C (41° F) and engine coolant temperature is less than 60° C (140° F). The rear window defroster LED indicator does not illuminate when the rear defroster self actuates.

Glass, Frames and Mechanisms

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD105-R025D 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

LH Front Window Operation

NOTE: The master window control switch and the LH front window motor each contains integral electronics which must be initialized whenever:

- a new window control switch is installed.
- a new window regulator and motor is installed.
- a new window glass is installed.
- a glass top run removal and installation.
- carrying out any operation in which grease or lubricants are applied to the window system.
- battery voltage has been removed from the LH front window control switch for more than 3 minutes (for example, battery or window control switch disconnected).

For additional information, refer to Window Motor Initialization in this section.

The master window control switch contains electronics that control the one-touch up/down operation. The master window control switch receives feedback from the Hall-effect sensors which are integral to the LH front window motor. If the Hall-effect sensors or any associated circuitry fails, the window still operates but the one-touch up/down and obstacle detection is inoperative.

If an obstacle has been detected in the window opening as the window glass is moving upward, the window motor automatically reverses direction and moves the glass toward the bounce-back position.

To override a bounce-back condition (for example, to overcome the resistance of ice on the window or seals), close the window glass twice until it reaches the resistance and allow it to reverse to the bounce-back position. On the third attempt, activate and hold the master window control switch in the UP position. The window travels up with no bounce-back protection.

Rear Window Defrost

The engine must be running for the rear window defrost system to operate. When the rear window defrost switch (integral to the HVAC module) is pressed, a ground signal is sent to the Body Control Module (BCM). When the BCM receives the defrost request signal, it supplies voltage to the rear window defrost grid. The rear defrost self actuates when the ambient air temperature is less than 5° C (41° F) and engine coolant temperature is less than 60° C (140° F). The rear window defroster LED indicator does not illuminate when the rear defroster self actuates.

The BCM deactivates the rear window defrost grid when one of the following conditions is met:

- The rear window defrost switch is pressed when the feature is active
- The ignition state is changed from ON to OFF/LOCK
- The 14-minute timing function is complete

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Window run weatherstrip • Window glass • Rear window defrost grid	• Central Junction Box (CJB) fuse(s): ♦ 16 (7.5A) (vehicles built after 1/14/2011) ♦ 31 (30A) ♦ 34 (30A) • Battery Junction Box (BJB) fuse(s): ♦ 26 (7.5A) (vehicles built up to 1/14/2011) ♦ 33 (30A) • Window motor • Window control switch • Wiring, terminals or connectors

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 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 CMDTCs and carry out the self-test diagnostics for the BCM .

9. If the DTCs retrieved are related to the concern, go to the Body Control Module (BCM) 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

NOTE: Refer to Description and Operation, Intelligent Access with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states on vehicles with this feature.

NOTE: This module utilizes a 5-character DTC followed by a 2-character failure type code. The failure type code provides information about specific fault conditions such as opens or shorts to ground. Continuous Memory Diagnostic Trouble Codes (CMDTCs) have an additional 2-character DTC status code suffix to assist in determining DTC history.

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B1013:23	Heater Rear Defog Switch: Signal Stuck Low	GO to Pinpoint Test J .
All Other DTCs	-	REFER to the Master DTC Chart in Section 419-10 .

Symptom Chart

Symptom Chart
NOTE: Refer to Description and Operation, Intelligent Access with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states on vehicles with this feature.

ConditionPossible SourcesAction

- All power windows are inoperative

- Wiring, terminals or connectors
- Window control switch

- GO to Pinpoint Test A .

- The RH front, LH rear and RH rear power windows are inoperative

td>

- Wiring, terminals or connectors
- Window control switch

- GO to Pinpoint Test B .

- The LH front and RH front power windows are inoperative

- Wiring, terminals or connectors
- Window control switch

- GO to Pinpoint Test C .

- The LH rear and RH rear power windows are inoperative

- Wiring, terminals or connectors
- Window control switch

- GO to Pinpoint Test D .

- A single power window is inoperative - LH front window

- Fuse(s)
- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

- GO to Pinpoint Test E .

- A single power window is inoperative - RH front window

- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

- GO to Pinpoint Test F .

- A single power window is inoperative - LH rear window

- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

- GO to Pinpoint Test G .

- A single power window is inoperative - RH rear window

- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

- GO to Pinpoint Test H .

- The one-touch up/down feature is inoperative

- LH front window motor not initialized
- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

- GO to Pinpoint Test I .

- The defrost system is inoperative

- Fuse
- Wiring, terminals or connectors
- Rear window defrost grid
- HVAC module
- Body Control Module (BCM)

- GO to Pinpoint Test J .

- The defrost system will not shut off automatically

- Wiring, terminals or connectors
- BCM

- GO to Pinpoint Test K .

- The defrost system LED does not illuminate when the defrost system is active

- Wiring, terminals or connectors
- HVAC module
- BCM

- **NOTE:** The rear defrost self actuates when the ambient air temperature is less than 5° C (41° F) and engine coolant temperature is less than 60° C (140° F). The rear window defroster LED indicator does not illuminate when the rear defroster self actuates.

  GO to Pinpoint Test L .

Pinpoint Tests

Pinpoint Test A: All Power Windows are Inoperative

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Otion

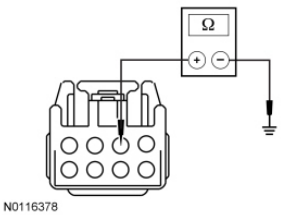
There are two high current voltage circuits to the master window control switch. One of these circuits provides voltage for front window operation, the other provides voltage for rear window operation. The master window control switch supplies ground for all window motor operation.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Window control switch

PINPOINT TEST A: ALL POWER WINDOWS 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
A1 CHECK ALL WINDOW OPERATION FROM THE MASTER WINDOW CONTROL SWITCH	
NOTE: Make sure the window lock-out switch is in the UNLOCK position. • Ignition ON. • Attempt to operate each window from the master window control switch. • **Do any of the windows operate from the master window control switch?**	**Yes** GO to Symptom Chart to diagnose the inoperative window(s). **No** GO to A2 .
A2 CHECK THE MASTER WINDOW CONTROL SWITCH GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Master Window Control Switch C504A. • Measure the resistance between master window control switch C504A-2, circuit GD143 (BK/VT), harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

Pinpoint Test B: The RH Front, LH Rear and RH Rear Power Windows are Inoperative

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Operation

There are two high current voltage circuits to the master window control switch. One of these circuits provides voltage for front window operation, the other provides voltage for rear window operation. The master window control switch supplies ground for all window motor operation through two different circuits. One of the circuits provides ground only to the LH front window, the other provides ground for the RH front, LH rear and RH rear window motor operation.

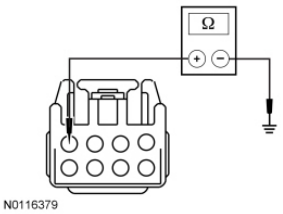
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Window control switch

PINPOINT TEST B: THE RH FRONT, LH REAR AND RH REAR POWER WINDOWS 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
B1 CHECK ALL WINDOW OPERATION FROM THE MASTER WINDOW CONTROL SWITCH	
NOTE: Make sure the window lock-out switch is in the UNLOCK position. • Ignition ON. • Attempt to operate each window from the master window control switch. • **Does the RH front, LH rear or RH rear window operate from the master window control switch?**	**Yes** GO to Symptom Chart to diagnose the inoperative window(s). **No** GO to B2 .
B2 CHECK THE MASTER WINDOW CONTROL SWITCH GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Master Window Control Switch C504C. • Measure the resistance between master window control switch C504C-4, circuit GD143 (BK/VT), harness side and ground.	**Yes** INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

 • **Is the resistance less than 5 ohms?**	

Pinpoint Test C: The LH Front and RH Front Power Windows are Inoperative

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Operation

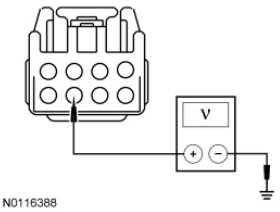
There are two high current voltage circuits to the master window control switch. One of these circuits provides voltage for front window operation, the other provides voltage for rear window operation. The master window control switch supplies ground for all window motor operation through two different circuits. One of the circuits provides ground only to the LH front window, the other provides ground for the RH front, LH rear and RH rear window motor operation.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Window control switch

PINPOINT TEST C: THE LH FRONT AND RH FRONT POWER WINDOWS 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
C1 CHECK FOR VOLTAGE TO THE MASTER WINDOW CONTROL SWITCH	
• Ignition OFF. • Disconnect: Master Window Control Switch C504A. • Ignition ON. • Measure the voltage between master window control switch C504A-7, circuit CBP34 (VT/BN), harness side and ground.	**Yes** INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** VERIFY Central Junction Box (CJB) fuse 34 (30A) is OK, If OK, REPAIR the circuit. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. REPAIR the circuit. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

 • **Is the voltage greater than 10 volts?**	

Pinpoint Test D: The LH Rear and RH Rear Power Windows are Inoperative

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Operation

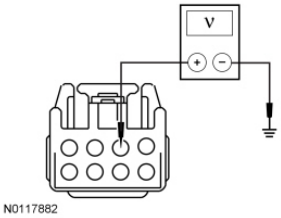
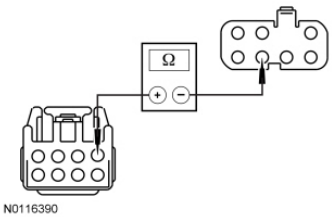
There are two high current voltage circuits to the master window control switch. One of these circuits provides voltage for front window operation, the other provides voltage for rear window operation when the master window lock-out switch is in the UNLOCK position. The master window control switch supplies ground for all window motor operation through two different circuits. One of the circuits provides ground only to the LH front window, the other provides ground for the RH front, LH rear and RH rear window motor operation.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Window control switch

PINPOINT TEST D: THE LH REAR AND RH REAR POWER WINDOWS 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
D1 CHECK FOR VOLTAGE TO THE MASTER WINDOW CONTROL SWITCH	
• Ignition OFF. • Disconnect: Master Window Control Switch C504C. • Ignition ON. • Measure the voltage between master window control switch C504C-2, circuit CBP31 (BU/OG), harness side and ground.	**Yes** GO to D2 . **No** VERIFY Central Junction Box (CJB) fuse 31 (30A) is OK, If OK, REPAIR the circuit. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. REPAIR the circuit. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

 • **Is the voltage greater than 10 volts?**	
D2 CHECK FOR AN OPEN CIRCUIT BETWEEN THE MASTER WINDOW CONTROL SWITCH AND THE REAR WINDOW CONTROL SWITCH	
• Ignition OFF. • Disconnect: LH Rear Window Control Switch C701. • Measure the resistance between master window control switch C504C-1, circuit CPW01 (BN/BU), harness side and LH rear window control switch C701-2, circuit CPW01 (BN/BU), harness side.  • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

Pinpoint Test E: A Single Power Window is Inoperative - LH Front Window

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Operation

There are two voltage supplies to the master window control switch for LH front window operation. One circuit powers the integral electronics, the other provides high current voltage for the LH front window motor. The master window control switch and LH front window motor are grounded through the same circuit. The master window control switch provides voltage and ground to the LH front window motor. Window direction is controlled by reversing polarity of the voltage and ground circuits being supplied to the window motor.

This pinpoint test is intended to diagnose the following:

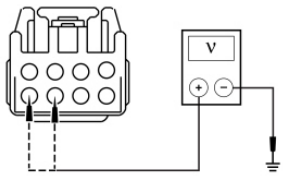
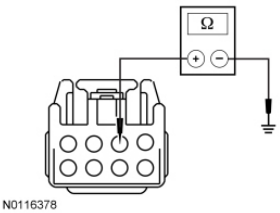
- Fuse(s)
- Wiring, terminals or connectors

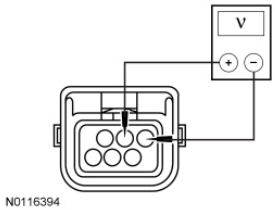
Window control switch

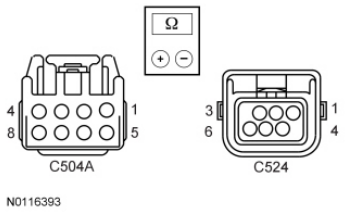
- Window regulator motor

PINPOINT TEST E: A SINGLE POWER WINDOW IS INOPERATIVE - LH FRONT WINDOW

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
E1 CHECK FOR VOLTAGE TO THE MASTER WINDOW CONTROL SWITCH	
• Ignition OFF. • Disconnect: Master Window Control Switch C504A. • Ignition ON. • Measure the voltage between master window control switch C504A-7, circuit CBP34 (VT/BN), harness side and ground; and between master window control switch C504A-8, circuit SBB26 (YE/RD) (vehicles built up to 1/14/2011) or SBP16 (VT/RD) (vehicles built after 1/14/2011), harness side and ground.  N0116392 • **Is the voltage greater than 10 volts for both measurements?**	**Yes** GO to E2 . **No** VERIFY Central Junction Box (CJB) fuse 34 (30A) and Battery Junction Box (BJB) fuse 26 (7.5A) (vehicles built up to 1/14/2011) or fuse 16 (7.5 (vehicles built after 1/14/2011) are OK. If OK, REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.
E2 CHECK THE MASTER WINDOW CONTROL SWITCH GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between master window control switch C504A-2, circuit GD143 (BK/VT), harness side and ground.  N0116378 • **Is the resistance less than 5 ohms?**	**Yes** GO to E3 . **No** REPAIR the circuit. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.
E3 CHECK FOR VOLTAGE AND GROUND TO THE WINDOW MOTOR	

• Ignition OFF. • Connect: Master Window Control Switch C504A. • Disconnect: LH Front Power Window Motor C524. • Ignition ON. • **NOTE:** During the following step, the voltage being measured changes polarity dependent upon which direction the window control switch is activated. • Measure the voltage between LH front power window motor C524-1, circuit CPW11 (BU/GY), harness side and LH front power window motor C524-2, circuit CPW10 (YE/VT), harness side while operating the master window control switch in the down then up positions.  • **Is the voltage greater than 10 volts when the window control switch is operated and 0 volt in the rest position?**	**Yes** INSTALL a new LH front window regulator motor. REFER to Window Regulator Motor - Front Door in this section. TEST the system for normal operation. **No** GO to E4 .
E4 CHECK FOR AN OPEN CIRCUIT BETWEEN THE MASTER WINDOW CONTROL SWITCH AND THE WINDOW MOTOR	
• Ignition OFF. • Disconnect: Master Window Control Switch C504A. • Measure the resistance between master window control switch C504A, harness side and LH front power window motor C524, harness side using the following chart: **Master Window Control Switch** / **Circuit** / **LH Front Power Window Motor** C504A-3 / CPW11 (BU/GY) / C524-1 C504A-5 / CPW10 (YE/VT) / C524-2	**Yes** INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

 • **Are the resistances less than 5 ohms?**	

Pinpoint Test F: A Single Power Window is Inoperative - RH Front Window

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Operation

The RH front window control switch receives power from the Central Junction Box (CJB). Ground is provided to the RH front window control switch through the master window control switch. The RH fronwindow control switch transfers power and ground to the RH front window motor. Window direction is controlled by reversing polarity of the voltage and ground circuits being supplied to the window motor.

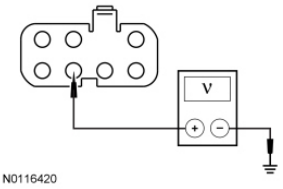
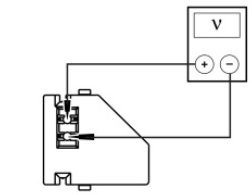
When operating the RH front window from the master window control switch, power and ground is sent from the master window control switch through the normally closed contacts within the RH front window control switch to operate the RH front window. Window direction is controlled by reversing polarity of the voltage and ground circuits being supplied to the window motor.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

PINPOINT TEST F: A SINGLE POWER WINDOW IS INOPERATIVE - RH FRONT WINDOW

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.**

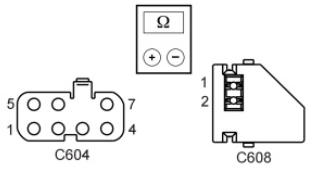
Test Step	Result / Action to Take
F1 CHECK THE RH FRONT WINDOW OPERATION FROM THE MASTER WINDOW CONTROL SWITCH	
• Ignition ON. • Operate the RH front window from the master window control switch. • **Does the RH front window operate from the master window control switch?**	**Yes** GO to F2 . **No** GO to F3 .
F2 CHECK FOR VOLTAGE TO THE RH FRONT WINDOW CONTROL SWITCH	

• Ignition OFF. • Disconnect: RH Front Window Control Switch C604. • Ignition ON. • Measure the voltage between RH front window control switch C604-2, circuit CBP34 (VT/BN), harness side and ground.  N0116420 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new RH front window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit. TEST the system for normal operation.
F3 CHECK FOR VOLTAGE AND GROUND TO THE WINDOW MOTOR	
• Ignition OFF. • Disconnect: RH Front Power Window Motor C608. • Ignition ON. • **NOTE:** During the following step, the voltage being measured changes polarity dependent upon which direction the window control switch is activated. • Measure the voltage between RH front power window motor C608-1, circuit CPW19 (VT), harness side and RH front power window motor C608-2, circuit CPW20 (WH/OG), harness side while operating the master window control switch in the down then up positions.  N0116421 • **Is the voltage greater than 10 volts when the window control switch is operated and 0 volt in the rest position?**	**Yes** INSTALL a new RH front window regulator motor. REFER to Window Regulator Motor - Front Door in this section. TEST the system for normal operation. **No** GO to F4 .
F4 CHECK THE RH FRONT WINDOW CONTROL SWITCH	
• Ignition OFF. • Disconnect: RH Front Window Control Switch C604. • Carry out the window control switch component test on the RH front window control switch. Refer to Wiringiagrams Cell 149 for component testing. • **Did the RH front window control switch pass the component test?**	**Yes** GO to F5 . **No** INSTALL a new RH front window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation.

F5 CHECK FOR AN OPEN CIRCUIT BETWEEN THE RH WINDOW CONTROL SWITCH AND THE WINDOW MOTOR

- Measure the resistance between RH front window control switch C604, harness side and RH front power window motor C608, harness side, using the following chart:

RH Front Window Control Switch	Circuit	RH Front Power Window Motor
C604-1	CPW20 (WH/OG)	C608-2
C604-7	CPW19 (VT)	C608-1



N0116422

- **Are the resistances less than 5 ohms?**

Yes
GO to F6 .

No
REPAIR the circuit(s). TEST the system for normal operation.

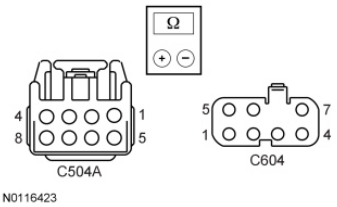
F6 CHECK FOR AN OPEN CIRCUIT BETWEEN THE RH WINDOW CONTROL SWITCH AND THE MASTER WINDOW CONTROL SWITCH

- Disconnect: Master Window Control Switch C504A.
- Measure the resistance between master window control switch C504A, harness side and RH front window control switch C604, harness side using the following chart:

Master Window Control Switch	Circuit	RH Front Window Control Switch
C504A-1	CPW12 (GN/OG)	C604-3
C504A-4	CPW13 (BN/YE)	C604-6

Yes
INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation.

No
REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

 • **Are the resistances less than 5 ohms?**	

Pinpoint Test G: A Single Power Window is Inoperative - LH Rear Window

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Operation

The LH rear window control switch receives power from the master window control switch when the lock-out switch is in the UNLOCK position. Ground is provided to the LH rear window control switch through the master window control switch. The LH rear window control switch transfers power and ground to the LH rear window motor. Window direction is controlled by reversing polarity of the voltage and ground circuits being supplied to the window motor.

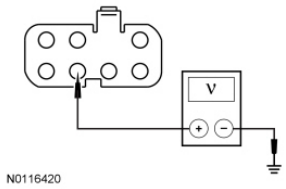
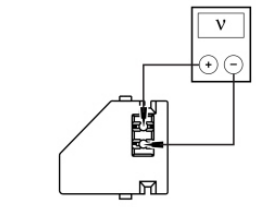
When operating the LH rear window from the master window control switch, power and ground is sent from the master window control switch through the normally closed contacts within the LH rear window control switch to operate the LH rear window. Window direction is controlled by reversing polarity of the voltage and ground circuits being supplied to the window motor.

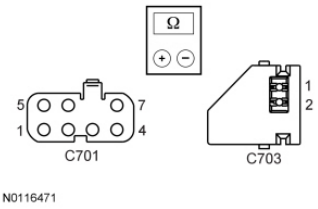
This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

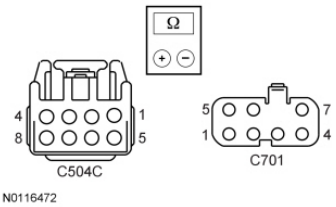
PINPOINT TEST G: A SINGLE POWER WINDOW IS INOPERATIVE - LH REAR WINDOW

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
G1 CHECK THE LH REAR WINDOW OPERATION FROM THE MASTER WINDOW CONTROL SWITCH	
• Ignition ON. • Operate the LH rear window from the master window control switch. • **Does the LH rear window operate from the master windowontrol switch?**	**Yes** GO to G2 . **No** GO to G3 .
G2 CHECK FOR VOLTAGE TO THE LH REAR WINDOW CONTROL SWITCH	

• Ignition OFF. • Disconnect: LH Rear Window Control Switch C701. • Ignition ON. • **NOTE:** Make sure the window lock-out switch is in the UNLOCK position. • Measure the voltage between LH rear window control switch C701-2, circuit CPW01 (BN/BU), harness side and ground.  N0116420 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new LH rear window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit. TEST the system for normal operation.
G3 CHECK FOR VOLTAGE AND GROUND TO THE WINDOW MOTOR	
• Ignition OFF. • Disconnect: LH Rear Power Window Motor C703. • Ignition ON. • **NOTE:** During the following step, the voltage being measured changes polarity dependent upon which direction the window control switch is activated. • Measure the voltage between LH rear power window motor C703-1, circuit CPW22 (GN/VT), harness side and LH rear power window motor C703-2, circuit CPW21 (BN), harness side while operating the master window control switch in the down then up positions.  N0116431 • **Is the voltage greater than 10 volts when the window control switch is operated and 0 volt in the rest position?**	**Yes** INSTALL a new LH rear window regulator motor. REFER to Window Regulator Motor - Rear Door in this section. TEST the system for normal operation. **No** GO to G4 .
G4 CHECK THE LH REAR WINDOW CONTROL SWITCH	
• Ignition OFF. • Disconnect: LH Rear Window Control Switch C701. • Carry out the window control switch component test on the LH rear window control switch. Refer to Wiring Diagrams Cell 149 for component testing. • **Did the LH rear window control switch pass the component test?**	**Yes** GO to G5 . **No** INSTALL a new LH rear window control switch. REFER to Window Control Switch in this section. TEST the system for normal

	operation.
G5 CHECK FOR AN OPEN CIRCUIT BETWEEN THE REAR WINDOW CONTROL SWITCH AND THE WINDOW MOTOR	
• Measure the resistance between LH rear window control switch C701, harness side and LH rear power window motor C703, harness side, using the following chart: **LH Rear Window Control Switch** / **Circuit** / **LH Rear Power Window Motor** C701-1 / CPW22 (GN/VT) / C703-1 C701-7 / CPW21 (BN) / C703-2  N0116471 • **Are the resistances less than 5 ohms?**	**Yes** GO to G6 . **No** REPAIR the circuit(s). TEST the system for normal operation.
G6 CHECK FOR AN OPEN CIRCUIT BETWEEN THE LH REAR WINDOW CONTROL SWITCH AND THE MASTER WINDOW CONTROL SWITCH	
• Disconnect: Master Window Control Switch C504C. • Measure the resistance between master window control switch C504C, harness side and LH rear window control switch C701, harness side using the following chart: **Master Window Control Switch** / **Circuit** / **LH Rear Window Control Switch** C504C-8 / CPW15 (YE) / C701-3 C504C-7 / CPW16 (BU/OG) / C701-6	**Yes** INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

 • **Are the resistances less than 5 ohms?**	

Pinpoint Test H: A Single Power Window is Inoperative - RH Rear Window

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Operation

The RH rear window control switch receives power from the master window control switch when the lock-out switch is in the UNLOCK position. Ground is provided to the RH rear window control switch through the master window control switch. The RH rear window control switch transfers power and ground to the RH rear window motor. Window direction is controlled by reversing polarity of the voltage and ground circuits being supplied to the window motor.

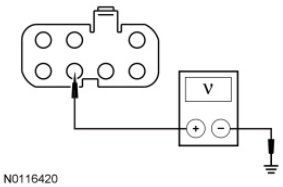
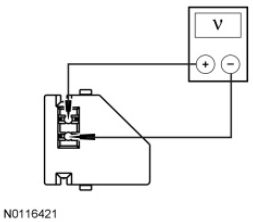
When operating the RH rear window from the master window control switch, power and ground is sent from the master window control switch through the normally closed contacts within the RH rear window control switch to operate the RH rear window. Window direction is controlled by reversing polarity of the voltage and ground circuits being supplied to the window motor.

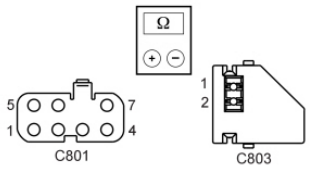
This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

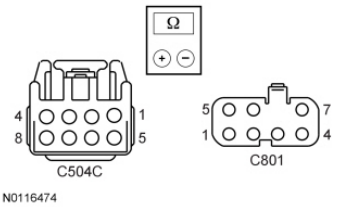
PINPOINT TEST H: A SINGLE POWER WINDOW IS INOPERATIVE - RH REAR WINDOW

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to uhe correct probe adapter(s) may damage the connector.**

Test Step	Result / Action to Take
H1 CHECK THE RH REAR WINDOW OPERATION FROM THE MASTER WINDOW CONTROL SWITCH	
• Ignition ON. • Operate the RH rear window from the master window control switch. • **Does the RH rear window operate from the master window control switch?**	**Yes** GO to H2 . **No** GO to H3 .
H2 CHECK FOR VOLTAGE TO THE RH REAR WINDOW CONTROL SWITCH	

• Ignition OFF. • Disconnect: RH Rear Window Control Switch C801. • Ignition ON. • **NOTE:** Make sure the window lock-out switch is in the UNLOCK position. • Measure the voltage between RH rear window control switch C801-2, circuit CPW01 (BN/BU), harness side and ground.  N0116420 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new RH rear window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit. TEST the system for normal operation.
H3 CHECK FOR VOLTAGE AND GROUND TO THE WINDOW MOTOR	
• Ignition OFF. • Disconnect: RH Rear Power Window Motor C803. • Ignition ON. • **NOTE:** During the following step, the voltage being measured changes polarity dependent upon which direction the window control switch is activated. • Measure the voltage between RH rear power window motor C803-1, circuit CPW24 (WH/VT), harness side and RH rear power window motor C803-2, circuit CPW23 (GY), harness side while operating the master window control switch in the down then up positions.  N0116421 • **Is the voltage greater than 10 volts when the window control switch is operated and 0 volt in the rest position?**	**Yes** INSTALL a new RH rear window regulator motor. REFER to Window Regulator Motor - Rear Door in this section. TEST the system for normal operation. **No** GO to H4 .
H4 CHECK THE RH REAR WINDOW CONTROL SWITCH	
• Ignition OFF. • Disconnect: RH Rear Window Control Switch C801. • Carry out the window control switch component test on the RH rear window control switch.	**Yes** GO to H5 . r> **No** INSTALL a new RH rear window control switch. REFER to Window Control Switch in this section. TEST

Refer to Wiring Diagrams Cell 149 for component testing. • **Did the RH rear window control switch pass the component test?**	the system for normal operation.
H5 CHECK FOR AN OPEN CIRCUIT BETWEEN THE REAR WINDOW CONTROL SWITCH AND THE WINDOW MOTOR	
• Measure the resistance between RH rear window control switch C801, harness side and RH rear power window motor C803, harness side, using the following chart: **RH Rear Window Control Switch** / **Circuit** / **RH Rear Power Window Motor** C801-1 / CPW24 (WH/VT) / C803-1 C801-7 / CPW23 (GY) / C803-2  N0116473 • **Are the resistances less than 5 ohms?**	**Yes** GO to H6 . **No** REPAIR the circuit(s). TEST the system for normal operation.
H6 CHECK FOR AN OPEN CIRCUIT BETWEEN THE RH REAR WINDOW CONTROL SWITCH AND THE MASTER WINDOW CONTROL SWITCH	
• Disconnect: Master Window Control Switch C504C. • Measure the resistance between master window control switch C504C, harness side and RH rear window control switch C801, harness side using the following chart: **Master Window Control Switch** / **Circuit** / **RH Rear Window Control Switch** C504C-5 / CPW17 (BN/GN) / C801-3 C504C-6 / CPW18 (GY/VT) / C801-6	**Yes** INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

 • **Are the resistances less than 5 ohms?**	

Pinpoint Test I: The One-Touch Up/Down Feature is Inoperative

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

NOTE: The master window control switch and the LH front window motor each contain integral electronics which must be initialized whenever:

- a new window control switch is installed.
- a new window regulator and motor is installed.
- a new window glass is installed.
- a glass top run removal and installation.
- carrying out any operation in which grease or lubricants are applied to the window system.
- battery voltage has been removed from the LH front window control switch for more than 3 minutes (for example, battery or window control switch disconnected).

For additional information, refer to Window Motor Initialization in this section.

Normal Operation

The master window control switch contains the electronics which controls the one-touch up/down operation of the LH front window. The master window control switch determines window position based upon feedback from two Hall-effect sensors (integral to the LH front window motor). Voltage and ground is supplied to the Hall-effect sensors from the master window control switch. If any fault occurs in the Hall-effect sensor circuits, the LH front window still operates (only the one-touch operation and obstacle detection is inoperative).

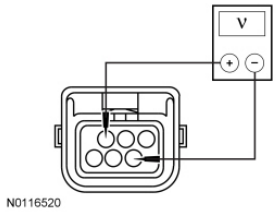
This pinpoint test is intended to diagnose the following:

- LH front window motor not initialized
- Wiring, terminals or connectors
- Window control switch
- Window regulator motor

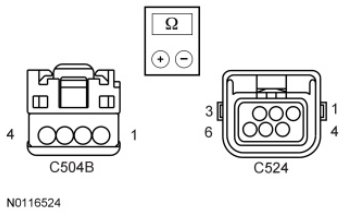
PINPOINT TEST I: ONE-TOUCH UP/DOWN FEATURE IS INOPERATIVE

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.**

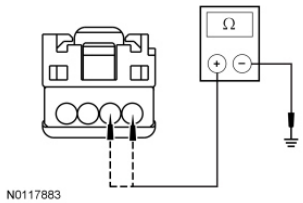
Test Step	Result / Action to Take
I1 INITIALIZE THE LH FRONT WINDOW	
• Ignition ON. • Carry out the window motor initialization	**Yes** The system is operating normally at this time. The front window motor lost initialization.

procedure. Refer to Window Motor Initialization in this section. • **Is the one-touch up/down feature operating correctly?**	**No** GO to I2 .
I2 CHECK THE HALL-EFFECT VOLTAGE SUPPLY AND GROUND CIRCUIT OUTPUTS FROM THE MASTER WINDOW CONTROL SWITCH	
• Ignition OFF. • Disconnect: LH Front Power Window Motor C524. • Ignition ON. • Measure the voltage between LH front power window motor C524-3, circuit RCA17 (WH/BN), harness side and LH front power window motor C524-4, circuit RPW37 (VT/GN), harness side.  N0116520 • **Is the voltage greater than 10 volts?**	**Yes** GO to I5 . **No** GO to I3 .
I3 CHECK THE HALL-EFFECT VOLTAGE SUPPLY AND GROUND CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: Master Window Control Switch C504B. • Measure the resistance between master window control switch C504B, harness side and LH front power window motor C524, harness side using the following chart:	**Yes** GO to I4 . **No** REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

Master Window Control Switch	Circuit	LH Front Power Window Motor
C504B-1	RCA17 (WH/BN)	C524-3
C504B-2	RPW37 (VT/GN)	C524-4

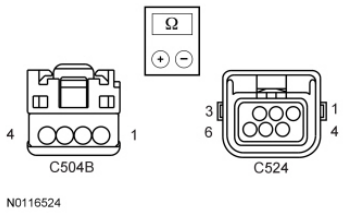


- **Are the resistances less than 5 ohms?**

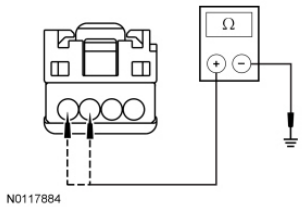
I4 CHECK THE HALL-EFFECT VOLTAGE SUPPLY AND GROUND CIRCUITS FOR A SHORT TO GROUND	
• Measure the resistance between master window control switch C504B-1, circuit RCA17 (WH/BN), harness side and ground; and between master window control switch C504B-2, circuit RPW37 (VT/GN), harness side and ground.  • **Is the resistance greater than 10,000 ohms for both measurements?**	**Yes** INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. **No** REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.
I5 CHECK THE HALL-EFFECT SIGNAL CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: Master Window Control Switch C504B. • Measure the resistance between master window control switch C504B, harness side and LH front power window motor C524, harness side using the following chart:	**Yes** GO to I6 . **No** REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

Master Window Control Switch	Circuit	LH Front Power Window Motor
C504B-3	VPW38 (YE/BU)	C524-6
C504B-4		C524-5

	VPW39 (BU/WH)	



- **Are the resistances less than 5 ohms?**

I6 CHECK THE HALL-EFFECT SIGNAL CIRCUITS FOR A SHORT TO GROUND	
• Measure the resistance between master window control switch C504B-3, circuit VPW38 (YE/BU), harness side and ground; and between master window control switch C504B-4, circuit VPW39 (BU/WH), harness side and ground.  • **Is the resistance greater than 10,000 ohms for both measurements?**	**Yes** INSTALL a new LH front window regulator motor. REFER to Window Regulator Motor - Front Door in this section. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation. If the concern is still present, INSTALL a new master window control switch. REFER to Window Control Switch in this section. TEST the system for normal operation. CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation. **No** REPAIR the circuit(s). CARRY OUT the window motor initialization procedure. REFER to Window Motor Initialization in this section. TEST the system for normal operation.

Pinpoint Test J: The Defrost System is Inoperative

Refer to Wiring Diagrams Cell 56 , Heated Window for schematic and connector information.

Normal Operation

The engine must be running for the rear window defrost system to operate. When the rear window defrost switch (integral to the HVAC module) is pressed, a ground signal is sent to the Body Control Module (BCM). When the BCM receives the defrost request signal, it supplies voltage to the rear window defrost grid. When the rear window defrost is active, the BCM supplies voltage through a dedicated feedback circuit to the HVAC module to illuminate the LED indicator.

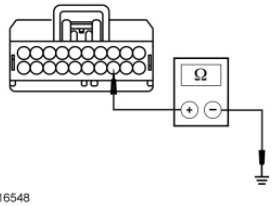
- DTC B1013:23 (Heater Rear Defog Switch: Signal Stuck Low) - sets if the rear window defrost switch is active during self-test, or if the rear window defrost switch has been active for more than 2 minutes.

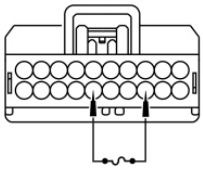
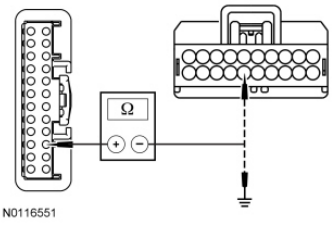
This pinpoint test is intended to diagnose the following:

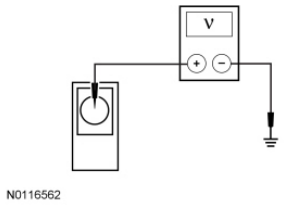
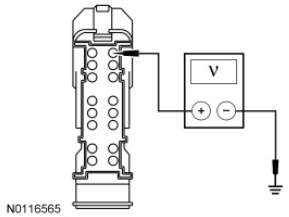
- Fuse
- Wiring, terminals or connectors
- Rear window defrost grid
- HVAC module
- BCM

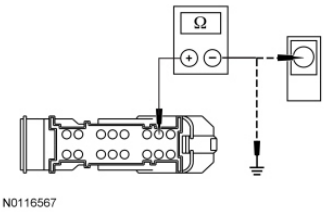
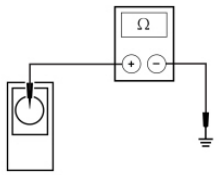
PINPOINT TEST J: THE DEFROST SYSTEM IS INOPERATIVE

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.**

TesStep	Result / Action to Take
J1 CHECK THE BCM REAR DEFROST SWITCH (R_DEFRST_SW) PID OPERATION	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • While monitoring the BCM R_DEFRST_SW PID, press and release the rear window defrost switch. • **Does the PID agree with the rear window defrost switch status?**	**Yes** GO to J5 . **No** If DTC B1013:23 is present, GO to J3 . If DTC B1013:23 is not present, GO to J2 .
J2 CHECK THE HVAC MODULE (REAR WINDOW DEFROST SWITCH) GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Measure the resistance between HVAC module C228A-13, circuit GD115 (BK/GY), harness side and ground.  N0116548 • **Is the resistance less than 5 ohms?**	**Yes** GO to J3 . **No** REPAIR the circuit. TEST the system for normal operation.
J3 CHECK THE BCM REAR DEFROST SWITCH (R_DEFRST_SW) PID OPERATION	

• Ignition OFF. • Disconnect: HVAC Module C228A. • Connect a fused jumper wire between HVAC module C228A-13, circuit GD115 (BK/GY), harness side and HVAC module C228A-16, circuit CRD09 (BU/GY), harness side.  N0116549 • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • Observe the BCM R_DEFRST_SW PID status. • Remove the fused jumper wire. • Observe the BCM R_DEFRST_SW PID status. • **Did the PID state change when the fused jumper wire was removed?**	**Yes** INSTALL a new HVAC module. REFER to Section 412-00 . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to J4 .
J4 CHECK THE REAR WINDOW DEFROST SWITCH CIRCUIT FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280E. • Measure the resistance between BCM C2280E-10, circuit CRD09 (BU/GY), harness side and HVAC module C228A-16, circuit CRD09 (BU/GY), harness side; and between BCM C2280E-10, circuit CRD09 (BU/GY), harness side and ground.  N0116551 • **Is the resistance less than 5 ohms between the BCM and the HVAC module; and greater than 10,000 ohms between the BCM and ground?**	**Yes** GO to J9 . **No** REPAIR the circuit. CLEAR all DTCs. TEST the system for normal operation.
J5 CHECK FOR VOLTAGE TO THE REAR WINDOW DEFROST GRID	

• Ignition OFF. • Disconnect: Rear Window Defrost Grid C402A. • Start the engine. • Activate the rear window defrost switch. • Measure the voltage between rear window defrost grid C402A-1, circuit CRD06 (BN/YE), harness side and ground.  N0116562 • **Is the voltage greater than 10 volts?**	**Yes** If the rear window defrost switch LED is illuminated, GO to J8 . If the rear window defrost switch LED is not illuminated, GO to Pinpoint Test L to diagnose the LED circuit. **No** GO to J6 .
J6 CHECK THE BCM VOLTAGE FEED FOR AN OPEN	
• Ignition OFF. • Measure the voltage between BCM C2280A-1, circuit SBB33 (RD), harness side and ground.  N0116565 • **Is the voltage greater than 10 volts?**	**Yes** GO to J7 . **No** VERIFY BJB fuse 33 (30A) is OK, If OK, REPAIR the circuit. CLEAR all DTCs. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. REPAIR the circuit. CLEAR all DTCs. TEST the system for normal operation.
J7 CHECK THE REAR WINDOW DEFROST GRID VOLTAGE CIRCUIT FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280C. • Measure the resistance between BCM C2280C-10, circuit CRD06 (BN/YE), harness side and rear window defrost grid C402A-1, circuit CRD06 (BN/YE), harness side; and between BCM C2280C-10, circuit CRD06 (BN/YE), harness side and ground.	**Yes** GO to J9 . **No** REPAIR the circuit. CLEAR all DTCs. TEST the system for normal operation.

 N0116567 • **Is the resistance less than 5 ohms between the BCM and the rear window defrost grid; and greater than 10,000 ohms between the BCM and ground?**	
J8 CHECK THE REAR WINDOW DEFROST GRID GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Rear Window Defrost C402B. • Measure the resistance between rear window defrost grid C402B-1, circuit GD143 (BK/VT), harness side and ground.  N0116569 • **Is the resistance less than 5 ohms?**	**Yes** CARRY OUT the Grid Wire component test in this section. REPAIR the rear window defrost grid or INSTALL a new rear window glass as necessary. REFER to Window Grid Wire Repair or Window Glass - Rear in this section. TEST the system for normal operation. **No** REPAIR the circuit. CLEAR all DTCs. TEST the system for normal operation.
J9 CHECK FOR CORRECT BCM MODULE OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all the BCM 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 BCM . 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. CLEAR all DTCs. TEST the system for normal operation.

Pinpoint Test K: The Defrost System Will Not Shut Off Automatically

Refer to Wiring Diagrams Cell 56 , Heated Window for schematic and connector information.

Normal Operation

The engine must be running for the rear window defrost system to operate. When the rear window defrost switch (integral to the HVAC module) is pressed, a ground signal is sent to the Body Control Module (BCM). When the BCM receives the defrost request signal, it supplies voltage to the rear window defrost grid. When

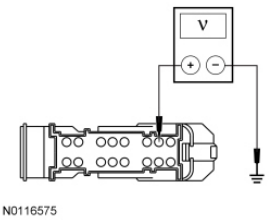
the rear window defrost is active, the BCM supplies voltage through a dedicated feedback circuit to the HVAC module to illuminate the LED indicator.

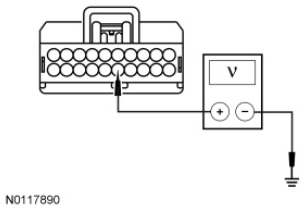
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- BCM

PINPOINT TEST K: THE DEFROST SYSTEM WILL NOT SHUT OFF AUTOMATICALLY

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
K1 CHECK FOR VOLTAGE TO THE REAR WINDOW DEFROST GRID WITH BCM DISCONNECTED	
• Ignition OFF. • Disconnect: BCM C2280C. • Ignition ON. • Measure the voltage between BCM C2280C-10, circuit CRD06 (BN/YE), harness side and ground.  N0116575 • **Is any voltage present?**	**Yes** REPAIR the short to voltage in circuit CRD06 (BN/YE). TEST the system for normal operation. **No** GO to K2 .
K2 CHECK FOR A SHORT TO VOLTAGE ON THE SWITCH ILLUMINATION CIRCUIT	
• Ignition OFF. • Disconnect: BCM C2280F. • Disconnect: HVAC Module C228A. • Ignition ON. • Measure the voltage between HVAC module C228A-15, circuit CRD04 (BN/GN), harness side and ground.	**Yes** REPAIR the short to voltage in circuit CRD04 (BN/GN). TEST the system for normal operation. **No** GO to K3 .

 • **Is any voltage present?**	
K3 CHECK FOR CORRECT BCM MODULE OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all the BCM 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 BCM . 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. CLEAR all DTCs. TEST the system for normal operation.

Pinpoint Test L: The Defrost System LED Does Not Illuminate When the Defrost System is Active

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

Normal Operation

The engine must be running for the rear window defrost system to operate. When the rear window defrost switch (integral to the HVAC module) is pressed, a ground signal is sent to the Body Control Module (BCM). When the BCM receives the defrost request signal, it supplies voltage to the rear window defrost grid. When the rear window defrost is active, the BCM supplies voltage through a dedicated feedback circuit to the HVAC module to illuminate the LED indicator. The rear defrost self actuates when the ambient air temperature is less than 5° C (41° F) and engine coolant temperature is less than 60° C (140° F). The rear window defroster LED indicator does not illuminate when the rear defroster self actuates.

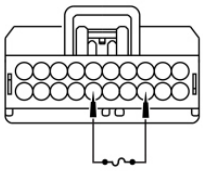
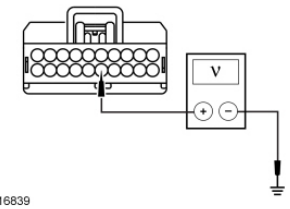
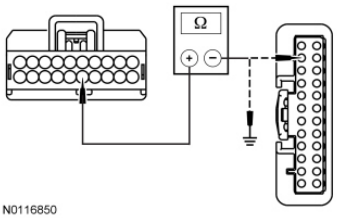
This pint test is intended to diagnose the following:

- Wiring, terminals or connectors
- HVAC module
- BCM

PINPOINT TEST L: THE DEFROST SYSTEM LED DOES NOT ILLUMINATE WHEN THE DEFROST SYSTEM IS ACTIVE

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
L1 CHECK FOR VOLTAGE SIGNAL TO THE REAR WINDOW DEFROST SWITCH LED	

• Ignition OFF. • Disconnect: HVAC Module C228A. • Start the engine. • Momentarily connect a fused jumper wire between HVAC module C228A-13, circuit GD115 (BK/GY), harness side and HVAC module C228A-16, circuit CRD09 (BU/GY), harness side.  N0116549 • Remove the fused jumper wire. • Measure the voltage between HVAC module C228A-15, circuit CRD04 (BN/GN), harness side and ground.  N0116839 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new HVAC module. REFER to Section 412-00 . TEST the system for normal operation. **No** GO to L2 .
L2 CHECK THE REAR WINDOW DEFROST SWITCH LED CIRCUIT FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280F. • Measure the resistance between HVAC module C228A-15, circuit CRD04 (BN/GN), harness side and BCM C2280F-11, circuit CRD04 (BN/GN), harness side; and between HVAC module C228A-15, circuit CRD04 (BN/GN), harness side and ground.  N0116850 • **Is the resistance less than 5 ohms between the HVAC module and the BCM ; and greater than 10,000 ohms between the HVAC module and ground?**	**Yes** GO to L3 . **No** REPAIR the circuit. TEST the system for normal operation.

L3 CHECK FOR CORRECT BCM MODULE OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion. ♦ pushed-out pins. • Connect all the BCM 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 BCM . 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. CLEAR all DTCs. TEST the system for normal operation.

Component Test

Grid Wire Test

1. Using a bright lamp inside the vehicle, inspect the wire grid from the outside. A broken grid wire appears as a brown spot.

2. Run the engine at idle. Set the rear window defrost switch to ON. The indicator light should illuminate.

3. Working inside the vehicle with a voltmeter, contact the broad, red-brown stripes of the back glass window grid (positive lead to B+ side and negative lead to ground side). The meter should read 10-13 volts. A lower voltage reading may indicate a loose grid connection.

4. Contact a good ground point with the negative lead of the meter. The voltage reading should not change. If the voltage increases, this indicates a loose ground connection. A voltage reading of less than 10 volts indicates a loose B+ side connection.

5. With the negative lead of the meter grounded, touch each grid line of the rear window defrost glass at its midpoint with the positive lead. A reading of approximately 6 volts indicates the line is good. A reading of 0 volt 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 volt 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.

Window Motor Initialization

NOTE: Initialization is required to learn both the full UP and full DOWN positions and the profile of the glass as it travels through the glass channel. Once initialized, obstacle detection is enabled. This procedure is only required for the LH front window motor.

NOTE: The master window control switch and the LH front window motor each contain integral electronics which must be initialized whenever:

- a new window control switch is installed.
- a new window regulator and motor is installed.
- a new window glass is installed.
- a glass top run removal and installation.
- carrying out any operation in which grease or lubricants are applied to the window system.
- battery voltage has been removed from the LH front window control switch for more than 3 minutes (for example, battery or window control switch disconnected).

NOTE: Before carrying out the initialization procedure, make sure all window components (window glass, window regulator, window motor, seals and glass top run) are installed and tightened to specifications.

1. Turn the ignition ON.

2. Activate and hold the window control switch in the UP position at the second detent until the window glass stalls for 2 seconds into the glass top run and release the switch. While the window is up, repeat this step 2 more times.

3. Activate and hold the window control switch in the DOWN position at the second detent until the window glass stalls for 2 seconds at the bottom of its travel and release the switch.

4. Test for correct window operation by carrying out the one-touch up/down feature.

Window Glass Adjustment

1. If needed, remove the door trim panel. For additional information, refer to Section 501-05 .
2. If needed, remove the 2 access hole plugs.
3. If needed, connect the window control switch, or install the window regulator handle.
4. If needed, position the window glass in order to access the window glass clamp bolts.
5. If needed, loosen the 2 window glass clamp bolts.
6. **NOTE:** Make sure the window glass is correctly installed in door glass top run.

   Manually lift the window glass by hand, to the top of the door.
7. **NOTE:** Make sure to lower the window glass evenly.

   NOTE: Make sure the window glass is seated in the bottom of the window glass clamps.

   Shift the glass rearward until it stops against the rear of the door glass top run while manually lowering the glass back down into the window glass clamps.
8. Tighten the 2 window glass clamp bolts to 9 Nm (80 lb-in).
9. Using the window control switch, fully raise the window glass and check that the window glass seats correctly in the upper door glass top run.
10. If the window glass does not seat correctly, repeat steps 4 - 8.
11. If this procedure was performed on the LH front window glass, the LH window motor must be initialized. For additional information, refer to Window Motor Initialization in this section.

Window Grid Wire Repair

General Equipment

Polypropylene Film Fine Line Tape (Commercially available)

Material

Item	Specification
Motorcraft® Lacquer Touch-Up Paint (match color to exterior grid wire) PMP-19500-XXXXX	ESR-M2P100-C
Rear Window Defroster Repair PM-11 (US); CPM-11 (Canada)	-
Motorcraft® Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

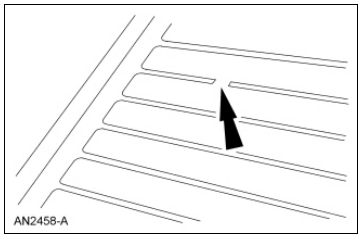
NOTE: The grid line material is not embedded into the glass, but is baked to the glass surface and consequently can be scraped off. An undamaged grid line will have small ridges that project above the surface of the glass and can easily be felt when running a fingernail across them. Grid lines that have 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.

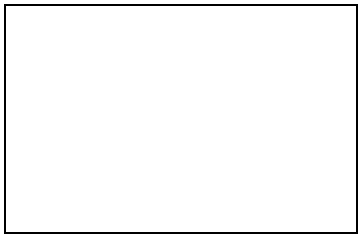
2. ***NOTICE:*** **Do not use scrapers, sharp instruments or abrasive window cleaners on the interior surface of the rear window glass as this may cause damage to the grid lines.**

   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.



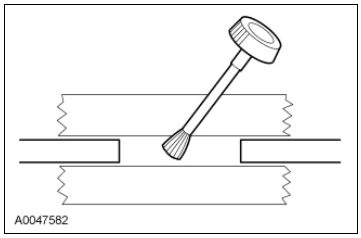
4. Using a polypropylene film fine line tape, mask the area directly above and below the grid break extending the tape 26 mm (1.02 in) beyond the concern area in both directions. The break area should be at the center of the mask.



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

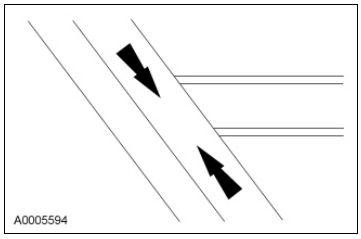
Material

Item	Specification
Motorcraft® 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 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.

Glass Reseal - Windshield

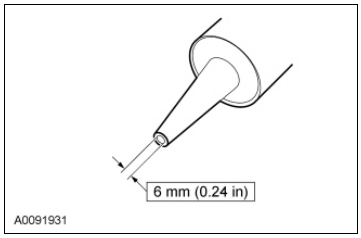
Special Tool(s)

 ST3109-A	Air Caulking Gun AST405 or equivalent

Material

Item	Specification
Dow Urethane Adhesive BetasealTM Express	-
Sika Urethane Adhesive Sika Tack ASAP	-
Motorcraft® 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 LH and RH A-pillar trim panels. For additional information, refer to Section 501-05 .
4. If equipped, disconnect the automatic-dimming interior rear view mirror electrical connector.
5. Remove the 4 screws and LH and RH sun visors.
6. Remove the RH and LH sun visor clips.
7. 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 Air Caulking Gun or a high-ratio, electric or battery-operated caulk gun that will apply the urethane adhesive with less effort and a continuous bead.

    NOTE: Make sure there are no gaps in the urethane adhesive bead.

Apply 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 has cured, check the windshield seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

12. Position the front portion of the headliner.

13. Install the RH and LH sun visor clips.

14. Install the LH and RH sun visors and the 4 screws.

15. If equipped, connect the automatic-dimming interior rear view mirror electrical connector.

16. If equipped, install the overhead console.

17. Install the LH and RH A-pillar trim panels. For additional information, refer to Section 501-05 .

18. Install the cowl panel grille. For additional information, refer to Section 501-02 .

19. Clean the interior and exterior windshield glass with glass cleaner.

Glass Reseal - Rear

Special Tool(s)

 ST3109-A	Air Caulking Gun AST405 or equivalent

Material

Item	Specification
Dow Urethane Adhesive BetasealTM Express	-
Sika Urethane Adhesive Sika Tack ASAP	-
Motorcraft® Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

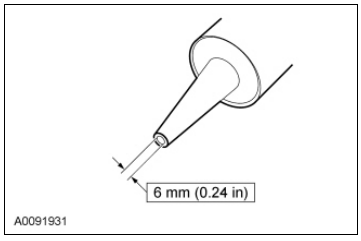
1. **4-door vehicles:** Remove the C-pillar trim panel, parcel shelf, high mounted stoplamp and lower the headliner. For additional information, refer to Section 501-05 and Section 417-01 .

2. **5-door vehicles:** Remove te trim panel. For additional information, refer to Section 501-05 .

3. Disconnect the rear window glass electrical connectors.

4. Clean the interior and exterior of the rear window glass surface with glass cleaner.

5. Cut the urethane adhesive applicator tip to specification.



6. **NOTE:** Use either a Air Caulking Gun or a high-ratio, electric or battery-operated caulk gun that applies the urethane adhesive with less effort and continuous bead.

   NOTE: Make sure there are no gaps in the urethane adhesive 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 window glass from the interior of the vehicle.

- **4-door vehicles:** Apply the urethane adhesive to the bottom of the rear window glass from the exterior of the vehicle.
- **5-door vehicles:** Apply the urethane adhesive to the bottom of the rear window glass from the interior of the vehicle.

7. **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 window glass seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

8. Connect the rear window glass electrical connectors.

9. **4-door vehicles:** Install the high mounted stoplamp, headliner, parcel shelf and C-pillar trim panels. For additional information, refer to Section 417-01 and Section 501-05 .

10. **5-door vehicles:** Install the liftgate trim panel. For additional information, refer to Section 501-05 .

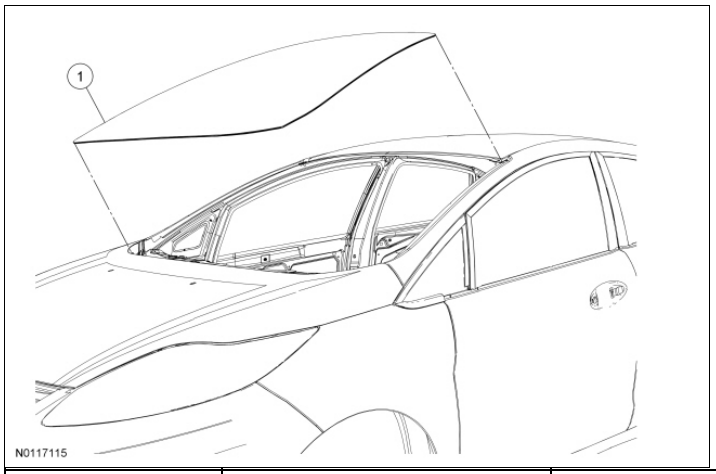
Windshield Glass

Special Tool(s)

 ST3109-A	Air Caulking Gun AST405 or equivalent
 ST3274-A	Deluxe Air Windshield Knife 300-AST1770E or equivalent
 ST2085-A	The Pumper 164-R2459 or equivalent

Material

Item	Specification
Dow Urethane Adhesive BetasealTM Express	-
Dow Urethane One Step Glass Primer BetaprimeTM 5500 / 5500A / 5500SA	-
Sika Urethane Adhesive Sika Tack ASAP	-
Sika Urethane Metal and Glass Primer Sika 206 G+P	-
Motorcraft® Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A



Item	Part Number	Description
1	03100	Windshield glass

Removal

NOTE: If the windshield glass is being removed to repair a dust/water leak, remove and reinstall the existing windshield glass.

1. Remove the A-pillar trim panels. For additional information, refer to Section 501-05 .
2. Remove the 4 screws and LH and RH sun visors.
3. Remove the RH and LH sun visor clips.
4. Remove the interior rear view mirror. For additional information, refer to Section 501-09 .
5. Partially lower the front portion of the headliner near the windshield header and block with suitable material.
6. Remove the cowl panel grille. For additional information, refer to Section 501-02 .
7. Before cutting the urethane adhesive, remove dirt and other foreign material from the windshield pinchweld area.
    - Use a clean shop towel or oil-free, compressed air.
8. **NOTE:** Refer to manufacturer's instructions before using the Deluxe Air Windshield Knife.

   Lubricate the urethane adhesive with water to aid the Deluxe Air Windshield Knife when cutting.
9. **⚠ WARNING: Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.**

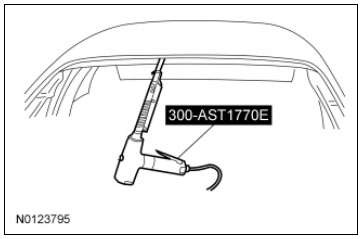
   ⚠ WARNING: Wear protective gloves when handling components or parts that have pointed or sharp edges. Failure to follow this instruction may result in serious personal injury.

   NOTICE: **To avoid rust formation, use extreme care not to scratch the paint or primer or otherwise damage the pinchweld during glass removal.**

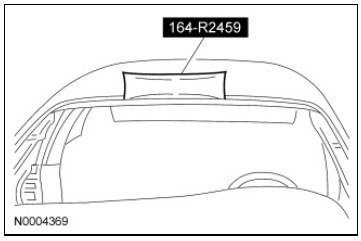
   NOTE: Insert the blade into the Deluxe Air Windshield Knife so that the flat side is against the glass. This will leave the entire urethane adhesive bead on the pinchweld and allow a dry fit of the replacement windshield glass.

   NOTE: Support the windshield glass to prevent the glass from dropping while cutting the urethane adhesive.

   Working from inside the vehicle, insert the Deluxe Air Windshield Knife at the upper center of the windshield glass and work toward the bottom corners.



10. Using The Pumper, distance the windshield glass from the body.



11. Insert the Deluxe Air Windshield Knife into the bottom of the urethane adhesive and cut from corner to corner.

12. Carefully remove the windshield glass from the vehicle and place on a stable work surface.

Installation

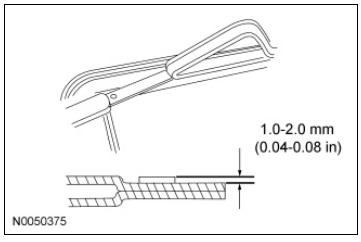
1. Dry-fit the windshield glass on the existing urethane adhesive bead on the pinch weld.
    - Position the windshield glass on the pinch weld.
    - Center the glass in the opening.
    - Adjust the windshield glass stop blocks (if equipped) as needed for best fit.
    - Make alignment marks with tape or non-staining grease pencil (preferably at the windshield glass stop blocks) on the windshield glass and the body.

2. After the dry-fit alignment, remove the glass from the body opening and place on a stable work surface with the interior side of the glass facing upward.

3. ⚠ **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 pinchweld.



4. 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 glass removal.

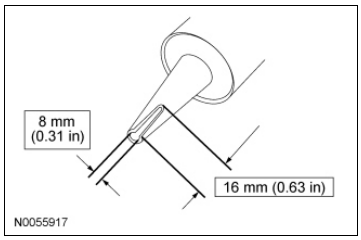
5. If reinstalling the same windshield glass, remove the remaining urethane adhesive from the glass leaving a thin layer to bond with the new urethane adhesive bead.

6. Clean the inside of the windshield glass surface with glass cleaner.
    - Make sure to thoroughly clean the surface of the blackened border area where the urethane adhesive will be applied.

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.

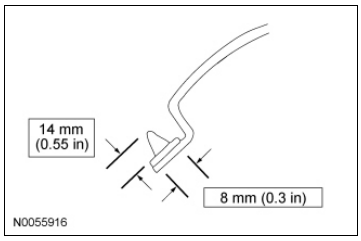
8. Cut the urethane adhesive applicator tip to specification.



9. **NOTE:** Use a Air Caulking Gun or a high-ratio, electric or battery-operated caulk gun that will apply the urethane adhesive with less effort and a continuous bead.

   NOTE: The windshield glass must be positioned within 10 minutes of applying the urethane adhesive.

   Apply a uniform 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 glass 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 urethane 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.

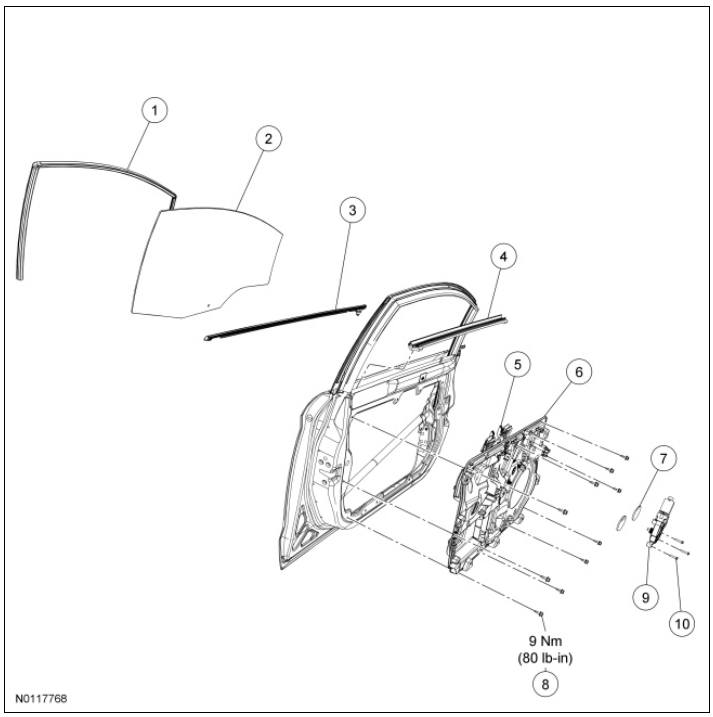
    After the urethane adhesive has cured, check the windshield glass seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

12. Install the cowl panel grille. For additional information, refer to Section 501-02 .

13. Install the headliner. For additional information, refer to Section 501-05 .

14. Install the interior rear view mirror. For additional information, refer to Section 501-09 .
15. Install the RH and LH sun visor clips.
16. Install the LH and RH sun visors and the 4 screws.
17. Install the A-pillar trim panels. For additional information, refer to Section 501-05 .

Glass, Frames and Mechanisms - Exploded View, Front Door



Item	Part Number	Description
1	21456 RH / 21457 LH	Door window glass top run
2	21410 RH/ 21411 LH	Door window glass
3	20562 RH/ 20563 LH	Exterior door window glass belt moulding
4	21456 RH/ 21457 LH	Interior door window glass belt moulding
5	23208 RH/ 23209 LH	Window regulator
6	235A86 RH/ 235A87 LH	Door carrier
7	202A84	Access hole plug (2 required)
8	W706127	Door carrier bolt (10 required)
9	23394	Window regulator motor
10	-	Window regulator motor screws (part of 23394) (3 required)

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

Window Glass - Front Door

Removal and Installation

1. Fully lower the front door window glass.
2. Remove the front door trim panel. For additional information, refer to Section 501-05 .
3. Remove the interior door window glass belt moulding.
4. Remove and discard the exterior door window glass belt moulding.
5. Remove the 2 access hole plugs.
6. Connect the window control switch, or install the window regulator handle.
7. Position the window glass in order to access the window glass clamp bolts.
8. Loosen the 2 window glass clamp bolts.
9. Tilt the window glass forward and lift upward to remove the window glass from the door.

Installation

1. Install the window glass into the door.
2. **NOTE:** The window glass clamp bolts will be tightened when performing this step.

   Before tightening the window glass clamp bolts, make sure window glass is adjusted correctly. For additional information, refer to Window Glass Adjustment in this section.

-96. Install the 2 access hole plugs.

4. Fully lower the front door window glass.
5. Install a new exterior door window glass belt moulding.
6. Install the interior door window glass belt moulding.
7. Install the front door trim panel. For additional information, refer to Section 501-05 .
8. If installing a new LH front window glass, the LH window motor must be initialized. For additional information, refer to Window Motor Initialization in this section.

Window Regulator Motor - Front Door

Removal and Installation

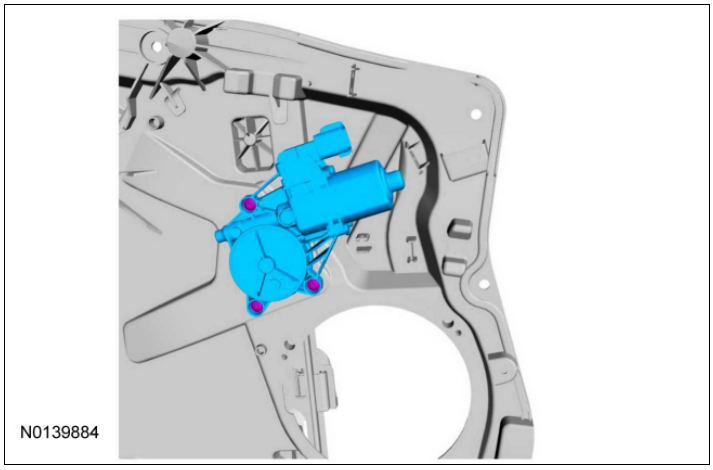
1. Remove the front door trim panel. For additional information, refer to Section 501-05 .
2. Disconnect the window regulator motor electrical connector.
3. Secure the window glass in position with tape.
4. Remove the 3 window regulator motor screws.
5. Remove the window regulator motor.
6. To install, reverse the removal procedure.
    - If installing a new LH front window regulator motor, it must be initialized. For additional information, refer to Window Motor Initialization in this section.

Window Regulator - Front Door

Removal and Installation

1. Remove the front door window glass. For additional information, refer to Window Glass - Front Door in this section.

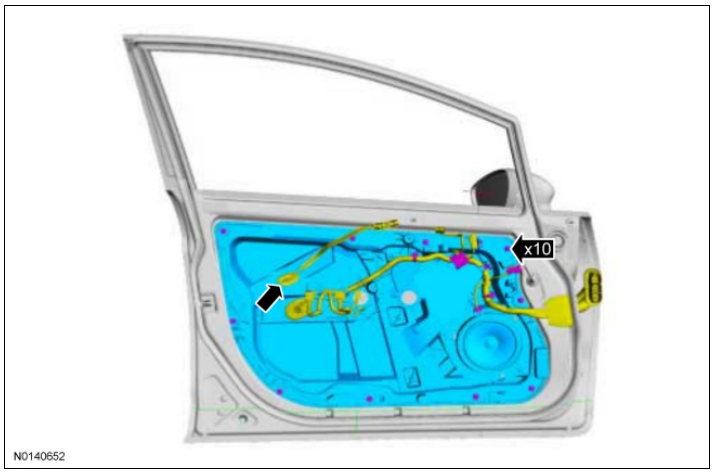
2. Remove the window regulator motor from the front of the carrier
   - Disconnect the window motor electrical connector.
   - Remove the 3 screws the window regulator motor.



3. **NOTE:** Do not remove the carrier from the door.

   Remove the 10 door carrier bolts.

   - To install, tighten to 9 Nm (80 lb-in).



4. **NOTE:** Back side of carrier shown for clarity.

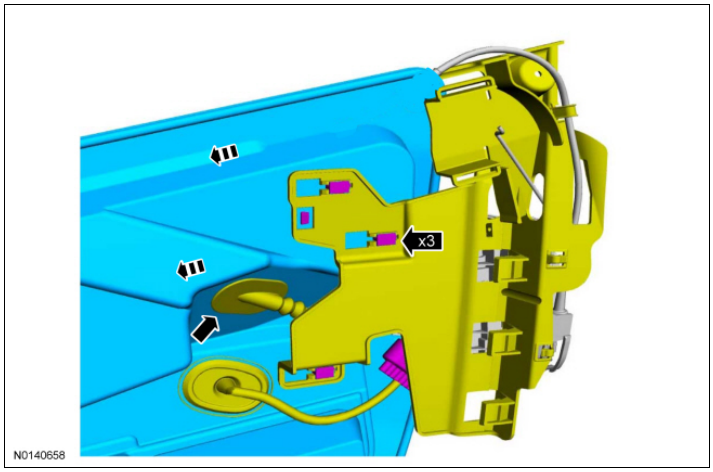
   NOTE: DO NOT remove the carrier from the door.

   NOTE: During installation, make sure the carrier tabs are correctly positioned inside the run channel retainers before sliding the cain place otherwise the carrier will prevent the installation of the window

glass.

Detach the carrier from the door frame .

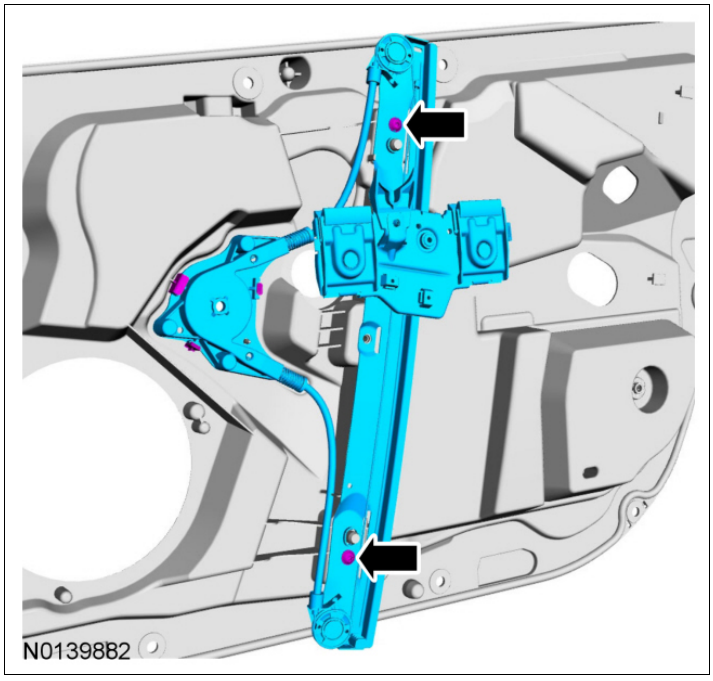
- Slide the carrier forward to release the carrier tabs from the 3 run channel retainers.
- Route the interior door cable through the door carrier.



5. **NOTE:** Carrier shown removed from door for clarity.

   Remove the window regulator.

   - Reaching between the door frame and carrier, remove the 2 window regulator bolts.
   - Using a suitable socket (10mm) release the window regulator retaining tabs located on the front of the carrier.
   - Remove the window regulator from the door carrier.



6. To install, reverse the removal procedure.
   - If installing a new LH front window regulator, the LH window motor must be initialized. For additional information, refer to Window Motor Initialization in this section.

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 3 door speaker screws and the door speaker.
   - Disconnect the electrical connector.

3. Remove the front door glass top run.

4. To install, reverse the removal procedure.
   - If installing a new LH front door glass top run, the LH window motor must be initialized. For additional information, refer to Window Motor Initialization in this section.

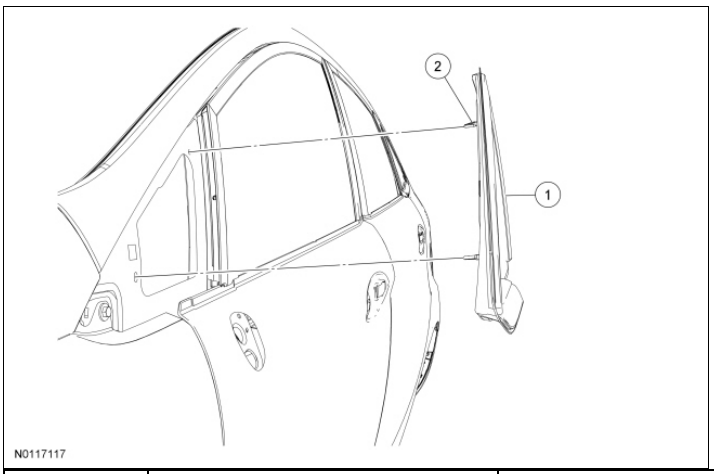
Window Glass - Front Quarter

Special Tool(s)

 ST3109-A	Air Caulking Gun AST405 or equivalent
 ST3274-A	Deluxe Air Windshield Knife 300-AST1770E or equivalent
 ST1109-A	Pneumatic Knife with Offset Blade 107-R1511 or equivalent

Material

Item	Specification
Dow Urethane Adhesive BetasealTM Express	-
Dow Urethane One Step Glass Primer BetaprimeTM 5500 / 5500A / 5500SA	-
Sika Urethane Adhesive Sika Tack ASAP	-
Sika Urethane Metal and Glass Prim 206 G+P	-
Motorcraft® Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A



Item	Part Number	Description
1	29710 RH/ 29711 LH	Front quarter window glass

Removal

1. Remove the A-pillar upper trim panel. For additional information, refer to Section 501-05 .

2. Before cutting the urethane adhesive, remove dirt and other foreign material from the front quarter window glass pinch weld area.
    - Use a clean shop towel or oil-free compressed air.

3. **NOTE:** Refer to manufacturer's instructions before using the Deluxe Air Windshield Knife.

   Lubricate the urethane adhesive with water to aid the Deluxe Air Windshield Knife when cutting the urethane adhesive.

4. ⚠ **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.**

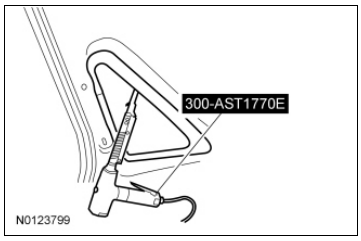
   NOTICE: **Make sure the cutting blades are changed where the cutting depth changes to avoid damage to the body and trim panels.**

   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 Air Windshield Knife so that the flat side is against the glass.

   NOTE: Some resistance may be encountered when cutting through the glass locating pegs in the upper right and lower left corners of the glass.

   Working from inside the vehicle, insert the Deluxe Air Windshield Knife at the upper of the front quarter window glass and work towards the corners and remove the front quarter window glass.



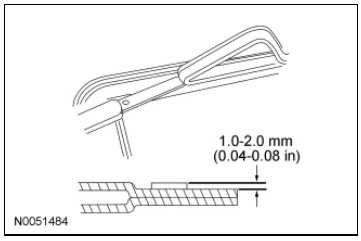
Installation

NOTE: For additional material guidelines, refer to the manufacturer's installation information.

1. ⚠ **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 mm to 2 mm (0.04 in to 0.08 in) base of original equipment urethane adhesive on the pinch weld.



2. 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 glass removal.

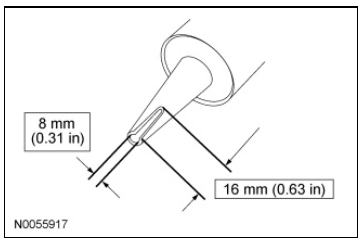
3. If installing the original front quarter window glass, remove the excess urethane adhesive.

4. Clean the inside of the front quarter window glass with glass cleaner.

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 this procedure.

   If installing a new front quarter window glass, apply glass primer according to the manufacturer's instructions. Allow at least 6 minutes to dry.

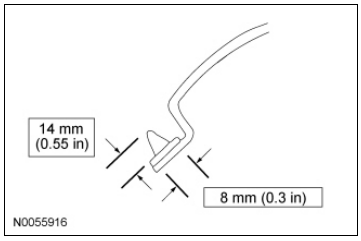
6. Cut the urethane adhesive applicator tip to specification.



7. **NOTE:** The front quarter window glass must be positioned within 10 minutes of applying the urethane adhesive.

   NOTE: Use either a Air Caulking Gun or a high-ratio, electric or battery-operated caulk gun that will apply the urethane adhesive with less effort and a continuous bead.

   Apply urethane adhesive on top of the existing trimmed urethane adhesive bead on the pinch weld, starting and ending at the bottom of the front quarter window glass near the center, making sure there are no gaps in the bead.



8. ⚠ **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 front quarter window glass, open vehicle windows to prevent the air pressure of closing doors from affecting the urethane adhesive bond.**

Install the front quarter window glass.

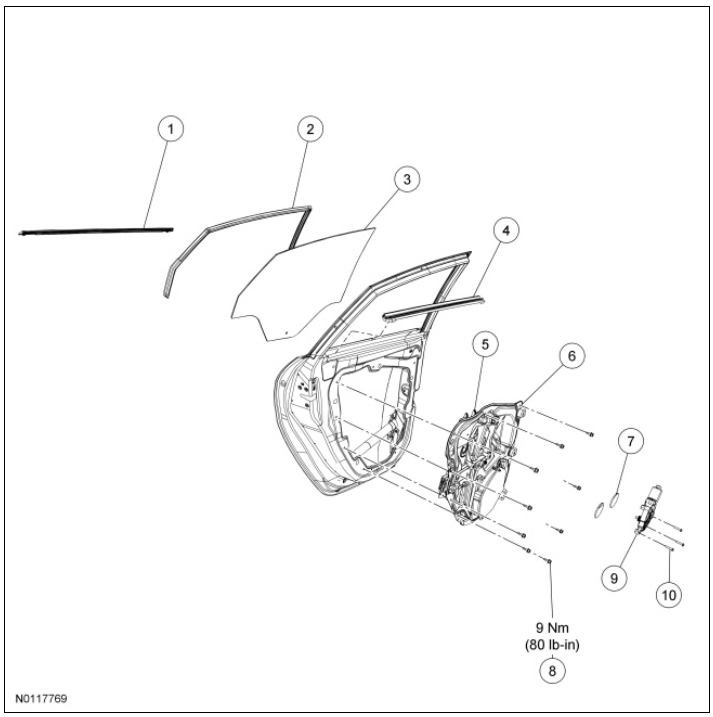
- Position the front quarter window glass to the flange, and press the retaining tabs into the flange to engage.

9. **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 front quarter window glass seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

10. Install the A-pillar upper trim panel. For additional information, refer to Section 501-05 .

Glass, Frames and Mechanisms - Exploded View, Rear Door



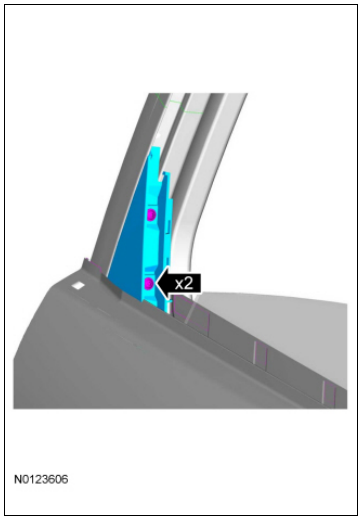
Item	Part Number	Description
1	253A10	Exterior door window glass belt moulding
2	25766 RH / 25767 LH	Door glass top run
3	25712 RH/ 25713 LH	Door window glass
4	25860 RH/ 25861 LH	Interior door window glass belt moulding
5	27008 RH/ 27009 LH	Window regulator
6	235A88 RH/ 235A89 LH	Door carrier
7	202A84	Access hole plug (2 required)
8	W706127	Door carrier bolt (10 required)
9	23394	Window regulator motor
10	-	Window regulator motor screws (part of 23394) (3 required)

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

Window Glass - Rear Door

Removal

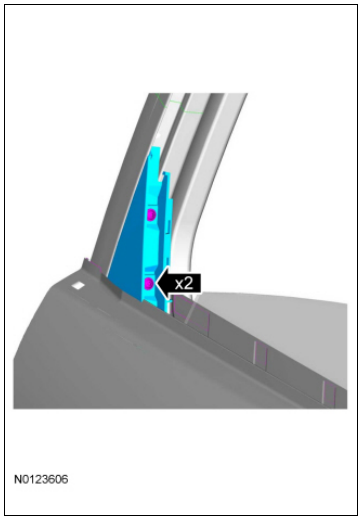
1. Fully lower the rear door window glass.
2. Remove the rear door trim panel. For additional information, refer to Section 501-05 .
3. Remove the interior door window glass belt moulding.
4. Remove and discard the exterior door window glass belt moulding.
5. Position aside the lower rear portion of the rear door glass top run.
6. Remove the 2 window extension screws and the window extension.



7. Remove the 2 access hole plugs.
8. Connect the window control switch, or install the window regulator handle.
9. Position the window glass in order to access the window glass clamp bolts.
10. Loosen the 2 window glass clamp bolts.
11. Tilt the window glass forward and lift upward to remove the window glass from the door.

Installation

1. Install the window glass into the door, but do not tighten the window glass clamps bolts.
2. Position the window gldownward.
3. Install the window extension and the tighten the 2 window extension screws.



4. Install the lower rear portion of the rear door glass top run.
5. **NOTE:** The window glass clamp bolts will be tightened when performing this step.

   Before tightening the window glass mounting bolts, make sure window glass is adjusted correctly. For additional information, refer to Window Glass Adjustment in this section.
6. Install the 2 access hole plugs.
7. Fully lower the rear door window glass.
8. Install a new exterior door window glass belt moulding.
9. Install the interior door window glass belt moulding.
10. Install the rear door trim panel. For additional information, refer to Section 501-05 .

Window Regulator Motor - Rear Door

Removal and Installation

1. Remove the rear door trim panel. For additional information, refer to Section 501-05 .
2. Disconnect the window regulator motor electrical connector.
3. Secure the window glass in position with tape.
4. Remove the 3 window regulator motor screws.
5. Remove the window regulator motor.
6. To install, reverse the removal procedure.

Window Regulator - Rear Door

Removal and Installation

1. Remove the rear door window glass. For additional information, refer to Window Glass - Rear Door in this section.
2. Disconnect the speaker and window regulator motor electrical connectors.
3. Remove the 3 wire harness retainers and the door latch cable retainer.
4. Remove the 3 window regulator motor bolts and the window regulator motor.
5. Remove the 9 door carrier bolts.
   - To install, tighten to 9 Nm (80 lb-in).
6. Slide the door carrier toward the front of the vehicle to release the door carrier retainers.
7. Position aside the door carrier and disconnect the door lock actuator electrical connector.
8. Route the interior door handle cable and door lock actuator electrical connector through the front door carrier.
9. Remove the 2 window regulator bolts from the door carrier.
10. Depress the retaining tabs and remove the window regulator from the door carrier.
11. To install, reverse the removal procedure.

Door Glass Top Run - Rear

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 9 rear door carrier bolts.
   - To install, tighten to 9 Nm (80 lb-in).

3. Slide the rear door carrier toward the front of the vehicle to release the door carrier retainers and position it aside.

4. Remove the rear door glass top run.

5. To install, reverse the removal procedure.

Window Glass - Rear Quarter

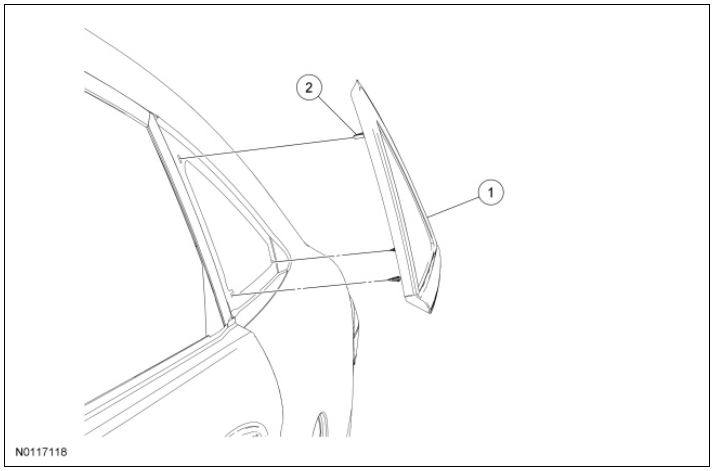
Special Tool(s)

 ST3109-A	Air Caulking Gun AST405 or equivalent
 ST3274-A	Deluxe Air Windshield Knife 300-AST1770E or equivalent
 ST1109-A	Pneumatic Knife with Offset Blade 107-R1511 or equivalent

Material

Item	Specification
Dow Urethane Adhesive BetasealTM Express	-
Dow Urethane One Step Glass Primer BetaprimeTM 5500 / 5500A / 5500SA	-
Sika Urethane Adhesive Sika Tack ASAP	-
Sika Urethane Metal and Glass Primer06 G+P	-
Motorcraft® Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

NOTE: 4-door shown, 5-door similar.



Item	Part Number	Description
1	29710 RH/ 29711 LH	Rear quarter window glass

Removal

1. Remove the C-pillar upper trim panel. For additional information, refer to Section 501-05 .

2. Before cutting the urethane adhesive, remove dirt and other foreign material from the rear quarter window glass pinch weld area.
   - Use a clean shop towel or oil-free compressed air.

3. **NOTE:** Refer to manufacturer's instructions before using the Deluxe Air Windshield Knife.

   Lubricate the urethane adhesive with water to aid the Deluxe Air Windshield Knife when cutting the urethane adhesive.

4. ⚠ **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.**

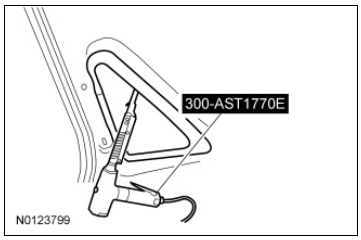
   NOTICE: **Make sure the cutting blades are changed where the cutting depth changes to avoid damage to the body and trim panels.**

   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 Air Windshield Knife so that the flat side is against the glass.

   NOTE: Some resistance may be encountered when cutting through the glass locating pegs in the upper right and lower left corners of the glass.

   Working from inside the vehicle, insert the Deluxe Air Windshield Knife at the upper of the rear quarter window glass and work towards the corners and and remove the rear quarter window glass.



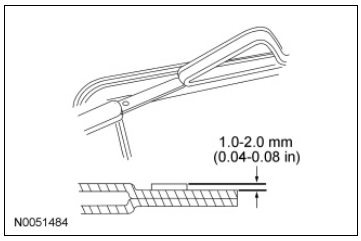
Installation

NOTE: For additional material guidelines, refer to the manufacturer's installation information.

1. ⚠ **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 mm to 2 mm (0.04 in to 0.08 in) base of original equipment urethane adhesive on the pinch weld.



2. 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 glass removal.

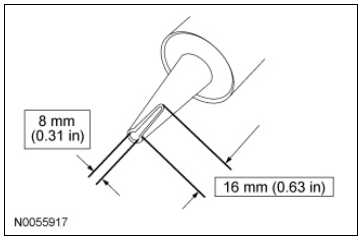
3. If installing the original rear quarter window glass, remove the excess urethane adhesive.

4. Clean the inside of the rear quarter window glass with glass cleaner.

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 this procedure.

   If installing a new rear quarter window glass, apply glass primer according to the manufacturer's instructions. Allow at least 6 minutes to dry.

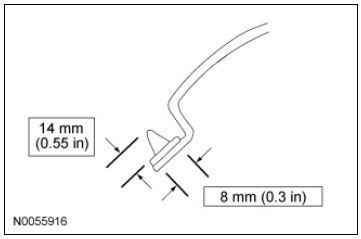
6. Cut the urethane adhesive applicator tip to specification.



7. **NOTE:** The rear quarter window glass must be positioned within 10 minutes of applying the urethane adhesive.

   NOTE: Use either a Air Caulking Gun or a high-ratio, electric or battery-operated caulk gun that will apply the urethane adhesive with less effort and a continuous bead.

   Apply urethane adhesive on top of the existing trimmed urethane adhesive bead on the pinch weld, starting and ending at the bottom of the rear quarter window glass near the center, making sure there are no gaps in the bead.



8. ⚠ **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 rear quarter window glass, open vehicle windows to prevent the air pressure of closing doors from affecting the urethane adhesive bond.**

Install the rear quarter window glass.

- Position the rear quarter window glass to the flange, and press the retaining tabs into the flange to engage.

9. **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 quarter window glass seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

10. Install the C-pillar upper trim panel. For additional information, refer to Section 501-05 .

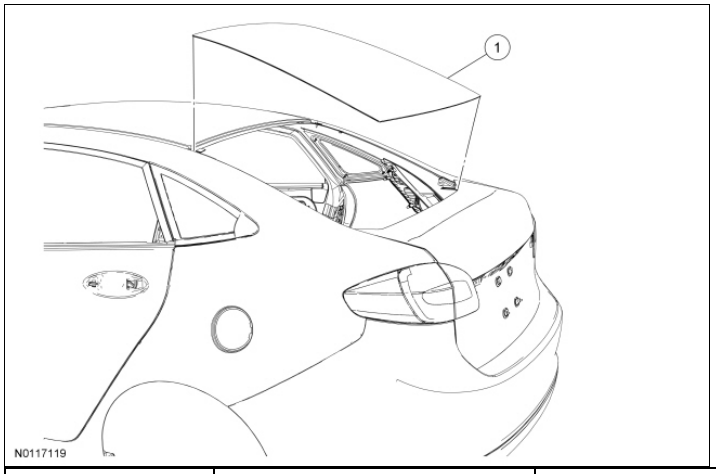
Window Glass - Rear

Special Tool(s)

 ST3109-A	Air Caulking Gun AST405 or equivalent
 ST3274-A	Deluxe Air Windshield Knife 300-AST1770E or equivalent
 ST2085-A	The Pumper 164-R2459 or equivalent

Material

Item	Specification
Dow Urethane Adhesive BetasealTM Express	-
Dow Urethane One Step Glass Primer BetaprimeTM 5500 / 5500A / 5500SA	-
Sika Urethane Adhesive Sika Tack ASAP	-
Sika Urethane Metal and Glass Primer Sika 206 G+P	Motorcraft® Ultra-Clear Spray Glass Cleaner ZC-23 ESR-M14P5-A



Item	Part Number	Description
1	42006	Rear window glass

Removal

NOTE: If the rear window glass is being removed to repair a dust/water leak, remove and reinstall the existing rear window glass.

4-door vehicles

1. Remove the C-pillar trim panel and parcel shelf, and lower the headliner. For additional information, refer to Section 501-05 .

2. Remove the high mounted stoplamp. For additional information, refer to Section 417-01 .

5-door vehicles

3. Remove the liftgate trim panel. For additional information, refer to Section 501-05 .

4. Remove the roof-mounted spoiler. For additional Information, refer to Section 501-08

All vehicles

5. Disconnect the 2 rear window defrost electrical connectors.

6. Before cutting the urethane adhesive, remove dirt and other foreign material from the rear window glass pinchweld area.
   - Use a clean shop towel or oil-free, compressed air.

7. **NOTE:** Refer to manufacturer's instructions before using the Deluxe Air Windshield Knife.

   Lubricate the urethane adhesive with water to aid the Deluxe Air Windshield Knife when cutting.

4 Door vehicles

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

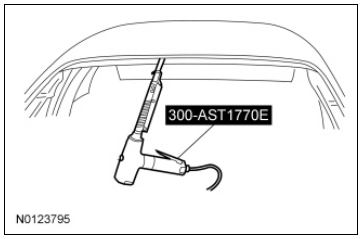
   ⚠ **WARNING: Wear protective gloves when handling components or parts that have pointed or sharp edges. Failure to follow this instruction may result in serious personal injury.**

NOTICE: **To avoid rust formation, use extreme care not to scratch the paint or primer or otherwise damage the pinchweld during glass removal.**

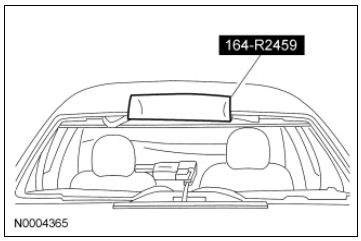
NOTE: Insert the blade into the Deluxe Air Windshield Knife so that the flat side is against the glass. This will leave the entire urethane adhesive bead on the pinchweld and allow a dry fit of the replacement rear window glass.

NOTE: Support the rear window glass to prevent the glass from dropping while cutting the urethane adhesive.

Working from inside the vehicle, insert the Deluxe Air Windshield Knife at the upper center of the rear window glass and work toward the bottom corners.



9. Using The Pumper, distance the rear window glass from the body.



10. Insert the Deluxe Air Windshield Knife into the bottom of the urethane adhesive and cut from corner to corner.

5 Door vehicles

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

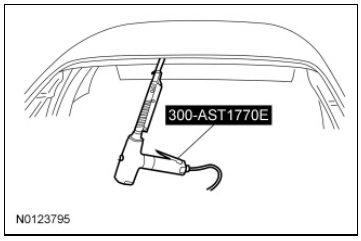
    ⚠ WARNING: Wear protective gloves when handling components or parts that have pointed or sharp edges. Failure to follow this instruction may result in serious personal injury.

    NOTICE: **To avoid rust formation, use extreme care not to scratch the paint or primer or otherwise damage the pinchweld during glass removal.**

    NOTE: Insert the blade into the Deluxe Air Windshield Knife so that the flat side is against the glass. This will leave the entire urethane adhesive bead on the pinchweld and allow a dry fit of the replacement rear window glass.

    NOTE: Support the rear window glass to prevent the glass from dropping while cutting the urethane adhesive.

    Working from inside the vehicle, insert the Deluxe Air Windshield Knife at the upper center of the rear window glass and work toward the upper corners.



12. Working from the outside of the vehicle, insert the Deluxe Air Windshield Knife at the upper corners of the rear window glass and cut the remainder of the urethane adhesive.

All vehicles

13. Carefully remove the rear window glass from the vehicle and place on a stable work surface.

Installation

All vehicles

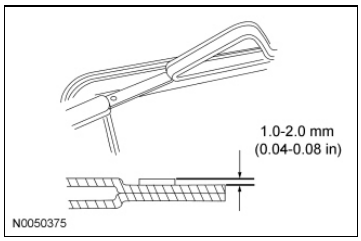
1. Dry-fit the rear window glass on the existing urethane adhesive bead on the pinch weld.
   - Position the glass on the pinch weld.
   - Center the glass in the opening.
   - Make alignment marks with tape or non-staining grease pencil on the rear window glass and the body.

2. After the dry-fit alignment, remove the glass from the body opening and place on a stable work surface with the interior side of the glass facing upward.

3. ⚠ **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 pinchweld.



4. 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 glass removal.

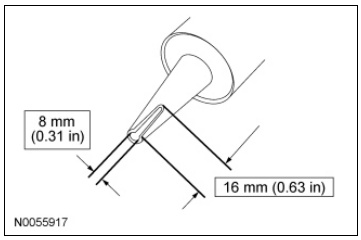
5. If reinstalling the same rear window glass, remove the remaining urethane adhesive from the glass leaving a thin layer to bond with the new urethane adhesive bead.

6. Clean the inside of the new rear window glass surface 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 rear window glass, apply glass primer according to manufacturer's instructions. Allow at least 6 minutes to dry.

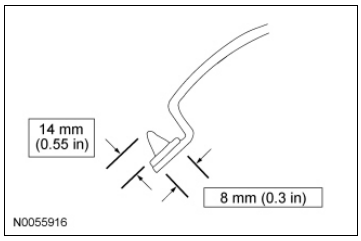
8. Cut the urethane adhesive applicator tip to specification.



9. **NOTE:** Use either a Air Caulking Gun or a high-ratio, electric or battery-operated caulk gun that will apply the urethane adhesive with less effort and a continuous bead.

   NOTE: The rear window glass must be positioned within 10 minutes of applying the urethane adhesive.

   Apply urethane adhesive on top of the existing trimmed 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.



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 rear window glass, open vehicle windows to prevent the air pressure of closing doors from affecting the urethane adhesive bond.**

    Using the alignment marks made previously, position the rear window 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 has cured, check the rear window glass seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

12. Connect the LH and RH heated rear window electrical connector.

4-door vehicles

13. Install the C-pillar trim panel and parcel shelf, and raise the headliner. For additional information, refer to Section 501-05 .

14. Install the high mounted stoplamp. For additional information, refer to Section 417-01 .

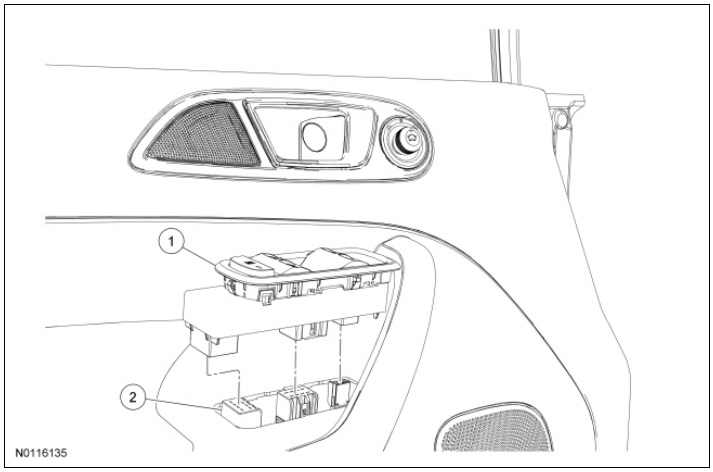
5-door vehicles

15. Install the liftgate trim panel. For additional information, refer to Section 501-05 .

16. Install the roof-mounted spoiler. For additional Information, refer to Section 501-08

Window Control Switch

NOTE: Driver window control switch shown, all others similar.



Item	Part Number	Description
1	14529	Master window control switch
2	-	Master window control switch electrical connector (Part of 14631 LH/ 14630 RH)

Removal and Installation

Passenger window control switch

1. Insert a non-marring tool under the window control switch bezel and pry upward.
2. Remove the window control switch from the door trim panel.

Master window control switch

3. Remove the front door trim panel. For additional information, refer to Section 501-05 .
4. Release the window control switch retaining tabs and remove the master window control switch from the door trim panel.

All window control switches

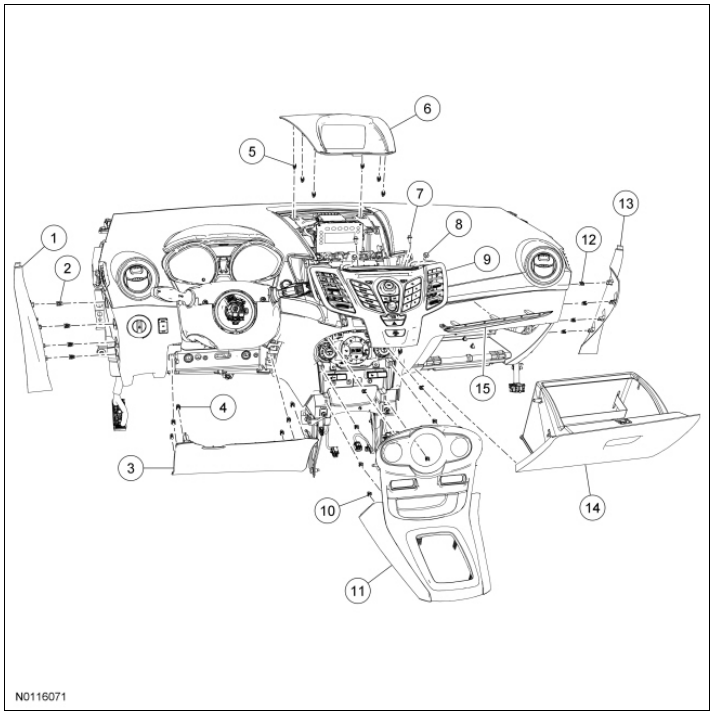
5. Disconnect the electrical connector(s).
6. To install, reverse the removal procedure.
    - The master window control switch and the LH window motor must be initialized whenever battery voltage has been removed from the driver window control switch for greater than 3 minutes (for example, the battery or the master window switch is disconnected) or if a new driver window control switch is installed. For additional information, refer to Window Motor Initialization in this section.

Torque Specifications

Description	Nm	lb-ft	lb-in
Floor console front screws	3	â	27
Floor console rear screws	3	â	27
Instrument panel front screws	8	â	71
Instrument panel bolts	25	18	â
In-vehicle cross car beam to floor pan brace screw	25	18	â
In-vehicle cross car beam to instrument panel screw	2	â	18
Instrument panel-to-front of dash bolt	25	18	â
LH instrument panel side bolt	25	18	â
Exterior heater core housing nut	1	â	9
Upper steering column shaft-to-lower steering column shaft bolt	28	21	â

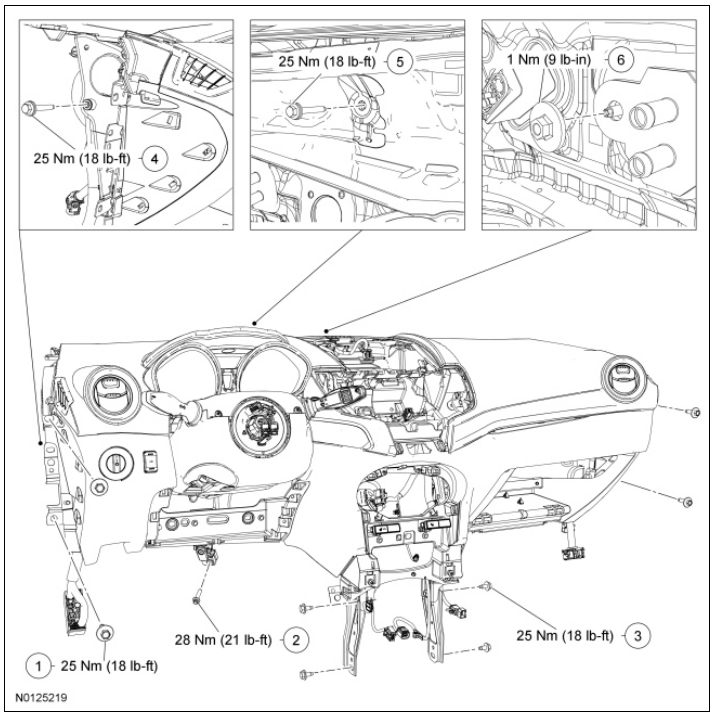
Instrument Panel - Exploded View

Instrument Panel Finish Panels



Item	Part Number	Description
1	044C61	LH instrument panel side cover
2	W714972	LH instrument panel side cover clips (4 required)
3	045N68	Steering column opening trim panel
4	W714972	Steering column opening trim panel clips (6 required)
5	W714972	Upper finish panel clips (6 required)
6	58042A82	Upper finish panel
7	W505142	Front Controls Interface Module (FCIM) finish panel screws (2 required)
8	W707628	FCIM finish panel screws (2 required)
9	18A802	Finish panel
10	W714972	Lower finish panel clips (8 required)
11	18498	Lower finish panel
12	W714972	RH instrument panel side cover clips (4 required)
	044C60	RH instrument panel side cover
14	06010	Glove compartment
15	13E002 / 13E726	Close out bezel non-ambient / Ambient light pipe

Instrument Panel Mounting Fasteners



Item	Part Number	Description
1	W711557	Instrument panel screw (4 required)
2	3R827	Steering column shaft-to-steering column bolt
3	W701096	In-vehicle cross car beam to floor pan brace screw (2 required)
4	W711563	LH instrument panel bolt
5	W711563	Instrument panel-to-front of dash bolt
6	18N316	Exterior heater core housing nut

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

Instrument Panel

Removal and Installation

Vehicles with air conditioning

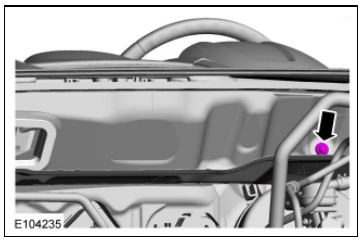
1. Recover the refrigerant. For additional information, refer to Section 412-00 .

All vehicles

2. Remove the upper and lower cowl panel grille. For additional information, refer to Section 501-02 .

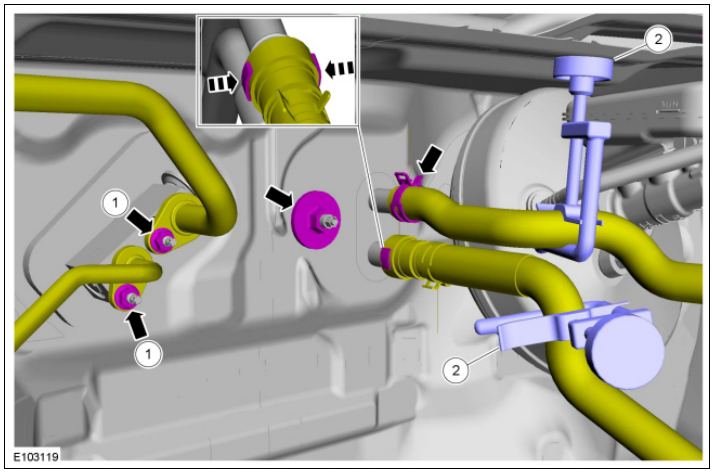
3. Remove the windshield wiper mounting arm and pivot shaft assembly and the windshield wiper motor. For additional information, refer to Section 501-16 .

4. Remove the instrument panel-to-front of dash bolt.
   - To install, tighten to 25 Nm (18 lb-ft).



NOTICE: **Make sure all the coolant openings are sealed, or coolant may leak into the vehicle when the instrument panel is removed.**

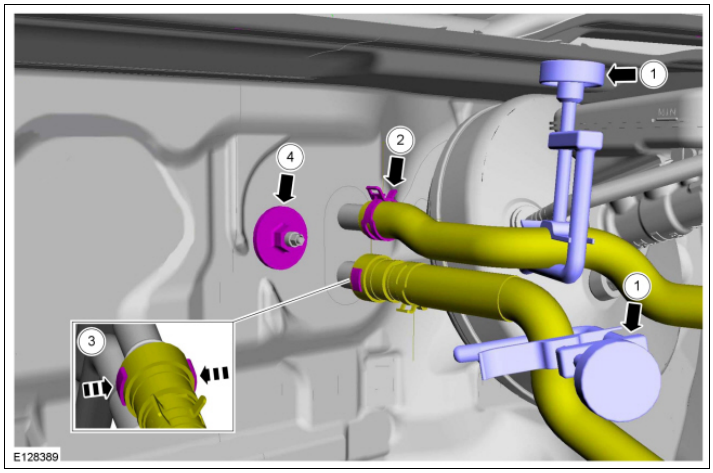
5. Crimp the two heater hoses and remove the hoses from the heater core. Remove the Thermostatic Expansion Valve (TXV) fitting nuts. Remove exterior heater core housing nut.
   - To install, tighten to 1 Nm (9 lb-in).



Vehicles without air conditioning

NOTICE: **Make sure all the coolant openings are sealed, or coolant may leak into the vehicle when the instrument panel is removed.**

6. Crimp the two heater hoses and remove the hoses from the heater core. Remove exterior heater core housing nut.
    - To install, tighten to 1 Nm (9 lb-in).



All vehicles

7. Remove the drivers side front door. For additional information, refer to Section 501-03 .

8. Remove the drivers seat. For additional information, refer to Section 501-10 .

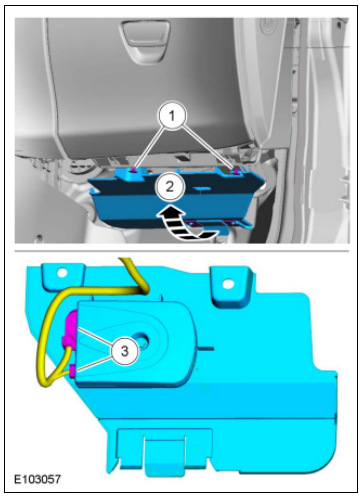
9. Remove the transmission selector lever assembly. For additional information, refer to Section 307-05 .

Vehicles with manual transmission

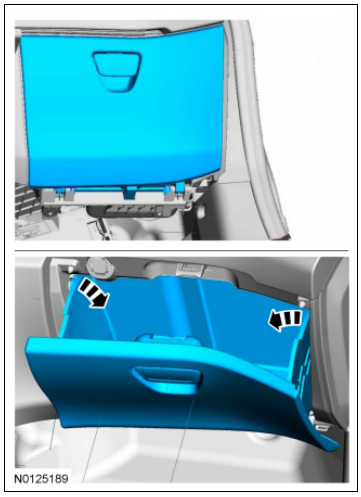
10. Remove the gear shift lever. For additional information, refer to Section 308-06 .

All vehicles

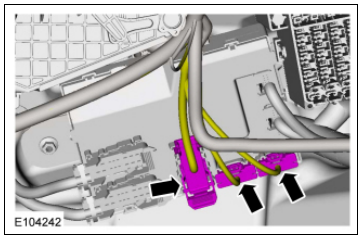
11. Remove the 2 push pins and remove the hush panel from the lower right side of the instrument panel.
    - Disconnect the electrical connector.



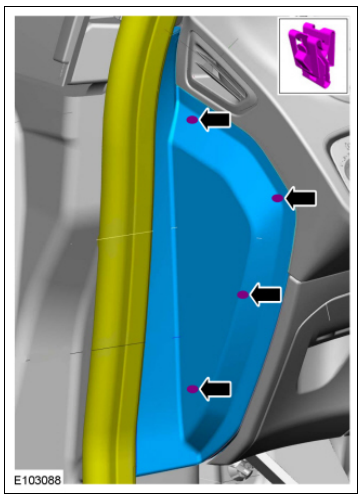
12. Remove the glove compartment.



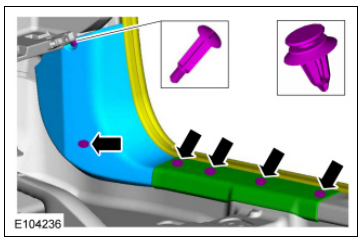
13. Disconnect the 3 electrical connecters at the lower RH side of the cowl.



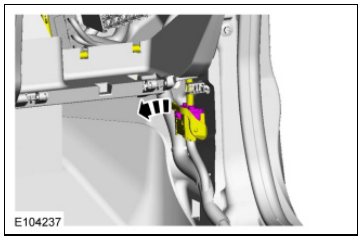
14. Remove the RH and LH instrument panel side covers.



15. Remove the RH and LH front scuff plates and the RH and LH cowl side trim panels.

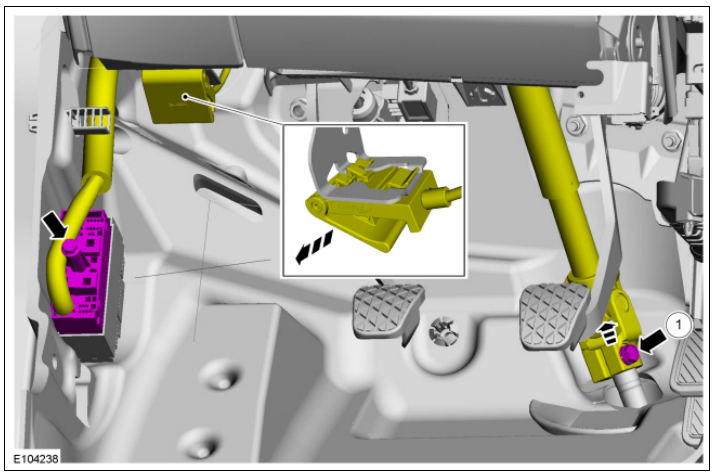


16. Disconnect the lever lock electrical connector and push pin at the lower RH side cowl. Disconnect the yellow connector and push pin at the lower RH side cowl.

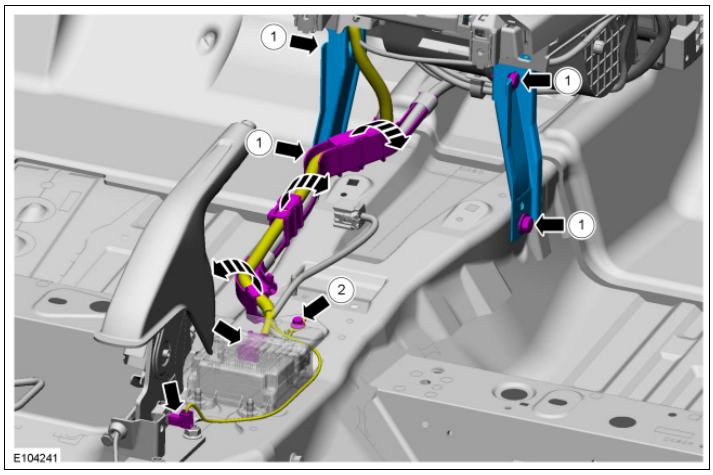


NOTICE: **Do not allow the steering wheel to rotate while the steering column shaft is disconnected, or damage to the clockspring may result. If there is evidence that the shaft has rotated, remove and recenter the clockspring. For additional information, refer to Section 501-20B .**

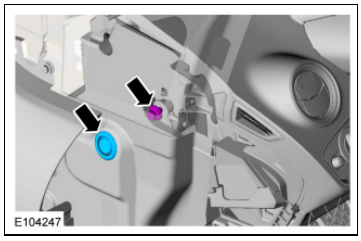
17. Remove the bolt-in electrical connector at the lower LH side cowl. Disconnect the hood release lever from bracket. Remove and discard the steering column shaft-to-steering column pinch bolt.
    - To install, use a new steering column shaft-to-steering column pinch bolt and tighten to 28 Nm (21 lb-ft).



18. Disconnect the 2 Restraints Control Module (RCM) electrical connectors. Remove the RCM harness from the plastic channel. Remove the ground strap bolt. Disconnect the parking brake electrical connector. Remove the 2 RH and the 2 LH instrument panel bolts and remove the instrument panel braces.
    - To install, tighten to 25 Nm (18 lb-ft).



19. Remove the LH instrument panel side bolt.
    - To install, tighten to 25 Nm (18 lb-ft).

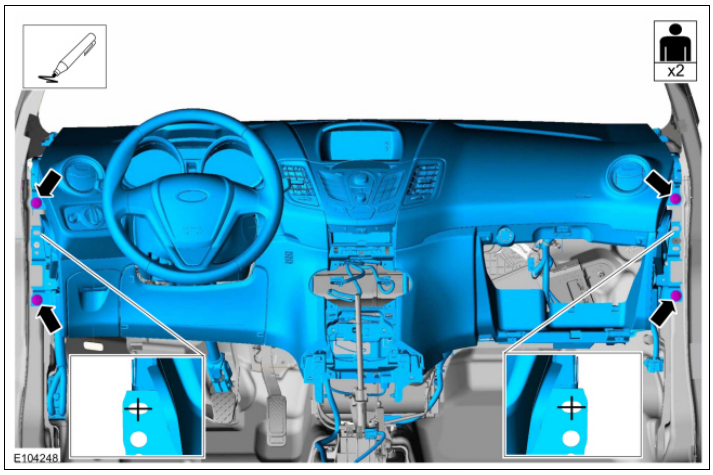


NOTICE: **To avoid damage to the instrument panel, this step requires the help of an assistant.**

NOTICE: **Make sure that all electrical connectors and wiring are not hindered before removing the instrument panel or damage to the components may occur.**

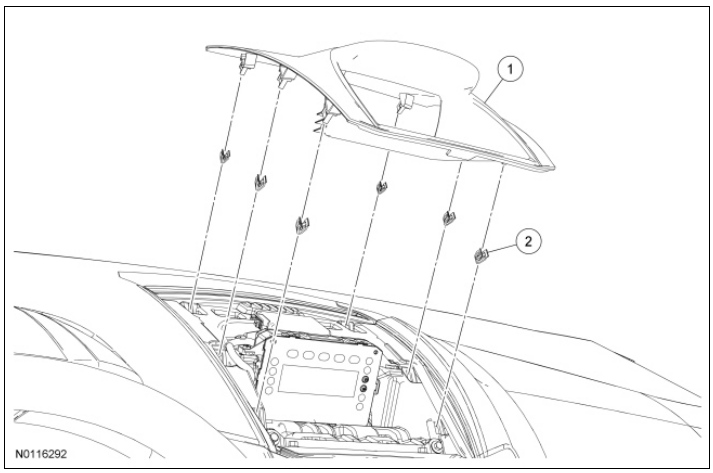
NOTE: Rotate the instrument panel as necessary to remove from the vehicle.

20. Remove the 2 RH and the two LH instrument panel bolts and remove the instrument panel.
    - To install, tighten to 25 Nm (18 lb-ft).



21. To install, reverse the removal procedure.

Instrument Panel Finish Panel - Upper



Item	Part Number	Description
1	58042A82	Upper finish panel
2	W714972	Upper finish panel clips (6 required)

Removal and Installation

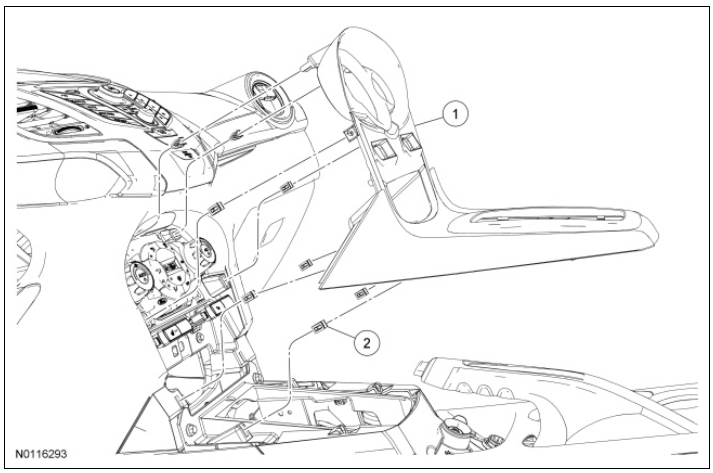
1. With a non-marring tool, lift the corners of the instrument panel upper finish panel upward to release the retaining clips.

2. ***NOTICE:*** **To avoid damage to the upper finish panel, remove any retaining clips from the instrument panel and attach them to the upper finish panel before installing.**

   To install, reverse the removal procedure.

   - Make sure to align the finish panel retaining clips to the adjacent retaining clip holes.

Instrument Panel Finish Panel - Lower



Item	Part Number	Description
1	5404644	Lower finish panel
2	W714972	Lower finish panel clips (8 required)

Removal and Installation

1. On vehicles equipped with automatic transmission, remove the selector lever trim ring using a non-marring tool.



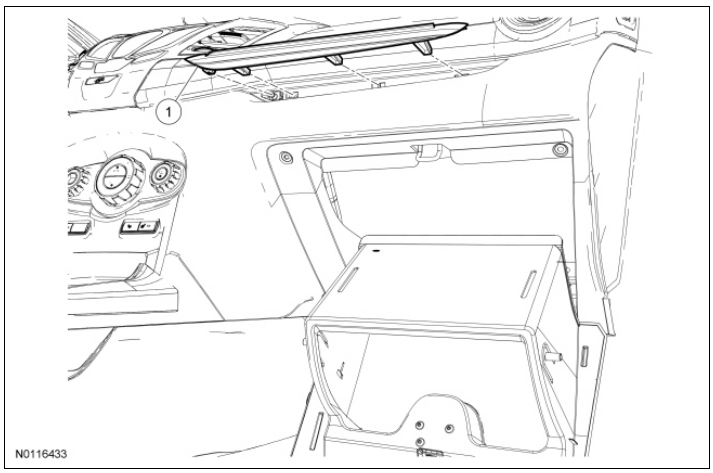
2. Using a non-marring tool, lift the corners of the instrument panel lower finish panel upward to release the retaining clips.
    - Disconnect the electrical connectors.

3. ***NOTICE:*** **To avoid damage to the lower finish panel, remove any retaining clips from the instrument panel and attach them to the lower finish panel before installing.**

   To install, reverse the removal procedure.

    - Make sure to align the finish panel retaining clips to the adjacent retaining clip holes.

Instrument Panel Finish Panel - RH



Item	Part Number	Description
1	13E002/13E726	Close out bezel-not ambient/Ambient light pipe

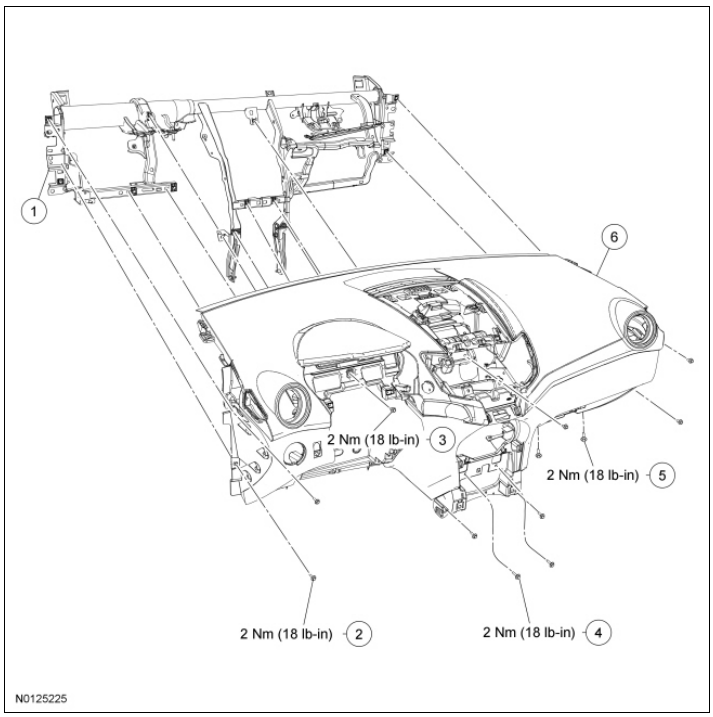
Removal and Installation

1. Lower the glove compartment door completely.

2. Release the 3 RH instrument panel finish panel retaining tabs by reaching through the glove compartment opening.
   - For vehicles equipped with the ambient light pipe, disconnect the electrical connector.

3. To install, reverse the removal procedure.
   - Make sure to align the finish panel retaining clips to the adjacent retaining clip holes.

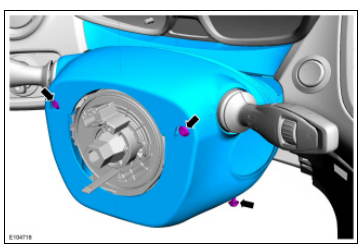
Instrument Panel Upper Section



Item	Part Number	Description
1	04545	In-vehicle cross car beam
2	W711557	Instrument panel screw (4 required)
3	W711557	Instrument panel front screw (2 required)
4	W711557	Instrument panel screw (4 required)
5	W711557	Lower instrument panel screw (2 required)
6	04302	Upper instrument panel

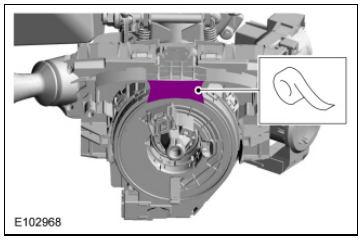
Removal and Installation

1. Remove the knee air bag module. For additional information, refer to Section 501-20B .
2. Remove the steering wheel. For additional information, refer to Section 211-04 .
3. Remove the 3 torx screws and remove the steering column shroud.

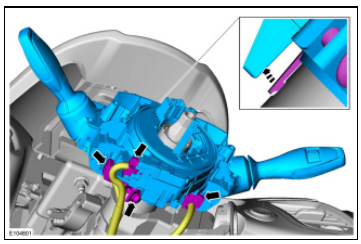


NOTICE: **Make sure the clockspring rotor does not rotate.**

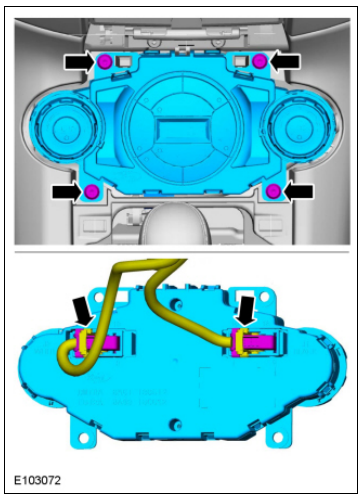
4. Secure the clockspring.



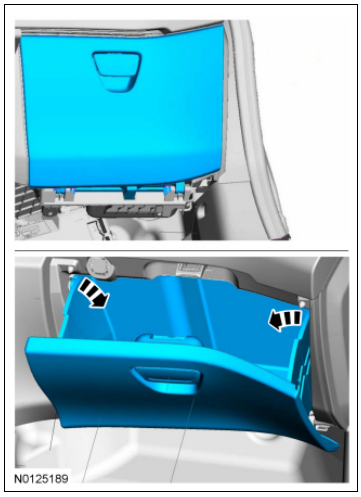
5. Remove the steering column switch carrier.



6. Remove the instrument cluster. For additional information, refer to Section 413-01 .
7. Remove the headlamp switch. For additional information, refer to Section 417-01 .
8. Remove the instrument panel dimmer swtich. For additional information, refer to Section 413-00 .
9. Remove the instrument panel upper finish panel. For additional information, refer to Instrument Panel Finish Panel - Upper in this section.
10. Remove the Front Controls Interface Module (FCIM), the Audio Control Module (ACM), the Front Control/Display Interface Module (FCDIM), and disconnect the Global Positioning System Module (GPSM). For additional information, refer to Section 415-00 .
11. Remove the floor console. For additional information, refer to Console - Floor in this section.
12. Remove the 4 Heating Ventilation Air Conditioning (HVAC) module screws and remove the HVAC module.
    - Disconnect the electrical connector.



13. Remove the glove box.



14. Remove the Accessory Protocol Interface Module (APIM). For additional information, refer to Section 415-00 .

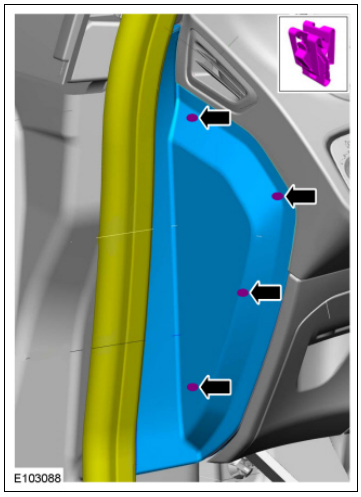
15. Disconnect the RH finish panel ambient light pipe electrical connector. For additional information on connector location, refer to exploded view in Instrument Panel Finish Panel - RH in this section.

16. Disconnect and remove the LH and RH Light Emitting Diode (LED) connectors.

17. Remove the passenger side air bag module bracket. For additional information, refer to Section 501-20B .

18. Remove the LH and RH A-Pillar trim panels. For additional information, refer to Section 501-05 .

19. Remove the LH and RH instrument panel side covers.

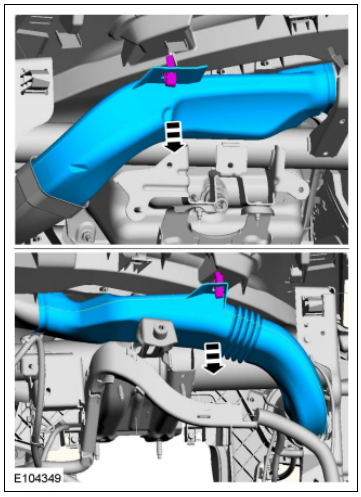


20. Position both front seats fully rearward.

21. Remove the 12 upper instrument panel screws.
    - To install, tighten to 2 Nm (18 lb-in).

22. **NOTE:** The RH and LH defroster ducts stay in the vehicle when the upper instrument panel is removed.

    With the upper instrument panel loose release the RH and LH defroster duct clips.



23. Gently pull the upper instrument panel outward and release the 12 harness push pins and 6 metal harness retaining clips.

24. ***NOTICE:*** **To avoid damage to the instrument panel, an assistant is required when carrying out this step.**

    NOTICE: **Note the harness routing and make sure that all electrical connectors and wiring are not hindered before removing the instrument panel or damage to the components may occur.**

    Remove the upper instrument panel.

25. ***NOTICE:*** **To avoid damaging the instrument panel, use an assistant when positioning the instrument panel to the vehicle.**

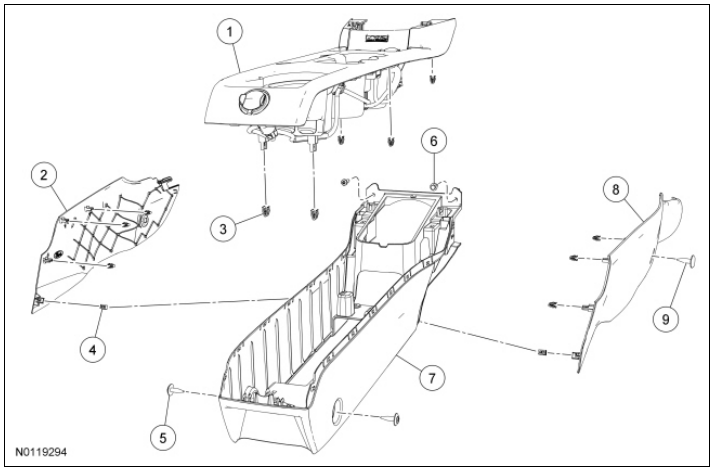
    NOTICE: **Make sure that all electrical connectors and wiring are correctly routed when installing the instrument panel or damage to the components may occur.**

    To install, reverse the removal procedure.

Console - Floor

NOTE: Click here or refer to the on-line Workshop Manual to view this illustration as an interactive exploded view, requires Adobe® Acrobat® 8.0 or higher.

NOTE: Click here or refer to the on-line Workshop Manual to learn about using an Interactive Illustration.



Item	Part Number	Description
1	045A76	Floor console finish panel
2	04608	RH floor console side panel
3	W714972	Floor console finish panel clips (6 required)
4	W714972	Floor console side panel clips (4 required)
5	N808720	Floor console rear screws (2 ed)
6	W500214	Floor console front screws (2 required)
7	045A36	Floor console assembly
8	04609	LH floor console side panel
9	W707068	Side panel push pin (2 required)

Removal and Installation

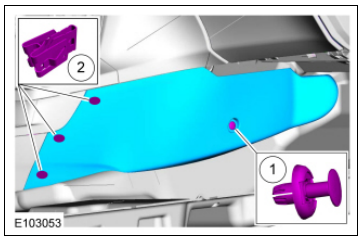
1. On vehicles equipped with automatic transmission, remove the selector lever trim ring using a non-marring tool.



2. Using a non-marring tool, lift the corners of the instrument panel lower finish panel upward to release the retaining clips.
    - Disconnect the electrical connectors.

3. Remove the RH and LH floor console side trim panels.

1. Remove the side panel push pins.
2. Pull outward to release the floor console side panel clips.



4. Apply the parking brake handle in the full upright position.

5. Position the seats fully forward and remove the 2 floor console rear screws.

6. Remove the 2 floor console front screws.

7. Disconnect the 2 console electrical connectors on the right side and the 2 console electrical connectors on the left side. Separate the data cable pin type retainer from the console on the right side.

8. Remove the floor console assembly.

9. To install, reverse the removal procedure.

Power Point

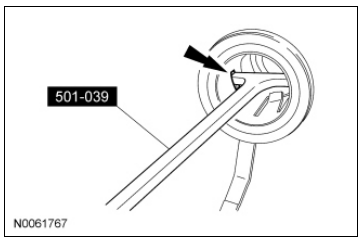
Special Tool(s)

 ST3024-A	Remover, Power Point Socket 501-039 or equivalent

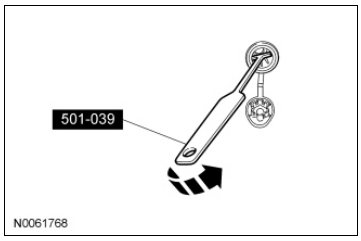
Removal

NOTE: Power point cover may differ depending on location.

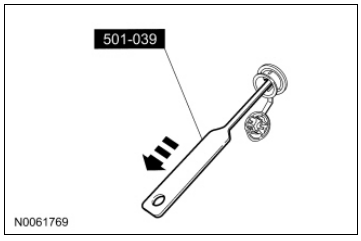
1. Open the power point cover.
2. Install the Power Point Socket Remover in one of the power point socket slots.



3. Position the Power Point Socket Remover so that it engages in the adjacent slot.



4. Using the Power Point Socket Remover, pull the power point socket out of the retainer.



5. Disconnect the electrical connector.

Installation

1. Connect the electrical connector.
2. Slide the power point socket into the retainer.

Material

Item	Specification	Fill Capacity
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B	-
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-	-

Torque Specifications

Description	Nm	lb-ft	lb-in
Door latch screws	8	-	71
Door striker bolts	20	-	177
Exterior door handle reinforcement screws	2	-	18
Exterior door handle bolts	1	-	9
Hood latch bolts	9	-	80
Hood striker bolts	10	-	89
Interior door handle screws	1	-	9
Luggage compartment lid/liftgate latch bolts	10	-	89
Luggage compartment lid/liftgate latch striker bolts	24	18	-

Handles, Locks, Latches and Entry Systems

Hood Latch

The hood latch system consists of the hood latch and the hood latch release handle and cable.

Front Door

The front door consists of the following components:

- Door ajar switch (part of the front door latch)
- Door lock cylinder
- Exterior front door handle (contains an antenna and lock button on Intelligent Access (IA)-equipped vehicles)
- Exterior front door handle actuating cable
- Exterior front door handle reinforcement
- Front door latch
- Front door lock actuator (part of the front door latch)
- Interior door handle actuating cable
- Interior door handle

Rear Door

The rear door consists of the following components:

- Door ajar switch (part of the rear door latch)
- Exterior rear door handle
- Exterior rear door handle actuating cable
- Exterior rear door handle reinforcement
- Interior door handle actuating cable
- Interior door handle
- Rear door latch
- Rear door lock actuator (part of the rear door latch)

Luggage Compartment Lid/Liftgate

The luggage compartment lid/liftgate consists of the following components:

- Luggage compartment lid/liftgate latch
- Luggage compartment lid/liftgate release switch (located on the luggage compartment lid/liftgate trim)
- Mechanical emergency release cable and handle (part of the luggage compartment lid latch)
- Luggage compartment/liftgate IA antenna (IA -equipped vehicles) (located behind the rear bumper cover)

Manual Door Lock

In the event of a failure of the power door locks, the doors can be individually locked through the manual door lock. The manual door lock is located on the rear edge of the door just above the door latch opening. For the doors on the driver side of the vehicle, insert a key and turn the key clockwise to lock. For the doors on the passenger side of the vehicle, insert a key and turn the key counterclockwise to lock.

Power Lock/Unlock

The power lock/unlock feature requests all of the vehicle doors locked or unlocked upon a customer request from the door lock control switch (part of the Front Controls Interface Module (FCIM)) in the vehicle. The power door locking system functions independently of ignition status or vehicle speed.

Door Lock Indicator

The door lock indicator provides visual indication of the door lock status. When the light on the door lock control switch is illuminated it indicates that all of the doors are locked. When the light is off it indicates that one or more doors are unlocked.

Central Locking/Unlocking

The central locking/unlocking feature allows all of the doors to be locked or unlocked from a key in the driver door lock cylinder. To unlock the driver door with stepped unlock enabled, turn the key once to the unlock position. To unlock all of the doors with stepped unlock enabled, turn the key a second time to unlock all of the doors. To unlock all of the doors with stepped unlock disabled, turn the key once to the unlock position. Refer to Stepped Unlock Programming in this section for programming information.

To lock all of the doors, turn the key to the LOCK position.

Autolock

The autolock feature (when enabled) locks all the doors when the following conditions are met:

- All the doors are closed
- The ignition is in the RUN mode
- The vehicle is shifted into any gear putting the vehicle in motion
- The vehicle reaches a speed greater than 7 km/h (5 mph)

The autolock feature repeats when:

- any door is opened then closed with the ignition in the RUN mode.
- the vehicle reaches a speed greater than 7 km/h (5 mph).

Refer to Autolock and Auto-Unlock Programming in this section for programming information.

Auto-Unlock

NOTE: The doors will not auto-unlock if the vehicle has been electronically locked before the driver door is opened.

The auto-unlock feature (when enabled) unlocks all the doors when the following conditions are met:

- The ignition is in the RUN mode
- All the doors are closed
- The vehicle has been in motion at a speed greater than 20 km/h (12 mph)
- The vehicle then comes to a stop
- The ignition is switched to the OFF or ACC mode
- The driver door is opened within 10 minutes of the ignition being switched to the OFF mode.

Refer to Autolock and Auto-Unlock Programming in this section for programming information.

Smart Unlock

Without Intelligent Access (IA)

The smart unlock feature prevents the doors from locking with the key in the ignition lock cylinder. When the vehicle is locked from the central lock control switch and the key is in the ignition lock cylinder with one of the front doors open, the doors lock and then unlock.

The vehicle can still be locked with the key in the ignition lock cylinder by locking the doors with another key in the driver door lock cylinder.

With Intelligent Access (IA)

NOTE: The IA smart unlock feature iIs only available on late build vehicles.

The smart unlock feature prevents the doors from electronically locking when an IA key is left inside the vehicle. When a door becomes ajar, the interior of the vehicle is scanned for an IA key. If an IA key is inside the vehicle when a door is ajar and a lock command is received the doors lock and then unlock.

The vehicle can still be locked with an IA key inside the vehicle by locking the doors with another key in the driver door lock cylinder or the lock button pressed on another key.

Luggage Compartment/Liftgate Smart Unlock Feature - Intelligent Access (IA)

The luggage compartment/liftgate smart unlock feature prevents the luggage compartment/liftgate from latching when an IA key is detected inside the luggage compartment area. When the luggage compartment lid/liftgate is closed when the doors are locked, the luggage compartment is searched for an IA key. If an IA key is detected inside the luggage compartment, the luggage compartment lid/liftgate releases.

An IA key can still be locked inside a luggage compartment/ liftgate area by closing the luggage compartment lid/liftgate when the doors are unlocked and then locking the doors after the luggage compartment lid/ liftgate is closed with the key inside. Or if a second IA key is in range of the luggage compartment/ liftgate IA antenna when the luggage compartment lid/liftgate is closed.

Driver/Passenger Door Intelligent Access (IA) Feature

The driver/passenger door IA feature allows the doors to be locked or unlocked without having to use the door lock cylinr or the Remote Keyless Entry (RKE) transmitter feature. With a programmed IA key within 1 m (3 ft) outside the driver or passenger front door, press the lock button on the exterior door handle. The doors lock or unlock depending upon their current state (locked/unlocked).

Driver Door Intelligent Access (IA)

The driver door IA feature either unlocks just the driver door or all four doors. If stepped unlock Is enabled, the driver door Is the only door that unlocks from the driver door IA feature. If stepped unlock Is disabled, then all four doors unlock. The driver door IA feature always locks all four doors. Refer to Stepped Unlock Programming in this section for programming information.

Passenger Door Intelligent Access (IA)

The passenger door IA feature always locks or unlocks all four doors.

Luggage Compartment/Liftgate Intelligent Access (IA) Feature

The luggage compartment IA feature allows the luggage compartment lid to be released without having to use the interior luggage compartment lid release switch or the keyless entry keypad. With a programmed IA key within 1 m (3 ft) outside the luggage compartment lid/liftgate, press the release button, and the luggage compartment lid/liftgate latch releases.

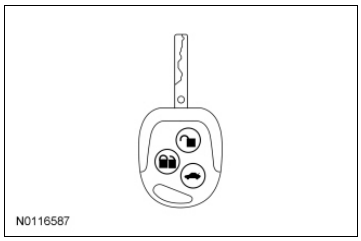
Remote Keyless Entry (RKE)

The RKE transmitter carries out the following functions:

- Unlocks the driver door
- Unlocks all doors
- Locks all doors
- Releases the luggage compartment lid or liftgate latch
- Arms/disarms the perimeter alarm (if equipped)
- Commands the interior lamps on (when unlocking) and off (when locking)
- Provides a long flash of the turn signals when UNLOCK is pressed
- Sounds the horn once and flashes the turn signals when LOCK is pressed twice within 3 seconds, and the doors are closed
- Sounds the horn twice when LOCK is pressed twice within 3 seconds, and any door is ajar

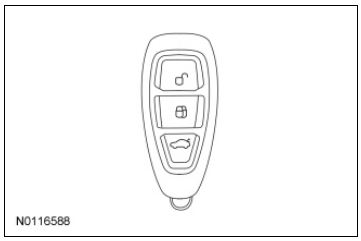
The RKE transmitter has a normal operating range of 20 m (66 ft).

Without Intelligent Access (IA)



This RKE system uses an Integrated Keyhead Transmitter (IKT). The IKT incorporates both the Passive Anti-Theft System (PATS) functions and the RKE transmitter functions in a single device. The key programming is a two step procedure, the PATS information is programmed into the IPC and then the RKE transmitter Transmitter Identification Code (TIC) is programmed into the Body Control Module (BCM). The vehicle accepts the programming of up to 8 keys. Refer to the key programming procedures in Section 419-01B for the PATS programming, and then refer to Remote Keyless Entry (RKE) Transmitter Programming in this section to program the RKE transmitter.

With Intelligent Access (IA)



This RKE system uses an IA key. The IA key incorporates both the PATS functions and the RKE transmitter functions in a single device. The RKE transmitter is programmed automatically during IA key programming. During IA key programming, the Remote Function Actuator (RFA) module obtains the TIC from the IA key. The RFA module accepts programming of up to 8 IA keys. Refer to the key programming procedures in Section 419-01B for the for key programming information.

Remote Keyless Entry (RKE) Lock/Unlock Control - Unlock

The RKE feature provides a stepped (if enabled) process for unlocking the doors. Upon receipt of the first request for unlocking the doors, the RKE control feature requests the BCM to unlock the driver door only and provis a long flash of the turn signals. If another unlock request is received within 3 seconds of the first, the RKE feature requests the BCM to unlock all of the doors. This feature can be disabled so that all of the doors unlock on the first press of the unlock button. Refer to Stepped Unlock Programming in this section.

Remote Keyless Entry (RKE) Lock/Unlock Control - Lock

The RKE feature requests that all of the doors be locked when the lock button is pressed. On any press of the lock button with all doors closed, the BCM flashes the turn signals once. If any door is ajar, no flash occurs. As soon as the last door is closed, the BCM provides the flash of the turn signals. If 2 presses of the lock button are received within 3 seconds, the horn chirps once and the turn signals flash twice (once for each button press) to indicate that all of 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 BCM chirp the horn twice without flashing the turn signals to indicate it locked all the doors but one or more doors are ajar.

Remote Keyless Entry (RKE) Luggage Compartment Lid/Liftgate Release

The RKE feature provides luggage compartment lid/liftgate release function. The luggage compartment lid release system is inhibited when the ignition is on and vehicle speed exceeds 7 km/h (5 mph).

Handles, Locks, Latches and Entry Systems

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent

Material

Item	Specification
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-

Principles of Operation - Without Intelligent Access (IA)

Power Door Locks

The Body Control Module (BCM) monitors the door lock control switch and the driver door lock cylinder. When the BCM receives an unlock/lock command from either the door lock control switch or the driver door lock cylinder, the BCM energizes a relay (internal to the SJB) to supply the correct power and grounds for the door lock actuators. The power door locks function independently of ignition status or vehicle speed.

Door Lock Indicator

For a visual indication of the door lock status, the BCM controls the door lock indicator on the door lock control switch. If all four doors are locked, the indicator is illuminated. If any one door is unlocked, the indicator turns off. The BCM monitors the door lock status through the unlock switches inside each of the 4 door latches. The BCM uses the input from the unlock switches to determine if the indicator should be illuminated or off.

Luggage Compartment Lid/Liftgate Release

The luggage compart lid/liftgate release system is inhibited when the vehicle speed exceeds 8 km/h (5 mph) and when the vehicle doors are locked. The luggage compartment lid/liftgate latch releases the luggage compartment lid/liftgate when the release switch on the luggage compartment lid/liftgate or on the Remote Keyless Entry (RKE) transmitter is pressed. When the BCM receives a signal to release the luggage

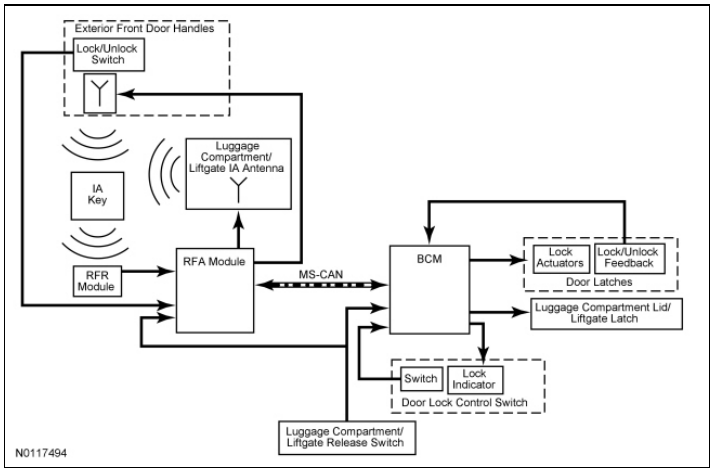
compartment lid/liftgate, the BCM supplies voltage to the latch. The luggage compartment lid/liftgate latch then actuates to release the luggage compartment lid/liftgate.

Remote Keyless Entry (RKE)

The BCM interprets radio frequency signals from the RKE transmitters. The BCM requests the illuminated entry feature to turn the interior lamps on when an unlock command is received. If a lock command is received, the illuminated entry feature turns off.

The RKE transmitter supplies a signal to the antenna internal to the BCM when any button is pressed. The BCM then supplies voltage to the appropriate door lock actuator(s) to lock or unlock the doors or release the luggage compartment lid/liftgate.

Principles of Operation - WithIntelligent Access (IA)



Intelligent Access (IA) Components

Exterior Front Door Handles

The exterior front door handles both contain an Intelligent Access (IA) antenna and a lock switch. The antennas and lock switches are hardwired to the Remote Function Actuator (RFA) module. When a lock switch is pressed, it signals the RFA module there is an IA request. When the RFA module receives the request it activates the IA antenna in the corresponding door handle. The low frequency signal from the IA antenna activates an IA key.

Luggage Compartment/Liftgate Intelligent Access (IA) Antenna

The luggage compartment/liftgate IA antenna is hardwired to the RFA module and, when activated by the RFA module, it transmits a low frequency signal that activates an IA key.

Remote Functions Receiver (RFR) Module

The Remote Functions Receiver (RFR) module is hardwired to the RFA module and is a receiving antenna that receives the high frequency signals from an IA key. It also receives the signals from an RKE command.

Intelligent Access (IA) Key

The IA key receives the low frequency signals from the IA antennas. When the IA key is activated by one of the low frequency signals, it sends out a high frequency signal that is received by the RFR module. The IA key also contains a key blade that is used to enter the vehicle as a backup.

Power Door Locks

The BCM monitors the door lock control switch and the driver door lock cylinder. When the BCM receives an unlock/lock command from either the door lock control switch or the driver door lock cylinder, the BCM energizes a relay (internal to the SJB) to supply the correct power and grounds for the door lock actuators. The power door locks function independently of ignition status or vehicle speed.

Door Lock Indicator

For a visual indication of the door lock status, the BCM controls the door lock indicator on the door lock control switch. If all 4 doors are locked, the indicator is illuminated. If any one door is unlocked, then the indicator turns off. The BCM monitors the door lock status through the unlock switches inside each of the four door latches. The BCM uses the input from the unlock switches to determine if the indicator should be illuminated or off.

Luggage Compartment Lid/Liftgate Release

The luggage compartment lid/liftgate release system is inhibited when the vehicle speed exceeds 8 km/h (5 mph) and when the vehicle doors are locked. The luggage compartment lid/liftgate latch releases the luggage compartment lid/liftgate when the release switch on the luggage compartment lid/liftgate or on the Remote Keyless Entry (RKE) transmitter is pressed. When the BCM receives a signal to release the luggage compartment lid/liftgate, the BCM supplies voltage to the latch. The luggage compartment lid/liftgate latch then actuates to release the luggage compartment lid/liftgate.

Driver/Passenger Door Intelligent Access (IA) Feature

The driver/passenger door IA feature allows the doors to be locked or unlocked without having to use the door lock cylinder or the RKE transmitter. With a programmed IA key within 1 m (3 ft) of either front door handle outside of the door, press the lock button on the exterior door handle and, depending upon their current state, the doors either lock or unlock. The IA feature from the driver door only unlocks the driver door and the IA feature from the passenger door unlocks all four doors. The IA feature from either front door locks all four doors.

When the RFA module detects that a lock button is pressed on a front exterior door handle, it activates the low frequency antenna in the corresponding exterior front door handle. The low frequency antenna sends out a signal to the IA key. The low frequency signal activates the IA key and the IA key then sends a high frequency signal back to the RFR module. The RFR module interprets the high frequency signal from the IA key and sends the information to the RFA module. If the RFA module determines that it is a programmed key, it sends a message over the Medium Speed Controller Area Network (MS-CAN) to the BCM . Depending upon the signal received from the RFA module, the BCM either unlocks the driver door, unlocks all 4 doors, or locks all 4 doors.

Luggage Compartment/Liftgate Intelligent Access (IA) Feature

The luggage compartment/liftgate IA feature allows the luggage compartment lid to be released without using an RKE transmitter. With a programmed IA key within 1 m (3 ft) outside of the luggage compartment lid/liftgate, press the release button on the luggage compartment lid/liftgate, and the luggage compartment lid/liftgate latch releases.

The luggage compartment/liftgate release switch is connected to both the BCM and the RFA module. When the doors are unlocked, the BCM receives the signal from the switch and releases the luggage compartment lid/liftgate. When the doors are locked, the BCM ignores the input from the switch and only releases the luggage compartment lid/liftgate if it receives a signal from the RFA module for the luggage compartment/liftgate IA feature.

When the RFA module detects a signal from the luggage compartment lid/liftgate release switch, it activates the low frequency antenna in the rear bumper cover. The low frequency antenna sends out a signal to the IA key. The low frequency signal activates the IA key and the IA key then sends a high frequency signal back to the RFR module. The RFR module interprets the high frequency signal from the IA key and sends the information to the RFA module. If the RFA module determines that it is a programmed key, it sends a message over the MS-CAN to the BCM to release the luggage compartment lid/liftgate.

Remote Keyless Entry (RKE)

The IA key transmitter supplies a signal to the RFR module when any button is pressed. The RFR module interprets the information from the IA key and sends a signal to the RFA module. If the RFA module determines that it is a programmed key, it sends a message over the MS-CAN to the BCM . Depending upon the signal received from the RFA module, the BCM either unlocks the driver door, unlocks all 4 doors, locks all 4 doors, or releases the luggage compartment lid/liftgate.

The BCM requests the illuminated entry feature to turn the interior lamps on when an unlock command is received. If a lock command is received, the illuminated entry feature turns off.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Binding latch mechanisms • Door handles	• Battery Junction Box (BJB) fuse 6 (30A) • Wiring, terminals or connectors • Remote Keyless Entry (RKE) transmitter • Door lock control switch

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 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.
   - verify the scan tool operation with a known good vehicle.
   - refer to Section 418-00 , Inspection and Verification to establish a scan tool session.

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. Carry out the self-test diagnostics for the RFA module and Body Control Module (BCM).

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

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B108F:23	Cabin Lock/Unlock Switch: Signal Stuck Low	GO to Pinpoint Test C .
B1108:92	Driver Door Central Locking Motor: Performance or Incorrect Operation	GO to Pinpoint Test D .
B113E:23	External Boot/Trunk Release Switch: Signal Stuck Low	GO to Pinpoint Test E .
B1187:92	Trunk Motor: Performance or Incorrect Operation	GO to Pinpoint Test E .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

Remote Function Actuator (RFA) Module DTC Chart

DTC	Description	Action
B10C6:1F	Exterior Trunk Antenna: Circuit Intermittent	GO to Pinpoint Test K .
B10D1:24	Left Front Lock Button: Signal Stuck High	GO to Pinpoint Test J .

Autolock and Auto-Unlock Programming

NOTE: Make sure the ignition is in the OFF mode and the doors are closed and unlocked.

NOTE: When programming the autolock feature, carry out the following steps within 30 seconds or the procedure needs to be repeated. If the procedure needs to be repeated, wait 30 seconds between programming sessions.

1. Turn the ignition from OFF to RUN mode.

2. Press the door lock control switch 3 times.

3. Turn the ignition from RUN to OFF mode.

4. Press the door lock control switch 3 times.

5. **NOTE:** A chime sounds as acknowledgement that programming mode has been entered. The safety belt must be engaged otherwise the Belt-Minder® chime will take priority over other chimes.

   Turn the ignition to the RUN position. The module is now in programming mode.

6. Once in programming mode, the autolock or auto-unlock feature can be programmed independently of each other.
   - To program the autolock feature, press the door lock control switch for **greater than 2 seconds** and release. Each long press of the door lock control switch toggles the state of the autolocking feature between enabled and disabled. A chime sounds when the feature is enabled or disabled.
   - To program the auto-unlock feature, press the door lock control switch for **less than 1 second** and release. Each short press of the door lock control switch toggles the state of the auto-unlocking feature between enabled and disabled. A chime sounds when the feature is enabled or disabled.

7. Turn the ignition to the OFF mode to exit programming. If a setting was toggled, a chime will be heard.

Remote Keyless Entry (RKE) Transmitter Programming

NOTE: A maximum of 8 Remote Keyless Entry (RKE) transmitters can be programmed to the vehicle. Programming must be done at the same time for all the RKE transmitters.

NOTE: This procedure is for programming the RKE transmitter portion of the Integrated Keyhead Transmitter (IKT). The RKE transmitter for an Intelligent Access (IA) key is programmed automatically during key programming. Refer to the key programming procedures in Section 419-01B .

NOTE: There is an audible feedback chime heard indicating that the programming mode for the RKE transmitter portion of the Integrated Keyhead Transmitter (IKT) has been initiated. The chime is also heard for every key that is programmed and when programming of a RKE transmitter was successful. The chime is not heard if the vehicle has not been transitioned from transport to NORMAL mode.

1. Close all doors.

2. Buckle the front safety belts.

3. Use the door lock control switch to electronically unlock all door locks.

4. Turn the ignition from the OFF to RUN position 4 times in rapid succession (within 6 seconds), with the fourth turn ending in OFF.

5. **NOTE:** If no action is taken within 10 seconds after a transmitter has been programmed, the programming sequence ends.

   Within 10 seconds, press any button on the RKE transmitter to be programmed. After the first RKE transmitter is programmed, press a button on each subsequent RKE transmitter to be programmed (each within 10 seconds of each other).

6. **NOTE:** If programming mode is exited and no key is learned, all keys (if one or two were programmed) are erased for RKE transmitter operation.

   Exiting the programming mode is accomplished if one of the following occurs:

   - The key transitions to the RUN position.
   - 10 seconds have passed since entering programming mode or since the last RKE transmitter was programmed.
   - The maximum number (8) of RKE transmitters have been programmed.

7. Check the operation of the transmitter. If the door locks do not respond for the programmed RKE transmitter(s), wait several seconds and press the button again. If the door locks still fail to respond, refer to Handles, Locks, Latches and Entry Systems in this section.

Stepped Unlock Programming

1. With the ignition switch in the OFF position, press the LOCK and UNLOCK buttons on the Remote Keyless Entry (RKE) transmitter simultaneously for 4 seconds.
    - The turn signals flash twice to indicate the mode change.

2. Repeat Step 1 to enable/disable the stepped unlocking feature.

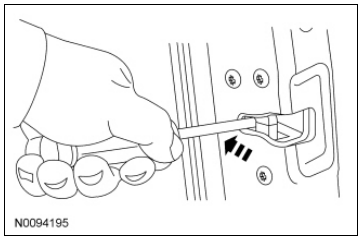
Latch Lubrication

Material

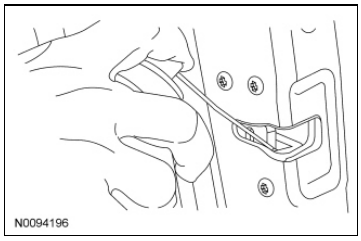
Item	Specification
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B

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.

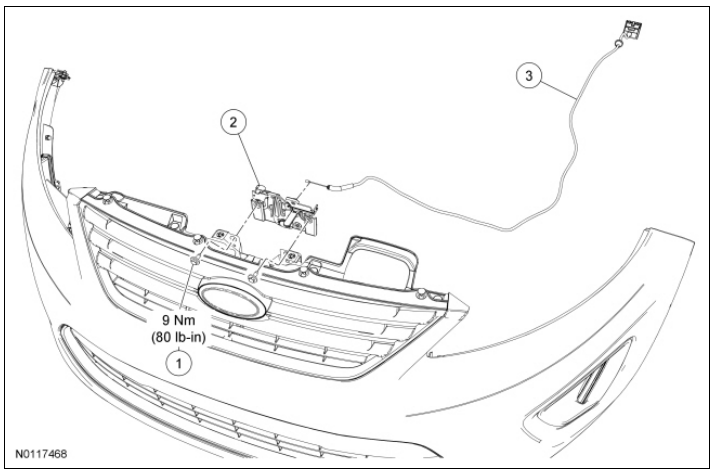


4. Open the latch using either the interior or exterior door handle.

5. Open and close the door several times to circulate the lubricant inside the latch.

6. Wipe off any excess grease.

Hood Latch and Components - Exploded View



Item	Part Number	Description
1	W702928	Hood latch bolts (2 required)
2	16700	Hood latch
3	16916	Hood latch release handle and cable

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

Hood Latch

Removal and Installation

1. **NOTE:** Mark the hood latch position prior to removal of the hood latch bolts.

   Remove the 2 hood latch bolts.

   - To install, tighten to 9 Nm (80 lb-in).

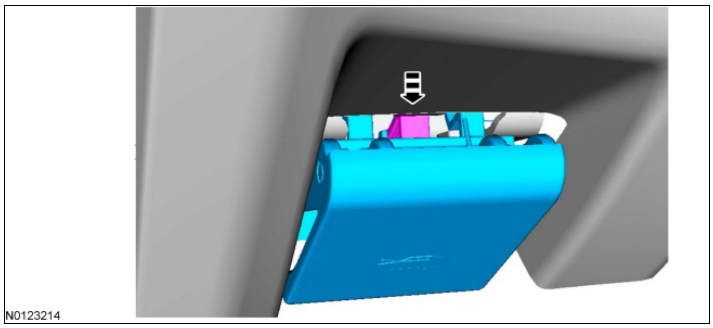
2. Remove the hood latch.
   - Disconnect the hood latch from the hood latch cable.

3. To install, reverse the removal procedure.
   - When the hood latch is installed, the latch adjustment must be checked to make sure the latch is installed and aligned correctly.

Hood Latch Release Handle

Removal and Installation

1. Using a suitable tool, depress the hood latch release handle retaining tab.



2. Remove the hood latch release handle.
   - Pull the hood latch release handle rearward.

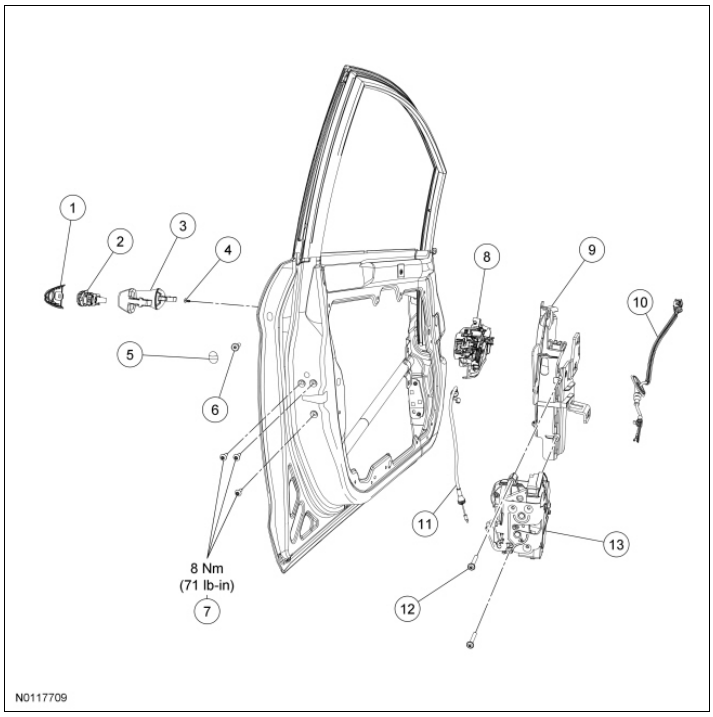
3. Disconnect the hood release cable from the hood latch release handle.

4. To install, reverse the removal procedure.

Front Door Handles, Locks and Latches - Exploded View

NOTE: Vehicle without Intelligent Access (IA) shown, Vehicle with IA similar.

NOTE: LH side shown, RH side similar.



Item	Part Number	Description
1	224A44 RH/ 224A45 LH	Exterior front door handle bezel
2	21990 RH (if equipped)/ 21991LH	Door lock cylinder
3	22404 (non-PEPS)/ 26604 (PEPS)	Exterior front door handle
4	W703168	Exterior front door handle reinforcement screw
5	W710048	Exterior front door handle bolt cover
6	-	Exterior front door handle bolt (Part of 26684 RH/ 26685 LH)
7	W715340	Front door latch screws (3 required)
8	22464 RH/ 22465 LH	Exterior front door handle reinforcement
9	21978 RH/ 21979 LH	Exterior front door handle reinforcement carrier
10	221A00	Interior front door handle actuating cable
11	218B26	

		Exterior front door handle actuating cable
12	-	
13	218812 RH/ 218813 LH	Front door latch

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

Front Door Latch

Removal and Installation

1. Remove the exterior front door handle reinforcement. For additional information, refer to Door Handle Reinforcement - Exterior, Front in this section.

2. Remove the 2 screws and separate the front door latch from the exterior front door handle reinforcement carrier.

3. Detach the exterior front door handle cable from the front door latch and separate the front door latch from the exterior front door handle reinforcement carrier.

4. To install, reverse the removal procedure.

Exterior Front Door Handle

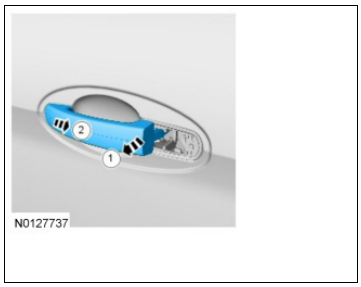
Removal and Installation

All vehicles

1. Remove the exterior front door handle bezel bolt cover.
2. ***NOTICE:*** **Overtightening the exterior front door handle bezel bolt will result in the increased opening effort of the door handle and possible damage to the exterior front door handle bezel.**

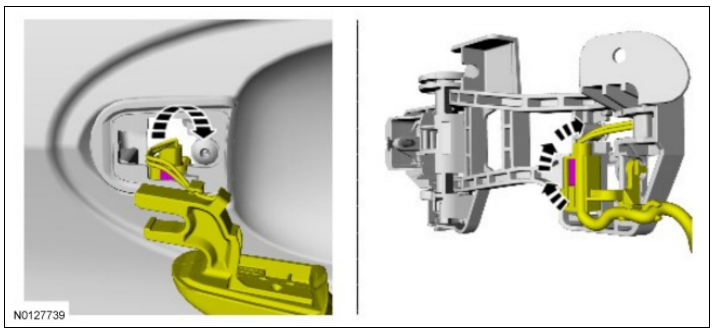
   Loosen, but do not remove, the exterior front door handle bezel bolt.

   - To install, tighten the exterior front door handle bezel bolt by hand, until the exterior front door handle bezel is no longer loose.
3. Pull outward and remove the exterior front door handle bezel.
4. Remove the exterior front door handle.
   - Pull the exterior front door handle rearward and then outward.

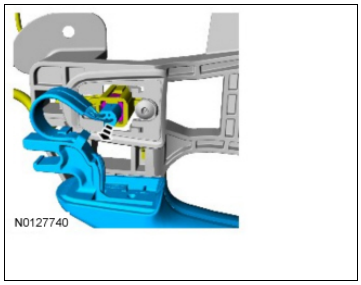


Vehicles with Intelligent Access (IA)

5. Position the exterior door handle electrical connector carrier in order to access the exterior door handle electrical connector.



6. Disconnect the exterior door handle electrical connector.



All vehicles

7. To install, reverse the removal procedure.

Door Handle Reinforcement - Exterior, Front

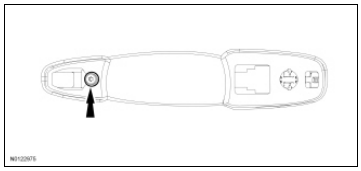
Removal and Installation

1. **NOTE:** Do not separate the window regulator or window regulator motor from the front door carrier.

   Remove the window regulator. For additional information, refer to Section 501-11 .

2. Remove the exterior front door handle. For additional information, refer to Exterior Front Door Handle in this section.

3. Loosen, but do not remove, the exterior front door handle reinforcement screw.



4. Remove the 3 front door latch screws.
   - To install, tighten to 8 Nm (71 lb-in).

5. Remove the door latch, carrier, and reinforcement assembly from vehicle.
   - Pull the front edge of the door latch, carrier, and reinforcement assembly inward and then toward the front of the vehicle.

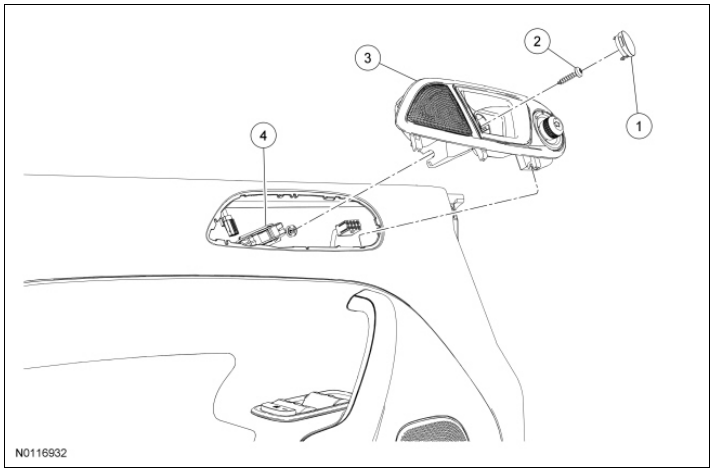
start="6">
- Disconnect exterior front door handle cable from the exterior front door handle reinforcement.

7. Separate the exterior front door handle reinforcement from the exterior front door handle reinforcement carrier.

8. To install, reverse the removal procedure.

Interior Door Handle - Front

NOTE: LH side shown, RH side similar.



Item	Part Number	Description
1	237W10	Interior door handle screw cover
2	46058	Interior door handle screw
3	22600 RH/ 22601 LH	Interior door handle
4	221A00	Interior door handle cable

Removal and Installation

1. Remove the interior door handle screw cover.
2. Remove the interior door handle screw.
3. ***NOTICE:*** **Do not pry outward at the bottom of the front interior door handle. Otherwise, damage to the front interior door handle may occur.**

   Using a non-marring tool, pry outward at the top of the front interior door handle.
4. Disconnect door latch cable from the front interior door handle.
5. If equipped, disconnect the electrical connector.
6. To install, reverse the removal procedure.

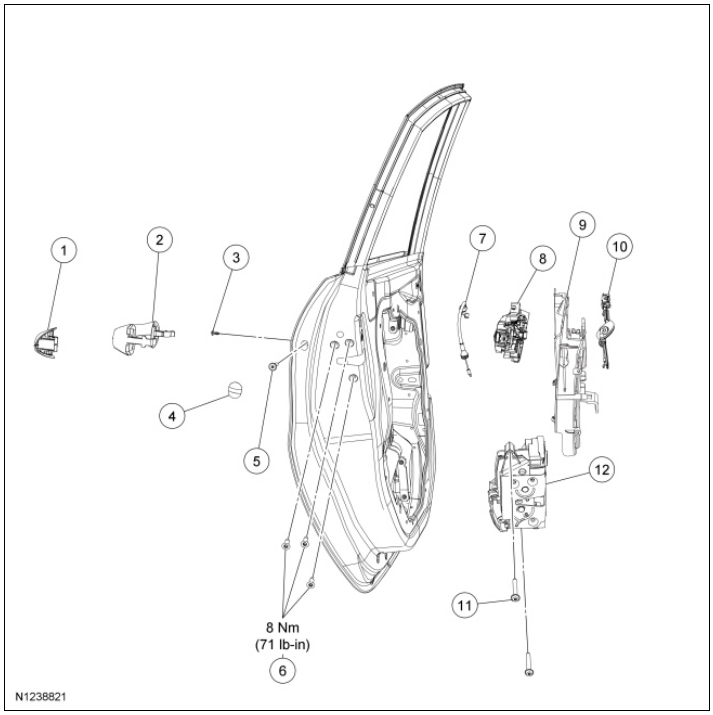
Door Lock Cylinder

Removal and Installation

1. Remove the exterior front door handle bezel bolt cover.
2. Loosen, but do not remove, the exterior front door handle bezel bolt.
3. Pull outward and remove the exterior front door handle bezel.
4. Separate the door lock cylinder from the exterior front door handle.
5. To install, reverse the removal procedure.

Rear Door Handles, Locks and Latches - Exploded View

NOTE: LH side shown, RH side similar.



Item	Part Number	Description
1	224A44	Exterior rear door handle bezel
2	26604	Exterior rear door handle
3	-	Exterior rear door handle reinforcement bolt (Part of 26684 RH/ 26685 LH)
4	W710048	Exterior rear door handle bezel bolt cover
5	W703168	Exterior rear door handle bezel bolt
6	W715340	Rear door latch screws (3 required)
7	265B10	Exterior rear door handle actuating cable
8	26684 RH/ 26685 LH	Exterior rear door handle reinforcement
9	224A52 RH/ 224A53 LH	Exterior rear door handle reinforcement carrier
10	264B58	Interior rear door handle actuating cable
11	-	Rear door latch mounting screw (2 required)
12	26412 RH/ 26413 LH	Rear door latch

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

Rear Door Latch

Removal and Installation

1. Remove the exterior rear door handle reinforcement. For additional information, refer to Door Handle Reinforcement - Exterior, Rear .
2. Remove the 2 screws and separate the rear door latch from the exterior rear door handle reinforcement carrier.
3. Detach the exterior rear door handle cable from the rear door latch and separate the rear door latch from the exterior rear door handle reinforcement carrier.
4. To install, reverse the removal procedure.

Exterior Rear Door Handle

Removal and Installation

1. Remove the exterior rear door handle bezel bolt cover.

2. ***NOTICE:*** **Overtightening the exterior front door handle bezel bolt will result in the increased opening effort of the door handle and possible damage to the exterior front door handle bezel.**

   Loosen, but do not remove, the exterior rear door handle bezel bolt.

   - To install, tighten the exterior front door handle bezel bolt by hand, until the exterior front door handle bezel is no longer loose.

3. Pull outward and remove the exterior rear door handle bezel.

4. Remove the exterior rear door handle.
   - Pull the exterior rear door handle rearward and then outward.

5. To install, reverse the removal procedure.

Door Handle Reinforcement - Exterior, Rear

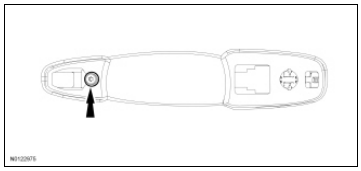
Removal and Installation

1. **NOTE:** Do not separate the window regulator or window regulator motor from the front door carrier.

   Remove the window regulator. For additional information, refer to Section 501-11 .

2. Remove the exterior rear door handle. For additional information, refer to Exterior Rear Door Handle in this section.

3. Loosen, but do not remove, the exterior rear door handle reinforcement screw.



4. Remove the 3 front door latch screws.
   - To install, tighten to 8 Nm (71 lb-in).

5. Remove the door latch, door carrier, and reinforcement assembly from vehicle.
   - Pull the front edge of the latch, carrier, and reinforcement assembly inward and then toward the front of the vehicle.

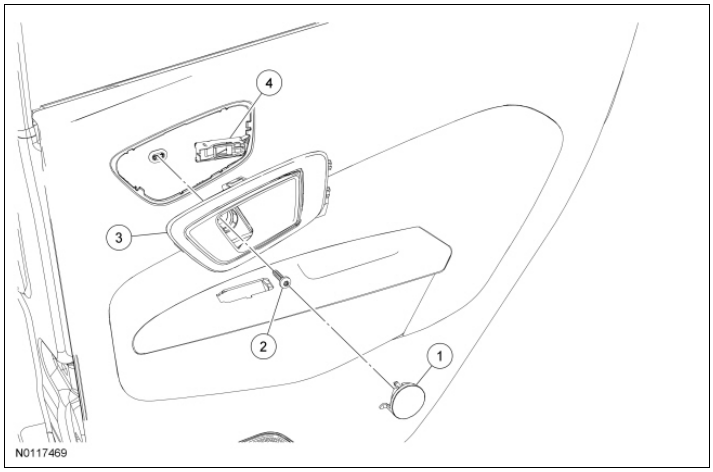
1. Disconnect exterior rear door handle cable from the exterior rear door handle reinforcement.

7. Separate the exterior rear door handle reinforcement from the exterior rear door handle reinforcement carrier.

8. To install, reverse the removal procedure.

Interior Door Handle - Rear

NOTE: RH side shown, LH side similar.

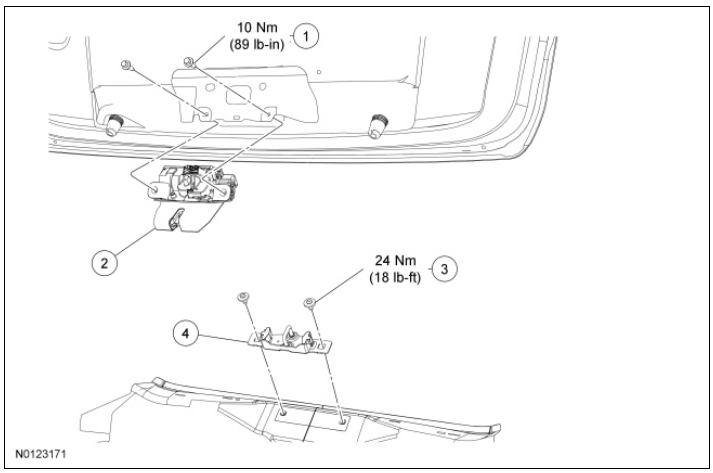


Item	Part Number	Description
1	237W10	Rear interior door handle screw cover
2	46058	Rear interior door handle screw
3	22600 RH/ 2260 1LH	Rear interior door handle
4	264B58	Rear interior door handle cable

Removal and Installation

1. Remove the rear door trim panel. For additional information, refer to Section 501-05 .
2. Release the 3 retaining tabs and remove the rear interior door handle from the rear door trim panel.
3. To install, reverse the removal procedure.

Liftgate Latch



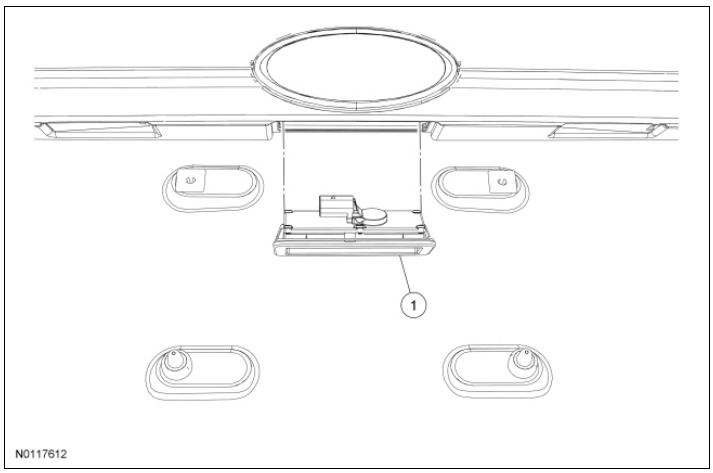
Item	Part Number	Description
1	W705125	Liftgate latch bolt
2	442A66	Liftgate latch
3	W500212	Liftgate striker bolt
4	404B12	Liftgate striker

Removal and Installation

1. Remove the liftgate trim panel. For additional information, refer to Section 501-05 .

2. Refer to exploded view(s) and any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Liftgate Release Switch



Item	Part Number	Description
1	14018	Liftgate release switch

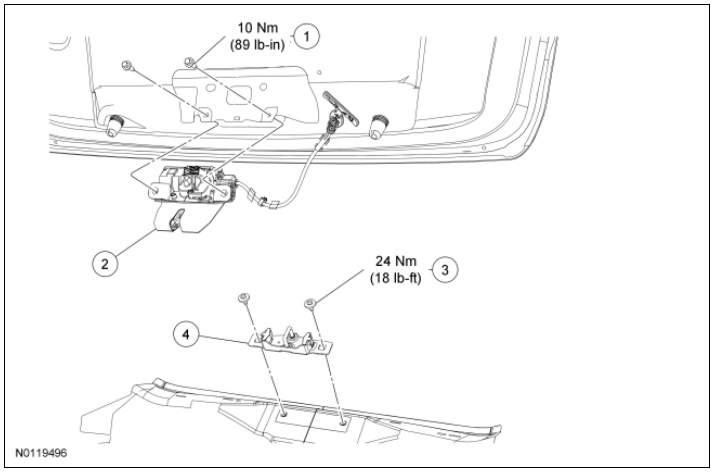
Removal and Installation

1. Remove the liftgate applique. For additional information, refer to Section 501-08 .

2. Refer to exploded view(s) and any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Luggage Compartment Lid Latch

Removal and Installation

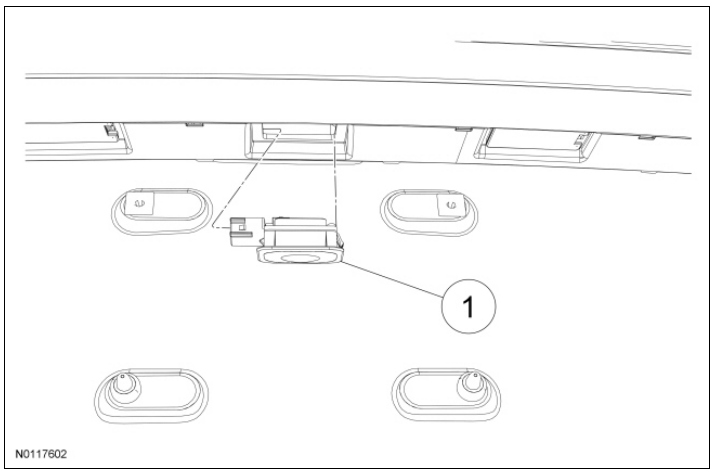


Item	Part Number	Description
1	W705125	Luggage compartment latch bolt
2	442A66	Luggage compartment latch
3	W500212	Luggage compartment striker bolt
4	404B12	Luggage compartment striker

1. Remove the 10 pin-type retainers and the luggage compartment lid trim panel.

2. Refer to exploded view(s) and any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Luggage Compartment Lid Release Switch

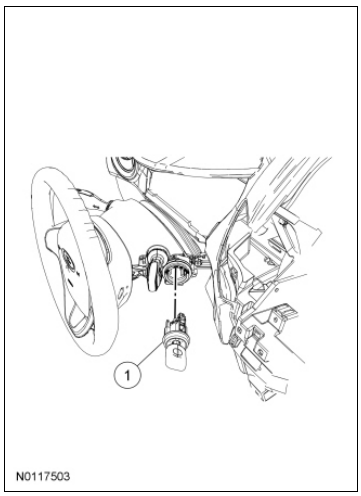


Item	Part Number	Description
1	19B514	Luggage compartment lid release switch

Removal and Installation

1. Remove the luggage compartment lid applique. For additional information, refer to Section 501-08 .
2. Refer to exploded view(s) and any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Ignition Lock Cylinder

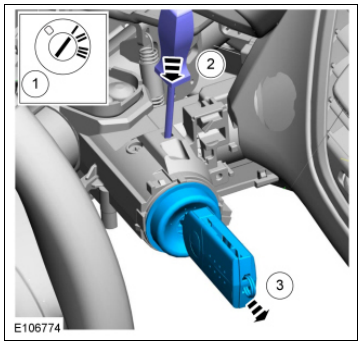


Item	Part Number	Description
1	11582	Ignition lock cylinder

Removal and Installation

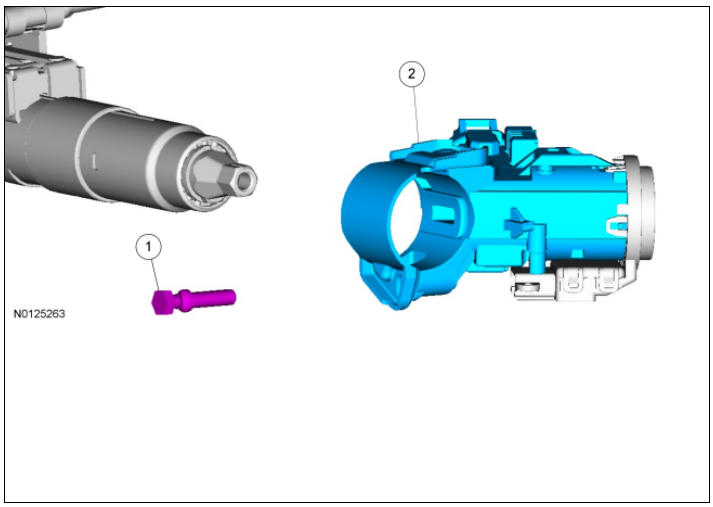
1. Remove the PATS transceiver. For additional information, refer to Section 419-01B .

2. Remove the ignition lock cylinder.
    1. Position the ignition key to the ACC position.
    2. Inset a suitable tool into the ignition lock cylinder release access hole and depress the ignition lock cylinder release button.
    3. Pull outward on the ignition key and remove the ignition lock cylinder.



3. To install, reverse the removal procedure.

Ignition Lock Cylinder Housing



Item	Part Number	Description
1	W709942	Ignition lock cylinder housing bolt
2	3F527	Ignition lock cylinder housing

Removal and Installation

1. Remove the steering wheel and steering column shrouds. For additional information, refer to Section 211-04 .

2. Remove the Passive Anti-Theft System (PATS) transceiver. For additional information, refer to Section 419-01B .

3. Remove the ignition lock cylinder. For additional information, refer to Ignition Lock Cylinder in this section.

4. Remove the ignition switch and the steering column multifunction switch. For additional information, refer to Section 211-05 .

5. Remove the wiper/washer switch. For additional information, refer to Section 501-16 .

6. Remove the steering column switch carrier. For additional information, refer to the steering column exploded view in Section 211-05 .

7. **NOTE:** Clean all metal shavings and foreign material after cutting a slot into the ignition lock cylinder housing bolt.

   Cut a slot into the head of the ignition lock cylinder housing bolt.

8. Remove and discard the ignition lock cylinder housing bolt.
   - To install, tighten the new bolt until the head of the bolt shears off.

9. Remove the ignition lock cylinder housing.

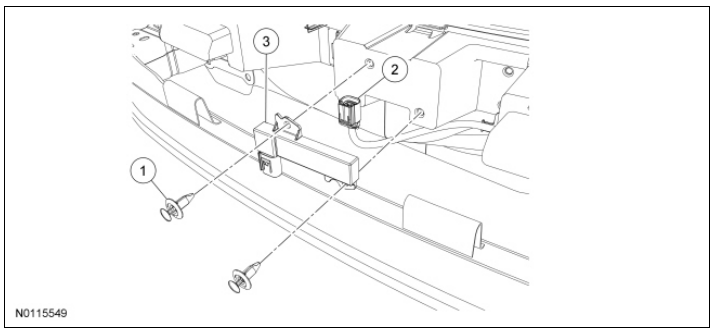
10. To install, reverse the removal procedure.

Door Lock Control Switch

Removal and Installation

1. The door lock control switch is integrated into the FCIM . For additional information, refer to Section 415-00 .

Intelligent Access (IA) Antenna



Item	Part Number	Description
1	16K262	Pin-type retainers (2 required)
2	-	Intelligent Access (IA) antenna electrical connector (part of 14D559)
3	15K603	IA antenna

Removal and Installation

1. Remove the rear bumper cover. For additional information, refer to Section 501-19 .

2. Refer to exploded view(s) and any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

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	-

Torque Specifications

Description	Nm	lb-ft	lb-in
Front wiper pivot arm nut	24	18	-
Rear wiper motor bolts	9	-	80
Rear wiper pivot arm nut	15	-	133
Washer reservoir bolts	3	-	27
Front wiper mounting arm and pivot shaft center bolt	24	18	-
Front wiper mounting arm and pivot shaft end bolts	5	-	44

Wipers and Washers

The wiper and washer system consists of the following components:

- Front/rear washer pump and reservoir (located in the front right corner of the engine compartment)
- Front and rear wiper pivot arms
- Windshield and rear window wiper motors
- Windshield wiper mounting arm and pivot shaft assembly
- Wiper/washer switch
- Front and rear wiper blades
- Body Control Module (BCM)

The wiper and washer system functions are activated by the wiper/washer switch which provides an input to the BCM . The BCM then provides an output to operate the desired wiper system feature. The windshield and rear window wiper systems share the window washer pump and cannot be used simultaneously.

The windshield wiper system offers 4 wipe modes:

- Single
- Intermittent (6 settings)
- Normal
- Fast

When activated by the wiper/washer switch, the rear wiper offers 3 wipe modes which are based on the windshield wiper mode selected.

- 4 second rest between wipes (windshield wiper system in off or normal modes)
- Intermittent (6 settings based on windshield wiper system setting)
- Continuously (windshield wiper system in fast mode)

Wipers and Washers

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-IV or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Principles of Operation

Windshield Wiper System

The wiper and washer system functions are activated by the wiper/washer switch which provides an input to the Body Control Module (BCM). The BCM then provides an output to operate the desired wiper system feature. The windshield and rear window wiper systems share the window washer pump and cannot be used simultaneously. The windshield wiper system only operates when the ignition is ON.

The windshield wiper system offers 4 wipe modes:

- Single
- Intermittent (6 settings)
- Normal
- Fast

The wiper system setting of the wiper/washer switch is transmitted to the BCM to actuate the wiper motor and set the wiper speed. Normal wipe speed remains available in the event of BCM failure.

Windshield Intermittent Wipe

The windshield intermittent wipe setting of the wiper/washer switch is transmitted to the BCM to actuate the wiper motor and set the wiper delay interval. The wiper/washer switch has 6 intermittent wiper delay settings ranging from a short to a long delay:

- Level 1 delay = 1.2 seconds
- Level 2 delay = 4 seconds
- Level 3 delay = 8 seconds
- Level 4 delay = 12 seconds
- Level 5 delay = 17.5 seconds
- Level 6 delay = 25 seconds

Windshield Wiper Motor

The integrated park switch is directly connected to the BCM . The windshield wiper motor park switch contacts are open in all wiper motor positions except PARK. When the windshield wiper motor park switch contacts are open, the windshield wiper motor remains switched on even if a signal from the BCM requests the wipers to stop. In PARK position, the windshield wiper motor park switch contacts create a ground connection. The BCM recognizes this ground connection and switches the windshield wiper motor off.

Front Washer System

When the front washer system is switched ON, the BCM switches the window washer pump ON. The windshield and rear window wiper systems share the window washer pump and cannot be used simultaneously. The BCM delays wiper operation for 360 ms after operation of the wiper/washer switch washer setting. If the wiper/washer switch washer setting is not operated for at least 360 ms, the BCM does not switch the windshield wiper motor ON. The BCM activates the windshield wiper motor for as long as the wiper/washer switch washer setting is operated, up to 10 seconds maximum. After the washer pump is turned OFF, the BCM allows the windshield wipers to wipe 4 more times. An additional courtesy wipe follows the 4 wipes after a brief pause.

Rear Window Wiper System

The rear window wiper system only operates if the ignition is ON. The position that the wiper/washer switch is in for the front windshield wipers determines the action of the rear wiper:

- When the wiper/washer switch is in a position that commands the rear wiper ON and the front windshield wipers are in the OFF position, the rear wiper is activated by the BCM with a 4 second delay between wipes.
- When the front windshield wipers are being operated in the intermittent mode, the rear wiper also operates in the intermittent mode. The rear wiper reacts along with the front windshield wipers to changes in the position of the rotary interval switch. When the rotary switch is positioned for a long delay between wipes, the rear wiper also operates with a long delay between wipes. The same is true for a short delay between wipes.
- When the front windshield wipers are operated at normal speed, the rear wiper operates with a 4 second delay between wipes when switched on.
- When the front windshield wipers are operated at high speed, the rear wiper operates continuously when switched on.

Rear Washer System

When the rear wash system is switched ON, the BCM supplies power to the washer pump. Reversing the polarity of the pump enables the washing fluid to flow to the rear washer jet instead of the front washer jets. The BCM activates the window wiper for as long as the window washer switch is operated. The window washer pump is switched OFF after a maximum of 10 seconds. After clearance from the switch, the BCM allows the wiper to wipe 2 or 3 more times.

Rear Wiper Motor

The integrated park switch is directly connected to the BCM . The rear window wiper motor park switch contacts are closed in all rear window wiper motor positions except PARK. When the rear window wiper motor park switch contacts are closed, the rear window wiper motor is supplied with a voltage by the BCM . When the rear window wiper motor reaches the PARK position, the park switch contacts open and the power supply is interrupted by the BCM . While the wiper/washer switch remains in the rear washer position, the rear window wiper motor is again supplied with a voltage by the BCM and continues to run. This process is repeated during every revolution of the rear window wiper 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
• Wiper/washer switch • Wiper linkage • Windshield washer pump hoses • Windshield washer nozzles • Rear window washer pump hoses • Rear window washer nozzles • Washer reservoir	• Central Junction Box (CJB) fuses: ♦ 11 (20A) ♦ 13 (15A) ♦ 15 (15A) ♦ 21 (10A) • Body Control Module (BCM) • Wiring, terminals or connectors • Wiper/washer switch • Windshield wiper motor • Rear window wiper motor • Washer pump

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 Body Control Module (BCM).

   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 is in ON.
   - verify the scan tool operation with a known good vehicle.
   - refer to Section 418-00 to diagnose no response from the BCM .

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 BCM .

9. If the DTCs retrieved are related to the concern, go to the Body Control Module (BCM) 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

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B1008:92	Wiper Mode Switch: Performance or Incorrect Operation	GO to Pinpoint Test E .
B1051:92	Front Washer Switch: Performance or Incorrect Operation	GO to Pinpoint Test G .
B1052:92	Rear Washer Switch: Performance or Incorrect Operation	GO to Pinpoint Test G .
B11DC:92	Rear Wiper Mode Switch: Performance or Incorrect Operation	GO to Pinpoint Test D .
B1C45:24	Front Wiper Park Position Switch: Signal Stuck High	GO to Pinpoint Test H .
B1C53:13	Front Wiper Intermittent Data: Circuit Open	GO to Pinpoint Test E .
All other DTCs	-	REFER to Section 419-10 .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: The Wipers Are Inoperative - Windshield

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

Normal Operation

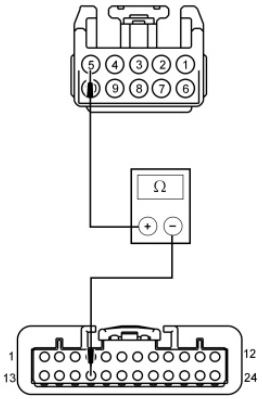
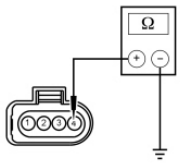
Power is supplied from the Central Junction Box (CJB) to the Body Control Module (BCM) for the front wiper system when the ignition is in the ON position. The BCM supplies a signal voltage(s) to the wiper/washer switch for the HIGH speed, LOW speed, and INTERMITTENT functions. Each function has its own dedicated signal (sense) voltage. The wiper/washer switch physically grounds the signal voltage(s) when a function is selected. The BCM then reacts to the grounded signal voltage(s) and its integral electronics make a decision on which wiper system function to carry out. Ground is supplied to the wiper motor through a circuit that is shared by the BCM windshield wiper return circuit.

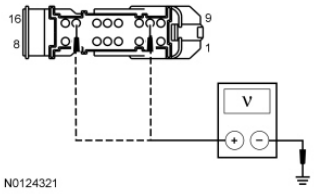
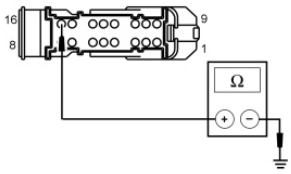
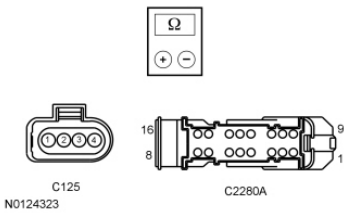
This pinpoint test is intended to diagnose the following:

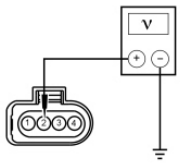
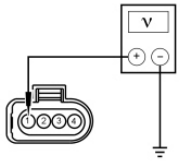
- Fuse(s)
- Wiring, terminals or connectors
- Windshield wiper motor
- Wiper/washer switch
- BCM

PINPOINT TEST A: THE WIPERS ARE INOPERATIVE - WINDSHIELD

Result / Action to Take	
A1 CHECK FOR BCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test - BCM . • **Are any BCM DTCs present?**	**Yes** REFER to the Body Control Module (BCM) DTC Chart for further diagnosis. **No** GO to A2 .
A2 CHECK THE BCM WINDSHIELD WIPER SWITCH PIDs	
• Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • Monitor the BCM PIDs listed below while operating the wiper/washer switch in the INTTTENT, LOW and HIGH positions. ♦ Front Wiper Interval/Auto Wiper Switch (FRNWIPER_Int) ♦ Front Wiper Command Low Speed (FRNWIPER_Lo) ♦ Front Wiper Command High Speed (FRNWIPER_Hi) • **Does the status of each PID match the wiper/washer switch setting?**	**Yes** GO to A6 . **No** GO to A3 .
A3 CHECK THE WIPER/WASHER SWITCH	
• Ignition OFF. • Disconnect: Wiper/Washer Switch C2081. • Carry out the wiper/washer switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the wiper/washer switch pass the component test?**	**Yes** GO to A4 . **No** INSTALL a new wiper/washer switch. REFER to Section 211-05 . TEST the system for normal operation.
A4 CHECK THE WIPER GROUND CIRCUIT FROM THE BCM	

• Disconnect: BCM C2280F. • Measure the resistance between the wiper/washer switch C2081-5, circuit CRW17 (GN/VT), harness side and BCM C2280F-16, circuit CRW17 (GN/VT), harness side.  N0124319 • **Is the resistance less than 5 ohms?**	**Yes** GO to A5 . **No** REPAIR the circuit. TEST the system for normal operation.
A5 CHECK THE WINDSHIELD WIPER MOTOR GROUND FOR AN OPEN OR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: Windshield Wiper Motor C125. • Measure the resistance between windshield wiper motor C125-4, circuit GD133 (BK), harness side and ground.  N0124320 • **Is the resistance less than 5 ohms?**	**Yes** GO to A6 . **No** REPAIR the circuit. TEST the system for normal operation.
A6 CHECK THE BCM VOLTAGE	
• Disconnect: BCM C2280B. • Ignition ON. • Measure the voltage between BCM C2280B-10, circuit CBP11 (BN), harness side and ground and between BCM C2280B-15, circuit CBP13 (GY/BN), harness side and ground.	**Yes** GO to A7 . **No** If circuit CBP11 (BN) was less than 10 volts, VERIFY CJB fuse 11 (20A) is OK. If OK, REPAIR circuit CBP11 (BN) for an open or high resistance. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the short to ground.

 N0124321 • **Are the voltages greater than 10 volts?**	If circuit CBP13 (GY/BN) was less than 10 volts, VERIFY Central Junction Box (CJB) fuse 13 (15A) is OK. If OK, REPAIR circuit CBP13 (GY/BN) for an open or high resistance. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the short to ground.
A7 CHECK THE BCM GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: BCM C2280A. • Measure the resistance between BCM C2280A-16, circuit GD156 (BK/VT), harness side and ground.  N0125564 • **Is the resistance less than 5 ohms?**	**Yes** GO to A8 . **No** REPAIR the circuit. TEST the system for normal operation.
A8 CHECK WINDSHIELD WIPER MOTOR LOW AND HIGH RELAY OUTPUT CIRCUITS FOR AN OPEN OR HIGH RESISTANCE	
• Measure the resistance between windshield wiper motor C125-1, circuit CRW15 (BN/WH), harness side and BCM C2280A-10, circuit CRW15 (BN/WH), harness side and between windshield wiper motor C125-2, circuit CRW16 (GY/BN), harness side and BCM C2280A-9, circuit CRW16 (GY/BN), harness side.  N0124323 • **Are the resistances less than 5 ohms?**	**Yes** GO to A9 . **No** REPAIR the affected circuit. TEST the system for normal operation.
A9 CHECK FOR VOLTAGE TO THE WINDSHIELD WIPER MOTOR USING THE BCM PIDs FRONT WIPER RELAY - LOW SPEED (WPR_RLY_F_Lo) AND FRONT WIPER RELAY - FAST SPEED (WPR_RLY_F_Hi)	

• Connect: BCM C2280A. • Connect: BCM C2280B. • Connect: BCM C2280F (if previously disconnected). • Connect: Wiper/Washer Switch C2081 (if previously disconnected). • Ignition ON. • Command the BCM PID WPR_RLY_F_Lo on. • Measure the voltage between windshield wiper motor C125-2, circuit CRW16 (GY/BN), harness side and ground.  N0124324 • Command the BCM PID WPR_RLY_F_Hi on. • Measure the voltage between windshield wiper motor C125-1, circuit CRW15 (BN/WH), harness side and ground.  N0124325 • **Are the voltages greater than 10 volts?**	**Yes** GO to A10 . **No** GO to A11 .
A10 CHECK FOR CORRECT WINDSHIELD WIPER MOTOR OPERATION	
• Ignition OFF. • Inspect windshield wiper motor C125 for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the windshield wiper motor C125 and make sure it seats correctly. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new windshield wiper motor. REFER to Wiper Motor - Windshield in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.
A11 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Inspect the BCM connectors for the following conditions: ♦ corrosion ♦ damaged or pushed out pins	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation.

• Connect the BCM connectors and make sure they seat correctly. • Connect: Windshield Wiper Motor C125. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

Pinpoint Test B: The Wipers are Inoperative - Rear Window

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

Normal Operation

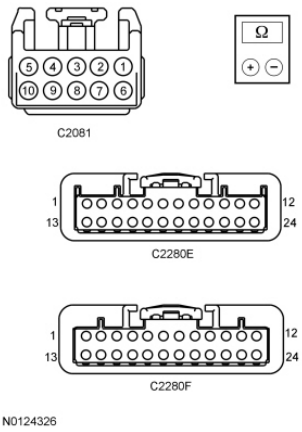
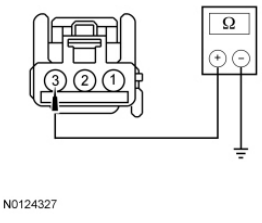
Power is supplied from the Ceral Junction Box (CJB) to the Body Control Module (BCM) for the rear window wiper system when the ignition is in the ON position. The BCM supplies a signal voltage(s) to the wiper/washer switch for the CONTINUOUS and INTERMITTENT wiper functions. Both functions share a dedicated signal (sense) line. The wiper/washer switch physically grounds the signal voltage(s) when a function is selected. The BCM then reacts to the grounded signal voltage(s) and its integral electronics make a decision on which wiper system function to carry out (depending on the windshield wiper setting). Ground is supplied to the rear window wiper motor through its own dedicated circuit.

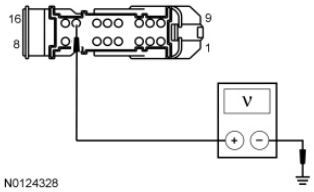
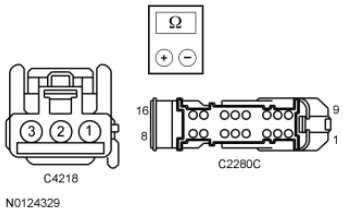
This pinpoint test is intended to diagnose the following:

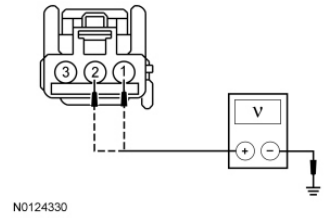
- Fuse(s)
- Wiring, terminals or connectors
- Wiper/washer switch
- Rear window wiper motor
- BCM

PINPOINT TEST B: THE WIPERS ARE INOPERATIVE - REAR WINDOW

Test Step	Result / Action to Take
B1 CHECK FOR BCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test - BCM . • **Are any BCM DTCs present?**	**Yes** REFER to the Body Control Module (BCM) DTC Chart for further diagnosis. **No** GO to B2 .
B2 CHECK THE BCM PID REAR WIPER INPUT SWITCH STATUS (R_WP-SW)	
• Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • Monitor the BCM PID R_WP-SW while operating the wiper/washer switch in the rear wiper mode. • **Does the status of the PID match the wiper/washer switch setting?**	**Yes** GO to B5 . **No** GO to B3 .
B3 CHECK THE WIPER/WASHER SWITCH	
• Ignition OFF. • Disconnect: Wiper/Washer Switch C2081.	**Yes** GO to B4 .

• Carry out the wiper/washer switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the wiper/washer switch pass the component test?**	**No** INSTALL a new wiper/washer switch. REFER to Section 211-05 . TEST the system for normal operation.
B4 CHECK THE WIPER GROUND CIRCUIT FROM THE BCM AND THE REAR WIPER INTERVAL CIRCUIT	
• Disconnect: BCM C2280E. • Disconnect: BCM C2280F. • Measure the resistance between wiper/washer switch C2081-4, circuit CRW20 (GY/YE), harness side and BCM C2280E-5, circuit CRW20 (GY/YE), harness side and between wiper/washer switch C2081-5, circuit CRW17 (GN/VT), harness side and BCM C2280F-16, circuit CRW17 (GN/VT), harness side.  • **Are the resistances less than 5 ohms?**	**Yes** GO to B5 . **No** REPAIR the affected circuit. TEST the system for normal operation.
B5 CHECK THE REAR WINDOW WIPER MOTOR GROUND FOR AN OPEN OR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: Rear Window Wiper Motor C4218. • Measure the resistance between rear window wiper motor C4218-3, circuit GD143 (BK/VT), harness side and ground.  	**Yes** GO to B6 . **No** REPAIR the circuit. TEST the system for normal operation.

• **Is the resistance less than 5 ohms?**	
B6 CHECK THE BCM VOLTAGE	
• Disconnect: BCM C2280B. • Ignition ON. • Measure the voltage between BCM C2280B-15, circuit CBP13 (GY/BN), harness side and ground.  • **Is the voltage greater than 10 volts?**	**Yes** GO to B7 . **No** VERIFY Central Junction Box (CJB) fuse 13 (15A) is OK. If OK, REPAIR circuit CBP13 (GY/BN) for an open or high resistance. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the short to ground.
B7 CHECK REAR WINDOW WIPER MOTOR SUPPLY AND RELAY OUTPUT CIRCUITS FOR AN OPEN OR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: BCM C2280C. • Measure the resistance between rear window wiper motor C4218-1, circuit CRW02 (GY/BU), harness side and BCM C2280C-11, circuit CRW02 (GY/BU), harness side and between rear window wiper motor C4218-2, circuit CRW05 (BU), harness side and BCM C2280C-9, circuit CRW05 (BU), harness side.  • **Are the resistances less than 5 ohms?**	**Yes** GO to B8 . **No** REPAIR the affected circuit. TEST the system for normal operation.
B8 CHECK FOR VOLTAGE TO THE REAR WINDOW WIPER MOTOR USING THE BCM PID REAR WIPER RELAY (WPR_RLY_REAR)	
• Connect: BCM C2280B. • Connect: BCM C2280C. • Connect: BCM C2280E. • Connect: BCM C2280F. • Connect: Wiper/Washer Switch C2081. • Ignition ON. • Command the BCM PID WPR_RLY_REAR on. • Measure the voltage between rear window wiper motor C4218-1, circuit CRW02 (GY/BU), harness side and	**Yes** GO to B9 . **No** GO to B10 .

ground and between rear window wiper motor C4218-2, circuit CRW05 (BU), harness side and ground.  N0124330 • **Are the voltages greater than 10 volts?**	
B9 CHECK FOR CORRECT WIPER MOTOR OPERATION	
• Ignition OFF. • Inspect rear window wiper motor C4218 for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the rear window wiper motor C4218 and make sure it seats correctly. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new rear window wiper motor. REFER to Wiper Motor - Rear Window in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.
B10 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Inspect the BCM connectors for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the BCM connectors and make sure they seat correctly. • Connect: Rear Window Wiper Motor C4218. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

Pinpoint Test C: The Wipers Stay ON Continuously - Windshield

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

Normal Operation

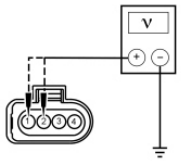
The Body Control Module (BCM) supplies a signal voltage(s) to the wiper/washer switch for the HIGH speed, LOW speed, and INTERMITTENT functions. Each function has its own dedicated signal (sense) line. The wiper/washer switch physically grounds the signal voltage(s) when a function is selected. The BCM then reacts to the grounded signal voltage(s) and its integral electronics make a decision on which wiper system function to carry out.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Wiper/washer switch
- Windshield wiper motor
- BCM

PINPOINT TEST C: THE WIPERS STAY ON CONTINUOUSLY - WINDSHIELD

Test Step	Result / Action to Take
C1 CHECK FOR BCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test - BCM . • **Are any BCM DTCs present?**	**Yes** REFER to the Body Control Module (BCM) DTC Chart for further diagnosis. **No** GO to C2 .
C2 CHECK THE BCM WINDSHIELD WIPER SWITCH PIDs	
• Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • Monitor the BCM PIDs listed below while operating the wiper/washer switch in the INTERMITTENT, LOW and HIGH positions. ♦ Front Wiper Interval/Auto Wiper Switch (FRNWIPER_Int) ♦ Front Wiper Command Low Speed (FRNWIPER_Lo) ♦ Front Wiper Command High Speed (FRNWIPER_Hi) • **Does the status of each PID match the wiper/washer switch setting?**	**Yes** GO to C4 . **No** GO to C3 .
C3 CHECK THE WIPER/WASHER SWITCH	
• Ignition OFF. • Disconnect: Wiper/Washer Switch C2081. • Carry out the wiper/washer switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the wiper/washer switch pass the component test?**	**Yes** GO to C5 . **No** INSTALL a new wiper/washer switch. REFER to Section 211-05 . TEST the system for normal operation.
C4 CHECK WINDSHIELD WIPER MOTOR LOW AND HIGH RELAY OUTPUT CIRCUITS FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: Windshield Wiper Motor C125. • Disconnect: BCM C2280A. • Ignition ON. • Measure the voltage between windshield wiper motor C125-1, circuit CRW15 (BN/WH), harness side and ground and between windshield wiper motor C125-2, circuit CRW16 (GY/BN), harness side and ground.  N0124344 • **Is voltage present on either circuit?**	**Yes** REPAIR the affected circuit. TEST the system for normal operation. **No** GO to C5 .
C5 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Inspect the BCM connectors for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the BCM connectors and make sure they seat correctly. • Connect: Windshield Wiper Motor C125. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

Pinpoint Test D: The Wipers Stay ON Continuously - Rear Window

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

Normal Operation

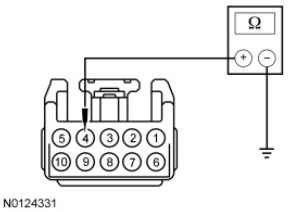
The Body Control Module (BCM) supplies a signal voltage(s) to the wiper/washer switch for the CONTINUOUS and INTERMITTENT wiper functions. Both functions share a dedicated signal (sense) line. The wiper/washer switch physically grounds the signal voltage(s) when a function is selected. The BCM then reacts to the grounded signal voltage(s) and its integral electronics make a decision on which wiper system function to carry out (depending on windshield wiper setting).

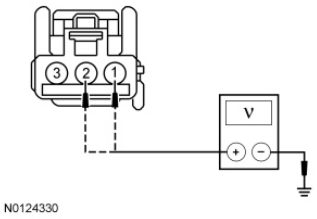
- DTC B11DC:92 (Rear Wiper Mode Switch: Performance or Incorrect Operation) - sets during self-test when the rear wiper interval switch circuit is grounded.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Wiper/washer switch
- Rear window wiper motor
- BCM

PINPOINT TEST D: THE WIPERS STAY ON CONTINUOUSLY - REAR WINDOW

Test Step	Result / Action to Take
D1 CHECK FOR BCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test - BCM . • **Are any BCM DTCs present?**	**Yes** REFER to the Body Control Module (BCM) DTC Chart for further diagnosis. **No** GO to D2 .
D2 CHECK THE BCM PID REAR WIPER INPUT SWITCH STATUS (R_WP-SW)	
• Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • Monhe BCM PID R_WP-SW while operating the wiper/washer switch in the rear wiper mode. • **Does the status of the PID match the wiper/washer switch setting?**	**Yes** GO to D5 . **No** GO to D3 .
D3 CHECK THE WIPER/WASHER SWITCH	
• Ignition OFF. • Disconnect: Wiper/Washer Switch C2081. • Carry out the wiper/washer switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the wiper/washer switch pass the component test?**	**Yes** GO to D4 . **No** INSTALL a new wiper/washer switch. REFER to Section 211-05 . TEST the system for normal operation.
D4 CHECK THE REAR WIPER INTERVAL CIRCUIT FOR A SHORT TO GROUND	
• Disconnect: BCM C2280E. • Measure the resistance between wiper/washer switch C2081-4, circuit CRW20 (GY/YE), harness side and ground.  N0124331 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to D6 . **No** REPAIR the affected circuit. TEST the system for normal operation.
D5 CHECK REAR WINDOW WIPER SUPPLY AND WIPER MOTOR RELAY OUTPUT CIRCUITS FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: Rear Window Wiper Motor C4218. • Measure the voltage between rear window wiper motor C4218-1, circuit CRW02 (GY/BU), harness side and ground and between rear window wiper motor C4218-2, circuit CRW05 (BU), harness side and ground.  N0124330 • **Is any voltage present?**	**Yes** REPAIR the affected circuit. TEST the system for normal operation. **No** GO to D6 .
D6 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Inspect the BCM connectors for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the BCM connectors and make sure they seat correctly. • Connect: Wiper/Washer Switch C2081. • Connect: Rear Window Wiper Motor C4218. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

Pinpoint Test E: The HIGH/LOW/INTERMITTENT Wiper Speeds Do Not Operate Correctly - Windshield

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

Normal Operation

The Body Control Module (BCM) supplies a signal voltage(s) to the wiper/washer switch for the HIGH speed, LOW speed, and INTERMITTENT funions. Each function has its own dedicated signal (sense) line. The wiper/washer switch physically grounds the signal voltage(s) when a function is selected. The BCM reacts to the grounded signal voltage(s) and its integral electronics make a decision on which wiper system function to carry out. The wiper/washer switch has a rheostat (variable resistor) which, when moved, changes the time delay between wipes. The BCM monitors the position of the rheostat through a sense line.

- DTC B1008:92 (Wiper Mode Switch: Performance or Incorrect Operation) - sets when the INTERMITTENT mode is grounded at the same time as the LOW and/or HIGH speed functions for more than 2 seconds.
- DTC B1C53:13 (Front Wiper Intermittent Data: Circuit Open) - sets when the front interval potentiometer input circuit is open.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors

- Wiper/washer switch
- Windshield wiper motor
- BCM

PINPOINT TEST E: THE HIGH/LOW/INTERMITTENT WIPER SPEEDS DO NOT OPERATE CORRECTLY - WINDSHIELD

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>E1 CHECK FOR BCM DTCs</td><td></td></tr>
<tr><td>• Enter the following diagnostic mode on the scan tool: Self-Test - BCM .
• Are any BCM DTCs present?</td><td>Yes
For DTC B1008:92, GO to E5 .

For DTC B1C53:13, GO to E4 .

For all other BCM DTCs, REFER to the Body Control Module (BCM) DTC Chart for further diagnosis.

No
GO to E2 .</td></tr>
<tr><td>E2 CHECK THE BCM WINDSHIELD WIPER SWITCH PIDs</td><td></td></tr>
<tr><td>• Enter the following diagnostic mode on the scan tool: DataLogger - BCM .
• Monitor the BCM PIDs listed below while operating the wiper/washer switch in the INTERMITTENT, LOW and HIGH positions.
♦ Front Wiper Select Switch A (FRNWIPER_A)
♦ Front Wiper Select Switch B (FRNWIPER_B)
♦ Front Wiper Select Switch C (FRNWIPER_C)
♦ Front Wiper Command Low Speed (FRNWIPER_Lo)
♦ Front Wiper Command High Speed (FRNWIPER_Hi)
♦ Front Wiper Interval / Auto Wiper Switch (FRNWIPER_Int)
♦ Front Wiper Command Low Speed (FRNWIPER_Lo)
♦ Front Wiper Command High Speed (FRNWIPER_Hi)
• Monitor the BCM PIDs FRNWIPER_A, FRNWIPER_B and FRNWIPER_C in each INTERMITTENT setting and refer to the table below.

<table><tr><th>INTERMITTENT Setting</th><th>FRNWIPER_A</th><th>FRNWIPER_B</th><th>FRNWIPER_C</th></tr><tr><td>Level 1</td><td>Active</td><td>Inactive</td><td>Inactive</td></tr></table></td><td>Yes
GO to E6 .

No
GO to E3 .</td></tr>
</table>

Level 2	Inactive	Active	Inactive
Level 3	Active	Active	Inactive
Level 4	Inactive	Inactive	Active
Level 5	Active	Inactive	Active
Level 6	Inactive	Active	Active

- **Does the status of each PID match the wiper/washer switch setting?**

E3 CHECK THE WIPER/WASHER SWITCH

- Ignition OFF.
- Disconnect: Wiper/Washer Switch C2081.
- Carry out the wiper/washer switch component test.

  Refer to Wiring Diagrams Cell 149 for component testing.
- **Does the wiper/washer switch pass the component test?**

Yes
GO to E4 .

No
INSTALL a new wiper/washer switch. REFER to Section 211-05 . TEST the system for normal operation.

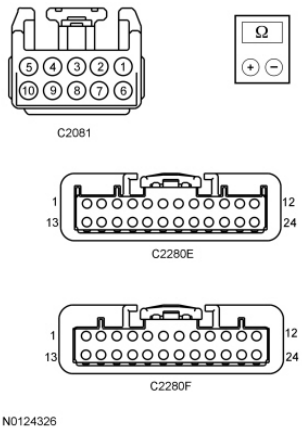
E4 CHECK WIPER/WASHER SWITCH WINDSHIELD WIPER CIRCUITS FOR AN OPEN OR HIGH RESISTANCE

- Ignition OFF.
- Disconnect: Wiper/Washer Switch C2081 (if not previously disconnected).
- Disconnect: BCM C2280E.
- Disconnect: BCM C2280F.
- Measure the resistance between wiper/washer switch C2081, harness side and BCM C2280E and C2280F, harness side as follows:

Wiper/Washer Switch	Circuit	BCM
C2081-3	CRW10 (BU/GN)	C2280F-3
C2081-5	CRW17 (GN/VT)	C2280F-16
C2081-8	CRW08 (VT/OG)	C2280F-9
C2081-9	VRW11 (GN/BN)	C2280E-6
C2081-10	CRW18 (VT/WH)	C2280F-6

Yes
GO to E5 .

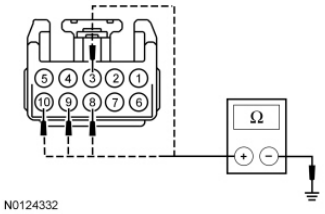
No
REPAIR the affected circuit. TEST the system for normal operation.



- **Are the resistances less than 5 ohms?**

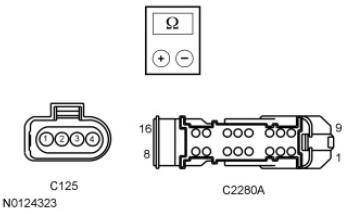
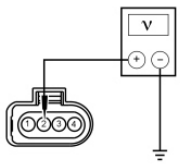
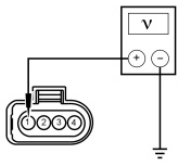
E5 CHECK WIPER/WASHER SWITCH WINDSHIELD WIPER CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: Wiper/Washer Switch C2081 (if not previously disconnected). • Disconnect: BCM C2280E (if not previously disconnected). • Disconnect: BCM C2280F (if not previously disconnected). • Measure the resistance between wiper/washer switch C2081, harness side and ground as follows:	**Yes** GO to E9 . **No** REPAIR the affected circuit. TEST the system for normal operation.

Wiper/Washer Switch	Circuit
C2081-3	CRW10 (BU/GN)
C2081-8	CRW08 (VT/OG)
C2081-9	VRW11 (GN/BN)
C2081-10	CRW18 (VT/WH)



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

E6 CHECK WINDSHIELD WIPER MOTOR LOW AND HIGH RELAY OUTPUT CIRCUITS FOR AN OPEN OR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: Windshield Wiper Motor C125. • Disconnect: BCM C2280A. • Measure the resistance between windshield wiper motor C125-1, circuit CRW15 (BN/WH), harness side and BCM C2280A-10, circuit CRW15 (BN/WH), harness side and between windshield wiper motor C125-2,	**Yes** GO to E7 . **No** REPAIR the affected circuit. TEST the system

circuit CRW16 (GY/BN), harness side and BCM C2280A-9, circuit CRW16 (GY/BN), harness side.  • **Are the resistances less than 5 ohms?**	for normal operation.
E7 CHECK FOR VOLTAGE TO THE WINDSHIELD WIPER MOTOR USING THE BCM PIDs FRONT WIPER RELAY - LOW SPEED (WPR_RLY_F_Lo) AND FRONT WIPER RELAY - FAST SPEED (WPR_RLY_F_Hi)	
• Connect: BCM C2280A. • Ignition ON. • Command the BCM PID WPR_RLY_F_Lo on. • Measure the voltage between windshield wiper motor C125-2, circuit CRW16 (GY/BN), harness side and ground.  • Command the BCM PID WPR_RLY_F_Hi on. • Measure the voltage between windshield wiper motor C125-1, circuit CRW15 (BN/WH), harness side and ground.  • **Are the voltages greater than 10 volts?**	**Yes** GO to E8 . **No** GO to E9 .
E8 CHECK FOR CORRECT WINDSHIELD WIPER MOTOR OPERATION	
• Ignition OFF. • Inspect windshield wiper motor C125 for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the windshield wiper motor C125 and make sure it seats correctly.	**Yes** INSTALL a new windshield wiper motor. REFER to Wiper Motor - Windshield in this

• Connect: BCM C2280E. • Connect: BCM C2280F. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	section. TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.
E9 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Inspect the BCM connectors for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the BCM connectors and make sure they seat correctly. • Connect: Wiper/Washer Switch C2081 (if previously disconnected). • Connect: Windshield Wiper Motor C125 (if previously disconnected). • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

Pinpoint Test F: The CONTINUOUS or INTERMITTENT Wiper Speeds Do Not Operate Correctly - Rear Window

Refer to Wiring Diagrams Cell 81 , Front Wipers and Washers for schematic and connector information.

Normal Operation

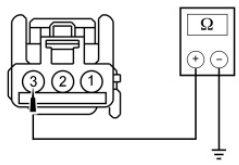
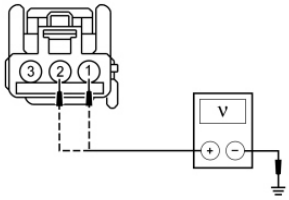
The Body Control Module (BCM) supplies a signal voltage(s) to the wiper/washer switch for CONTINUOUS and INTERMITTENT wiper functions. Both functions share a dedicated signal (sense) line. The wiper/washer switch physically grounds the signal voltage(s) when a function is selected. The BCM reacts to the grounded signal voltage(s) and its integral electronics make a decision on which wiper system function to carry out (depending on the windshield wiper setting).

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Wiper/washer switch
- Rear window wiper motor
- BCM

PINPOINT TEST F: THE CONTINUOUS OR INTERMITTENT WIPER SPEEDS DO NOT OPERATE CORRECTLY - REAR WINDOW

Test Step	Result / Action to Take
F1 CHECK FOR BCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test - BCM . • **Are any BCM DTCs present?**	**Yes** REFER to the Body Control Module (BCM) DTC Chart for further diagnosis. **No** GO to F2 .
F2 CHECK OPERATION OF THE WINDSHIELD WIPERS	
• Operate the windshield wipers in LOW, HIGH and in each INTERMITTENT mode. • **Do the windshield wipers operate correctly?**	**Yes** GO to F3 . **No** IDENTIFY the windshield wiper system symptom and GO to Symptom Chart for further diagnosis.
F3 CHECK THE BCM PID REAR WIPER INPUT SWITCH STATUS (R_WP-SW)	
• Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • Monitor the BCM PID R_WP-SW while operating the wiper/washer switch in the rear wiper mode. • **Does the status of the PID match the wiper/washer switch setting?**	**Yes** GO to F5 . **No** GO to F4 .
F4 CHECK THE WIPER/WASHER SWITCH	
• Ignition OFF. • Disconnect: Wiper/Washer Switch C2081. • Carry out the wiper/washer switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the wiper/washer switch pass the component test?**	**Yes** GO to F8 . **No** INSTALL a new wiper/washer switch. REFER to Section 211-05 . TEST the system for normal operation.
F5 CHECK THE REAR WINDOW WIPER MOTOR GROUND FOR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: Rear Window Wiper Motor C4218. • Measure the resistance between rear window wiper motor C4218-3, circuit GD143 (BK/VT), harness side and ground.	**Yes** GO to F6 . **No** REPAIR the circuit. TEST the system for normal operation.

 N0124327 • **Is the resistance less than 5 ohms?**	
F6 CHECK FOR VOLTAGE TO THE REAR WINDOW WIPER MOTOR USING THE BCM PID REAR WIPER RELAY (WPR_RLY_REAR)	
• Ignition ON. • Command the BCM PID WPR_RLY_REAR on. • Measure the voltage between rear window wiper motor C4218-1, circuit CRW02 (GY/BU), harness side and ground and between rear window wiper motor C4218-2, circuit CRW05 (BU), harness side and ground.  N0124330 • **Are the voltages greater than 10 volts?**	**Yes** GO to F7 . **No** GO to F8 .
F7 CHECK FOR CORRECT WIPER MOTOR OPERATION	
• Ignition OFF. • Inspect rear window wiper motor C4218 for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the rear window wiper motor C4218 and make sure it seats correctly. • Connect: Wiper/Washer Switch C2081. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new rear window wiper motor. REFER to Wiper Motor - Rear Window in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.
F8 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Inspect the BCM connectors for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the BCM connectors and make sure they seat correctly. • Connect: Wiper/Washer Switch C2081. • Connect: Rear Window Wiper C4218. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corrod connector.

Pinpoint Test G: The Washer Pump is Inoperative - Front/Rear

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

Normal Operation

The front and rear washer systems share the same washer pump motor. The Body Control Module (BCM) supplies a signal voltage(s) to the wiper/washer switch for the front/rear wash functions. Each function has its own dedicated signal (sense) line. The wiper/washer switch physically grounds the signal voltage when a wash function is selected. The BCM reacts to the grounded signal voltage(s) and its integral electronics make a decision on what polarity to supply the washer pump motor with. The BCM changes the polarity to the washer pump motor in reaction to a front or rear wash selection, changing the rotational direction of the motor.

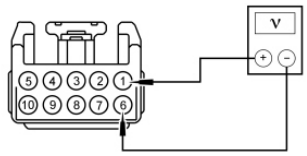
- DTC B1051:92 (Front Washer Switch: Performance or Incorrect Operation) - sets during self-test when the wiper/washer switch front washer circuit to the BCM or the front washer pump circuit is grounded.
- DTC B192 (Rear Washer Switch: Performance or Incorrect Operation) - sets during self-test when the wiper/washer switch rear washer circuit to the BCM or rear washer pump circuit is grounded.

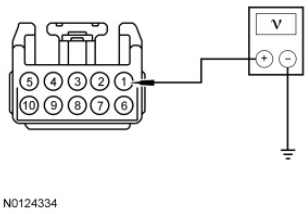
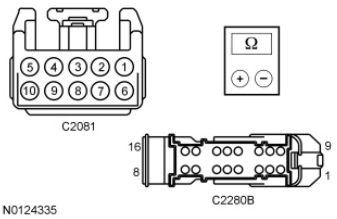
This pinpoint test is intended to diagnose the following:

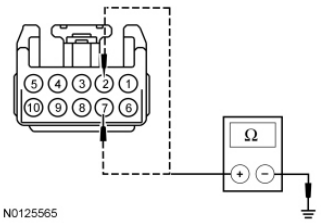
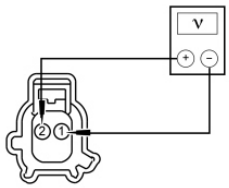
- Wiring, terminals or connectors
- Wiper/washer switch
- Washer pump
- BCM

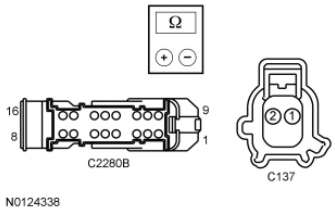
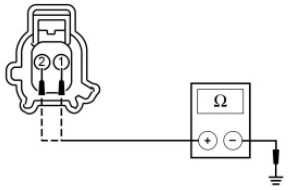
PINPOINT TEST G: THE WASHER PUMP IS INOPERATIVE - FRONT/REAR

Test Step	Result / Action to Take
G1 CHECK THE BCM PIDs FRONT WASHER SWITCH (FRNWIPER_Wsh) AND REAR WASHER SWITCH INPUT (RWASH_SW)	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - BCM . • **NOTE:** The rear window washer feature is only available on 5-door hatchback vehicles. • Monitor the BCM PIDs FRNWIPER_Wsh and RWASH_SW while operating the wiper/washer switch front and rear washer modes. • **Does the status of each PID match the wiper/washer switch setting?**	**Yes** GO to ef="SBR~us~en~file=SBR1G003.HTM~gen~ref.HTM#G7" >G7 . **No** GO to G2 .

G2 CHECK THE WIPER/WASHER SWITCH	
• Ignition OFF. • Disconnect: Wiper/Washer Switch C2081. • Carry out the wiper/washer switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the wiper/washer switch pass the component test?**	**Yes** GO to G3 . **No** INSTALL a new wiper/washer switch. REFER to Section 211-05 . TEST the system for normal operation.
G3 CHECK VOLTAGE AND GROUND CIRCUITS TO THE WIPER/WASHER SWITCH	
• Ignition ON. • Measure the voltage between wiper/washer switch C2081-1, circuit CBP15 (BN/BU), harness side and C2081-6, circuit GD115 (BK/GY), harness side.  N0124333 • **Is the voltage greater than 10 volts?**	**Yes** GO to G5 . **No** GO to G4 .
G4 CHECK THE VOLTAGE CIRCUIT TO THE WIPER/WASHER SWITCH FOR AN OPEN OR HIGH RESISTANCE	
• Measure the voltage between wiper/washer switch C2081-1, circuit CBP15 (BN/BU), harness side and ground.	**Yes** REPAIR circuit GD115 for an open or high resistance. TEST the system for normal operation. **No** VERIFY Central Junction Box (CJB) fuse 15 (15A) is OK. If OK, REPAIR circuit CBP15 (BN/BU). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the short to ground.

 N0124334 • **Is the voltage greater than 10 volts?**	
G5 CHECK THE WIPER/WASHER SWITCH WASHER PUMP MOTOR REQUEST CIRCUITS TO THE BCM FOR AN OPEN OR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: BCM C2280B. • Measure the resistance between wiper/washer switch C2081-2, circuit CRW07 (GY/BN), harness side and BCM C2280B-12, circuit CRW07 (GY/BN), harness side and between wiper/washer switch C2081-7, circuit CRW12 (GY/OG), harness side and BCM C2280B-14, circuit CRW12 (GY/OG), harness side  N0124335 • **Are the resistances less than 5 ohms?**	**Yes** GO to G6 . **No** REPAIR the affected circuit. TEST the system for normal operation.
G6 CHECK THE WIPER/WASHER SWITCH WASHER PUMP MOTOR REQUEST CIRCUITS TO THE BCM FOR A SHORT TO GROUND	
• Measure the resistance between wiper/washer switch C2081-2, circuit CRW07 (GY/BN), harness side and ground and between wiper/washer switch C2081-7, circuit CRW12 (GY/OG), harness side and	**Yes** GO to G10 . **No** REPAIR the affected circuit. CLEAR the BCM DTCs. REPEAT the self-test. TEST the system for normal operation.

ground.  N0125565 • **Are the resistances greater than 10,000 ohms?**	
G7 CHECK FOR VOLTAGE AND GROUND TO THE WASHER PUMP MOTOR	
• Disconnect: Washer Pump Motor C137. • **NOTE:** On 5-door hatchback vehicles, make sure to operate both the front and rear washer modes. • While using the wiper/washer switch to activate the washer pump motor, measure the voltage between washer pump motor C137-2, circuit CRW23 (VT/GN), harness side and washer pump motor C137-1, circuit CRW14 (BU/WH), harness side.  N0124337 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new washer pump motor. REFER to Washer Pump in this section. TEST the system for normal operation. **No** GO to G8 .
G8 CHECK THE WASHER PUMP MOTOR CIRCUITS FOR AN OPEN OR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: BCM C2280B. • Measure the resistance between BCM C2280B-4, circuit CRW23 (VT/GN), harness side and washer pump motor	**Yes** GO to G9 . **No** REPAIR the affected circuit. TEST the system for normal operation.

C137-2, circuit CRW23 (VT/GN), harness side and between BCM C2280B-13, circuit CRW14 (BU/WH), harness side and washer pump motor C137-1, circuit CRW14 (BU/WH), harness side.  N0124338 • **Are the resistances less than 5 ohms?**	
G9 CHECK THE WASHER PUMP MOTOR CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280A. • Measure the resistance between washer pump motor C137-1, circuit CRW14 (BU/WH), harness side and ground and between washer pump motor C137-2, circuit CRW23 (VT/GN), harness side and ground.  N0124339 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to G10 . **No** REPAIR the affected circuit. CLEAR the BCM DTCs. REPEAT the self-test. TEST the system for normal operation.
G10 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Inspect the BCM connectors for the following conditions: ♦ corrosion ♦ damaged or pushed out pins	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

• Connect the BCM connectors and make sure they seat correctly. • Connect: Wiper/Washer Switch C2081 (if previously disconnected). • Connect: Windshield Wiper Motor C125 (if previously disconnected). • Operate the system and verify if the concern is still present. • **Is the concern still present?**	

Pinpoint Test H: The Wipers Will Not PARK at the Correct Position - Windshield

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

Normal Operation

Integral to the wiper motor is a set of contacts that only close when the wipers are in the PARK position. When closed the contacts supply ground to the Body Control Module (BCM) which uses the ground to sense when the wipers are in the PARK position. If the wipers are in use, the BCM continues to supply power to the wiper motor after the wipers are commanded OFF and in a NON-PARK position. Once the wipers are in the PARK position, the BCM removes power from the wiper motor and the wipers remain PARKED.

- DTC B1C45:24 (Front Wiper Position Switch: Signal Stuck High) - sets during self-test when the wipers are not initially PARKED or are still PARKED after 500 ms with the wiper/washer switch set to LOW SPEED. Also sets while being continuously monitored when the wiper/washer switch is set to SINGLE WIPE or INTERMITTENT and the wipers remain PARKED for longer than 1.5 seconds or when the wiper/washer switch is set to OFF and the wipers remain in a NON-PARKED position for longer than 12 seconds.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Linkage
- Windshield wiper motor
- BCM

PINPOINT TEST H: THE WIPERS WILL NOT PARK AT THE CORRECT POSITION - WINDSHIELD

Test Step	Result / Action to Take
H1 INSPECT THE WINDSHIELD WIPERS	
• Inspect the wiper pivot arms and wiper mounting arm and pivot shaft assembly for damage or obstructions. • **Are any parts damaged or is an obstruction present?**	**Yes** REMOVE any damaged parts and INSTALL new. REMOVE any debris or obstructions. TEST the system for normal operation. **No** GO to H2 .
H2 CHECK FOR BCM DTCs	

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: Self-Test - BCM .
- **Are any BCM DTCs present?**

Yes
For DTC B1C45:24, GO to H4 .

For all other BCM DTCs, REFER to the Body Control Module (BCM) DTC Chart for further diagnosis.

No
GO to H3 .

H3 CHECK THE BCM PID FRONT WIPER PARK SWITCH (FRNWIPER_Prk) WHILE OPERATING THE WINDSHIELD WIPERS

- Enter the following diagnostic mode on the scan tool: DataLogger - BCM .
- Monitor the BCM PID FRNWIPER_Prk while operating the windshield wipers in LOW mode.
- **Does the status of the PID alternate between Wipe and Parked?**

Yes
GO to H7 .

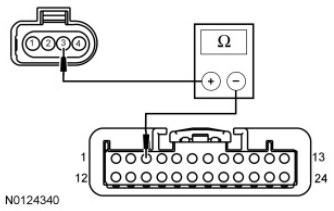
No
GO to H4 .

H4 CHECK THE FRONT WIPER PARK SWITCH CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

- Ignition OFF.
- Disconnect: Windshield Wiper Motor C125.
- Disconnect: BCM C2280D.
- Measure the resistance between windshield wiper motor C125-3, circuit CRW09 (BN/BU), harness side and BCM C2080D-3, circuit CRW09 (BN/BU), harness side.

Yes
GO to H5 .

No
REPAIR the circuit. TEST the system for normal operation.



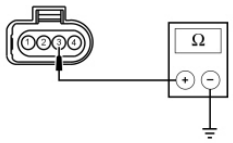
- **Is the resistance less than 5 ohms?**

H5 CHECK THE FRONT WIPER PARK SWITCH CIRCUIT FOR A SHORT TO GROUND

- Measure the resistance between windshield wiper motor C125-3, circuit CRW09 (BN/BU), harness side and ground.

Yes
GO to H6 .

No
REPAIR the circuit. TEST the system for normal operation.



N0124341

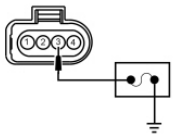
- **Is the resistance greater than 10,000 ohms?**

H6 CHECK THE BCM PID FRONT WIPER PARK SWITCH (FRNWIPER_Prk)

- Connect: BCM C2280D.
- Ignition ON.
- Enter the following diagnostic mode on the scan tool: DataLogger - BCM .
- With the windshield wiper motor C125 disconnected, monitor the BCM PID FRNWIPER_Prk.
- Connect a fused jumper wire between windshield wiper motor C125-3, circuit CRW (BN/BU), harness side and ground.

Yes
GO to H8 .

No
GO to H9 .



N0124342

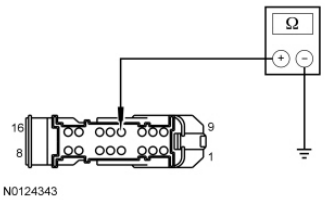
- With the front wiper park switch circuit shorted to ground, monitor the BCM PID FRNWIPER_Prk.
- **Does the status of the PID read Wipe with the windshield wiper motor disconnected and Parked with the wiper park switch circuit shorted to ground?**

H7 CHECK THE FRONT WIPER RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

- Ignition OFF.
- Disconnect: BCM C2280A.
- Measure the resistance between BCM C2080A-12, circuit GD133 (BK), harness side and ground.

Yes
GO to H9 .

No
REPAIR the circuit. TEST the system for normal operation.



N0124343

- **Is the resistance less than 5 ohms?**

H8 CHECK FOR CORRECT WINDSHIELD WIPER MOTOR OPERATION

• Ignition OFF. • Inspect windshield wiper motor C125 for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the windshield wiper motor C125 and make sure it seats correctly. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new windshield wiper motor. REFER to Wiper Motor - Windshield in this section. TEST the system for normal opetion. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

H9 CHECK FOR CORRECT BCM OPERATION

• Ignition OFF. • Inspect the BCM connectors for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the BCM connectors and make sure they seat correctly. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

Pinpoint Test I: The Wipers Will Not PARK at the Correct Position - Rear Window

Refer to Wiri Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

Normal Operation

Integral to the wiper motor is a set of contacts that only close when the wipers are in a NON-PARK position. The Body Control Module (BCM) supplies power to the wiper motor as long as the contacts are closed or the wipers are in a NON-PARK position. When the wipers are commanded OFF during use, the BCM continues to supply the wiper motor with power until the contacts open when the PARK position is reached.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Rear window wiper motor
- BCM

PINPOINT TEST I: THE WIPERS WILL NOT PARK AT THE CORRECT POSITION - REAR WINDOW

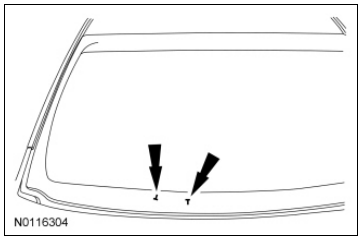
Test Step	Result / Action to Take
I1 CHECK FOR BCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the an tool: Self-Test - BCM . • **Are any BCM DTCs present?**	**Yes** REFER to the Body Control Module (BCM) DTC Chart for further diagnosis. **No** GO to I2 .

I2 CHECK OPERATION OF THE WINDSHIELD WIPERS	
• Operate the windshield wipers in LOW, HIGH and in each INTERMITTENT mode. • **Do the windshield wipers operate correctly?**	**Yes** GO to I3 . **No** IDENTIFY the windshield wiper system symptom and GO to Symptom Chart for further diagnosis.
I3 CHECK OPERATION OF THE REAR WINDOWIPER	
• Operate the windshield wipers in HIGH and turn the rear window wiper ON. • **Does the rear window wiper operate continuously and correctly?**	**Yes** GO to I4 . **No** GO to Pinpoint Test F .
I4 CHECK FOR CORRECT WIPER MOTOR OPERATION	
• Ignition OFF. • Inspect the rear window wiper motor C4218 for the following conditions: ♦ corrosion ♦ damaged or pushed out pins • Connect the rear window wiper motor C4218 and make sure it seats correctly. • Connect: Rear Window Wiper Motor C4218. • Operate the system and verify if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new rear window wiper motor. REFER to Wiper Motor - Re Window in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

Wiper Blade and Pivot Arm Adjustment - Windshield

1. Cycle and park the windshield wipers.

2. Verify that the RH and LH wiper blade tips are aligned to the "T" marks on the lower windshield glass.

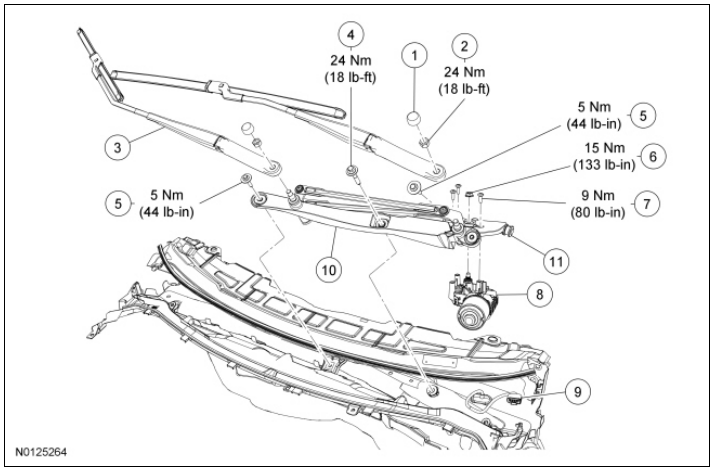


3. **NOTE:** Make sure there is no mechanical binding in the linkage preventing the wiper arms from returning to the full PARK position.

   If not within specification, remove the wiper pivot arms and reposition to the correct location. For additional information, refer to Wiper Pivot Arm - Front In this section.

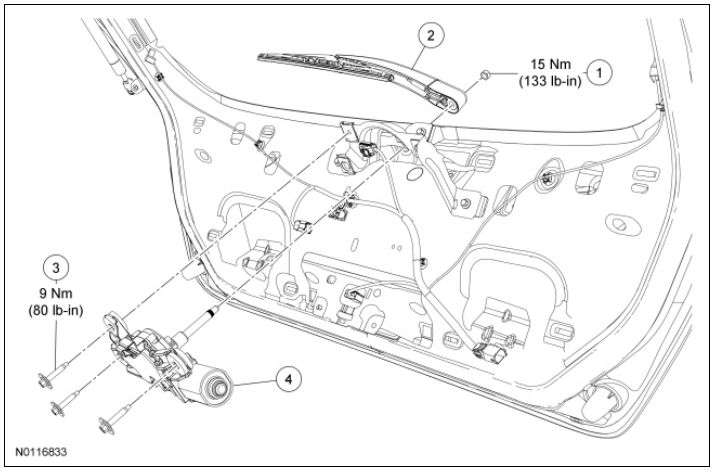
Wiper and Washer System - Exploded View

Windshield Wipers



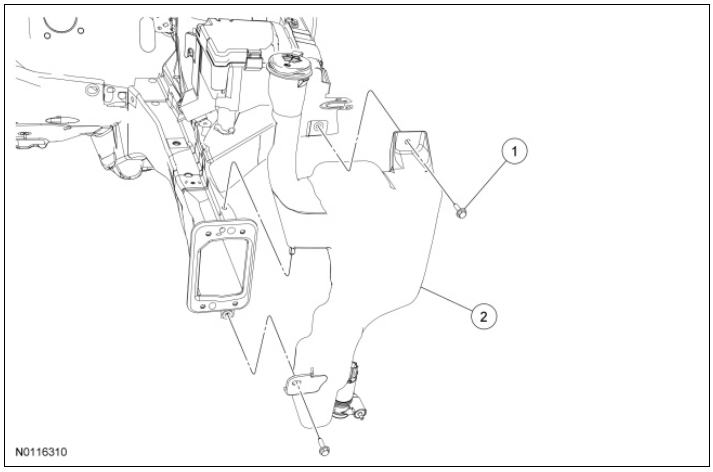
Item	Part Number	Description
1	W710461	Front wiper pivot arm nut cover (2 required)
2	W520404	Front wiper pivot arms nut (2 required)
3	17526 RH/ 17527 LH	Front wiper pivot arm
4	W714182	Wiper mounting arm and pivot shaft center bolt
5	W701121	Wiper mounting arm and pivot shaft end bolt (2 required)
6	-	Windshield wiper motor pivot arm nut (part of 17566)
7	-	Windshield wiper motor bolt (part of 17566) (3 required)
8	17508	Windshield wiper motor
9	-	Windshield wiper motor electrical connector (part of 14290)
10	17566	Wiper mounting arm and pivot shaft assembly
11	-	Wiper mounting arm and pivot shaft mount (part of 17566)

Rear Window Wipers



Item	Part Number	Description
1	W520403	Rear wiper pivot arm nut
2	17526	Rear wiper pivot arm
3	W701389	Rear wear wiper motor bolt
4	17508	Rear wear wiper motor

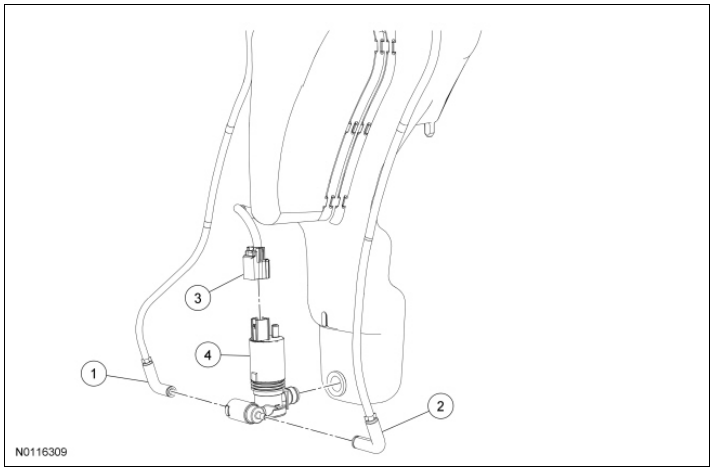
Washer Reservoir



Item	Part Number	Description
1	W700133	Washer reservoir bolt (2 required)
2	17618	Washer reservoir

Washer Pump

NOTE: 5 door washer pump shown, 4 door washer pump similar.



Item	Part Number	Description
1	-	Windshield washer hose (part of 17618)
2	-	Rear window washer hose (part of 17618)
3	-	Washer pump electrical connector (part of 14K012)
4	17664	Washer pump

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

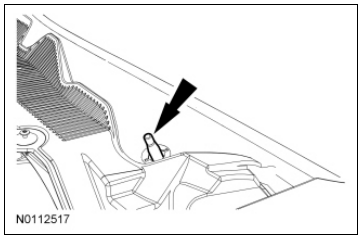
Wiper Pivot Arm - Front

Removal

1. Remove the front wiper pivot arm nut cover.
2. Remove the front wiper pivot arm nut.
3. Using a suitable 2 jaw puller, remove the front wiper pivot arm.

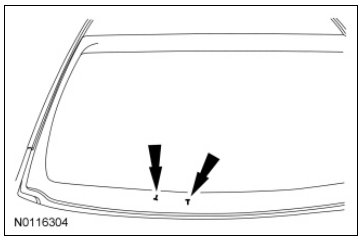
Installation

1. Using a wire brush, clean the front wiper pivot arm shaft.



2. **NOTE:** Make sure the wiper motor is in the full PARK position before installing the wiper pivot arms.

   Install the front wiper pivot arm so that the wiper blade tip is aligned to the "T" marks on the lower windshield glass.



3. Install the front wiper pivot arm nut.
   - To install, tighten to 24 Nm (18 lb-ft).
4. Install the front wiper pivot arm nut cover.

Wiper Mounting Arm and Pivot Shaft

Removal and Installation

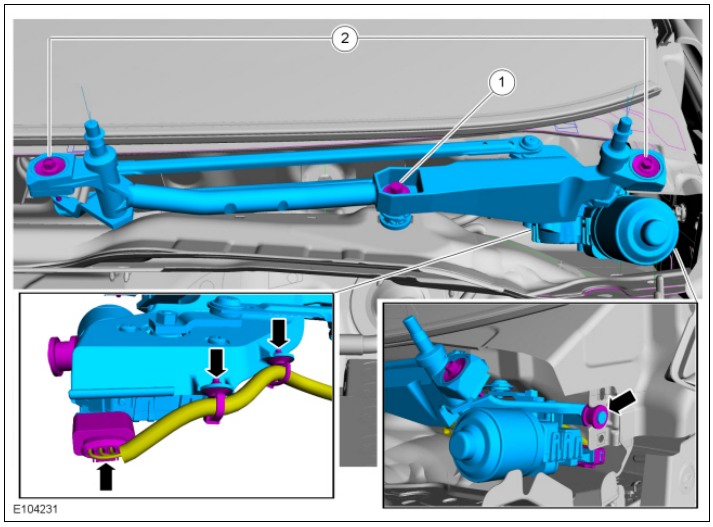
1. Remove the cowl panel grilles. For additional information, refer to Section 501-02 .

2. **NOTE:** Make sure to align the wiper mounting arm pivot shaft mount to the body when installing the wiper mounting arm pivot shaft.

   Remove the wiper mounting arm pivot shaft in the following sequence:

   1. Remove the wiper mounting arm pivot shaft center bolt.
      - ♦ To install, tighten to 24 Nm (18 lb-ft).
   2. Remove the wiper mounting arm pivot shaft end bolts.
      - ♦ To install, tighten to 5 Nm (44 lb-in).

   • Detach the electrical wiring harness retainers and disconnect the electrical connector.



3. To install, reverse the removal procedure.

Wiper Motor - Windshield

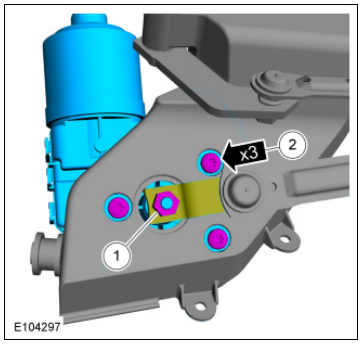
Removal and Installation

1. Remove the wiper mounting arm and pivot shaft. For additional information, refer to Wiper Mounting Arm and Pivot Shaft in this section.

2. **NOTE:** Note the position of the component before removal.

   Remove the windshield wiper motor.

   1. Remove the windshield wiper pivot arm nut.
      - To install, tighten to 15 Nm (133 lb-in).
   2. Remove the 3 windshield wiper motor bolts.
      - To install, tighten to 9 Nm (80 lb-in).

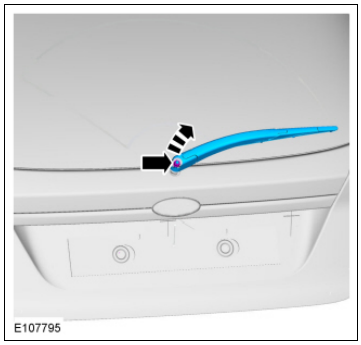


3. To install, reverse the removal procedure.

Wiper Pivot Arm - Rear

Removal and Installation

1. Lift the rear wiper pivot arm nut cover upwards and remove the rear wiper pivot arm nut.
   - To install, tighten to 15 Nm (133 lb-in).



2. Remove the rear pivot wiper arm.

3. To install, reverse the removal procedure.

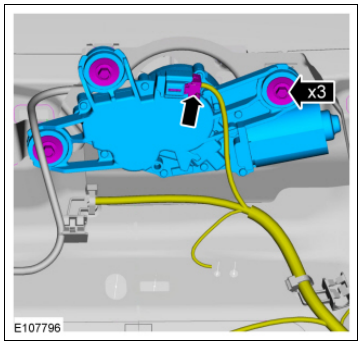
Wiper Motor - Rear Window

Removal and Installation

1. Remove the rear wiper pivot arm. For additional information, refer to Wiper Pivot Arm - Rear in this section.

2. Remove the lower liftgate trim panel. For additional information, refer to Section 501-05 .

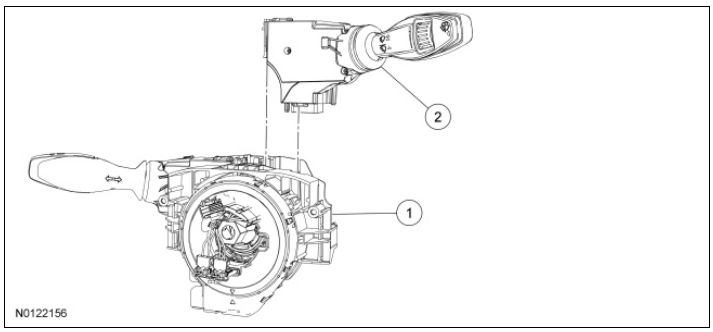
3. Remove the 3 rear wiper motor bolts.
   - To install, tighten to 9 Nm (80 lb-in).
   - Disconnect the electrical connector.



4. Remove the rear wiper motor.

5. To install, reverse the removal procedure.

Wiper/Washer Switch

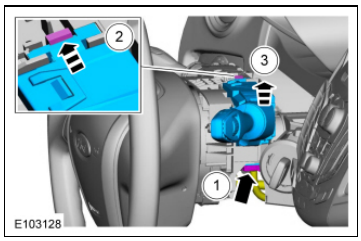


Item	Part Number	Description
1	17A553	Steering column switch carrier
2	6475	Wiper/washer switch

Removal and Installation

1. Remove the steering column shrouds. For additional information, refer to the exploded view in Section 211-05 .

2. Remove the wiper/washer switch.
    1. Disconnect the electrical connector.
    2. Release the wiper/washer switch retaining tab.
    3. Lift upward and remove the wiper/washer switch.



3. To install, reverse the removal procedure.

Washer Pump

Material

Item	Specification
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

Removal and Installation

⚠ **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 operate the washer pump prior to filling the windshield washer reservoir. Failure to follow these instructions may result in premature pump failure.**

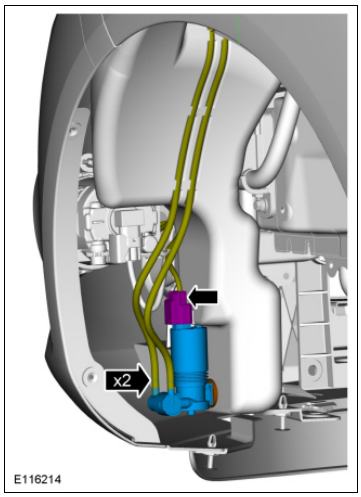
1. Remove the LF fender splash shield. For additional information, refer to Section 501-02 .

2. ***NOTICE:*** **When replacing the washer pump, be careful not to damage the rubber grommet.**

   NOTE: To prevent spilling windshield washer fluid, drain the washer reservoir before washer pump removal.

   Remove the washer pump in the following sequence:

   1. Disconnect the electrical connector.
   2. Disconnect the 2 washer hoses.
   3. Remove the washer pump.



3. To install, reverse the removal procedure.
    - Fill the washer reservoir with windshield washer fluid.

Washer Pump and Reservoir

Material

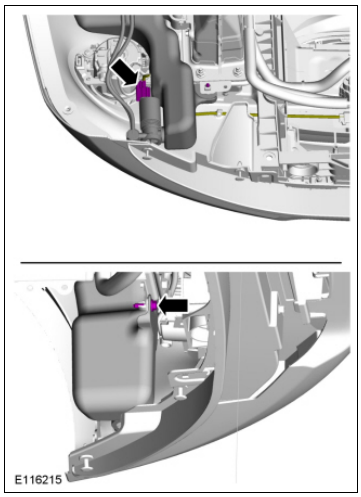
Item	Specification
Motorcraft® Premium Quality Windshield Washer Fluid (Canada) CXC-37-(A, B, D, and F (Canada)	-
Motorcraft® Premium Windshield Washer Concentrate (US) ZC-32-A or B (US)	WSB-M8B16-A2

Removal and Installation

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NOTICE: **Do not operate the washer pump prior to filling the windshield washer reservoir. Failure to follow these instructions may result in premature pump failure.**

1. Remove the LF headlamp assembly. For additional information, refer to Section 417-01 .
2. Remove the upper washer reservoir bolt.
3. Disconnect the washer reservoir hose(s).
4. Remove the LH fender splash shield. For additional information, refer to Section 501-02 .
5. Remove the lower washer reservoir bolt and disconnect the electrical connector.



6. To remove the washer reservoir, lift the washer reservoir slightly upward and then lower the washer reservoir.

7. To install, reverse the removal procedure.

General Specifications

Item	Specification
Roof opening panel glass clearance - front edge	-1.0 - 0.0 mm (-0.04 - 0.0 in) flush at front
Roof opening panel glass clearance - rear edge	0.0 - 1.0 mm (0.0 - 0.04 in) flush at rear

Torque Specifications

Description	Nm	lb-in
Roof opening panel frame bolts	9	80
Roof opening panel frame bracket bolts	9	80
Roof opening panel glass screws	3	27
Roof opening panel motor bolts	3	27

Roof Opening Panel

The roof opening panel consists of the following components:

- Air deflector
- Control switch
- Drain hoses
- Frame
- Glass
- Motor/Module
- Shield
- Trim lace
- Trough assembly
- Weatherstrip

Roof Opening Panel Operation

The roof opening panel is an electronically operated glass panel with one-touch open and one-touch vent features. The roof opening panel assembly uses an integrated motor and module to operate the roof opening panel.

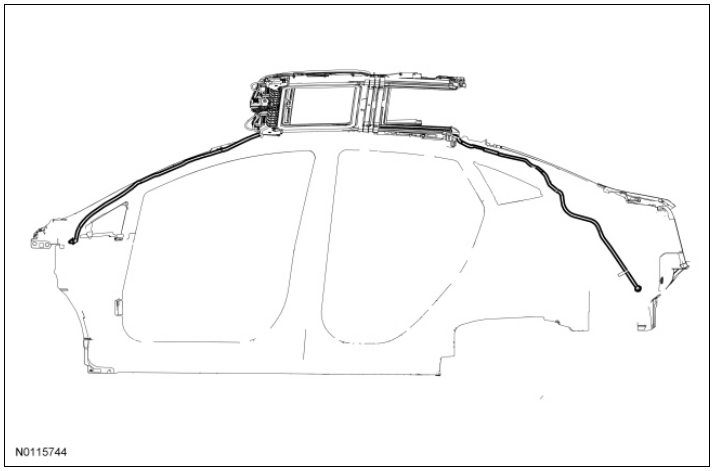
To open the roof opening panel, press and release the rear of the SLIDE control switch. The roof opening panel opens automatically. Press the SLIDE control switch at any time to stop roof opening panel movement.

To vent the roof opening panel, the roof opening panel must be in the CLOSED position. Press and release the rear of the TILT control switch. The roof opening panel automatically moves to the VENT position.

To close the roof opening panel from the VENT (or any other open position), press and hold the front of the TILT or SLIDE control switch until the glass panel stops moving.

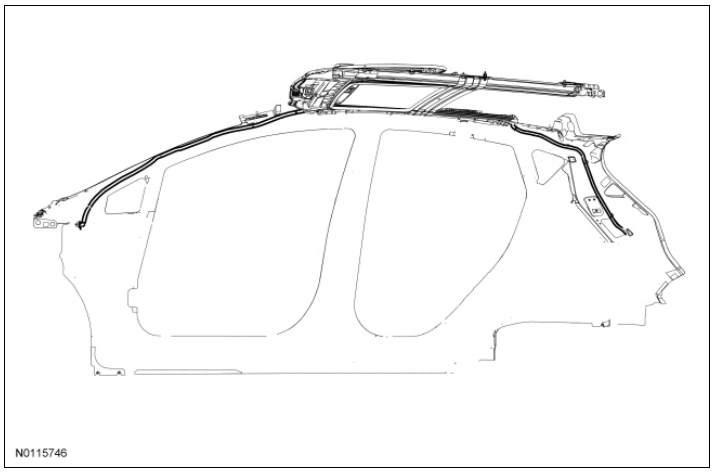
Roof Opening Panel Drain Hose Routing - 4-Door Sedan

NOTE: Passenger side shown, driver side similar.



Roof Opening Panel Drain Hose Routing - 5-Door Hatchback

NOTE: Passenger side shown, driver side similar.



Roof Opening Panel

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent

Principles of Operation

NOTE: The roof opening panel motor must be initialized when repairs are carried out on any part of the roof opening panel system, including:

- whenever the roof opening panel motor has been removed from the roof opening panel system.
- whenever the roof opening panel glass has been removed from the roof opening panel system.
- whenever the roof opening panel assembly has been removed from the vehicle.
- whenever a new roof opening panel motor has been installed.
- whenever a new roof opening panel glass has been installed.
- whenever a new roof opening panel assembly has been installed.

The roof opening panel is an electronically operated glass panel that can be opened, closed or vented by the roof opening panel switch. The roof opening panel assembly uses an integrated motor and module to operate the roof opening panel. The roof opening panel motor and module are installed new as an assembly.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Roof opening panel glass • Roof opening panel air deflector • Roof opening panel alignment • Roof opening panel shield • Trough assembly • Roof opening panel weatherstrip (part of the roof opening panel glass)	• Central Junction Box (CJB) fuse(s): ♦ 24 (7.5A) ♦ 35 (20A) • Wiring, terminals or connectors • Roof opening panel switch

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, determine the symptom. GO to Symptom Chart - Roof Opening Panel or GO to Symptom Chart - NVH .

Symptom Chart - Roof Opening Panel

Symptom Chart - Roof Opening Panel
NOTE: Refer to Description and Operation, Intelligent Access with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states on vehicles with this feature.

Condition	Possible Sources	Action
• The roof opening panel leaks	• Roof opening panel alignment • Drain tube attachment points • Roof opening panel drain hose(s) • Roof opening panel weatherstrip • Trough assembly	• GO to Pinpoint Test B .
• The roof opening panel does not open or close	• Roof opening panel motor not initialized • Fuse • Wiring, terminals or connectors • Roof opening panel switch • Roof opening pane motor/module • Roof opening pane lifter assemblies • Roof opening panel alignment	• GO to Pinpoint Test E .
• The roof opening panel does not open or close in VENT position	• Wiring, terminals or connectors • Roof opening panel switch • Roof opening panel motor/module	• GO to Pinpoint Test F .
• The express open is inoperative	• Roof opening panel motor not initialized • Roof opening panel motor/module	

- INITIALIZE the roof opening panel motor/module. REFER to Roof Opening Panel Initialization in this section. If concern is still present after initialization, INSTALL a new roof opening panel motor/module. REFER to Roof Opening Panel - Exploded View and Roof Opening Panel Motor in this section. TEST the system for normal operation.

- The roof opening panel does not stop in FLUSH from any position

- Roof opening panel alignment

- REFER to Roof Opening Panel Alignment in this section.

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 roof opening panel has excessive wind noise

- Roof opening panel alignment
- Roof opening panel weatherstrip
- Roof opening panel air deflector

- GO to Pinpoint Test A .

- The roof opening panel rattles

- Roof opening panel glass
- Roof opening panel air deflector
- Roof opening panel shield
- Roof opening panel frame
- Trough assembly

- GO to Pinpoint Test C .

- The roof opening panel is noisy during operation

- Roof opening panel alignment
- Roof opening panel frame
- Roof opening panel shield
- Roof opening panel motor/module

- GO to Pinpoint Test D .

Pinpoint Tests

Pinpoint Test A: The Roof Opening Panel Has Excessive Wind Noise

Normal Operation

When the roof opening panel glass is completely closed, it is flush with the roof panel.

This pinpoint test is intended to diagnose the following:

- Roof opening panel alignment
- Roof opening panel weatherstrip
- Roof opening panel motor/module

PINPOINT TEST A: THE ROOF OPENING PANEL HAS EXCESSIVE WIND NOISE

Test Step	Result / Action to Take
A1 VERIFY ROOF OPENING PANEL NOISE	
• Road test the vehicle with the roof opening panel in the CLOSED and OPEN positions. • **Is the wind noise present only in the OPEN position?**	**Yes** GO to A4 . **No** GO to A2 .
A2 CHECK THE ROOF OPENING PANEL WEATHERSTRIP	
NOTE: Make sure the weatherstrip is secured to the glass, not cut, cracked, pinched, loose or obstructed in CLOSED, VENT and OPEN positions. • Check the roof opening panel weatherstrip. • **Is the roof opening panel weatherstrip OK?**	**Yes** GO to A3 . **No** INSTALL a new roof opening panel glass. REFER to Roof Opening Panel Glass in this section. TEST the system for normal operation.
A3 CHECK ROOF OPENING PANEL ALIGNMENT	
• Check the roof opening panel alignment. • **Is the alignment OK?**	**Yes** CHECK for correct installation of the roof opening panel and motor/module. REFER to Roof Opening Panel - Exploded View , Roof Opening Panel and Roof Opening Panel Motor in this section. TEST the system for normal operation. **No** ALIGN the roof opening panel. REFER to Roof Opening Panel Alignment in this section. TEST the system for normal operation.
A4 CHECK THE AIR DEFLECTOR	

• Make sure the air deflector is securely attached and check for damaged or unsecured springs. • **Is the air deflector OK?**	**Yes** Partially CLOSE the roof opening panel until the noise is eliminated. If the noise is eliminated, INFORM the customer that changing glass location will eliminate the wind noise. If the wind noise is not eliminated, RE-ALIGN panel. TEST the system for normal operation. **No** INSTALL new air deflector. REFER to Air Deflector in this section. TEST the system for normal operation.

Pinpoint Test B: The Roof Opening Panel Leaks

Normal Operation

When the roof opening panel glass is completely closed, it should be within specifications. Refer to Specifications in this section.

This pinpoint test is intended to diagnose the following:

- Roof opening panel alignment
- Roof opening panel drain hose(s)
- Roof opening panel seal/weatherstrip
- Roof opening panel frame
- Trough assembly

PINPOINT TEST B: THE ROOF OPENING PANEL LEAKS

Test Step	Result / Action to Take
B1 CHECK THE ROOF OPENING PANEL WEATHERSTRIP AND GLASS ALIGNMENT	
• **NOTE:** Make sure the roof opening panel weatherstrip is not cracked or loose. • Check the roof opening panel weatherstrip condition and verify the roof opening panel glass is aligned properly. • **Is the roof opening panel glass aligned and weatherstrip sealing correctly?**	**Yes** GO to B2 . **No** INSTALL a new roof opening panel glass and/or ALIGN the roof opening panel. REFER to Roof Opening Panel Glass and/or Roof Opening Panel Alignment in this section. TEST the system for normal operation.
B2 CHECK THE ROOF OPENING PANEL DRAIN HOSES	
• **NOTE:** Make sure the roof opening panel drain hoses are not cracked, slit, pinched or obstructed. • Check the 4 roof opening panel drain hoses for correct operation.	**Yes** GO to B3 . **No** REPAIR or INSTALL a new roof opening panel drain hose(s). TEST the system for normal operation.

• **Are the roof opening panel drain hoses OK?**	
B3 CHECK THE ROOF OPENING PANEL DRAIN HOSE ATTACHMENT POINTS	
• **NOTE:** Make sure the roof opening panel drain hose attachment points are not damaged or obstructed. • Check the roof opening panel drain hose attachment points for correct attachment. • **Are the roof opening panel drain hose attachment points OK?**	**Yes** GO to B4 . **No** REPAIR or INSTALL a new roof opening panel frame. REFER to Roof Opening Panel in this section. TEST the system for normal operation.
B4 CHECK THE ROOF OPENING PANEL TROUGH ASSEMBLY CONDITION	
• Check the roof opening panel trough assembly for damage. • **Is the roof opening panel trough assembly OK?**	**Yes** GO to B5 . **No** REPAIR or INSTALL a new roof opening panel trough assembly. REFER to Trough Assembly in this section. TEST the system for normal operation.
B5 CHECK THE CONDITION OF THE ROOF OPENING GLASS	
• Check the roof opening panel frame for damage that may cause the roof opening panel glass seal to seat incorrectly. • **Is the roof opening panel frame OK?**	**Yes** INSTALL a new roof opening panel glass. REFER to Roof Opening Panel Glass in this section. TEST the system for normal operation. **No** REPAIR or INSTALL a new roof opening panel frame. REFER to Roof Opening Panel in this section. TEST the system for normal operation.

Pinpoint Test C: The Roof Opening Panel Rattles

Normal Operation

When the roof opening panel glass is completely closed, it should be within specifications. Refer to Specifications in this section. Make sure all components are properly secured.

This pinpoint test is intended to diagnose the following:

- Roof opening panel glass
- Roof opening panel air deflector
- Roof opening panel shield
- Roof opening panel frame
- Trough assembly

PINPOINT TEST C: THE ROOF OPENING PANEL RATTLES

Test Step	Result / Action to Take
C1 CHECK THE ROOF OPENING PANEL TIGHTNESS	
• With the roof opening panel in the CLOSED position, manually push up and fore/aft on the glass panel. • **Is the roof opening panel glass loose?**	**Yes** ALIGN and TIGHTEN the roof opening panel glass fasteners to specification. REFER to Roof Opening Panel Alignment in this section. TEST the system for normal operation. **No** GO to C2 .
C2 CHECK THE ROOF OPENING PANEL TRACKS	
• Open the roof opening panel. • Check the roof opening panel tracks for obstructions and damage. • **Are the roof opening panel tracks OK?**	**Yes** GO to C3 . **No** REMOVE all the roof opening panel track obstructions and REPAIR the roof opening panel tracks. If the roof opening panel tracks cannot be repaired, INSTALL a new roof opening panel frame. REFER to Roof Opening Panel in this section. TEST the system for normal operation.
C3 CHECK THE ROOF OPENING PANEL SHIELD	
• Check the roof opening panel shield for correct installation. • **Is the roof opening panel shield installed correctly?**	**Yes** GO to C4 . **No** INSTALL the roof opening panel shield correctly. REFER to Roof Opening Panel Shield in this section. TEST the system for normal operation.
C4 CHECK THE AIR DEFLECTOR	
• Check the air deflector for obstructions and damage. • **Is the air deflector OK?**	**Yes** GO to C5 . **No** REMOVE all obstructions and REPAIR or INSTALL a new air deflector. REFER to Air Deflector in this section. TEST the system for normal operation.
C5 CHECK THE ROOF OPENING PANEL LIFTER ASSEMBLIES	
• Verify the roof opening panel lifter assemblies are free from obstructions and damage. • **Are the roof opening panel lifter assemblies OK?**	**Yes** GO to C6 . **No** REMOVE all obstructions from the roof opening panel lifter assemblies and REPAIR any damage. If the roof

	opening panel lifter assemblies cannot be repaired, INSTALL a new roof opening panel frame. REFER to Roof Opening Panel - Exploded View and Roof Opening Panel in this section. TEST the system for normal operation.
C6 CHECK ROOF OPENING PANEL FRAME INSTALLATION	
• Lower the headliner and check all roof opening fasteners for correct torque and verify correct installation of the roof opening panel frame. Refer to Roof Opening Panel - Exploded View and Roof Opening Panel in this section. • **Is the roof opening panel frame correctly installed and tightened to specification?**	**Yes** GO to C7 . **No** TIGHTEN the loose fasteners to the correct specifications or INSTALL the roof opening panel frame correctly. REFER to Roof Opening Panel - Exploded View and Roof Opening Panel in this section. TEST the system for normal operation.
C7 CHECK THE ROOF OPENING PANEL TROUGH ASSEMBLY FOR RATTLES	
• Check the roof opening panel trough assembly for any loose parts or for any condition that will cause rattles. • **Is the trough assembly installed securely and free from any condition that will cause rattles?**	**Yes** GO to C8 . **No** REPAIR or INSTALL a new roof opening panel trough assembly. REFER to Trough Assembly in this section. TEST the system for normal operation.
C8 CHECK THE ROOF OPENING PANEL FRAME FOR RATTLES	
• Check the roof opening panel frame assembly for any loose parts or for any condition that will cause rattles. • **Is there a condition that will cause rattles?**	**Yes** INSTALL a suitable sound damper material to correct the condition. If the rattle still persists, INSTALL a new roof opening panel frame. REFER to Roof Opening Panel - Exploded View and Roof Opening Panel in this section. TEST the system for normal operation. **No** INSTALL a new roof opening panel frame. REFER to Roof Opening Panel in this section. TEST the system for normal operation.

Pinpoint Test D: The Roof Opening Panel is Noisy During Operation

Normal Operation

The roof opening panel operates smoothly and quietly while opening and closing.

This pinpoint test is intended to diagnose the following:
- Roof opening panel alignment
- Roof opening panel frame

- Roof opening panel motor/module

PINPOINT TEST D: THE ROOF OPENING PANEL IS NOISY DURING OPERATION

Test Step	Result / Action to Take
D1 CHECK THE ROOF OPENING PANEL FOR OBSTRUCTIONS OR DAMAGE	
• Check the roof opening panel for any obstructions and damage. • **Are there any obstructions and/or damage?**	**Yes** REMOVE all obstructions. REPAIR any damage. If the damage cannot be repaired, INSTALL a new roof opening panel frame. REFER to Roof Opening Panel in this section. TEST the system for normal operation. **No** GO to D2 .
D2 CHECK THE ROOF OPENING PANEL OPERATION	
• Check the roof opening panel during operation. • **Is the roof opening panel glass loose or incorrectly aligned?**	**Yes** ALIGN the roof opening panel. REFER to Roof Opening Panel Alignment in this section. TEST the system for normal operation. **No** GO to D3 .
D3 CHECK THE ROOF OPENING PANEL TRACKS	
• Open the roof. • Check the roof opening panel tracks for obstructions and damage. • **Are the roof opening panel tracks OK?**	**Yes** GO to D4 . **No** REMOVE all obstructions and REPAIR any damage. If the roof opening panel tracks cannot be repaired, INSTALL a new roof opening panel frame. REFER to Roof Opening Panel in this section. TEST the system for normal operation.
D4 CHECK THE ROOF OPENING PANEL SHIELD	
• Check the roof opening panel shield for correct movement. • **Is the roof opening panel shield moving correctly?**	**Yes** GO to D5 . **No** REMOVE and REINSTALL the roof opening panel shield. If necessary, INSTALL a new roof opening panel shield. REFER to Roof Opening Panel Shield in this section. TEST the system for normal operation.
D5 CHECK THE ROOF OPENING PANEL LIFTER ASSEMBLIES	

• Check the roof opening panel lifter assemblies for obstructions and damage. • **Are the roof opening panel lifter assemblies OK?**	**Yes** GO to D6 . **No** REMOVE all obstructions and REPAIR any damage. If the roof opening panel lifter assemblies cannot be repaired, INSTALL a new roof opening panel frame. REFER to Roof Opening Panel in this section. TEST the system for normal operation.
D6 CHECK THE ROOF OPENING PANEL MOTOR/MODULE	
• Remove the roof opening panel motor/module and leave the electrical connector connected. • Operate the roof opening panel to the fully OPEN and CLOSED position. • **Does the motor/module make excessive noise?**	**Yes** INSTALL a new roof opening panel motor/module. REFER to Roof Opening Panel Motor in this section. TEST the system for normal operation. **No** REINSTALL the roof opening panel motor/module. TEST the system for normal operation. If the roof opening panel is still noisy, INSTALL a new roof opening panel frame. REFER to Roof Opening Panel in this section. If the roof opening panel is no longer noisy, the system is operating correctly. The concern may have been caused by an incorrectly installed roof opening panel motor.

Pinpoint Test E: The Roof Opening Panel Does Not Open or Close

Refer to Wiring Diagrams Cell 101 , Roof Opening Panel for schematic and connector information.

NOTE: The roof opening panel motor must be initialized when repairs are carried out on any part of the roof opening panel system, including:

- whenever the roof opening panel motor has been removed from the roof opening panel system.
- whenever the roof opening panel glass has been removed from the roof opening panel system.
- whenever the roof opening panel assembly has been removed from the vehicle.
- whenever a new roof opening panel motor has been installed.
- whenever a new roof opening panel glass has been installed.
- whenever a new roof opening panel assembly has been installed.

Refer to Roof Opening Panel Motor Initialization in this section.

Normal Operation

The roof opening panel uses an integrated motor and module to operate the roof opening panel. A new roof opening panel motor/module is installed as an assembly.

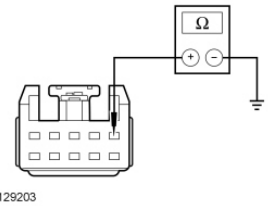
The roof opening panel motor/module and switch receive voltage from the Central Junction Box (CJB) when the ignition is in the RUN position. The roof opening panel switch supplies voltage signals to the roof opening panel motor/module to operate the roof opening panel.

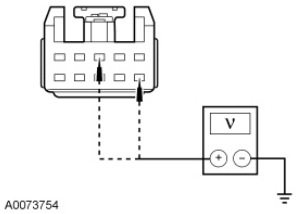
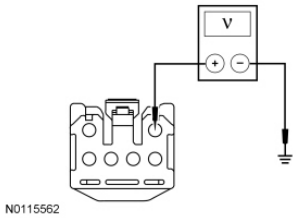
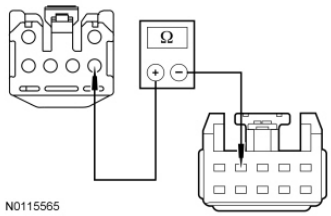
This pinpoint test is intended to diagnose the following:

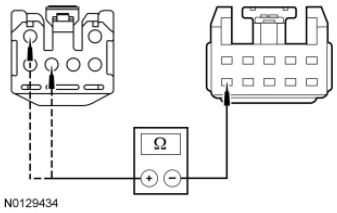
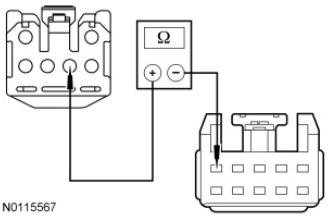
- Fuse(s)

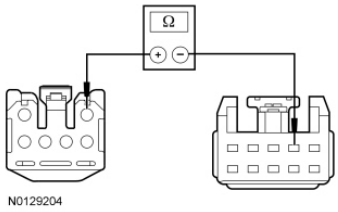
- Wiring, terminals or connectors
- Roof opening panel switch
- Roof opening panel motor/module

PINPOINT TEST E: THE ROOF OPENING PANEL DOES NOT OPEN OR CLOSE

Test Step	Result / Action to Take
E1 CHECK THE ROOF OPENING PANEL SWITCH	
• Ignition OFF. • Disconnect: Roof Opening Panel Switch C912. • Carry out the roof opening panel switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Is the roof opening panel switch OK?**	**Yes** GO to E2 . **No** INSTALL a new roof opening panel switch. TEST the system for normal operation.
E2 CHECK THE ROOF OPENING PANEL MODULE GROUND CIRCUIT FOR AN OPEN	
• Disconnect: Roof Opening Panel Module C921. • Measure the resistance between roof opening panel module C921-1, circuit GD145 (BK/BU), harness side and ground.  N0129203 • **Is the resistance less than 5 ohms?**	**Yes** GO to E3 . **No** REPAIR the circuit. TEST the system for normal operation.
E3 CHECK VOLTAGE TO THE ROOF OPENING PANEL MODULE	
• Ignition ON. • Measure the voltage between ground and ♦ roof opening panel module C921-3, circuit CBP08 (GY/YE) ♦ roof opening panel module C921-6, circuit SBP35 (BU/RD)	**Yes** GO to E4 . **No** VERIFY CJB fuses 24 (7.5A) and 35 (20A) are OK. If OK, REPAIR the affected circuit(s). TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system for

 • **Are the voltages greater than 10 volts?**	normal operation.
E4 CHECK VOLTAGE TO THE ROOF OPENING PANEL SWITCH	
• Ignition OFF. • Connect: Roof Opening Panel Module C921. • Ignition ON. • Measure the voltage between roof opening panel switch C912-1, circuit CBP24 (VT/GN), harness side and ground.  • **Is the voltage greater than 10 volts?**	**Yes** GO to E5 . **No** GO to E8 .
E5 CHECK THE ROOF OPENING PANEL TILT UP CIRCUIT FOR AN OPEN	
• Measure the resistance between roof opening panel switch C912-3, circuit CPR38 (WH/BU), and roof opening panel module C921-4, circuit CPR38 (WH/BU) harness side.  • **Is the resistance less than 5 ohms?**	**Yes** GO to E6 . **No** REPAIR the circuit. TEST the system for normal operation.
E6 CHECK THE ROOF OPENING PANEL CLOSE/DOWN CIRCUIT FOR AN OPEN	

• Measure the resistance between roof opening panel module C921-10, circuit CPR40 (YE/OG), harness side and: ♦ roof opening panel switch C912-2, circuit CPR40 (YE/OG), harness side. ♦ roof opening panel switch C912-5, circuit CPR40 (YE/OG), harness side.  • **Is the resistance less than 5 ohms?**	**Yes** GO to E7 . **No** REPAIR the affected circuit(s). TEST the system for normal operation.
E7 CHECK THE ROOF OPENING PANEL OPEN CIRCUIT FOR AN OPEN	
• Measure the resistance between roof opening panel switch C912-4, circuit CPR31 (VT/BN), and roof opening panel module C921-5, circuit CPR31 (VT/BN), harness side.  • **Is the resistance less than 5 ohms?**	**Yes** GO to E9 . **No** REPAIR the circuit. TEST the system for normal operation.
E8 CHECK THE ROOF OPENING PANEL SWITCH VOLTAGE CIRCUIT FOR AN OPEN	
• Measure the resistance between roof opening panel switch C912-1, circuit CPR39 (VT/WH), and roof opening panel module C921-2, circuit CPR39 (VT/WH), harness side.	**Yes** GO to E9 . **No** REPAIR the circuit. TEST the system for normal operation.

 • **Is the resistance less than 5 ohms?**	
E9 CHECK THE ROOF OPENING PANEL MOTOR/MODULE FOR CORRECT OPERATION	
• Inspect the roof opening panel motor/module electrical connector. • Check for: ♦ corrosion. ♦ bent pins. ♦ pushed-out pins. • Connect the roof opening panel motor/module connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new roof opening panel motor/module. REFER to Roof Opening Panel Motor in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. TEST the system for normal operation.

Pinpoint Test F: The Roof Opening Panel Does Not Open or Close in VENT Position

Refer to Wiring Diagrams Cell 101 , Roof Opening Panel for schematic and connector information.

NOTE: The roof opening panel motor must be initialized when repairs are carried out on any part of the roof opening panel system, including:

- whenever the roof opening panel motor has been removed from the roof opening panel system.
- whenever the roof opening panel glass has been removed from the roof opening panel system.
- whenever the roof opening panel assembly has been removed from the vehicle.
- whenever a new roof opening panel motor has been installed.
- whenever a new roof opening panel glass has been installed.
- whenever a new roof opening panel assembly has been installed.

Refer to Roof Opening Panel Motor Initialization in this section.

Normal Operation

The roof opening panel uses an integrated motor and module to operate the roof opening panel. A new roof opening panel motor/module is installed as an assembly.

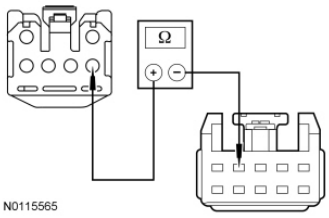
The roof opening panel motor/module and switch receive voltage from the Central Junction Box (CJB) when the ignition is in the RUN position. The roof opening panel switch supplies voltage signals to the roof opening panel motor/module to operate the roof opening panel.

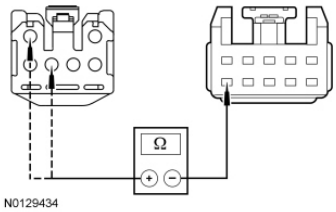
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors

- Roof opening panel switch
- Roof opening panel motor/module

PINPOINT TEST F: THE ROOF OPENING PANEL DOES NOT OPEN OR CLOSE IN VENT POSITION

Test Step	Result / Action to Take
F1 CHECK THE ROOF OPENING PANEL SWITCH	
• Ignition OFF. • Disconnect: Roof Opening Panel Switch C912. • Carry out the roof opening panel switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Is the roof opening panel switch OK?**	**Yes** GO to F2 . **No** INSTALL a new roof opening panel switch. TEST the system for normal operation.
F2 CHECK THE ROOF OPENING PANEL CONTROL CIRCUIT FOR AN OPEN	
• Disconnect: Roof Opening Panel Motor/Module C921. • Measure the resistance between roof opening panel switch C912-3, circuit CPR38 (WH/BU), and roof opening panel motor/module C921-4, circuit CPR38 (WH/BU) harness side.  • **Is the resistance less than 5 ohms?**	**Yes** GO to F3 . **No** REPAIR the circuit. TEST the system for normal operation.
F3 CHECK THE ROOF OPENING PANEL CONTROL CIRCUIT FOR AN OPEN	
• Measure the resistance between roof opening panel module C921-10, circuit CPR40 (YE/OG), harness side and: ♦ roof opening panel switch C912-2, circuit CPR40 (YE/OG), harness side. ♦ roof opening panel switch C912-5, circuit CPR40 (YE/OG), harness side.	**Yes** GO to F4 . **No** REPAIR the affected circuit(s). TEST the system for normal operation.

 • **Is the resistance less than 5 ohms?**	
F4 CHECK THE ROOF OPENING PANEL MOTOR/MODULE FOR CORRECT OPERATION	
• Inspect the roof opening panel motor/module electrical connector. • Check for: ♦ corrosion. ♦ bent pins. ♦ pushed-out pins. • Connect the roof opening panel motor/module connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new roof opening panel motor/module. REFER to Roof Opening Panel Motor in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. TEST the system for normal operation.

Roof Opening Panel Alignment

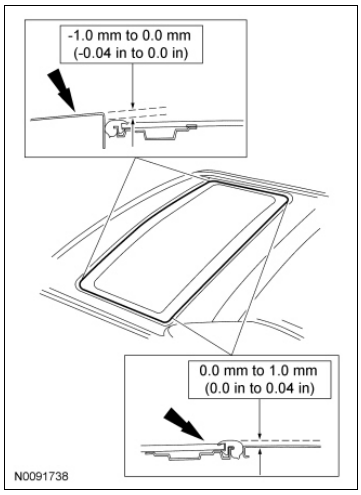
NOTE: The roof opening panel motor must be initialized when repairs are carried out on any part of the roof opening panel system, including: whenever the roof opening panel motor has been removed from the roof opening panel system, the roof opening panel glass has been removed from the roof opening panel system, the roof opening panel assembly has been removed from the vehicle, a new roof opening panel motor has been installed, a new roof opening panel glass has been installed or a new roof opening panel assembly has been installed. For additional information, refer to Roof Opening Panel Motor Initialization in this section.

1. Position the roof opening panel to the CLOSED position.

2. Place a suitable 1.0-1.2 mm (0.040-0.050 in) thick, 150 mm (5.9 in) long plastic spacer between the rear edge of the roof opening panel glass and the roof panel opening.

3. Loosen the 4 roof opening panel glass screws.

4. Make sure the roof opening panel is centered in the roof opening. Adjust the roof opening panel glass height to specification.



5. Tighten the 4 roof opening panel glass screws to 3 Nm (27 lb-in).

6. **NOTE:** Remove the plastic spacer.

   Initialize the roof panel opening motor. For additional information, refer to Roof Opening Panel Motor Initialization in this section.

Roof Opening Panel Motor Initialization

⚠ **WARNING: Keep objects and body parts clear of the glass panel when carrying out the initialization procedure. During the initialization procedure, the glass panel closes with high force and cannot detect objects in its path. Failure to follow this instruction may result in serious personal injury.**

NOTE: A new roof opening panel motor only moves towards the VENT position until it is initialized.

NOTE: The roof opening panel motor must be initialized when repairs are carried out on any part of the roof opening panel system, including:

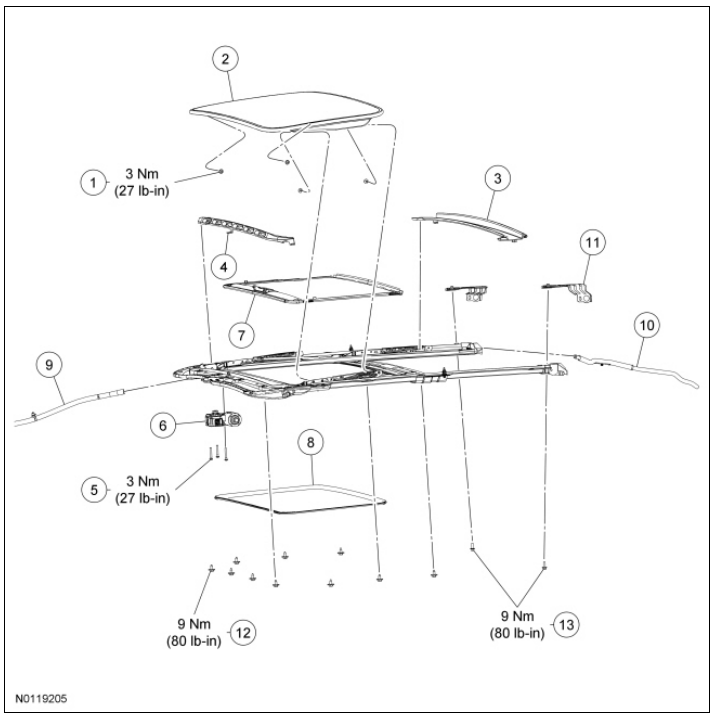
- whenever the roof opening panel motor has been removed from the roof opening panel system.
- whenever the roof opening panel glass has been removed from the roof opening panel system.
- whenever the roof opening panel assembly has been removed from the vehicle.
- whenever a new roof opening panel motor has been installed.
- whenever a new roof opening panel glass has been installed.
- whenever a new roof opening panel assembly has been installed.

1. Turn the ignition OFF. **For a new roof opening panel motor** , only carry out Step 2. **For an existing roof opening panel motor** , only carry out Step 3.

2. **For a new roof opening panel motor:**
    1. Turn the ignition ON.
    2. Press and hold the front of the SLIDE control switch until the roof opening panel glass moves slightly past the full VENT position and suddenly returns back to the full VENT position.
    3. Release and quickly press and hold the front of the SLIDE control switch while the roof opening panel glass moves to the full OPEN position and then back to fully CLOSED position (movement starts approximately 3 seconds after the switch is pressed).
    4. Release the switch and verify successful initialization by performing one-touch open and one-touch VENT operations

3. **For an existing roof opening panel motor:**
    1. Turn the ignition ON.
    2. Using the SLIDE and/or TILT control switch, position the roof opening panel into the full VENT position.
    3. Press and hold the front of the SLIDE control switch (for approximately 10 seconds) until the roof opening panel glass moves slightly past the full VENT position and suddenly returns back to the full VENT position.
    4. Release the switch and quickly press and hold the front of the SLIDE control switch while the roof opening panel glass moves to the full OPEN position and then back to fully CLOSED position (movement starts approximately 3 seconds after the switch is pressed).
    5. Release the switch and verify successful initialization by performing one-touch open and one-touch VENT operations

Roof Opening Panel - Exploded View



Item	Part Number	Description
1	31014	Roof opening panel glass screws (4 required)
2	500A18	Roof opening panel glass
3	518A30	Trough assembly
4	500A26	Air deflector
5	38682	Roof opening panel motor bolts (3 required)
6	15B1689	Roof opening panel motor
7	519A02	Roof opening panel shield
8	5450980	Headliner retainer
9	502C52	Front drain hose (2 required)
10	502C53	Rear drain hose (2 required)
11	2919891 (RH) / 2929892 (LH)	Roof opening panel frame brackets
12	W505253	Roof opening panel frame bracket bolts (2 required)
13	W702704	Roof opening panel frame bolts (10 required)

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

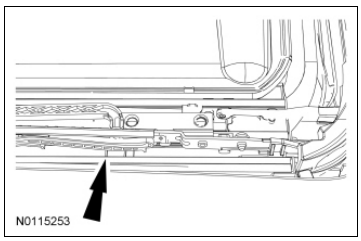
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Air Deflector

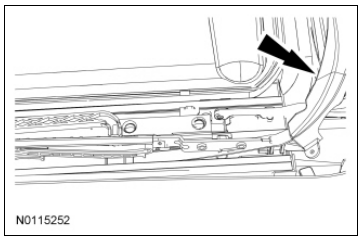
Removal and Installation

1. Place the roof opening panel in the full OPEN position.

2. From the top of the vehicle and using a flat-blade screwdriver, press the spring steel locating tab down on each side while pushing the deflector toward the rear of the vehicle.



3. Tilt the air deflector upward and pull forward to remove.



4. To install, reverse the removal procedure.
    - Make sure the locating tabs are locked firmly in place.
    - Initialize the roof opening panel motor. For additional information, refer to Roof Opening Panel Motor Initialization in this section.

Roof Opening Panel

Removal

1. **NOTE:** Make sure the roof opening panel is in the CLOSED position.

   Remove the headliner. For additional information, refer to Section 501-05 .

2. Disconnect the 2 front and the 2 rear drain hoses from the roof opening panel.

3. Disconnect the roof opening panel motor electrical connector.

4. Remove the 10 roof opening panel frame bolts, the 2 roof opening panel frame bracket bolts and the roof opening panel.
   - With the aid of an assistant, compress the legs of the roof opening panel retaining clip and lower the roof opening panel.

5. If installing a new roof opening panel frame, transfer components as necessary.

Installation

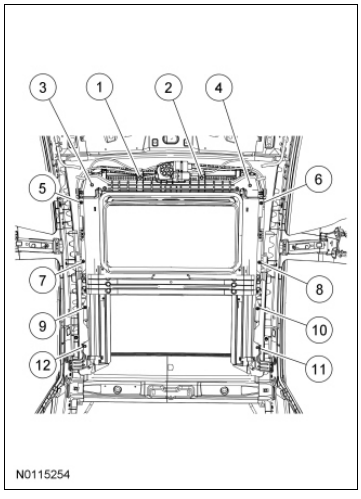
1. **NOTE:** Make sure the roof opening panel is positioned correctly on the retaining clip before tightening the roof opening panel bolts.

   NOTE: Do not fully tighten the roof opening panel frame bolts at this stage.

   Compress the legs of the roof opening panel retaining clip and install the roof opening panel.

   - Loosely install the 10 roof opening panel frame bolts and the 2 roof opening panel frame bracket bolts.

2. Tighten the 10 roof opening panel frame bolts and the 2 roof opening panel frame bracket bolts in the sequence shown.
   - Tighten to 9 Nm (80 lb-in).



3. Connect the roof opening panel motor electrical connector.

4. Connect the 2 front and the 2 rear drain hoses to the roof opening panel.

5. Install the headliner. For additional information, refer to Section 501-05 .

6. Initialize the roof opening panel motor. For additional information, refer to Roof Opening Panel Motor Initialization in this section.

Roof Opening Panel Glass

Removal

NOTE: The roof opening panel motor must be initialized when repairs are carried out on any part of the roof opening panel system, including: whenever the roof opening panel motor has been removed from the roof opening panel system, the roof opening panel glass has been removed from the roof opening panel system, the roof opening panel assembly has been removed from the vehicle, a new roof opening panel motor has been installed, a new roof opening panel glass has been installed or a new roof opening panel assembly has been installed. For additional information, refer to Roof Opening Panel Motor Initialization in this section.

1. Position the roof opening panel to the CLOSED position.
2. Remove the 4 roof opening panel glass screws.
3. Remove the roof opening panel glass.

Installation

1. **NOTE:** Do not fully tighten the roof opening panel glass screws at this stage.

   Position the roof opening panel glass and loosely install the 4 screws.
2. Align the roof opening panel glass. For additional information, refer to Roof Opening Panel Alignment in this section.
3. Initialize the roof opening panel motor. For additional information, refer to Roof Opening Panel Motor Initialization in this section.

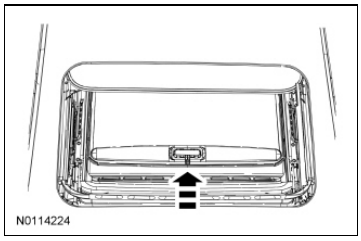
Roof Opening Panel Shield

Removal and Installation

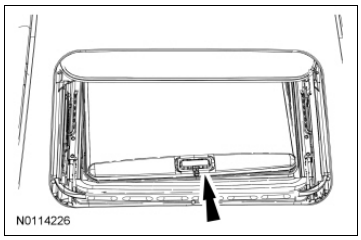
1. Remove the roof opening panel glass. For additional information, refer to Roof Opening Panel Glass in this section.

2. Slide the roof opening panel shield forward halfway.

3. Disengage the roof opening panel shield guide feet.
   - Lift the front portion of the roof opening panel shield upward at center until able to disengage one of the front guide feet.



4. With one of the guide feet released, carefully rotate the roof opening panel to disengage the remaining guide feet.



5. To install, reverse the removal procedure.

Roof Opening Panel Motor

Removal

NOTE: The roof opening panel motor must be initialized when repairs are carried out on any part of the roof opening panel system, including: whenever the roof opening panel motor has been removed from the roof opening panel system, the roof opening panel glass has been removed from the roof opening panel system, the roof opening panel assembly has been removed from the vehicle, a new roof opening panel motor has been installed, a new roof opening panel glass has been installed or a new roof opening panel assembly has been installed. For additional information, refer to Roof Opening Panel Motor Initialization in this section.

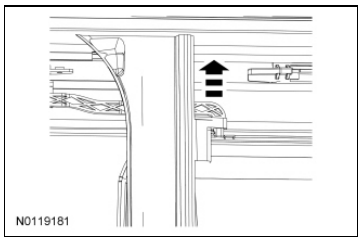
1. Remove the LH and RH A- and B-pillar trim panels. For additional information, refer to Section 501-05 .
2. Remove the roof opening panel headliner retainer (trim ring).
3. Remove the LH and RH sun visors.
4. Position aside the front door weatherstrip as necessary and lower the front portion of the headliner.
5. Disconnect the roof opening panel motor electrical connector.
6. Remove the 3 bolts and the roof opening panel motor.

Installation

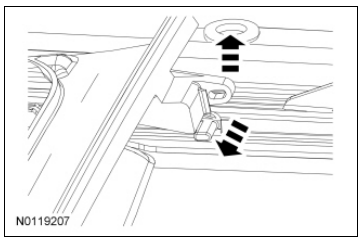
1. Install the roof opening panel motor and the 3 bolts.
   - Tighten to 3 Nm (27 lb-in).
2. Connect the roof opening panel motor electrical connector.
3. Raise the front of the headliner and reposition the front door weatherstrip.
4. Install the LH and RH sun visors.
5. Install the roof opening panel headliner retainer (trim ring).
6. Install the LH and RH A- and B-pillar trim panels. For additional information, refer to Section 501-05 .
7. Initialize the roof opening panel motor. For additional information, refer to Roof Opening Panel Motor Initialization in this section.

Trough Assembly

1. Remove the roof opening panel glass. For additional information, refer to Roof Opening Panel Glass .
2. Remove the roof opening panel, For additional information, refer to Roof Opening Panel .
3. Using a suitable tool, pry the trough assembly guides from the trough assembly.

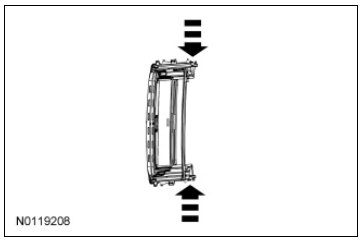


4. Gently raise the trough assembly and slide the trough assembly guides under the trough assembly.



5. Slide the trough assembly rearward until the trough assembly is approximately 76.2 mm (3 in) from the roof opening panels rear edge.
6. ***NOTICE:*** **Use care when disconnecting the trough assembly from the roof opening panel tracks to prevent damage to the trough assembly.**

   Gently flex the roof opening panel tracks and release the trough assembly from the tracks.

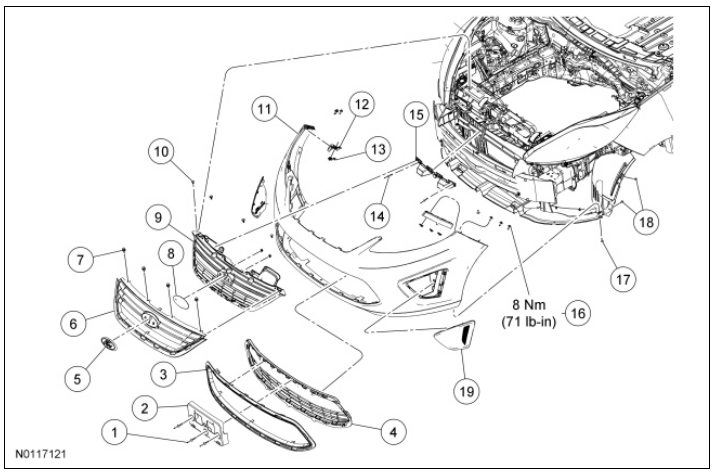


7. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-ft	lb-in
Front bumper bolts	25	18	-
Front bumper cover bolts	8	-	71
Rear bumper nuts	25	18	-

Bumper - Exploded View, Front



Item	Part Number	Description
1	W705297	License plate bracket rivet (3 required)
2	17A385	License plate bracket
3	8200	Lower radiator grille outer frame
4	8200	Lower radiator grille
5	8213	Emblem
6	8200	Upper radiator grille
7	N807389	Upper radiator grille pin-type retainer (4 required)
8	8213	Emblem base (5-door hatchback only)
9	8A284	Upper radiator grille reinforcement
10	W714040	Upper radiator grille reinforcement pin-type retainer (4 required)
11	17D957	Front bumper cover
12	17E856/ 17E857	Front bumper cover bracket (RH/LH)
13	W520822	Front bumper cover bracket nut (6 required)
14	W706737	Upper radiator grille lower reinforcemnet bracket rivet
15	8A284	Upper rtor grille lower reinforcement bracket
16	W503924	Front bumper cover screw (6 required)
17	W710763	Radiator lower air deflector retainer (3 required)
18	W701054	Front fender splash shield retainers (4 required)
19	17E810/ 17E811	Supplemental parking lamps cover (RH/LH)

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

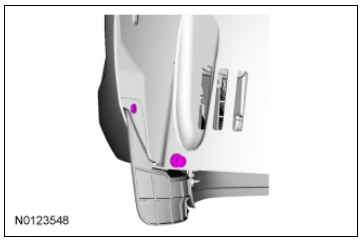
Bumper Cover - Front

Removal and Installation

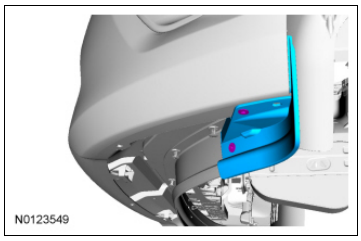
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the front wheels and tires. For additional information, refer to Section 204-04 .

3. If equipped, remove the 2 front stone deflector extension retainers on both sides from inside the front wheel wells.

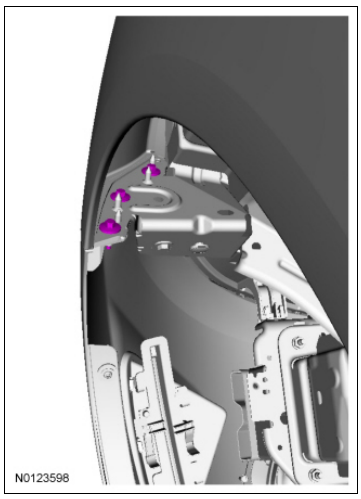


4. If equipped, remove the 2 bolts and both of the front stone deflector extension.



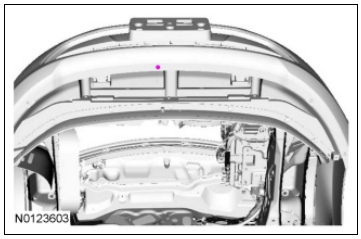
5. Remove both front fender sh shields. For additional information, refer to Section 501-02 .

6. Disconnect the front bumper cover from the bumper cover brackets.
    1. Remove the 3 front bumper cover-to-front bumper cover bracket bolts on both sides.
        - To install, tighten to 8 Nm (71 lb-in).
    2. Gently pull down on the front bumper cover to disconnect it from the bumper cover brackets on both sides.

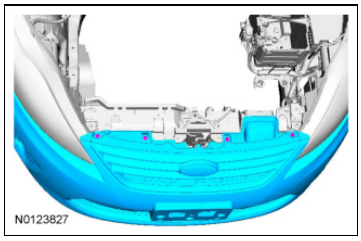


7. If equipped, disconnect the auxiliary parking lamp electrical connectors.

8. Remove the front bumper cover bolt on the underside of vehicle.

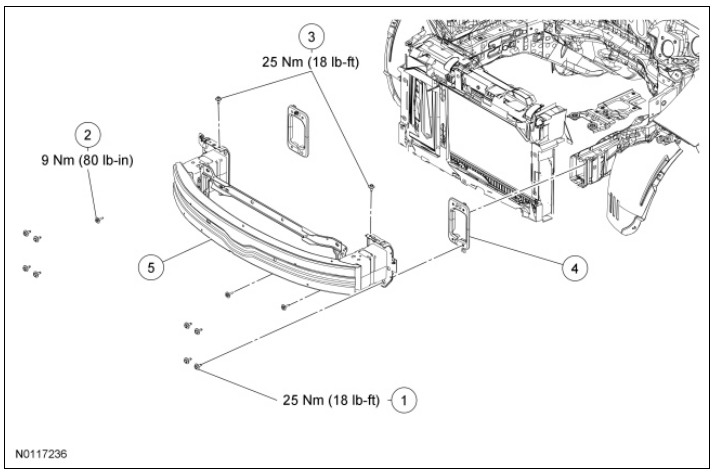


9. Remove the 4 upper radiator grille reinforcement-to-radiator support pin-type retainers and remove the front bumper cover assembly.



10. To install, reverse the removal procedure.
    - Transfer all necessary components.

Bumper - Front



Item	Part Number	Description
1	W709933	Front bumper bolt (8 required)
2	W701121	Front bumper-to-radiator grille opening panel reinforcement bolt (4 required)
3	W713533	Radiator grille opening panel reinforcement-to-front bumper bolts (2 required)
4	17B749/ 17B750	Front bumper mounting bracket (RH/LH)
5	17757	Front bumper

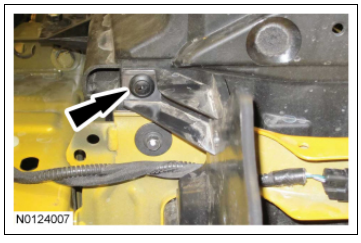
1. Remove the front severity sensors. For additional information, refer to Section 501-20B .

2. Disconnect the front severity sensors wiring harness retainers from the front bumper.

3. Remove the both headlamp assemblies.
    1. Remove the 3 headlamp assembly bolts.
        ♦ To install, tighten to 5 Nm (44 lb-in).
    2. Disconnect and remove both headlamp assemblies.

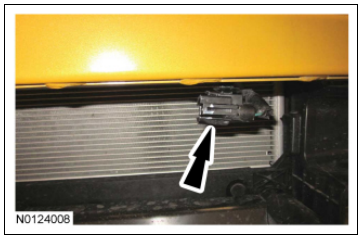
5. Disconnect the wiring harnesses attached to the front bumper.
    - 3 on the RH side.
    - 4 on the LH side.

6. If equipped, remove the 2 radiator side air deflector upper retainers.



7. If equipped, remove the 2 retainers and the both lower air deflectors.

8. Disconnect and remove the ambient temperature sensor from the bottom of the front bumper.



9. Support the underside of the radiator support housing prior to removing the front bumper bolts.

10. Remove the 2 radiator grille opening panel reinforcement-to-front bumper bolts.
    - To install, tighten to 25 Nm (18 lb-ft).

11. Remove the 4 front bumper-to-radiator grille opening panel reinforcement bolts.
    - To install, tighten to 9 Nm (80 lb-in).

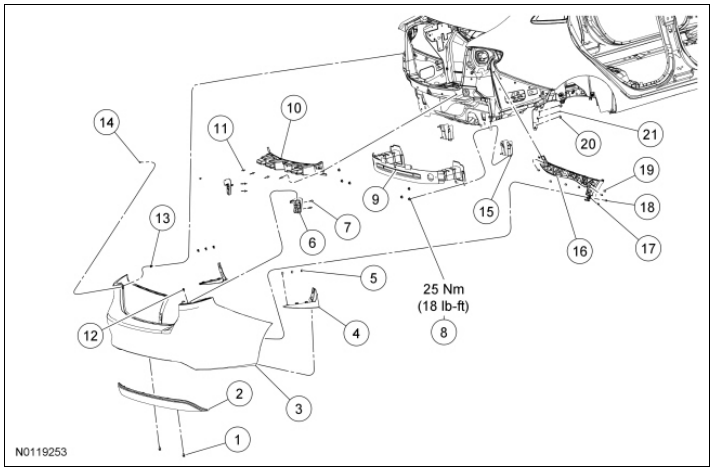
12. Remove the radiator grille opening panel reinforcement support-front bumper bolt.
    - To install, tighten to 9 Nm (80 lb-in).

13. With the help of an assistant, remove the 8 front bumper bolts and remove the front bumper.
    - To install, tighten to 25 Nm (18 lb-ft).

14. To install, reverse the removal procedure.

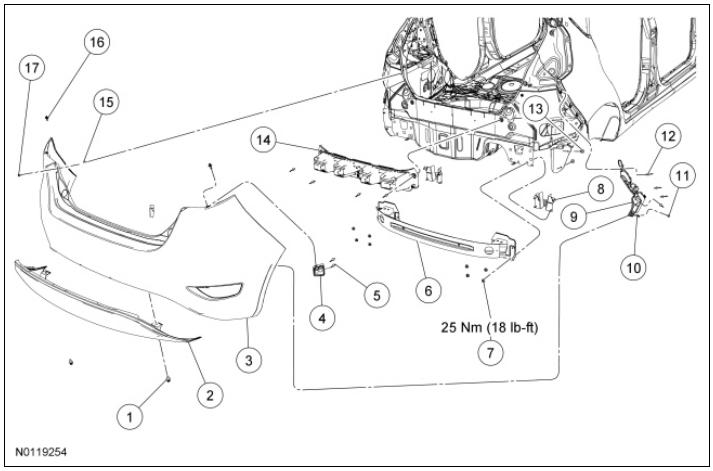
Bumper - Exploded View, Rear

4-Door Sedan



Item	Part Number	Description
1	W711035	Rear stone deflector pin-type retainer (2 required)
2	17808	Rear stone deflector
3	17K835	Rear bumper cover
4	16A550	Rear mudflap (RH/LH)
5	W710754	Rear mudflap clip (6 required)
6	17D942/ 17D943	Rear bumper cover mounting bracket (RH/LH)
7	W709095	Rear bumper cover mounting bracket rivet (4 required)
8	W706817	Rear bumper nut (6 required)
9	17906	Rear bumper
10	17D995	Rear bumper cover center reinforcement
11	W709095	Rear bumper cover center reinforcement rivet (4 required)
12	16K262	Rear bumper cover-to-rear bumper cover mounting bracket pin-type retainer (2 required)
13	W707977	Rear bumper cover retainer nut (2 required)
14	W713090	Rear bumper cover w (2 required)
15	17A750	Rear bumper mounting bracket (RH/LH)
16	17D942/ 17D943	Rear bumper cover reinforcement (RH/LH)
17	W708590	Rear bumper cover reinforcement retainer nut (2 required)
18	W700092	Rear bumper cover-to-rear bumper cover reinforcement retainer (2 required)
19	W709095	Rear bumper cover reinforcement rivet (12 required)
20	W701054	Rear wheel splash shield pin-type retainer (2 required)
21	W707433	Rear mudflap retainer (2 required)

5-Door Hatchback



Item	Part Number	Description
1	W711035	Rear stone deflector pin-type retainer (2 required)
2	17808	Rear stone deflector
3	17K835	Rear bumper cover
4	17D942/ 17D943	Rear bumper cover mounting bracket (RH/LH)
5	W709095	Rear bumper cover mounting bracket rivet (4 required)
6	17906	Rear bumper
7	W706817	Rear bumper nut (8 required)
8	17A750	Rear bumper mounting bracket (RH/LH)
9	17D942/ 17D943	Rear bumper cover reinforcement (RH/LH)
10	W708590	Rear bumper cover reinforcement retainer nut (2 required)
11	W700092	Rear bumper cover-to-rear bumper cover reinforcement retainer (2 required)
12	W709095	Rear bumper cover reinforcement rivet (8 required)
13	W701054	Rear wheel splash shield pin-type retainer (4 required)
14	17D995	Rear bumper cover center reinforcement
15	W707977	Rear bumper cover retainer nut (2 required)
16	16K262	Rear bumper cover-to-rear bumper cover mounting bracket pin-type retainer (2 required)
17	W713090	Rear bumper cover screw (2 required)

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

Bumper Cover - Rear

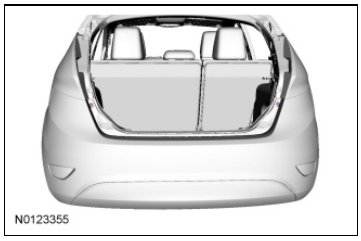
Removal and Installation

4-Door Sedan and 5-Door Hatchback

NOTE: Illustrations are from a 5-door hatchback, 4-door sedan similar.

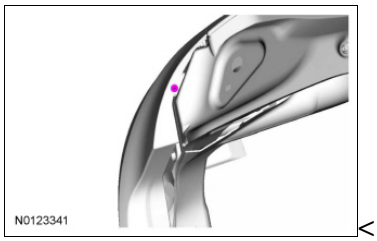
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the 2 rear bumper screws.



3. Remove the rear lamp assembly. For additional information, refer to Section 417-01 .

4. Remove the rear bumper cover-to-rear bumper cover mounting bracket pin-type retainer.

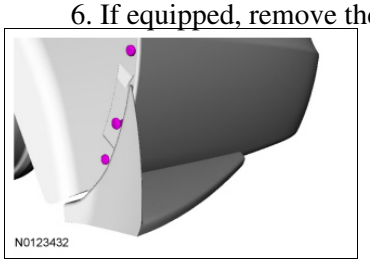


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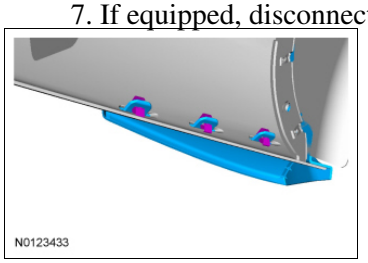
5. Remove both rear wheels and tires. For additional information, refer to Section 204-04 .

4-Door Sedan

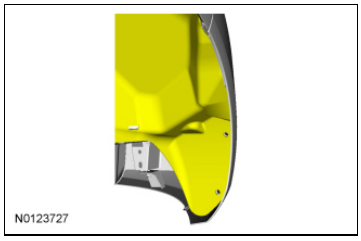
6. If equipped, remove the 3 rear mudflap retainers.



7. If equipped, disconnect the 3 clips and remove the rear mudflaps.

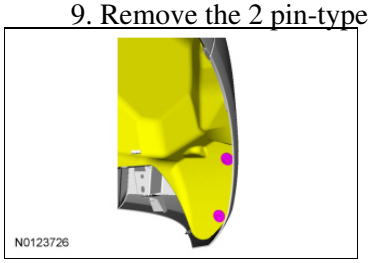


8. Position both rear wheel splash shields aside.



5-Door Hatchback

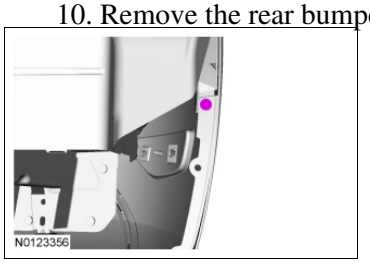
9. Remove the 2 pin-type retainers and position both rear wheel splash shields.



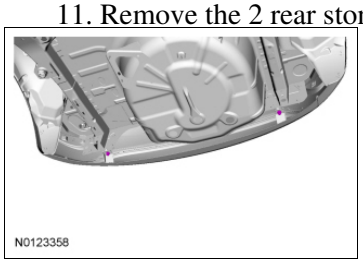
4-Door Sedan and 5-Door Hatchback

NOTE: 5-door hatchback shown, 4-door sedan similar.

10. Remove the rear bumper cover-to-bumper cover bracket bolt.

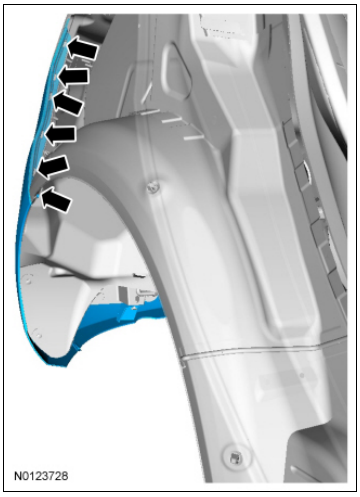


11. Remove the 2 rear stone deflector-to-rear bumper bracket pin-type retainers.



12. **NOTE:** The rear bumper cover is attached to the rear bumper cover brackets by 6 clips on each side.

    Release the 6 clips on each side and remove the rear bumper cover.



13. Inspect the rear bumper cover mounting brackets for damage at the attaching points. If necessary, install new bumper cover mounting reinforcements before installation.
14. To install, reverse the removal procedure.
    - Transfer parts as necessary.

Bumper - Rear

Removal and Installation

1. Remove the rear bumper cover. For additional information, refer to Bumper Cover - Rear in this section.

2. Remove the rear bumper nuts.
   - 4-door sedan has 6 nuts (3 each side).
   - 5-door hatchback has 8 nuts (4 each side).
   - To install, tighten to 25 Nm (18 lb-ft).

3. Remove the rear bumper.

4. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-ft	lb-in
Front Safety Belts			
D-ring bolt	40	30	-
Safety belt anchor bolt	40	30	-
Safety belt buckle bolt	48	35	-
Safety belt retractor and pretensioner large bolt	40	30	-
Safety belt retractor and pretensioner small bolt	14	-	124
Safety belt retractor bolt	40	30	-
Safety belt shoulder height adjuster bolt	40	30	-
Rear Safety Belts			
Child safety seat tether anchor bolt	28	21	-
D-ring bolt	40	30	-
Hinge pin bolt	38	28	-
Safety belt anchor bolt (with and without safety belt buckle)	48	35	-
Safety belt buckle bolt	48	35	-
Safety belt retractor bolt, rear, center, 4-door sedan	40	30	-
Safety belt retractor bolt, rear, center, 5-door hatchback	48	35	-
Safety belt retractor bolt, rear, outboard	40	30	-

Safety Belt System

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 Component Tests 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.

Use only the replacement parts specified in the Ford Catalog AdvantageTM or equivalent when installing new safety belt buckles and/or retractor assemblies.

Active Restraint System Components

The active restraint system consists of the following serviceable items:

- Front safety belt shoulder height adjusters
- Front safety belt buckles attached to the inboard side of the seats
- Front safety belt retractors and pretensioners (pretensioner feature available only on vehicles equipped with Supplemental Restraint System (SRS)) located behind the lower B-pillar trim panels
- Rear center safety belt retractor attached to the parcel shelf sheet metal (4-door sedan) or LR seat frame (5-door hatchback) and LH safety belt buckle assembly attached to the floor pan under the rear seat cushion
- Rear safety belt retractors (outboard) attached to the parcel shelf sheet metal (4-door sedan) or C-pillars (5-door hatchback)
- Rear dual safety belt buckle assembly (RH and center safety belt buckles) attached to the floor pan
- Child safety seat tether anchors located on the parcel shelf (4-door sedan) or on the back of the second row seat back rest (5-door hatchback), at all 3 seating positions
- Lower Anchors and Tethers for CHildren (LATCH) attached to the floor pan

Safety Belt Retractors

The safety belt retractors consist of the following components:

- Safety belt retractor pretensioner (front only), on vehicles equipped with SRS
- Adaptive load limiting (front passenger only), on vehicles equipped with SRS
- Dual locking mode
    - ♦ Emergency Locking Retractor (ELR)
    - ♦ Automatic Locking Retractor (ALR) (all except driver seat)
- Belt Tension Sensor (BTS) (front passenger only), on vehicles equipped with SRS

Automatic Locking Retractor (ALR)

The ALR mode is used when locking a child seat in any passenger seating position. The ALR mode automatically activates when the safety belt webbing is fully extracted from the retractor and then allowed to retract. As the safety belt webbing retracts 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. The ALR mode disengages when the webbing is allowed to fully retract back into the retractor. For testing, refer to the appropriate Functional Test procedure in Safety Belt System in this section.

Safety Belt Retractor Pretensioner

The safety belt retractor pretensioner is a pyrotechnic device that removes excess webbing from the safety belt system when deployed by the SRS . When the pretensioner deploys, the retractor spools in the safety belt webbing, removing excess webbing from the lap and shoulder safety belts.

If the vehicle is involved in a crash resulting in pretensioner deployment, install a new safety belt retractor pretensioner. For safety belt retractor pretensioner diagnosis and disposal information, refer to Section 501-20B .

If the ignition is ON with the safety belt retractor pretensioner electrical connector(s) disconnected, a DTC sets.

The pretensioner feature is only available on the front safety belt retractors of SRS -equipped vehicles.

Adaptive Load Limiting

Adaptive load limiting safety belt retractors are pyrotechnic devices integrated with the front passenger safety belt retractor assembly. The adaptive load limiting safety belt retractor works in conjunction with the safety belt pretensioner to control the tension of the front passenger safety belt. The Restraints Control Module (RCM) monitors the readiness of the adaptive load limiting safety belt retractor. The RCM uses this information and all other information provided by the restraints system to determine what action is to be taken.

The adaptive load limiting pyrotechnic device feature is only available on the front passenger safety belt retractors of SRS -equipped vehicles.

Emergency Locking Retractor (ELR)

The ELR is a vehicle-sensitive feature designed to activate and lock the safety belt webbing during hard braking, cornering hard or in an impact of approximately 24 km/h (15 mph). The ELR feature helps reduce the forward movement of the driver and passengers. For testing, refer to the appropriate Functional Test procedure in Safety Belt System in this section.

Belt Tension Sensor (BTS)

The BTS is located at the front passenger safety belt retractor anchor point and operates as part of the Occupant Classification System (OCS) system on the front passenger seat. To diagnose the BTS , refer to

Section 501-20B .

Safety Belt Buckles

Front Safety Belt Buckles

The front seat safety belt buckles are attached to the front seat tracks.

On vehicles equipped with an SRS , the front safety belt buckles have a switch indicating buckle status to the RCM . To diagnose the buckle switch, refer to Section 501-20B .

Rear Safety Belt Buckles

The rear seat safety belt buckles are attached to the floor pan under the rear seat cushion. The LH safety belt buckle is part of the rear center safety belt retractor and is serviced as an assembly. The rear dual safety belt buckle assembly (RH and center buckle) is also serviced as an assembly.

Child Safety Seat Restraints

The child safety seat restraints include the following items:

- Serviceable child safety seat tether anchor located at the rear seating positions, bolted to the parcel shelf sheet metal on 4-door sedans. On 5-door hatchbacks, the child safety seat tether anchors are part of the second row seat back and are not serviced separately from the seat back.
- Non-serviceable Lower Anchors and Tethers for CHildren (LATCH), welded to the floor pan.

If a child safety seat was in use during a collision, inspect the vehicle structure at the child safety seat component mounting areas, repair any damage and restore the vehicle to the original production configuration.

Safety Belt System

Principles of Operation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 Component Tests 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 safety belt warning system is present only on vehicles equipped with a Supplemental Restraint System (SRS). The conditions of operation for the safety belt warning indicator and chime are as follows:

- If the driver safety belt is not buckled when the ignition is ON, 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 chime is sounding, the warning indicator and warning chime turn OFF.
- If the driver safety belt is buckled before the ignition is turned ON, the warning indicator and chime remain off.

Belt-Minder®

The Belt-Minder® feature is present only on vehicles equipped with an SRS and is a supplemental warning to the safety belt warning function. This feature provides additional reminders 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 Panel Cluster (IPC).

Either the driver or front passenger safety belt systems may activate the Belt-Minder®. If the Belt-Minder® warnings have expired (warnings last 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 System (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 or front passenger safety belt is not buckled when the vehicle has reached at least 5 km/h (3 mph) and 1 to 2 minutes have elapsed since the ignition has been turned ON...	the Belt-Minder® feature is activated, safety belt warning indicator illuminates and 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 to 2 minutes have elapsed since the ignition has been turned ON...	the Belt-Minder® feature is activated, the safety belt warning indicator illuminates and warning chime sounds for 6 seconds every 30 seconds, repeating for approximately 5 minutes or until the safety belt(s) is buckled.
the driver and/or passenger safety belt is buckled before the ignition is turned ON or less than 1 to 2 minutes have elapsed since the ignition has been turned ON...	the Belt-Minder® feature will not activate.

Inspection and Verification

1. Verify the customer concern by operating the active restraint system to duplicate the condition.

2. Inspect to determine any of the following mechanical or electrical concerns apply:

Visual Inspection Chart

Mechanical	Electrical
• Safety belt webbing integrity (torn, frayed, cut or stretched) • Safety belt buckle and tongue • Safety belt retractor	• Wiring, terminals or connectors • Safety belt warning indicator burned out or broken • High Speed Controller Area Network (HS-CAN) concern

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 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 Component Tests 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(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 pressing the safety belt buckle release button and allowing the safety belt to release and retract.

4. Verify the following during the unlatching process:
   - Pressing the push-button 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 tull 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 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 Retractooad 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. Reach 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.

Safety Belt Maintenance

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 Component Tests 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 Functional Test Procedures. For additional information, refer to Safety Belt System in this section.

Safety Belt Procedure After a Collision

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 Component Tests 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.

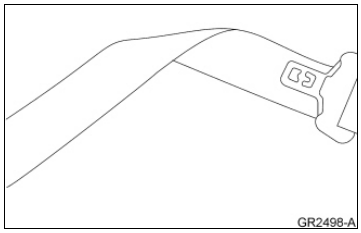
After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases 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.

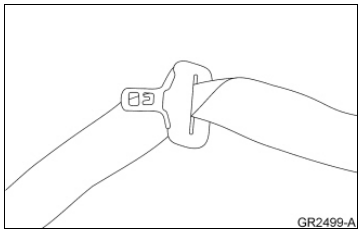
2. Install the new safety belt(s). For additional information, refer to the procedure in this section. Carry out the Functional Test. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.

Safety Belt Tongue Rotated on Belt

1. Fold the safety belt as indicated.



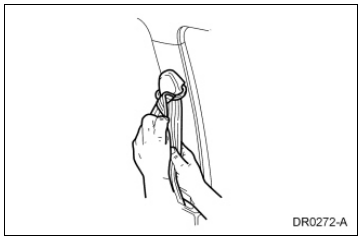
2. Pull the safety belt tongue over the fold in the safety belt.



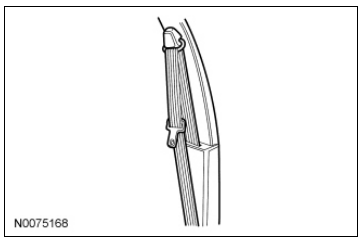
Safety Belt Twisted at the Safety Belt Guide

NOTE: These procedures apply to both wire-formed and stamped D-ring designs.

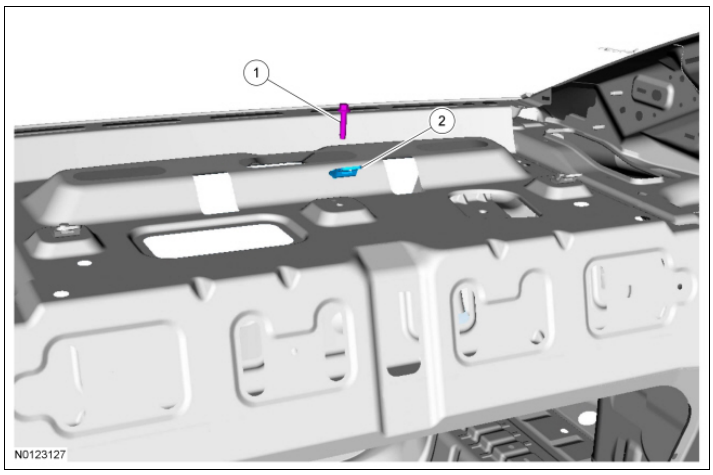
1. Grasp the safety belt webbing at the D-ring and fold the twisted portion of the belt webbing over itself.



2. Feed the folded portion of the safety belt webbing through the safety belt guide (D-ring) to remove the twist from the belt webbing.



Child Safety Seat Tether Anchor



Item	Part Number	Description
1	W708745	Child safety seat tether anchor bolt (3 required) - 28 Nm (21 lb-ft)
2	613D74	Center child safety seat tether anchor (3 required)

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 Component Tests 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.

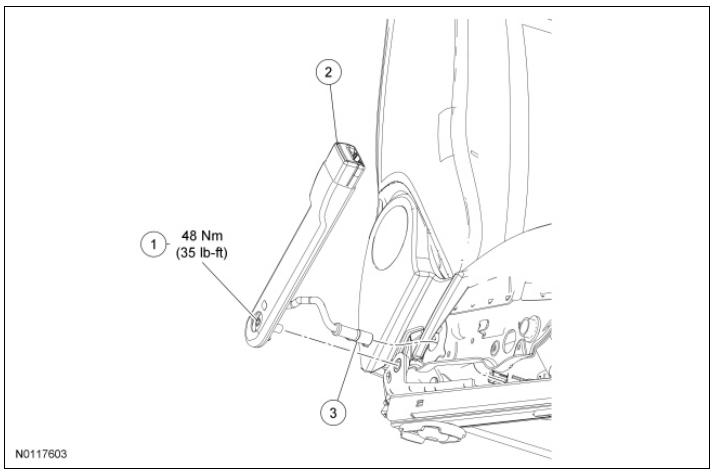
After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

⚠ WARNING: 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.

1. Remove the parcel shelf trim panel. For additional information, refer to Section 501-05 .

2. Complete the removal by referring to the exploded view.

Safety Belt Buckle - Front



Item	Part Number	Description
1	-	Safety belt buckle bolt (part of 61202 RH/ 61203 LH)
2	61202 RH/ 61203 LH	Safety belt buckle assembly
3	-	Safety belt buckle switch electrical connector (part of 61202 RH/ 61203 LH) (if equipped)

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 Component Tests of this section, a ny 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 front seat. For additional information, refer to Section 501-10 .

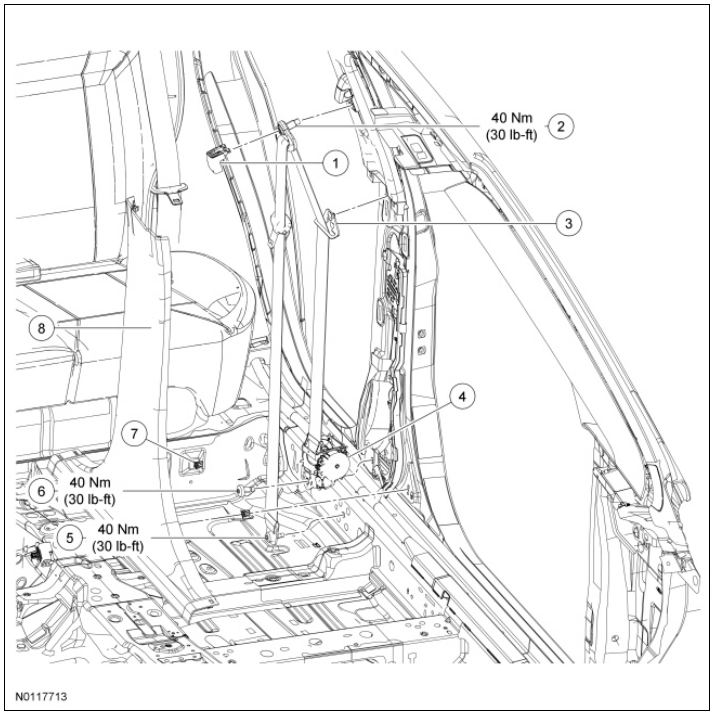
2. **NOTE:** Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

   Complete the removal by referring to the exploded view.

3. Check the active restraint system for correct operation. For additional information, refer to Safety Belt System in this section.

Safety Belt Retractor - Front

NOTE: LH shown, RH similar.



Item	Part Number	Description
1	60262	D-ring cover
2	-	Safety belt D-ring bolt (part of 611B08 (RH) / 611B09 (LH))
3	-	Safety belt guide (part of 611B08 (RH) / 611B09 (LH))
4	611B08 (RH) / 611B09 (LH)	Safety belt retractor
5	-	Safety belt anchor bolt (part of 611B08 (RH) / 611B09 (LH))
6	W712015	Safety belt retractor bolt
7	63918	B-pillar lower trim panel retaining clip (2 required)
8	24346 (RH) / 24347 (LH)	B-pillar lower trim panel

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected to verify correct function:

- Retractors
- 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 Component Tests 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 lower B-pillar trim panel. For additional information, refer to Section 501-05 .

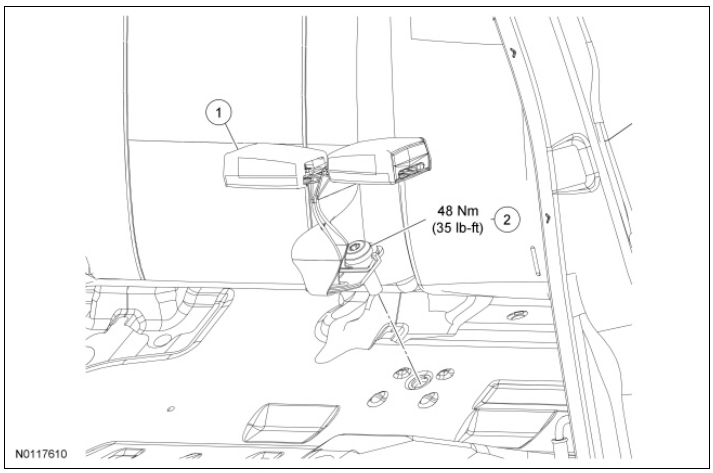
2. Pull straight out on the D-ring cover and remove.

3. **NOTE:** Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

   Complete the removal by referring to the exploded view.

4. Check the active restraint system for correct operation. For additional information, refer to Safety Belt System in this section.

Safety Belt Buckle - Rear



Item	Part Number	Description
1	60045	Safety belt buckle assembly
2	-	Safety belt buckle bolt (part of 60045)

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 Component Tests 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 iny 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 LH safety belt buckle is a part of the rear center safety belt retractor and is not serviced separately. To remove the LH safety belt buckle, refer to Safety Belt Retractor - Rear, Center, 4-Door Sedan or Safety Belt Retractor - Rear, Center, 5-Door Hatchback In this section.

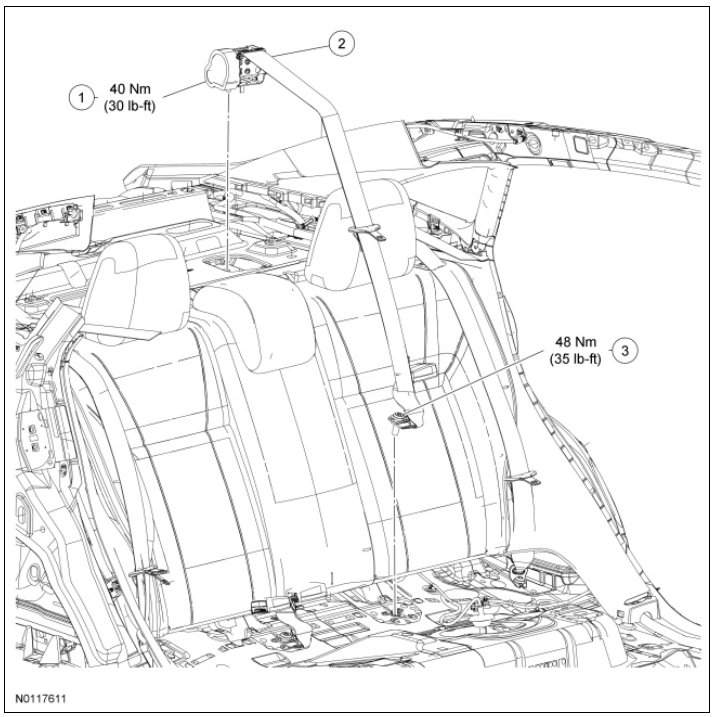
1. Remove the rear seat cushion. For additional information, refer to Section 501-10 .

2. **NOTE:** Before installation, make sure the sy belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

   Complete the removal by referring to the exploded view.

3. Check the active restraint system for correct operation. For additional information, refer to Safety Belt System in this section.

Safety Belt Retractor - Rear, Center, 4-Door Sedan



Item	Part Number	Description
1	-	Safety belt retractor bolt (part of 611B66)
2	611B66	Safety belt retractor
3	W703708	Safety belt anchor bolt

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 Component Tests of this section, a new safety belt assembly must be installed.y 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 parcel shelf. For additional information, refer to Section 501-05 .

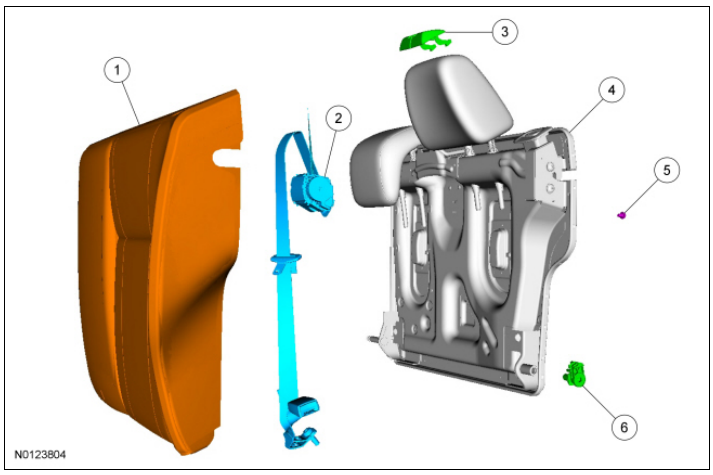
2. Remove the rear seat cushion. For additional information, refer to Section 501-10 .

3. **NOTE:** Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

   Complete the removal by referring to the exploded view.

4. Check the active restraint system for correct operation. For additional information, refer to Safety Belt System in this section.

Safety Belt Retractor - Rear, Center, 5-Door Hatchback



Item	Part Number	Description
1	66601/66801	Backrest cover/backrest foam pad
2	611B66	Safety belt retractor assembly
3	611A70	Safety belt bezel
4	60509	Seatback panel assembly
5	W790240	Safety belt retractor bolt - 48 Nm (35 lb-ft)
6	613B48	Hinge pin and bolt - 38 Nm (28 lb-ft)

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected to verify correct function:

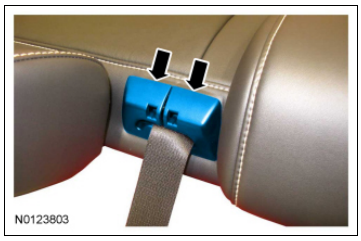
- Retractors
- Buckles
- Belt tension sensor (BTS) (if equipped)
- Front safety belt buckle support assemblies (slide bar) (if equipped)
- Safety belt shoulder belt height adjusters (if equipped)
- Child safety seat tether bracket assemblies
- Autic locking retractor (ALR) feature for child safety seats (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 Component Tests 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 60 percent rear seat backrest. For additional information, refer to Section 501-10 .

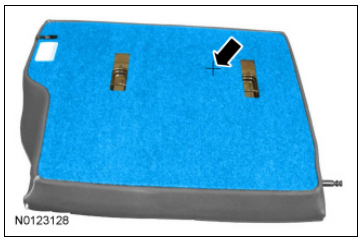
2. Detach the safety belt retractor bezel from the backrest frame wire and remove the bezel.
    - Pull where shown to unsnap the safety belt bezel from the backrest frame wire.



3. Remove the hinge pin and bolt.

4. Detach the backrest cover retainer from the backrest frame at the rear of the backrest.

5. Make a small cross cut into the carpet above the safety belt retractor bolt.
    - Push into the carpet on the rear of the backrest and feel for the safety belt retractor bolt.



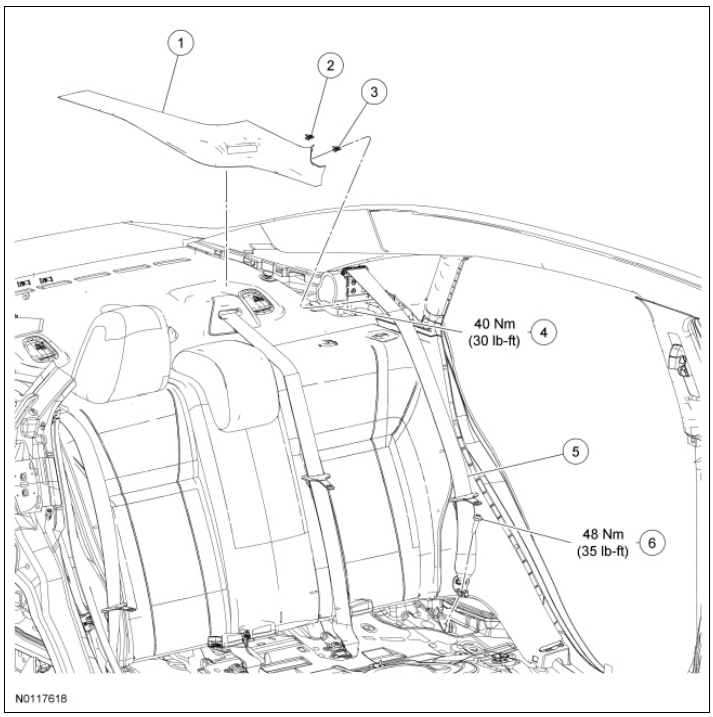
6. Remove the safety belt retractor.
    1. Remove the safety belt retractor bolt.
    2. Lift the backrest foam pad and cover.
    3. Route the safety belt and tongue out of the backrest cover.
    4. Remove the safety belt retractor.

7. **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.

8. Check the active restraint system for correct operation. For additional information, refer to Safety Belt System in this section.

Safety Belt Retractor - Rear, Outboard, 4-Door Sedan



Item	Part Number	Description
1	52018 (RH) / 52016 (LH)	Parcel shelf upper trim panel
2	W714232	Parcel shelf upper trim panel retaining clip (2 required)
3	W710338	Parcel shelf upper trim panel retaining clip
4	-	Safety belt retractor bolt (part of 611B68)
5	611B68	Safety belt retractor
6	W703708	Safety belt anchor bolt

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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 tetheket 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 Component Tests 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 parcel shelf upper trim panel. For additional information, refer to Section 501-05 .

2. Remove the rear seat cushion. For additional information, refer to Section 501-10 .

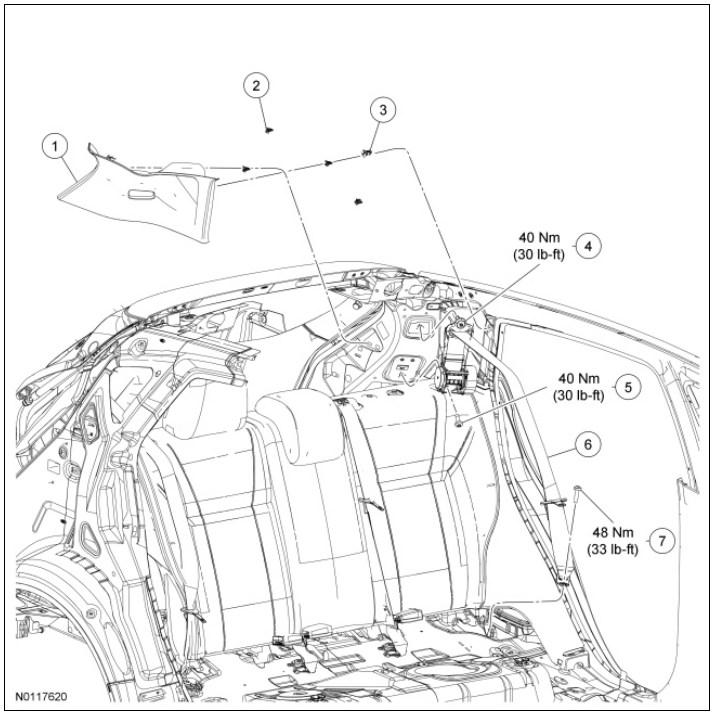
3. **NOTE:** Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

   Complete the removal by referring to the exploded view.

4. Check the active restraint system for correct operation. For additional information, refer to Safety Belt System in this section.

Safety Belt Retractor - Rear, Outboard, 5-Door Hatchback

NOTE: LH shown, RH similar.



Item	Part Number	Description
1	31010 (RH)/31011 (LH)	C-pillar upper trim panel
2	W710338	C-pillar upper trim panel retaining clip (4 required)
3	W714232	C-pillar upper trim panel 2-stage high-retention retaining clip
4	-	D-ring bolt (part of 611B68)
5	W504775	Safety belt retractor bolt
6	611B68 (RH)/611B69 (LH)	Safety belt retractor
7	W703708	Rear safety belt anchor bolt

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected to verify correct function:

- Retractors
- Buckles
- Belt tension sensor (BTS) (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 Component Tests 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 quarter trim panel. For additional information, refer to Section 501-05 .

2. Remove the rear seat cushion. For additional information, refer to Section 501-10 .

3. Complete the removal by referring to the exploded view.

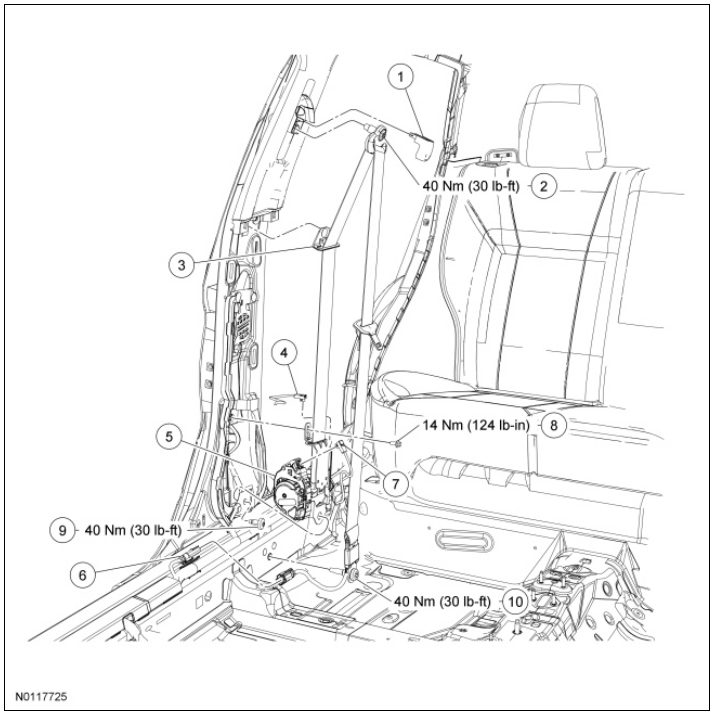
4. **NOTE:** Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

   To install, reverse the removal procedure.

5. Check the active restraint system for correct operation. For additional information, refer to Safety Belt System in this section.

Safety Belt Retractor and Pretensioner

NOTE: RH shown, LH similar.



Item	Part Number	Description
1	60262	D-ring cover
2	-	Safety belt D-ring bolt (part of 611B08 (RH) / 611B09 (LH))
3	-	Safety belt guide (part of 611B08 (RH) / 611B09 (LH))
4	-	Safety belt retractor and pretensioner electrical connector (part of 14A005)
5	611B08 (RH) / 611B09 (LH)	Safety belt retractor and pretensioner
6	-	Belt Tension Sensor (BTS) electrical connector (part of 14A005) (passenger side only)
7	-	Safety belt retractor and pretensioner load limiting electrical connector (part of 14A005) (passenger side only)
8	W505252	Safety belt retractor and pretensioner bolt
9	W712015	Safety belt retractor and pretensioner bolt
10	-	Safety belt anchor bolt (part of 611B08 (RH) / 611B09 (LH))

Removal and Installation

⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected 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)

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.**

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.

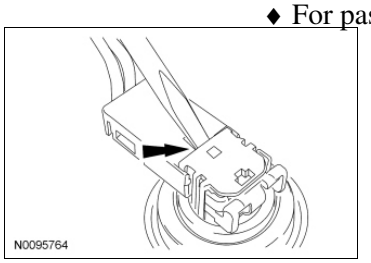
1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .
2. Remove the lower B-pillar trim panel. For additional information, refer to Section 501-05 .
3. **NOTE:** Inspect the D-ring cover for damage. If the cover is damaged or does not remain closed, install a new D-ring cover.

   Remove the D-ring cover and D-ring bolt.

   - Pull straight out on the D-ring cover to remove.
4. Remove the safety belt anchor bolt.
   - For passenger seat, disconnect the Belt Tension Sensor (BTS) electrical connector.
5. ***NOTICE:*** **Do not pull the electrical connector out by the locking button. Damage to the locking button can occur.**

   Disconnect the safety belt retractor and pretensioner electrical connector(s).

   - Lift up and release the locking button and disconnect the electrical connector.
     - For driver and passenger sides, disconnect the pretensioner electrical connector.
     - For passenger side, disconnect the load limiter electrical connector.



6. Detach the safety belt guide from the B-pillar.
7. Remove the 2 bolts and the safety belt retractor and pretensioner.

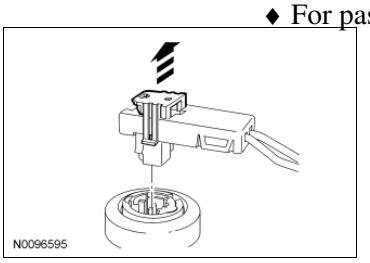
Installation

NOTE: Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

1. Position the safety belt retractor and pretensioner and install the bolts.
    - Tighten the large bolt to 40 Nm (30 lb-ft).
    - Tighten the small bolt to 14 Nm (124 lb-in).
2. Attach the safety belt guide to the B-pillar.
3. ***NOTICE:*** **The locking button must be in the released position before installing the connector into the safety belt retractor and pretensioner. Failure to have the locking button in the released position may break the tabs on the locking button causing Diagnostic Trouble Codes (DTCs) to set in the Restraints Control Module (RCM).**

   Connect the safety belt retractor and pretensioner electrical connector(s).

    - With the locking button released, install the electrical connector fully into the safety belt retractor and pretensioner and seat the locking button.
        - For driver and passenger sides, connect the pretensioner electrical connector.
        - For passenger side, connect the load limiter electrical connector.



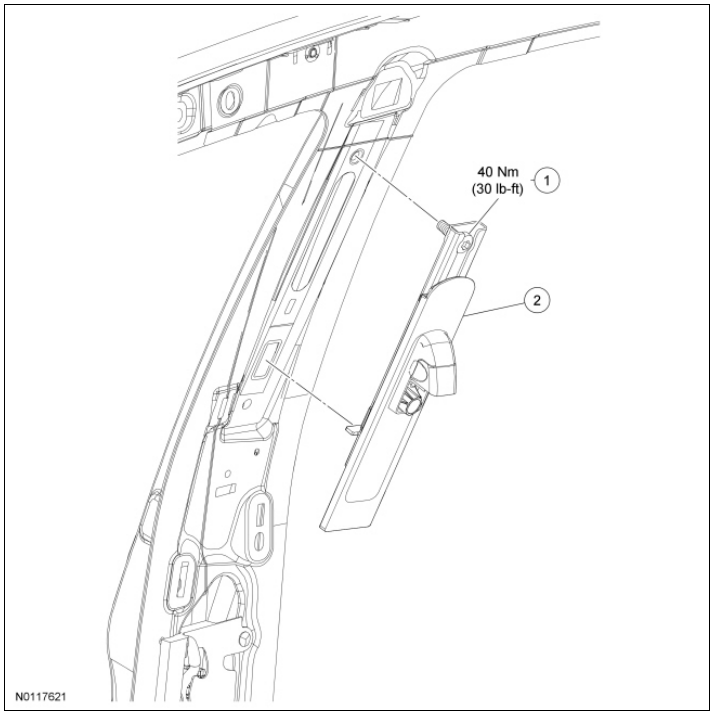
4. Install the safety belt anchor bolt.
    - Tighten to 40 Nm (30 lb-ft).
    - For passenger seat, connect the Belt Tension Sensor (BTS) electrical connector.
5. Install the lower B-pillar trim panel. For additional information, refer to Section 501-05 .
6. **NOTE:** If the D-ring cover is damaged or does not remain closed, install a new D-ring cover.

   Install the D-ring bolt and cover.

    - Tighten to 40 Nm (30 lb-ft).
7. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .
8. Check the active restraint system for correct operation. For additional information, refer to Safety Belt System in this section.

Safety Belt Shoulder Height Adjuster

NOTE: RH shown, LH similar.



Item	Part Number	Description
1	-	Safety belt height adjuster bolt (part of 602B82)
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 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 Component Tests 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.

Torque Specifications

Description	Nm	lb-ft	lb-in
Front impact severity sensor nut	11	-	97
Ignition switch housing bolt	8	-	71
Knee air bag module nuts	8	-	71
Passenger air bag module nuts	6	-	53
Passenger air bag module bracket nuts	6	-	53
Restraints Control Module (RCM) nuts	11	-	97
Side air bag module nuts [a]	-	-	-
Side air curtain module bolts	9	-	80
Side air curtain roof bracket bolts (5-door hatchback)	9	-	80
Side impact sensor bolts (front door)	2	-	18
Side impact sensor bolt (second row)	11	- n="center">97	
Steering wheel bolt	40	30	-

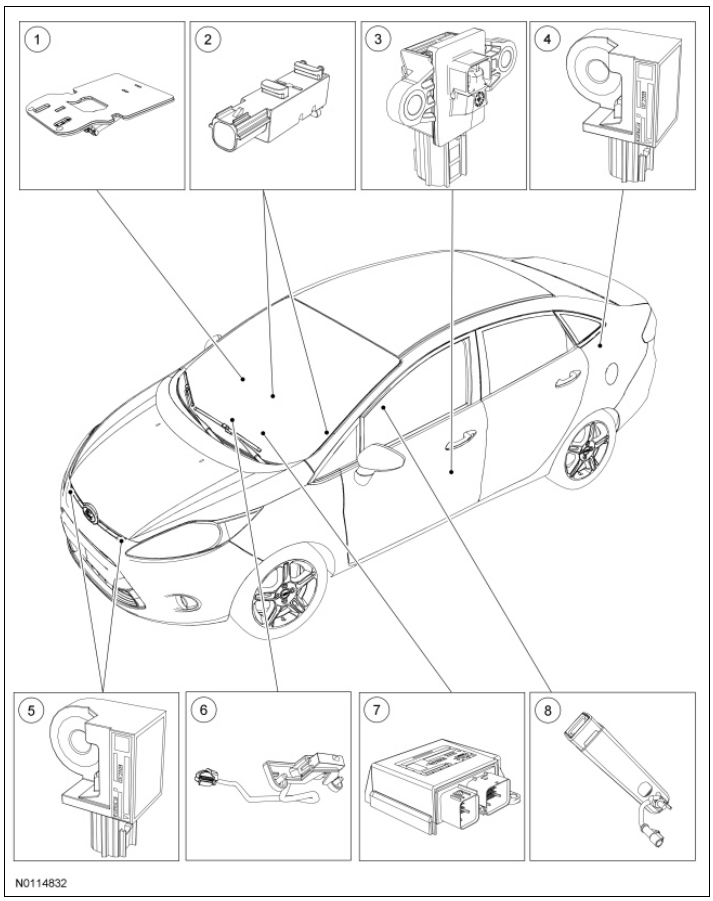
[a] Refer to the procedure in this section.

Airbag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

The air bag Supplemental Restraint System (SRS) is designed to provide increased collision protection for front and rear seat occupants in addition to the collision protection 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.

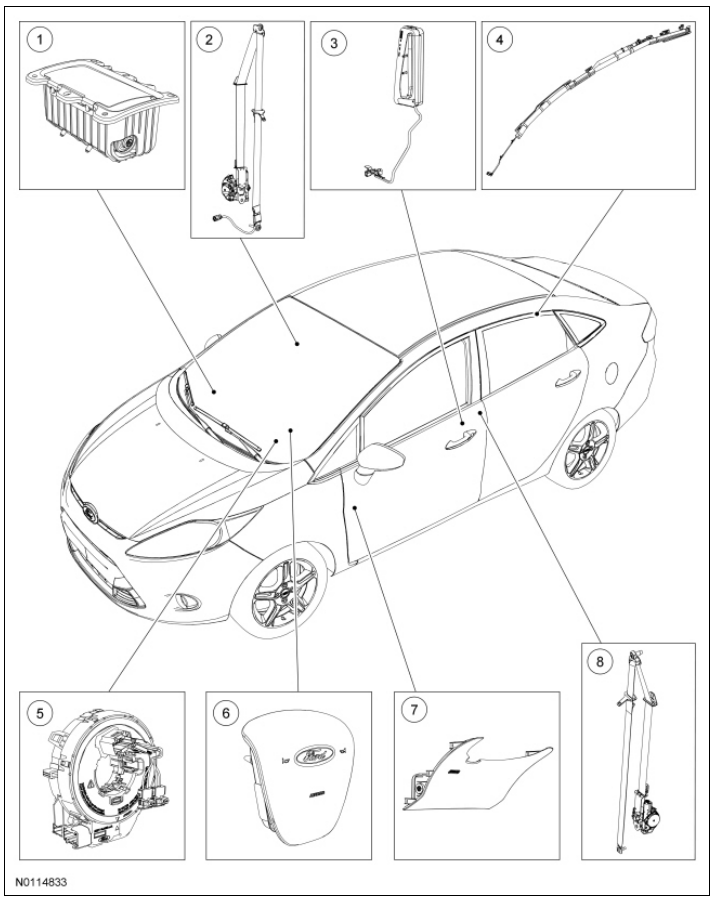
Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) Components - Illustration 1 of 2



Item	Part Number	Description
1	54632A22	Occupant Classification System (OCS) system
2	14B416	Driver/passenger seat track position sensor
3	14B345	Driver/passenger first row side impact sensor (pressure sensor) (located in front door)
4	14B004	Driver/passenger second row side impact sensor (C-pillar)
5	14B004	LH/RH front impact severity sensor

6	10A936	Passenger Air Bag Deactivation (PAD) indicator
7	14B321	Restraints Control Module (RCM)
8	5461202 (RH)/5461203 (LH)	Safety belt buckle (includes safety belt buckle switch)

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) Components - Illustration 2 of 2



Part Number	Description	
1	54044A74	Passenger air bag module
2	54611B08	Passenger safety belt retractor and pretensioner (includes deployable load limiter and Belt Tension Sensor (BTS))
3	54611D10 (LH)/54611D11 (RH)	Driver/passenger seat side air bag module
4	54042D94 (RH)/54042D95 (LH)	Driver/passenger side air curtain module
5	14A664	Clockspring
6	54043B13	Driver air bag module
7	54045J77	Driver knee air bag module

8	54611B09	Driver safety belt retractor and pretensioner

Airbag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD105-R025D 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 Restraints Control Module (RCM) continuously receives/monitors all inputs from the following Supplemental Restraint System (SRS) components:

- LH and RH front impact severity sensors
- Driver and passenger front door side impact sensor
- Driver and passenger second row side impact sensors (C-pillar)
- Safety belt buckle switches (driver and passenger)
- Seat track position sensors (driver and passenger)
- Occupant Classification System Module (OCSM)
- Safing sensors internal to the RCM

If the RCM detects sudden vehicle deceleration and/or lateral deceleration based on the information received from all sensors and switches and determines that deployment is required, the RCM sends voltage and current to deploy the appropriate SRS components.

During a frontal or side crash, the RCM may deploy the following SRS components, based on crash severity and sensor input.

- Safety belt retractor pretensioner(s)
- Safety belt load limiter (passenger side only)
- Seat side air bag(s)
- Side air curtain(s)
- Driver and passenger dual-stage air bag(s) (one or both stages)
- Driver knee air bag

The fact that the safety belt retractor pretensioner, safety belt load limiter, side air curtain, or air bags did not activate for both front seat occupants in a crash does not mean that something is wrong with the system.

The RCM performs a self-test of the complete SRS during each start up. If a SRS fault exists, the air bag warning indicator illuminates and remains illuminated for the rest of the ignition cycle. In addition to the self-test at start up, the RCM continuously monitors all of its SRS components and circuitry for correct

operation.

Air Bag Warning Indicator

The air bag warning indicator:

- located in the Instrument Panel Cluster (IPC), proves out by illuminating for 6 seconds and then turning off.
- flashes and/or illuminates based on the message the IPC receives from the RCM .
- illuminates if the IPC does not receive a message from the RCM .

Air Bag Module Second Stage Deployment Check

Because the driver and passenger front air bags each have 2 deployment stages, it is possible that stage 1 has deployed and stage 2 has not.

If a front air bag module has deployed, it is **mandatory** the front air bag module be remotely deployed using the appropriate air bag disposal procedure.

- 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 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, upon receiving a flow of current from the RCM , deploying at 1 of 2 different rates depending upon vehicle impact severity and sensor input.

High Speed Controller Area Network (HS-CAN)

This vehicle utilizes a communication system called a High Speed Controller Area Network (HS-CAN). The RCM communicates with various modules for required information about the vehicle. Refer to Section 418-00 for additional information about the HS-CAN .

Occupant Classification System (OCS) System

The Occupant Classification System (OCS) system is found only on the front passenger seat. The OCS system classifies the size of front passenger seat occupant and provides this information to the Restraints Control Module (RCM). The RCM uses this information (and other inputs) in determining the deployment strategy of the passenger air bag and safety belt pretensioner.

The OCS system is also used for operation of the passenger Belt-MinderÂ®. For information on the passenger Belt-MinderÂ® feature, refer to Section 413-01 or the Owner's Literature.

The OCS system consists of:

- a silicone gel-filled bladder mounted between the seat cushion foam and pan
- a pressure sensor that is mounted to the seat frame
- an OCSM 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, sensed by the OCS system pressure sensor, then electronically communicated to the OCSM . The components of an OCS bladder system (bladder, pressure sensor and tube, OCSM) are serviced as an assembly.

Belt Tension Sensor (BTS)

The Belt Tension Sensor (BTS):

- is a 3-wire Hall-effect sensor located at the safety belt anchor point and is part of the front passenger safety belt and retractor assembly.
- is used in conjunction with the OCS system.

The BTS is used by the OCS system to identify the presence of a child safety seat on the front passenger seat. The BTS senses the tension on the safety belt assembly then provides an output to the OCSM , indicating the safety belt assembly is cinched. After sensing the weight applied to the seat by the occupant and using the BTS input, the OCSM determines how the occupant should be classified and communicates this information to the RCM . If the occupant is classified as a child, the RCM automatically deactivates the passenger air bag module and illuminates the Passenger Air Bag Deactivation (PAD) indicator.

Passenger Air Bag Deactivation (PAD) Indicator

The RCM controls the state of the PAD indicator through a direct, hard-wired connection, based on information provided by the OCS system. The PAD indicator illuminates to indicate the passenger air bag module is disabled. An exception to this is when the front passenger seat is determined to be empty and indication of a deactivated passenger air bag module is not necessary. In all other cases, the PAD indicator is off 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 that the PAD indicator is operating correctly.

The following table indicates the passenger air bag and PAD indicator status based on the size of the front passenger occupant.

Passenger Air Bag and Passenger Air Bag Deactivation (PAD) Indicator Status

Occupant Size	Passenger Safety Belt Buckle Status	Pass. Air Bag Status	PAD Ind. Status
Empty	Unbuckled	Disabled	Unlit
Empty	Buckled	Disabled	Lit
Small	Buckled/ Unbuckled	Disabled	Lit
Large	Buckled/ Unbuckled	Enabled	Unlit

Passenger Air Bag Module

The passenger air bag module is a dual-stage air bag, deploying at 1 of 2 different rates depending upon vehicle impact severity and sensor input.

Restraints Control Module (RCM)

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ 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 airbags have deployed. Failure to follow these instructions may result in serious personal injury or death in a crash.

NOTE: This vehicle may be equipped with the SYNCÂ® feature which contains the 911 assist option. For additional information, refer to Owner's Literature.

The RCM carries out the following functions:

- deploys the air bag(s)/safety curtains in the event of a deployable collision
- activates the safety belt retractor pretensioners to remove slack from the safety belts in the event of a deployable collision
- activates the passenger retractor to control the tension of the passenger safety belt in the event of a deployable collision
- monitors the SRS for faults
- sends a message to the IPC to illuminate the air bag warning indicator if a fault is detected

The RCM monitors the SRS for possible faults. If a fault is detected, the RCM requests the IPC to illuminate the air bag warning indicator. When the ignition is turned OFF and then ON, the IPC proves out the air bag warning indicator by illuminating it for 6 seconds. If no faults are detected by the RCM , the IPC turns the air bag warning indicator off and it remains off. If the RCM detects a fault, it sends a message to the IPC to illuminate the air bag warning indicator and it remains illuminated for the rest of the ignition cycle. If the RCM requests illumination of the air bag warning indicator and the air bag warning indicator does not function, the IPC automatically activates an audible chime. The chime is a series of 5 sets of 5 tone bursts. If the chime is heard, the SRS and the air bag warning indicator require repair.

The RCM includes a backup power supply. This feature provides sufficient backup power to deploy the air bags in the event the ignition circuit is lost or damaged during impact. The backup power supply depletes its stored energy approximately one minute after power and/or ground has been removed from the RCM .

Event Notification Signal

The deployment event notification signal provides other vehicle subsystems with information pertaining to restraint system deployment or fuel cutoff status. Signal communication between the RCM and fuel pump relay allows the PCM to initiate fuel cut-off to disable the fuel system in the event of a crash.

The RCM does not monitor the event notification signal circuit for faults and **will not set** a DTC if a fault occurs.

Safety Belt Buckle Switches

The safety belt buckles contain integrated circuits called Hall-effect switches. The safety belt buckle switches indicate to the RCM whether the safety belts are buckled or unbuckled.

The RCM also communicates the status of each safety belt buckle switch to the IPC , which monitors the information to control the safety belt warning indicator. For information on the safety belt warning indicator, refer to Section 413-01 .

Safety Belt Retractor Pretensioners

The safety belt retractor pretensioners remove excess slack from the safety belt webbing. The pretensioners are activated by the RCM when the module detects a crash event force exceeding a programmed limit.

Safety Belt Retractor

The front passenger safety belt retractor is equipped with the adaptive load limiting feature that controls the tension of the front passenger safety belt in the event of a crash. The adaptive load limiter is activated by the RCM . The driver safety belt retractor is equipped with a non-deployable (mechanical) load limiter. The front safety belt retractor may also be referred to as a seatbelt load limiter.

Side Air Curtain Modules

⚠ WARNING: Anytime the Safety CanopyÂ® or side air curtain module has deployed, a new headliner and new A-, B- and C-pillar upper trim panels and attaching hardware must be installed. Remove any other damaged components and hardware and install new components and hardware as needed. Failure to follow these instructions may result in the Safety CanopyÂ® or side air curtain module deploying incorrectly and increases the risk of serious personal injury or death in a crash.

The side air curtain module:

- deploys upon receiving a flow of current from the RCM , initiated by the RCM .
- is installed as an assembly.
- is mounted above the headliner.
- attaches from the A-pillar frame to the C-pillar frame.

Seat Track Position Sensors

The seat track position sensors indicate the position of the driver and passenger seats along the seat track to the RCM . The sensor detects the presence of a shunt bracket on the track, indicating that the seat has moved forward beyond a certain point of adjustment. The RCM uses seat track position sensor information to determinine the deployment rate of the dual-stage driver air bag and/or passenger air bag module(s).

Secondary Air Bag Warning (Chime)

The secondary air bag warning chime is an audible chime located in and controlled by the IPC . If a fault is detected with the air bag warning indicator, a DTC is stored in IPC memory. Upon receiving the message from the RCM that a SRS fault has been detected, the IPC sounds the secondary air bag warning chime in a pattern of 5 sets of 5 beeps.

Impact Sensors

In addition to the RCM , the SRS uses 6 satellite impact sensors. The RCM is mounted to the center tunnel beneath the floor console. All vehicles have 2 front impact severity sensors (frontal restraints sensor), 2 first row (front door) impact sensors (side restraints sensor 1), and 2 second row impact sensors (side restraints sensor 2). The front impact severity sensors are located in the front of the vehicle, behind the bumper. The front door impact sensors are mounted behind each front door trim panel and each second row sensor is located on each C-pillar. Mounting orientation is critical for correct operation of all impact sensors.

Seat Side Air Bag Modules

The seat side air bag module:

- deploys upon receiving a flow of current from the RCM , initiated by the side restraints sensor and internal RCM circuitry.
- is mounted in the seat backrest.
- is used in conjunction with a side air curtain module.

Driver Knee Bolster Air Bag Module

The driver knee bolster air bag module is part of the steering column opening trim panel and deploys upon receiving a flow of current from the RCM .

Fault Reporting

There are 2 types of fault reporting that can be utilized by the OCSM . 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 (for 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 (for example, DTC B2290 (Occupant Classification System Fault)). DTC B2290 can have up to 3 specific on-demand fault PIDs (areas of concern) associated with this DTC.

The RCM **does not** utilize fault PIDs for this vehicle.

Those associated fault PIDs are an extension of the information provided by the DTC and are identified by the same DTC number. Use a scan tool 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 (for 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 scan tool manufacturer's instructions for the scan tool being used on how to view fault PIDs.

Inspection and Verification

1. Verify the customer concern by checking the air bag warning indicator in the IPC . Refer to Prove Out

the System in this section.
With the ignition OFF, wait 10 seconds, then turn the ignition ON and monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator illuminates continuously for approximately 6 seconds and then turns off. If an air bag SRS fault is detected, the air bag warning indicator indicates the fault in one of the following ways:
â fails to light
â remains lit continuously
â flashes
The flashing might not occur until approximately 30 seconds after the ignition has been turned from OFF to ON. This is the time required to complete 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 diagnose and repair the air bag warning indicator and any SRS fault discovered.

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
• Damaged Restraints Control Module (RCM) or loose mounting • Damaged LH or RH front impact severity sensor(s) or loose mounting • Damaged side impact sensor B- and/or C-pillar side impact sensor(s) or loose mounting • Damaged or disconnected Passenger Air Bag Deactivation (PAD) indicator • Damaged front driver/passenger seat assembly	• Open Central Junction Box (CJB) fuse 20 (10A) and/or 4 (7.5A) • Damaged wiring harness • Loose, damaged or corroded connectors • Circuitry open/shorted • Damaged shorting bars • Loose, damaged or pinched passenger seat wire harness

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 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 is ON.
   - 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 and OCSM .

8. If the DTCs retrieved are related to the concern, go to the Restraints Control Module (RCM) DTC Chart or Occupant Classification System Module (OCSM) DTC Chart. 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

NOTE: Refer to Description and Operation, Intelligent Access with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states on vehicles with this feature.

The DTCs can be retrieved from the RCM and the OCSM with a scan tool via the DLC .

Restraints Control Module (RCM) DTC Chart

NOTE: Always make sure the correct Supplemental Restraint System (SRS) component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

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 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: This module utilizes a 5-character DTC followed by a 2-character failure type code. The failure type code provides information about specific fault conditions such as opens or shorts to ground. Continuous Memory Diagnostic Trouble Codes (CMDTCs) have an additional 2-character DTC status code suffix to assist in determining DTC history.

DTC	Description	Action To Take
B0001:11	Driver Frontal Stage 1 Deployment Control: Circuit Short to Ground	GO to Pinpoint Test A .
B0001:12	Driver Frontal Stage 1 Deployment Control: Circuit Short to Battery	GO to Pinpoint Test A .
B0001:13	Driver Frontal Stage 1 Deployment Control: Circuit Open	GO to Pinpoint Test A .
B0001:1A		GO to Pinpoint Test A .

	Driver Frontal Stage 1 Deployment Control: Circuit Resistance Below Threshold	
B0001:2B	Driver Frontal Stage 1 Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B0001:4A	Driver Frontal Stage 1 Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
B0002:11	Driver Frontal Stage 2 Deployment Control: Circuit Short to Ground	GO to Pinpoint Test B .
B0002:12	Driver Frontal Stage 2 Deployment Control: Circuit Short to Battery	GO to Pinpoint Test B .
B0002:13	Driver Frontal Stage 2 Deployment Control: Circuit Open	GO to Pinpoint Test B .
B0002:1A	Driver Frontal Stage 2 Deployment Control: Circuit Resistance Below Threshold	GO to Pinpoint Test B .
B0002:2B	Driver Frontal Stage 2 Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B0002:4A	Driver Frontal Stage 2 Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
B0004:11	Driver Knee Bolster Deployment Control: Circuit Short to Ground	GO to Pinpoint Test C .
B0004:12	Driver Knee Bolster Deployment Control: Circuit Short to Battery	GO to Pinpoint Test C .
B0004:13	Driver Knee Bolster Deployment Control: Circuit Open	GO to Pinpoint Test C .
B0004:1A	Driver Knee Bolster Deployment Control: Circuit Resistance Below Threshold	GO to Pinpoint Test C .
B0004:2B	Driver Knee Bolster Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B0004:4A	Driver Knee Bolster Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .

B0010:11	Passenger Frontal Stage 1 Deployment Control: Circuit Short to Ground	GO to Pinpoint Test D .
B0010:12	Passenger Frontal Stage 1 Deployment Control: Circuit Short to Battery	GO to Pinpoint Test D .
B0010:13	Passenger Frontal Stage 1 Deployment Control: Circuit Open	GO to Pinpoint Test D .
B0010:1A	Passenger Frontal Stage 1 Deployment Control: Circuit Resistance Below Threshold	GO to Pinpoint Test D .
B0010:2B	Passenger Frontal Stage 1 Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B0010:4A	Passenger Frontal Stage 1 Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
B0011:11	Passenger Frontal Stage 2 Deployment Control: Circuit Short to Ground	GO to Pinpoint Test E .
B0011:12	Passenger Frontal Stage 2 Deployment Control: Circuit Short to Battery	GO to Pinpoint Test E .
B0011:13	Passenger Frontal Stage 2 Deployment Control: Circuit Open	GO to Pinpoint Test E .
B0011:1A	Passenger Frontal Stage 2 Deployment Control: Circuit Resistance Below Threshold	GO to Pinpoint Test E .
B0011:2B	Passenger Frontal Stage 2 Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B0011:4A	Passenger Frontal Stage 2 Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
B0020:11	Left Side Airbag Deployment Control: Circuit Short to Ground	GO to Pinpoint Test F .
B0020:12	Left Side Airbag Deployment Control: Circuit Short to Battery	GO to Pinpoint Test F .
B0020:13	Left Side Airbag Deployment Control: Circuit Open	GO to Pinpoint Test F .
B0020:1A	Left Side Airbag Deployment Control:	GO to Pinpoint Test F .

	Circuit Resistance Below Threshold	
B0020:2B	Left Side Airbag Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B0020:4A	Left Side Airbag Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
B0021:11	Left Curtain Deployment Control 1: Circuit Short to Ground	GO to Pinpoint Test G .
B0021:12	Left Curtain Deployment Control 1: Circuit Short to Battery	GO to Pinpoint Test G .
B0021:13	Left Curtain Deployment Control 1: Circuit Open	GO to Pinpoint Test G .
B0021:1A	Left Curtain Deployment Control 1: Circuit Resistance Below Threshold	GO to Pinpoint Test G .
B0021:2B	Left Curtain Deployment Control 1: Signal Cross Coupled	GO to Pinpoint Test W .
B0021:4A	Left Curtain Deployment Control 1: Incorrect Component Installed	GO to Pinpoint Test X .
B0028:11	Right Side Airbag Deployment Control: Circuit Short to Ground	GO to Pinpoint Test H .
B0028:12	Right Side Airbag Deployment Control: Circuit Short to Battery	GO to Pinpoint Test H .
B0028:13	Right Side Airbag Deployment Control: Circuit Open	GO to Pinpoint Test H .
B0028:1A	Right Side Airbag Deployment Control: Circuit Resistance Below Threshold	GO to Pinpoint Test H .
B0028:2B	Right Side Airbag Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B0028:4A	Right Side Airbag Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
B0029:11	Right Curtain Deployment Control 1: Circuit Short to Ground	GO to Pinpoint Test I .

B0029:12	Right Curtain Deployment Control 1: Circuit Short to Battery	GO to Pinpoint Test I .
B0029:13	Right Curtain Deployment Control 1: Circuit Open	GO to Pinpoint Test I .
B0029:1A	Right Curtain Deployment Control 1: Circuit Resistance Below Threshold	GO to Pinpoint Test I .
B0029:2B	Right Curtain Deployment Control 1: Signal Cross Coupled	GO to Pinpoint Test W .
B0029:4A	Right Curtain Deployment Control 1: Incorrect Component Installed	GO to Pinpoint Test X .
B0050:11	Driver Seatbelt Sensor: Circuit Short to Ground	GO to Pinpoint Test J .
B0050:12	Driver Seatbelt Sensor: Circuit Short to Battery	GO to Pinpoint Test J .
B0050:13	Driver Seatbelt Sensor: Circuit Open	GO to Pinpoint Test J .
B0050:1D	Driver Seatbelt Sensor: Circuit Current Out of Range	GO to Pinpoint Test J .
B0050:2B	Driver Seatbelt Sensor: Signal Cross Coupled	GO to Pinpoint Test W .
B0050:4A	Driver Seatbelt Sensor: Incorrect Component Installed	GO to Pinpoint Test X .
B0052:11	Passenger Seatbelt Sensor: Circuit Short to Ground	GO to Pinpoint Test K .
B0052:12	Passenger Seatbelt Sensor: Circuit Short to Battery	GO to Pinpoint Test K .
B0052:13	Passenger Seatbelt Sensor: Circuit Open	GO to Pinpoint Test K .
B0052:1D	Passenger Seatbelt Sensor: Circuit Current Out of Range	GO to Pinpoint Test K .
B0052:2B	Passenger Seatbelt Sensor: Signal Cross Coupled	GO to Pinpoint Test W .
B0052:4A	Passenger Seatbelt Sensor: Incorrect Component Installed	GO to Pinpoint Test X .
B0082:11	Passenger Seatbelt Load Limiter Deployment	GO to Pinpoint Test L .

	Control: Circuit Short to Ground	
B0082:12	Passenger Seatbelt Load Limiter Deployment Control: Circuit Short to Battery	GO to Pinpoint Test L .
B0082:13	Passenger Seatbelt Load Limiter Deployment Control: Circuit Open	GO to Pinpoint Test L .
B0082:1A	Passenger Seatbelt Load Limiter Deployment Control: Circuit Resistance Below Threshold	GO to Pinpoint Test L .
B0082:2B	Passenger Seatbelt Load Limiter Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B0082:4A	Passenger Seatbelt Load Limiter Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
B0090:11	Left Frontal Restraints Sensor: Circuit Short to Ground	GO to Pinpoint Test M .
B0090:4A	Left Frontal Restraints Sensor: Incorrect Component Installed	GO to Pinpoint Test X .
B0090:81	Left Frontal Restraints Sensor: Invalid Serial Data Received	INSTALL a new LH front impact severity sensor. REFER to Front Impact Severity Sensor in this section.
B0090:93	Left Frontal Restraints Sensor: No Operation	GO to Pinpoint Test M .
B0090:96	Left Frontal Restraints Sensor: Component Internal Failure	INSTALL a new LH front impact severity sensor. REFER to Front Impact Severity Sensor in this section.
B0091:11	Left Side Restraints Sensor 1: Circuit Short to Ground	GO to Pinpoint Test N .
B0091:4A	Left Side Restraints Sensor 1: Incorrect Component Installed	GO to Pinpoint Test X .
B0091:81	Left Side Restraints Sensor 1: Invalid Serial Data Received	INSTALL a new driver front door impact sensor. REFER to Side Impact Sensor â Front Door in this section.
B0091:93	Left Side Restraints Sensor 1: No Operation	GO to Pinpoint Test N .
B0091:96	Left Side Restraints Sensor 1: Component Internal Failure	INSTALL a new driver front door impact sensor. REFER to Side Impact Sensor â Front Door in this section.

B0092:11	Left Side Restraints Sensor 2: Circuit Short to Ground	GO to Pinpoint Test O .
B0092:4A	Left Side Restraints Sensor 2: Incorrect Component Installed	GO to Pinpoint Test X .
B0092:81	Left Side Restraints Sensor 2: Invalid Serial Data Received	INSTALL a new driver second row C-pillar side impact sensor. REFER to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section.
B0092:93	Left Side Restraints Sensor 2: No Operation	GO to Pinpoint Test O .
B0092:96	Left Side Restraints Sensor 2: Component Internal Failure	INSTALL a new driver second row C-pillar side impact sensor. REFER to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section.
B0095:11	Right Frontal Restraints Sensor: Circuit Short to Ground	GO to Pinpoint Test P .
B0095:4A	Right Frontal Restraints Sensor: Incorrect Component Installed	GO to Pinpoint Test X .
B0095:81	Right Frontal Restraints Sensor: Invalid Serial Data Received	INSTALL a new RH front impact severity sensor. REFER to Front Impact Severity Sensor in this section.
B0095:93	Right Frontal Restraints Sensor: No Operation	GO to Pinpoint Test P .
B0095:96	Right Frontal Restraints Sensor: Component Internal Failure	INSTALL a new RH front impact severity sensor. REFER to Front Impact Severity Sensor in this section.
B0096:11	Right Side Restraints Sensor 1: Circuit Short to Ground	GO to Pinpoint Test O .
B0096:4A	Right Side Restraints Sensor 1: Incorrect Component Installed	GO to Pinpoint Test X .
B0096:81	Right Side Restraints Sensor 1: Invalid Serial Data Received	INSTALL a new passenger front door side impact sensor. REFER to Side Impact Sensor â Front Door in this section.
B0096:93	Right Side Restraints Sensor 1: No Operation	GO to Pinpoint Test O .
B0096:96	Right Side Restraints Sensor 1: Component Internal Failure	INSTALL a new passenger front door side impact sensor. REFER to Side Impact Sensor â Front Door in this section.
B0097:11	Right Side Restraints Sensor 2: Circuit Short to Ground	GO to Pinpoint Test N .
B0097:4A	Right Side Restraints Sensor 2: Incorrect Component Installed	GO to Pinpoint Test X .
B0097:81	Right Side Restraints Sensor 2: Invalid Serial	INSTALL a new passenger second row C-pillar side impact sensor. REFER to Side Impact Sensor â Second Row, 4-Door Sedan or Side

	Data Received	Impact Sensor â Second Row, 5-Door Hatchback in this section.
B0097:93	Right Side Restraints Sensor 2: No Operation	GO to Pinpoint Test N .
B0097:96	Right Side Restraints Sensor 2: Component Internal Failure	INSTALL a new passenger second row C-pillar side impact sensor. REFER to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section.
B00A0:09	Occupant Classification System: Component Failure	GO to Pinpoint Test Q .
B00A0:4A	Occupant Classification System: Incorrect Component Installed	GO to Pinpoint Test Q .
B00A0:63	Occupant Classification System: Circuit / Component Protection Time-Out	GO to Pinpoint Test Q .
B00A0:64	Occupant Classification System: Signal Plausibility Failure	GO to Pinpoint Test Q .
B00A0:68	Occupant Classification System: Event Information	GO to Pinpoint Test Q .
B00B5:11	Driver Seat Track Position Restraints Sensor: Circuit Short to Ground	GO to Pinpoint Test R .
B00B5:12	Driver Seat Track Position Restraints Sensor: Circuit Short to Battery	GO to Pinpoint Test R .
B00B5:13	Driver Seat Track Position Restraints Sensor: Circuit Open	GO to Pinpoint Test R .
B00B5:1D	Driver Seat Track Position Restraints Sensor: Circuit Current Out of Range	GO to Pinpoint Test R .
B00B5:2B	Driver Seat Track Position Restraints Sensor: Signal Cross Coupled	GO to Pinpoint Test W .
B00B5:4A	Driver Seat Track Position Restraints Sensor: Incorrect Component Installed	GO to Pinpoint Test X .
B00C5:11	Passenger Seat Track Position Restraints Sensor: Circuit Short to Ground	GO to Pinpoint Test S .
B00C5:12	Passenger Seat Track Position Restraints	GO to Pinpoint Test S .

	Sensor: Circuit Short to Battery	
B00C5:13	Passenger Seat Track Position Restraints Sensor: Circuit Open	GO to Pinpoint Test S .
B00C5:1D	Passenger Seat Track Position Restraints Sensor: Circuit Current Out of Range	GO to Pinpoint Test S .
B00C5:2B	Passenger Seat Track Position Restraints Sensor: Signal Cross Coupled	GO to Pinpoint Test W .
B00C5:4A	Passenger Seat Track Position Restraints Sensor: Incorrect Component Installed	GO to Pinpoint Test X .
B00D5:11	Restraint System Passenger Disable Indicator: Circuit Short to Ground	GO to Pinpoint Test T .
B00D5:12	Restraint System Passenger Disable Indicator: Circuit Short to Battery	GO to Pinpoint Test T .
B00D5:13	Restraint System Passenger Disable Indicator: Circuit Open	GO to Pinpoint Test T .
B00D5:4A	Restraint System Passenger Disable Indicator: Incorrect Component Installed	GO to Pinpoint Test X .
B1193:00	Crash Event Storage Full and Locked: No Sub Type Information	**NOTE:** Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢; or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set. This DTC indicates the vehicle has been in a crash. INSTALL a new Restraints Control Module (RCM) and impact sensors. REFER to Inspection and Repair After a Supplemental Restraint System (SRS) Deployment in this section.
B1211:11	Driver Seatbelt Retractor Pretensioner Deployment Control: Circuit Short to Ground	GO to Pinpoint Test U .
B1211:12	Driver Seatbelt Retractor Pretensioner Deployment Control: Circuit Short to Battery	GO to Pinpoint Test U .

B1211:13	Driver Seatbelt Retractor Pretensioner Deployment Control: Circuit Open	GO to Pinpoint Test U .
B1211:1A	Driver Seatbelt Retractor Pretensioner Deployment Control: Circuit Resistance Below Threshold	GO to Pinpoint Test U .
B1211:2B	Driver Seatbelt Retractor Pretensioner Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B1211:4A	Driver Seatbelt Retractor Pretensioner Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
B1214:11	Passenger Seatbelt Retractor Pretensioner Deployment Control: Circuit Short to Ground	GO to Pinpoint Test V .
B1214:12	Passenger Seatbelt Retractor Pretensioner Deployment Control: Circuit Short to Battery	GO to Pinpoint Test V .
B1214:13	Passenger Seatbelt Retractor Pretensioner Deployment Control: Circuit Open	GO to Pinpoint Test V .
B1214:1A	Passenger Seatbelt Retractor Pretensioner Deployment Control: Circuit Resistance Below Threshold	GO to Pinpoint Test V .
B1214:2B	Passenger Seatbelt Retractor Pretensioner Deployment Control: Signal Cross Coupled	GO to Pinpoint Test W .
B1214:4A	Passenger Seatbelt Retractor Pretensioner Deployment Control: Incorrect Component Installed	GO to Pinpoint Test X .
U0028:08	Vehicle Communication Bus A: Bus Signal / Message Failures	GO to Pinpoint Test Y .
U0028:88	Vehicle Communication Bus A: Bus Off	GO to Pinpoint Test Y .
U0154:00	Lost Communication With Restraints	**NOTE:** The DTC sets in a module that is reporting a communication fault from another module on the data bus. The module that reports the

	Occupant Classification System Module: No Sub Type Information	fault is not the problem module. Do not install a new RCM as part of repair. REFER to Section 418-00 to diagnose the Occupant Classification System Module (OCSM). The OCSM does not respond to the scan tool.
U0155:00	Lost Communication With Instrument Panel Cluster (IPC) Control Module: No Sub Type Information	**NOTE:** The DTC 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. Do not install a new RCM as part of repair. REFER to Section 418-00 to diagnose the IPC . The IPC does not respond to the scan tool.
U0253:00	Lost Communication With Accessory Protocol Interface Module: No Sub Type Information	**NOTE:** This DTC sets in the RCM if a message is not received from the Accessory Protocol Interface Module (APIM). Check for additional RCM and APIM DTCs. REFER to the appropriate section to diagnose DTCs concern. If no other DTCs are present, REFER to APIM Software Level Check in the General Procedures portion of Section 415-00 .
U0300:00	Internal Control Module Software Incompatibility: No Sub Type Information	CARRY OUT Programmable Module Installation (PMI). RETRIEVE RCM DTCs. If RCM DTC U0300:00 is retrieved on-demand during self-test. INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section.
U0554:00	Invalid Data Received From Accessory Protocol Interface Module: No Sub Type Information	CHECK for additional RCM and APIM DTCs. REFER to the appropriate section to diagnose the DTCs. If no other DTCs are present, REFER to Accessory Protocol Interface Module (APIM) Software Level Check in the General Procedures portion of Section 415-00 .
U2100:00	Initial Configuration Not Complete: No Sub Type Information	CARRY OUT Programmable Module Installation (PMI). RETRIEVE RCM DTCs. If RCM DTC U0300:00 is retrieved on-demand during self-test, INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section.
U2200:00	Control Module Configuration Memory Corrupt: No Sub Type Information	INSTALL a new RCM and CARRY OUT Programmable Module Installation (PMI). Use as-built data when CARRYING out PMI for this DTC. REFER to Restraints Control Module (RCM) in this section.
U3000:46	Control Module: Calibration / Parameter Memory Failure	INSTALL a new RCM and CARRY OUT Programmable Module Installation (PMI). REFER to Restraints Control Module (RCM) in this section.
U3000:49	Control Module: Internal Electronic Failure	INSTALL a new RCM and CARRY OUT Programmable Module Installation (PMI). If DTC U2200:00 is also present, use as-built data when CARRYING out PMI . REFER to Restraints Control Module (RCM) in this section.
U3000:4A	Control Module: Incorrect Component Installed	GO to Pinpoint Test X .
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	GO to Pinpoint Test Z .
U3003:17		GO to Pinpoint Test Z .

	Battery Voltage: Circuit Voltage Above Threshold	

Occupant Classification System Module (OCSM) DTC Chart

DTC	Description	Action To Take
B1231	Event Threshold Exceeded (Crash Data Memory Full)	INSPECT the passenger seat for damage. REFER to Inspection and Repair After a Supplemental Restraint System (SRS) Deployment in this section.
B1317	Battery Voltage High	GO to Pinpoint Test Z .
B1318	Battery Voltage Low	GO to Pinpoint Test Z .
B1342	ECU is Faulted	INSTALL an Occupant Classification System (OCS) service kit. REFER to Occupant Classification Sensor in this section.
B2290	Occupant Classification System Fault	GO to Pinpoint Test AA .
B2909	Belt Tension Sensor Fault	GO to Pinpoint Test AB .
C1941	Zero Seat Weight Test Failure	This DTC is only reported when carrying out the System Reset. GO to Pinpoint Test AA .
U0151	Lost Communication with Restraints Control Module (RCM)	**NOTE:** The DTC will set 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. Do not install a new OCSM as part of repair. REFER to Section 418-00 to diagnose the RCM . RCM does not respond to the scan tool.
U2050	No Application Present	INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section.
U2051	One or More Calibration Files Missing/Corrupt	INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section.

Symptom Chart

NOTE: Refer to Description and Operation, Intelligent Access with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states on vehicles with this feature.

Symptom Chart

Pinpoint Test â Restraints Control Module (RCM)

Pinpoint Test A: DTCs B0001:11, B0001:12, B0001:13 and B0001:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

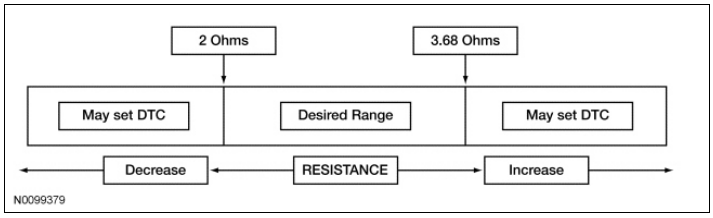
The Restraints Control Module (RCM) continuously monitors the driver air bag module stage 1 circuits for the following faults:

- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted driver air bag module

If a fault is detected, the RCM stores DTC B0001:11, B0001:12, B0001:13 or B0001:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Clockspring
- Driver air bag module
- RCM



DTC Description	Fault Trigger Condition
• B0001:11 â Driver Frontal Stage 1 Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on either driver air bag stage 1 circuit, a fault is indicated.
• B0001:12 â Driver Frontal Stage 1 Deployment Control: Circuit Short to Battery	When the RCM senses a short to voltage on either driver air bag stage 1 circuit, a fault is indicated.
• B0001:13 â Driver Frontal Stage 1 Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between driver air bag stage 1 circuits, a fault is indicated.
• B0001:1A â Driver Frontal Stage 1 Deployment Control: Circuit Resistance	When the RCM measures less than the desired resistance range between driver air bag stage 1 circuits, a fault is indicated.

Below Threshold	

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Clockspring
- Driver air bag module
- RCM

PINPOINT TEST A: DTCs B0001:11, B0001:12, B0001:13 AND B0001:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

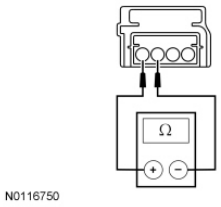
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

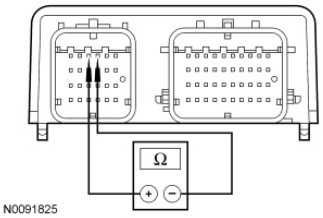
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

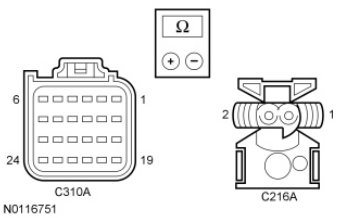
Test Step	Result / Action to Take
A1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0001:11, B0001:12, B0001:13 or B0001:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0001:13 or B0001:1A, GO to A2 . For DTC B0001:11, GO to A12 . For DTC B0001:12, GO to A15 . **No**

	This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0001:13 or B0001:1A, GO to A20 . For DTC B0001:11, GO to A21 . For DTC B0001:12, GO to A22 .
A2 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_00_R) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_00_R PID • **Does the PID value read between 2 and 3.68 ohms?**	**Yes** GO to A19 . **No** GO to A3 .
A3 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_00_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• Remove the lower steering column shroud to access the clockspring electrical connector. • While monitoring the DEPLOY_00_R PID, carry out the harness test of the driver air bag circuits and accessible connectors (including any in-line connectors) by wiggling and flexing the wire harness, connectors, tilting and rotating the steering wheel frequently. • **Does the PID value read between 2 and 3.68 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness or INSTALL a new clockspring as needed. REFER to Clockspring in this section. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A23 . **No** For PID value less than 2 ohms, GO to A4 . For PID value greater than 3.68 ohms, GO to A8 .
A4 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF.	**Yes** GO to A17 . **No** GO to A5 .

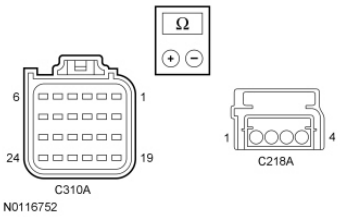
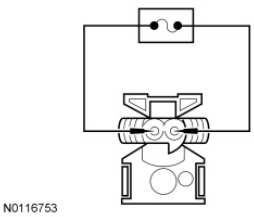
• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag in this section. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module disconnected, open circuit faults would normally be retrieved on stages 1 and 2. • **Did the on-demand DTC change from B0001:1A to B0001:13?**	
A5 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED) (CLOCKSPRING DISCONNECTED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Disconnect: Clockspring C218A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module / clockspring disconnected, open circuit faults would normally be retrieved on stages 1 and 2. • **Did the on-demand DTC change from B0001:1A to B0001:13?**	**Yes** GO to A18 . **No** GO to A6 .
A6 CHECK FOR A SHORT BETWEEN DRIVER AIR BAG STAGE 1 CIRCUITS	
• Measure the resistance between clockspring C218A-2, circuit CR101 (VT/BN), harness side, and clockspring C218A-1, circuit RR101 (YE/GN), harness side.  N0116750	**Yes** GO to A7 . **No** REPAIR circuits CR101 (VT/BN) and RR101 (YE/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A24 .

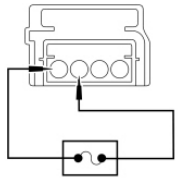
• **Is the resistance greater than 10,000 ohms?**	
A7 CHECK THE RCM FOR LOW RESISTANCE	
• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310A pins 3 and 4, component side.  • **Is the resistance greater than 10,000 ohms?**	**Yes** REPAIR circuits CR101 (VT/BN) and RR101 (YE/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A24 . **No** GO to A19 .
A8 CHECK THE DRIVER AIR BAG STAGE 1 CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310A, harness side, and driver air bag module stage 1 C216A, harness side, using the following chart.	**Yes** GO to A10 . **No** GO to A9 .

RCM	Circuit	Driver Air Bag Module Electrical Connector
C310A-4	CR101 (VT/BN)/(WH)	C216A-1
C310A-3	RR101 (YE/GN)/(OG)	C216A-2

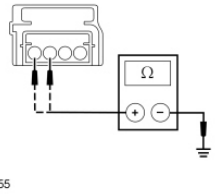


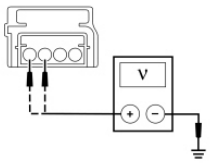
• **Are the resistances less than 1 ohm?**

A9 CHECK THE DRIVER AIR BAG STAGE 1 CIRCUITS FOR AN OPEN (CLOCKSPRING DISCONNECTED)	
• Disconnect: Clockspring C218A. • Measure the resistance between RCM C310A, harness side, and clockspring C218A, harness side, using the following chart. **RCM** / **Circuit** / **Clockspring Electrical Connector** C310A-4 / CR101 (VT/BN) / C218A-2 C310A-3 / RR101 (YE/GN) / C218A-1  • **Are the resistances less than 0.5 ohm?**	**Yes** GO to A18 . **No** REPAIR circuit CR101 (VT/BN) or RR101 (YE/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A24 .
A10 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between driver air bag module stage 1 C216A-1, circuit CR101 (WH), harness side, and C216A-2, circuit RR101 (OG), harness side.  • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS)	**Yes** REMOVE the fused jumper wire and GO to A17 . **No** REMOVE the fused jumper wire and GO to A11 .

Depowering and Repowering in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag stage 1 circuits shorted together, a low resistance fault would normally be retrieved on stage 1. Stage 2 will show an open circuit fault due to the driver air bag being disconnected. • **Was DTC B0001:1A retrieved on-demand during self-test?**	
A11 CHECK THE DRIVER AIR BAG STAGE 1 CIRCUITS FOR AN OPEN (CLOCKSPRING DISCONNECTED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Clockspring C218A. • Connect a fused jumper wire between clockspring C218A-1, circuit RR101 (YE/GN), harness side, and C218A-2, circuit CR101 (VT/BN), harness side.  N0116754 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the clockspring stage 1 circuits shorted together, a low resistance fault would normally be retrieved on stage 1. Stage 2 will show an open circuit fault due to the driver air bag being disconnected. • **Was DTC B0001:1A retrieved on-demand during self-test?**	**Yes** REMOVE the fused jumper wire and GO to A18 . **No** REMOVE the fused jumper wire and GO to A19 .
A12 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the	**Yes** GO to A17 . **No** GO to A13 .

fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module disconnected, open circuit faults would normally be retrieved on stages 1 and 2. • **Did the on-demand DTC change from B0001:11 to B0001:13?**	
A13 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED) (CLOCKSPRING DISCONNECTED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Disconnect: Clockspring C218A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the clockspring disconnected, open circuit faults would normally be retrieved on driver air bag stages 1 and 2. • **Did the on-demand DTC change from B0001:11 to B0001:13?**	**Yes** GO to A18 . **No** GO to A14 .
A14 CHECK THE DRIVER AIR BAG STAGE 1 CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between clockspring: ♦ C218A-2, circuit CR101 (VT/BN), harness side, and ground. ♦ C218A-1, circuit RR101 (YE/GN), harness side, and ground.	**Yes** GO to A19 . **No** Due to the shorting bar feature in the RCM electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit CR101 (VT/BN) or RR101 (YE/GN).

 • **Are the resistances greater than 10,000 ohms?**	Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A24 .
A15 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO BATTERY INDICATED) (CLOCKSPRING DISCONNECTED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag in this section. • Disconnect: Clockspring C218A. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module/clockspring disconnected, open circuit faults would normally be retrieved on driver air bag stages 1 and 2. • **Did the on-demand DTC change from B0001:12 to B0001:13?**	**Yes** GO to A18 . **No** GO to A16 .
A16 CHECK THE DRIVER AIR BAG STAGE 1 CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • 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 clockspring:	**Yes** Due to the shorting bar feature in the RCM electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit CR101 (VT/BN) or RR101 (YE/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

♦ C218A-2, circuit CR101 (VT/BN), harness side, and ground. ♦ C218A-1, circuit RR101 (YE/GN), harness side, and ground.  N0116756 • **Is any voltage present?**	GO to A24 . **No** GO to A19 .
A17 CONFIRM THE DRIVER AIR BAG MODULE FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damaged, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Install the driver air bag module. Refer to Driver Airbag 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new driver air bag module. REFER to Driver Airbag in this section. GO to A24 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0001:13 or B0001:1A, GO to A20 . For DTC B0001:11, GO to A21 . For DTC B0001:12, GO to A22 .
A18 CONFIRM THE CLOCKSPRING FAULT	

NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damaged, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Clockspring C218A. • Install the driver air bag module. Refer to Driver Airbag 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new clockspring. REFER to Clockspring in this section. GO to A24 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0001:13 or B0001:1A, GO to A20 . For DTC B0001:11, GO to A21 . For DTC B0001:12, GO to A22 .
A19 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damaged, pinched, cut or pierced wires.	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to A24 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0001:13 or B0001:1A, GO to A20 . For DTC B0001:11, GO to A21 .

♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • If previously removed, install the driver air bag module. Refer to Driver Airbag in this section. • Connect: Clockspring C218A (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	For DTC B0001:12, GO to A22 .
A20 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_00_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_00_R PID • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness, tilting and rotating the steering wheel frequently. • **Does the PID value read between 2 and 3.68 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to A23 . **No** If the driver air bag PID indicates incorrect resistance only when the steering wheel is rotated, INSTALL a new clockspring. REFER to Clockspring in this section. For all other faults, DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A24 .
A21 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO GROUND FAULT	

• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness, tilting and rotating the steering wheel frequently. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0001:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A24 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to A23 .
A22 CHECK THE DRIVER FRONTAL STAGE 1 DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO BATTERY FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness, tilting and rotating the steering wheel frequently. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0001:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A24 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to A23 .
A23 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module: ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires.	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to A24 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this**

• Inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. • **Were any concerns found?**	**time. Install SRS components only when directed to do so in the pinpoint test.** GO to A24 .
A24 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test B: DTCs B0002:11, B0002:12, B0002:13 and B0002:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) continuously monitors the driver air bag module stage 2 circuits for the following faults:

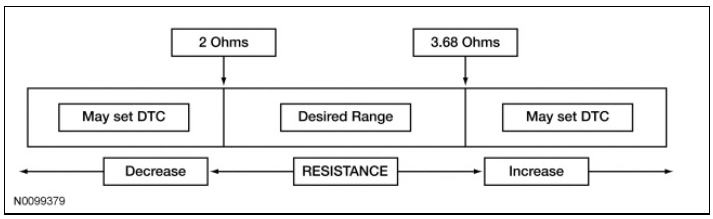
- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted driver air bag module

If a fault is detected, the RCM stores DTC B0002:11, B0002:12, B0002:13 or B0002:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the

deployment loop circuit including:

- Wiring
- Connections
- Clockspring
- Driver air bag module
- RCM



DTC Description	Fault Trigger Condition
• B0002:11 â Driver Frontal Stage 2 Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on either driver air bag stage 2 circuit, a fault is indicated.
• B0002:12 â Driver Frontal Stage 2 Deployment Control: Circuit Short to Battery	When the RCM senses a short to voltage on either driver air bag stage 2 circuit, a fault is indicated.
• B0002:13 â Driver Frontal Stage 2 Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between driver air bag stage 2 circuits, a fault is indicated.
• B0002:1A â Driver Frontal Stage 2 Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between driver air bag stage 2 circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Clockspring
- Driver air bag module
- RCM

PINPOINT TEST B: DTCs B0002:11, B0002:12, B0002:13 AND B0002:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

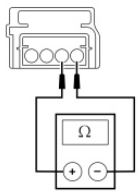
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

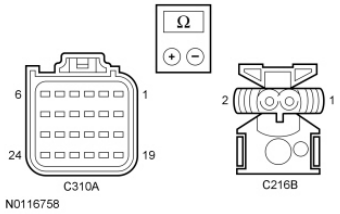
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
B1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0002:11, B0002:12, B0002:13 or B0002:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0002:13 or B0002:1A, GO to B2 . For DTC B0002:11, GO to B11 . For DTC B0002:12, GO to B14 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0002:13 or B0002:1A, GO to B19 . For DTC B0002:11, GO to B20 . For DTC B0002:12, GO to B21 .
B2 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_01_R) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_01_R PID • **Does the PID value read between 2 and 3.68 ohms?**	**Yes** GO to B18 . **No** GO to B3 .
B3 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL RESISTANCE	

(DEPLOY_01_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• Remove the lower steering column shroud to access the clockspring connector. • While monitoring the DEPLOY_01_R PID, carry out the harness test of the driver air bag circuits and accessible connectors (including any in-line connectors), by wiggling and flexing the wire harness, connectors, tilting and rotating the steering wheel frequently. • **Does the PID value read between 2 and 3.68 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness or INSTALL a new clockspring as needed. REFER to Clockspring in this section. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to B23 . **No** For PID value less than 2 ohms, GO to B4 . For PID value greater than 3.68 ohms, GO to B7 .
B4 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module disconnected, open circuit faults would normally be retrieved on stages 1 and 2. • **Did the on-demand DTC change from B0002:1A to B0002:13?**	**Yes** GO to B16 . **No** GO to B5 .
B5 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED) (CLOCKSPRING DISCONNECTED)	
	Yes GO to B17 .

NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Disconnect: Clockspring C218A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module/clockspring disconnected, open circuit faults would normally be retrieved on stages 1 and 2. • **Did the on-demand DTC change from B0002:1A to B0002:13?**	**No** GO to B6 .
B6 CHECK FOR A SHORT BETWEEN DRIVER AIR BAG STAGE 2 CIRCUITS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between C218A-4, circuit CR102 (BU), harness side and C218A-3, circuit RR102 (WH), harness side.  N0116757 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to B18 . **No** REPAIR circuits CR102 (BU) and RR102 (WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to B23 .
B7 CHECK THE DRIVER AIR BAG STAGE 2 CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310A, harness side and driver air bag module stage 2 C216B, harness side using the following chart.	**Yes** GO to B9 . **No** GO to B8 .

RCM	Circuit	Driver Air Bag Module Electrical Connector
C310A-7	CR102 (BU)/(BN)	C216B-1
C310A-8	RR102 (WH)/(BU)	C216B-2

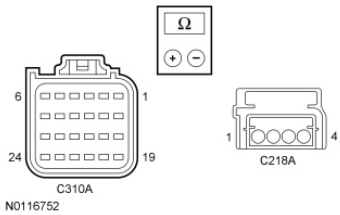


- **Are the resistances less than 1 ohm?**

B8 CHECK THE DRIVER AIR BAG STAGE 2 CIRCUITS FOR AN OPEN (CLOCKSPRING DISCONNECTED)

- Disconnect: Clockspring C218A.
- Measure the resistance between RCM C310A, harness side, and clockspring C218A, harness side, using the following chart.

RCM	Circuit	Clockspring
C310A-7	CR102 (BU)	C218A-4
C310A-8	RR102 (WH)	C218A-3



- **Are the resistances less than 0.5 ohm?**

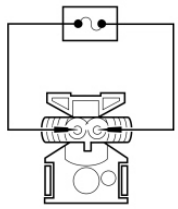
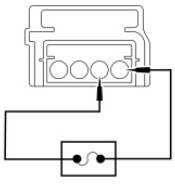
Yes
GO to B17 .

No
REPAIR circuit CR102 (BU) or RR102 (WH).

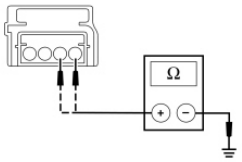
Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

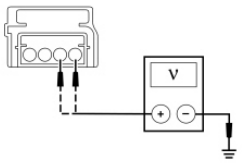
GO to B23 .

B9 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)

NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between driver air bag module stage 2 C216B-1, circuit CR102 (BN), harness side, and C216B-2, circuit RR102 (BU), harness side.  N0116759 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with driver air bag module stage 2 circuits shorted together, a low resistance fault would normally be retrieved on stage 2. Stage 1 will show an open circuit fault due to the driver air bag being disconnected. • **Was DTC B0002:1A retrieved on-demand during self-test?**	**Yes** REMOVE the fused jumper and GO to B16 . **No** REMOVE the fused jumper and GO to B10 .
B10 CHECK THE DRIVER AIR BAG STAGE 2 CIRCUITS FOR AN OPEN (CLOCKSPRING DISCONNECTED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Clockspring C218A. • Connect a fused jumper wire between clockspring C218A-3, circuit RR102 (WH), harness side, and C218A-4, circuit CR102 (BU), harness side.  N0116760	**Yes** REMOVE the fused jumper and GO to B17 . **No** REMOVE the fused jumper and GO to B18 .

• 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the clockspring stage 2 circuits shorted together, a low resistance fault would normally be retrieved on stage 2. Stage 1 will show an open circuit fault due to the driver air bag being disconnected. • **Was DTC B0002:1A retrieved on-demand during self-test?**	
B11 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module disconnected, open circuit faults would normally be retrieved on stages 1 and 2. • **Did the on-demand DTC change from B0002:11 to B0002:13?**	**Yes** GO to B16 . **No** GO to B12 .
B12 CHECK DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED) (CLOCKSPRING DISCONNECTED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Disconnect: Clockspring C218A.	**Yes** GO to B17 . **No** GO to B13 .

• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module/clockspring disconnected, open circuit faults would normally be retrieved on stage 1 and 2. • **Did the on-demand DTC change from B0002:11 to B0002:13?**	
B13 CHECK THE DRIVER AIR BAG STAGE 2 CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between clockspring: ♦ C218A-4, circuit CR102 (BU), harness side and ground. ♦ C218A-3, circuit RR102 (WH), harness side and ground.  N0116761 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to B18 . **No** REPAIR circuit CR102 (BU) or RR102 (WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to B23 .
B14 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO BATTERY INDICATED) (CLOCKSPRING DISCONNECTED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag in this section. • Disconnect: Clockspring C218A. • 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 B17 . **No** GO to B15 .

• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver air bag module/clockspring disconnected, open circuit faults would normally be retrieved on stages 1 and 2. • **Did the on-demand DTC change from B0002:12 to B0002:13?**	
B15 CHECK THE DRIVER AIR BAG STAGE 2 CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • 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 clockspring: ♦ C218A-4, circuit CR102 (BU), harness side and ground. ♦ C218A-3, circuit RR102 (WH), harness side and ground.  N0116762 • **Is any voltage present?**	**Yes** REPAIR circuit CR102 (BU) or RR102 (WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to B23 . **No** GO to B18 .
B16 CONFIRM THE DRIVER AIR BAG MODULE FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires.	**Yes** INSTALL a new driver air bag module. REFER to Driver Airbag in this section. GO to B23 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0002:13 or B0002:1A, GO to B19 . For DTC B0002:11, GO to B20 .

♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Install the driver air bag module. Refer to Driver Airbag 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	For DTC B0002:12, GO to B21 .
B17 CONFIRM THE CLOCKSPRING FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Clockspring C218A. • Install the driver air bag module. Refer to Driver Airbag 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.	**Yes** INSTALL a new clockspring. REFER to Clockspring in this section. GO to B23 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0002:13 or B0002:1A, GO to B19 . For DTC B0002:11, GO to B20 . For DTC B0002:12, GO to B21 .

• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was the original DTC retrieved on-demand during self-test?**	
B18 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • If previously removed, install the driver air bag module. Refer to Driver Airbag in this section. • Connect: Clockspring C218A (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to B23 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0002:13 or B0002:1A, GO to B19 . For DTC B0002:11, GO to B20 . For DTC B0002:12, GO to B21 .
B19 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_01_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_01_R PID	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only**

• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness, tilting and rotating the steering wheel frequently. • **Does the PID value read between 2 and 3.68 ohms?**	**when directed to do so in the pinpoint test.** GO to B22 . **No** If the driver air bag PID indicates incorrect resistance only when the steering wheel is rotated, INSTALL a new clockspring. REFER to Clockspring in this section. For all other faults, DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to B23 .
B20 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness, tilting and rotating the steering wheel frequently. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0002:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to B23 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to B22 .
B21 CHECK THE DRIVER FRONTAL STAGE 2 DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO BATTERY FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. Refer to Driver Airbag 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.	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to B23 . **No** The fault is not present and cannot be

• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness, tilting and rotating the steering wheel frequently. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0002:12 retrieved on-demand during self-test?**	recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to B22 .
B22 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the driver air bag module. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. • Inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. • **Were any concerns found?**	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to B23 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to B23 .
B23 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test C: DTCs B0004:11, B0004:12, B0004:13 and B0004:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

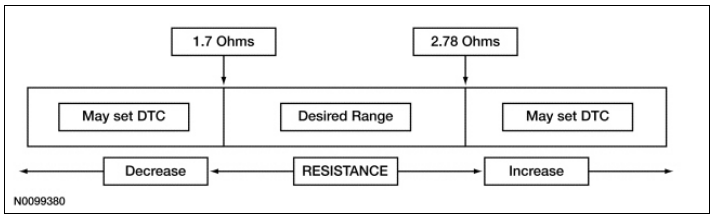
The Restraints Control Module (RCM) continuously monitors the driver knee bolster air bag module circuits for the following faults:

- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted driver knee bolster air bag module

If a fault is detected, the RCM stores DTC B0004:11, B0004:12, B0004:13 or B0004:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Driver knee bolster air bag module
- RCM



DTC Description	Fault Trigger Condition
• B0004:11 â Driver Knee Bolster Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on either driver knee bolster air bag module circuit, a fault is indicated.
• B0004:12 â Driver Knee Bolster Deployment Control: Circuit Short to Battery	When the RCM senses a short to voltage on either driver knee bolster air bag module circuit, a fault is indicated.
• B0004:13 â Driver Knee Bolster Deployment Control: Circuit Open	When the RCM measures greater than the desired resistance range between driver knee bolster air bag module circuits, a fault is indicated.
• B0004:1A â Driver Knee Bolster Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between driver knee bolster air bag module circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver knee bolster air bag module
- RCM

PINPOINT TEST C: DTCs B0004:11, B0004:12, B0004:13 AND B0004:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

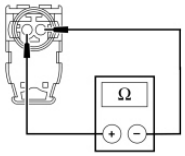
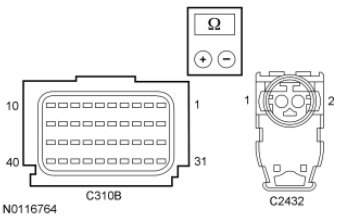
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

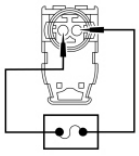
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

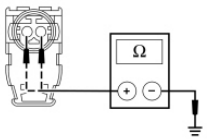
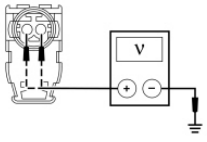
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
C1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0004:11, B0004:12, B0004:13 or B0004:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0004:13 or B0004:1A, GO to C2 . For DTC B0004:11, GO to C8 . For DTC B0004:12, GO to C10 . **No** This is an intermittent fault when

	present as a CMDTC only. For DTC B0004:13 or B0004:1A, GO to C13 . For DTC B0004:11, GO to C14 . For DTC B0004:12, GO to C15 .
C2 CHECK THE DRIVER KNEE BOLSTER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_02_R) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_02_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to C12 . **No** GO to C3 .
C3 CHECK THE DRIVER KNEE BOLSTER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_02_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_02_R PID, carry out the harness test of the driver knee air bag module circuits and accessible connectors (including any in-line connectors), by wiggling connectors and flexing the wire harness frequently. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 . **No** For PID value less than 1.7 ohms, GO to C4 . For PID value greater than 2.78 ohms, GO to C6 .
C4 CHECK THE DRIVER KNEE BOLSTER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Knee Air Bag Module C2432. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver knee air bag module disconnected, open circuit faults	**Yes** GO to C11 . **No** GO to C5 .

would normally be retrieved. • **Did the on-demand DTC change from B0004:11 to B0004:13?**	
C5 CHECK FOR A SHORT BETWEEN DRIVER KNEE AIR BAG MODULE CIRCUITS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver knee air bag module C2432-1, circuit CR139 (VT/WH), harness side and C2432-2, circuit RR139 (YE), harness side.  N0116763 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to C12 . **No** REPAIR circuits CR139 (VT/WH) and RR139 (YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 .
C6 CHECK THE DRIVER KNEE AIR BAG MODULE CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Knee Air Bag Module C2432. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B, harness side and driver knee air bag module C2432, harness side using the following chart. **RCM** / **Circuit** / **Driver Knee Air Bag Module** C310B-4 / RR139 (YE) / C2432-2 C310B-3 / CR139 (VT/WH) / C2432-1  N0116764 • **Are the resistances less than 0.5 ohm?**	**Yes** GO to C7 . **No** REPAIR circuit CR139 (VT/WH) or RR139 (YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 .

C7 CHECK THE DRIVER KNEE BOLSTER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
• Connect: RCM C310A and C310B. • Connect a fused jumper wire between driver knee air bag module C2432-1, circuit CR139 (VT/WH), harness side and C2432-2, circuit RR139 (YE), harness side.  N0116765 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver knee air bag module circuits shorted together, a low resistance fault would normally be retrieved. • **Did the on-demand DTC change from B0004:13 to B0004:1A?**	**Yes** REMOVE the fused jumper wire and GO to C11 . **No** REMOVE the fused jumper wire and GO to C12 .
C8 CHECK THE DRIVER KNEE BOLSTER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Knee Bolster Air Bag Module C2432. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver knee air bag module disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0004:11 to B0004:13?**	**Yes** GO to C11 . **No** GO to C9 .

C9 CHECK THE DRIVER KNEE AIR BAG MODULE CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver knee air bag module: ♦ C2432-1, circuit CR139 (VT/WH), harness side and ground. ♦ C2432-2, circuit RR139 (YE), harness side and ground.  N0116766 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to C12 . **No** REPAIR circuit CR139 (VT/WH) or RR139 (YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 .
C10 CHECK THE DRIVER KNEE AIR BAG MODULE CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Knee Air Bag Module C2432. • 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 knee air bag module: ♦ C2432-1, circuit CR139 (VT/WH), harness side and ground. ♦ C2432-2, circuit RR139 (YE), harness side and ground.  N0116767 • **Is any voltage present?**	**Yes** REPAIR circuit CR139 (VT/WH) or RR139 (YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 . **No** GO to C12 .
C11 CONFIRM THE DRIVER KNEE AIR BAG MODULE FAULT	
NOTE: Make sure all SRS components, sensor electrical connectors and the RCM electrical connectors are	**Yes** INSTALL a new driver knee air bag module. REFER to Knee Airbag in

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: Driver Knee Air Bag Module C2432. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	this section. GO to C17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0004:13 or B0004:1A, GO to C13 . For DTC B0004:11, GO to C14 . For DTC B0004:12, GO to C15 .
C12 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components, 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Knee Air Bag Module C2432 (if previously disconnected). • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM .	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to C17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0004:13 or B0004:1A, GO to C13 . For DTC B0004:11, GO to C14 . For DTC B0004:12, GO to C15 .

• **Was the original DTC retrieved on-demand during self-test?**	
C13 CHECK THE DRIVER KNEE BOLSTER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_02_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_02_R PID • Attempt to recreate the fault by wiggling connectors (including any in-line connectors), and flexing the wire harness frequently. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to C16 . **No** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 .
C14 CHECK THE DRIVER KNEE BOLSTER DEPLOYMENT CONTROL CIRCUITS FOR AN INTERMITTENT SHORT TO GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness frequently. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0004:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to C16 .
C15 CHECK THE DRIVER KNEE BOLSTER DEPLOYMENT CONTROL CIRCUITS FOR AN INTERMITTENT SHORT TO BATTERY FAULT	
• Ignition OFF.	**Yes** DEPOWER the SRS and REPAIR as necessary.

• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Knee Air Bag Module C2432. • 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness frequently. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0004:12 retrieved on-demand during self-test?**	Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to C16 .
C16 CHECK HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Knee Bolster Air Bag Module C2432 (if not previously disconnected). ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. • **Were any concerns found?**	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to C17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to C17 .
C17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and Occupant	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Classification System Module (OCSM). • **Are any RCM and/or OCSM retrieved on-demand during self-test?**	

Pinpoint Test D: DTCs B0010:11, B0010:12, B0010:13 and B0010:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

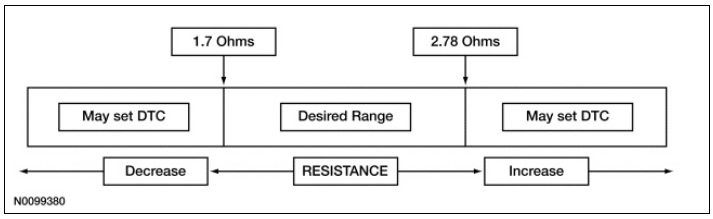
The Restraints Control Module (RCM) continuously monitors the passenger air bag module stage 1 circuits for the following faults:

- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted passenger air bag module

If a fault is detected, the RCM stores DTC B0010:11, B0010:12, B0010:13 or B0010:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Passenger air bag module
- RCM



DTC Description	Fault Trigger Conditions
• B0010:11 â Passenger Frontal Stage 1 Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on either passenger air bag stage 1 circuit, a fault is indicated.
	When the RCM senses a short to voltage on either passenger air bag stage 1 circuit, a fault is indicated.

• B0010:12 â Passenger Frontal Stage 1 Deployment Control: Circuit Short to Battery	
• B0010:13 â Passenger Frontal Stage 1 Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between passenger air bag stage 1 circuits, a fault is indicated.
• B0010:1A â Passenger Frontal Stage 1 Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between passenger air bag stage 1 circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Passenger air bag module
- RCM

PINPOINT TEST D: DTCs B0010:11, B0010:12, B0010:13 AND B0010:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

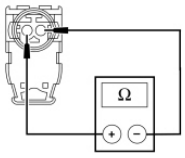
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

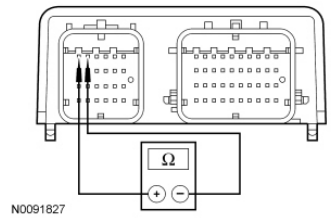
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
D1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM .	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during

• **Was DTC B0010:11, B0010:12, B0010:13 or B0010:1A retrieved on-demand during self-test?**	self-test. For DTC B0010:13 or B0010:1A, GO to D2 . For DTC B0010:11, GO to D9 . For DTC B0010:12, GO to D11 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0010:13 or B0010:1A, GO to D14 . For DTC B0010:11, GO to D15 . For DTC B0010:12, GO to D16 .
D2 CHECK THE PASSENGER FRONTAL STAGE 1 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_05_R) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_05_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to D13 . **No** GO to D3 .
D3 CHECK THE PASSENGER FRONTAL STAGE 1 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_05_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_05_R PID, carry out the harness test of the passenger air bag module circuits and accessible connectors (including any in-line connectors) by wiggling connectors and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to D18 . **No** For PID value less than 1.7 ohms, GO to D4 . For PID value greater than 2.78 ohms, GO to D7 .
D4 CHECK THE PASSENGER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	

NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove and disconnect the passenger air bag module. Refer to Passenger Airbag 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger air bag module removed, open circuit faults would normally be retrieved on passenger air bag stage 1 and stage 2 circuits. • **Did the on-demand DTC change from B0010:1A to B0010:13?**	**Yes** GO to D12 . **No** GO to D5 .
D5 CHECK FOR A SHORT BETWEEN PASSENGER AIR BAG STAGE 1 CIRCUITS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Measure the resistance between passenger air bag module stage 1 C256A-1, circuit CR103 (GY/BU), harness side and C256A-2, circuit RR103 (VT/GN), harness side.  N0116763 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to D13 . **No** GO to D6 .
D6 CHECK RCM FOR LOW RESISTANCE	
• Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310A pins 1 and 2, component side.	**Yes** REPAIR circuits CR103 (GY/BU) and RR103 (VT/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to D18 .



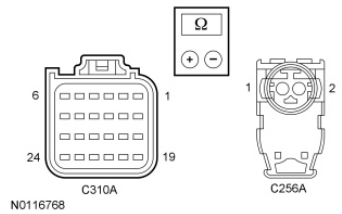
- **Is the resistance greater than 10,000 ohms?**

No
GO to D13 .

D7 CHECK THE PASSENGER AIR BAG STAGE 1 CIRCUITS FOR AN OPEN

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag in this section.
- Disconnect: RCM C310A and C310B.
- Measure the resistance between RCM C310A, harness side and passenger air bag module stage 1 C256A, harness side using the following chart.

RCM	Circuit	Passenger Air Bag Module Stage 1
C310A-1	CR103 (GY/BU)	C256A-1
C310B-2	RR103 (VT/GN)	C256A-2



- **Are the resistances less than 0.5 ohm?**

Yes
GO to D8 .

No
REPAIR circuit CR103 (GY/BU) or RR103 (VT/GN).

Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

GO to D18 .

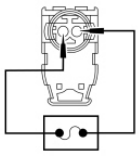
D8 CHECK THE PASSENGER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)

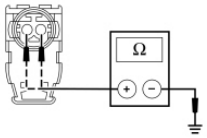
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault.

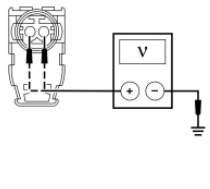
- Prior to reconnecting any previously disconnected SRS component:

Yes
REMOVE the fused jumper wire and GO to D12 .

No
REMOVE the fused jumper wire and GO to D13 .

♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between passenger air bag module stage 1 C256A-1, circuit CR103 (GY/BU), harness side and C256A-2, circuit RR103 (VT/GN), harness side.  N0116765 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger air bag module stage 1 circuits shorted together, a low resistance fault would normally be retrieved on stage 1. Stage 2 shows an open circuit fault due to the passenger air bag being removed. • **Did the on-demand DTC change from B0010:13 to B0010:1A?**	
D9 CHECK THE PASSENGER FRONTAL STAGE 1 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag in this section.	**Yes** GO to D12 . **No** GO to D10 .

• 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger air bag module removed, open circuit faults would normally be retrieved on passenger air bag stage 1 and stage 2 circuits. • **Did the on-demand DTC change from B0010:11 to B0010:13?**	
D10 CHECK THE PASSENGER AIR BAG STAGE 1 CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger air bag module: ♦ C256A-1, circuit CR103 (GY/BU), harness side and ground. ♦ C256A-2, circuit RR103 (VT/GN), harness side and ground.  N0116766 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to D13 . **No** Due to the shorting bar feature in the RCM electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit CR103 (GY/BU) or RR103 (VT/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to D18 .
D11 CHECK THE PASSENGER AIR BAG STAGE 1 CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag in this section. • 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 air bag module: ♦ C256A-1, circuit CR103 (GY/BU), harness side and ground. ♦ C256A-2, circuit RR103 (VT/GN), harness side and ground.	**Yes** Due to the shorting bar feature in the RCM electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit CR103 (GY/BU) or RR103 (VT/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to D18 . **No**

 N0116767 • **Is any voltage present on either circuit?**	GO to D13 .
D12 CONFIRM THE PASSENGER AIR BAG MODULE FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect and install the passenger air bag module (if previously disconnected). Refer to Passenger Airbag 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new passenger air bag module. REFER to Passenger Airbag in this section. GO to D18 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0010:13 or B0010:1A, GO to D14 . For DTC B0010:11, GO to D15 . For DTC B0010:12, GO to D16 .
D13 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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.	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to D18 . **No** In the process of diagnosing the

• Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect and install the passenger air bag module (if previously disconnected). Refer to Passenger Airbag in this section. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0010:13 or B0010:1A, GO to D14 . For DTC B0010:11, GO to D15 . For DTC B0010:12, GO to D16 .
D14 CHECK THE PASSENGER FRONTAL STAGE 1 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_05_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_05_R PID • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness frequently. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to D17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to D18 .
D15 CHECK THE PASSENGER FRONTAL STAGE 1 DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO GROUND FAULT	

• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • **Was DTC B0010:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to D18 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to D17 .
D16 CHECK THE PASSENGER FRONTAL STAGE 1 DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO BATTERY FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0010:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to D18 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to D17 .
D17 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove and disconnect the passenger air bag module. Refer to Passenger Airbag in this section. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires.	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to D18 . **No**

♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. • **Were any concerns found?**	The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to D18 .
D18 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test E: DTCs B0011:11, B0011:12, B0011:13 and B0011:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) continuously monitors the passenger air bag module 2 circuits for the following faults:

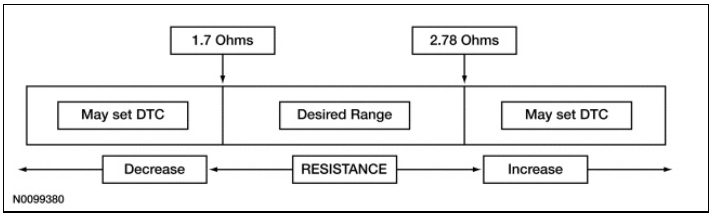
- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted passenger air bag module

If a fault is detected, the RCM stores DTC B0011:11, B0011:12, B0011:13 or B0011:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at the time of diagnosis. Following this direction helps make sure that minor changes in

resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Passenger air bag module
- RCM



DTC Description	Fault Trigger Conditions
• B0011:11 â Passenger Frontal Stage 2 Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on either passenger frontal stage 2 deployment control circuit, a fault is indicated.
• B0011:12 â Passenger Frontal Stage 2 Deployment Control: Circuit Short to Battery	When the RCM senses a short to voltage on either passenger frontal stage 2 deployment control circuit, a fault is indicated.
• B0011:13 â Passenger Frontal Stage 2 Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between passenger frontal stage 2 deployment control circuits, a fault is indicated.
• B0011:1A â Passenger Frontal Stage 2 Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between passenger frontal stage 2 deployment control circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Passenger air bag module
- RCM

PINPOINT TEST E: DTCs B0011:11, B0011:12, B0011:13 AND B0011:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

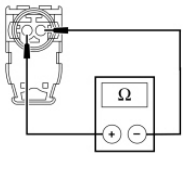
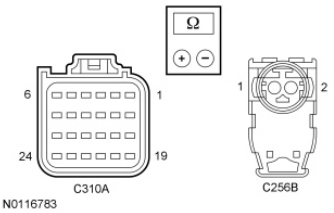
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

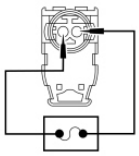
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

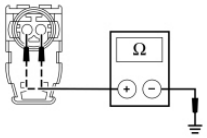
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

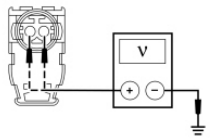
Test Step	Result / Action to Take
E1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0011:11, B0011:12, B0011:13 or B0011:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during the self-test. For DTC B0011:13 or B0011:1A, GO to E2 . For DTC B0011:11, GO to E8 . For DTC B0011:12, GO to E10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0011:13 or B0011:1A, GO to E13 . For DTC B0011:11, GO to E14 . For DTC B0011:12, GO to E15 .
E2 CHECK THE PASSENGER FRONTAL STAGE 2 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_06_R) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_06_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to E12 . **No** GO to E3 .

E3 CHECK THE PASSENGER FRONTAL STAGE 2 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_06_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_06_R PID, carry out the harness test of the passenger air bag module circuits and accessible connectors (including any in-line connectors) by wiggling connectors and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E16 . **No** For PID value less than 1.7 ohms, GO to E4 . For PID value greater than 2.78 ohms, GO to E6 .
E4 CHECK THE PASSENGER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger air bag module disconnected, open circuit faults would normally be retrieved on passenger air bag stage 1 and 2 circuits. • **Did the on-demand DTC change from B0011:1A to B0011:13?**	**Yes** GO to E11 . **No** GO to E5 .
E5 CHECK FOR A SHORT BETWEEN PASSENGER AIR BAG STAGE 2 CIRCUITS	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger air bag module stage 2 C256B-1, circuit CR104 (YE/GY), harness side and C256B-2, circuit RR104 (WH/BU), harness side.  N0116763 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to E11 . **No** REPAIR circuits CR104 (YE/GY) and RR104 (WH/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E17 .
E6 CHECK THE PASSENGER AIR BAG STAGE 2 CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310A, harness side and passenger air bag module stage 2 C256B, harness side using the following chart. **RCM** / **Circuit** / **Passenger Air Bag Module Stage 2** C310A-10 / CR104 (YE/GY) / C256B-1 C310A-9 / RR104 (WH/BU) / C256B-2  N0116783 • **Are the resistances less than 0.5 ohm?**	**Yes** GO to E7 . **No** REPAIR circuit CR104 (YE/GY) or RR104 (WH/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E17 .
E7 CHECK THE PASSENGER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS	

CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between passenger air bag module stage 2 C256B-1, circuit CR104 (YE/GY), harness side and C256B-2, circuit RR104 (WH/BU), harness side.  N0116765 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger air bag stage 2 circuits shorted together, a low resistance fault would normally be retrieved on stage 2. Stage 1 shows an open circuit fault due to the passenger air bag module being removed. • **Did the on-demand DTC change from B0011:13 to B0011:1A?**	**Yes** REMOVE the fused jumper wire and GO to E11 . **No** REMOVE the fused jumper wire and GO to E12 .
E8 CHECK THE PASSENGER FRONTAL STAGE 2 DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag 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.	**Yes** GO to E11 . **No** GO to E9 .

• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger air bag module removed, open circuit faults would normally be retrieved on stage 1 and stage 2. • **Did the on-demand DTC change from B0011:11 to B0011:13?**	
E9 CHECK THE PASSENGER AIR BAG STAGE 2 CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger air bag module stage 2: ♦ C256B-1, circuit CR104 (YE/GY), harness side and ground. ♦ C256B-2, circuit RR104 (WH/BU), harness side and ground.  N0116766 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to E12 . **No** REPAIR circuit CR104 (YE/GY) or RR104 (WH/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E17 .
E10 CHECK THE PASSENGER AIR BAG STAGE 2 CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove and disconnect the passenger air bag module. Refer to Passenger Airbag in this section. • 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 air bag module stage 2: ♦ C256B-1, circuit CR104 (YE/GY), harness side and ground. ♦ C256B-2, circuit RR104 (WH/BU), harness side and ground.	**Yes** REPAIR circuit CR104 (YE/GY) or RR104 (WH/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E17 . **No** GO to E12 .

 N0116767 • **Is any voltage present on either circuit?**	
E11 CONFIRM THE PASSENGER AIR BAG MODULE FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B SRS lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect and install the passenger air bag module (if previously disconnected). Refer to Passenger Airbag 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new passenger air bag module. REFER to Passenger Airbag in this section. GO to E17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0011:13 or B0011:1A, GO to E13 . For DTC B0011:11, GO to E14 . For DTC B0011:12, GO to E15 .
E12 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component:	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to E17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not**

♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Install the passenger air bag module (if previously removed) and connect passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag in this section. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0011:13 or B0011:1A, GO to E13 . For DTC B0011:11, GO to E14 . For DTC B0011:12, GO to E15 .
E13 CHECK THE PASSENGER FRONTAL STAGE 2 DEPLOYMENT CONTROL RESISTANCE (DEPLOY_06_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_06_R PID • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness, tilting and rotating the steering wheel frequently. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to E16 . **No** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E17 .
E14 CHECK THE PASSENGER FRONTAL STAGE 2 DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire	**Yes** DEPOWER the SRS and REPAIR as necessary.

harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0011:11 retrieved on-demand during self-test?**	Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to E16 .
E15 CHECK THE PASSENGER FRONTAL STAGE 2 DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO BATTERY FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0011:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to E16 .
E16 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Remove the passenger air bag module and disconnect the passenger air bag module connectors C256A and C256B. Refer to Passenger Airbag in this section. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. • **Were any concerns found?**	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to E17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS**

	components only when directed to do so in the pinpoint test. GO to E17 .
E17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer on-demand during self-test.

Pinpoint Test F: DTCs B0020:11, B0020:12, B0020:13 and B0020:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) continuously monitors the driver seat side air bag module circuits for the following faults:

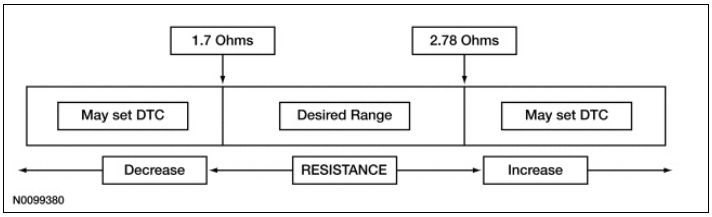
- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted driver seat side air bag module

If a fault is detected, the RCM stores DTC B0020:11, B0020:12, B0020:13 or B0020:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring

- Connections
- Driver seat side air bag module
- RCM



DTC Description	Fault Trigger Conditions
• B0020:11 â Left Side Airbag Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on either driver seat side air bag circuit, a fault is indicated.
• B0020:12 â Left Side Airbag Deployment Control: Circuit Short to Battery	When the RCM senses a short to voltage on either driver seat side air bag circuit, a fault is indicated.
• B0020:13 â Left Side Airbag Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between the driver seat side air bag circuit, a fault is indicated.
• B0020:1A â Left Side Airbag Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between the driver seat side air bag circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver seat side air bag module
- RCM

PINPOINT TEST F: DTCs B0020:11, B0020:12, B0020:13 AND B0020:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

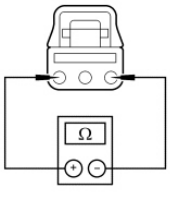
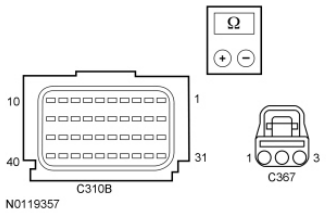
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

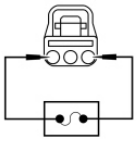
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

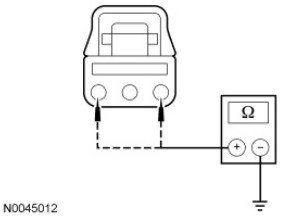
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

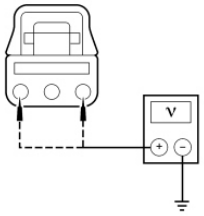
Test Step	Result / Action to Take
F1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0020:11, B0020:12, B0020:13 or B0020:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during the self-test. For DTC B0020:13 or B0020:1A, GO to F2 . For DTC B0020:11, GO to F8 . For DTC B0020:12, GO to F10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0020:13 or B0020:1A, GO to F13 . For DTC B0020:11, GO to F14 . For DTC B0020:12, GO to F15 .
F2 CHECK THE LEFT SIDE AIRBAG DEPLOYMENT CONTROL RESISTANCE (DEPLOY_10_R) PID	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_10_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to F12 . **No** GO to F3 .

F3 CHECK THE LEFT SIDE AIRBAG DEPLOYMENT CONTROL RESISTANCE (DEPLOY_10_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_10_R PID carry out the harness test of the driver seat side air bag circuits and accessible connectors (including any in-line connectors) by wiggling connectors and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 . **No** For PID value less than 1.7 ohms, GO to F4 . For PID value greater than 2.78 ohms, GO to F6 .
F4 CHECK THE LEFT SIDE AIRBAG DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Side Air Bag Module C367. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver seat side air bag disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0020:1A to B0020:13?**	**Yes** GO to F11 . **No** GO to F5 .
F5 CHECK FOR A SHORT BETWEEN DRIVER SEAT SIDE AIR BAG CIRCUITS	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver seat side air bag module C367-3, circuit CR105 (GN/BU), harness side and C367-1, circuit RR105 (GY/YE), harness side.  DR1050-A • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to F12 . **No** REPAIR circuits CR105 (GN/BU) and RR105 (GY/YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 .
F6 CHECK THE DRIVER SEAT SIDE AIR BAG CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Side Air Bag Module C367. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B, harness side and driver seat side air bag module C367, harness side using the following chart. **RCM** / **Circuit** / **Driver Seat Side Air Bag Module** C310B-6 / CR105 (GN/BU) / C367-3 C310B-5 / RR105 (GY/YE) / C367-1  N0119357 • **Are the resistances less than 0.5 ohm?**	**Yes** GO to F7 . **No** REPAIR circuit CR105 (GN/BU) or RR105 (GY/YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 .
F7 CHECK THE LEFT SIDE AIRBAG DEPLOYMENT CONTROL DTC FOR A FAULT	

STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between driver seat side air bag module C367-1, circuit RR105 (GY/YE), harness side and C367-3, circuit CR105 (GN/BU), harness side.  N0116770 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver seat side air bag module circuits shorted together, a low resistance fault would normally be retrieved. • **Did the on-demand DTC change from B0020:13 to B0020:1A?**	**Yes** REMOVE the fused jumper wire and GO to F11 . **No** REMOVE the fused jumper wire and GO to F12 .
F8 CHECK THE LEFT SIDE AIRBAG DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Side Air Bag Module C367. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS)	**Yes** GO to F11 . **No** GO to F9 .

Depowering and Repowering in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver seat side air bag module disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0020:11 to B0020:13?**	
F9 CHECK THE DRIVER SEAT SIDE AIR BAG CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver seat side air bag module: ♦ C367-1, circuit RR105 (GY/YE), harness side and ground. ♦ C367-3, circuit CR105 (GN/BU), harness side and ground.  • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to F12 . **No** REPAIR circuit CR105 (GN/BU) or RR105 (GY/YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 .
F10 CHECK THE DRIVER SEAT SIDE AIR BAG CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Side Air Bag Module C367. • 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 seat side air bag module: ♦ C367-1, circuit RR105 (GY/YE), harness side and ground. ♦ C367-3, circuit CR105 (GN/BU), harness side and ground.	**Yes** REPAIR circuit CR105 (GN/BU) or RR105 (GY/YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 . **No** GO to F12 .

 • **Is any voltage present on either circuit?**	
F11 CONFIRM THE DRIVER SEAT SIDE AIR BAG MODULE FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Side Air Bag Module C367. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new driver side air bag module. REFER to Side Airbag in this section. GO to F17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0020:13 or B0020:1A, GO to F13 . For DTC B0020:11, GO to F14 . For DTC B0020:12, GO to F15 .
F12 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to F17 .

recorded. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Seat Side Air Bag Module C367. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0020:13 or B0020:1A, GO to F13 . For DTC B0020:11, GO to F14 . For DTC B0020:12, GO to F15 .
F13 CHECK THE LEFT SIDE AIRBAG DEPLOYMENT CONTROL RESISTANCE (DEPLOY_10_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_10_R PID • Monitor the DEPLOY_10_R PID. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to F16 . **No** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 .

F14 CHECK THE LEFT SIDE AIRBAG DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0020:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to F16 .
F15 CHECK THE LEFT SIDE AIRBAG DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO BATTERY FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Side Air Bag Module C367. • 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0020:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to F16 .
F16 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect the driver seat side air bag module C367: ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals.	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to F17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any**

♦ inspect wire harness for any damage, pinched, cut or pierced wires. • **Were any concerns found?**	**new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to F17 .
F17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test G: DTCs B0021:11, B0021:12, B0021:13 and B0021:1A

Normal Operation

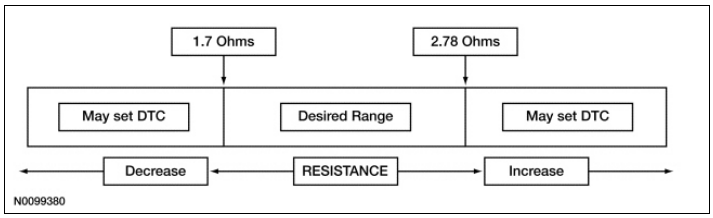
The Restraints Control Module (RCM) continuously monitors the driver side air curtain circuits for the following faults:

- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted driver side air curtain

If a fault is detected, the RCM stores DTC B0021:11, B0021:12, B0021:13 or B0021:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Driver side curtain module
- RCM



DTC Description	Fault Trigger Conditions
• B0021:11 â Left Curtain Deployment Control 1: Circuit Short to Ground	When the RCM senses a short to ground on either driver side air curtain circuit, a fault is indicated.
• B0021:12 â Left Curtain Deployment Control 1: Circuit Short to Battery	When the RCM senses a short to voltage on either driver side air curtain circuit, a fault is indicated.
• B0021:13 â Left Curtain Deployment Control 1: Circuit Open	When the RCM measures more than the desired resistance range between the driver side air curtain circuits, a fault is indicated.
• B0021:1A â Left Curtain Deployment Control 1: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between the driver side air curtain circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver side air curtain module
- RCM

PINPOINT TEST G: DTCs B0021:11, B0021:12, B0021:13 AND B0021:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

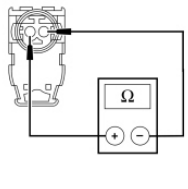
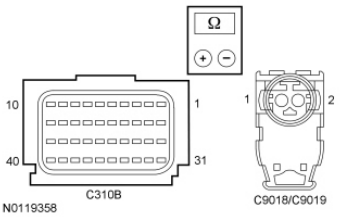
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

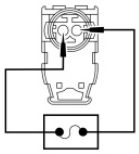
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

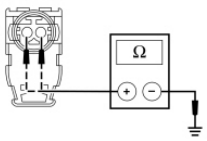
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

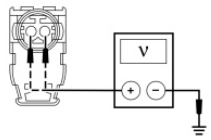
Test Step	Result / Action to Take
G1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0021:11, B0021:12, B0021:13 or B0021:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0021:13 or B0021:1A, GO to G2 . For DTC B0021:11, GO to G8 . For DTC B0021:12, GO to G10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0021:13 or B0021:1A, GO to G13 . For DTC B0021:11, GO to G14 . For DTC B0021:12, GO to G15 .
G2 CHECK THE LEFT CURTAIN DEPLOYMENT CONTROL 1 RESISTANCE (DEPLOY_11_R) PID	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_11_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to G12 . **No** GO to G3 .
G3 CHECK THE LEFT CURTAIN DEPLOYMENT CONTROL 1 RESISTANCE (DEPLOY_11_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_11_R PID carry out the harness test of the driver side air curtain circuits and accessible connectors (including any in-line connectors) by wiggling connectors and	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed.

flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to G17 . **No** For PID value less than 1.7 ohms, GO to G4 . For PID value greater than 2.78 ohms, GO to G6 .
G4 CHECK THE LEFT CURTAIN DEPLOYMENT CONTROL 1 DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Side Air Curtain C9018. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver side air curtain disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0021:1A to B0021:13?**	**Yes** GO to G11 . **No** GO to G5 .
G5 CHECK FOR A SHORT BETWEEN DRIVER SIDE AIR CURTAIN CIRCUITS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver side air curtain C9018-1, circuit CR109 (BN/BU), harness side and C9018-2, circuit RR109 (BU/GN), harness side.	**Yes** GO to G12 . **No** REPAIR circuits CR109 (BN/BU) and RR109 (BU/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

 N0116763 • **Is the resistance greater than 10,000 ohms?**	GO to G17 .
G6 CHECK THE DRIVER SIDE AIR CURTAIN CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Side Air Curtain C9018. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B, harness side and driver side air curtain C9018, harness side using the following chart. **RCM** / **Circuit** / **Driver Side Air Curtain** C310B-7 / CR109 (BN/BU) / C9018-1 C310B-8 / RR109 (BU/GN) / C9018-2  N0119358 • **Are the resistances less than 0.5 ohm?**	**Yes** GO to G7 . **No** REPAIR circuit CR109 (BN/BU) or RR109 (BU/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to G17 .
G7 CHECK THE LEFT CURTAIN DEPLOYMENT CONTROL 1 DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	

NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between driver side air curtain C9018-1, circuit CR109 (BN/BU), harness side and C9018-2, circuit RR109 (BU/GN), harness side.  N0116765 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver side air curtain circuits shorted together, a low resistance fault would normally be retrieved. • **Did the on-demand DTC change from B0021:13 to B0021:1A?**	**Yes** REMOVE the fused jumper wire and GO to G11 . **No** REMOVE the fused jumper wire and GO to G12 .
G8 CHECK THE LEFT CURTAIN DEPLOYMENT CONTROL 1 DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Side Air Curtain C9018. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • 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 G11 . **No** GO to G9 .

• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver side air curtain disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0021:11 to B0021:13?**	
G9 CHECK THE DRIVER SIDE AIR CURTAIN CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver side air curtain: ♦ C9018-1, circuit CR109 (BN/BU), harness side and ground. ♦ C9018-2, circuit RR109 (BU/GN), harness side and ground.  N0116766 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to G12 . **No** REPAIR circuit CR109 (BN/BU) or RR109 (BU/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to G17 .
G10 CHECK THE DRIVER SIDE AIR CURTAIN CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Side Air Curtain C9018. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • 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 air curtain: ♦ C9018-1, circuit CR109 (BN/BU), harness side and ground. ♦ C9018-2, circuit RR109 (BU/GN), harness side and ground.	**Yes** REPAIR circuit CR109 (BN/BU) or RR109 (BU/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to G17 . **No** GO to G12 .

 N0116767 • **Is any voltage present?**	
G11 CONFIRM THE DRIVER SIDE AIR CURTAIN MODULE FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Side Air Curtain C9018. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new driver side air curtain. REFER to Side Air Curtain in this section. GO to G17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0021:13 or B0021:1A, GO to G13 . For DTC B0021:11, GO to G14 . For DTC B0021:12, GO to G15 .
G12 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be recorded.	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to G17 . **No**

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Side Air Curtain C9018. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0021:13 or B0021:1A, GO to G13 . For DTC B0021:11, GO to G14 . For DTC B0021:12, GO to G15 .
G13 CHECK THE LEFT CURTAIN DEPLOYMENT CONTROL 1 RESISTANCE (DEPLOY_11_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_11_R PID • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to G16 . **No** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to G17 .
G14 CHECK THE LEFT CURTAIN DEPLOYMENT CONTROL 1 FOR AN INTERMITTENT SHORT TO	

GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0021:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to G17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to G16 .
G15 CHECK THE LEFT CURTAIN DEPLOYMENT CONTROL 1 FOR AN INTERMITTENT SHORT TO BATTERY FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Side Air Curtain C9018. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0021:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to G17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to G16 .
G16 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Side Air Curtain C9018. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. • **Were any concerns found?**	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to G17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install**

	SRS components only when directed to do so in the pinpoint test. GO to G17 .
G17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test H: DTCs B0028:11, B0028:12, B0028:13 and B0028:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

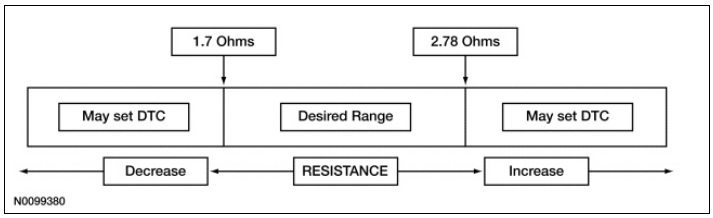
The Restraints Control Module (RCM) continuously monitors the passenger seat side air bag circuits for the following faults:

- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted passenger seat side air bag module

If a fault is detected, the RCM stores DTC B0028:11, B0028:12, B0028:13 or B0028:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at the time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Passenger seat side air bag module
- RCM



DTC Description	Fault Trigger Conditions
• B0028:11 â Right Side Airbag Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on either passenger seat side air bag circuit, a fault is indicated.
• B0028:12 â Right Side Airbag Deployment Control: Circuit Short to Battery	When the RCM senses a short to voltage on either passenger seat side air bag circuit, a fault is indicated.
• B0028:13 â Right Side Airbag Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between the passenger seat side air bag circuits, a fault is indicated.
• B0028:1A â Right Side Airbag Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between the passenger seat side air bag circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Passenger seat side air bag module
- RCM

PINPOINT TEST H: DTCs B0028:11, B0028:12, B0028:13 AND B0028:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

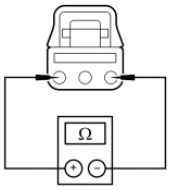
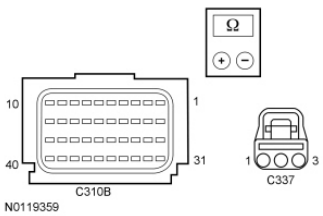
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

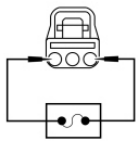
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

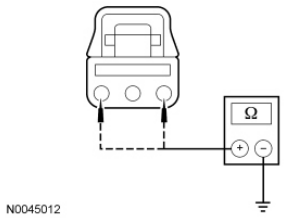
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

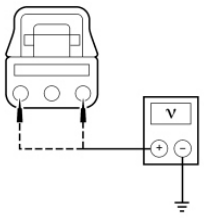
Test Step	Result / Action to Take
H1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0028:11, B0028:12, B0028:13 or B0028:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during the self-test. For DTC B0028:13 or B0028:1A, GO to H2 . For DTC B0028:11, GO to H8 . For DTC B0028:12, GO to H10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0028:13 or B0028:1A, GO to H13 . For DTC B0028:11, GO to H14 . For DTC B0028:12, GO to H15 .
H2 CHECK THE RIGHT SIDE AIRBAG DEPLOYMENT CONTROL RESISTANCE (DEPLOY_13_R) PID	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_13_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to H12 . **No** GO to H3 .

H3 CHECK THE RIGHT SIDE AIRBAG DEPLOYMENT CONTROL RESISTANCE (DEPLOY_13_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_13_R PID carry out the harness test of the passenger seat side air bag circuits and accessible connectors (including any in-line connectors) by wiggling connectors and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to H17 . **No** For PID value less than 1.7 ohms, GO to H4 . For PID value greater than 2.78 ohms, GO to H6 .
H4 CHECK THE RIGHT SIDE AIRBAG DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger seat side air bag module disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0028:1A to B0028:13?**	**Yes** GO to H11 . **No** GO to H5 .
H5 CHECK FOR A SHORT BETWEEN PASSENGER SEAT SIDE AIR BAG CIRCUITS	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger seat side air bag module C337-3, circuit CR106 (VT/GY), harness side and C337-1, circuit RR106 (YE/OG), harness side.  DR1050-A • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to H12 . **No** REPAIR circuits CR106 (VT/GY) and RR106 (YE/OG). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to H17 .
H6 CHECK PASSENGER SEAT SIDE AIR BAG CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B, harness side and passenger seat side air bag module C337, harness side using the following chart. **RCM** / **Circuit** / **Passenger Seat Side Air Bag Module** C310B-16 / CR106 (VT/GY) / C337-3 C310B-15 / RR106 (YE/OG) / C337-1  10 1 40 31 C310B 1 3 C337 N0119359 • **Are the resistances less than 0.5 ohm?**	**Yes** GO to H7 . **No** REPAIR circuit CR106 (VT/GY) or RR106 (YE/OG). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to H17 .

H7 CHECK THE RIGHT SIDE AIRBAG DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between passenger seat side air bag module C337-3, circuit CR106 (VT/GY), harness side and C337-1, circuit RR106 (YE/OG), harness side.  N0116770 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger seat side air bag circuits shorted together, a low resistance fault would normally be retrieved. • **Did the on-demand DTC change from B0028:13 to B0028:1A?**	**Yes** REMOVE the fused jumper wire and GO to H11 . **No** REMOVE the fused jumper wire and GO to H12 .
H8 CHECK THE RIGHT SIDE AIRBAG DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337.	**Yes** GO to H11 . **No** GO to H9 .

• 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger seat side air bag module disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0028:11 to B0028:13?**	
H9 CHECK PASSENGER SEAT SIDE AIR BAG CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger seat side air bag module: ♦ C337-1, circuit RR106 (YE/OG), harness side and ground. ♦ C337-3, circuit CR106 (VT/GY), harness side and ground.  • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to H12 . **No** REPAIR circuit CR106 (VT/GY) or RR106 (YE/OG). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to H17 .
H10 CHECK THE PASSENGER SEAT SIDE AIR BAG CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • 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: ♦ C337-1, circuit RR106 (YE/OG), harness side and ground.	**Yes** REPAIR circuit CR106 (VT/GY) or RR106 (YE/OG). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to H17 . **No** GO to H12 .

♦ C337-3, circuit CR106 (VT/GY), harness side and ground.  N0045011 • **Is any voltage present on either circuit?**	
H11 CONFIRM THE PASSENGER SEAT SIDE AIR BAG MODULE FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Passenger Seat Side Air Bag Module C337. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** REMOVE and INSPECT the seat side air bag module harness for damage. REFER to Side Airbag in this section. If a concern is found, REPAIR as necessary. If a concern was not found, INSTALL a new passenger side air bag module. REFER to Side Airbag in this section. GO to H17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0028:13 or B0028:1A, GO to H13 . For DTC B0028:11, GO to H14 . For DTC B0028:12, GO to H15 .
H12 CONFIRM THE RCM FAULT	

NOTE: Make sure all restraint system components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Passenger Seat Side Air Bag Module C337. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to H17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0028:13 or B0028:1A, GO to H13 . For DTC B0028:11, GO to H14 . For DTC B0028:12, GO to H15 .
H13 CHECK THE RIGHT SIDE AIRBAG DEPLOYMENT CONTROL RESISTANCE (DEPLOY_13_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_13_R PID • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to H16 . **No** DEPOWER the SRS and REPAIR as necessary.

	Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to H17 .
H14 CHECK THE RIGHT SIDE AIRBAG DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0028:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to H17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to H16 .
H15 CHECK THE RIGHT SIDE AIRBAG DEPLOYMENT CONTROL FOR AN INTERMITTENT SHORT TO BATTERY FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0028:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to H17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to H16 .
H16 CHECK HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337.	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. • **Were any concerns found?**	GO to H17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to H17 .
H17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test I: DTCs B0029:11, B0029:12, B0029:13 and B0029:1A

Normal Operation

The Restraints Control Module (RCM) continuously monitors the passenger side air curtain circuits for the following faults:

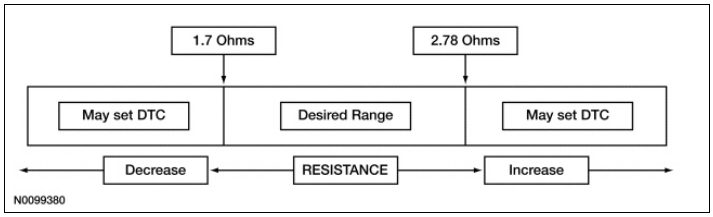
- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted passenger side air curtain

If a fault is detected, the RCM stores DTC B0029:11, B0029:12, B0029:13 or B0029:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to

be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Passenger side air curtain module
- RCM



DTC Description	Fault Trigger Conditions
• B0029:11 â Right Curtain Deployment Control 1: Circuit Short to Ground	When the RCM senses a short to ground on either passenger side air curtain circuit, a fault is indicated.
• B0029:12 â Right Curtain Deployment Control 1: Circuit Short to Battery	When the RCM senses a short to voltage on either passenger side air curtain circuit, a fault is indicated.
• B0029:13 â Right Curtain Deployment Control 1: Circuit Open	When the RCM measures more than the desired resistance range between the passenger side air curtain circuits, a fault is indicated.
• B0029:1A â Right Curtain Deployment Control 1: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between the passenger side air curtain circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Passenger side air curtain module
- RCM

PINPOINT TEST I: DTCs B0029:11, B0029:12, B0029:13 AND B0029:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

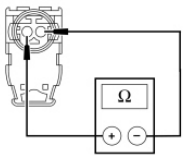
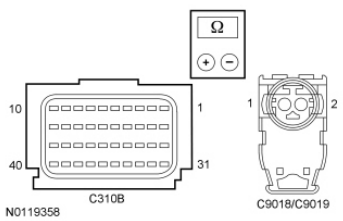
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

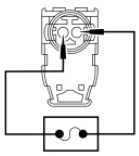
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

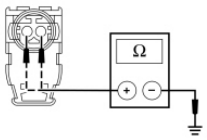
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

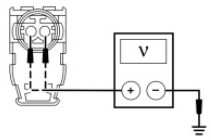
Test Step	Result / Action to Take
I1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0029:11, B0029:12, B0029:13 or B0029:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0029:13 or B0029:1A, GO to I2 . For DTC B0029:11, GO to I8 . For DTC B0029:12, GO to I10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0029:13 or B0029:1A, GO to I13 . For DTC B0029:11, GO to I14 . For DTC B0029:12, GO to I15 .
I2 CHECK RIGHT CURTAIN DEPLOYMENT CONTROL 1 RESISTANCE (DEPLOY_14_R) PID	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_14_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to I12 . **No** GO to I3 .
I3 CHECK THE RIGHT CURTAIN DEPLOYMENT CONTROL 1 RESISTANCE (DEPLOY_14_R) PID	

WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_14_R PID carry out the harness test of the passenger side air curtain circuits and accessible connectors (including any in-line connectors), by wiggling connectors and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to I17 . **No** For PID value less than 1.7 ohm, GO to I4 . For PID value greater than 2.78 ohms, GO to I6 .
I4 CHECK THE RIGHT CURTAIN DEPLOYMENT CONTROL 1 DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Side Air Curtain C9019. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger side air curtain disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0029:1A to B0029:13?**	**Yes** GO to I11 . **No** GO to I5 .
I5 CHECK THE FOR A SHORT BETWEEN PASSENGER SIDE AIR CURTAIN CIRCUITS	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger side air curtain C9019-1, circuit CR111 (BN/WH), harness side and C9019-2, circuit RR111 (YE/VT), harness side.  N0116763 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to I12 . **No** REPAIR circuits CR111 (BN/WH) and RR111 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to I17 .
I6 CHECK THE PASSENGER SIDE AIR CURTAIN CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Side Air Curtain C9019. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B, harness side and passenger side air curtain C9019, harness side using the following chart. **RCM** / **Circuit** / **Passenger Side Air Curtain** C310B-17 / CR111 (BN/WH) / C9019-1 C310B-18 / RR111 (YE/VT) / C9019-2  N0119358	**Yes** GO to I7 . **No** REPAIR circuit CR111 (BN/WH) or RR111 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to I17 .

• **Are the resistances less than 0.5 ohm?**	
I7 CHECK THE RIGHT CURTAIN DEPLOYMENT CONTROL 1 DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between passenger side air curtain C9019-1, circuit CR111 (BN/WH), harness side and C9019-2, circuit RR111 (YE/VT), harness side.  N0116765 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger side air curtain circuits shorted together, a low resistance fault would normally be retrieved. • **Did the on-demand DTC change from B0029:13 to B0029:1A?**	**Yes** REMOVE the fused jumper wire and GO to I11 . **No** REMOVE the fused jumper wire and GO to I12 .
I8 CHECK THE RIGHT CURTAIN DEPLOYMENT CONTROL 1 DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Side Air Curtain C9019. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 .	**Yes** GO to I11 . **No** GO to I9 .

• 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger side air curtain disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0029:11 to B0029:13?**	
I9 CHECK THE PASSENGER SIDE AIR CURTAIN CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger side air curtain: ♦ C9019-1, circuit CR111 (BN/WH), harness side and ground. ♦ C9019-2, circuit RR111 (YE/VT), harness side and ground.  N0116766 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to I12 . **No** REPAIR circuit CR111 (BN/WH) or RR111 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to I17 .
I10 CHECK THE PASSENGER SIDE AIR CURTAIN CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Side Air Curtain C9019. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • 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 side air curtain: ♦ C9019-1, circuit CR111 (BN/WH), harness side and ground.	**Yes** REPAIR circuit CR111 (BN/WH) or RR111 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to I17 . **No** GO to I12 .

♦ C9019-2, circuit RR111 (YE/VT), harness side and ground.  N0116767 • **Is any voltage present on either circuit?**	
I11 CONFIRM THE PASSENGER SIDE AIR CURTAIN MODULE FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Passenger Side Air Curtain C9019. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new passenger side air curtain. REFER to Side Air Curtain in this section. GO to I17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0029:13 or B0029:1A, GO to I13 . For DTC B0029:11, GO to I14 . For DTC B0029:12, GO to I15 .
I12 CONFIRM THE RCM FAULT	
	Yes INSTALL a new RCM . REFER to

NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Passenger Side Air Curtain C9019. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	Restraints Control Module (RCM) in this section. GO to I17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0029:13 or B0029:1A, GO to I13 . For DTC B0029:11, GO to I14 . For DTC B0029:12, GO to I15 .
I13 CHECK THE RIGHT CURTAIN DEPLOYMENT CONTROL 1 RESISTANCE (DEPLOY_14_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_14_R PID • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to I16 . **No** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for

	schematic and connector information. GO to I17 .
I14 CHECK FOR AN INTERMITTENT RIGHT CURTAIN DEPLOYMENT CONTROL 1 SHORT TO GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0029:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to I17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to I16 .
I15 CHECK FOR AN INTERMITTENT RIGHT CURTAIN DEPLOYMENT CONTROL 1 SHORT TO BATTERY FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Side Air Curtain C9019. ♦ Remove the headliner. Refer to the appropriate procedure in Section 501-05 . • 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0029:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to I17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to I16 .
I16 CHECK HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Side Air Curtain C9019.	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. • **Were any concerns found?**	GO to I17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to I17 .
I17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs will be retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test J: DTCs B0050:11, B0050:12, B0050:13 and B0050:1D

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) monitors the driver safety belt buckle switch circuits for the following faults:

- Open circuit
- Short to voltage
- Short to ground
- Current out of range
- Faulted driver safety belt buckle switch

If a fault is detected, the RCM stores DTC B0050:11, B0050:12, B0050:13 or B0050:1D in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

DTC Description	Fault Trigger Conditions
• B0050:11 â Driver Seatbelt Sensor: Circuit Short to Ground	When the RCM senses a short to ground on the driver safety belt buckle switch circuit, a fault is indicated.
• B0050:12 â Driver Seatbelt Sensor: Circuit Short to Battery	When the RCM senses a short to voltage on the driver safety belt buckle switch circuit, a fault is indicated.
• B0050:13 â Driver Seatbelt Sensor: Circuit Open	When the RCM senses an open on either driver safety belt buckle switch circuit, a fault is indicated.
• B0050:1D â Driver Seatbelt Sensor: Circuit Current Out of Range	When the RCM senses current out of an acceptable range between the driver safety belt buckle switch circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver safety belt buckle assembly
- RCM

PINPOINT TEST J: DTCs B0050:11, B0050:12, B0050:13 AND B0050:1D

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

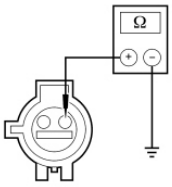
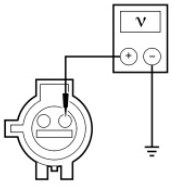
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

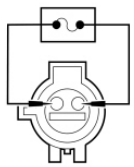
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect

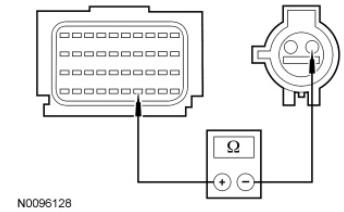
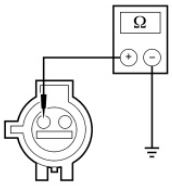
SRS component is installed, DTCs may set.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
J1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0050:11, B0050:12, B0050:13 or B0050:1D retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during the self-test. For DTC B0050:11 or B0050:1D, GO to J2 . For DTC B0050:12, GO to J4 . For DTC B0050:13, GO to J5 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to J10 .
J2 CHECK THE DRIVER SEATBELT SENSOR DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND OR CURRENT OUT OF RANGE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • ⚠ **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.** • Disconnect: Driver Safety Belt Buckle Switch C3065. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver safety belt buckle switch disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0050:11 or B0050:1D to B0050:13?**	**Yes** GO to J8 . **No** For DTC B0050:11, GO to J3 . For DTC B0050:1D, GO to J9 .
J3 CHECK THE DRIVER SAFETY BELT BUCKLE SWITCH CIRCUIT FOR A SHORT TO GROUND	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver safety belt buckle switch C3065-2, circuit CR201 (GN/BU), harness side and ground.  N0010350 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to J9 . **No** REPAIR circuit CR201 (GN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to J11 .
J4 CHECK THE DRIVER SAFETY BELT BUCKLE SWITCH CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Side Air Bag Module C367. • Disconnect: Driver Safety Belt Buckle Switch C3065. • 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 safety belt buckle switch C3065-2, circuit CR201 (GN/BU), harness side and ground.  N0010351 • **Is any voltage present?**	**Yes** REPAIR circuit CR201 (GN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to J11 . **No** GO to J9 .
J5 CHECK THE DRIVER SEATBELT SENSOR DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	

NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Side Air Bag Module C367. • Ignition OFF. • Disconnect: Driver Safety Belt Buckle Switch C3065. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Connect a fused jumper wire between driver safety belt buckle switch C3065-2, circuit CR201 (GN/BU), harness side and C3065-1, circuit GD143 (BK/VT), harness side.  N0116777 • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver safety belt buckle switch circuits shorted together, a short to ground fault would normally be retrieved. • **Did the on-demand DTC change from B0050:13 to B0050:11?**	**Yes** REMOVE the fused jumper wire and GO to J8 . **No** REMOVE the fused jumper wire and GO to J6 .
J6 CHECK THE DRIVER SAFETY BELT BUCKLE SWITCH CIRCUIT FOR A OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B-34, circuit CR201 (GN/BU), harness side and driver safety belt buckle switch C3065-2, circuit CR201 (GN/BU), harness side.	**Yes** GO to J7 . **No** REPAIR circuit CR201 (GN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to J11 .

 • **Is the resistance less than 0.5 ohm?**	
J7 CHECK THE DRIVER SAFETY BELT BUCKLE SWITCH GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between driver safety belt buckle switch C3065-1, circuit GD143 (BK/VT), harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** GO to J9 . **No** REPAIR circuit GD143 (BK/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to J11 .
J8 CONFIRM DRIVER SEATBELT SENSOR FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: RCM C310A and C310B. • Connect: Driver Safety Belt Buckle Switch C3065.	**Yes** INSTALL a new driver safety belt buckle assembly. REFER to Section 501-20A . GO to J11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to J10 .

• 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	
J9 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Safety Belt Buckle Switch C3065. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to J11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to J10 .
J10 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B.	**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.

• Disconnect: Driver Safety Belt Buckle Switch C3065. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC B0050:11, B0050:12, B0050:13 or B0050:1D retrieved on-demand during self-test?**	For DTC B0050:11 or B0050:1D, GO to J2 . For DTC B0050:12, GO to J4 . For DTC B0050:13, GO to J5 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** REPAIR any intermittent wiring, terminal or connector concerns found. GO to J11 .
J11 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test K: DTCs B0052:11, B0052:12, B0052:13 and B0052:1D

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) monitors the passenger safety belt buckle switch and circuits for the following faults:

- Open circuit
- Short to voltage
- Short to ground
- Current out of range
- Faulted safety belt buckle switch

If a fault is detected, the RCM stores DTC B0052:11, B0052:12, B0052:13 or B0052:1D in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

DTC Description	Fault Trigger Conditions
• B0052:11 â Passenger Seatbelt Sensor: Circuit Short to Ground	When the RCM senses a short to ground on the passenger safety belt buckle switch circuit, a fault is indicated.
• B0052:12 â Passenger Seatbelt Sensor: Circuit Short to Battery	When the RCM senses a short to voltage on the passenger safety belt buckle switch circuit, a fault is indicated.
• B0052:13 â Passenger Seatbelt Sensor: Circuit Open	When the RCM senses an open on either passenger safety belt buckle switch circuit, a fault is indicated.
• B0052:1D â Passenger Seatbelt Sensor: Circuit Current Out of Range	When the RCM senses current out of an acceptable range between the passenger safety belt buckle switch circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Passenger safety belt buckle assembly
- RCM

PINPOINT TEST K: DTCs B0052:11, B0052:12, B0052:13 AND B0052:1D

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.**

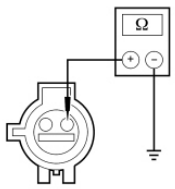
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

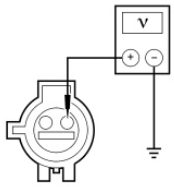
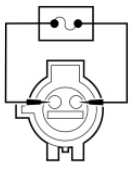
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

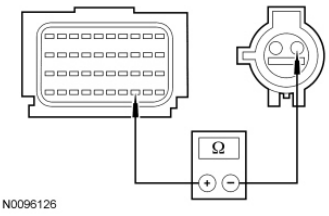
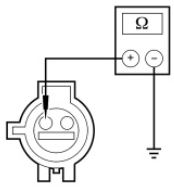
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
K1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any DTC B0052:11, B0052:12, B0052:13 or B0052:1D retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during the self-test. For DTC B0052:11 or B0052:1D, GO to K2 . For DTC B0052:12, GO to K4 . For DTC B0052:13, GO to K5 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to K10 .
K2 CHECK THE PASSENGER SEATBELT SENSOR DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND OR CURRENT OUT OF RANGE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • ⚠ **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.**	**Yes** GO to K8 . **No** For DTC B0052:11, GO to K3 . For DTC B0052:1D, GO to K9 .

• Disconnect: Passenger Safety Belt Buckle Switch C3066. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger safety belt buckle switch disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0052:11 or B0052:1D to B0052:13?**	
K3 CHECK THE PASSENGER SAFETY BELT BUCKLE SWITCH CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger seat belt buckle switch C3066-2, circuit CR202 (BN/GN), harness side and ground.  N0010350 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to K9 . **No** REPAIR circuit CR202 (BN/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to K11 .
K4 CHECK THE PASSENGER SAFETY BELT BUCKLE SWITCH CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: Passenger Safety Belt Buckle Switch C3066. • 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 belt buckle switch C3066-2, circuit CR202 (BN/GN), harness side and ground.	**Yes** REPAIR circuit CR202 (BN/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to K11 . **No** GO to K9 .

 N0010351 • **Is any voltage present?**	
K5 CHECK THE PASSENGER SEATBELT SENSOR DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: Passenger Safety Belt Buckle Switch C3066. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Connect a fused jumper wire between passenger safety belt buckle switch C3066-2, circuit CR202 (BN/GN), harness side and C3066-1, circuit GD145 (BK/BU), harness side.  N0116777 • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger safety belt buckle switch circuits shorted together, a short to ground fault would normally be retrieved.	**Yes** REMOVE the fused jumper wire and GO to K8 . **No** REMOVE the fused jumper wire and GO to K6 .

• **Did the on-demand DTC change from B0052:13 to B0052:11?**	
K6 CHECK PASSENGER SAFETY BELT BUCKLE SWITCH CIRCUIT FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B-33, circuit CR202 (BN/GN), harness side and the passenger safety belt buckle switch C3066-2, circuit CR202 (BN/GN), harness side.  N0096126 • **Is the resistance less than 0.5 ohm?**	**Yes** GO to K7 . **No** REPAIR circuit CR202 (BN/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to K11 .
K7 CHECK PASSENGER SAFETY BELT BUCKLE SWITCH GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between passenger safety belt buckle switch C3066-1, circuit GD145 (BK/BU), harness side and ground.  N0010409 • **Is the resistance less than 5 ohms?**	**Yes** GO to K9 . **No** REPAIR circuit GD145 (BK/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to K11 .
K8 CONFIRM PASSENGER SEATBELT SENSOR FAULT	
NOTE: Make sure all SRS components 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 passenger safety belt buckle assembly. REFER to Section 501-20A . GO to K11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not**

• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: RCM C310A and C310B. • Connect: Passenger Safety Belt Buckle Switch C3066. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to K10 .
K9 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to K11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to K10 .

for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Passenger Safety Belt Buckle Switch C3066. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	
K10 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Buckle Switch C3066. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC B0052:11, B0052:12, B0052:13 or B0052:1D retrieved on-demand during self-test?**	**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 the self-test. For DTC B0052:11 or B0052:1D, GO to K2 . For DTC B0052:12, GO to K4 . For DTC B0052:13, GO to K5 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** REPAIR any intermittent wiring, terminal or connector concerns found. GO to K11 .
K11 CHECK FOR ADDITIONAL SRS DTCs	

• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test L: DTCs B0082:11, B0082:12, B0082:13 and B0082:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) continuously monitors the passenger safety belt load limiter circuits for the following faults:

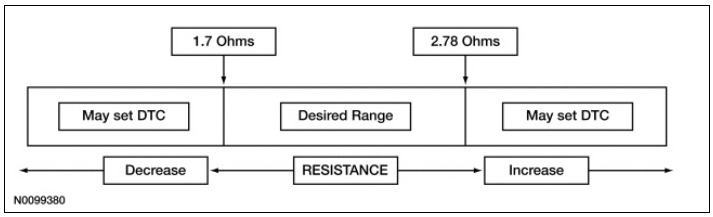
- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted passenger safety belt load limiter

If a fault is detected, the RCM stores DTC B0082:11, B0082:12, B0082:13 or B0082:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at the time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections

- Passenger safety belt load limiter
- RCM



DTC Description	Fault Trigger Condition
• B0082:11 â Passenger Seatbelt Load Limiter Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on either passenger safety belt load limiter circuit, a fault is indicated.
• B0082:12 â Passenger Seatbelt Load Limiter Deployment Control: Short to Battery	When the RCM senses a short to battery on either passenger safety belt load limiter circuit, a fault is indicated.
• B0082:13 â Passenger Seatbelt Load Limiter Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between the passenger safety belt load limiter circuits, a fault is indicated.
• B0082:1A â Passenger Seatbelt Load Limiter Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between the passenger safety belt load limiter circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Passenger safety belt load limiter
- RCM

PINPOINT TEST L: DTCs B0082:11, B0082:12, B0082:13 AND B0082:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

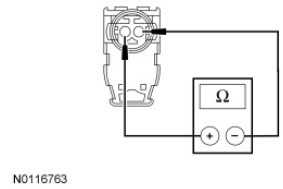
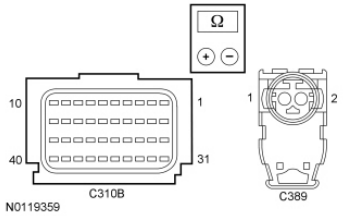
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

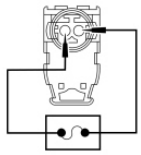
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

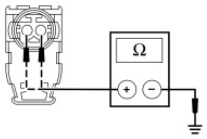
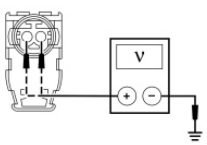
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
L1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0082:11, B0082:12, B0082:13 or B0082:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0082:13 or B0082:1A, GO to L2 . For DTC B0082:11, GO to L8 . For DTC B0082:12, GO to L10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B0082:13 or B0082:1A, GO to L13 . For DTC B0082:11, GO to L14 . For DTC B0082:12, GO to L15 .
L2 CHECK THE PASSENGER SEATBELT LOAD LIMITER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_26_R) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_26_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to L12 . **No** GO to L3 .
L3 CHECK THE PASSENGER SEATBELT LOAD LIMITER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_26_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_26_R PID, carry out the harness test of the passenger safety belt load limiter circuits and accessible connectors (including	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed.

any in-line connectors), by wiggling connectors and flexing the wire harness frequently. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to L17 . **No** For PID value less than 1.7 ohms, GO to L4 . For PID value greater than 2.78 ohms, GO to L6 .
L4 CHECK THE PASSENGER SEATBELT LOAD LIMITER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Load Limiter C389. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger safety belt load limiter disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0082:1A to B0082:13?**	**Yes** GO to L11 . **No** GO to L5 .
L5 CHECK FOR A SHORT BETWEEN PASSENGER SAFETY BELT LOAD LIMITER CIRCUITS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger safety belt load limiter C389-1, circuit CR122 (WH/OG), harness side and C389-2, circuit RR122 (BN), harness side.	**Yes** GO to L12 . **No** REPAIR circuits CR122 (WH/OG) and RR122 (BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

 N0116763 • **Is the resistance greater than 10,000 ohms?**	GO to L17 .
L6 CHECK THE PASSENGER SAFETY BELT LOAD LIMITER CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Load Limiter C389. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B, and passenger safety belt load limiter C389, harness side using the following chart. **RCM** / **Circuit** / **Passenger Safety Belt Load Limiter** C310B-13 / CR122 (WH/OG) / C389-1 C310B-14 / RR122 (BN) / C389-2  10 1 40 31 C310B 1 2 C389 N0119359 • **Are the resistances less than 0.5 ohm?**	**Yes** GO to L7 . **No** REPAIR circuit CR122 (WH/OG) or RR122 (BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to L17 .
L7 CHECK THE PASSENGER SEATBELT LOAD LIMITER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B.	**Yes** REMOVE the fused jumper wire and GO to L11 . **No** REMOVE the fused jumper wire and GO to L12 .

• Connect a fused jumper wire between passenger safety belt load limiter C389-1, circuit CR122 (WH/OG), harness side and C389-2, circuit RR122 (BN), harness side.  N0116765 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger safety belt retractor circuits shorted together, a low resistance fault would normally be retrieved. • **Did the on-demand DTC change from B0082:13 to B0082:1A?**	
L8 CHECK THE PASSENGER SEATBELT LOAD LIMITER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Load Limiter C389. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger safety belt load limiter disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B0082:11 to B0082:13?**	**Yes** GO to L11 . **No** GO to L9 .

L9 CHECK THE PASSENGER SAFETY BELT LOAD LIMITER CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger safety belt load limiter: ♦ C389-1, circuit CR122 (WH/OG), harness side and ground. ♦ C389-2, circuit RR122 (BN), harness side and ground.  N0116766 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to L12 . **No** REPAIR circuit CR122 (WH/OG) or RR122 (BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to L17 .
L10 CHECK THE PASSENGER SAFETY BELT LOAD LIMITER CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Load Limiter C389. • 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 safety belt load limiter: ♦ C389-1, circuit CR122 (WH/OG), harness side and ground. ♦ C389-2, circuit RR122 (BN), harness side and ground.  N0116767 • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit CR122 (WH/OG) or RR122 (BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to L17 . **No** GO to L12 .

L11 CONFIRM THE PASSENGER SAFETY BELT RETRACTOR FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Passenger Safety Belt Load Limiter C389. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new passenger safety belt load limiter. REFER to Section 501-20A . GO to L17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B0082:13 or B0082:1A, GO to L13 . For DTC B0082:11, GO to L14 . For DTC B0082:12, GO to L15 .
L12 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component:	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to L17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.**

♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Restraint System Components. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	For DTC B0082:13 or B0082:1A, GO to L13 . For DTC B0082:11, GO to L14 . For DTC B0082:12, GO to L15 .
L13 CHECK THE PASSENGER SEATBELT LOAD LIMITER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_26_R) PID FOR AN INTERMITTENT LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_26_R PID • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness frequently. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to L16 . **No** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to L17 .
L14 CHECK FOR AN INTERMITTENT PASSENGER SEATBELT LOAD LIMITER DEPLOYMENT CONTROL SHORT TO GROUND FAULT	
	Yes DEPOWER the SRS and REPAIR as

• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness frequently. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0082:11 retrieved on-demand during self-test?**	necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to L17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to L16 .
L15 CHECK FOR AN INTERMITTENT PASSENGER SEATBELT LOAD LIMITER DEPLOYMENT CONTROL SHORT TO VOLTAGE FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Load Limiter C389. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness frequently. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0082:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to L17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to L16 .
L16 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Load Limiter C389. ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section.	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to L17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to L17 .

• **Were any concerns found?**	
L17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test M: DTC B0090:11 or B0090:93

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) checks the LH front impact severity sensor and circuits for the following faults:

- Open circuit
- Short to voltage
- Short to ground
- Faulted LH front impact severity sensor

If a fault is detected, the RCM stores DTC B0090:11, B0090:81, B0090:93 or B0090:96 in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

- DTC B0090:11 (Left Frontal Restraints Sensor: Circuit Short to Ground) â When the RCM senses a short to ground on the feed circuit of the LH front severity impact sensor, a fault is indicated.
- DTC B0090:93 (Left Frontal Restraints Sensor: No Operation) â When the RCM senses a faulted sensor, a short to voltage on the feed circuit, open on the feed or return circuit, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- LH front impact severity sensor
- RCM

PINPOINT TEST M: DTCs B0090:11 OR B0090:93

⚠ **WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.**

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

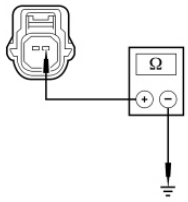
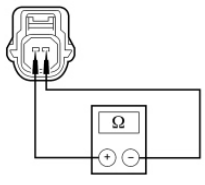
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

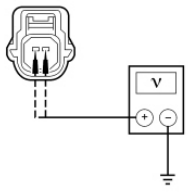
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

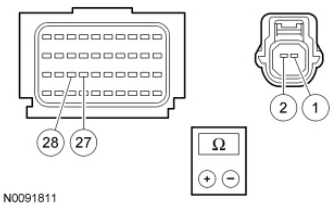
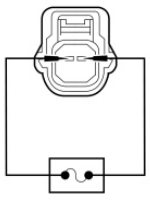
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

NOTE: Do not probe any impact sensor. The impact sensor can not be tested using a multi-meter.

Test Step	Result / Action to Take
M1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0090:11 or B0090:93 retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0090:11, GO to M2 . For DTC B0090:93, GO to M5 . **No** The fault is intermittent when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to M10 .
M2 CHECK THE LEFT FRONTAL RESTRAINTS SENSOR DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF.	**Yes** INSTALL a new LH front impact severity sensor. REFER to Front Impact Severity Sensor in this section. GO to M11 . **No** GO to M3 .

• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: LH Front Impact Severity Sensor C1465. • 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 â RCM . • **Did the on-demand DTC change from B0090:11 to B0090:93?**	
M3 CHECK THE LH FRONT IMPACT SEVERITY SENSOR FEED CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between LH front impact severity sensor C1465-1, circuit VR213 (VT/GN), harness side and ground.  N0092553 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to M4 . **No** REPAIR circuit VR213 (VT/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to M11 .
M4 CHECK FOR A SHORT BETWEEN LH FRONT IMPACT SEVERITY SENSOR CIRCUITS	
• Measure the resistance between LH front impact severity sensor C1465-1, circuit VR213 (VT/GN), harness side and C1465-2, circuit RR129 (YE/GY), harness side.  N0036987 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to M9 . **No** REPAIR circuits VR213 (VT/GN) and RR129 (YE/GY). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to M11 .
M5 CHECK THE LH FRONT IMPACT SEVERITY SENSOR AND RCM CONNECTIONS (NO OPERATION INDICATED)	

• Ignition OFF. • ⚠ **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.** • Inspect LH front impact severity sensor C1465 to be fully seated and locked. Seat and lock connector as necessary. • Gain access to the RCM and inspect C310A and C310B to be sure they are fully seated and locked. Seat and lock the connector(s) as necessary. Refer to Restraints Control Module (RCM) in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0090:93 retrieved on-demand during self-test?**	**Yes** GO to M6 . **No** Fault corrected. GO to M11 .
M6 CHECK THE LH FRONT IMPACT SEVERITY SENSOR CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: LH Front Impact Severity Sensor C1465. • 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 LH front impact severity sensor: ♦ C1465-1, circuit VR213 (VT/GN), harness side and ground. ♦ C1465-2, circuit RR129 (YE/GY), harness side and ground.  N0036990 • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit VR213 (VT/GN) or RR129 (YE/GY). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to M11 . **No** GO to M7 .
M7 CHECK THE LH FRONT IMPACT SEVERITY SENSOR CIRCUITS FOR AN OPEN	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Measure the resistance between RCM C310B, harness side and LH front impact severity sensor C1465, harness side using the following chart. | RCM	Circuit	LH Front Impact Severity Sensor | |---|---|---| | C310B-27 | VR213 (VT/GN) | C1465-1 | | C310B-28 | RR129 (YE/GY) | C1465-2 |  N0091811 • **Are the resistances less than 0.5 ohm?**	**Yes** GO to M8 . **No** REPAIR circuit VR213 (VT/GN) or RR129 (YE/GY). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to M11 .
M8 CHECK THE LEFT FRONTAL RESTRAINTS SENSOR DTC FOR A FAULT STATUS CHANGE (NO OPERATION INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between LH front impact severity sensor C1465-1, circuit VR213 (VT/GN), harness side and C1465-2, circuit RR129 (YE/GY), harness side.  N0114279 • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS)	**Yes** REMOVE the fused jumper wire and INSTALL a new sensor. REFER to Front Impact Severity Sensor in this section. GO to M11 . **No** REMOVE the fused jumper wire and GO to M9 .

Depowering and Repowering in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Did the on-demand DTC change from B0090:93 to B0090:11?**	
M9 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components, 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: RCM C310A and C310B. • Connect: LH Front Impact Severity Sensor C1465. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to M11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to M10 .
M10 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: LH Front Impact Severity Sensor C1465. • Disconnect: RCM C310A and C310B. • Inspect for the following:	**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. For DTC B0090:11, GO to M2 .

♦ inspect harness and component connectors for loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC B0090:11 or B0090:93 retrieved on-demand during self-test?**	For DTC B0090:93, GO to M5 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to M11 .
M11 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand self test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test N: DTCs B0091:11, B0091:93, B0097:11 and B0097:93

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) monitors the driver front door and passenger second row C-pillar side impact sensors and circuits for the following faults:

- Open circuit
- Short to voltage
- Short to ground
- Faulted driver front door side impact sensor
- Faulted passenger second row C-pillar side impact sensor

If a fault is detected, the RCM stores DTC B0091:11, B0091:93, B0097:11 or B0097:93 in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM communicates with each impact sensor. If the RCM is unable to communicate with the sensor, a DTC is stored in memory. A Continuous Memory Diagnostic Trouble Code (CMDTC) **no operation** (failure type :93) can be set by a short to voltage on the return circuit of the impact sensor.

NOTE: A short to ground on either impact sensor feed circuit sets DTCs B0091:11 and B0097:11.

A short to voltage on either impact sensor feed or return circuit sets DTCs B0091:93 and B0097:93.

DTC Description	Fault Trigger Condition
• B0091:11 â Left Side Restraints Sensor 1: Circuit Short to Ground	When the RCM senses a shorted driver front door side impact sensor, a shorted passenger second row C-pillar side impact sensor, a short to ground on the driver front door side impact sensor feed circuit or a short to ground on the passenger second row C-pillar side impact sensor feed circuit, a fault is indicated.
• B0091:93 â Left Side Restraints Sensor 1: No Operation	When the RCM senses a faulted driver front door side impact sensor, a short to voltage on the feed or return circuit of the driver front door side impact sensor, a short to voltage on the feed or return circuit of passenger second row C-pillar side impact sensor or an open feed or return circuit of the driver front door side impact sensor, a fault is indicated.
• B0097:11 â Right Side Restraints Sensor 2: Circuit Short to Ground	When the RCM senses a shorted driver front door side impact sensor, a shorted passenger second row C-pillar side impact sensor, a short to ground on the driver front door side impact sensor feed circuit or a short to ground on the passenger second row C-pillar side impact sensor feed circuit, a fault is indicated.
• B0097:93 â Right Side Restraints Sensor 2: No Operation	When the RCM senses a faulted passenger second row C-pillar side impact sensor, a short to voltage on the feed or return circuit of passenger second row C-pillar side impact sensor, a short to voltage on the feed or return circuit of the driver front door side impact sensor or an open feed or return circuit of the passenger second row C-pillar side impact sensor, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver front door side impact sensor
- Passenger second row C-pillar side impact sensor
- RCM

PINPOINT TEST N: DTCs B0091:11, B0091:93, B0097:11 AND B0097:93

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

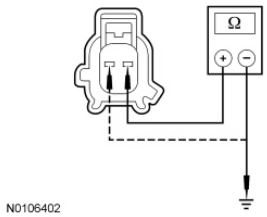
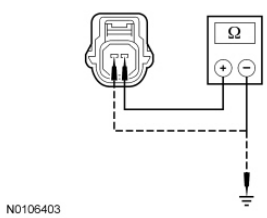
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

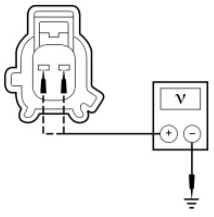
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

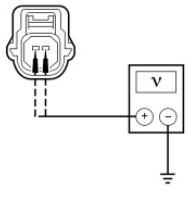
NOTE: Do not probe any impact sensor. The impact sensor cannot be tested using a multi-meter.

Test Step	Result / Action to Take
N1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any DTCs retrieved on-demand during self-test?**	**Yes** Fault(s) cannot be cleared until corrected and the DTC(s) are no longer retrieved on-demand during self-test. For DTC B0091:11 **AND** B0097:11, GO to N2 . For DTC B0091:93 **AND** B0097:93, GO to N6 . For DTC B0091:93 **ONLY** , GO to N8 . For DTC B0097:93 **ONLY** , GO to N11 . For any other DTCs, REFER to the DTC Chart in this section.

	No The fault is intermittent when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to N15 .
N2 CHECK THE LEFT SIDE RESTRAINTS SENSOR 1 DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Front Door Side Impact Sensor C567. • 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 â RCM . • **Did the on-demand DTCs change from B0091:11 and B0097:11 to B0091:93?**	**Yes** INSTALL a new driver front door side impact sensor. REFER to Side Impact Sensor â Front Door in this section. GO to N16 . **No** GO to N3 .
N3 CHECK THE RIGHT SIDE RESTRAINTS SENSOR 2 DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Connect: Driver Front Door Side Impact Sensor C567. • Disconnect: Passenger Second Row C-Pillar Side Impact Sensor C3249. • 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 â RCM .	**Yes** INSTALL a new passenger second row C-pillar side impact sensor. REFER to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section. GO to N16 . **No** GO to N4 .

• **Did the on-demand DTC change from B0091:11 and B0097:11 to B0097:93?**	
N4 CHECK THE DRIVER FRONT DOOR SIDE IMPACT SENSOR FEED CIRCUIT FOR A SHORT TO GROUND AND SHORT BETWEEN SENSOR CIRCUITS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Front Door Side Impact Sensor C567. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver front door side impact sensor: ♦ C567-1, circuit VR217 (GY/YE), harness side and ground. ♦ C567-1, circuit VR217 (GY/YE), harness side and C567-2, circuit RR131 (VT/GY), harness side.  N0106402 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to N5 . **No** REPAIR circuit VR217 (GY/YE) and/or RR131 (VT/GY). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to N16 .
N5 CHECK THE PASSENGER SECOND ROW C-PILLAR SIDE IMPACT SENSOR FEED CIRCUIT FOR A SHORT TO GROUND AND SHORT BETWEEN SENSOR CIRCUITS	
• Measure the resistance between passenger second row C-pillar side impact sensor: ♦ C3249-1, circuit VR220 (VT/OG), harness side and ground. ♦ C3249-1, circuit VR220 (VT/OG), harness side and C3249-2, circuit RR134 (BN/BU), harness side.  N0106403 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to N14 . **No** REPAIR circuit VR220 (VT/OG) and/or RR134 (BN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to N16 .

N6 CHECK THE DRIVER FRONT DOOR SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TO VOLTAGE (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: Driver Front Door Side Impact Sensor C567. • 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 front door side impact sensor: ♦ C567-1, circuit VR217 (GY/YE), harness side and ground. ♦ C567-2, circuit RR131 (VT/GY), harness side and ground.  • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit VR217 (GY/YE) or RR131 (VT/GY). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to N16 . **No** GO to N7 .
N7 CHECK THE PASSENGER SECOND ROW C-PILLAR SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TO VOLTAGE (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Second Row C-Pillar Side Impact Sensor C3249. • 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 second row C-pillar side impact sensor: ♦ C3249-1, circuit VR220 (VT/OG), harness side and ground. ♦ C3249-2, circuit RR134 (BN/BU), harness side and ground.	**Yes** REPAIR circuit VR220 (VT/OG) or RR134 (BN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to N16 . **No** GO to N14 .

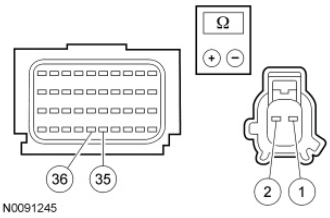


- **Is any voltage present on either circuit?**

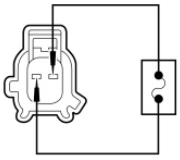
N8 CHECK THE DRIVER FRONT DOOR SIDE IMPACT SENSOR AND RCM CONNECTIONS (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Gain access to the driver front door side impact sensor and inspect C567 to be fully seated and locked. Seat and lock the connector as necessary. Refer to Side Impact Sensor â Front Door in this section. • Gain access to the RCM and inspect C310A and C310B to be fully seated and locked. Seat and lock the connector(s) as necessary. Refer to Restraints Control Module (RCM) 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 â RCM . • **Was DTC B0091:93 retrieved on-demand during self-test?**	**Yes** GO to N9 . **No** Fault corrected. GO to N16 .
N9 CHECK THE DRIVER FRONT DOOR SIDE IMPACT SENSOR CIRCUITS FOR AN OPEN (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: Driver Front Door Side Impact Sensor C567. • Measure the resistance between RCM C310B, harness side and driver front door side impact sensor C567, harness side using the following chart.	**Yes** GO to N10 . **No** REPAIR circuit VR217 (GY/YE) or RR131 (VT/GY). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to N16 .

RCM	Circuit	Driver Front Door Side Impact Sensor
C310B-36		C567-1

	VR217 (GY/YE)	
C310B-35	RR131 (VT/GY)	C567-2

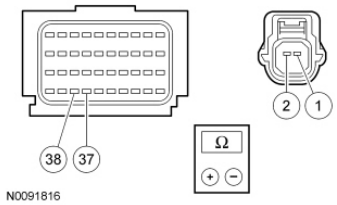
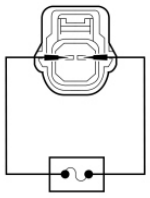


- **Are the resistances less than 0.5 ohm?**

N10 CHECK THE LEFT SIDE RESTRAINTS SENSOR 1 DTC FOR A FAULT STATUS CHANGE (NO OPERATION INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between driver front door side impact sensor C567-1, circuit VR217 (GY/YE), harness side and C567-2, circuit RR131 (VT/GY), harness side.  • 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 â RCM . • **Did the DTC change from B0091:93 to B0091:11 and B0097:11?**	**Yes** REMOVE the fused jumper wire and INSTALL a new driver front door side impact sensor. REFER to Side Impact Sensor â Front Door in this section. GO to N16 . **No** REMOVE the fused jumper wire and GO to N14 .
N11 CHECK THE PASSENGER SECOND ROW C-PILLAR SIDE IMPACT SENSOR AND RCM CONNECTIONS (NO OPERATION INDICATED)	
• Ignition OFF.	**Yes** GO to N12 .

• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Gain access to the passenger second row C-pillar side impact sensor and inspect C3249 to be fully seated and locked. Seat and lock the connector as necessary. Refer to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section. • Gain access to the RCM and inspect C310A and C310B to be fully seated and locked. Seat and lock the connector(s) as necessary. Refer to Restraints Control Module (RCM) 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 â RCM . • **Was DTC B0097:93 retrieved on-demand during self-test?**	**No** Fault corrected. GO to N16 .
N12 CHECK THE PASSENGER SECOND ROW C-PILLAR SIDE IMPACT SENSOR CIRCUITS FOR AN OPEN (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: Passenger Second Row C-Pillar Side Impact Sensor C3249. • Measure the resistance between RCM C310B, harness side and passenger second row C-pillar side impact sensor C3249, harness side using the following chart.	**Yes** GO to N13 . **No** REPAIR circuit VR220 (VT/OG) or RR134 (BN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to N16 .

RCM	Circuit	Passenger Second Row C-Pillar Side Impact Sensor
C310B-37	VR220 (VT/OG)	C3249-1
C310B-38	RR134 (BN/BU)	C3249-2

 N0091816 • **Are the resistances less than 0.5 ohm?**	
N13 CHECK THE RIGHT SIDE RESTRAINTS SENSOR 2 DTC FOR A FAULT STATUS CHANGE (NO OPERATION INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between passenger second row C-pillar side impact sensor C3249-1, circuit VR220 (VT/OG), harness side and C3249-2, circuit RR134 (BN/BU), harness side.  N0114279 • 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 â RCM . • **Did the DTC change from B0097:93 to B0097:11 and B0091:11?**	**Yes** REMOVE the fused jumper wire and INSTALL a new passenger second row C-pillar side impact sensor. REFER to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section. GO to N16 . **No** REMOVE the fused jumper wire and GO to N14 .
N14 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component:	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to N16 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to N15 .

♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: RCM C310A and C310B. • Connect: Driver Front Door Side Impact Sensor C567 (if previously disconnected). • Connect: Passenger Second Row C-Pillar Side Impact Sensor C3249 (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	
N15 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Front Door Side Impact Sensor C567 and/or Passenger Second Row C-Pillar Side Impact Sensor C3249. • Disconnect: RCM C310A and C310B. • Inspect for the following: ♦ inspect harness and component connectors for loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.	**Yes** Fault(s) cannot be cleared until corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0091:11 **AND** B0097:11, GO to N2 . For DTC B0091:93 **AND** B0097:93, GO to N6 . For DTC B0091:93 **ONLY** , GO to N8 . For DTC B0097:93 **ONLY** , GO to N11 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to N16 .

• Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC B0091:11, B0091:93, B0097:11 or B0097:93 retrieved on-demand during self-test?**	
N16 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test O: DTCs B0092:11, B0092:93, B0096:11 and B0096:93

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) monitors the driver second row C-pillar and passenger front door side impact sensors and circuits for the following faults:

- Open circuit
- Short to voltage
- Short to ground
- Faulted driver second row C-pillar side impact sensor
- Faulted passenger front door side impact sensor

If a fault is detected, the RCM stores DTC B0092:11, B0092:93, B0096:11 or B0096:93 in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM communicates with each impact sensor. If the RCM is unable to communicate with the sensor, a DTC is stored in memory. A Continuous Memory Diagnostic Trouble Code (CMDTC) **no operation** (failure type status :93) can be set by a short to voltage on the return circuit of the impact sensor.

NOTE: A short to ground on either impact sensor feed circuit sets DTCs B0092:11 and B0096:11.

A short to voltage on either impact sensor feed or return circuit sets DTCs B0092:93 and B0096:93.

DTC Description	Fault Trigger Condition
• B0092:11 â Left Side Restraints Sensor 2: Circuit Short to Ground	When the RCM senses a shorted passenger front door side impact sensor, a shorted driver second row C-pillar side impact sensor, a short to ground on the passenger front door side impact sensor feed circuit or a short to ground on the driver second C-pillar side impact sensor feed circuit, a fault is indicated.
• B0092:93 â Left Side Restraints Sensor 2: No Operation	When the RCM senses a faulted driver second row C-pillar side impact sensor, a short to voltage on the feed or return circuit of the driver second row C-pillar side impact sensor, a short to voltage on the feed or return circuit of passenger front door side impact sensor or an open feed or return circuit of the passenger front door side impact sensor, a fault is indicated.
• B0096:11 â Right Side Restraints Sensor 1: Circuit Short to Ground	When the RCM senses a shorted passenger front door side impact sensor, a shorted driver second row C-pillar side impact sensor, a short to ground on the passenger front door side impact sensor feed circuit or a short to ground on the driver second row C-pillar side impact sensor feed circuit, a fault is indicated.
• B0096:93 â Right Side Restraints Sensor 1: No Operation	When the RCM senses a faulted passenger front door side impact sensor, a short to voltage on the feed or return circuit of passenger front door side impact sensor, a short to voltage on the feed or return circuit of the driver second row C-pillar side impact sensor or an open feed or return circuit of the passenger front door side impact sensor, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver second row C-pillar side impact sensor
- Passenger front door side impact sensor
- RCM

PINPOINT TEST O: DTCs B0092:11, B0092:93, B0096:11 AND B0096:93

⚠ **WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.**

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

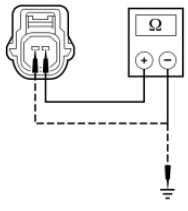
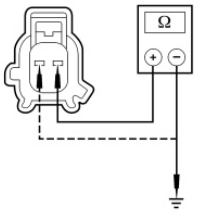
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

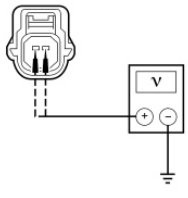
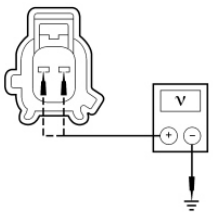
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

NOTE: Do not probe any impact sensor. The impact sensor cannot be tested using a multi-meter.

Test Step	Result / Action to Take
O1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any DTCs retrieved on-demand during self-test?**	**Yes** Fault(s) cannot be cleared until corrected and the DTC(s) are no longer retrieved on-demand during self-test. For DTC B0092:11 **AND** B0096:11, GO to O2 . For DTC B0092:93 **AND** B0096:93, GO to O6 . For DTC B0092:93 **ONLY** , GO to O8 . For DTC B0096:93 **ONLY** , GO to O11 . For any other DTCs, REFER to the DTC Chart in this section. **No** The fault is intermittent when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to O15 .
O2 CHECK THE LEFT SIDE RESTRAINTS SENSOR 2 DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF.	**Yes** INSTALL a new driver second row C-pillar side impact sensor. REFER to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section. GO to O16 . **No**

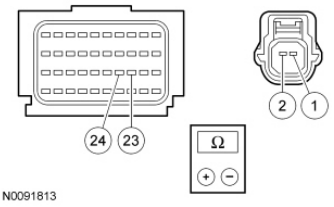
• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Second Row C-Pillar Side Impact Sensor C3248. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Did the on-demand DTC change from B0092:11 and B0096:11 to B0092:93?**	GO to O3 .
O3 CHECK THE RIGHT SIDE RESTRAINTS SENSOR 1 DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Connect: Driver Second Row C-Pillar Side Impact Sensor C3248. • Disconnect: Passenger Front Door Side Impact Sensor C644. • 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 â RCM . • **Did the on-demand DTC change from B0092:11 and B0096:11 to B0096:93?**	**Yes** INSTALL a new passenger front door side impact sensor. REFER to Side Impact Sensor â Front Door in this section. GO to O16 . **No** GO to O4 .
O4 CHECK THE DRIVER SECOND ROW C-PILLAR SIDE IMPACT SENSOR FEED CIRCUIT FOR A SHORT TO GROUND AND SHORT BETWEEN SENSOR CIRCUITS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Second Row C-Pillar Side Impact Sensor C3248. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver second row C-pillar side impact sensor:	**Yes** GO to O5 . **No** REPAIR circuit VR219 (GN/WH) and/or RR133 (GY/BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

♦ C3248-1, circuit VR219 (GN/WH), harness side, and ground. ♦ C3248-1, circuit VR219 (GN/WH), harness side, and C3248-2, circuit RR133 (GY/BN), harness side.  N0106403 • **Are the resistances greater than 10,000 ohms?**	GO to O16 .
O5 CHECK THE PASSENGER FRONT DOOR SIDE IMPACT SENSOR FEED CIRCUIT FOR A SHORT TO GROUND AND SHORT BETWEEN SENSOR CIRCUITS	
• Measure the resistance between passenger front door side impact sensor: ♦ C644-1, circuit VR218 (YE/OG), harness side, and ground. ♦ C644-1, circuit VR218 (YE/OG), harness side, and C644-2, circuit RR132 (BU/WH), harness side.  N0106402 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to O14 . **No** REPAIR circuits VR218 (YE/OG) and/or RR132 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to O16 .
O6 CHECK THE DRIVER SECOND ROW C-PILLAR SIDE IMPACT SENSOR FEED CIRCUIT FOR A SHORT TO VOLTAGE (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: Driver Second Row C-Pillar Side Impact Sensor C3248. • 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 second row C-pillar side impact sensor:	**Yes** REPAIR circuit VR219 (GN/WH) or RR133 (GY/BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to O16 . **No** GO to O7 .

♦ C3248-1, circuit VR219 (GN/WH), harness side and ground. ♦ C3248-2, circuit RR133 (GY/BN), harness side and ground.  N0036990 • **Is any voltage present on either circuit?**	
O7 CHECK THE PASSENGER FRONT DOOR SIDE IMPACT SENSOR FEED CIRCUIT FOR A SHORT TO VOLTAGE (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Front Door Side Impact Sensor C644. • 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 front door side impact sensor: ♦ C644-1, circuit VR218 (YE/OG), harness side and ground. ♦ C644-2, circuit RR132 (BU/WH), harness side and ground.  N0052817 • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit VR218 (YE/OG) or RR132 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to O16 . **No** GO to O14 .
O8 CHECK THE DRIVER SECOND ROW C-PILLAR SIDE IMPACT SENSOR AND RCM CONNECTIONS (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Gain access to the driver second row C-pillar side impact sensor and inspect C3248 to be fully seated	**Yes** GO to O9 . **No** Fault corrected. GO to O16 .

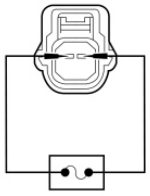
and locked. Seat and lock the connector as necessary. Refer to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section. • Gain access to the RCM and inspect C310A and C310B to be fully seated and locked. Seat and lock the connector(s) as necessary. Refer to Restraints Control Module (RCM) 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 â RCM . • **Was DTC B0092:93 retrieved on-demand during self-test?**	
O9 CHECK THE DRIVER SECOND ROW C-PILLAR SIDE IMPACT SENSOR CIRCUITS FOR AN OPEN (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: Driver Second Row C-Pillar Side Impact Sensor C3248. • Measure the resistance between RCM C310B, harness side and driver second row C-pillar side impact sensor C3248, harness side, using the following chart.	**Yes** GO to O10 . **No** REPAIR circuit VR219 (GN/WH) or RR133 (GY/BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to O16 .

RCM	Circuit	Driver Second Row C-Pillar Side Impact Sensor
C310B-23	VR219 (GN/WH)	C3248-1
C310B-24	RR133 (GY/BN)	C3248-2



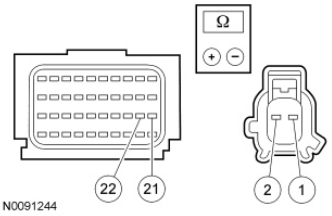
• **Are the resistances less than 0.5 ohm?**

O10 CHECK THE LEFT SIDE RESTRAINTS SENSOR 2 DTC FOR A FAULT STATUS CHANGE (NO	

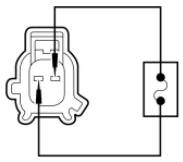
OPERATION INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between driver second row C-pillar side impact sensor C3248-1, circuit VR219 (GN/WH), harness side, and C3248-2, circuit RR133 (GY/BN), harness side.  N0114279 • 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 â RCM . • **Did the DTC change from B0092:93 to B0092:11 and B0096:11?**	**Yes** REMOVE the fused jumper wire and INSTALL a new driver second row C-pillar side impact sensor. REFER to Side Impact Sensor â Second Row, 4-Door Sedan or Side Impact Sensor â Second Row, 5-Door Hatchback in this section. GO to O16 . **No** REMOVE the fused jumper wire and GO to O14 .
O11 CHECK THE PASSENGER FRONT DOOR SIDE IMPACT SENSOR AND RCM CONNECTIONS (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Gain access to passenger front door side impact sensor and inspect C644 to be fully seated and locked. Seat and lock the connector as necessary. Refer to Side Impact Sensor â Front Door in this section. • Gain access to the RCM and inspect C310A and C310B to be fully seated and locked. Seat and lock the connector(s) as necessary. Refer to Restraints Control Module (RCM) 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 â RCM .	**Yes** GO to O12 . **No** Fault corrected. GO to O16 .

• **Was DTC B0096:93 retrieved on-demand during self-test?**	
O12 CHECK THE PASSENGER FRONT DOOR SIDE IMPACT SENSOR CIRCUITS FOR AN OPEN (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: Passenger Front Door Side Impact Sensor C644. • Measure the resistance between RCM C310B, harness side and passenger front door side impact sensor C644, harness side, using the following chart. • **Are the resistances less than 0.5 ohm?**	**Yes** GO to O13 . **No** REPAIR circuit VR218 (YE/OG) or RR132 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to O16 .

RCM	Circuit	Passenger Front Door Side Impact Sensor
C310B-22	VR218 (YE/OG)	C644-1
C310B-21	RR132 (BU/WH)	C644-2



O13 CHECK THE RIGHT SIDE RESTRAINTS SENSOR 1 DTC FOR A FAULT STATUS CHANGE (NO OPERATION INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between passenger front door side impact sensor C644-1, circuit VR218 (YE/OG), harness side, and C644-2, circuit RR132 (BU/WH), harness side.	**Yes** REMOVE the fused jumper wire and INSTALL a new passenger front door side impact sensor. REFER to Side Impact Sensor â Front Door in this section. GO to O16 . **No** REMOVE the fused jumper wire and GO to O14 .



N0109792

- 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 â RCM .
- **Did the DTC change from B0096:93 to B0092:11 and B0096:11?**

O14 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Second Row C-Pillar Side Impact Sensor C3248 (if previously disconnected). • Connect: Passenger Front Door Side Impact Sensor C644 (if previously disconnected). • 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** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to O16 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to O15 .

• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was the original DTC retrieved on-demand during self-test?**	
O15 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Affected Impact Sensor â Driver Second Row C-Pillar Side Impact Sensor C3248 and/or Passenger Front Door Side Impact Sensor C644. • Disconnect: RCM C310A and C310B. • Inspect for the following: ♦ inspect harness and component connectors for loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC B0092:11, B0092:93, B0096:11 or B0096:93 retrieved on-demand during self-test?**	**Yes** Fault(s) cannot be cleared until corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0092:11 **AND** B0096:11, GO to O2 . For DTC B0092:93 **AND** B0096:93, GO to O6 . For DTC B0092:93 **ONLY** , GO to O8 . For DTC B0096:93 **ONLY** , GO to O11 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to O16 .
O16 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

and Repowering in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test.**	

Pinpoint Test P: DTC B0095:11 or B0095:93

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) checks the RH front impact severity sensor and circuits for the following faults:

- Open circuit
- Short to voltage
- Short to ground
- Faulted RH front impact severity sensor

If a fault is detected, the RCM stores DTC B0095:11, B0095:81, B0095:93 or B0095:96 in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

- DTC B0095:11 (Right Front Restraints Sensor: Circuit Short to Ground) â When the RCM senses a short to ground on the RH front impact severity sensor feed circuit, a fault is indicated.
- DTC B0095:93 (Right Front Restraints Sensor: No Operation) â When the RCM senses a faulted sensor, short to voltage or open on either RH front impact severity sensor circuit, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- RH front impact severity sensor
- RCM

PINPOINT TEST P: DTC B0095:11 OR B0095:93

⚠ **WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.**

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

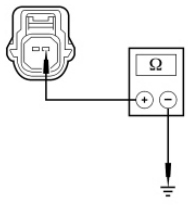
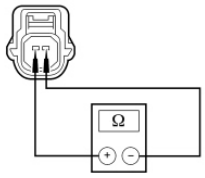
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

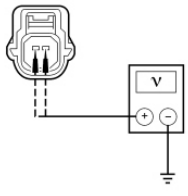
NOTE: Always make sure the correct Supplemental Restraint System (SRS) component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

NOTE: Do not probe any impact sensor. The impact sensor can not be tested using a multi-meter.

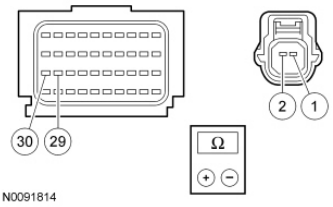
Test Step	Result / Action to Take
P1 RETRIEVE RCM DTCs	
• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0095:11 or B0095:93 retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B0095:11, GO to P2 . For DTC B0095:93, GO to P5 . **No** The fault is intermittent when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to P10 .
P2 CHECK THE RIGHT FRONT RESTRAINTS SENSOR DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RH Front Impact Severity Sensor C1466. • 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 â RCM . • **Did the on-demand DTC change from B0095:11 to B0095:93?**	**Yes** INSTALL a new RH front impact severity sensor. REFER to Front Impact Severity Sensor in this section. GO to P11 . **No** GO to P3 .
P3 CHECK THE RH FRONT IMPACT SEVERITY SENSOR CIRCUIT FOR A SHORT TO GROUND	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RH front impact severity sensor C1466-1, circuit VR214 (WH/BU), harness side and ground.  N0092553 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to P4 . **No** REPAIR circuit VR214 (WH/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to P11 .
P4 CHECK FOR A SHORT BETWEEN RH FRONT IMPACT SEVERITY SENSOR CIRCUITS	
• Measure the resistance between RH front impact severity sensor C1466-1, circuit VR214 (WH/BU), harness side and C1466-2, circuit RR130 (GN/BU), harness side.  N0036987 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to P9 . **No** REPAIR circuits VR214 (WH/BU) and RR130 (GN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to P11 .
P5 CHECK THE RH FRONT IMPACT SEVERITY SENSOR AND RCM CONNECTIONS (NO OPERATION INDICATED)	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Inspect RH front impact severity sensor C1466 to be fully seated and locked. • Gain access to the RCM and inspect C310A and C310B to be sure they are fully seated and locked. Refer to Restraints Control Module (RCM) 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.	**Yes** GO to P6 . **No** Fault corrected. GO to P11 .

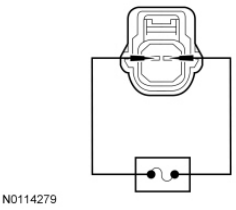
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B0095:93 retrieved on-demand during self-test?**	
P6 CHECK THE RH FRONT IMPACT SEVERITY SENSOR CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RH Front Impact Severity Sensor C1466. • 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 RH front impact severity sensor: ♦ C1466-1, circuit VR214 (WH/BU), harness side and ground. ♦ C1466-2, circuit RR130 (GN/BU), harness side and ground.  N0036990 • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit VR214 (WH/BU) or RR130 (GN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to P11 . **No** GO to P7 .
P7 CHECK THE RH FRONT IMPACT SEVERITY SENSOR CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Measure the resistance between RCM C310B, harness side and RH front impact severity sensor C1466, harness side using the following chart.	**Yes** GO to P8 . **No** REPAIR circuit VR214 (WH/BU) or RR130 (GN/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to P11 .

RCM	Circuit	RH Front Impact Severity Sensor
C310B-30	VR214 (WH/BU)	C1466-1

C310B-29	RR130 (GN/BU)	C1466-2



- **Are the resistances less than 0.5 ohm?**

P8 CHECK THE RIGHT FRONT RESTRAINTS SENSOR DTC FOR A FAULT STATUS CHANGE (NO OPERATION INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between RH front impact severity sensor C1466-1, circuit VR214 (WH/BU), harness side and C1466-2, circuit RR130 (GN/BU), harness side.  N0114279 • 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 â RCM . • **Did the on-demand DTC change from B0095:93 to B0095:11?**	**Yes** REMOVE the fused jumper wire and INSTALL a new sensor. REFER to Front Impact Severity Sensor in this section. GO to P11 . **No** REMOVE the fused jumper wire and GO to P8 .
P9 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components, sensor electrical connectors 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 RCM . REFER to Restraints Control Module (RCM) in this section. GO to P11 . **No** In the process of diagnosing the fault, the

• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: RH Front Impact Severity Sensor C1466. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to P10 .
P10 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RH Front Impact Severity Sensor C1466. • Disconnect: RCM C310A and C310B. • Inspect for the following: ♦ inspect harness and component connectors for loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic	**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. For DTC B0095:11, GO to P2 . For DTC B0095:93, GO to P5 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to P11 .

and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC B0095:11 or B0095:93 retrieved on-demand during self-test?**	
P11 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test Q: DTCs B00A0:09, B00A0:4A, B00A0:63, B00A0:64 and B00A0:68

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) is in constant communication with various control modules on the High Speed Controller Area Network (HS-CAN), including the Occupant Classification System Module (OCSM). The RCM continuously monitors the HS-CAN for fault messages reported by the Occupant Classification System (OCS) system. The RCM also checks for the correct identification of the OCSM . If the RCM detects one of the following faults reported by the OCS system, it stores DTC B00A0:09, B00A0:4A, B00A0:63, B00A0:64 or B00A0:68 in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

This pinpoint test is intended to diagnose the following:
- OCSM
- RCM

DTC Description	Fault Trigger Conditions
• B00A0:09 â Occupant Classification System: Component Failure	When the RCM receives a message from the OCSM that a fault exists within the OCS system, this fault is indicated.
• B00A0:4A â Occupant Classification System: Incorrect Component Installed	When the RCM senses the OCS system is present but not configured, a fault is indicated.
• B00A0:63 â Occupant Classification System: Circuit / Component Protection Time-Out	When the RCM receives 8 or more invalid states from the OCSM , a fault is indicated.
• B00A0:64 â Occupant Classification System: Signal Plausibility Failure	When the RCM receives messages containing upper or lower data limits other than limits stored in memory, a fault is indicated.
• B00A0:68 â Occupant Classification System: Event Information	When the RCM receives a message containing incorrect data, a fault is indicated.

PINPOINT TEST Q: DTCs B00A0:09, B00A0:4A, B00A0:63, B00A0:64 and B00A0:68

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ 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: Only disconnect or reconnect Supplemental Restraint System (SRS) components 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: Always make sure the correct Supplemental Restraint System (SRS) component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take

Q1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B00A0:09, B00A0:4A, B00A0:63, B00A0:64 or B00A0:68 retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTCs B00A0:09, B00A0:63 and B00A0:68, RETRIEVE DTCs from the OCSM and REFER to the Occupant Classification System Module (OCSM) DTC chart for diagnostic direction. For DTC B00A0:4A or B00A0:64, GO to Q2 . **No** CHECK for causes of the intermittent fault. Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition frequently. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to Q5 .
Q2 CHECK THE OCS	
• Ignition OFF. • ⚠ **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.** • Verify the correct OCS system service kit has been installed in the vehicle. • **Is the correct OCS system service kit installed?**	**Yes** GO to Q3 . **No** INSTALL the correct OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to Q5 .
Q3 CHECK FOR THE CORRECT RCM	
• Disconnect the scan tool. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Log Viewer. • Retrieve and record the RCM part number from Log Viewer and check the recorded part number against the part number listed in the Ford Catalog Advantage ™ or equivalent. • **Is the correct RCM installed?**	**Yes** GO to Q4 . **No** INSTALL the correct RCM . REFER to Restraints Control Module (RCM) in this section. GO to Q5 .
Q4 CHECK THE RCM	

• Ignition ON. • Carry out Programmable Module Installation (PMI) for the RCM . Manually enter as-built data. Refer to Section 418-01 . • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B00A0:4A or B00A0:64 retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to Q5 . **No** Fault corrected. GO to Q5 .
Q5 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM DTCs. PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test R: DTCs B00B5:11, B00B5:12, B00B5:13 and B00B5:1D

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) monitors the driver seat track position sensor and circuits for the following faults:

- Short to ground
- Short to voltage

- Open circuit
- Current out of range
- Faulted driver seat track position sensor

If a fault is detected, the RCM stores DTC B00B5:11, B00B5:12, B00B5:13 or B00B5:1D in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

DTC Description	Fault Trigger Conditions
• B00B5:11 â Driver Seat Track Position Restraints Sensor: Circuit Short to Ground	When the RCM senses a short to ground on the driver seat track position sensor circuit, a fault is indicated.
• B00B5:12 â Driver Seat Track Position Restraints Sensor: Circuit Short to Battery	When the RCM senses a short to voltage on the driver seat track position sensor circuit, a fault is indicated.
• B00B5:13 â Driver Seat Track Position Restraints Sensor: Circuit Open	When the RCM senses an open on either of the driver seat track position sensor circuits, a fault is indicated.
• B00B5:1D â Driver Seat Track Position Restraints Sensor: Circuit Current Out of Range	When the RCM senses current out of an acceptable range between the driver seat track position sensor circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver seat track position sensor
- RCM

PINPOINT TEST R: DTCs B00B5:11, B00B5:12, B00B5:13 AND B00B5:1D

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking measurements. Failure**

to use the correct probe adapter(s) may damage the connector.

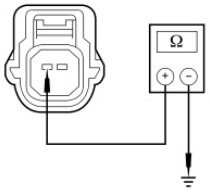
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

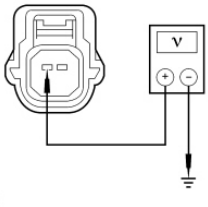
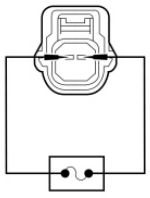
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

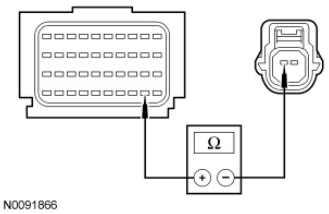
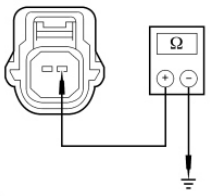
NOTE: Always make sure the correct Supplemental Restraint System (SRS) component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
R1 RETRIEVE RCM DTCs	
• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B00B5:11, B00B5:12, B00B5:13 or B00B5:1D retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during the self-test. For DTC B00B5:11 or B00B5:1D, GO to R2 . For DTC B00B5:12, GO to R4 . For DTC B00B5:13, GO to R5 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to R10 .
R2 CHECK THE DRIVER SEAT TRACK POSITION RESTRAINTS SENSOR DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND OR CURRENT OUT OF RANGE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • ⚠ **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.** • Disconnect: Driver Seat Track Position Sensor C356.	**Yes** GO to R8 . **No** For DTC B00B5:1D, GO to R9 . For DTC B00B5:11, GO to R3 .

• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver seat track position sensor disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B00B5:11 or B00B5:1D to B00B5:13?**	
R3 CHECK THE DRIVER SEAT TRACK POSITION SENSOR CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver seat track position sensor C356-2, circuit VR215 (YE/VT) and ground.  N0061722 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to R9 . **No** REPAIR circuit VR215 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to R11 .
R4 CHECK THE DRIVER SEAT TRACK POSITION SENSOR CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: Driver Seat Track Position Sensor C356. • Disconnect: Driver Seat Side Air Bag Module C367. • 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 seat track position sensor C356-2, circuit VR215 (YE/VT), harness side and ground.	**Yes** REPAIR circuit VR215 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to R11 . **No** GO to R9 .

 N0061721 • **Is any voltage present?**	
R5 CHECK THE DRIVER SEAT TRACK POSITION RESTRAINTS SENSOR DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Side Air Bag Module C367. • Disconnect: Driver Seat Track Position Sensor C356. • Connect a fused jumper wire between driver seat track position sensor C356-2, circuit VR215 (YE/VT), harness side and C356-1, circuit GD143 (BK/VT), harness side.  N0114279 • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • 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. • **DIAGNOSTIC TIP:** When viewing DTCs with the driver seat track position sensor circuits shorted together, a short to ground fault would normally be retrieved.	**Yes** REMOVE the fused jumper wire and GO to R8 . **No** REMOVE the fused jumper wire and GO to R6 .

• **Did the on-demand DTC change from B00B5:13 to B00B5:11?**	
R6 CHECK THE DRIVER SEAT TRACK POSITION SENSOR CIRCUIT FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B-32, circuit VR215 (YE/VT), harness side and driver seat track position sensor C356-2, circuit VR215 (YE/VT), harness side.  • **Is the resistance less than 0.5 ohm?**	**Yes** GO to R7 . **No** REPAIR circuit VR215 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to R11 .
R7 CHECK THE DRIVER SEAT TRACK POSITION SENSOR GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between driver seat track position sensor C356-1, circuit GD143 (BK/VT) and ground.  • **Is the resistance less than 0.5 ohm?**	**Yes** GO to R9 . **No** REPAIR circuit GD143 (BK/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to R11 .
R8 CONFIRM THE DRIVER SEAT TRACK POSITION RESTRAINTS SENSOR FAULT	
NOTE: Make sure all SRS components, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be recorded. • Ignition OFF. • ⚠ **WARNING: Turn the ignition OFF and wait one minute to deplete the backup power**	**Yes** INSTALL a new driver seat track position sensor. REFER to Seat Position Sensor in this section. GO to R11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this**

supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Disconnect: Driver Seat Track Position Sensor C356. • Connect: RCM C310A and C310B (if previously disconnected). • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**time. Install SRS components only when directed to do so in the pinpoint test.** GO to R10 .
R9 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components, 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found.	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to R11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to R10 .

Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Seat Track Position Sensor C356. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	
R10 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Seat Track Position Sensor C356. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC B00B5:11, B00B5:12, B00B5:13 or B00B5:1D retrieved on-demand during self-test?**	**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 the self-test. For DTC B00B5:11 or B00B5:1D, GO to R2 . For DTC B00B5:12, GO to R4 . For DTC B00B5:13, GO to R5 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** REPAIR any intermittent wiring, terminal or connector concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to R11 .
R11 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No**

the event of an accidental deployment. • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved?**	CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test S: DTCs B00C5:11, B00C5:12, B00C5:13 and B00C5:1D

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) monitors the passenger seat track position sensor and circuits for the following faults:

- Short to ground
- Short to voltage
- Open circuit
- Current out of range
- Faulted passenger seat track position sensor

If a fault is detected, the RCM stores DTC B00C5:11, B00C5:12, B00C5:13 or B00C5:1D in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

DTC Description	Fault Trigger Conditions
• B00C5:11 â Passenger Seat Track Position Restraints Sensor: Circuit Short to Ground	When the RCM senses a short to ground on the passenger seat track position sensor circuit, a fault is indicated.
• B00C5:12 â Passenger Seat Track Position Restraints Sensor: Circuit Short to Battery	When the RCM senses a short to voltage on the passenger seat track position sensor circuit, a fault is indicated.
• B00C5:13 â Passenger Seat Track Position Restraints Sensor: Circuit Open	When the RCM senses an open on either of the passenger seat track position sensor circuits, a fault is indicated.

• B00C5:1D â Passenger Seat Track Position Restraints Sensor: Circuit Current Out of Range	When the RCM senses current out of an acceptable range between the passenger seat track position sensor circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Passenger seat track position sensor
- RCM

PINPOINT TEST S: DTCs B00C5:11, B00C5:12, B00C5:13 AND B00C5:1D

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

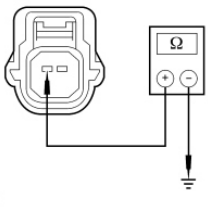
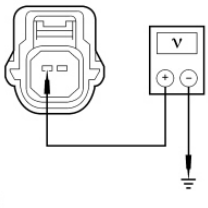
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

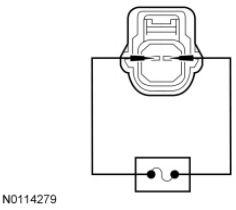
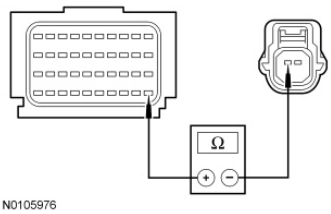
NOTE: Always make sure the correct Supplemental Restraint System (SRS) component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

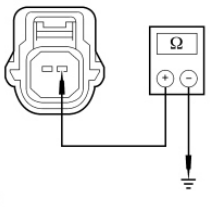
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
S1 RETRIEVE RCM DTCs	
• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B00C5:11, B00C5:12, B00C5:13 or B00C5:1D retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during the self-test. For DTC B00C5:11 or B00C5:1D, GO

	to S2 . For DTC B00C5:12, GO to S4 . For DTC B00C5:13, GO to S5 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to S10 .
S2 CHECK THE PASSENGER SEAT TRACK POSITION RESTRAINTS SENSOR DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND OR CURRENT OUT OF RANGE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • ⚠ **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.** • Disconnect: Passenger Seat Track Position Sensor C3617. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger seat track position sensor disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B00C5:11 or B00C5:1D to B00C5:13?**	**Yes** GO to S8 . **No** For DTC B00C5:1D, GO to S9 . For DTC B00C5:11, GO to S3 .
S3 CHECK THE PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between passenger seat track position sensor C3617-2, circuit VR216 (GN/OG) and ground.	**Yes** GO to S9 . **No** REPAIR circuit VR216 (GN/OG). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to S11 .

 • **Is the resistance greater than 10,000 ohms?**	
S4 CHECK THE PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: Passenger Seat Track Position Sensor C3617. • Disconnect: Passenger Seat Side Air Bag Module C337. • 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 track position sensor C3617-2, circuit VR216 (GN/OG), harness side and ground.  • **Is any voltage present?**	**Yes** REPAIR circuit VR216 (GN/OG). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to S11 . **No** GO to S9 .
S5 CHECK THE PASSENGER SEAT TRACK POSITION RESTRAINTS SENSOR DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.	**Yes** REMOVE the fused jumper wire and GO to S8 . **No** REMOVE the fused jumper wire and GO to S6 .

• Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: Passenger Seat Track Position Sensor C3617. • Connect a fused jumper wire between passenger seat track position sensor C3617-2, circuit VR216 (GN/OG), harness side and C3617-1, circuit GD145 (BK/BU), harness side.  N0114279 • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • 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. • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger seat track position restraints sensor circuits shorted together, a short to ground fault would normally be retrieved. • **Did the on-demand DTC change from B00C5:13 to B00C5:11?**	
S6 CHECK THE PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B-31, circuit VR216 (GN/OG), harness side and passenger seat track position sensor C3617-2, circuit VR216 (GN/OG), harness side.  N0105976 • **Is the resistance less than 0.5 ohm?**	**Yes** GO to S7 . **No** REPAIR circuit VR216 (GN/OG). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to S11 .
S7 CHECK THE PASSENGER SEAT TRACK POSITION SENSOR GROUND CIRCUIT FOR AN OPEN	

• Measure the resistance between passenger seat track position sensor C3617-1, circuit GD145 (BK/BU) and ground.  N0061723 • **Is the resistance less than 0.5 ohm?**	**Yes** GO to S9 . **No** REPAIR circuit GD145 (BK/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to S11 .
S8 CONFIRM THE PASSENGER SEAT TRACK POSITION RESTRAINTS SENSOR FAULT	
NOTE: Make sure all SRS components, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be recorded. • Ignition OFF. • ⚠ **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.** • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Disconnect: Passenger Seat Track Position Sensor C3617. • Connect: RCM C310A and C310B (if previously disconnected). • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new passenger seat track position sensor. REFER to Seat Position Sensor in this section. GO to S11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to S10 .
S9 CONFIRM THE RCM FAULT	

NOTE: Make sure all SRS components, 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Passenger Seat Track Position Sensor C3617. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to S11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to S10 .
S10 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Track Position Sensor C3617. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector	**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 the self-test. For DTC B00C5:11 or B00C5:1D, GO to S2 . For DTC B00C5:12, GO to S4 . For DTC B00C5:13, GO to S5 . **No** The fault is not present and cannot be recreated at this time. **Do not install**

information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC B00C5:11, B00C5:12, B00C5:13 or B00C5:1D retrieved on-demand during self-test?**	**any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** REPAIR any intermittent wiring, terminal or connector concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to S11 .
S11 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and Occupant Classification System Module (OCSM) CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test T: DTCs B00D5:11, B00D5:12 and B00D5:13

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The RCM briefly activates the Passenger Air Bag Deactivation (PAD) indicator to prove-out and verify to the occupants correct functional operation of the PAD indicator.

The RCM monitors the PAD indicator circuits for the following faults:

- Open circuit
- Short to voltage
- Short to ground
- Faulted PAD indicator

If a fault is detected, the RCM stores DTC B00D5:11, B00D5:12 or B00D5:13 in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

- DTC B00D5:11 (Restraint System Passenger Disable Indicator: Circuit Short to Ground) â When the RCM senses a short to ground on the PAD indicator circuit, a fault is indicated.

- DTC B00D5:12 (Restraint System Passenger Disable Indicator: Circuit Short to Battery) â When the RCM senses a short to voltage on the PAD indicator circuit, a fault is indicated.
- DTC B00D5:13 (Restraint System Passenger Disable Indicator: Circuit Open) â When the RCM senses an open circuit on the PAD indicator, a fault is indicated. An open ignition circuit to the PAD indicator can set this DTC.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- PAD indicator
- RCM

PINPOINT TEST T: DTCs B00D5:11, B00D5:12 AND B00D5:13

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.**

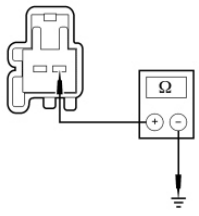
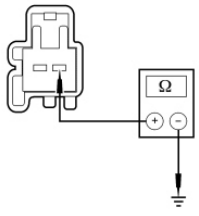
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

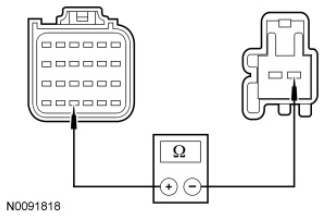
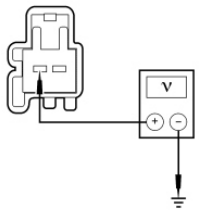
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

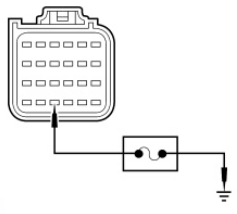
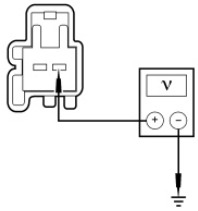
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
T1 RETRIEVE RCM DTCs	
• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B00D5:11, B00D5:12 or B00D5:13 retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B00D5:11, GO to T2 . For DTC B00D5:13, GO to T4 For DTC B00D5:12, GO to T7 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to T10 .

T2 CHECK THE PAD INDICATOR CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • ⚠ **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.** • Disconnect: PAD Indicator C2286. • Measure the resistance between PAD indicator C2286-2, circuit RR116 (BN/GN), harness side and ground.  N0061732 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to T9 . **No** GO to T3 .
T3 CHECK THE RCM FOR LOW RESISTANCE	
• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between PAD indicator C2286-2, circuit RR116 (BN/GN), harness side and ground.  N0061732 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to T9 . **No** REPAIR circuit RR116 (BN/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to T11 .
T4 CHECK THE PAD INDICATOR CIRCUIT FOR AN OPEN	

• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: PAD Indicator C2286. • Measure the resistance between PAD indicator C2286-2, circuit RR116 (BN/GN) and RCM C310A-22, circuit RR116 (BN/GN), harness side.  N0091818 • **Is the resistance less than 0.5 ohm?**	**Yes** GO to T5 . **No** REPAIR circuit RR116 (BN/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to T11 .
T5 CHECK THE IGNITION CIRCUIT AT PAD INDICATOR FOR VOLTAGE	
• 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 PAD indicator C2286-1, circuit CBP04 (VT), harness side and ground.  N0061734 • **Is the voltage greater than 10 volts?**	**Yes** GO to T6 . **No** VERIFY Central Junction Box (CJB) fuse 4 (7.5A) is OK. If OK, REPAIR circuit CBP04 (VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. GO to T11 .
T6 CHECK THE PAD INDICATOR	
• Ignition OFF. • Connect: PAD Indicator C2286. • Connect a fused jumper wire between RCM C310A-22, circuit RR116 (BN/GN), harness side and ground.	**Yes** REMOVE the fused jumper wire and GO to T9 . **No** REMOVE the fused jumper wire and INSTALL a new PAD indicator. REFER to Passenger Airbag Deactivation (PAD) Indicator in this section. GO to T11 .

 N0091819 • Ignition ON. • Monitor the PAD indicator. • **Does the PAD indicator illuminate?**	
T7 CHECK THE PAD INDICATOR CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: PAD Indicator C2286. • 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 PAD indicator C2286-2, circuit RR116 (BN/GN), harness side and ground.  N0061735 • **Is any voltage present?**	**Yes** REPAIR circuit RR116 (BN/GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to T11 . **No** GO to T8 .
T8 CHECK THE RCM	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Connect: RCM C310A and C310B. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental	**Yes** INSTALL a new PAD indicator. REFER to Passenger Airbag Deactivation (PAD) Indicator in this section. **No** GO to T9 .

Restraint System (SRS) Depowering and Repowering in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the PAD indicator disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B00D5:12 to B00D5:13?**	
T9 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: PAD Indicator C2286. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM .	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to T11 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to T10 .

• **Was the original DTC retrieved on-demand during self-test?**	
T10 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • ⚠ **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.** • Disconnect: PAD Indicator C2286. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B00D5:11, B00D5:12 or B00D5:13 retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B00D5:11, GO to T2 . For DTC B00D5:13, GO to T4 . For DTC B00D5:12, GO to T7 . **No** CHECK for causes of intermittent open, short to ground or short to voltage on circuit RR116 (BN/GN). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition frequently. ACTIVATE other systems in the same wire harness. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to T11 .
T11 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

• Enter the following diagnostic mode on the scan tool: Self Test â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any on-demand RCM and/or Occupant Classification System Module (OCSM) DTCs retrieved on-demand during self-test?**	

Pinpoint Test U: DTCs B1211:11, B1211:12, B1211:13 and B1211:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

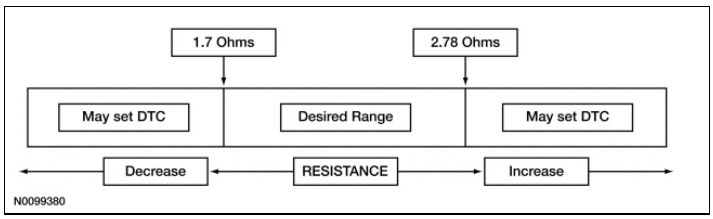
The Restraints Control Module (RCM) continuously monitors the driver safety belt retractor circuits for the following faults:

- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted driver safety belt retractor pretensioner

If a fault is detected, the RCM stores DTC B1211:11, B1211:12, B1211:13 or B1211:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to the diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Driver safety belt retractor
- RCM



DTC Description	Fault Trigger Conditions

• B1211:11 â Driver Seatbelt Retractor Pretensioner Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on the driver safety belt retractor pretensioner circuit, a fault is indicated.
• B1211:12 â Driver Seatbelt Retractor Pretensioner Deployment Control: Circuit Short to Battery	When the RCM senses a short to battery on the driver safety belt retractor pretensioner circuit, a fault is indicated.
• B1211:13 â Driver Seatbelt Retractor Pretensioner Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between the driver safety belt retractor pretensioner circuits, a fault is indicated.
• B1211:1A â Driver Seatbelt Retractor Pretensioner Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between the driver safety belt retractor pretensioner circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver safety belt retractor pretensioner
- RCM

PINPOINT TEST U: DTCs B1211:11, B1211:12, B1211:13 AND B1211:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.**

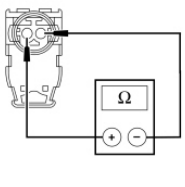
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

NOTE: Always make sure the correct Supplemental Restraint System (SRS) component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

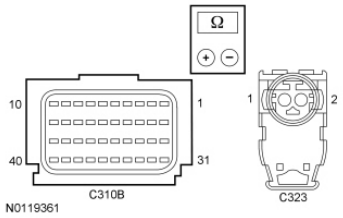
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
U1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B1211:11, B1211:12, B1211:13 or B1211:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during the self-test. For DTC B1211:13 or B1211:1A, GO to U2 . For DTC B1211:11, GO to U8 . For DTC B1211:12, GO to U10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. For DTC B1211:13 or B1211:1A, GO to U13 . For DTC B1211:11, GO to U14 . For DTC B1211:12, GO to U15 .
U2 CHECK THE DRIVER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_23_R) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_23_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to U12 . **No** GO to U3 .
U3 CHECK THE DRIVER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_23_R) PID WHILE CARRYING OUT THE HARNESS TEST	
• While monitoring the DEPLOY_23_R PID carry out the harness test of the driver safety belt retractor pretensioner circuits and accessible connectors (including any in-line connectors), by wiggling connectors and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 . **No** For PID value less than 1.7 ohms,

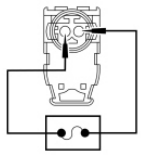
	GO to U4 . For PID value greater than 2.78 ohms, GO to U6 .
U4 CHECK THE DRIVER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Safety Belt Retractor Pretensioner C323. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver safety belt retractor pretensioner disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B1211:1A to B1211:13?**	**Yes** GO to U11 . **No** GO to U5 .
U5 CHECK FOR A SHORT BETWEEN DRIVER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between the driver safety belt retractor pretensioner C323-2, circuit CR146 (GY/VT), harness side and C323-1, circuit RR146 (BU/BN), harness side.  N0116763 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to U12 . **No** REPAIR circuit CR146 (GY/VT) or RR146 (BU/BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 .

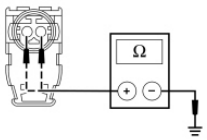
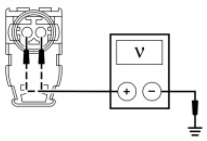
U6 CHECK THE DRIVER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Safety Belt Retractor Pretensioner C323. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B, harness side and driver safety belt retractor pretensioner C323, harness side using the following chart. • **Are the resistances less than 0.5 ohm?**	**Yes** GO to U7 . **No** REPAIR circuit CR146 (GY/VT) or RR146 (BU/BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 .

RCM	Circuit	Driver Safety Belt Retractor Pretensioner
C310B-2	CR146 (GY/VT)	C323-2
C310B-1	RR146 (BU/BN)	C323-1



U7 CHECK THE DRIVER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Connect a fused jumper wire between the driver safety belt retractor pretensioner C323-2, circuit CR146 (GY/VT), harness side and C323-1, circuit RR146 (BU/BN), harness side.	**Yes** REMOVE the fused jumper wire and GO to U11 . **No** REMOVE the fused jumper wire and GO to U12 .

 N0116765 • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver safety belt retractor pretensioner circuits shorted together, a low resistance fault would normally be retrieved. • **Did the on-demand DTC change from B1211:13 to B1211:1A?**	
U8 CHECK THE DRIVER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Safety Belt Retractor Pretensioner C323. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the driver safety belt retractor pretensioner disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B1211:11 to B1211:13?**	**Yes** GO to U11 . **No** GO to U9 .
U9 CHECK THE DRIVER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS FOR A SHORT TO GROUND	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between driver safety belt retractor pretensioner: ♦ C323-2, circuit CR146 (GY/VT), harness side and ground. ♦ C323-1, circuit RR146 (BU/BN), harness side and ground.  N0116766 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to U12 . **No** REPAIR circuit CR146 (GY/VT) or RR146 (BU/BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 .
U10 CHECK THE DRIVER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Safety Belt Retractor Pretensioner C323. • 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 the driver safety belt retractor pretensioner: ♦ C323-2, circuit CR146 (GY/VT), harness side and ground. ♦ C323-1, circuit RR146 (BU/BN), harness side and ground.  N0116767 • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit CR146 (GY/VT) or RR146 (BU/BN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 . **No** GO to U12 .
U11 CONFIRM THE DRIVER SAFETY BELT RETRACTOR PRETENSIONER FAULT	
NOTE: Make sure all SRS components and the RCM electrical connectors are connected before carrying out the	**Yes** INSTALL a new driver safety belt retractor pretensioner. REFER to

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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Safety Belt Retractor Pretensioner C323. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	Section 501-20A . GO to U17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B1211:13 or B1211:1A, GO to U13 . For DTC B1211:11, GO to U14 . For DTC B1211:12, GO to U15 .
U12 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section.	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to U17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B1211:13 or B1211:1A, GO to U13 . For DTC B1211:11, GO to U14 . For DTC B1211:12, GO to U15 .

♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Driver Safety Belt Retractor Pretensioner C323. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	
U13 CHECK FOR INTERMITTENT DRIVER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_23_R) PID LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_23_R PID • Attempt to recreate the fault by wiggling the connectors (including any in-line connectors) and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to U16 . **No** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 .
U14 CHECK FOR AN INTERMITTENT DRIVER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL SHORT TO GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B1211:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 . **No**

	The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to U16 .
U15 CHECK FOR AN INTERMITTENT DRIVER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL SHORT TO VOLTAGE FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Safety Belt Retractor Pretensioner C323. • 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. • Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B1211:12 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to U16 .
U16 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Driver Safety Belt Retractor Pretensioner C323. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. • **Were any concerns found?**	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to U17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to U17 .
U17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for

follow this instruction may result in serious personal injury or death in the event of an accidental deployment. • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	pinpoint test direction. **No** CLEAR all RCM and Occupant Classification System Module (OCSM) CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test V: DTCs B1214:11, B1214:12, B1214:13 and B1214:1A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

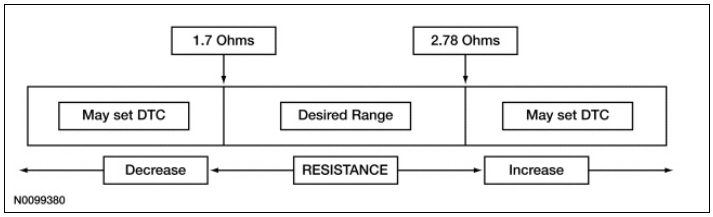
The Restraints Control Module (RCM) continuously monitors the passenger safety belt retractor pretensioner and circuits for the following faults:

- Resistance out of range
- Unexpected voltage
- Short to ground
- Faulted passenger safety belt retractor pretensioner

If a fault is detected, the RCM stores DTC B1214:11, B1214:12, B1214:13 or B1214:1A in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The RCM analyzes the deployment loop resistance and uses this measurement in combination with an age correction factor to determine if a fault exists. The value displayed in the PID is the deployment loop resistance as measured by the RCM . If the value displayed is lower or higher than the desired range (refer to diagram below), the RCM can set a DTC. As the deployment loop resistance drifts farther outside the desired range, the chance for a DTC increases. The RCM fault trigger threshold may vary as the vehicle ages. Small variations in resistance can occur due to the effect of road vibrations on terminal fit and/or temperature changes. These variables can result in an intermittent fault. For this reason, the test requires the PID value to be within the desired range before the fault is considered repaired, regardless if the module is reporting an on-demand DTC at time of diagnosis. Following this direction helps make sure that minor changes in resistance do not create a repeat concern. This test uses a process of elimination to diagnose each part of the deployment loop circuit including:

- Wiring
- Connections
- Passenger safety belt retractor pretensioner
- RCM



DTC Description	Fault Trigger Conditions
• B1214:11 â Passenger Seatbelt Retractor Pretensioner Deployment Control: Circuit Short to Ground	When the RCM senses a short to ground on the passenger safety belt retractor pretensioner circuit, a fault is indicated.
• B1214:12 â Passenger Seatbelt Retractor Pretensioner Deployment Control: Circuit Short to Battery	When the RCM senses a short to battery on the passenger safety belt retractor pretensioner circuit, a fault is indicated.
• B1214:13 â Passenger Seatbelt Retractor Pretensioner Deployment Control: Circuit Open	When the RCM measures more than the desired resistance range between the passenger safety belt retractor pretensioner circuits, a fault is indicated.
• B1214:1A â Passenger Seatbelt Retractor Pretensioner Deployment Control: Circuit Resistance Below Threshold	When the RCM measures less than the desired resistance range between the passenger safety belt retractor pretensioner circuits, a fault is indicated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Passenger safety belt retractor pretensioner
- RCM

PINPOINT TEST V: DTCs B1214:11, B1214:12, B1214:13 and B1214:1A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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.

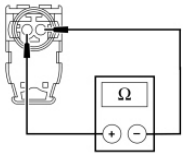
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

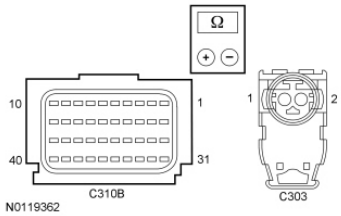
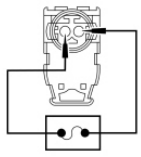
NOTE: Always make sure the correct Supplemental Restraint System (SRS) component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

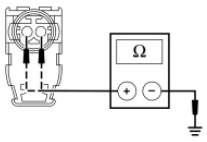
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

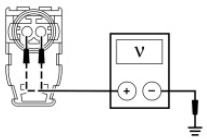
Test Step	Result / Action to Take
V1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B1214:11, B1214:12, B1214:13 or B1214:1A retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. For DTC B1214:13 or B1214:1A, GO to V2 . For DTC B1214:11, GO to V8 . For DTC B1214:12, GO to V10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. The fault condition is not present at this time. For DTC B1214:13 or B1214:1A, GO to V13 . For DTC B1214:11, GO to V14 . For DTC B1214:12, GO to V15 .
V2 CHECK THE PASSENGER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_24_R) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_24_R PID • **Does the PID value read between 1.7 and 2.78 ohms?**	**Yes** GO to V12 . **No** GO to V3 .
V3 CHECK THE PASSENGER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_24_R) PID WHILE CARRYING OUT THE HARNESS TEST	

• While monitoring the DEPLOY_24_R PID carry out the harness test of the passenger safety belt retractor pretensioner circuits and accessible connectors (including any in-line connectors), by wiggling connectors and flexing the wire harness. • **Does the PID value read between 1.7 and 2.78 ohms while carrying out the harness test?**	**Yes** DEPOWER the SRS and REPAIR the connector, terminals or wire harness as needed. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 . **No** For PID value less than 1.7 ohms, GO to V4 . For PID value greater than 2.78 ohms, GO to V6 .
V4 CHECK THE PASSENGER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (LOW RESISTANCE INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Retractor Pretensioner C303. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger safety belt retractor pretensioner disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B1214:1A to B1214:13?**	**Yes** GO to V11 . **No** GO to V5 .
V5 CHECK FOR A SHORT BETWEEN PASSENGER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between the passenger safety belt retractor pretensioner C303-1, circuit RR147 (YE/VT), harness side and C303-2, circuit CR147 (GN/OG), harness side.  N0116763 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to V12 . **No** REPAIR circuits CR147 (GN/OG) and RR147 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 .
V6 CHECK THE PASSENGER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Retractor Pretensioner C303. • Disconnect: RCM C310A and C310B. • Measure the resistance between RCM C310B, harness side and passenger safety belt retractor pretensioner C303, harness side using the following chart. **RCM** / **Circuit** / **Passenger Safety Belt Retractor Pretensioner** C310B-11 / RR147 (YE/VT) / C303-1 C310B-12 / CR147 (GN/OG) / C303-2	**Yes** GO to V7 . **No** REPAIR circuit CR147 (GN/OG) or RR147 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 .

 • **Are the resistances less than 0.5 ohm?**	
V7 CHECK THE PASSENGER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL DTCs FOR FAULT STATUS CHANGE (OPEN INDICATED)	
NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Disconnect: Passenger Seat Side Air Bag Module C337. • Connect: RCM C310A and C310B. • Connect a fused jumper wire between the passenger safety belt retractor pretensioner C303-1, circuit RR147 (YE/VT), harness side and C303-2, circuit CR147 (GN/OG), harness side.  • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger safety belt retractor pretensioner circuits shorted together, a low resistance fault would normally be retrieved. • **Did the on-demand DTC change from B1214:13 to B1214:1A?**	**Yes** REMOVE the fused jumper wire and GO to V11 . **No** REMOVE the fused jumper wire and GO to V12 .
V8 CHECK THE PASSENGER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL DTC FOR A FAULT STATUS CHANGE (SHORT TO GROUND INDICATED)	
	Yes GO to V11 .

NOTE: This pinpoint test step attempts to change the fault reported by the RCM by inducing a different fault condition. If the fault reported changes, this indicates the RCM is functioning correctly and is not the source of the fault. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Retractor Pretensioner C303. • 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 â RCM . • **DIAGNOSTIC TIP:** When viewing DTCs with the passenger safety belt retractor pretensioner disconnected, an open circuit fault would normally be retrieved. • **Did the on-demand DTC change from B1214:11 to B1214:13?**	**No** GO to V9 .
V9 CHECK THE PASSENGER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Measure the resistance between the passenger safety belt retractor pretensioner: ♦ C303-2, circuit CR147 (GN/OG), harness side and ground. ♦ C303-1, circuit RR147 (YE/VT), harness side and ground.  N0116766 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to V12 . **No** REPAIR circuit CR147 (GN/OG) or RR147 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 .
V10 CHECK THE PASSENGER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: Passenger Safety Belt Retractor Pretensioner C303. • 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 the passenger safety belt retractor pretensioner: ♦ C303-2, circuit CR147 (GN/OG), harness side and ground. ♦ C303-1, circuit RR147 (YE/VT), harness side and ground.  N0116767 • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit CR147 (GN/OG) or RR147 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 . **No** GO to V12 .
V11 CONFIRM THE PASSENGER SAFETY BELT RETRACTOR PRETENSIONER FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found.	**Yes** INSTALL a new passenger safety belt retractor pretensioner. REFER to Section 501-20A . GO to V17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B1214:13 or B1214:1A, GO to V13 . For DTC B1214:11, GO to V14 . For DTC B1214:12, GO to V15 .

Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: Passenger Safety Belt Retractor Pretensioner C303. • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	
V12 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Restraint System Components. • Connect: RCM C310A and C310B (if previously disconnected). • 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 â RCM . • **Was the original DTC retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to V17 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** For DTC B1214:13 or B1214:1A, GO to V13 . For DTC B1214:11, GO to V14 . For DTC B1214:12, GO to V15 .
V13 CHECK FOR AN INTERMITTENT PASSENGER SEATBELT RETRACTOR	

PRETENSIONER DEPLOYMENT CONTROL RESISTANCE (DEPLOY_24_R) PID LOW RESISTANCE OR OPEN CIRCUIT FAULT	
• Enter the following diagnostic mode on the scan tool: DataLogger â RCM . ♦ DEPLOY_24_R PID • Attempt to recreate the fault by wiggling the connectors (including any in-line connectors) and flexing the wire harness. • **Does the PID value read between 1.7 ohms and 2.78 ohms?**	**Yes** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to V16 . **No** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 .
V14 CHECK FOR AN INTERMITTENT PASSENGER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL SHORT TO GROUND FAULT	
• Attempt to recreate the fault by wiggling connectors (including any in-line connectors) and flexing the wire harness. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC B1214:11 retrieved on-demand during self-test?**	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to V16 .
V15 CHECK FOR AN INTERMITTENT PASSENGER SEATBELT RETRACTOR PRETENSIONER DEPLOYMENT CONTROL SHORT TO VOLTAGE FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Retractor Pretensioner C303. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.	**Yes** DEPOWER the SRS and REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 .

• Ignition ON. • Attempt to recreate the fault by wiggling the connectors (including any in-line connectors) and flexing the wire harness. • **Was DTC B1214:12 retrieved on-demand during self-test?**	**No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to V16 .
V16 CHECK THE HARNESS AND CONNECTORS	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Safety Belt Retractor Pretensioner C303. ♦ inspect connector(s) (including any in-line connectors) for loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. • **Were any concerns found?**	**Yes** REPAIR as necessary. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to V17 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to V17 .
V17 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and Occupant Classification System Module (OCSM) CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test W: DTCs B0001:2B, B0002:2B, B0004:2B, B0010:2B, B0011:2B, B0020:2B, B0021:2B, B0028:2B, B0029:2B, B0050:2B, B0052:2B, B0082:2B, B00B5:2B, B00C5:2B, B1211:2B and B1214:2B

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) monitors all deployable device and sensor circuits for a signal cross-coupled (short) between circuits. If the RCM detects a short between the circuits of one device and another device, it stores a DTC for each of the signal-cross coupled faults in memory. The RCM sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator. When a normal loop fault is present (one loop is either shorted to battery/ground, open circuit or low resistance), signal cross-coupled diagnostics are not active. Once the normal loop fault is repaired, the signal cross-coupled diagnostics resume.

DTC Description	Fault Trigger Condition
• B0001:2B â Driver Frontal Stage 1 Deployment Control: Signal Cross Coupled	If the RCM detects a short between the driver air bag module stage 1 circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0002:2B â Driver Frontal Stage 2 Deployment Control: Signal Cross Coupled	If the RCM detects a short between the driver air bag module stage 2 circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0004:2B â Driver Knee Bolster Deployment Control: Signal Cross Coupled	If the RCM detects a short between the driver knee bolster circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0010:2B â Passenger Frontal Stage 1 Deployment Control: Signal Cross Coupled	If the RCM detects a short between the passenger air bag module stage 1 circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0011:2B â Passenger Frontal Stage 2 Deployment Control: Signal Cross Coupled	If the RCM detects a short between the passenger air bag module stage 2 circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0020:2B â Left Side Airbag Deployment Control: Signal Cross Coupled	If the RCM detects a short between the driver seat side air bag module circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0021:2B â Left Curtain Deployment Control 1: Signal Cross Coupled	If the RCM detects a short between the driver side air curtain module circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0028:2B â Right Side Airbag Deployment Control: Signal Cross Coupled	If the RCM detects a short between the passenger seat side air bag module circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0029:2B â Right Curtain Deployment Control 1: Signal Cross Coupled	If the RCM detects a short between the passenger side air curtain module circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
	If the RCM detects a short between the driver safety belt buckle switch circuits and the circuits of another SRS

• B0050:2B â Driver Seatbelt Sensor: Signal Cross Coupled	component, it sets this DTC and the DTC of the corresponding SRS component.
• B0052:2B â Passenger Seatbelt Sensor: Signal Cross Coupled	If the RCM detects a short between the passenger safety belt buckle switch circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B0082:2B â Passenger Seatbelt Load Limiter Deployment Control: Signal Cross Coupled	If the RCM detects a short between the passenger safety belt adaptive load limiter circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B00B5:2B â Driver Seat Track Position Restraints Sensor: Signal Cross Coupled	If the RCM detects a short between the driver seat track position sensor circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B00C5:2B â Passenger Seat Track Position Restraints Sensor: Signal Cross Coupled	If the RCM detects a short between the passenger seat track position sensor circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B1211:2B â Driver Seatbelt Retractor Pretensioner Deployment Control: Signal Cross Coupled	If the RCM detects a short between the driver safety belt buckle pretensioner circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.
• B1214:2B â Passenger Seatbelt Retractor Pretensioner Deployment Control: Signal Cross Coupled	If the RCM detects a short between the passenger safety belt buckle pretensioner circuits and the circuits of another SRS component, it sets this DTC and the DTC of the corresponding SRS component.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- RCM

PINPOINT TEST W: DTCs B0001:2B, B0002:2B, B0004:2B, B0010:2B, B0011:2B, B0020:2B, B0021:2B, B0028:2B, B0029:2B, B0050:2B, B0052:2B, B0082:2B, B00B5:2B, B00C5:2B, B1211:2B AND B1214:2B

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

***NOTICE:* Use the correct probe adapter(s) from the Flex Probe Kit when taking 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: Only disconnect or reconnect Supplemental Restraint System (SRS) components 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 Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
W1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **NOTE:** Signal cross-coupled DTCs are only retrieved in pairs. • **Were any signal cross coupled DTCs retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to W2 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to W4 .
W2 CHECK THE AFFECTED DEPLOYABLE CIRCUITS FOR A SIGNAL CROSS COUPLED FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect **ALL of the affected** SRS devices. • **NOTE:** Most signal cross coupled faults are due to connector and/or wiring harness damage. Carry out a thorough inspection of connector(s) and/or wiring harness for damage. • Using the following table, measure resistance between the circuits of the affected SRS devices. **Signal Cross Coupled Fault Table** **Device/Loop (DTC) / Connector / Circuit** Driver air bag module stage 1 (B0001:2B) — • C216A-1 • C216A-2 — • CR101 (VT/BN)/(WH) • RR101 (YE/GN)/(OG) Driver air bag module stage 2 (B0002:2B) — • C216B-1 • C216B-2 — • CR102 (BU)/(BN) • RR102 (WH)/(BU)	**Yes** GO to W3 . **No** REPAIR the affected circuits. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to W5 .

Driver knee air bag (B0004:2B)	• C2432-1 • C2432-2	• CR139 (VT/WH) • RR139 (YE)
Passenger air bag module stage 1 (B0010:2B)	• C256A-1 • C256A-2	• CR103 (GY/BU) • RR103 (VT/GN)
Passenger air bag module stage 2 (B0011:2B)	• C256B-1 • C256B-2	• CR104 (YE/GY) • RR104 (WH/BU)
Driver seat side air bag module (B0020:2B)	• C367-1 • C367-3	• RR105 (GY/YE) • CR105 (GN/BU)
Driver side air curtain (B0021:2B)	• C9018-1 • C9018-2	• CR109 (BN/BU) • RR109 (BU/GN)
Passenger seat side air bag module (B0028:2B)	• C337-1 • C337-3	• RR106 (YE/OG) • CR106 (VT/GY)
Passenger side air curtain (B0029:2B)	• C9019-1 • C9019-2	• CR111 (BN/WH) • RR111 (YE/VT)
Driver safety belt buckle switch (B0050:2B)	• C3065-2 • â	• CR201 (GN/BU) • â
Passenger safety belt buckle switch (B0052:2B)	• C3066-2 • â	• CR202 (BN/GN) • â
Passenger safety belt load limiter (B0082:2B)	• C389-1 • C389-2	• CR122 (WH/OG) • RR122 (BN)
Driver seat track position sensor (B00B5:2B)	• C356-2 • â	• VR215 (YE/VT) • â
Passenger seat track position sensor (B00C5:2B)	• C3617-2 • â	• VR216 (GN/OG) • â
Driver safety belt retractor pretensioner (B1211:2B)	• C323-1 • C323-2	• RR146 (BU/BN) • CR146 (GY/VT)
Passenger safety belt retractor pretensioner	• C303-2 • C303-1	• CR147 (GN/OG)

(B1214:2B)		• RR147 (YE/VT)

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

W3 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be recorded. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Restraint System Component(s). • 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. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any signal cross coupled DTCs retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to W5 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to W4 .
W4 CHECK FOR AN INTERMITTENT FAULT	
NOTE: 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. • Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect **ALL of the affected** SRS devices. • Inspect the wiring harness(es) for any type of damage. Repair as necessary.	**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 the self-test. GO to W2 . **No** The fault is not present and cannot be recreated at this time. CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information. • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any signal cross coupled DTCs retrieved on-demand during self-test?**	ignition frequently. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to W5 .
W5 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and Occupant Classification System Module (OCSM) DTCs. PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test X: DTCs B0001:4A, B0002:4A, B0004:4A, B0010:4A, B0011:4A, B0020:4A, B0021:4A, B0028:4A, B0029:4A, B0050:4A, B0052:4A, B0082:4A, B0090:4A, B0091:4A, B0092:4A, B0095:4A, B0096:4A, B0097:4A, B00B5:4A, B00C5:4A, B00D5:4A, B1211:4A, B1214:4A and U3000:4A

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) monitors all of Supplemental Restraint System (SRS) device connections. If the RCM detects a connection or device connected that is not stored in memory, the RCM sets a DTC and sends a message to the Instrument Panel Cluster (IPC) to illuminate air bag warning indicator.

DTC Description	Fault Trigger Conditions
• B0001:4A â Driver Frontal Stage 1 Deployment Control: Incorrect	This DTC sets if the RCM detects the device but it is not configured for this component.

Component Installed	
• B0002:4A â Driver Frontal Stage 2 Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0004:4A â Driver Knee Bolster Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0010:4A â Passenger Frontal Stage 1 Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0011:4A â Passenger Frontal Stage 2 Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0020:4A â Left Side Airbag Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0021:4A â Left Curtain Deployment Control 1: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0028:4A â Right Side Airbag Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0029:4A â Right Curtain Deployment Control 1: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0050:4A â Driver Seatbelt Sensor: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0052:4A â Passenger Seatbelt Sensor: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0082:4A â Passenger Seatbelt Load Limiter Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0090:4A â Left Frontal Restraints Sensor: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0091:4A â Left Side Restraints Sensor 1: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.

• B0092:4A â Left Side Restraints Sensor 2: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0095:4A â Right Frontal Restraints Sensor: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0096:4A â Right Side Restraints Sensor 1: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B0097:4A â Right Side Restraints Sensor 2: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B00B5:4A â Driver Seat Track Position Restraints Sensor: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B00C5:4A â Passenger Seat Track Position Restraints Sensor: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B00D5:4A â Restraint System Passenger Disable Indicator: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B1211:4A â Driver Seatbelt Retractor Pretensioner Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• B1214:4A â Passenger Seatbelt Retractor Pretensioner Deployment Control: Incorrect Component Installed	This DTC sets if the RCM detects the device but it is not configured for this component.
• U3000:4A â Control Module: Incorrect Component Installed	This DTC sets if the RCM detects the incorrect vehicle or model year ID from the Occupant Classification System Module (OCSM) or ABS module.

This pinpoint test is intended to diagnose the following:

- Incorrect RCM for vehicle
- RCM not configured

PINPOINT TEST X: DTCs B0001:4A, B0002:4A, B0004:4A, B0010:4A, B0011:4A, B0020:4A, B0021:4A, B0028:4A, B0029:4A, B0050:4A, B0052:4A, B0082:4A, B0090:4A, B0091:4A, B0092:4A, B0095:4A, B0096:4A, B0097:4A, B00B5:4A, B00C5:4A, B00D5:4A, B1211:4A, B1214:4A AND U3000:4A

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

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
X1 RETRIEVE RCM DTCs	
• Connect the scan tool. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any incorrect component installed DTCs retrieved?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. GO to X2 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. The fault condition is not present at this time. GO to X7 .
X2 CHECK THE VEHICLE HISTORY	
• Ignition OFF. • Check the vehicle repair history. • **Has a new RCM or OCSM been installed during this or a prior repair?**	**Yes** GO to X3 . **No** GO to X4 .
X3 CHECK THE RCM AND OCSM VEHICLE IDENTIFICATION PIDs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger â RCM . • View and record the following PID values:	**Yes** GO to X4 . **No** INSTALL the correct RCM or Occupant

♦ V_ID_14229_RCM ♦ OCS_MY • Enter the following diagnostic mode on the scan tool: DataLogger â OCSM . • View and record the following PID values: ♦ OCS_MY_OCS ♦ OCS_VEH_ID • Verify the correct vehicle application. • **Does the PID values match the vehicle application?**	Classification System (OCS) system service kit. REFER to Restraints Control Module (RCM) or Occupant Classification Sensor in this section. GO to X8 .
X4 CHECK ABS MODULE	
• Enter the following diagnostic mode on the scan tool: Log Viewer. • Retrieve and record the ABS module part number from Log Viewer. • Check the recorded part number against the part number listed in the Ford Catalog Advantageâ ¢ or equivalent. • **Is the correct ABS module installed in the vehicle?**	**Yes** GO to X5 . **No** INSTALL the correct ABS module. REFER to Section 206-09 . GO to X8 .
X5 CHECK RCM	
• Carry out Programmable Module Installation (PMI) for the RCM . Use as-built data when carrying out PMI . Refer to Section 418-01 . • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any incorrect component installed DTCs retrieved on-demand during self-test?**	**Yes** GO to X6 . **No** Fault corrected. GO to X8 .
X6 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be recorded. • Ignition OFF. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to X8 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to X7 .

operation. Refer to Restraints Control Module (RCM) in this section. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any incorrect component installed DTCs retrieved?**	
X7 CHECK FOR AN INTERMITTENT FAULT	
• Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Were any incorrect component installed DTCs retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to X8 . **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition frequently. ACTIVATE other systems in the same wire harness. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to X8 .
X8 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self-Test menu, DTCs are retrieved from the RCM and OCSM .	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM DTCs. PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

• **Are any RCM and/or OCSM DTCs retrieved on-demand during the self-test?**	

Pinpoint Test Y: DTCs U0028:08 and U0028:88

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) supplies the stability/traction control system with the yaw rate, roll rate, lateral and longitudinal accelerometer readings over a dedicated Controller Area Network (CAN) bus. If the RCM detects a fault with communications with the ABS module or dedicated CAN bus circuits, it stores DTC U0028:08 or U0028:88.

The RCM **will not** request the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator if either DTC U0028:08 or U0028:88 sets. The air bag warning indicator remains off if either of these DTCs are set.

- DTC U0028:08 (Vehicle Communication Bus A: Bus Signal / Message Failures) â When the RCM does not receive dedicated CAN bus messages from the ABS module for 5 seconds, a fault is indicated. An open dedicated CAN circuit, incorrect installed ABS module or loss of power and/or ground to the ABS module also sets this DTC.
- DTC U0028:88 (Vehicle Communication Bus A: Bus Off) â When the RCM detects the dedicated CAN circuits are shorted to ground, shorted to voltage or shorted to each other, a fault is indicated.

The ABS module may set similar DTCs, U0151 (Lost Communication With Restraints Control Module) and U0452 (Invalid Data Received From Restraints Control Module).

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- RCM
- ABS module

PINPOINT TEST Y: DTCs U0028:08 and U0028:88

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

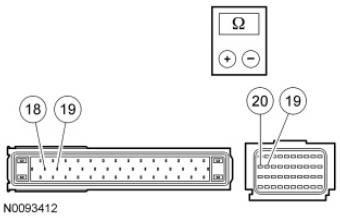
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

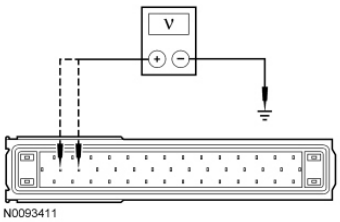
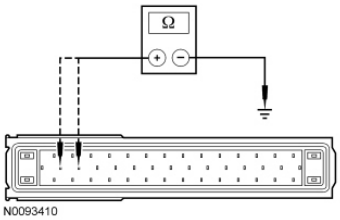
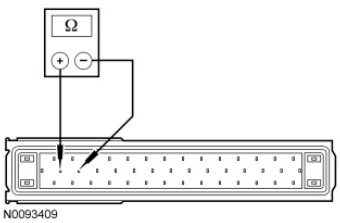
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

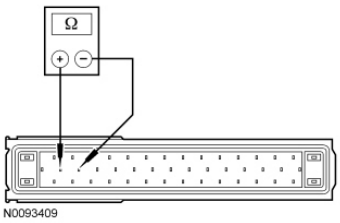
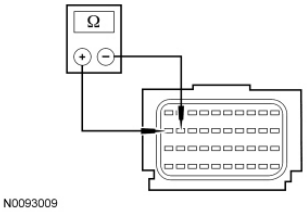
Test Step	Result / Action to Take
Y1 RETRIEVE RCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • **Was DTC U0028:08 or U0028:88 retrieved on-demand during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the self-test. For DTC U0028:08, GO to Y2 . For DTC U0028:88, GO to Y6 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to Y13 .
Y2 CHECK FOR CORRECT RCM	
• Enter the following diagnostic mode on the scan tool: Log Viewer. • Retrieve and record the RCM part number from Log Viewer. • Check the recorded RCM part number against the part number listed in the Ford Catalog Advantageâ ¢ or equivalent. Refer to Restraints Control Module (RCM) in this section. • **Is the correct RCM installed in the vehicle?**	**Yes** GO to Y3 . **No** INSTALL the correct RCM .GO to Y14 .
Y3 CHECK FOR CORRECT ABS MODULE	
• Retrieve and record the ABS module part number from Log Viewer. • Check the recorded ABS module part number against the part number listed in the Ford Catalog Advantageâ ¢ or equivalent. • **Is the correct ABS module installed in the vehicle?**	**Yes** GO to Y4 . **No** INSTALL the correct ABS module. REFER to Section 206-09 . GO to Y14 .
Y4 CHECK THE HS-CAN NETWORK COMMUNICATIONS (ABS MODULE	

COMMUNICATIONS)	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Network Test. • **NOTE:** The Network Test does not test the dedicated CAN communications between the ABS module and RCM . • **Did the Network Test pass (ABS module communicate with the scan tool)?**	**Yes** GO to Y5 . **No** REFER to Section 418-00 to diagnose the High Speed Controller Area Network (HS-CAN)/ ABS module communication concern. GO to Y14 .
Y5 CHECK THE DEDICATED CAN CIRCUITS FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: ABS Module C135. • Measure the resistance between the ABS module C135, harness side and the RCM C310B, harness side as indicated in the following chart: • **Are the resistances less 5 ohms?**	**Yes** GO to Y9 . **No** REPAIR circuit VCA24 (GN/OG) and VCA23 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to Y14 .
Y6 CHECK THE DEDICATED CAN CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310A and C310B. • Disconnect: ABS Module C135. • Repower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.	**Yes** REPAIR circuit VCA24 (GN/OG) or VCA23 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to Y14 .

ABS Module	Circuit	RCM
C135-18	VCA23 (BU/WH)	C310B-20
C135-19	VCA24 (GN/OG)	C310B-19



• Ignition ON. • Measure the voltage between ABS module: ♦ C135-18, circuit VCA23 (WH/BU), harness side and ground. ♦ C135-19, circuit VCA24 (GN/OG), harness side and ground.  N0093411 • **Is any voltage present on either circuit?**	**No** GO to Y7 .
Y7 CHECK THE DEDICATED CAN CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between ABS module: ♦ C135-18, circuit VCA23 (WH/BU), harness side and ground. ♦ C135-19, circuit VCA24 (GN/OG), harness side and ground.  N0093410 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to Y8 . **No** REPAIR circuit VCA24 (GN/OG) or VCA23 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to Y14 .
Y8 CHECK FOR SHORT BETWEEN THE DEDICATED CAN CIRCUITS	
• Measure the resistance between ABS module C135-18, circuit VCA23 (WH/BU), harness side and C135-19, circuit VCA24 (GN/OG), harness side.  N0093409	**Yes** GO to Y9 . **No** REPAIR circuit VCA24 (GN/OG) and VCA23 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to Y14 .

• **Is the resistance greater than 10,000 ohms?**	
Y9 CHECK THE RCM TERMINATING RESISTOR	
• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Connect: RCM C310B. • Measure the resistance between ABS module C135-18, circuit VCA23 (WH/BU), harness side and C135-19, circuit VCA24 (GN/OG), harness side.  N0093409 • **Is the resistance between 108 and 132 ohms?**	**Yes** GO to Y10 . **No** GO to Y11 .
Y10 CHECK THE ABS MODULE TERMINATING RESISTOR	
• Disconnect: RCM C310B. • Connect: ABS Module C135. • Measure the resistance between RCM C310B-20, circuit VCA23 (WH/BU), harness side and C310B-19, circuit VCA24 (GN/OG), harness side.  N0093009 • **Is the resistance between 108 and 132 ohms?**	**Yes** For DTC U0028:08, GO to Y11 . For DTC U0028:88, GO to Y12 . **No** GO to Y12 .
Y11 CONFIRM THE RCM FAULT	
NOTE: Make sure all SRS components and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be recorded.	**Yes** INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to Y14 . **No** In the process of diagnosing the fault, the fault

• If previously directed to repower the SRS , depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ inspect ABS module C135 for dirt, corrosion, water intrusion, pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC U0028:08 retrieved on-demand during self-test?**	condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to Y13 .
Y12 CONFIRM THE ABS MODULE FAULT	
NOTE: Make sure all restraint system components and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be recorded. • If previously directed to repower the SRS , depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Prior to reconnecting any previously disconnected SRS component:	**Yes** INSTALL a new ABS module. REFER to Section 206-09 . GO to Y14 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition frequently. ACTIVATE other systems in the same

♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to Restraints Control Module (RCM) in this section. ♦ inspect ABS module C135 for dirt, corrosion, water intrusion, pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC U0028:88 retrieved on-demand during self-test?**	wire harness. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to Y13 .
Y13 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: RCM C310B. • Disconnect: ABS Module C135. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found.	**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 the self-test. CHECK for causes of the intermittent fault in the areas previously worked in, particularly the pins and terminals of any electrical connector that were disconnected. REPAIR any intermittent wiring, terminal or connector concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information.

Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • 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 â RCM . • **Was DTC U0028:08 or U0028:88 retrieved on-demand during self-test?**	GO to Y14 . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** REPAIR any intermittent wiring, terminal or connector concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to Y14 .
Y14 CHECK FOR ADDITIONAL RCM AND ABS MODULE DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â RCM . • Enter the following diagnostic mode on the scan tool: Self Test â ABS Module. • **Were any DTCs retrieved on-demand from the RCM or ABS module during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the appropriate DTC Chart(s) in this section and/or Section 206-09 for pinpoint test direction. **No** CLEAR all CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test Z: DTCs B1317, B1318, U3003:16 and U3003:17

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

NOTE: DTCs B1317, B1318, B1676, U3003:16 and U3003:17 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 â Restraints Control Module (RCM)

The Restraints Control Module (RCM) continuously monitors the input voltage for correct operation. If the RCM detects input voltage below 9.5 volts, it stores DTC U3003:16 in memory. If the RCM detects input voltage above 20 volts, it stores DTC U3003:17 in memory. If the RCM sets DTC U3003:16 or U3003:17, it sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

Normal Operation â Occupant Classification System Module (OCSM)

The Occupant Classification System Module (OCSM) continuously monitors the input voltage for correct operation. If the OCSM detects input voltage below 8 volts, it stores DTC B1318 in memory. If the OCSM detects input voltage above 17.2 volts, it stores DTC B1317 in memory. If the OCSM sets DTC B1317 or B1318, it sends a fault message to the RCM . The RCM then sends a message to the IPC module to illuminate the air bag warning indicator.

DTC Description	Fault Trigger Conditions
• U3003:16 â Battery Voltage: Circuit Voltage Below Threshold	If the RCM detects voltage below 9.5 volts with a Supplemental Restraint System (SRS) fault, it sets this DTC.
• U3003:17 â Battery Voltage: Circuit Voltage Above Threshold	If the RCM detects voltage above 16 volts with a SRS fault or above 20 volts without a SRS fault, it sets this DTC.
• B1317 â Battery Voltage High	If the OCSM detects voltage above 17.2 volts, it sets this DTC.
• B1318 â Battery Voltage Low	If the OCSM detects voltage below 8 volts, it sets this DTC.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- RCM
- OCSM

PINPOINT TEST Z: DTCs B1317, B1318, U3003:16 and U3003:17

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety CanopyÂ® and cause serious personal injury or death.

⚠ 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.

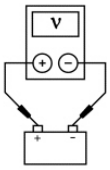
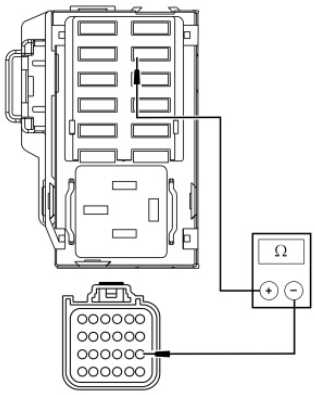
NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.**

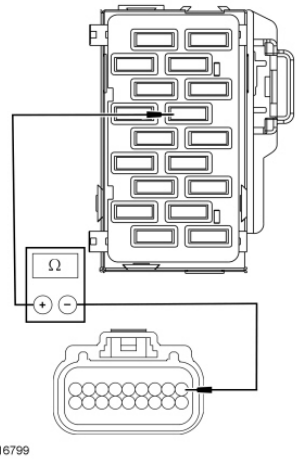
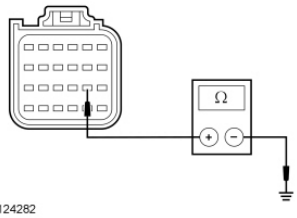
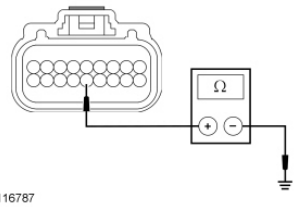
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components 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
Z1 RETRIEVE ALL CMDTCs IN ALL MODULES	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â ALL CMDTC (Continuous Memory). • **Is DTC B1317, B1318, B1676, U3003:16 or U3003:17 present in one or more modules AND P0562, P0563, P0620, P0625, P0626 or P065B retrieved from the PCM?**	**Yes** REFER to Section 414-00 to diagnose the charging system. **No** GO to Z2 .
Z2 TEST BATTERY CONDITION	
• Ignition OFF. • Carry out the battery condition test. Refer to Section 414-01 . • **Did battery pass the condition test?**	**Yes** If the battery passed the condition test but required a recharge, REFER to Section 414-00 to diagnose the charging system. CLEAR all Continuous Memory Diagnostic Trouble Codes (CMDTCs). TEST the system for normal operation. If the battery passed the condition test and did not require a recharge, GO to Z3 . **No** INSTALL a new battery. CLEAR all CMDTCs . TEST the SRS for normal operation.
Z3 CHECK CHARGING SYSTEM VOLTAGE	
NOTE: Do not allow the engine speed to exceed 2,000 rpm while performing this step or the generator may self excite and result in default charging system output voltage. If engine speed exceeds 2,000 rpm, shut the vehicle OFF and restart the engine before performing this step. • Measure the voltage of the battery: ♦ For DTC B1317 or U3003:17, turn off all accessories and run the engine at 1,500 rpm for a minimum of 2 minutes while measuring battery voltage.	**Yes** For DTC B1318 or U3003:16, GO to Z4 . For DTC B1317 or U3003:17, GO to Z6 . **No** REFER to Section 414-00 to diagnose the charging system. CLEAR all CMDTCs . TEST the SRS for normal operation.

♦ For DTC B1318 or U3003:16, 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.  AJ0210-A • **Is the voltage between 13 and 15.2 volts?**	
Z4 CHECK FOR OPEN IGNITION CIRCUIT TO THE MODULE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect the module with the concern: ♦ For the RCM , disconnect C310A and C310B. ♦ For the Occupant Classification System Module (OCSM), disconnect C3159. • For the RCM , measure the resistance between RCM C310A-13, circuit CBP20 (YE/VT), harness side and Central Junction Box (CJB) fuse 20.  N0114855 • For the OCSM , measure the resistance between OCSM C3159-1, circuit CBP04 (VT), harness side and CJB fuse 4.	**Yes** GO to Z5 . **No** REPAIR the affected circuit. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. CLEAR all CMDTCs . TEST the SRS for normal operation.

 N0116799 • **Is the resistance less than 1 ohm?**	
Z5 CHECK FOR OPEN GROUND TO THE MODULE	
• For the RCM : ♦ Measure the resistance between the RCM case and a good ground. ♦ Measure the resistance between RCM C310A-14, circuit GD174 (BK/WH), harness side and ground.  N0124282 • For the OCSM , measure the resistance between OCSM C3159-14, circuit GD145 (BK/BU), harness side and ground.  N0116787 • **Is the resistance less than 1 ohm?**	**Yes** GO to Z6 . **No** For the RCM , VERIFY there is no corrosion between the RCM case and mounting and VERIFY the fasteners are clean and tightened to specification with no corrosion or REPAIR circuit GD174 (BK/WH). For the OCSM , REPAIR circuit GD145 (BK/BU). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. CLEAR all CMDTCs . TEST the SRS for normal operation.
Z6 CHECK FOR MODULE OPERATION	
• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect the module with the concern: ♦ For the RCM , disconnect C310A and C310B. ♦ For the OCSM , disconnect C3159.	**Yes** INSTALL a new module. REFER to Restraints Control Module (RCM) or Occupant Classification Sensor in this section. **No** The system is operating correctly at this

• Check for the following: ♦ corrosion. ♦ damaged pins. ♦ pushed-out pins. • Connect the RCM C310A and C310B or OCSM C3159 and make sure the connector seats correctly. • Repower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Operate the system and verify the concern is still present. • **Is the concern still present?**	time. The concern may have been caused by a loose or corroded connector. CLEAR all CMDTCs . TEST the SRS for normal operation.

Pinpoint Test â Occupant Classification System Module (OCSM)

Pinpoint Test AA: DTCs B2290 and C1941

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Occupant Classification System Module (OCSM) monitors the pressure sensor and circuity for faults. If a fault is detected, the OCSM stores DTC B2290 in memory and sends a message to the Restraints Control Module (RCM). The RCM stores DTC B00A0:09 in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

The Occupant Classification System (OCS) system components **are not** to be serviced separately.

DTC C1941 sets when system reset fails to complete the testing. DTC C1941 clears upon a successful system reset.

Fault PIDs [a]	Description	Fault Trigger Condition
2290_12_OD and 2290_12_CM	Passenger Seat OCS Sensor No. 1 Circuit Short to Battery	When the OCSM senses a short to voltage on the bladder pressure sensor VREF and/or signal circuit, a fault is indicated.
2290_13_OD and 2290_13_CM	Passenger Seat OCS Sensor No. 1 Circuit Short to Ground	When the OCSM senses a short to ground on the bladder pressure sensor circuits, a fault is indicated.
2290_15_OD and 2290_15_CM	Passenger Seat OCS Sensor No. 1 Internal Fault	When the OCSM senses an internal failure with the bladder pressure sensor, a fault is indicated.

[a] Fault PIDs that end in OD indicate on-demand status and are associated with DTC B2290. Fault PIDs that end in CM indicate continuous memory status and are associated with DTC B2290.

- DTC C1941 (Zero Seat Weight Test Failure) â This DTC sets if the OCSM is unable to complete a successful System Reset. All other OCS system DTCs must be diagnosed and repaired before carrying out the OCS system reset.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors

- Faulty OCS system component
- Pressure sensing fault
- Mounting condition

PINPOINT TEST AA: DTCs B2290 AND C1941

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking 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 Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

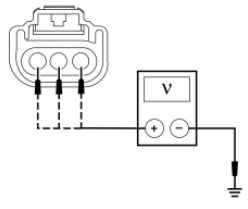
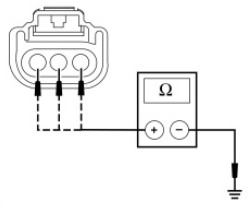
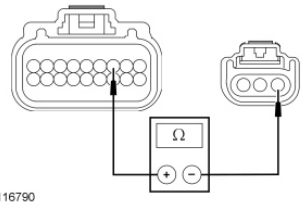
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

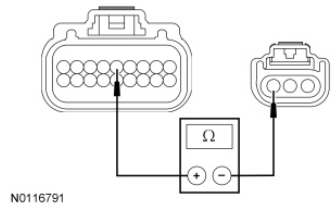
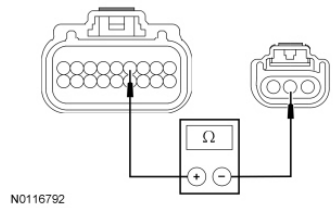
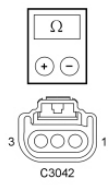
NOTE: A production OCS system allows the disconnect of the electrical connector from the OCSM .

An OCS system service kit has the OCSM electrical connector glued to the module. It cannot and should not be disconnected or altered.

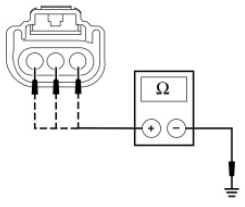
Test Step	Result / Action to Take
AA1 RETRIEVE OCSM DTCs	
• Enter the following diagnostic mode on the scan tool: Self Test â OCSM . • Enter the following diagnostic mode on the scan tool: DataLogger â OCSM â View and Record All 2290 Fault PIDs. ♦ Refer to PID list in Normal Operation to view 2290 fault PIDs. • **Do any on-demand 2290 fault PIDs indicate a fault and/or was DTC C1941 retrieved during self-test?**	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. GO to AA2 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to AA13 .
AA2 CHECK THE SEAT WIRING AND CONNECTORS	
	Yes

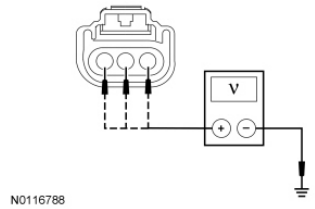
• Ignition OFF. • ⚠ **WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.** • Carry out a thorough inspection of the OCS system wiring, terminals and connectors and the related seat wiring harness and body wiring harness terminals and connectors. • **Were any problems noted?**	DEPOWER the SRS and REPAIR the seat connectors and wiring as needed. GO to AA14 . If DTC C1941 was present, GO to AA9 . If DTC C1941 was **not** present, GO to AA14 . **No** **Vehicles with a production OCS system:** For DTC C1941, GO to AA9 . For fault PID 2290_15_OD, GO to AA3 . For fault PID 2290_13_OD, GO to AA10 . For fault PID 2290_12_OD, GO to AA11 . **Vehicles with a OCS system service kit** , INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to AA14 .
AA3 CHECK THE OCS PRESSURE SENSOR CIRCUITS FOR A SHORT TO VOLTAGE	
• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: Seat Pressure Sensor C3042. • Disconnect: OCSM C3159. • Ignition ON. • Measure the voltage between seat pressure sensor: ♦ C3042-1, circuit CR152 (GY/YE), harness side and ground. ♦ C3042-2, circuit VR223 (BU/WH), harness side and ground. ♦ C3042-3, circuit RR152 (YE/VT), harness side and ground.	**Yes** REPAIR circuit CR152 (GY/YE), RR152 (YE/VT) or VR223 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AA14 . **No** GO to AA4 .

 N0116788 • **Is any voltage present on any circuit?**	
AA4 CHECK THE SEAT PRESSURE SENSOR CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • ⚠ **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.** • Measure the resistance between seat pressure sensor: ♦ C3042-1, circuit CR152 (GY/YE), harness side and ground. ♦ C3042-2, circuit VR223 (BU/WH), harness side and ground. ♦ C3042-3, circuit RR152 (YE/VT), harness side and ground.  N0116789 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to AA5 . **No** REPAIR circuit CR152 (GY/YE), RR152 (YE/VT) or VR223 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AA14 .
AA5 CHECK THE SEAT PRESSURE SENSOR CIRCUIT VREF FOR AN OPEN	
• Measure the resistance between OCSM C3159-3, circuit CR152 (GY/YE), harness side, and seat pressure sensor C3042-1, circuit CR152 (GY/YE), harness side.  N0116790 • **Is the resistance less than 0.5 ohm?**	**Yes** GO to AA6 . **No** REPAIR circuit CR152 (GY/YE). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AA14 .
AA6 CHECK THE SEAT PRESSURE SENSOR RETURN CIRCUIT FOR AN OPEN	

• Measure the resistance between OCSM C3159-5, circuit RR152 (YE/VT), harness side, and seat pressure sensor C3042-3, circuit RR152 (YE/VT), harness side.  N0116791 • **Is the resistance less than 0.5 ohm?**	**Yes** GO to AA7 . **No** REPAIR circuit RR152 (YE/VT). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AA14 .
AA7 CHECK THE SEAT PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN	
• Measure the resistance between OCSM C3159-4, circuit VR223 (BU/WH), harness side, and seat pressure sensor C3042-2, circuit VR223 (BU/WH), harness side.  N0116792 • **Is the resistance less than 0.5 ohm?**	**Yes** GO to AA8 . **No** REPAIR circuit VR223 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AA14 .
AA8 CHECK FOR A SHORT BETWEEN SEAT PRESSURE SENSOR CIRCUITS	
• Measure the resistance between seat pressure sensor: ♦ C3042-1, circuit CR152 (GY/YE), harness side, and C3042-2, circuit VR223 (BU/WH), harness side. ♦ C3042-1, circuit CR152 (GY/YE), harness side, and C3042-3, circuit RR152 (YE/VT), harness side. ♦ C3042-2, circuit VR223 (BU/WH), harness side, and C3042-3, circuit RR152 (YE/VT), harness side.  N0116793 • **Are the resistances greater than 10,000 ohms?**	**Yes** INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to AA14 . **No** REPAIR circuit CR152 (GY/YE), RR152 (YE/VT) and/or VR223 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AA14 .
AA9 CHECK THE OCS SYSTEM	
	Yes GO to AA12 .

NOTE: Make sure all OCS system components, SRS components, sensor electrical connectors and the RCM electrical connectors are connected before carrying out self-test. If not, DTCs will be recorded. • Enter the following diagnostic mode on the scan tool: OCS System Reset. • ⚠ **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 using System Reset to rezero the seat weight. 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, take the following precautions before carrying out the Occupant Classification System (OCS) system reset:** ♦ **Make sure the OCS system components are connected and no Occupant Classification System Module (OCSM) faults are present, with the exception of DTC C1941. All other OCS system DTCs must be diagnosed and repaired before carrying out the OCS system reset.** ♦ **Make sure the voltage to the OCSM is greater than 8 volts and less than 18 volts.** ♦ **Make sure the OCS system is not at a temperature below 6Â°C (42Â°F) or above 36Â°C (97Â°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, 6Â°C to 36Â°C (42Â°F to 97Â°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 switch 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. • Ignition OFF. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â OCSM . • Enter the following diagnostic mode on the scan tool: DataLogger â OCSM â View and Record All 2290 Fault	**No** Fault corrected. GO to AA14 .

PIDs. ♦ Refer to PID list in Normal Operation to view 2290 fault PIDs. • **Do any on-demand 2290 fault PIDs indicate a fault and/or was DTC C1941 retrieved on-demand during self-test?**	
AA10 CHECK THE SEAT PRESSURE SENSOR CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • ⚠ **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.** • Disconnect: Seat Pressure Sensor C3042. • Disconnect: OCSM C3159. • Measure the resistance between seat pressure sensor: ♦ C3042-1, circuit CR152 (GY/YE), harness side and ground. ♦ C3042-2, circuit VR223 (BU/WH), harness side and ground. ♦ C3042-3, circuit RR152 (YE/VT), harness side and ground.  N0116789 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to AA12 . **No** REPAIR circuit CR152 (GY/YE), RR152 (YE/VT) or VR223 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AA14 .
AA11 CHECK THE SEAT PRESSURE SENSOR CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: Seat Pressure Sensor C3042. • Disconnect: OCSM C3159. • Repower the SRS . **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Ignition ON. • Measure the voltage between seat pressure sensor: ♦ C3042-1, circuit CR152 (GY/YE), harness side and ground. ♦ C3042-2, circuit VR223 (BU/WH), harness side and ground. ♦ C3042-3, circuit RR152 (YE/VT), harness side and ground.	**Yes** REPAIR circuit CR152 (GY/YE), RR152 (YE/VT) or VR223 (BU/WH). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AA14 . **No** GO to AA12 .

 • **Is any voltage present on any circuit?**	
AA12 CONFIRM THE OCS FAULT	
NOTE: Make sure all OCS system components, SRS components, sensor electrical connectors and the RCM electrical connectors are connected before carrying out self-test. If not, DTCs will be recorded. • Ignition OFF. • ⚠ **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.** • Prior to reconnecting any previously disconnected SRS component: ♦ 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. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: OCSM C3159 (if disconnected previously). • Connect: Seat Pressure Sensor C3042 (if previously disconnected). • Enter the following diagnostic mode on the scan tool: Self Test â OCSM . • Enter the following diagnostic mode on the scan tool: DataLogger â OCSM â View and Record All 2290 Fault PIDs. ♦ Refer to PID list in Normal Operation to view 2290 fault PIDs. • **Does the original on-demand 2290 fault PID indicate a fault or was DTC C1941 retrieved on-demand during self-test?**	**Yes** INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to AA14 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to AA13 .
AA13 CHECK FOR AN INTERMITTENT FAULT	
• Enter the following diagnostic mode on the scan tool: Self Test â OCSM . • Enter the following diagnostic mode on the scan tool: DataLogger â OCSM â View and Record All 2290 Fault PIDs.	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test.

• **Do any on-demand 2290 fault PIDs indicate a fault?**	CHECK for causes of the intermittent fault at or near the affected SRS component connector. REPAIR any intermittent wiring, terminal or connector concerns found. Refer to Wiring Diagrams Cell 5, Connector Repair Procedures for schematic and connector information. If an intermittent concern **was** found and repaired, GO to AA14 . If an intermittent concern **was not** found and repaired, USE the fault PIDs recorded and GO to the appropriate pinpoint test step. **Vehicles with a production OCS system** For fault PID 2290_15_OD, GO to AA3 . For fault PID 2290_13_OD, GO to AA10 . For fault PID 2290_12_OD, GO to AA11 . **Vehicles with an OCS system service kit** : INSPECT the seat wiring harness for damage and REPAIR as needed. Refer to Wiring Diagrams Cell 5, Connector Repair Procedures for schematic and connector information. If OK, INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to AA11 . **No**

	CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition frequently. ACTIVATE other systems in the same wire harness. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to AA14 .
AA14 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). • If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved on-demand during self test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test AB: DTC B2909

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

Normal Operation

The Belt Tension Sensor (BTS) operates in conjunction with the Occupant Classification System (OCS) system. 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 voltage output of the BTS is proportional to the amount of tension applied to the sensor by the belt. No tension on the belt returns a low voltage (approximately 0.95 volt) to the Occupant Classification System Module (OCSM), while high tension returns a higher voltage (approximately 3.8 volts) to the OCSM .

The OCSM monitors the BTS and circuitry for faults. If a fault is detected, the OCSM stores DTC B2909 in memory and sends a message to the Restraints Control Module (RCM). The RCM stores DTC B00A0:09 in memory and sends a message to the Instrument Panel Cluster (IPC) to illuminate the air bag warning indicator.

Fault PIDs [a]	Description	Fault Trigger Condition
2909_29_OD and 2909_29_CM	Front Passenger Side Belt Tension Sensor Short to Ground	When the OCSM senses a short to ground on the BTS circuits, a fault is 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 is indicated.
2909_30_OD and 2909_30_CM	Front Passenger Side Belt Tension Sensor Circuit Open	When the OCSM senses an open on the BTS circuits, a fault is indicated.
2909_28_OD and 2909_28_CM	Front Passenger Side Belt Tension Sensor Circuit Short to Battery	When the OCSM senses a short to voltage on the BTS signal circuit, a fault is indicated.

[a] Fault PIDs that end in OD indicate on-demand status and are associated with DTC B2909. Fault PIDs that end in CM indicate continuous memory status and are associated with DTC B2909.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- BTS (part of RH front safety belt retractor)
- OCSM

PINPOINT TEST AB: DTC B2909

⚠ WARNING: Never probe the electrical connectors on airbag, Safety CanopyÂ® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

NOTICE: **Use the correct probe adapter(s) from the Flex Probe Kit when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.**

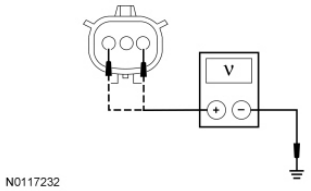
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

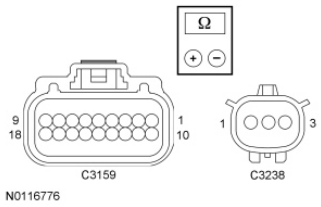
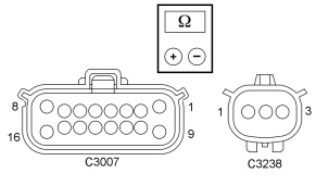
NOTE: Only disconnect or reconnect Supplemental Restraint System (SRS) components when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

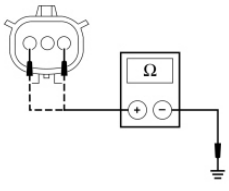
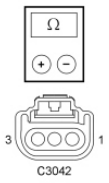
NOTE: Always make sure the correct SRS component is being installed. Parts released for other vehicles may not be compatible even if they appear physically similar. Check the part number listed in the Ford Catalog Advantageâ ¢ or equivalent to make sure the correct component is being installed. If an incorrect SRS component is installed, DTCs may set.

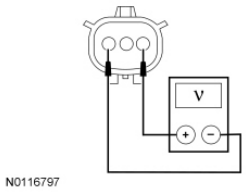
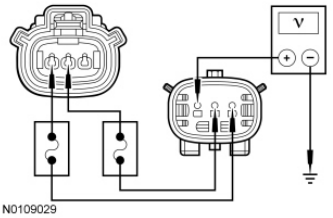
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

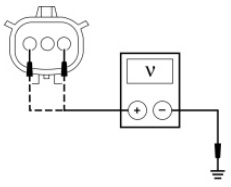
Test Step	Result / Action to Take
AB1 RETRIEVE OCSM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â OCSM .	**Yes** This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test.

• Enter the following diagnostic mode on the scan tool: DataLogger â OCSM â View and Record All 2909 Fault PIDs. ♦ Refer to PID list in Normal Operation to view 2909 fault PIDs. • **Do any on-demand 2909 fault PIDs indicate a fault?**	For fault PID 2909_31_OD, GO to AB2 . For fault PID 2909_28_OD, GO to AB8 . For fault PID 2909_30_OD, GO to AB9 . For fault PID 2909_29_OD, GO to AB10 . **No** This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to AB13 .
AB2 CHECK THE BTS CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: BTS C3238. • Disconnect: OCSM C3159 (vehicles with an OE OCS system). • Disconnect: Passenger Seat Harness C3007 (vehicles with an OCS system service kit). • 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 : ♦ C3238-1, circuit RR142 (GN), harness side and ground. ♦ C3238-3, circuit LR142 (YE/BU), harness side and ground.  N0117232 • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit LR142 (YE/BU) or RR142 (GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AB14 . **No** GO to AB3 .
AB3 CHECK THE BTS CIRCUITS FOR AN OPEN	

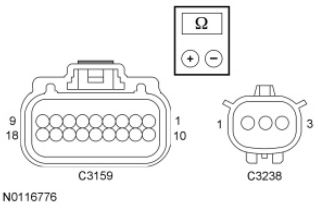
• Ignition OFF. • For vehicles with an OE OCS system, measure the resistance between OCSM C3159, harness side and BTS C3238, harness side using the following chart. | OCSM	Circuit	BTS | |---|---|---| | C3159-11 | LR142 (YE/BU) | C3238-3 | | C3159-12 | RR142 (GN) | C3238-1 | | C3159-13 | VR210 (BU/BN) | C3238-2 |  N0116776 • For vehicles with an OCS system service kit, measure the resistance between passenger seat harness C3007, main body harness side and BTS C3238, harness side using the following chart. | Passenger Seat Harness | Circuit | BTS | |---|---|---| | C3007-13 | LR142 (YE/BU) | C3238-3 | | C3007-14 | RR142 (GN) | C3238-1 | | C3007-12 | VR210 (BU/BN) | C3238-2 |  N0116936 • **Are the resistances less than 0.5 ohm?**	**Yes** GO to AB4 . **No** REPAIR the affected circuit(s). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AB14 .
AB4 CHECK THE BTS VREF AND SIGNAL CIRCUIT FOR A SHORT TO GROUND	

• Measure the resistance between BTS : ♦ C3238-1, circuit RR142 (GN), harness side and ground. ♦ C3238-3, circuit LR142 (YE/BU), harness side and ground.  N0116796 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to AB5 . **No** REPAIR circuit LR142 (YE/BU) or RR142 (GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AB14 .
AB5 CHECK FOR A SHORT BETWEEN BTS CIRCUITS	
• Measure the resistance between BTS : ♦ C3238-1, circuit RR142 (GN), harness side and C3238-3, circuit LR142 (YE/BU), harness side. ♦ C3238-1, circuit RR142 (GN), harness side and C3238-2, circuit VR210 (BU/BN), harness side. ♦ C3238-3, circuit LR142 (YE/BU), harness side and C3238-2, circuit VR210 (BU/BN), harness side.  N0116793 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to AB6 . **No** REPAIR the affected circuit(s). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AB14 .
AB6 CHECK THE OCSM OUTPUT	
• Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found.	**Yes** GO to AB7 . **No** GO to AB12 .

Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: OCSM C3159 (vehicles with an OE OCS system). • Connect: Passenger Seat Harness C3007 (vehicles with an OCS system service kit). • Ignition ON. • Measure the voltage between BTS C3238-3, circuit LR142 (YE/BU), harness side and C3238-1, circuit RR142 (GN), harness side.  N0116797 • **Is the voltage approximately 5 volts?**	
AB7 CHECK BTS VOLTAGE OUTPUT	
• Ignition OFF. • Connect a fused jumper wire between BTS C3238-3, circuit LR142 (YE/BU), harness side and C3238 pin 3, component side. • Connect a fused jumper wire between BTS C3238-2, circuit VR210 (BU/BN), harness side and C3238 pin 2, component side. • Ignition ON. • Measure the voltage between BTS C3238 pin 1, component side and ground as the tension of the BTS varies by pulling upward at the safety belt webbing.  N0109029 • **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?**	**Yes** REMOVE the fused jumper wires and GO to AB12 . **No** REMOVE the fused jumper wires and INSTALL a new RH safety belt retractor assembly. REFER to Section 501-20A . GO to AB14 .

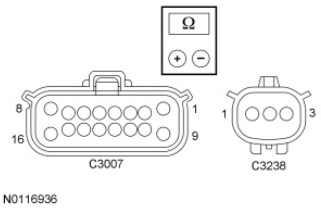
AB8 CHECK THE BTS CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: Passenger Seat Side Air Bag Module C337. • Disconnect: BTS C3238. • Disconnect: OCSM C3159 (vehicles with an OE OCS system). • Disconnect: Passenger Seat Harness C3007 (vehicles with an OCS system service kit). • 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 : ♦ C3238-1, circuit RR142 (GN), harness side and ground. ♦ C3238-3, circuit LR142 (YE/BU), harness side and ground.  N0116798 • **Is any voltage present on either circuit?**	**Yes** REPAIR circuit LR142 (YE/BU) or RR142 (GN). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AB14 . **No** GO to AB12 .
AB9 CHECK THE BTS CIRCUIT FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section. • Disconnect: BTS C3238. • Disconnect: OCSM C3159 (vehicles with an OE OCS system). • Disconnect: Passenger Seat Harness C3007 (vehicles with an OCS system service kit). • For vehicles with an OE OCS system, measure the resistance between OCSM C3159, harness side and BTS C3238, harness side using the following chart.	**Yes** GO to AB11 . **No** REPAIR the affected circuit(s). Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AB14 .

OCSM	Circuit	BTS
C3159-11	LR142 (YE/BU)	C3238-3
C3159-12	RR142 (GN)	C3238-1
C3159-13	VR210 (BU/BN)	C3238-2



- For vehicles with an OCS system service kit, measure the resistance between passenger seat harness C3007, harness side and BTS C3238, harness side using the following chart.

Passenger Seat Harness	Circuit	BTS
C3007-13	LR142 (YE/BU)	C3238-3
C3007-14	RR142 (GN)	C3238-1
C3007-12	VR210 (BU/BN)	C3238-2



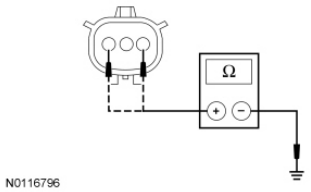
- **Are the resistances less than 0.5 ohm?**

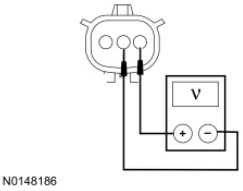
AB10 CHECK THE BTS CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Disconnect: BTS C3238.

Yes
GO to AB11 .

No
REPAIR circuit LR142 (YE/BU) or RR142 (GN).

• Disconnect: OCSM C3159 (vehicles with an OE OCS system). • Disconnect: Passenger Seat Harness C3007 (vehicles with an OCS system service kit). • Measure the resistance between BTS : ♦ C3238-1, circuit RR142 (GN), harness side and ground. ♦ C3238-3, circuit LR142 (YE/BU), harness side and ground.  N0116796 • **Are the resistances greater than 10,000 ohms?**	Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. GO to AB14 .
AB11 CHECK THE OCSM OUTPUT	
• Disconnect: Passenger Seat Side Air Bag Module C337. • Prior to reconnecting any previously disconnected component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: OCSM C3159 (vehicles with an OE OCS system). • Connect: Passenger Seat Harness C3007 (vehicles with an OCS system service kit). • 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 C3238-3, circuit LR142 (YE/BU), harness side and C3238-2, circuit VR210 (BU/BN), harness side.	**Yes** GO to AB7 . **No** GO to AB12 .

 • **Is the voltage approximately 5 volts?**	
AB12 CONFIRM THE OCS SYSTEM FAULT	
NOTE: Make sure all OCS system components, SRS sensor electrical connectors and the RCM electrical connectors are connected before carrying out 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. • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: BTS C3238. • Connect: OCSM C3159 (if previously disconnected) (vehicles with an OE OCS system). • Connect: Passenger Seat Harness C3007 (if previously disconnected) (vehicles with an OCS system service kit). • 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 â OCSM .	**Yes** INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to AB14 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** GO to AB13 .

• Enter the following diagnostic mode on the scan tool: DataLogger â OCSM â View and Record All 2909 Fault PIDs. ♦ Refer to PID list in Normal Operation to view 2909 fault PIDs. • **Does the original on-demand 2909 fault PID indicate a fault?**	
AB13 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Disconnect: BTS C3238. ♦ inspect connector(s) (including any in-line connectors) for loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: BTS C3238. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test â OCSM . • Enter the following diagnostic mode on the scan tool: DataLogger â OCSM â View and Record All 2909 Fault PIDs. ♦ Refer to PID list in Normal Operation to view 2909 fault PIDs. • **Do any on-demand 2909 fault PIDs indicate a fault?**	**Yes** This is a hard fault. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self-test. Using the on-demand fault PIDs recorded, GO to the appropriate pinpoint test step. For fault PID 2909_31_OD, GO to AB2 . For fault PID 2909_28_OD, GO to AB8 . For 2909_30_OD, GO to AB9 . For fault PID 2909_29_OD, GO to AB10 . **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition frequently. ACTIVATE other systems in the same wire harness. **Do not install any new SRS components at this time. Install SRS components only when directed to do so in the pinpoint test.** REPAIR any intermittent wiring, terminal or connector concerns found. GO to AB14 .
AB14 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected).	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Charts in this section for pinpoint test direction. **No** CLEAR all RCM and OCSM CMDTCs . PROVE OUT the SRS . Repair is complete. RETURN the vehicle to the customer.

• If previously directed to depower the SRS , 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 â Restraints. • **NOTE:** When selecting Restraints from the Self Test menu, DTCs are retrieved from the RCM and OCSM . • **Are any RCM and/or OCSM DTCs retrieved?**	

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 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 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 an OCS

2. **NOTE:** After installation of new OCS components, carry out the OCS Reset procedure as instructed in the workshop manual. Refer to the appropriate workshop manual for OCS removal and installation procedure.

   When a vehicle has been involved in a collision and the OCSM has DTC B1231/B1193:00 stored in memory, the repair of the OCS is to include the following procedures for the specified system:

   - For rail-type OCS , inspect the passenger side floorpan for damage and repair as necessary. Install new OCS rails. Do not install a new OCSM unless DTC B1231 cannot be cleared.
   - For weight sensor bolt-type OCS , inspect the passenger side floorpan for damage and repair as necessary. Install a new seat track with OCS weight sensor bolts. DTC must be cleared from the OCSM before carrying out OCS Reset. Do not install a new OCSM unless DTC B1231/B1193:00 cannot be cleared.
   - For bladder-type OCS , inspect for damage and repair as necessary. If installation of an OCS component is required, an OCS 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, anchors 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, safety belt retractors and safety belt anchors. 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.

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
- Knee 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 Principles of Operation in the Diagnosis and Testing 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, Knee Air Bag Module, Passenger Ai Bag Module and Seat Side Air Bag Modules - Remote Deployment in this procedure.

Driver Air Bag Module, Knee Air Bag Module, Passenger Air Bag Module and Seat Side Air Bag Modules - Remote Deployment

⚠ WARNING: Never probe the electrical connectors on airbag, Safety Canopy® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Always carry a live airbag with the deployment door/trim cover/tear seam pointed away from the body. Do not place a live airbag down with the deployment door/trim cover/tear seam facing down. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.

⚠ WARNING: Always carry a live Safety Canopy® or side air curtain assembly with the 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 (airbags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9 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.

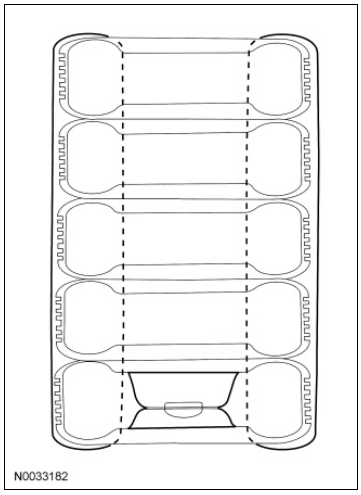
If a front air bag module has deployed, it is **mandatory** that the front air bag module be remotely deployed using the appropriate air bag disposal procedure.

NOTE: A typical air bag disposal is shown that is similar for all vehicles.

All driver, knee, 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.

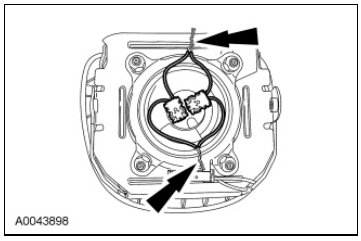
4. **NOTE:** If the air bag module does not have a hard-wired pigtail, it will be necessary to cut the wires and connector(s) from the vehicle wire harness and reconnect to the air bag module.

   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.

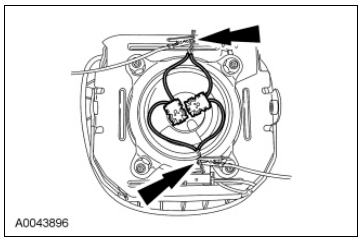
6. **NOTE:** Typical driver air bag module with 2 loops shown, other air bag modules with multiple loops similar.

   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.

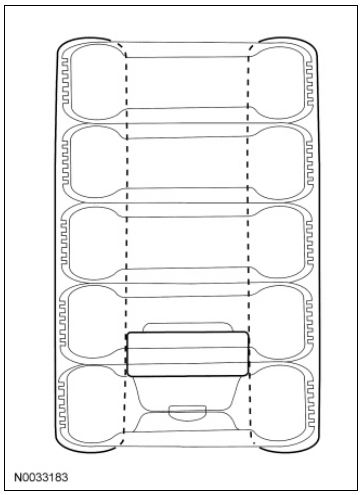
8. Using the end of the jumper harness where the wires are not connected together, attach each wire of the jumper harness to each wire of the air bag module or to the twisted-together wires if multiple loops. Use tape or other insulating material to make sure that the leads do not make contact with each 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.

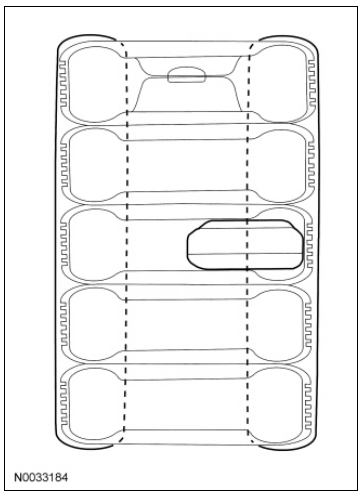


Passenger, knee and seat side air bag modules

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, knee, 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

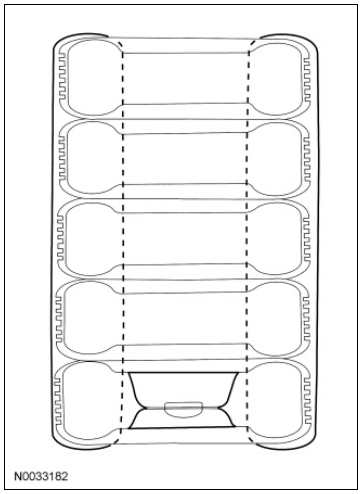
⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in peonal injury or death.

⚠ WARNING: Deploy all supplemental restraint system (SRS) devices (airbags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9 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.

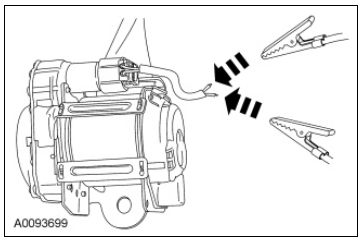
   Cut each of the safety belt buckle or retractor wires near the electrical connector that connects to the vehicle wire harness.

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.

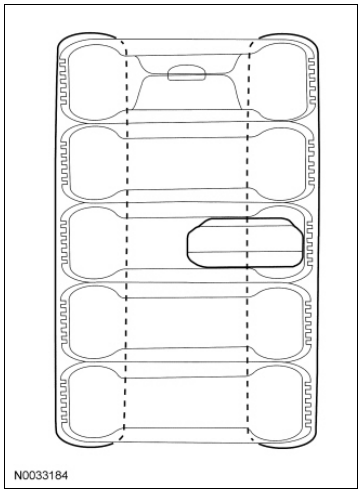
   Using the end of the jumper harness that the wires are not connected together, attach each wire of the jumper harness to each wire of the safety belt buckle or retractor. Use tape or other insulating material to make sure that the leads do not make contact with each other.



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 seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

⚠ WARNING: Deploy all supplemental restraint system (SRS) devices (airbags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9 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 .

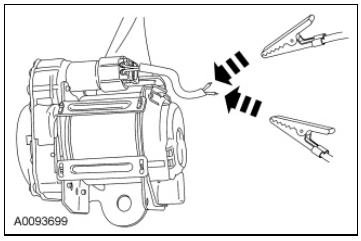
3. Cut each of the safety belt buckle or retractor wires, leaving at least 101.6 mm (4 in) to work with.

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 (airbags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9 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® or side air curtain module deployment for a sced vehicle will occur in its installed position in the vehicle.

NOTE: A typical Safety Canopy® or side air curtain 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.

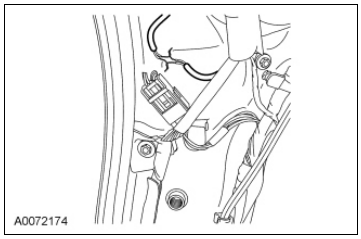
2. Access the Safety Canopy®/side air curtain module electrical connectors. For additional information, refer to the appropriate procedure in this section.

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.

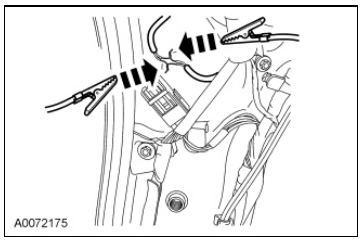
5. **NOTE:** Typical Safety Canopy®/side air curtain module with 2 loops shown, other Safety Canopy®/side air curtain modules with 2 loops are similar.

   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 jumrness 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 (airbags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9 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.

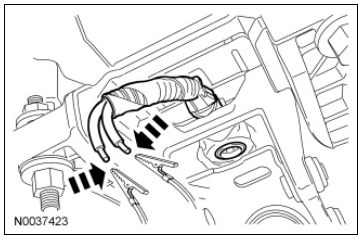
3. **NOTE:** If the deployable steering column does not have a hard-wired pigtail, it will be necessary to cut the wires and connector(s) from the vehicle wire harness and reconnect to the deployable steering column.

   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.

Supplemental Restraint System (SRS) Deactivation and Reactivation

Deactivation

⚠ WARNING: Always carry a live airbag with the deployment door/trim cover/tear seam pointed away from the body. Do not place a live airbag down with the deployment door/trim cover/tear seam facing 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 airbag, Safety Canopy® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety Canopy® and cause 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.

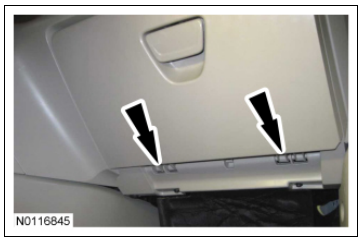
NOTE: The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. 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 driver air bag module. For additional information, refer to Driver Airbag in this section.

3. Remove the knee air bag module. For additional information, refer to Knee Airbag in this section.

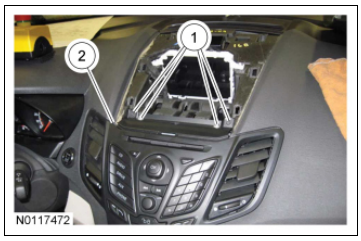
4. Remove the glove compartment.
   - Open the glove compartment and carefully pry at each end to separate the glove compartment from the hinges.



5. Pull up and out to release the clips and remove the upper center instrument panel finish panel.



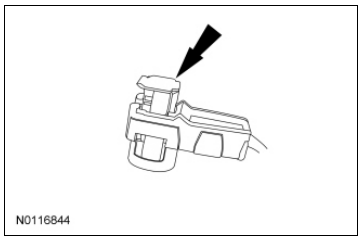
6. Separate the center instrument panel finish panel.
    1. Remove the 4 screws.
    2. Pull out and separate the center instrument panel finish panel.



7. ***NOTICE:*** **Do not pull the passenger air bag module electrical connectors out by the locking button. Damage to the locking buttons can occur.**

    Disconnect both passenger air bag module electrical connectors.

    - Using a small screwdriver, lift up and release the locking button on the passenger air bag module electrical connector. With the locking button released, disconnect the electrical connector.
    - Repeat for the other electrical connector.



8. From under the rear of the RH front seat, disconnect side air bag module electrical connector C337.
9. From under the rear of the LH front seat, disconnect side air bag module electrical connector C367.
10. Drop the headliner to access the side air curtain module electrical connectors. For additional information, refer to Section 501-05 .
11. Squeeze the tabs and disconnect the RH and LH side air curtain module electrical connectors.
12. Install RCM fuse 20 (10A) to the Central Junction Box (CJB).
13. Connect the battery ground cable.

Reactivation

1. Remove RCM fuse 20 (10A) from the CJB .

2. Disconnect the battery ground cable and wait at least one minute.

3. Connect the RH and LH side air curtain module electrical connectors.

4. Install the headliner. For additional information, refer to Section 501-05 .

5. From under the rear of the LH front seat, connect side air bag module electrical connector C367.

6. From under the rear of the RH front seat, connect side air bag module electrical connector C337.

7. ***NOTICE:*** **The passenger air bag module electrical connector locking buttons must be in the released position when connected. Do not install the passenger air bag module electrical connectors by the locking buttons. Failure to follow these instructions may cause connector damage.**

   With the locking button released, install the passenger air bag module electrical connectors fully into the passenger air bag module and seat the locking buttons.

8. Install the center instrument panel finish panel.
   1. Position the center instrument panel finish panel and push in seating the retaining clips.
   2. Install the 4 screws.

9. Position the upper center instrument panel finish panel and push in seating the retaining clips.

10. Install the glove compartment.

11. Install the knee air bag module. For additional information, refer to Knee Airbag in this section.

12. Install the driver air bag module. For additional information, refer to Driver Airbag in this section.

13. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

Supplemental Restraint System (SRS) Depowering and Repowering

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Depowering Procedure

⚠ WARNING: Never probe the electrical connectors on airbag, Safety Canopy® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in 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 OFF.

3. At the Central Junction Box (CJB), located behind the glove box, remove RCM fuse 20 (10A) from the CJB . For additional information, refer to the Wiring Diagrams manual.

4. Turn the ignition ON and monitor the air bag warning indicator for at least 30 seconds. The air bag warning indicator flashes once, then remains illuminated continuously (no flashing) if the correct RCM fuse has been removed. If the air bag warning indicator does not remain illuminated 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

Vehicles with keyed ignition (vehicles with ignition switch)

1. Turn the ignition from OFF to ON.

2. Install RCM fuse 20 (10A) to the CJB .

3. ⚠ **WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any airbag when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.**

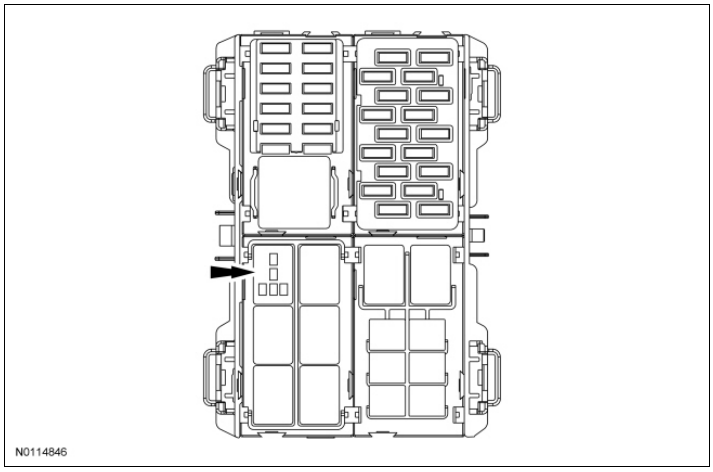
   Connect the battery ground cable.

4. 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 illuminates continuously for approximately 6 seconds and then turns off. If a SRS fault is present, the air bag warning indicator indicates the fault in one of the following ways:
   - fail to light.
   - remain lit continuously.
   - flash.
   The flashing might not occur until approximately 30 seconds after the ignition has been turned from OFF to ON. 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 sounds in a pattern of 5 sets of 5 beeps. If this occurs, diagnose and repair the air bag warning indicator and any SRS fault discovered. Clear all continuous DTCs from the RCM and Occupant Classification System Module (OCSM) using a scan tool.

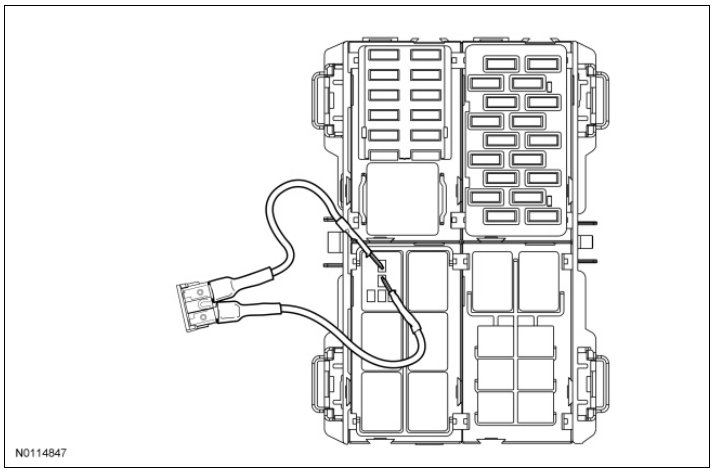
Vehicles with Intelligent Access (IA) (vehicles with push button start system)

5. Install RCM fuse 20 (10A) to the CJB and install the cover.

6. Remove the Smart Keyless Ignition Relay (CJB relay 7).



7. Install a fused (15A) jumper wire between Smart Keyless Entry Ignition Relay (CJB relay 7) socket pins 3 and 5 as shown..



8. ⚠ **WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any airbag when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.**

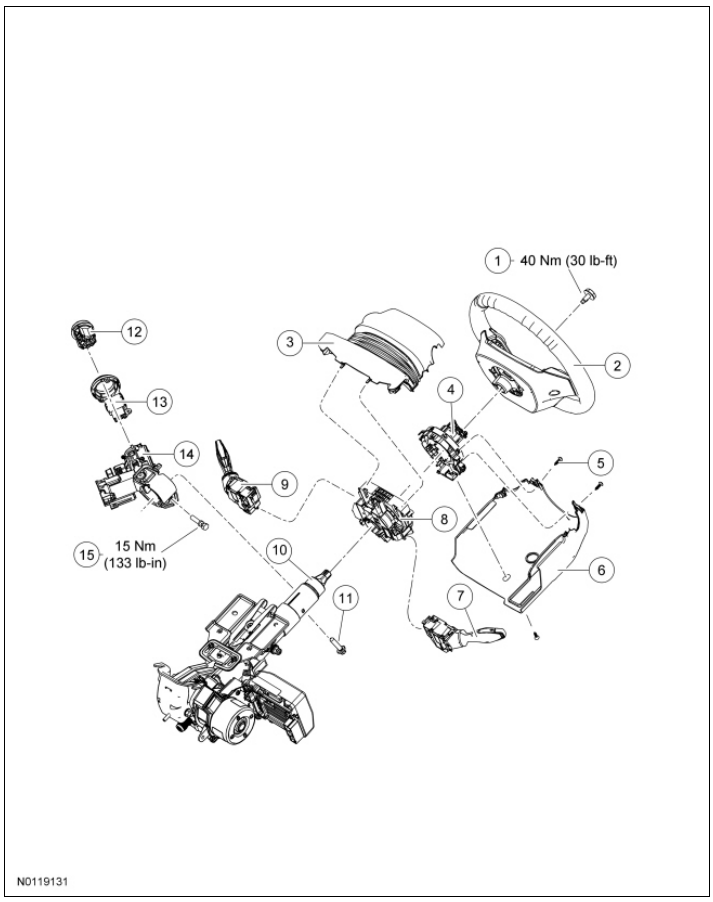
   Connect the battery ground cable.

9. Remove the fused jumper wire from the CJB .

10. Install the Smart Keyless Ignition Relay (CJB relay 7).

11. Prove out the SRS as follows:
    With the ignition OFF, wait 10 seconds, then turn the ignition ON and monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator illuminates continuously for approximately 6 seconds and then turns off. If an air bag SRS fault is detected, the air bag warning indicator indicates the fault in one of the following ways:
    - fail to light.
    - remain lit continuously.
    - flash.
    The flashing might not occur until approximately 30 seconds after the ignition has been turned from OFF to ON. This is the time required to complete 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 diagnose and repair the air bag warning indicator and any SRS fault discovered.
    Clear all RCM and OCSM CMDTCs .

Clockspring



Item	Part Number	Description
1	W750985	Steering wheel bolt
2	3600	Steering wheel
3	3530	Upper steering column shroud
4	14A664	Clockspring
5	W701928	Steering column shroud bolt (2 required)
6	3530	Lower steering column shroud
7	13341	Switch assembly
8	3F791	Steering column multifunction switch
9	17A553	Switch assembly wiper/washer
10	3C529	Steering column
11	-	Steering column lock bolt
12	11582	Ignition switch cylinder
13	15607	Passive Anti-Theft System (PATS) transceiver electrical connector (part of 14401)
14	3F790	Ignition switch housing
15	66154	Ignition switch housing bolt (part of 3F790)

Removal

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. ***NOTICE:*** **Make sure the road wheels are in the straight-ahead position to prevent damage to the clockspring.**

   Remove the steering wheel. For additional information, refer to Section 211-04 .

2. Remove the steering column shroud. For additional information, refer to Section 211-04 .

3. Disconnect the clockspring electrical connectors, disengage the 3 retaining tabs and remove the clockspring.

Installation

NOTICE: **If installing a new clockspring, do not remove the clockspring anti-rotation key until the steering wheel is installed. If the anti-rotation key has been removed before installing the steering wheel, the clockspring must be centered. Failure to follow this instruction may result in component damage and/or system failure.**

Position the clockspring onto the steering column and engage the retaining tabs to the multi-function switch.

2. Connect the clockspring electrical connectors.

3. ⚠ **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.**

   NOTICE: **Do not over-rotate the clockspring inner rotor. The internal ribbon wire is connected to the clockspring rotor. The internal ribbon wire acts as a stop and can be broken from its internal connection. Failure to follow this instruction may result in component damage and/or system failure.**

   If a new clockspring was installed and the anti-rotation key has not been removed **proceed to Step 5.**
   If a new clockspring was installed and the anti-rotation key has been removed before the steering wheel is installed or the same clockspring is being installed, rotate the clockspring inner rotor **counterclockwise** and carefully feel for the ribbon wire to run out of length with slight resistance. Stop rotating the clockspring inner rotor at this point.

4. Starting with the clockspring rotated fully counterclockwise as indicated in Step 3, rotate the clockspring inner rotor, wiring and connector clockwise through 3.75 full revolutions with the connector ending up in the 12 o'clock position.
   Verify the clockspring is correctly centralized by observing that the clockspring rotor, wiring and connector are in the 12 o'clock position.

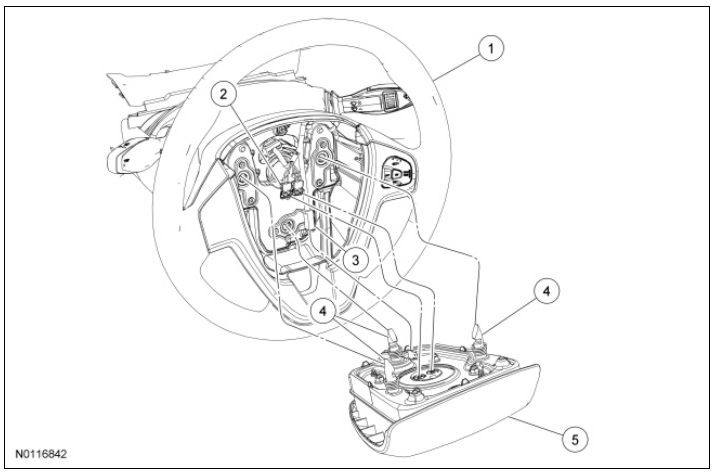
5. Install the steering column shroud. For additional information, refer to Section 211-04 .

6. Install the steering wheel. For additional information, refer to Section 211-04 .

7. If a new clockspring was installed, remove the anti-rotation key.

8. Install the driver air bag module. For additional information, refer to Driver Airbag in this section.

Driver Airbag



Item	Part Number	Description
1	3600	Steering wheel
2	-	Driver air bag module electrical connectors (2 required) (part of 14A664)
3	-	Horn switch electrical connector (part of 14A664)
4	-	Driver air bag module locking pins (part of 43B13)
5	43B13	Driver air bag module

Removal

⚠ WARNING: Always carry a live airbag with the deployment door/trim cover/tear seam pointed away from the body. Do not place a live airbag down with the deployment door/trim cover/tear seam facing down. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.

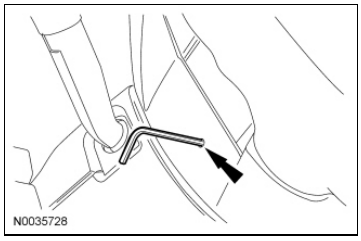
⚠ WARNING: Never probe the electrical connectors on airbag, Safety Canopy® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

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 this section.

2. Insert a 3 mm (0.118 in) Allen wrench or a suitable tool into 1 of the access holes on the steering wheel back cover.



3. Separate the driver air bag module from the steering wheel in the following sequence.
    1. Position the tool against the wire clip.
    2. Push the tool in, disengaging the wire clip from 1 of the driver air bag module locking pins.
        - ♦ It may be necessary to gently pull back on that side of the driver air bag module to release it from the steering wheel.
    3. Turn the steering wheel for access and repeat this step at all 3 steering wheel back cover openings.

4. Remove the driver air bag module.
    - Disconnect the 2 driver air bag module and the horn switch electrical connectors.

Installation

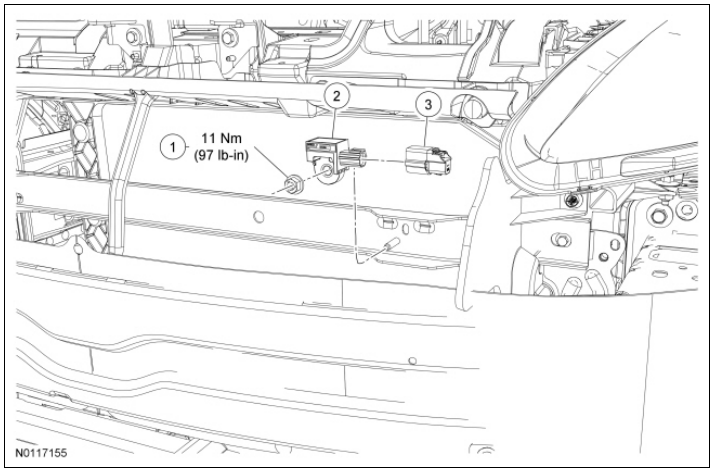
1. Connect the 2 driver air bag module and the horn switch electrical connectors.

2. Align the driver air bag module locking pins to the steering wheel and, while pushing inward, seat the 3 driver air bag module locking pins to the steering wheel wire clips.

3. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

Front Impact Severity Sensor

NOTE: LH side shown, RH similar.



Item	Part Number	Description
1	W700101	Front impact severity sensor nut
2	14B004	Front impact severity sensor
3	-	Electrical connector (part of 14K012)

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

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 nut, disconnect the electrical connector and remove the front impact severity sensor.
   - To install, tighten to 11 Nm (97 lb-in).

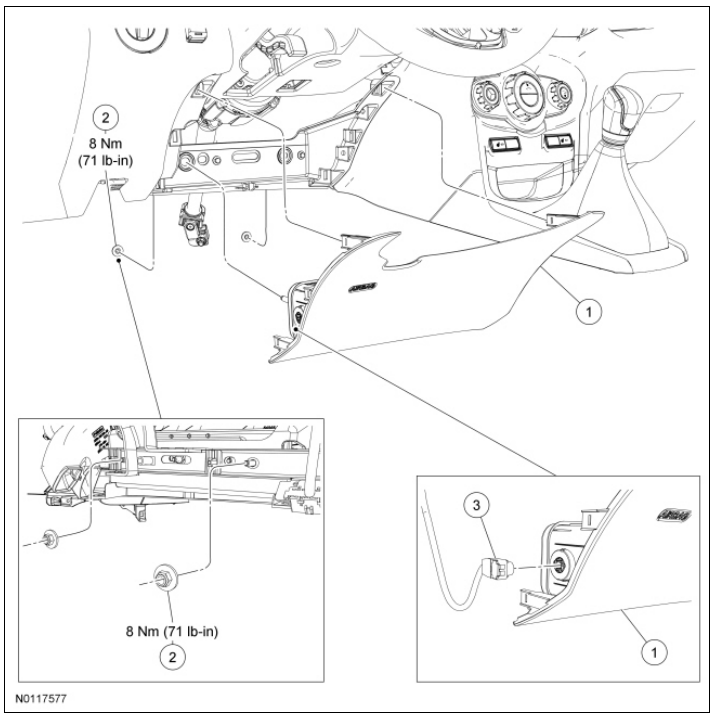
4. ⚠ **WARNING: Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.**

   NOTE: Make sure the radiator support and front impact severity sensor and bracket assembly mating surfaces are clean and free of foreign material.

To install, reverse the removal procedure.

5. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

Knee Airbag



Item	Part Number	Description
1	54045J77	Knee air bag module
2	W701014	Knee air bag module nuts (2 required)
3	-	Knee air bag module electrical connector (part of 14K024)

Removal

⚠ WARNING: Always carry a live airbag with the deployment door/trim cover/tear seam pointed away from the body. Do not place a live airbag down with the deployment door/trim cover/tear seam facing 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 airbag, Safety Canopy® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, 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 is ON.

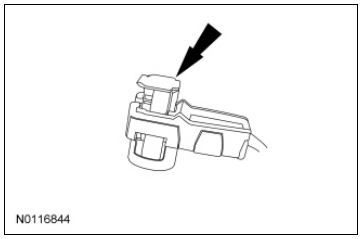
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

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 2 nuts, pull out to release the clips and separate the knee air bag from the instrument panel.

3. ***NOTICE:*** **Do not pull the knee air bag module electrical connector out by the locking button. Damage to the locking button can occur.**

   Using a small screwdriver, lift up and release the locking button on the knee air bag module electrical connector. With the locking button released, disconnect the electrical connector and remove the knee air bag module.



Installation

1. ***NOTICE:*** **Make sure the knee air bag module electrical connector locking button is in the released position when connected. Do not install the knee air bag module electrical connector by the locking button. Failure to follow these instructions may cause connector damage.**

   With the locking button released, install the knee air bag module electrical connector fully into the knee air bag module and seat the locking button.

2. Position the knee air bag module to the instrument panel, push in and seat the retaining clips.

3. Install the 2 knee air bag module nuts.
   - Tighten to 8 Nm (71 lb-in).

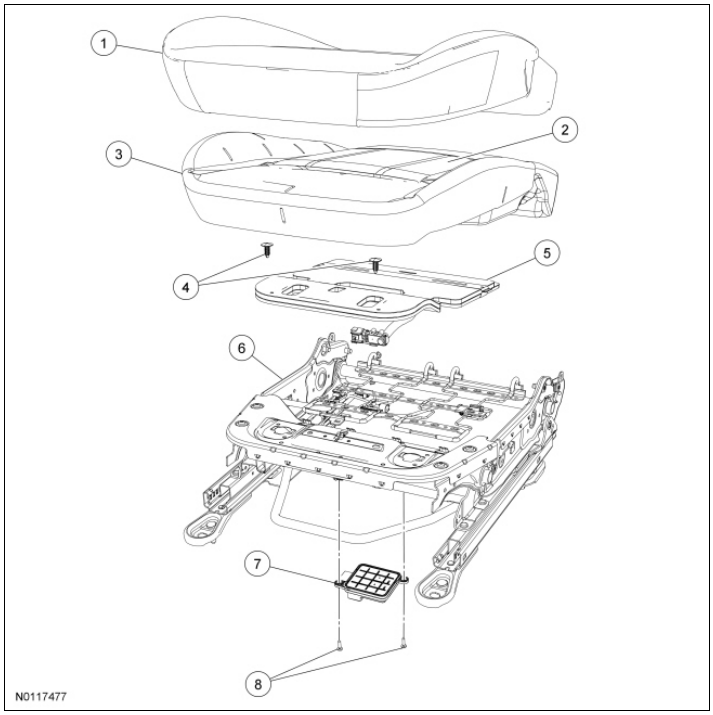
4. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

Occupant Classification Sensor

Special Tool(s)

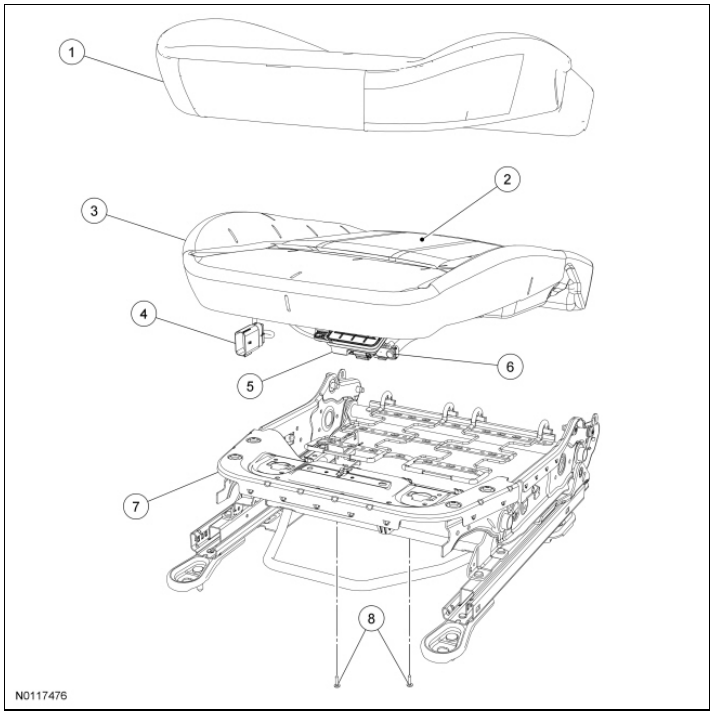
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Original Equipment Manufacturer (OEM) Occupant Classification System (OCS) System



Item	Part Number	Description
1	62900	Seat cushion cover
2	-	Heater mat (part of Original Equipment Manufacturer (OEM) Occupant Classification System (OCS)) (if equipped)
3	-	Cushion foam pad (part of OEM OCS)
4	-	Pin-type retainers (2 required) (part of OEM OCS)
5	-	OCS bladder and pressure sensor (part of OEM OCS)
6	61704	Seat track assembly
7	-	Occupant Classification System Module (OCSM) (part of OEM OCS /tr>
8	-	OCSM screws (2 required) (part of OEM OCS)

Service Kit Occupant Classification System (OCS) System



Item	Part Number	Description
1	62900	Seat cushion cover
2	-	Heater mat (part of 632A22) (if equipped)
3	-	Cushion foam pad (part of 632A22)
4	-	Passenger seat wire harness (part of 632A22)
5	-	Occupant Classification System Module (OCSM) (part of 632A22)
6	-	Pressure sensor (part of 632A22)
7	61704	Seat track assembly
8	-	

Removal

⚠ **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 using System Reset to rezero the seat weight. 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: **Carry out the Occupant Classification System (OCS) system reset when a front passenger seat cushion is disassembled, a new trim cover is installed or an OCS system service kit is installed. Use a scan tool to carry out the OCS system reset. Failure to follow this instruction may result in system failure and incorrect operation of the OCS system.**

NOTE: Occupant Classification System (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. If a new OCS system or OCS system component is needed, install a new OCS system service kit.

NOTE: To identify between a production OCS system and a OCS system service kit, inspect the OCSM and pressure sensor electrical connectors. An OCS system service kit has the electrical connectors glued and should not be disconnected or altered.

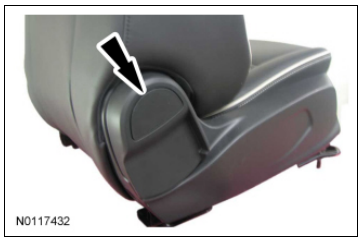
NOTE: The heater mat is not serviced separately. If a new heater mat is needed on the front passenger seat cushion, install a new OCS system service kit with a heater mat.

NOTE: The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

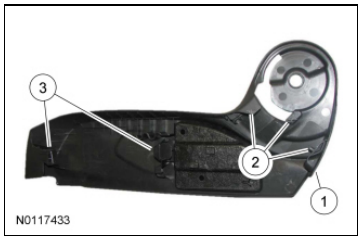
NOTE: The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Remove the front passenger seat. For additional information, refer to Section 501-10 .

2. Remove the recliner handle bolt cover, the bolt and the recliner handle.

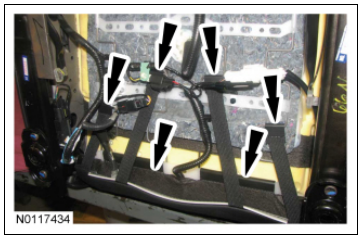


3. Remove the cushion side shield.
    1. Remove the screw at the rear of the cushion side shield.
    2. Pull out at the back of the cushion side shield to release the locator pins and tab.
    3. Slide the cushion side shield forward to disengage the brackets Remove the cushion side shield.



4. Remove the screw and the inner recliner cover.

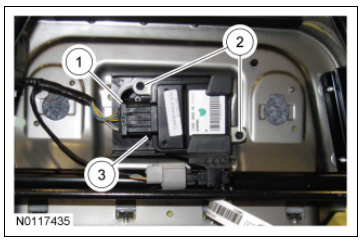
5. Detach the J-clip retainers.



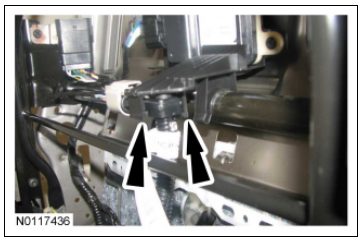
6. Disengage the remaining cushion cover retainers attached to the seat track and seat cushion frame.

- If Original Equipment Manufacturer (OEM) Occupant Classification System (OCS), remove the cushion foam pad and cover.

7. Remove the Occupant Classification System Module (OCSM).
    1. For OEM OCS , disconnect the electrical connector, if equipped.
    2. Remove the 2 screws.
    3. Release the tab and remove the OCSM .



8. Disengage the 2 retainers and slide the pressure sensor off the bracket.

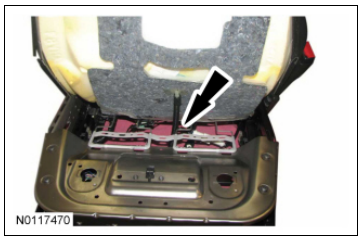


9. **NOTE:** Note the wire routing for installation.

   Disconnect all the seat cushion wire harness electrical connectors and detach the retainers.

10. For OEM OCS , lift the foam pad and remove the Occupant Classification System (OCS) bladder pin-type retainers.

11. Route the OCS components out from between the cushion supports.
    - At installation, make sure the hose is not kinked.



12. Remove the hog rings and the cushion cover.

13. To install, reverse the removal procedure.

14. Repower the SRS . **Do not** prove out the SRS at this time. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

15. ⚠ **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.**

NOTICE: **To prevent system failure, take the following precautions before carrying out the Occupant Classification System (OCS) system reset:**

- Make sure the voltage to the Occupant Classification System Module (OCSM) is greater than 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 between 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 and during the OCS system reset process.
- Prior to carrying out the OCS system reset, make sure a minimum of 8 seconds has elapsed after cycling the ignition switch ON.

Carry out the OCS system reset.

16. 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 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

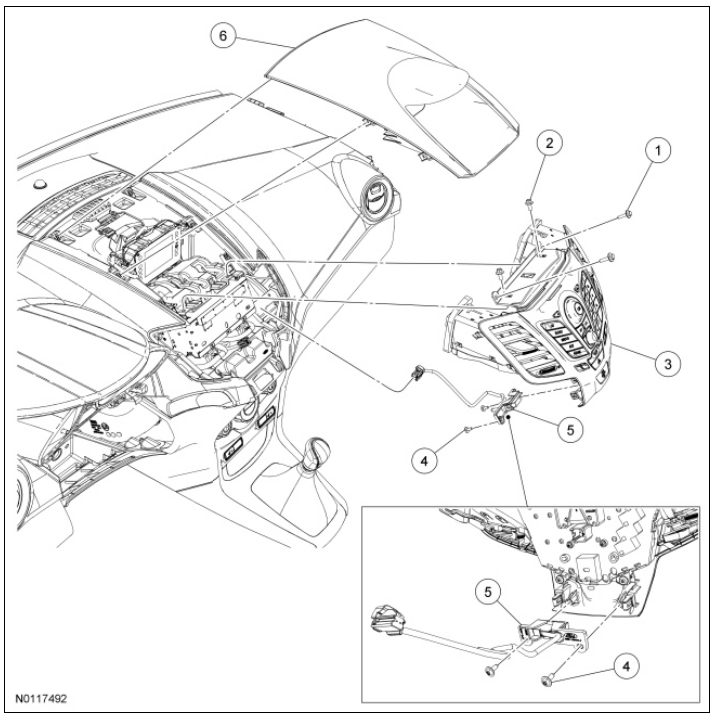
17. **NOTE:** Cycle the ignition switch after the OCS system reset.

    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 System in Section 501-20B .

18. Prove out the SRS as follows:
    Turn the ignition switch from ON to OFF. Wait 10 seconds, then turn the ignition switch back to ON and visually monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will illuminate 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 at a 5 Hz rate (RCM not configured).

    The air bag warning indicator may not illuminate until approximately 30 seconds after the ignition switch 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 sounds in a pattern of 5 sets of 5 beeps. If this occurs, diagnose and repair the air bag warning indicator and any SRS fault discovered.
    Use a scan tool and clear all continuous DTCs from the RCM and Occupant Classification System Module (OCSM).

Passenger Airbag Deactivation (PAD) Indicator



Item	Part Number	Description
1	W707628	Front Controls Interface Module (FCIM) finish panel screw (2 required)
2	W505142	FCIM finish panel screw (2 required)
3	5404320	FCIM finish panel
4	W715260	Passenger Air Bag Deactivation (PAD) indicator screw (2 required)
5	10A936	PAD indicator
6	58042A82	Upper finish panel

Removal and Installation

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.**

   NOTE: A DTC sets in the Restraints Control Module (RCM) if the Passenger Air Bag Deactivation (PAD) indicator electrical connector is disconnected with the ignition ON. Clear the RCM memory before releasing the vehicle.

   Turn the ignition OFF and wait at least one minute.

2. Pull up and out to release the clips and remove the upper panel finish panel.

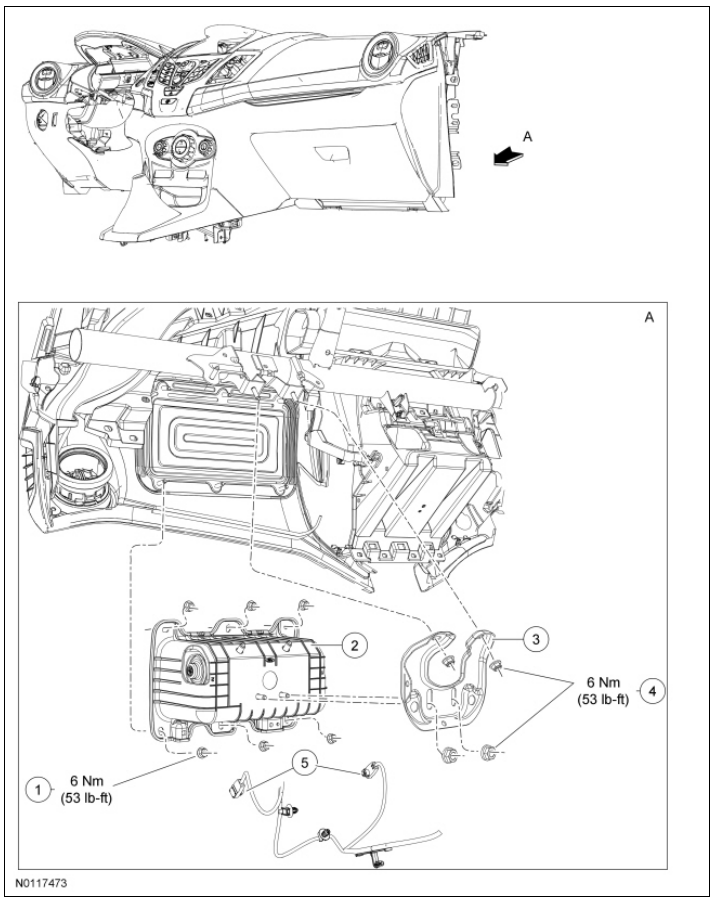
3. Remove 4 screws, pull out and separate the Front Controls Interface Module (FCIM) finish panel.

4. Remove 2 screws, disconnect the electrical connector and remove the PAD indicator.

5. To install, reverse the removal procedure.

6. Prove out the SRS as follows:
   Turn the ignition switch from ON to OFF. Wait 10 seconds, then turn the ignition switch back to ON and visually monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will illuminate 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 at a 5 Hz rate (RCM not configured).
   The air bag warning indicator may not illuminate until approximately 30 seconds after the ignition switch 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 sounds in a pattern of 5 sets of 5 beeps. If this occurs, diagnose and repair the air bag warning indicator and any SRS fault discovered.
   Use a scan tool and clear all continuous DTCs from the RCM and Occupant Classification System Module (OCSM).

Passenger Airbag



Item	Part Number	Description
1	W702147	Passenger air bag module nuts (6 required)
2	044A74	Passenger air bag module assembly
3	045F38	Passenger air bag module bracket
4	W520101	Passenger air bag module bracket nuts (4 required)
5	-	Electrical connectors (part of 14401)

Removal

⚠ WARNING: Always carry a live airbag with the deployment door/trim cover/tear seam pointed away from the body. Do not place a live airbag down with the deployment door/trim cover/tear seam facing 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 airbag, Safety Canopy® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

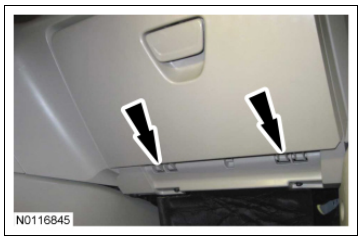
NOTE: The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

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. Remove the glove compartment.
    - Open the glove compartment and carefully pry at each end to separate the glove compartment from the hinges.



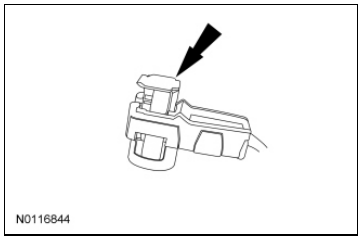
3. Remove the nuts and the passenger air bag module bracket.
    - Detach the wire harness retainers.

4. Remove the nuts and separate the passenger air bag module.
    - Detach the wire harness retainers.

5. ***NOTICE:*** **Do not pull the passenger air bag module electrical connectors out by the locking button. Damage to the locking buttons can occur.**

    Using a small screwdriver, lift up and release the locking button on the passenger air bag module electrical connector. With the locking button released, disconnect the electrical connector.

    - Repeat for the other electrical connector.
    - Remove the passenger air bag module.



Installation

1. Position the passenger air bag module into the instrument panel and install the nuts.
    - Tighten to 6 Nm (53 lb-in).

2. ***NOTICE:*** **Make sure the passenger air bag module electrical connector locking buttons are in the released position when connected. Do not install the passenger air bag module electrical connectors by the locking buttons. Failure to follow these instructions may cause connector damage.**

    With the locking button released, install the passenger air bag module electrical connectors fully into the passenger air bag module and seat the locking buttons.

    - Attach the wire harness retainers.

3. Position the passenger air bag module bracket and install the nuts.
    - Tighten to 6 Nm (53 lb-in).

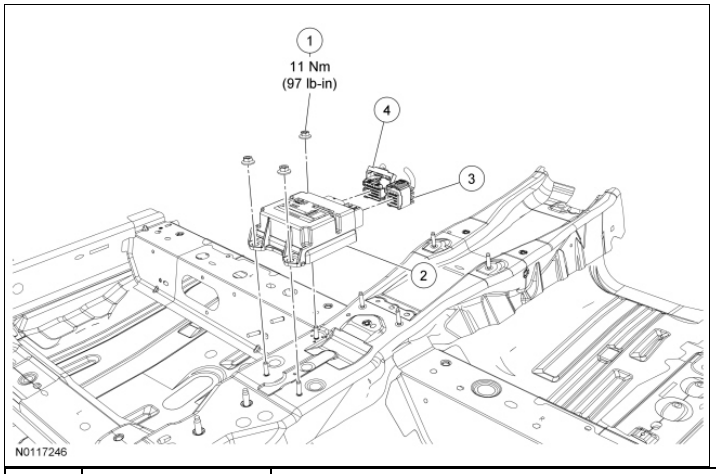
4. Install the glove compartment.

5. 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	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool



Item	Part Number	Description
1	W707142	Restraints Control Module (RCM) nuts (3 required)
2	14B321	RCM
3	-	RCM small electrical connector (part of 14K024)
4	-	RCM large electrical connector (part of 14A005)

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 airbags have deployed. Failure to follow these instructions may result in serious personal injury or death in a crash.

⚠ WARNING: Do not handle, move or change the original horizontal mounting position of the restraints control module (RCM) while the RCM is connected and the ignition switch is ON. Failure to follow this instruction may result in the accidental deployment of the Safety Canopy® and cause serious personal injury or death.

NOTE: The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ign is ON.

NOTE: The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

NOTE: Carrying out Programmable Module Installation (PMI) will not enable the 911 assist option that is

disabled. The RCM and Accessory Protocol Interface Module (APIM) must be configured correctly to fully support 911 assist functionality.

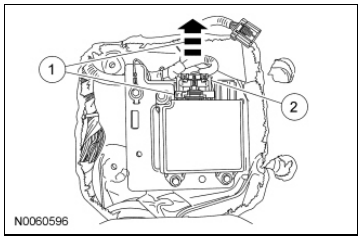
1. When installing a new RCM , carry out the appropriate steps necessary for the Programmable Module Installation (PMI) procedure. For additional information, refer to Section 418-01 .

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 floor console. For additional information, refer to Section 501-12 .

4. Slide the locking wedge back, press to release the locking tab and disconnect the small RCM electrical connector.

5. Disconnect the large RCM electrical connector.
    1. Pinch the thumb tab and pivot the Connector Position Assurance (CPA) lever all the way back until it stops.
    2. Pull out and disconnect the RCM electrical connector.



6. Remove the 3 nuts and the RCM .

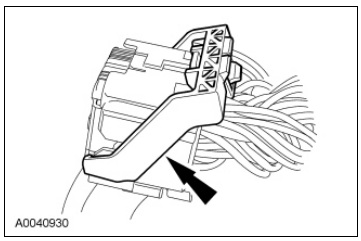
Installation

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.**

   Install the RCM and 3 nuts.

   - Tighten to 11 Nm (97 lb-in).

2. Make sure the CPA lever is in the full release position before attempting to connect the connector.



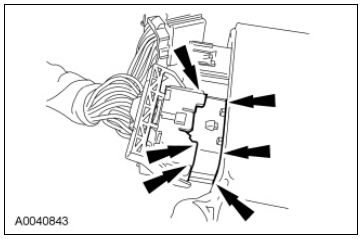
3. ***NOTICE:*** **Putting the large Restraints Control Module (RCM) electrical connector into the RCM on an angle can cause bad electrical connections and damage components.**

   Position the large RCM electrical connector into the RCM .

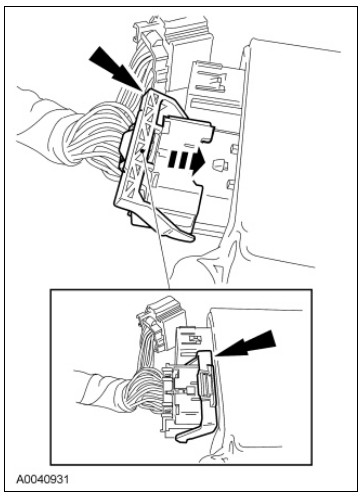
   - ***NOTICE:*** **Do not push the connector to where the lever pivots and seats itself. Light**

pressure is needed to get the connector into position on the Restraints Control Module (RCM) before using the lever to fully seat the connector. Failure to follow this instruction may result in component damage and/or system failure.

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.



4. Connect the large RCM electrical connector.
   - Using the CPA 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 locked in place.



5. Connect the small RCM electrical connector and push the locking wedge in.

6. Install the floor console. For additional information, refer to Section 501-12 .

7. Repower the SRS . **Do not prove out the SRS at this time.** For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

8. If a new RCM was installed, carry out the appropriate steps to complete the Programmable Module Installation (PMI) procedure. For additional information, refer to Section 418-01 .

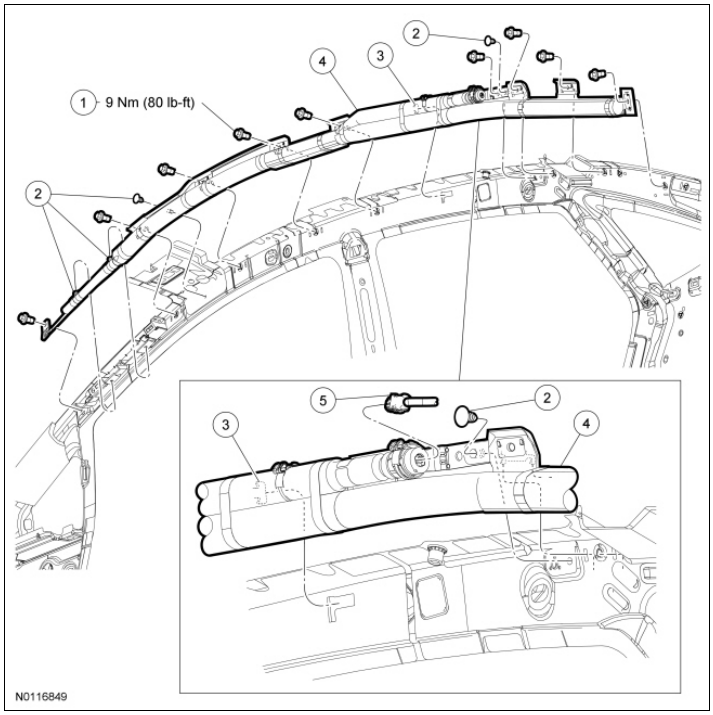
9. Prove out the SRS as follows:
   Turn the ignition switch from ON to OFF. Wait 10 seconds, then turn the ignition switch back to ON and visually monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will illuminate continuously for approximately 6 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 at a 5 Hz rate (RCM not configured).

   The air bag warning indicator may not illuminate until approximately 30 seconds after the ignition switch 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 sounds in a pattern of 5 sets of 5 beeps. If this occurs, diagnose and repair the air bag warning indicator and any SRS fault discovered.
Use a scan tool and clear all continuous DTCs from the RCM and Occupant Classification System Module (OCSM).

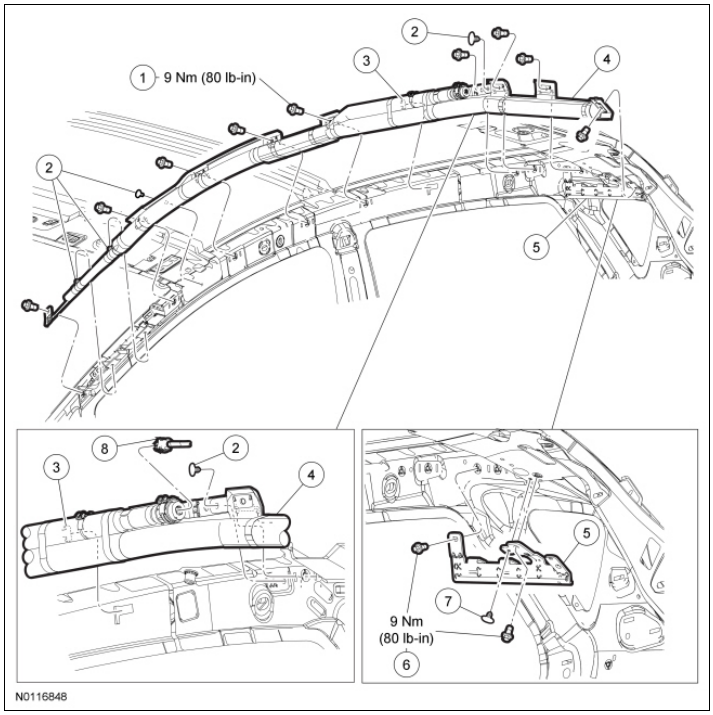
Side Air Curtain

4-Door Sedan



Item	Part Number	Description
1	W505252	Side air curtain module bolt (9 required)
2	-	Side air curtain module pin-type retainers (4 required) (part of 042D94/95)
3	-	Side air curtain module T-tab bracket (part of 042D94/95)
4	042D94/RH 042D95/LH	Side air curtain module
5	-	Side air curtain module electrical connector (part of 14A005)

5-Door Hatchback



Item	Part Number	Description
1	W505252	Side air curtain module bolt (9 required)
2	-	Side air curtain module pin-type retainers (4 required) (part of 042D94/95)
3	-	Side air curtain module T-tab bracket (part of 042D94/95)
4	042D94/RH 042D95/LH	Side air curtain module
5	611D78/RH 611D79/LH	Side air curtain roof bracket
6	W706681	Side air curtain roof bracket bolts
7	-	Pin-type retainer (part of 611D78/79) (2 required)
8	-	Side air curtain module electrical connector (part of 14A005)

Removal and Installation

⚠ WARNING: Always carry a live Safety Canopy® or side air curtain assembly with the 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: Anytime the Safety Canopy® or side air curtain module has deployed, a new headliner and new A-, B- and C-pillar upper trim panels and attaching hardware must be installed. Remove any other damaged components and hardware and install new components and hardware as needed. Failure to follow these instructions may result in the Safety Canopy® or side air curtain module deploying incorrectly and increases the risk of serious personal injury or death in a crash.

⚠ WARNING: Inspect a Safety Canopy® or side air curtain module before installation. If the module is damaged, the cover has separated or the Safety Canopy® or side air curtain material has been exposed, install a new module. Do not attempt to repair the module. Failure to follow these instructions

may result in the Safety Canopy® or side air curtain deploying incorrectly, which increases the risk of serious personal injury or death in a crash.

WARNING: Do not obstruct or place objects in the deployment path of the Safety Canopy® or side air curtain module. Failure to follow this instruction may result in the Safety Canopy® or side air curtain module deploying incorrectly and increases the risk of serious personal injury or death in a crash.

⚠ WARNING: Never put any type of fastener or tie strap around any part of a Safety Canopy® module, side air curtain module or interior trim panel. This will prevent the Safety Canopy® or side air curtain module from deploying correctly. Failure to follow this instruction may increase the risk of serious personal injury or death in a crash.

⚠ WARNING: Before installing a Safety Canopy® or side air curtain assembly, inspect the roofline for any damage. If necessary, the sheet metal must be reworked to its original condition and structural integrity. Install new fasteners if damaged and remove foreign material. Failure to follow these instructions may result in the Safety Canopy® or side air curtain deploying incorrectly, which increases the risk of serious persojury 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.

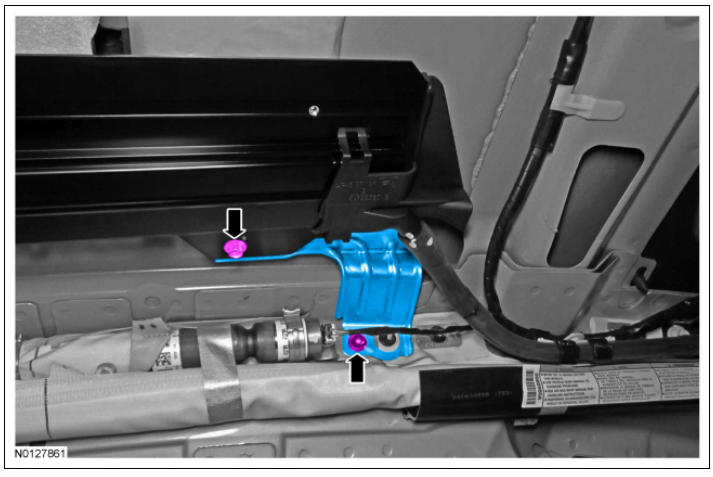
NOTE: The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Remove the headliner. For additional information, refer to Section 501-05 .

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. Squeeze the tabs and disconnect the side air curtain module electrical connector.

4. If equipped with a roof opening panel, remove the 2 bolts and the roof opening panel frame bracket.

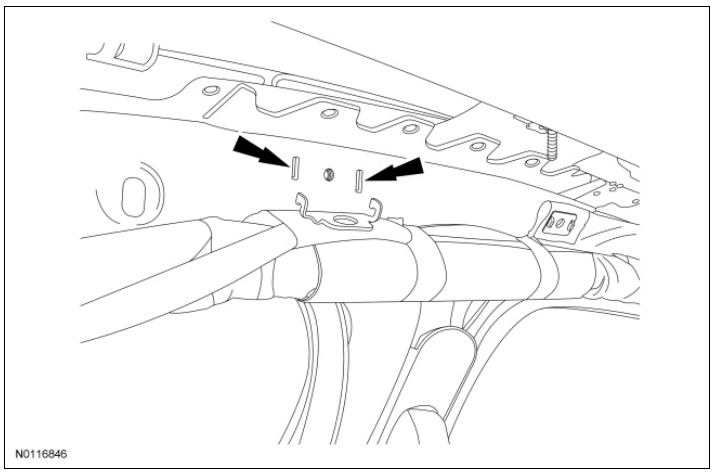


5. Remove all the side air curtain module bolts.
   - To install, tighten to 9 Nm (80 lb-in).

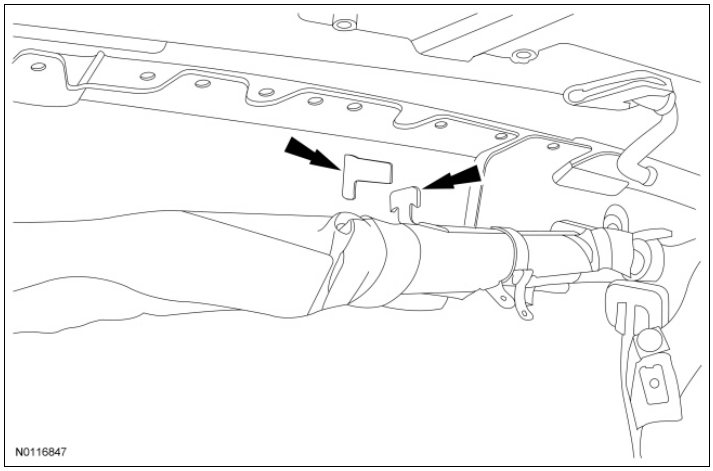
6. Disengage all the side air curtain module pin-type retainers.

7. At all screw attachment points except the rear, lift and rotate the top of the bracket out of the roof sheet metal slots.

- For the rear bracket, pull rearward and rotate out of the roof sheet metal slot.



8. Slide the side air curtain module canister forward and disengage the T-tab bracket from the roof sheet metal slot.
    - Remove the side air curtain module.

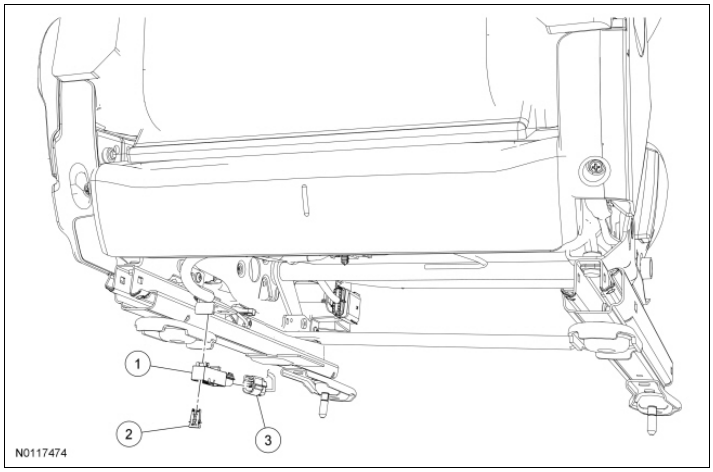


9. To install, reverse the removal procedure.

10. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

Seat Position Sensor

NOTE: Driver seat shown, passenger similar.



Item	Part Number	Description
1	14B416	Seat position sensor
2	-	Seat position sensor lock tab (part of 14B416)
3	-	Seat position sensor electrical connector (part of 14A698/RH 14A699/LH)

1. Position the seat all the way up (if equipped) and to the middle of the seat track.

2. ⚠ **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 at least one minute.

3. From under the rear of the affected seat, remove the retaining clip, disconnect the electrical connector and remove the seat position sensor.

4. To install, reverse the removal procedure.

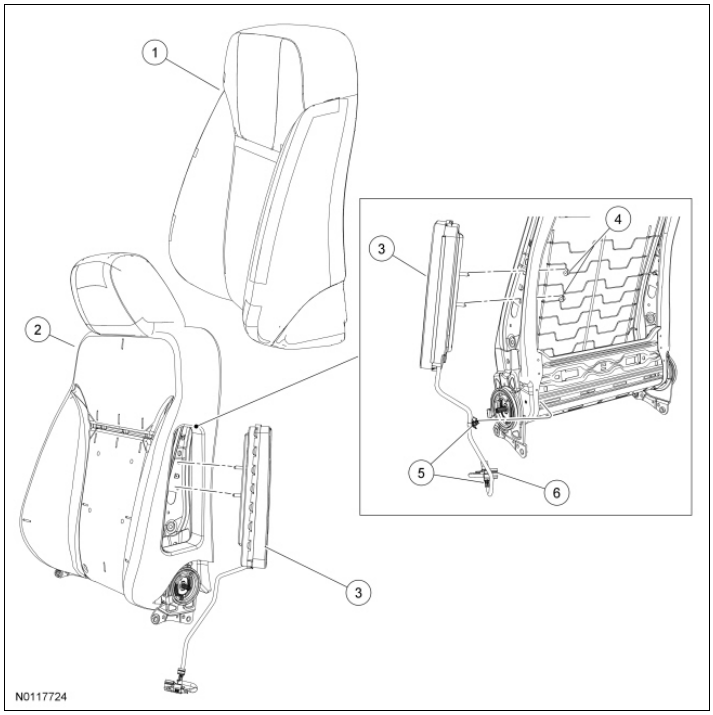
5. Prove out the SRS as follows:
   Turn the ignition switch from ON to OFF. Wait 10 seconds, then turn the ignition switch back to ON and visually monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will illuminate continuously for approximately 6 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 at a 5 Hz rate (RCM not configured).
   The air bag warning indicator may not illuminate until approximately 30 seconds after the ignition switch 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 sounds in a pattern of 5 sets of 5 beeps. If this occurs, diagnose and repair the air bag warning

indicator and any SRS fault discovered.
Use a scan tool and clear all continuous DTCs from the RCM and Occupant Classification System Module (OCSM).

Side Airbag

NOTE: Driver side shown, passenger similar.

NOTE: For side air bag module nut torque specification and tightening sequence, refer to the step in this procedure.



Item	Part Number	Description
1	64416	Backrest cover and deployment chute
2	-	Seat backrest assembly
3	611D11/LH 611D10/RH	Side air bag module
4	W790242	Side air bag module nuts (2 required)
5	-	Wire harness retainers (part of 611D10/11)
6	-	Electrical connector (part of 611D10/11)

Removal

⚠ WARNING: Always carry a live airbag with the deployment door/trim cover/tear seam pointed away from the body. Do not place a live airbag down with the deployment door/trim cover/tear seam facing 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 airbag, Safety Canopy® or side air curtain assemblies. Failure to follow this instruction may result in the accidental deployment of these assemblies, which increases the risk of serious personal injury or death.

⚠&nNING: If the seat side airbag cover has been damaged or separated from its mounting, or if the airbag material has been exposed, install a new seat side airbag assembly. Never try to repair the seat side airbag assembly. Failure to follow these instructions may result in the seat side airbag 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 airbags cannot be repaired. A new trim cover must be installed. Cleaning is permissible. Failure to follow these instructions may result in the seat side airbag deploying incorrectly and increase the risk of serious personal injury or death in a crash.

NOTE: If a side air bag deployment took place, install a new seat back pad, trim cover and side air bag module. The seat backrest frame should be installed new if necessary.

NOTE: When installing a new side air bag module after a deployment, refer to Section 501-10 for additional information concerning new side air bag module installation.

NOTE: The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

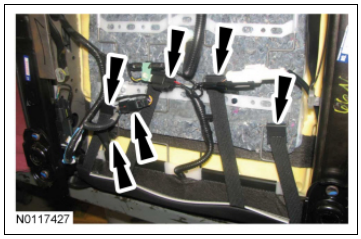
NOTE: The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Remove the front seat from the vehicle. For additional information, refer to Section 501-10 .

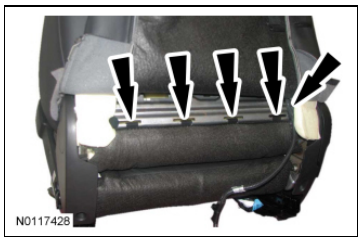
2. **NOTE:** Passenger seat shown, driver seat similar.

   From under the seat, carry out the following.

   - Disconnect the side air bag module electrical connector and detach the wire harness retainer.
   - Disengage the 4 backrest cover elastic strap retainers attached to the bottom rear of the seat.

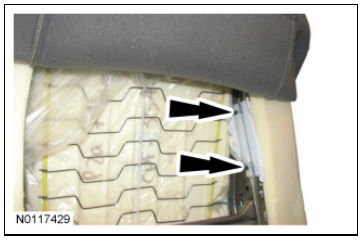


3. Detach the backrest cover retainers and the side air bag module wire harness retainer from the rear of the backrest frame.



4. Invert the backrest cover up enough to expose the side air bag deployment chute.

5. Remove 1 rivet from the deployment chute J-clip retainers.
   - From the back of the rivet, push the rivet stud end in and pull the head out from the other side.



6. Slide the 2 deployment chute J-clip retainers apart.

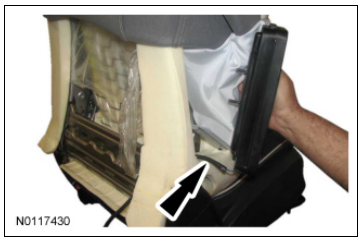
7. Remove the 2 side air bag module nuts.

8. Remove the side air bag module in the following sequence:
    1. Pull the side air bag module mounting studs back through the backrest frame.
    2. Position the side air bag module away from the backrest frame.
    3. Route out the wire harness.

Installation

1. **NOTE:** Passenger seat shown, driver seat similar.

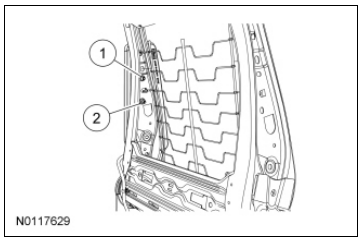
   Route the side air bag module wire harness through the backrest foam pad opening.



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.Position the side air bag module studs through the backrest frame holes and install the nuts in the sequence shown.
    - Tighten to 9 Nm (80 lb-in).

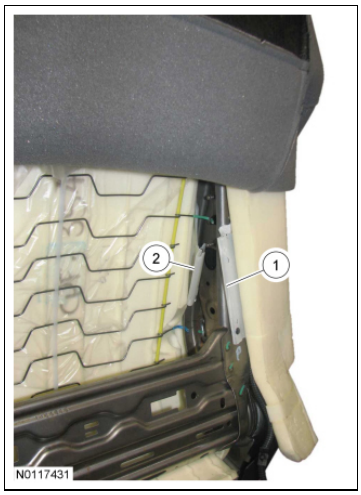


3. ⚠ **WARNING: Check the seat side air bag deployment chute for damage. The deployment chute must not be repaired. If there is any damage to the deployment chute, a new seat back trim cover and deployment chute must be installed as a unit. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increase the risk of serious personal injury or death in a crash.**

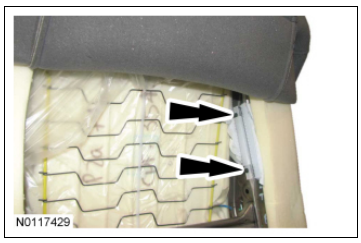
⚠ WARNING: If the seat side air bag module deployment chute is not correctly positioned and closed, the seat side air bag module may not deploy correctly. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increases the risk of serious personal injury or death in a crash.

Wrap the deployment chute around the side air bag module and backrest frame.

1. Position the outboard side of the air bag deployment chute around the outboard side of the backrest frame and pad.
2. Insert the inboard side of the air bag deployment chute between the seat backrest frame and pad.



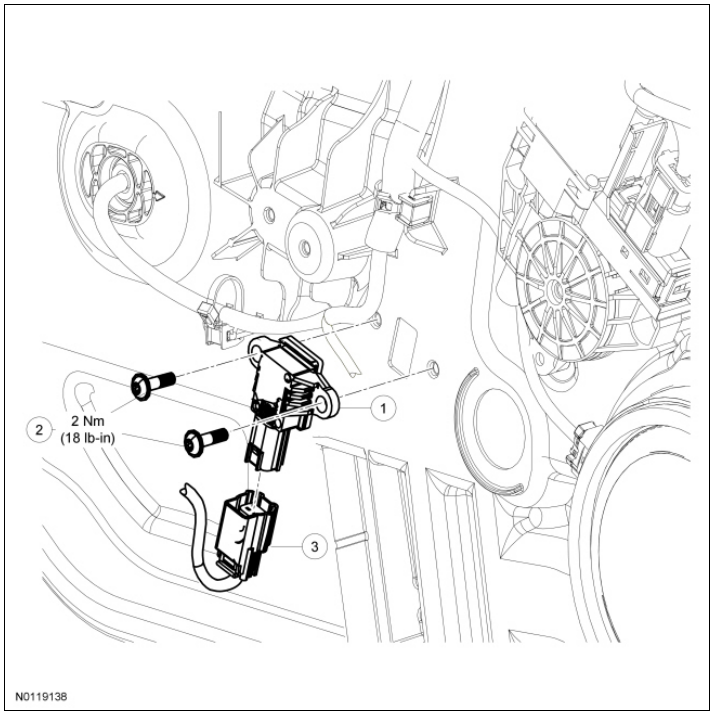
4. Engage the deployment chute J-clip retainers and install plastic rivets at the top and bottom of the J-clip retainers.



5. Roll the backrest cover down around the backrest frame.
6. Attach the side air bag module wire harness to the backrest frame.
7. Attach the backrest cover retainers to the rear of the backrest frame.
8. Route, attach and connect the side air bag module wire harness.
9. Attach the 4 backrest cover elastic strap retainers to the bottom rear of the seat.
10. Install the front seat. For additional information, refer to Section 501-10 .

Side Impact Sensor - Front Door

NOTE: LH shown, RH similar.



Item	Part Number	Description
1	14B345	Side impact sensor
2	W506964	Side impact sensor bolts
3	-	Side impact sensor electrical connector (part of 14631)

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 airbags 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.

start="1">
- Remove the front door trim panel. For additional information, refer to Section 501-05 .

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. Slide the locking wedge back and disconnect the side impact sensor electrical connector.

4. Remove the 2 bolts and the side impact sensor.
    - To install, tighten to 2 Nm (18 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.**

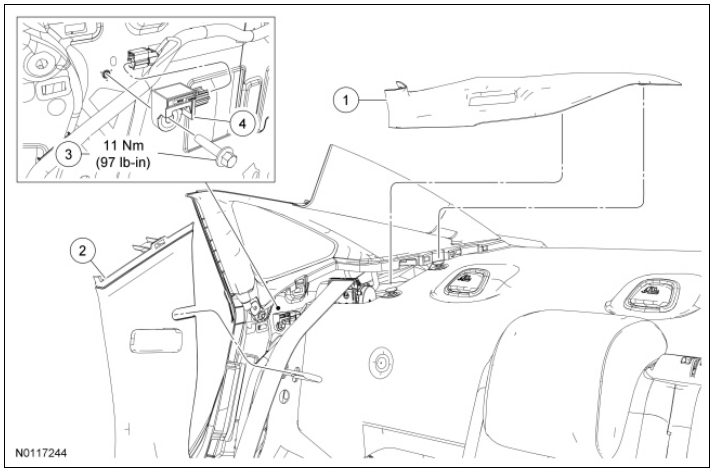
   NOTE: Make sure the door sheet metal and side impact sensor mating surfaces are clean.

   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.

Side Impact Sensor - Second Row, 4-Door Sedan

NOTE: RH shown, LH similar.



Item	Part Number	Description
1	5446808 RH / 5446809 LH	Upper parcel shelf trim panel
2	5431012 RH / 5431013 LH	Lower C-pillar trim panel
3	W505256	Side impact sensor bolt
4	14B004	Side impact sensor

⚠ 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 airbags 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 fullerational 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. Position the rear door opening weather-strip aside.

3. Pull to release the clips and position the upper parcel shelf trim panel aside.

4. Position the seat backrest down.

5. Position the lower C-pillar trim panel away enough to access the side impact sensor.
   - Pull to release the clips and locate the side impact sensor just below the quarter glass.

6. **⚠ 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 C-pillar and side impact sensor mating surface is clean and free of foreign material.

Remove the bolt, disconnect the electrical connector and remove the side impact sensor.

- To install, tighten to 11 Nm (97 lb-in).

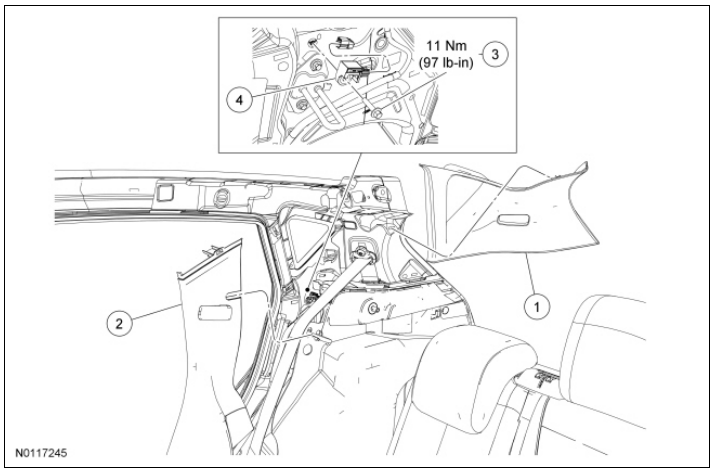
7. To install, reverse the removal procedure.

8. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

Side Impact Sensor - Second Row, 5-Door Hatchback

Removal and Installation

NOTE: RH shown, LH similar.



Item	Part Number	Description
1	5852018 RH / 5852019 LH	Upper quarter trim panel
2	5431012 RH / 5431013 LH	Lower C-pillar trim panel
3	W505256	Side impact sensor bolt
4	14B004	Side impact sensor

⚠ 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 airbags 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 Suppltal 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. Position the door opening weather-strip aside.

3. Pull to release the clips and position the upper quarter trim panel aside.

4. Position the seat backrest down.

5. Position the lower C-pillar trim panel away enough to access the side impact sensor.
   - Pull to release the clips and locate the side impact sensor just below the quarter glass.

6. ⚠ **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 C-pillar and side impact sensor mating surface is clean and free of foreign material.

   Remove the bolt, disconnect the electrical connector and remove the side impact sensor.

   - To install, tighten to 11 Nm (97 lb-in).

7. To install, reverse the removal procedure.

8. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

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-ItTM Show Car Liquid Wax 39026	-	-
Motorcraft® Detail Wash ZC-3-A	-	-
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Premium Undercoating ValuGardTM VG101, VG101A (aerosol)	-	-
Rust Inhibitor ValuGardTM VG104, VG104A (aerosol)	-	-
Plastic Bonding Adhesive TA-9	-	-
Roof Ditch Sealer Fusor® 122EZ or equivalent, obtain locally	-	-
Seam Sealer TA-2	-	-
Trim and Weatherstrip Adhesive Permatex® 81850 or equivalent	-	-
Motorcraft® Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A	-

General Equipment
3 Phase Inverter Spot Welder 254-00002

Compuspot 700F Welder 190-50080
I4 Inverter Spot Welder 254-00014 r 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)

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 Descrip-tions	Welding Method			Cold Repairs	Use of Heat for Repair	Temp-erature Range	Max-imum Heat
		Metal Inert Gas (MIG)	Squeeze-Type Resist-ance Spot Welding (STRW)	MIG Braze				
Mild Steel	Mild	Yes	Yes	NA	Yes [a]	Yes	Up to 650°C (1,200°F)	90 sec. x 2
Laminate Steel	Quiet Steel	No	Yes	No	Yes [a]	NA	NA	NA
Bake Hardened	BH 180, BH210, BH 250, BH 280	Yes	Yes	Yes [b]	Yes [a]	Yes	Up to 650°C (1,200°F)	90 sec. x 2
Solid Solution Strength- ened	-	Yes	Yes	Yes [b]	Yes [a]	Yes	Up to 650° C (1,200°F)	90 sec. x 2
High- Strength Low Alloy (HSLA)	HSLA 250, HSLA 350, HSLA 550	Yes	Yes	Yes [b]	Yes	Up to 650°C (1,200°F)	90 sec. x 2	
Dual Phase = 600 MPa Ultimate	DP 500, DP 600	Yes	Yes	Yes [b]	Yes [a]	No	NA	NA

Tensile Strength								
Dual Phase = 600 MPa Ultimate Tensile Strength (particular to 780 and 980 grades) [c]	DP 700, DP 780, DP 900	Yes [d]	Yes	Yes [b]	No	No	NA	NA
Ultra High Strength Steel (UHSS) (Martens-itic, Boron) [e]	Boron	Yes [a]	Yes	Yes [b]	No	No	NA	NA
Transform- ation Induced Plasticity (TRIP) Steel	TRIP 590, TRIP 780, TRIP 980	NA	NA	NA	NA	NA	NA	NA

[a] Cold repairs can be performed if damage excludes kinks. May section only if approved procedure in workshop manual.
[b] MIG braze allowed for non-structural applications only.
[c] Dual phase steels DP 700, DP 780 and DP 980 must be replaced at factory joints, no sectioning unless approved procedure in workshop manual.
[d] For DP 980, use MIG plug welding only, no stitch welding.
[e] Boron components must be replaced at factory joints, no sectioning allowed.

Body

⚠ WARNING: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may contain damage which is not visible.

Ford does not approve use of the following:

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures approved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

Ford Motor Company does not endorse, cannot attest to, and makes no representations regarding structural repairs (frames, rails, aprons and body panels) carried out using non-genuine Ford Motor Company parts or non-Ford-approved methods. In particular, Ford makes no representations that the vehicle will meet any crash safety or anti-corrosion performance requirement. Such parts and methods have not been tested by Ford, and may not meet Ford's requirements for safety, performance, strength, quality, durability and corrosion protection.

Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

The body consists of the following:

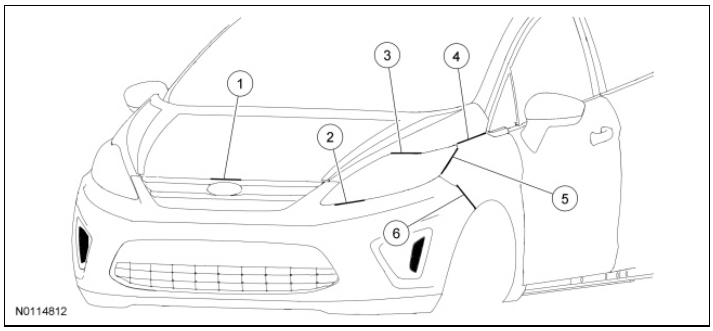
- Four-door sedan
- Five-door hatchback
- Bolted, removable front fenders, hinged doors and hood
- Steel roof panel constructed of mild steel
- Steel hood constructed of dent-resistant steel
- Steel fenders constructed of dent-resistant steel
- Steel doors with outer door panels constructed of high-strength bake hardenable steel
- Steel luggage compartment lid constructed of dent-resistant steel
- Door panels on all models have sound deadener (mastic) applied
- Mastic and sound deadener material applied to floor pan interior and exterior

- Boron reinforced bolt-on front bumper beam
- Boron reinforced bolt-on rear bumper beam
- Front subframe assembly housing suspension and steering components
- Front frame rail service kit is not available
- Sound deadener mastic material used in roof panel, floor pan and door panels

For dimensional information, refer to the following illustrations:

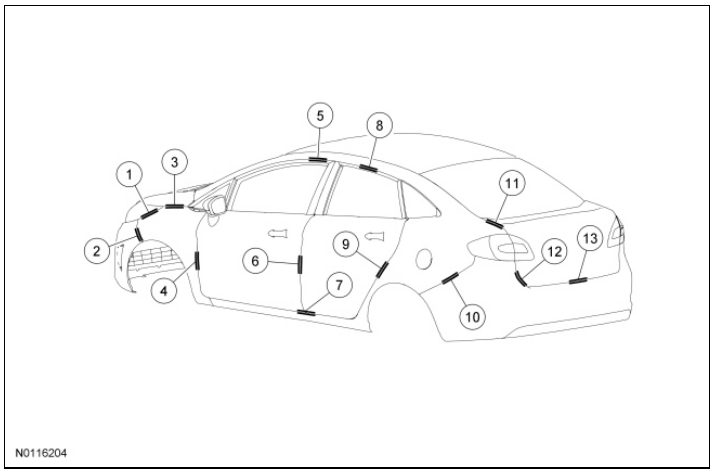
Body Margins

NOTE: Dimensions apply to right and left side.



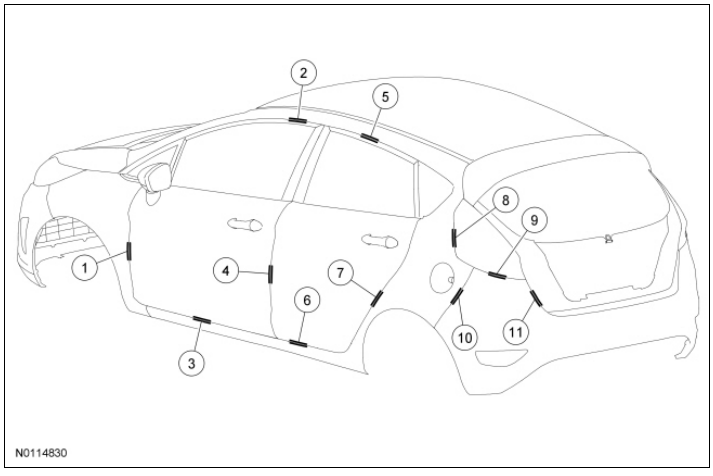
Item	Description	Margin Specification	Flushness Specification
1	Hood to front fascia	6.0 mm (0.236 in) ± 1.5 mm (0.059 in)	0.1 mm (0.003 in) ± 1.5 mm (0.059 in)
2	Headlamp assembly to fascia	4.5 mm (0.177 in) ± 2.0 mm (0.078 in)	-
3	Lamp assembly to hood	4.0 mm (0.157 in) ± 1.5 mm (0.059 in)	1.4 mm (0.055 in) ± 1.5 mm (0.059 in)
4	Hood to fender	4.5 mm (0.177 in) ± 2.0 mm (0.07 in)	-
5	Headlamp assembly to fender	2.5 mm (0.098 in) ± 1.0 mm (0.03 in)	1 mm (0.039 in) ± -0.8 mm (-0.031 in)
6	Fender to fascia	0.0 mm (0 in) ± 0.5 mm (0.019 in)	0.5 mm (0.019 in) ± 0.8 mm (0.031 in)

Body Margins - 4-Door Sedan



Item	Description	Margin Specification	Flushness Specification
1	Headlamp to fender	2.5 mm (0.098 in) ± 1.0 mm (0.039 in)	1.0 mm (0.039 in) ± -0.8 mm (-0.031 in)
2	Front fasciTD>	0.0 mm (0 in) ± 0.5 mm (0.019 in)	0.5 mm (0.019 in) ± 0.8 mm (0.031 in)
3	Fender to hood	4.5 mm (0.177 in) ± 2.0 mm (0.07 in)	-
4	Fender to front door	3.4 mm (0.133 in) ± 1.5 mm (0.05 in)	1.0 mm (0.039 in) ± 1.0 mm (0.039 in)
5	Front door to body side	5.0 mm (0.196 in) ± 1.5 mm (0.059 in)	6.1 mm (0.24 in) ± 1.5 mm (0.059 in)
6	Front door to rear door	3.5 mm (0.137 in) ± 1.5 mm (0.059 in)	0 mm (in) ± 1.5 mm (0.059 in)
7	Doors to rocker panel	5.9 mm (0.232 in) ± 1.5 mm (0.059 in)	-
8	Rear door to body side (upper)	4.8 mm (0.188 in) ± 1.5 mm (0.059 in)	0 mm (in) ± 1.5 mm (0.059 in)
9	Rear door to body side (lower)	3.6 mm (0.141 in) ± 1.5 mm (0.059 in)	0 mm (in) ± 1.5 mm (0.059 in)
10	Body side to rear fascia		0.5 mm (0.019 in) ± 0.5 mm (0.019 in)
11	Deck lid to body side (side)	4.0 mm (0.157 in) ± 1.5 mm (0.019 in)	1.5 mm (0.059 in) ± 2.0 mm (0.078 in)
12	Deck lid to rear fascia (side)	4.0 mm (0.157 in) ± 2.0 mm (0.078 in)	-2.5 mm (-0.098 in) ± 1.5 mm (0.059 in)
13	Deck lid to rear fascia (lower)	6.0 mm (0.236 in) ± 2.0 mm (0.078 in)	-

Body Margins - 5-Door Hatchback



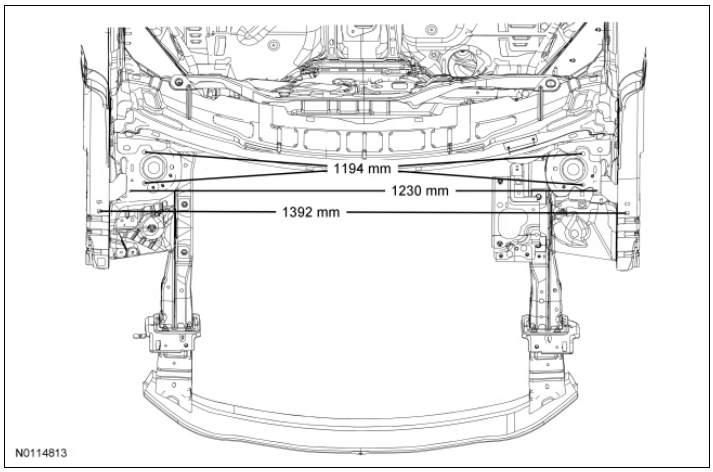
Item	Description	Margin Specification	Flushness Specification
1	Fender to front door	3.4 mm (0.133 in) ± 1.5 mm (0.059 in)	1.0 mm (0.039 in) ± 1.0 mm (0.039 in)
2	Front door to body side	5.0 mm (0.196 in) ± 1.5 mm (0.059	

		in)	
3	Front door to rocker panel	5.9 mm (0.232 in) ± 1.5 mm (0.059 in)	-
4	Front door to rear door	3.5 mm (0.137 in) ± 1.5 mm (0.05 in)	0.0 mm (in) ± 1.5 mm (0.059 in)
5	Rear door to body side (top)	4.8 mm (0.188 in) ± 1.5 mm (0.059 in)	0.0 mm (in) ± 1.5 mm (0.059 in)
6	Rear door to rocker panel	6.0 mm (0.236 in) ± 1.5 mm (0.05 in)	-
7	Rear door to body side	3.6 mm (0.141 in) ± 1.5 mm (0.059 in)	0.0 mm (in) ± 1.5 mm (0.059 in)
8	Body side to tail lamp	2.0 mm (0.078 in) ± 1.0 mm (0.039 in)	1 mm (0.039 in) ± 1.0 mm (0.039 in)
9	Tail lamp to rear fascia	0.4 mm (0.078 in) ± 1.5 mm (0.059 in)	2.0 mm (0.078 in) ± 2.0 mm (0.078 in)
10	Body side to rear fascia	0.0 mm (0 in) ± 0.5 mm (0.019 in)	.5 mm (0.196 in)in)
11	Rear fascia to liftgate	4.2 mm (0.165 in) ± 1.5 mm (0.059 in)	2.3 mm (0.09 in) ± 1.5 mm (0.059 in)

Underhood Dimensions

NOTE: Measurements are obtained on center, unless otherwise indicated.

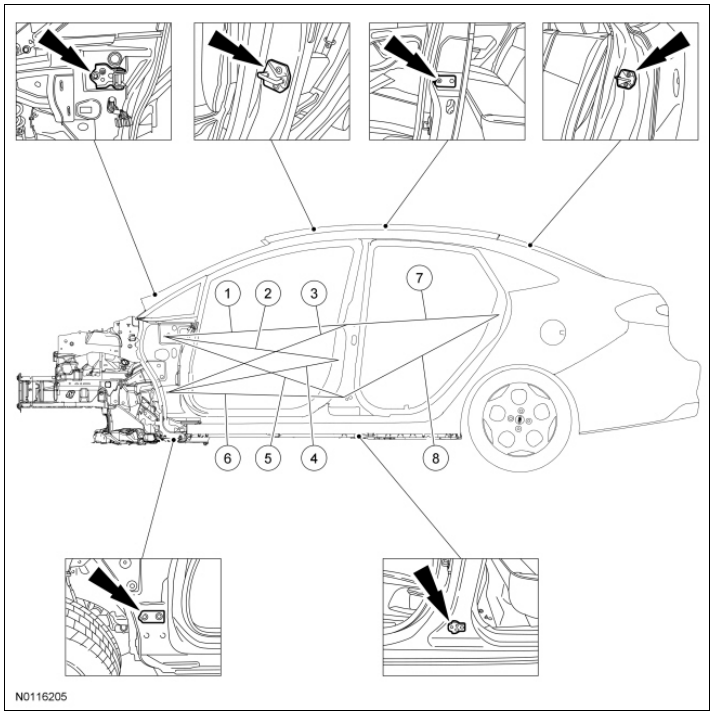
NOTE: Underhood dimensions shown in this illustration apply to all body styles.



Body Side Closure Dimensions

NOTE: 4-door sedan shown, 5-door hatchback the same.

NOTE: Measurements are obtained on center, unless otherwise indicated.

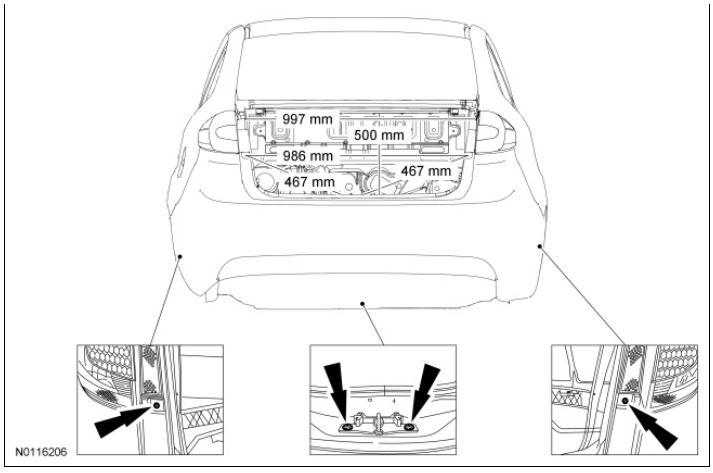


1	A-pillar upper door hinge to B-pillar upper door hinge	1081 mm
2	A-pillar upper door hinge to front door striker upper bolt	1050 mm
3	A-pillar lower door hinge to rear door upper hie	1135 mm
4	A-pillar lower door hinge to front door striker upper bolt	1055 mm
5	A-pillar upper door hinge to B-pillar lower door hinge	1115 mm
6	A-pillar lower door hinge to B-Pillar lower door hinge	1042 mm
7	B-pillar upper door hinge to rear door striker upper bolt	910 mm
8	B-pillar lower door hinge to rear door striker upper bolt	1048 mm

Rear Opening Dimensions

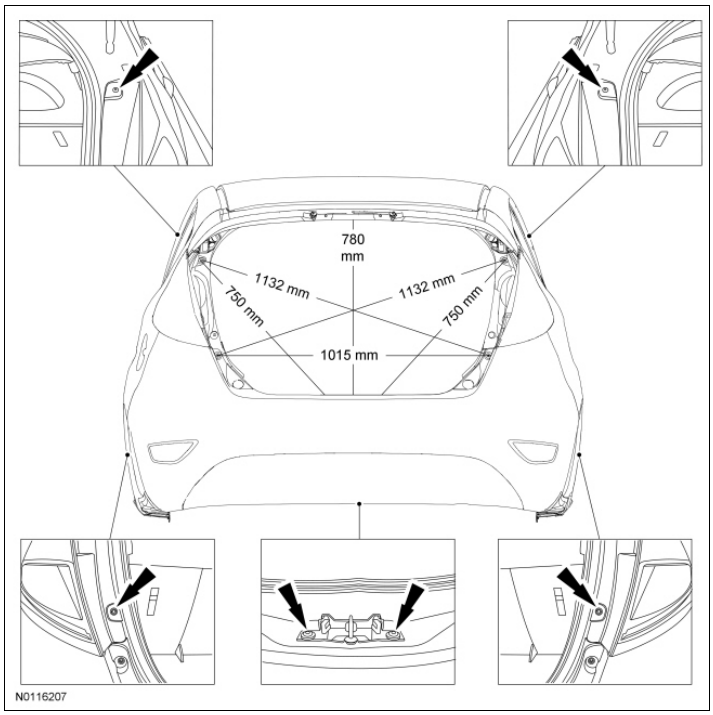
4-Door Sedan

NOTE: Measurements are obtained on center, unless otherwise indicated.



5-Door Hatchback

NOTE: Measurements are obtained on center, unless otherwise indicated.

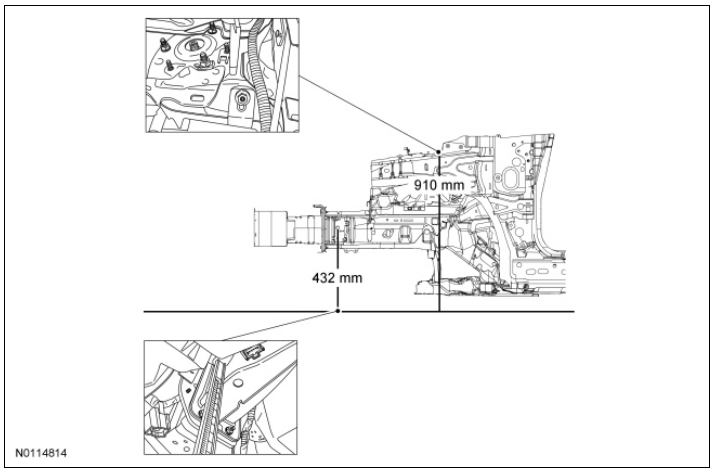


Underbody Dimensions

Datum Height - Front Structure

⚠ WARNING: Frame rail crush zones absorb crash energy during a collision and must be replaced if damaged. Straighten damaged frame rails to correct frame dimensions prior to frame member sectioning. Failure to follow these instructions may adversely affect frame rail performance and may result in serious personal injury to vehicle occupant(s).

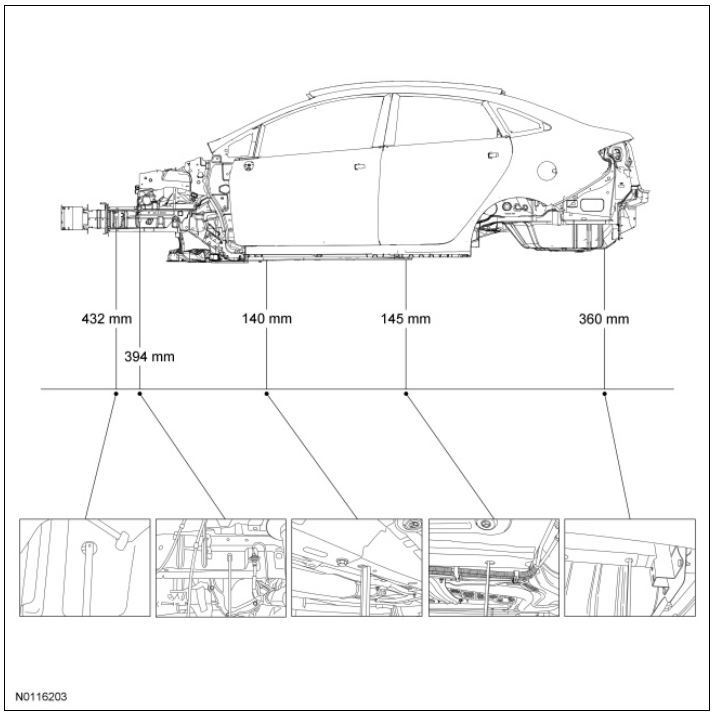
NOTE: A structural frame rail sectioning kit is not available. Frame rails must be replaced at factory seams.



Datum Height - 4-Door Sedan

⚠ WARNING: Frame rail crush zones absorb crash energy during a collision and must be replaced if damaged. Straighten damaged frame rails to correct frame dimensions prior to frame member sectioning. Failure to follow these instructions may adversely affect frame rail performance and may result in serious personal injury to vehicle occupant(s).

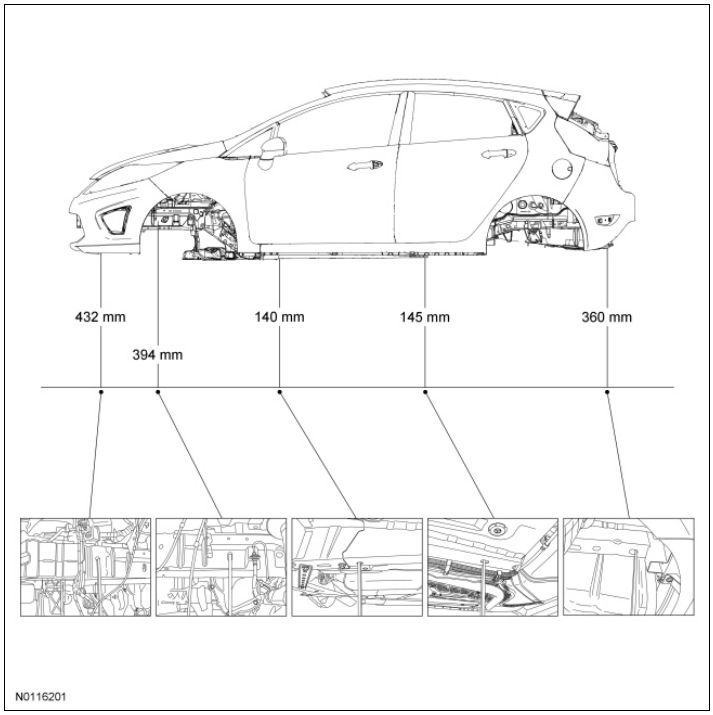
NOTE: A structural frame rail sectioning kit is not available. Frame rails must bplaced at factory seams.



Datum Height - 5-Door Hatchback

⚠ WARNING: Frame rail crush zones absorb crash energy during a collision and must be replaced if damaged. Straighten damaged frame rails to correct frame dimensions prior to frame member sectioning. Failure to follow these instructions may adversely affect frame rail performance and may result in serious personal injury to vehicle occupant(s).

NOTE: A structural frame rail sectioning kit is not available. Frame rails must be replaced at factory seams.

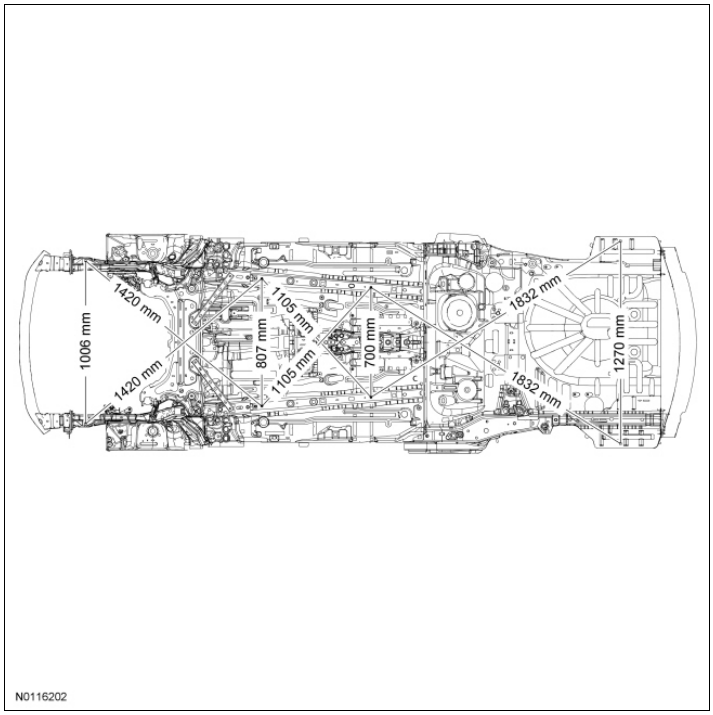


Underbody Dimensions - 4-Door Sedan

⚠ WARNING: Frame rail crush zones absorb crash energy during a collision and must be replaced if damaged. Straighten dad frame rails to correct frame dimensions prior to frame member sectioning. Failure to follow these instructions may adversely affect frame rail performance and may result in serious personal injury to vehicle occupant(s).

NOTE: A structural frame rail sectioning kit is not available for the front frame rail section. Frame rails must be replaced at factory seams. It is mandatory to maintain factory body dimensions when carrying out any repair procedure to the frame rails. Refer to Frame Members - Front in this section.

NOTE: Measurements are obtained on center, unless otherwise indicated.

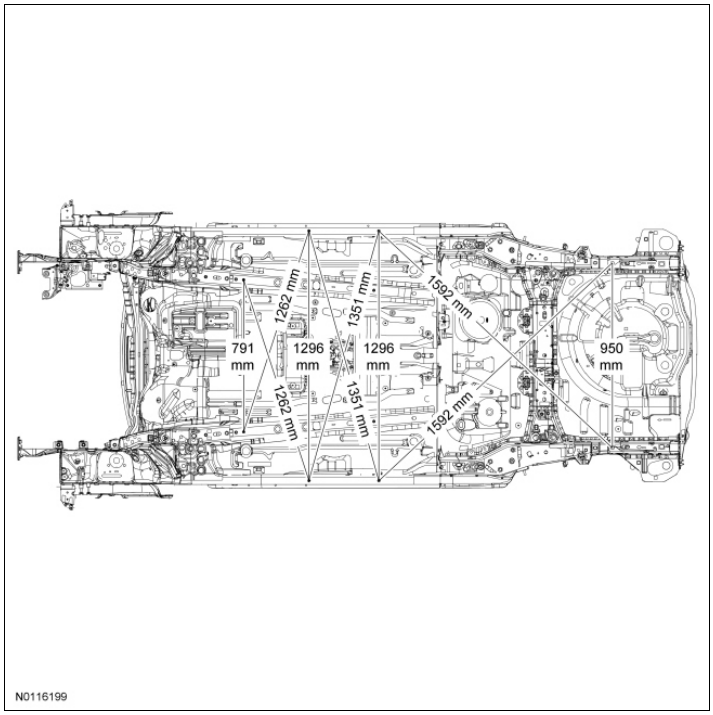


Underbody Dimensions - 5-Door Hatchback

⚠ WARNING: Frame rail crush zones absorb crash energy during a collision and must be replaced if damaged. Straighten damaged frame rails to correct frame dimensions prior to frame member sectioning. Failure to follow these instructions may adversely affect frame rail performance and may result in serious personal injury to vehicle oant(s).

NOTE: A structural frame rail sectioning kit is not available for the front frame rail section. Frame rails must be replaced at factory seams. It is mandatory to maintain factory body dimensions when carrying out any repair procedure to the frame rails. Refer to Frame Members - Front in this section.

NOTE: Measurements are obtained on center, unless otherwise indicated.


791
mm
1296
mm
1296
mm
950
mm
1262 mm
1351 mm
1592 mm
1262 mm
1351 mm
1592 mm
N0116199

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 .

Sealers

Material

Item	Specification
Seam Sealer TA-2	-

⚠ 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.

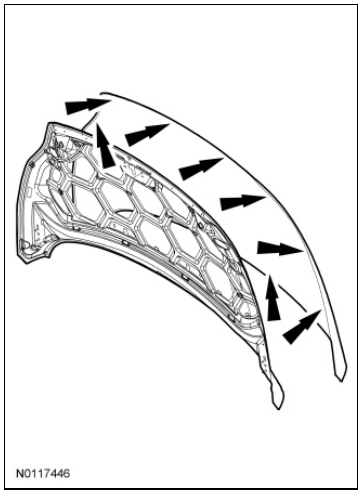
The correct sealing of joints is essential to repairing the vehicle correctly. Sealers are used to prevent wind noise, water leaks, exhaust fumes and dust from entering the vehicle. They also provide anti-corrosion barriers. Sealers are applied to areas such as door and rear compartment hem flanges, 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:

- Seam Sealer - Heavy-bodied, non-sag adhesive/sealer for use on standing cosmetic seams, truck bed seams, tooled door skin seams and floor pans.

Sealers should remain flexible after curing and must be paintable. Follow the manufacturer's directions for correct application of these materials.

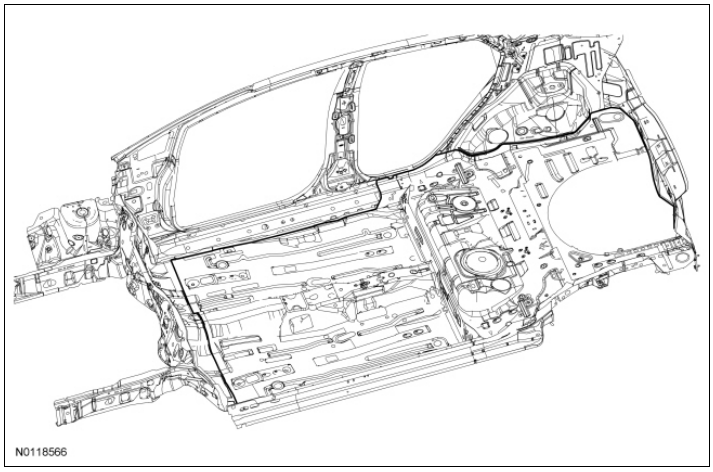
Any damage to originally sealed joints should be repaired by resealing. Along with attaching points of new panels, open joints that require bridging of sealer to close a gap should be sealed using a heavy-bodied sealer.

Hood Sealer

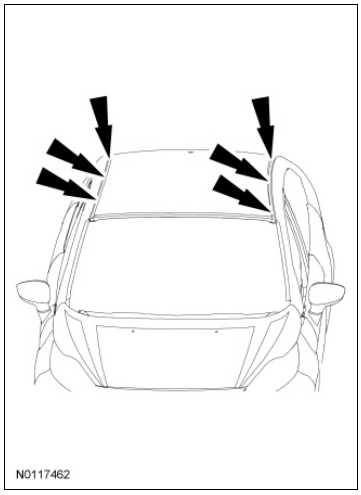


Floor Sealer

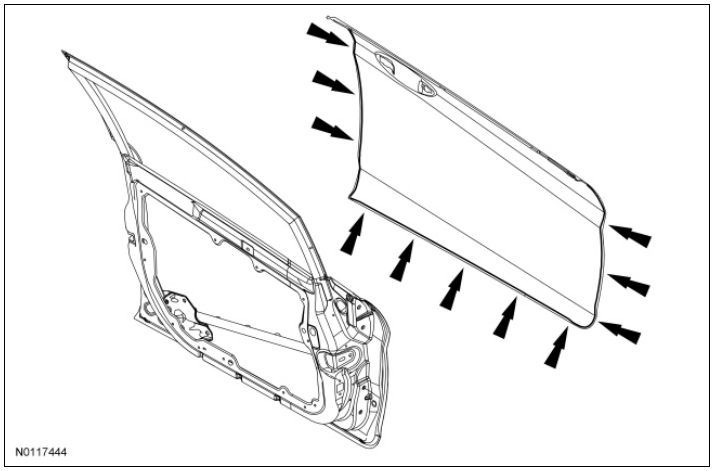
NOTE: RH side shown. LH side removed for clarity.



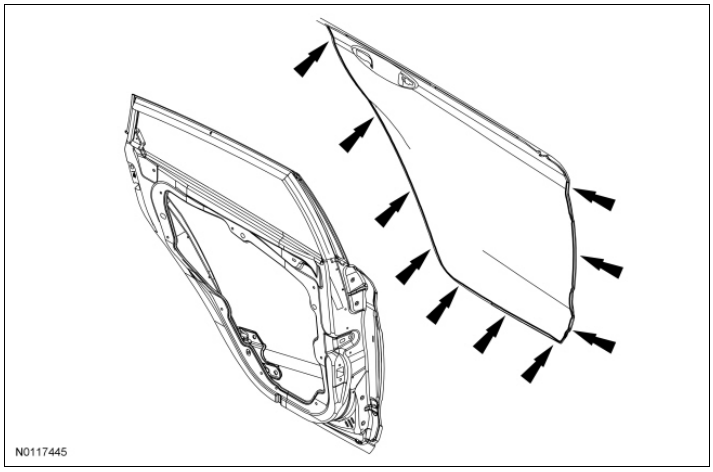
Roof Sealer



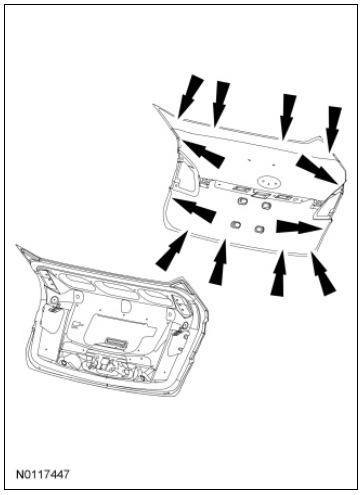
Front Door Sealer



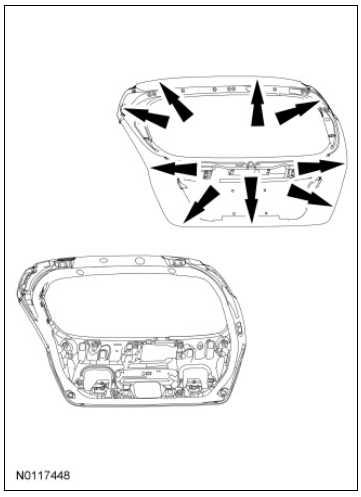
Rear Door Sealer



Deck Lid Sealer - 4-Door Sedan



Deck Lid Sealer - 5-Door Hatchback



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.**

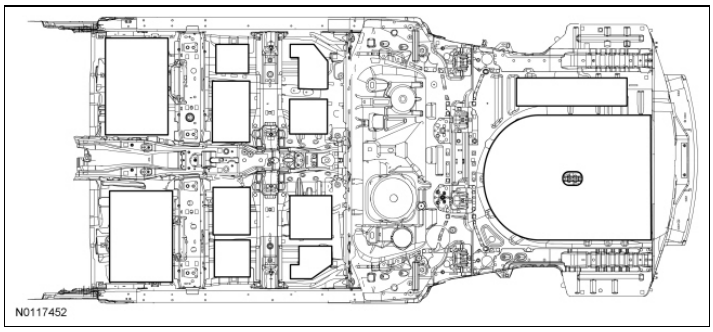
NOTICE: **Corrosion protection must be restored to the area AFTER the mastic material is applied. Corrosion protection products may be wax based and loss of adhesion may occur.**

NOTE: To restore the vehicle to design intent, missing or damaged sound deadeners and insulators should be installed with the correct service replacement component.

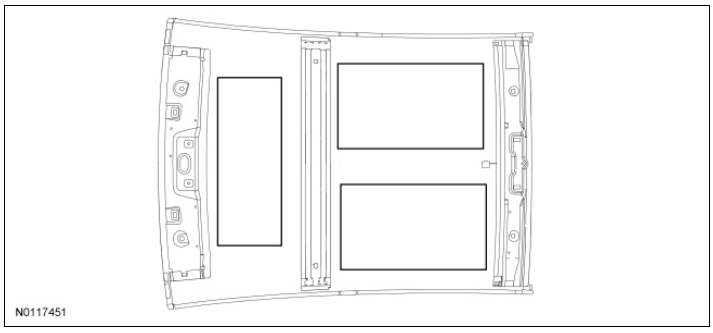
Whenever replacement of an existing mastic insulator is carried out, the surface must be thoroughly cleaned to make sure correct adhesion will occur. The surface should be 10°C (50°F) or greater before applying the mastic. The use of a heat gun to warm the metal surface will aid in adhesion.

NOTE: Noise, Vibration and Harshness (NVH) pads are obtained locally.

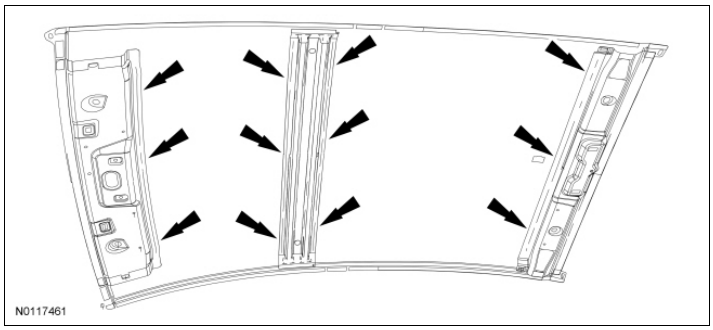
NVH Pads - Floor



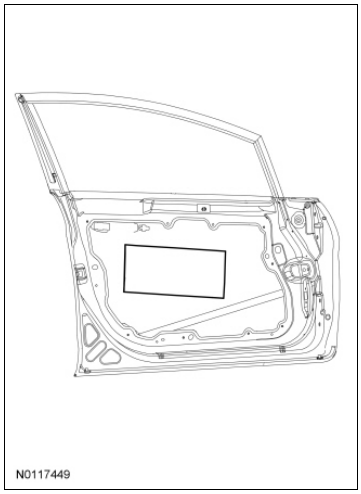
NVH Pads - Roof



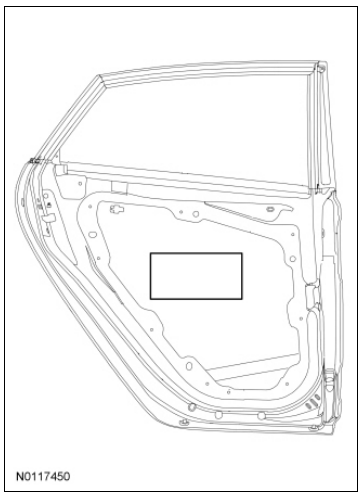
NVH Foam - Roof Bows



NVH Pad - Front Door



NVH Pad - Rear Door

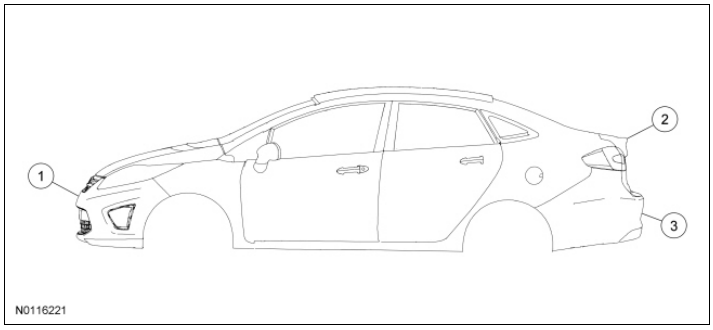


Plastic Components

⚠ 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.

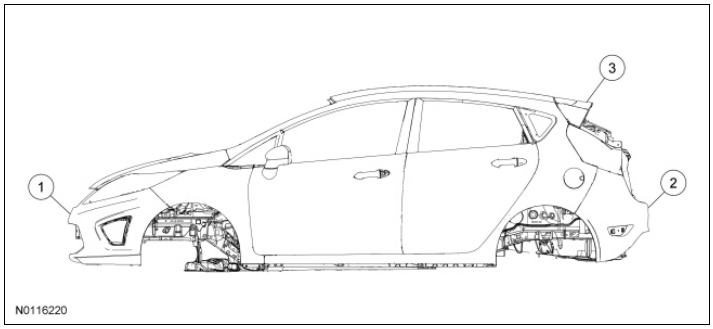
NOTE: The following illustration(s) are not all-inclusive of trim levels available. The actual trim level of the vehicle will determine the viability of carrying out a plastic repair.

Exterior Plastics - Painted, 4-Door Sedan



Item	Part Number	Description
1	17D957	Front bumper fascia - Thermoplastic Olefin (TPO)
2	5444210	Decklid spoiler - Acrylonitrile Butadiene Styrene (ABS)
3	17K835	Rear bumper fascia - TPO

Exterior Plastics - Painted, 5-Door Hatchback



Item	Part Number	Description			
1	17D957	Front bumper fascia - TPO			
2	17K835	Rear bumper fascia - TPO	3	5844210	Rear spoiler - ABS

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 Composite (SMC)

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, but not identical, to fiberglass. Ford Motor Company uses SMC in components such as fenders, hoods and liftgates.

Thermoplasticompounds

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.

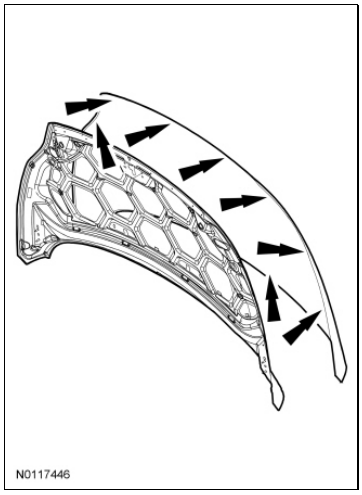
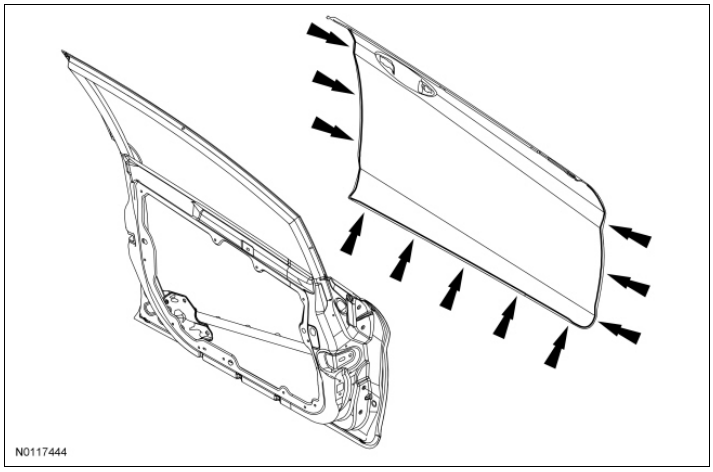
Polyolefin

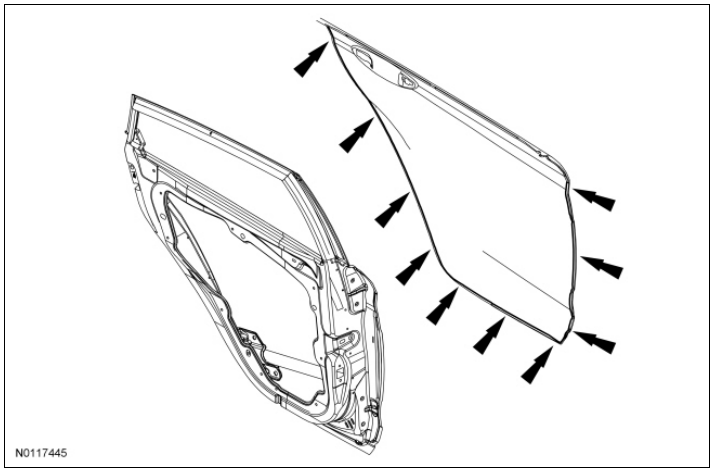
Polyolefins fall into the family of thermoplastics with one unique characteristic: an oily or waxy feel to the material when sanded or ground. Polyolefin lends itself very well to remolding through the use of heat. Because of this, components made of this material lend themselves well to the possibility of plastic welding. Most adhesive repair materials and paint will not bond to 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. Refer to Plastics Identification in this section.

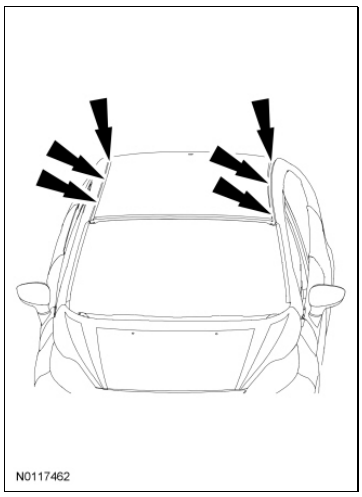
Adhesives

Material

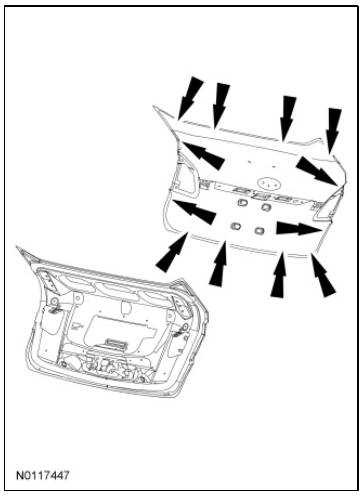
Item	Specification
Metal Bonding Adhesive TA-1	on and quantity. Do not place a new spot weld directly over an original weld location. Plug weld hole should equal 8 mm (0.31 in) diameter. **Hood Adhesive**  **Front Door Adhesive**  **Rear Door Adhesive**



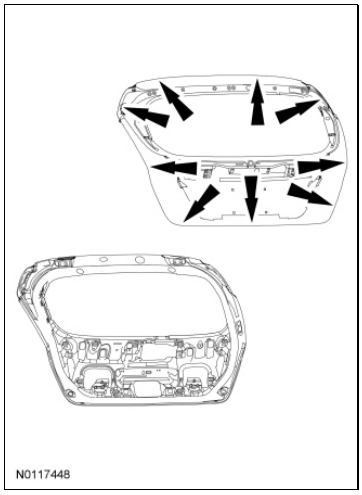
Roof Ditch Adhesive



Deck Lid Adhesive - 4-Door Sedan



Deck Lid Adhesive - 5-Door hback


N0117448

Sectioning Guidelines

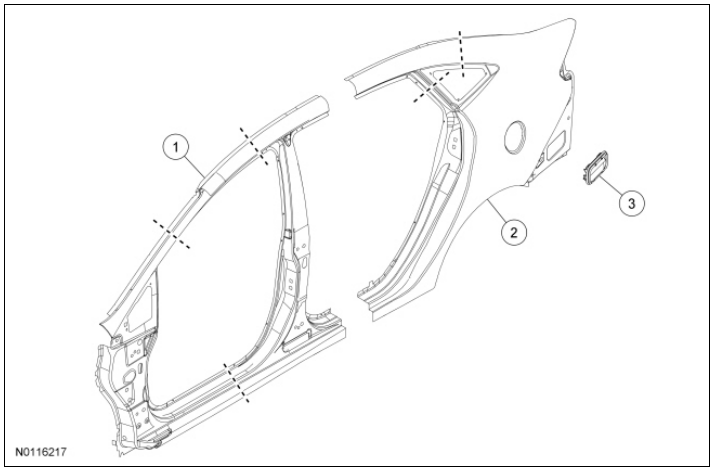
General Equipment

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

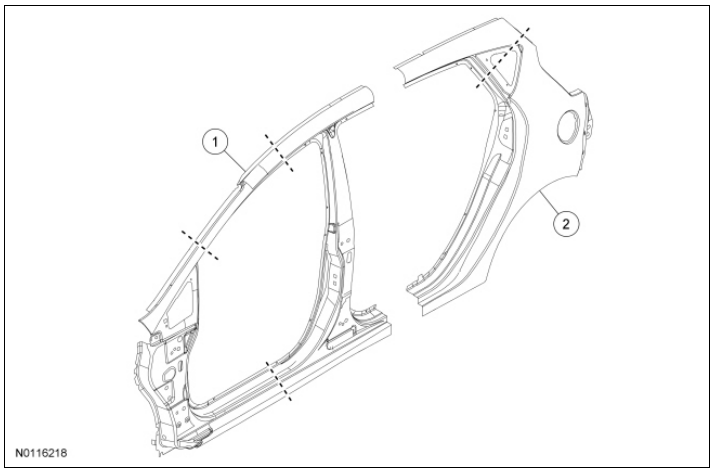
Item	Specification
Premium Undercoating ValuGardTM VG101, VG101A (aerosol)	-
Rust Inhibitor ValuGardTM VG104, VG104A (aerosol)	-
Seam Sealer TA-2	-

4-Door Sedan



Item	Part Number	Description
1	54211A10 (RH)/ 54211A11 (LH)	Door frame - mild steel
2	5427840 (RH)/ 5427841 (LH)	Body side panel - mild steel
3	54280B62	Outer air vent grille

5-Door Hatchback



Item	Part Number	Description
1	58211A10 (RH)/ 58211A11 (LH)	Door frame - mild steel
2	5827840 (RH)/ 5827841 (LH)	Body side panel - mild steel

⚠ 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: Do not carry out body side sectioning repairs in areas of laser welds. Factory laser welds cannot be duplicated with conventional welding equipment and structural integrity may be compromised. Failure to follow this instruction may result in serious injury to 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).

⚠ 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).

⚠ 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: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability

or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may contain damage which is not visible.

Ford does not approve use of the following:

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures approved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

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Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

1. **NOTE:** Observe prescribed welding procedures when carrying out repairs. 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.

   Detrim the vehicle as necessary and drill out the spot welds from the damaged area. Using an air chisel or reciprocating saw, cut off the portion of the panel to be replaced.

2. Where possible, create a backer piece using a portion of the old panel. This wl create a stronger joint.

3. When welding overlapping surfaces or substrates, apply a high quality weld-through primer between the surfaces prior to welding.
    - 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. Proceed with refinish procedures following Ford-approved paint guidelines.

5. Apply corrosion protection as necessary to 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 ValuGardTM VG101, VG101A (aerosol)	-
Rust Inhibitor ValuGardTM 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 deetal 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

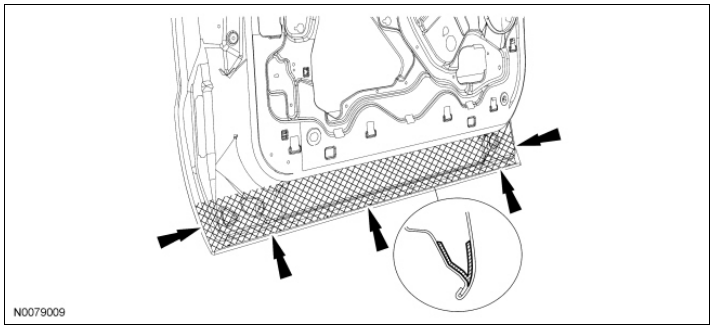
the trigger and wait 2-3 seconds and slowly pull the wand out of the access hole.
- The short, hook-shaped wand sprays in one direction and must be rotated to provide complete coverage.
- Apply the material in light mist coats.
- Material displaces moisture.

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.

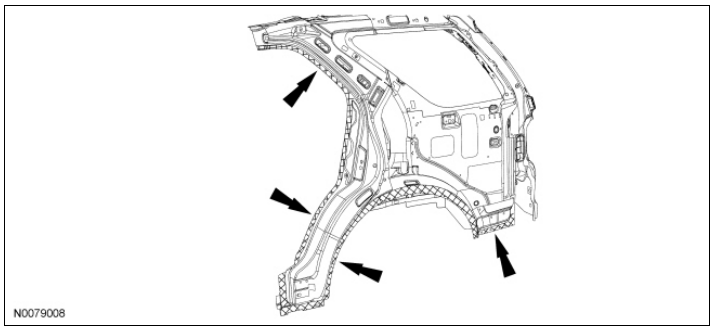
2. **NOTE:** Door assembly lower view.

   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.



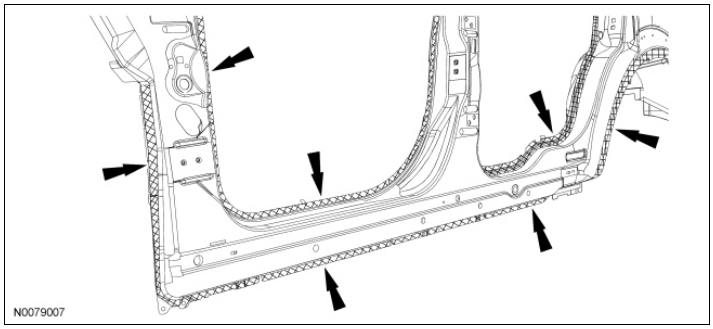
3. **NOTE:** Quarter panel inner view.

   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.

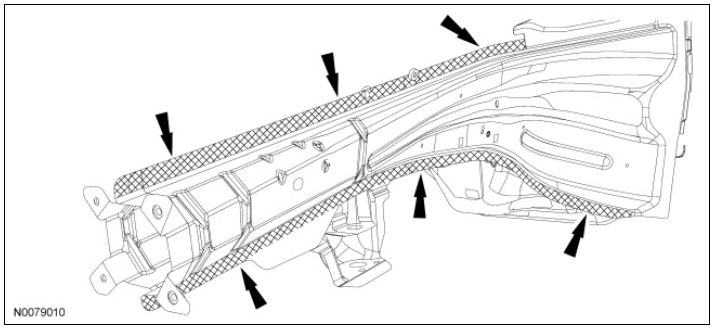
   Wire brush the area and make sure the surfaces are free of oil, dirt and other foreign material. Carry out the undercoating process in the following sequence.

   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.

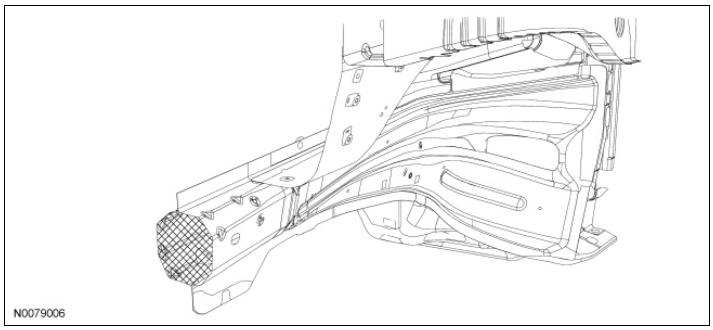
2. **NOTE:** Frame rail exterior spot-weld flange view.

   Apply undercoat material to the exterior exposed edges after carrying out the welding and refinishing process.



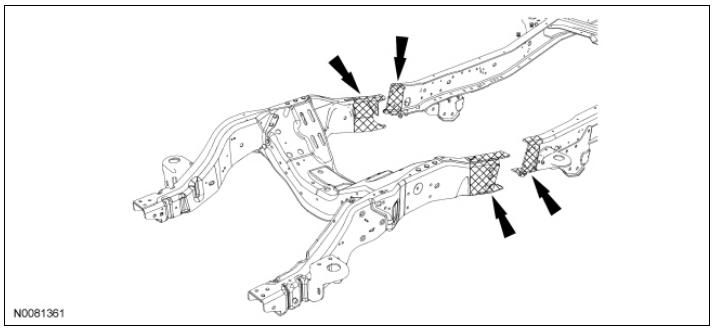
3. **NOTE:** Cross section view of typical unibody frame rail shown.

   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.



Refinishing - Environmental Damage

Material

Item	Specification
Motorcraft® Acid Neutralizer ZC-1-A	-
Motorcraft® Alkaline Neutralizer ZC-2-A	-
3MTM Perfect-ItTM 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 ng. 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.

Refinishing - Manufacturing Damage

Material

Item	Specification
3MTM Perfect-ItTM 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-neutralater.
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.

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 ValuGardTM 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.

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⚠ 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: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as

they may contain damage which is not visible.

Ford does not approve use of the following:

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures approved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

Ford Motor Company does not endorse, cannot attest to, and makes no representations regarding structural repairs (frames, rails, aprons and body panels) carried out using non-genuine Ford Motor Company parts or non-Ford-approved methods. In particular, Ford makes no representations that the vehicle will meet any crash safety or anti-corrosion performance requirement. Such parts and methods have not been tested by Ford, and may not meet Ford's requirements for safety, performance, strength, quality, durability and corrosion protection.

Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

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) ithe 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

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- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

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Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

⚠ 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.

Plastics Identification

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⚠ 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, Cycolac, 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.
        - ♦ Apply an open flame to the corner of the damaged component. If the material crystallizes and becomes hard, it is a thermosetting plastic.

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.

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 dryg.**

   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 primered 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 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

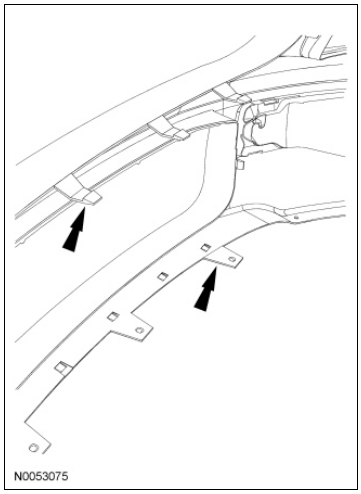
1. **NOTE:** Inspect the bumper cover to determine if part of it can be repaired to an acceptable level of quality of appearance, fit and durability. Will labor and material cost of the repair meet or exceed the cost of a new replacement bumper cover? If the bumper cover is determined to be repairable, 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.

Door Outer Panel - Front

Special Tool(s)

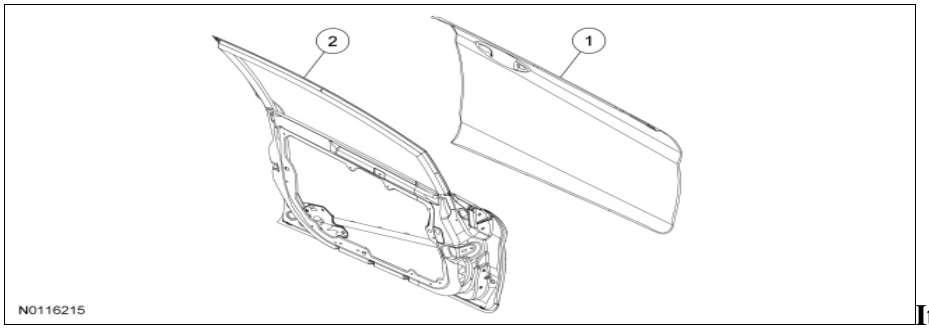
 ST1073-A	Heat Gun 107-R0300
 ST2956-A	Pro 230 MIG Welder 208-00030

Material

Item	Specification
Flexible Foam Repair Fusor® 121, or equivalent; obtain locally	-
Metal Bonding Adhesive TA-1	-
Rust Inhibitor ValuGardTM VG104, VG104A (aerosol)	-
Seam Sealer TA-2	-

Door Assembly - Front

NOTE: Door intrusion beam is constructed of boron steel and is non-serviceable.



ItemPart NumberDescription15420200 (RH)/ 5420201 (LH)Door outer panel - mild steel25420124 (RH)/ 5420125 (LH)Door shell - mild and boron steel

⚠ WARNING: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may contain damage which is not visible.

Ford does not approve use of the following:

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures oved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

Ford Motor Company does not endorse, cannot attest to, and makes no representations regarding structural repairs (frames, rails, aprons and body panels) carried out using non-genuine Ford Motor Company parts or non-Ford-approved methods. In particular, Ford makes no representations that the vehicle will meet any crash safety or anti-corrosion performance requirement. Such parts and methods have not been tested by Ford, and may not meet Ford's requirements for safety, performance, strength, quality, durability and corrosion protection.

Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

⚠ 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.

1. Inspect the door hinges prior to panel replacement. Install new or rebuild as necessary.

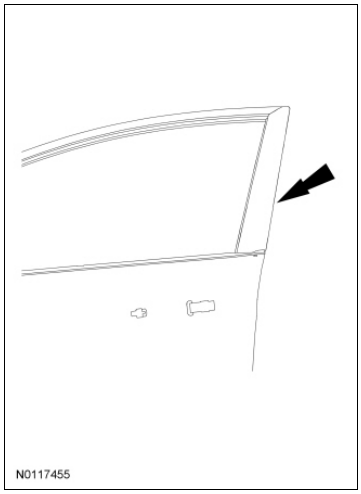
2. Remove the door window glass. For additional information, refer to Section 501-11 .

3. Remove the door. For additional information, refer to Section 501-03 .

4. Remove the door outer latch and outer door handle. For additional information, refer to Section 501-14 .

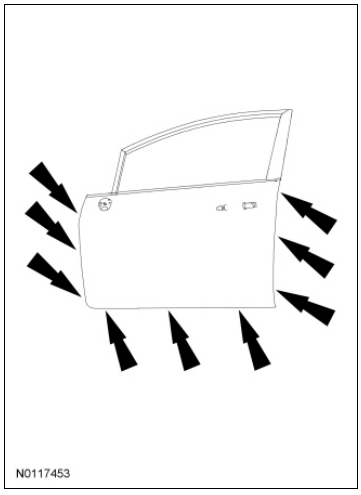
5. Remove the side view mirror. For additional information, refer to Section 501-09 .

6. Remove the door applique.



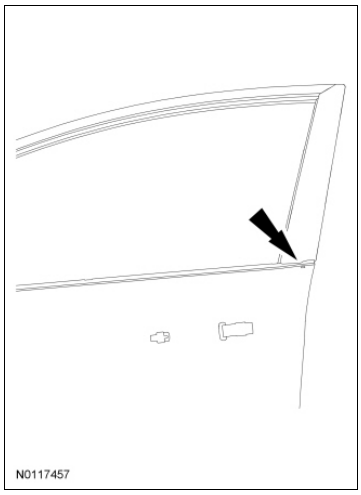
7. ***NOTICE:*** **To prevent damage to the mating surfaces of the door assembly, use extreme care to avoid cutting into the door shell.**

   Using a suitable grinder, grind along the perimeter of the outer door panel to separate the hem edges as indicated.



8. ***NOTICE:*** **Drill though the outer panel sheet metal only to avoid damage to the door assembly.**

   Carefully remove the tack weld at the upper rear of the outer door panel.



9. **NOTE:** The use of a heat gun may be required to soften the door panel adhesive.

   Prior to removing the outer door panel, use a sharp knife to cut the adhesive between the door shell and outer panel and the intrusion beam.

   - Using a flat-blade chisel or equivalent, remove the original panel.
   - Using a sharp knife or broad edge scraper, remove the remaining portion of the hem flange from the door shell.
   - Remove any remaining adhesive from the door shell flange.

Installation

1. Prepare the door shell assembly.
   - Grind clean all mating surfaces.
   - Dress any tack welds.

2. Prepare the service replacement outer door panel.
   - Sand clean all the mating surfaces of the replacement panel.
   - Apply a mastic sound-deadener patch (obtain locally) to the inner side of the replacement panel. For additional information, refer to Sound Deadeners and Insulators in this section.

3. **NOTE:** Hemming and alignment must be completed before the adhesive has begun to cure.

   Apply metal bonding adhesive to the replacement panel hem flange and position on the door shell and begin the hemming process.

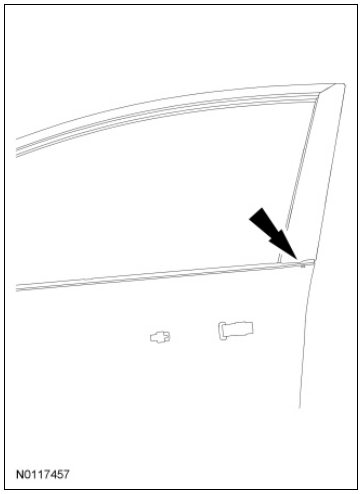
   - Using a door panel installation tool or the hammer and dolly method, close the door hem flange around the entire perimeter of the door and smooth any residual adhesive in the joints.

4. Fit the door assembly to the vehicle and assure correct alignment with the adjoining panels.

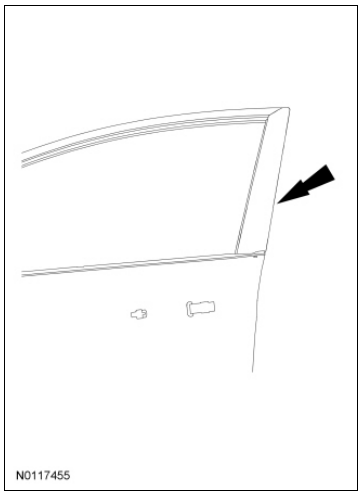
5. Clamp the upper front portion of the door outer panel to the door shell and allow adhesive to cure.

6. ⚠ **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.**

   Clamp the upper rear portion of the door outer panel to the door shell and apply a MIG tack weld where previously removed.



7. Remove the door assembly from the vehicle.
8. Apply flexible foam repair material between the door outer panel and the intrusion beam.
9. Sand and prime the flange area and apply a continuous bead of seam sealer to the entire door hem flange perimeter.
10. Prime and paint the door flange area using a Ford approved paint system.
11. Apply rust inhibitor to the inside of the door assembly to all hem flange areas. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.
12. Install the door on the vehicle. For additional information, refer to Section 501-03 and refinish using a Ford approved paint system.
13. Install the door latch and outer door handle. For additional information, refer to Section 501-14 .
14. Install the window glass. For additional information, refer to Section 501-11 .
15. Install the side view mirror. For additional information, refer to Section 501-09 .
16. Install a new door applique.



Door Outer Panel - Rear

Special Tool(s)

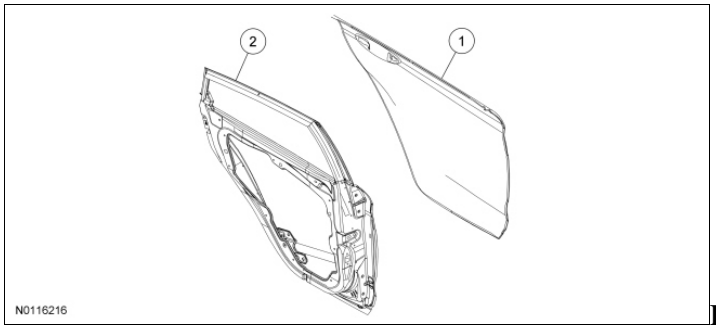
 ST1073-A	Heat Gun 107-R0300
 ST2956-A	Pro 230 MIG Welder 208-00030

Material

Item	Specification
Flexible Foam Repair Fusor® 121, or equivalent; obtain locally	-
Metal Bonding Adhesive TA-1	-
Rust Inhibitor ValuGardTM VG104, VG104A (aerosol)	-
Seam Sealer TA-2	-

Door Assembly - Rear

NOTE: Door intrusion beam is constructed of boron steel and is non-serviceable.



ItemPart NumberDescription15824700 (RH)/ 5825701 (LH)Door outer panel - mild steel25420124 (RH)/ 5420125 (LH)Door shell - mild and boron steel

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parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may contain damage which is not visible.

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    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
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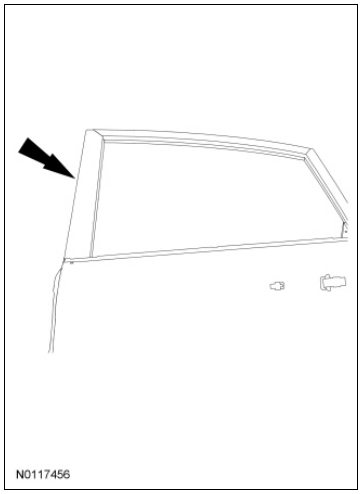
1. Inspect the door hinges prior to panel replacement. Install new or rebuild as necessary.

2. Remove the door window glass. For additional information, refer to Section 501-11 .

3. Remove the door. For additional information, refer to Section 501-03 .

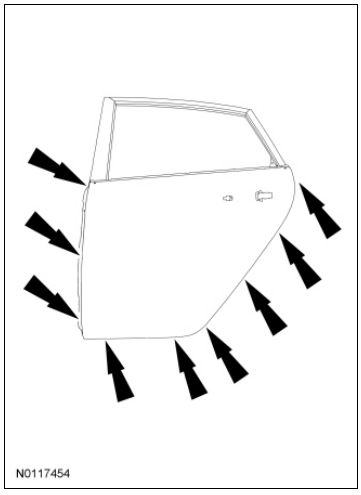
4. Remove the door outer latch and outer door handle. For additional information, refer to Section 501-14 .

5. Remove the door applique.

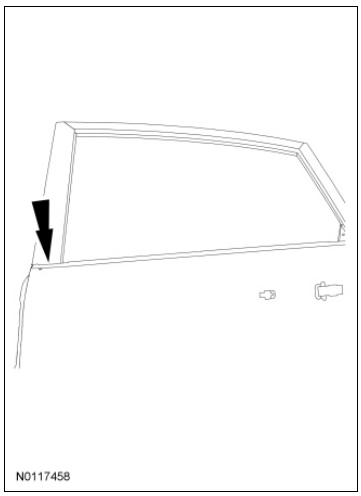


6. ***NOTICE:*** **To prevent damage to the mating surfaces of the door assembly, use extreme care to avoid cutting into the door shell.**

   Using a suitable grinder, grind along the perimeter of the outer door panel to separate the hem edges as indicated.



7. Carefully remove the tack weld at the upper front of the outer door panel.



8. **NOTE:** The use of a heat gun may be required to soften the door panel adhesive. Prior to removing the outer door panel, use a sharp knife to cut the adhesive between the door shell and outer panel and

the intrusion beam.

Remove the outer panel sheet metal.

- Using a flat-blade chisel or equivalent, remove the original panel.
- Using a sharp knife or broad edge scraper, remove the remaining portion of the hem flange from the door shell.
- Remove any remaining adhesive from the door shell flange.

Installation

1. Prepare the door shell assembly.
   - Grind clean all mating surfaces.
   - Dress any tack welds.

2. Prepare the service replacement outer door panel.
   - Sand clean all the mating surfaces of the replacement panel.
   - Apply a mastic sound-deadener patch (obtain locally) to the inner side of the replacement panel. For additional information, refer to Sound Deadeners and Insulators in this section.

3. **NOTE:** Hemming and alignment must be completed before the adhesive has begun to cure.

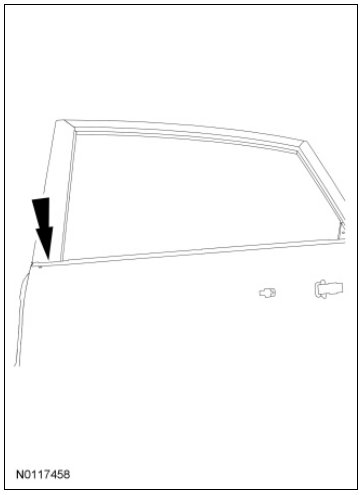
   Apply metal bonding adhesive to the replacement panel hem flange and position on the door shell and begin the hemming process.

   - Using a door panel installation tool or the hammer and dolly method, close the door hem flange around the entire perimeter of the door and smooth any residual adhesive in the joints

4. Fit the door assembly to the vehicle and assure correct alignment with the adjoining panels.

5. ⚠ **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.**

   Clamp the upper front portion of the door outer panel to the door shell and apply a MIG tack weld where previously removed.



6. Remove the door assembly from the vehicle.

7. Apply flexible foam repair material between the door outer panel and the intrusion beam.

8. Sand and prime the flange area and apply a continuous bead of seam sealer to the entire door hem flange perimeter.

9. Prime and paint the door flange area using a Ford approved paint system.

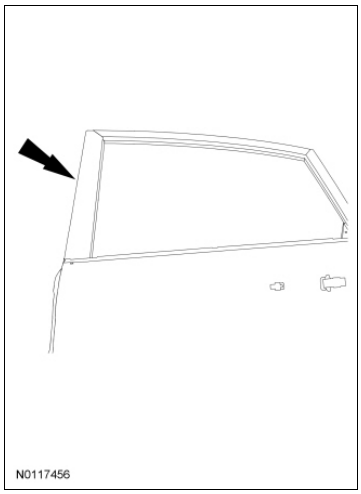
10. Apply rust inhibitor to the inside of the door assembly to all hem flange areas. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.

11. Install the door on the vehicle. For additional information, refer to Section 501-03 and refinish using a Ford approved paint system.

12. Install the door latch and outer door handle. For additional information, refer to Section 501-14 .

13. Install the window glass. For additional information, refer to Section 501-11 .

14. Install a new door applique.



Frame Members - Front

Special Tool(s)

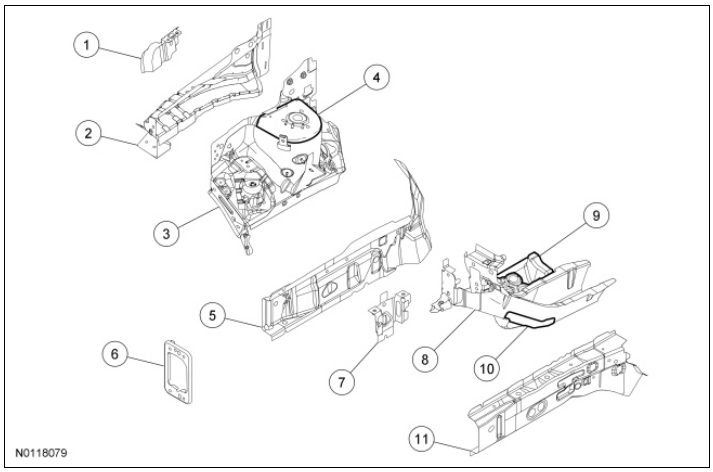
 ST2738-A	Heat Treatment Induction Resistance Spot Welder 254-00001
 ST2956-A	Pro 230 MIG Welder 208-00030

Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Premium Undercoating ValuGardTM VG101, VG101A (aerosol)	-
Rust Inhibitor ValuGardTM VG104, VG104A (aerosol)	-

Front Structure

NOTE: Right side fender reinforcements and apron shown, left side similar.



Item	Part Number	Description
1	16C078 (RH)/ 16C079 (LH)	Fender bracket - mild steel
2	16018 (RH)/ 16019 (LH)	Fender reinforcement, outer - HSLA 350 steel

3	16054 (RH)/ 16055 (LH)	Fender apron - mild steel
4	-	Strut tower (part of 16054/16055) - HSLA 300 steel
5	54010A88 (RH)/ 54101A89 (LH)	Frame rail, outer - Dual Phase Steel (DP) 600 steel
6	17B749 (RH)/ 17B750 (LH)	Bumper mounting bracket - mild steel HSLA 300 steel
7	-	Bracket (part of 54010A88/54101A89) - mild steel
8	-	Cowl top support (part of 16054/16055) - mild steel
9	-	Brace (part of 54010A88/54101A89 - HSLA 300 steel
10	-	Reinforcement (part of 54010A88/54101A89) - Dual Phase Steel (DP) 600 steel
11	5410008 (RH)/ 5410009 (LH)	Frame rail, inner - Dual Phase Steel (DP) 600 steel

⚠ 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: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may contain damage which is not visible.

Ford does not approve use of the following:

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures approved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

Ford Motor Company does not endorse, cannot attest to, and makes no representations regarding structural repairs (frames, rails, aprons and body panels) carried out using non-genuine Ford Motor Company parts or non-Ford-approved methods. In particular, Ford makes no representations that the vehicle will meet any crash safety or anti-corrosion performance requirement. Such parts and methods have not been tested by Ford, and may not meet Ford's requirements for safety, performance, strength, quality, durability and corrosion protection.

Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

⚠ WARNING: Frame rail crush zones absorb crash energy during a collision and must be replaced if damaged. Straighten damaged frame rails to correct frame dimensions prior to frame member sectioning. Failure to follow these instructions may adversely affect frame rail performance and may result in serious personal injury to vehicle occupant(s).

⚠ 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.

NOTICE: **A frame rail sectioning kit is not available for this vehicle. Frame rail replacement must be done at the factory seams. Failure to follow this direction will result in an incorrect repair and vehicle energy management will be compromised.**

1. Position the vehicle on a frame repair rack following the manufacturer's recommendations. Measure the vehicle to determine if the body requires rough straightening and alignment. For dimensional information, refer to Body in this section.

2. Remove the hood. For additional information, refer to Section 501-02 .

3. Remove the fender(s) from the affected side(s). For additional information, refer to Section 501-02 .

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

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

6. Remove the front strut from the affected side of the vehicle. For additional information, refer to Section 204-01 .

7. Remove the engine mount from the affected side of the vehicle. For additional information, refer to Section 303-01 .

8. Remove the subframe. For additional information, refer to Section 502-00 .

9. Disconnect and position aside the Anti-Lock Brake System (ABS) sensor wire.

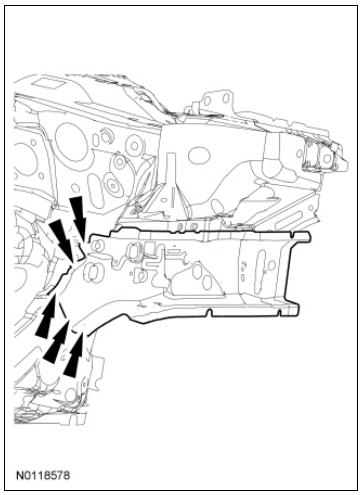
10. **NOTE:** Use care not to drill through to fender apron or A-pillar when removing the frame rail.

    Carefully drill out the spot welds and remove the outer frame rail.



11. **NOTE:** Use care not to drill through to fender apron or A-pillar when removing the frame rail.

    Carefully drill out the spot welds and remove the inner frame rail.



12. Dress any plug weld nuggets on the vehicle underbody structure resulting from inner or outer rail removal.

Installation

1. **NOTE:** Factory spot welds may 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.

   Apply a locally available weld-through primer only to the immediate weld locations of the inner and outer frame rails.

2. Install and clamp the service replacement inner frame rail in place. Tack weld and verify correct alignment of the frame rail.

3. **NOTE:** Factory spot welds may 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.

   Install and clamp the service replacement outer frame rail in place.

- Verify correct alignment of the outer frame rail.

4. Using a MIG welder or resistance spot welder, plug weld along the top and bottom seam of the service replacement rails.

5. Use a dye penetrant or equivalent to determine if any cracks or large voids exist, grind out any defects that exist and repair until the weld is free of defects.
   - Dress welds as necessary.

6. Apply corrosion protection. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.

7. MIG plug weld or resistance spot weld a new front bumper reinforcement mounting plate to the front frame rail assembly.

8. Install the subframe. For additional information, refer to Section 502-00 .

9. Install the engine mount from the affected side of the vehicle. For additional information, refer to Section 303-01 .

10. Install the front strut. For additional information, refer to Section 204-01 .

11. Connect the Anti-Lock Brake System (ABS) sensor wire.

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

13. Install the fender(s). For additional information, refer to Section 501-02 .

14. Install the front bumper cover and reinforcement. For additional information, refer to Section 501-19 .

15. Install the hood. For additional information, refer to Section 501-02 .

Frame Members - Rear

Special Tool(s)

 ST2738-A	Heat Treatment Induction Resistance Spot Welder 254-00001
 ST2956-A	Pro 230 MIG Welder 208-00030

Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Premium Undercoating ValuGardTM VG101, VG101A (aerosol)	-
Rust Inhibitor ValuGardTM VG104, VG104A (aerosol)	-

⚠ WARNING: Frame rail crush zones absorb crash energy during a collision and must be replaced if damaged. Straighten damaged frame rails to correct frame dimensions prior to frame meng. Failure to follow these instructions may adversely affect frame rail performance and may result in serious personal injury to vehicle occupant(s).

⚠ 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: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may contain damage which is not visible.

Ford does not approve use of the following:

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles

- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures approved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

Ford Motor Company does not endorse, cannot attest to, and makes no representations regarding structural repairs (frames, rails, aprons and body panels) carried out using non-genuine Ford Motor Company parts or non-Ford-approved methods. In particular, Ford makes no representations that the vehicle will meet any crash safety or anti-corrosion performance requirement. Such parts and methods have not been tested by Ford, and may not meet Ford's requirements for safety, performance, strength, quality, durability and corrosion protection.

Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

⚠ **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.**

NOTICE: **Because of component composition (Dual Phase Steel (DP) 600 steel) a frame rail sectioning kit is not available for this vehicle. Frame rail replacement must be carried out by replacement at the factory seams.**

1. Position the vehicle on a frame repair rack following the manufacturer's recommendations. Measure the vehicle to determine if the body requires rough straightening and alignment. For dimensional information, refer to Body in this section.

2. Remove the rear bumper cover and reinforcement. For additional information, refer to section Section 501-19 .

3. Remove the rear wheels. For additional information, refer to section Section 204-04 .

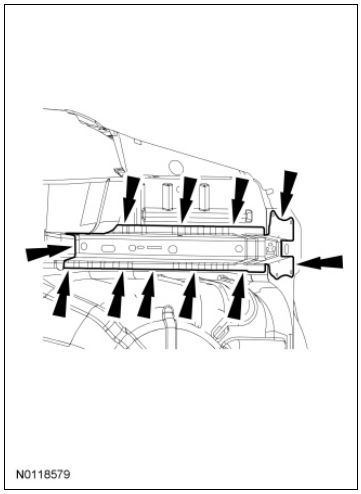
4. Remove the rear axle. For additional information, refer to section Section 204-02 .

5. LH side only. Remove the fuel fill assembly. For additional information, refer to section Section 310-01 .

6. **NOTE:** Use caution not to drill through the vehicle floor pan when removing spot welds.

   NOTE: LH side shown. RH side similar.

   Carefully remove the spot welds and the rear frame rail.



Installation

1. Dress all spot weld nuggets on the vehicle mating surfaces.

2. **NOTE:** Factory spot welds may 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.

   Drill plug weld holes in the replacement rear frame rail service part.

3. Apply a locally available weld-through primer to the immediate weld location only on the replacement part and vehicle mating surfaces.

4. Install and clamp the service replacement rear frame rail in place and verify correct alignment of the frame rail.

5. Using a MIG welder or resistance spot welder, plug weld the service replacement rail.

6. Apply corrosion protection. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.

7. Install a new rear bumper mounting plate.

8. LH side only. Install the fuel fill assembly. For additional information, refer to section Section 310-01 .

9. Install the rear axle. For additional information, refer to section Section 204-02 .

10. Install the rear wheels. For additional information, refer to section Section 204-04 .

11. Install the rear bumper cover and reinforcement. For additional information refer to section Section 501-19 .

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

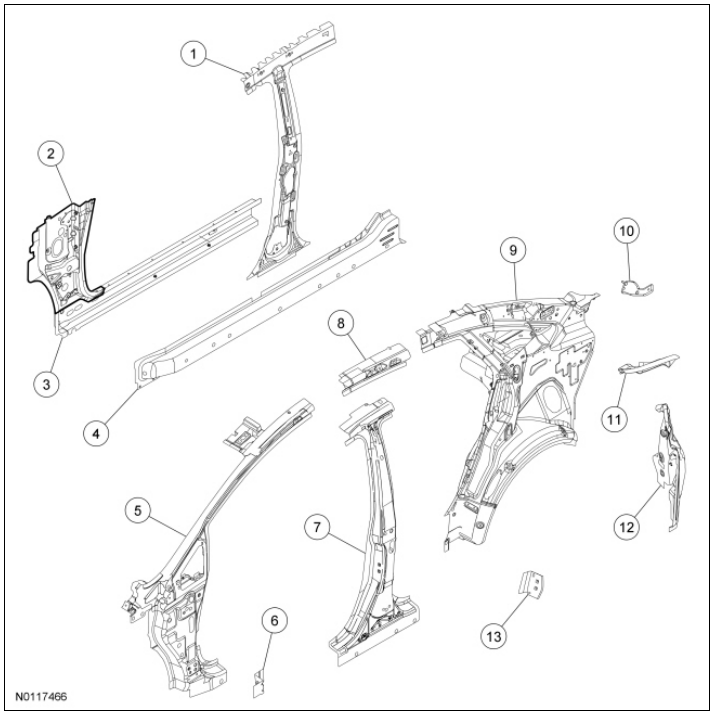
Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Premium Undercoating ValuGardTM VG101, VG101A (aerosol)	-
Rust Inhibitor ValuGardTM VG104, VG104A (aerosol)	-
Seam Sealer TA-2	-

4-Door Sedan

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 structural integrity of the vehicle.**

NOTE: Refer to the steel repairability matrix chart in the Specifications portion of this section for specific information regarding steel descriptions.

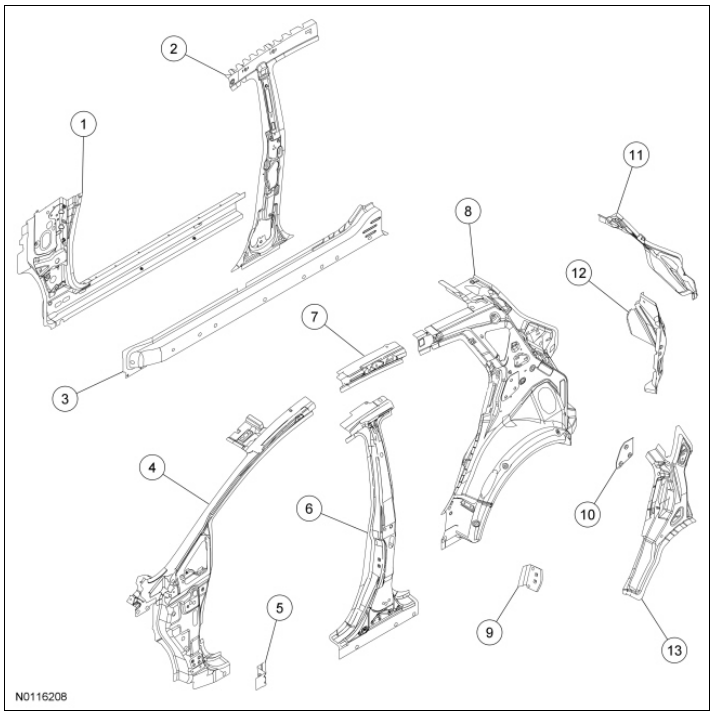


Item	Part Number	Description
1	5424300 (RH)/ 5424301 (LH)	B-pillar inner- boron steel
2	-	Cowl side panel, inner (part of 5402038/5402039) - Dual Phase Steel (DP) 600 steel
3	5402038 (RH)/ 5402039 (LH)	Cowl side panel, inner - DP 350 steel
4	5410116 (RH)/ 5410117 (LH)	Rocker panel reinforcement - DP 780 steel
5	5402500 (RH)/ 5402501 (LH)	A-pillar reinforcement- boron steel
6	54272A12 (RH)/ 54272A13 (LH)	Door check mounting bracket- mild steel
7	5424382 (RH)/ 5424383 (LH)	B-pillar reinforcement- boron steel
8	54513A06 (RH)/ 54513A07 (LH)	Upper body reinforcement- HSLA 350 steel
9	5427790 (RH)/ 5427791 (LH)	Quarter panel and wheelhouse - HSLA 350 steel
10	5444822 (RH)/ 5444823 (LH)	Hinge - mild steel
11	5445114 (RH)/ 5445115 (LH)	Luggage compartment drain trough - mild steel
12	13A418A (RH)/ 13A418B (LH)	Rear lamp closing panel - mild steel
13	54250A06 (RH)/ 54250A07 (LH)	Support plate - mild steel

5-Door Hatchback

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 structural integrity of the vehicle.**

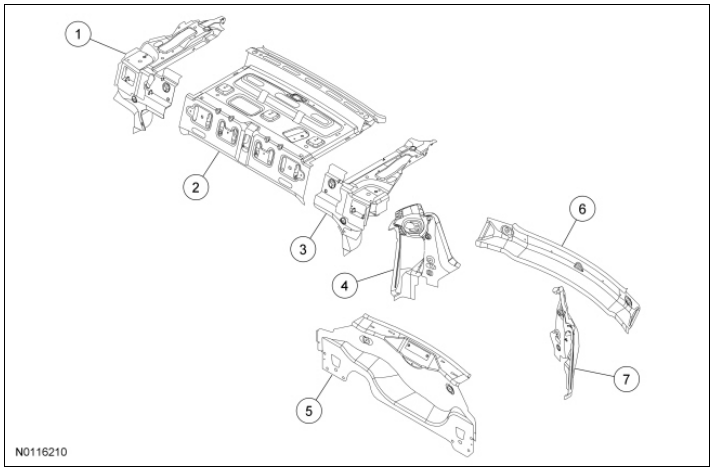
NOTE: Refer to the steel repairability matrix chart in the Specifications portion of this section for specific information regarding steel descriptions.



Item	Part Number	Description
1	5402038 (RH)/ 5402039 (LH)	Cowl side panel, inner - HSLA 350 steel
2	5424300 (RH)/ 5424301 (LH)	B-pillar - boron steel
3	5410116 (RH)/ 5410117 (LH)	Rocker panel reinforcement - DP 350 steel
4	5402500 (RH)/ 5402501 (LH)	A-pillar reinforcement - boron steel
5	54272A12 (RH)/ 54272A13 (LH)	Door check mounting bracket - mild steel
6	5424382 (RH)/ 5424383 (LH)	B-pillar reinforcement - boron steel
7	58513A06 (RH)/ 58513A07 (LH)	Upper body reinforcement - HSLA 350 steel
8	5827790 (RH)/ 5827791 (LH)	Quarter panel and wheelhouse, inner - HSLA 350 steel
9	54250A06 (RH)/ 54250A07 (LH)	Support plate - mild steel
10	58613A63 (LH only)	Bracket - mild steel
11	5845114	Luggage compartment drain trough - mild steel

12	5845115	Luggage compartment drain trough - mild steel
13	-	Quarter panel and wheelhouse reinforcement, inner (part of 5827790/5827791 - HSLA 350 steel

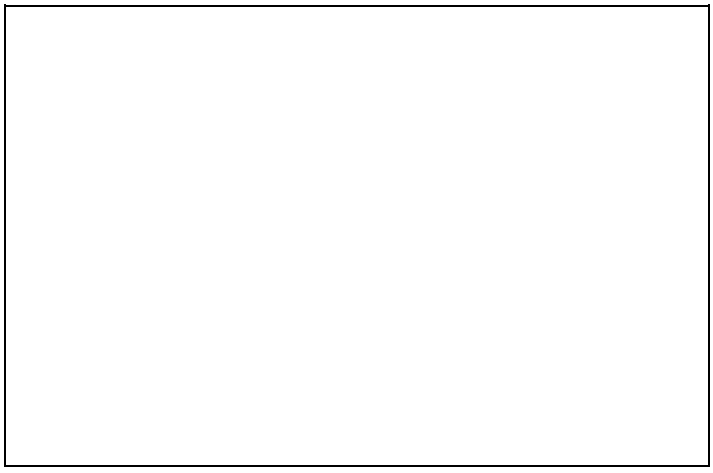
Package Tray Assembly - 4-Door Sedan



Item	Part Number	Description
1	5446774	Reinforcement - mild steel
2	5446506	Package tray - mild steel
3	5446775	Reinforcement - mild steel
4	13A418A	Rear lamp closing panel - mild steel
5	5440320	Back panel - mild steel
6	5440338	Reinforcement - mild steel
7	13A418B	Rear lamp closing panel - mild steel

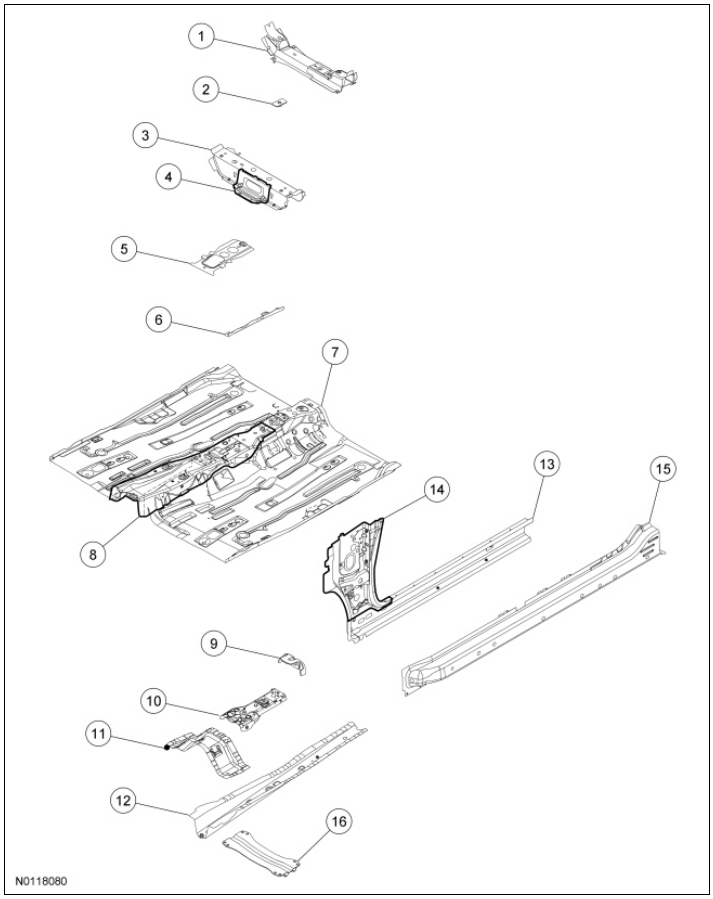
Front Structure

NOTE: Right side fender reinforcements and apron shown, left side similar.



Item	Part Number	Description
1	16C078 (RH)/ 16C079 (LH)	Fender bracket - mild steel
2	16018 (RH)/ 16019 (LH)	Fender reinforcement, outer - HSLA 350 steel
3	16054 (RH)/ 16055 (LH)	Fender apron - mild steel
4	-	Strut tower (part of 16054/16055) - HSLA 300 steel
5	54010A88 (RH)/ 54101A89 (LH)	Frame rail, outer - Dual Phase Steel (DP) 600 steel
6	17B749 (RH)/ 17B750 (LH)	Bumper mounting bracket - mild steel HSLA 300 steel
7	-	Bracket (part of 54010A88/54101A89) - mild steel
8	-	Cowl top support (part of 16054/16055) - mild steel
9	-	Brace (part of 54010A88/54101A89 - HSLA 300 steel
10	-	Reinforcement (part of 54010A88/54101A89) - Dual Phase Steel (DP) 600 steel
11	5410008 (RH)/ 5410009 (LH)	Frame rail, inner - Dual Phase Steel (DP) 600 steel

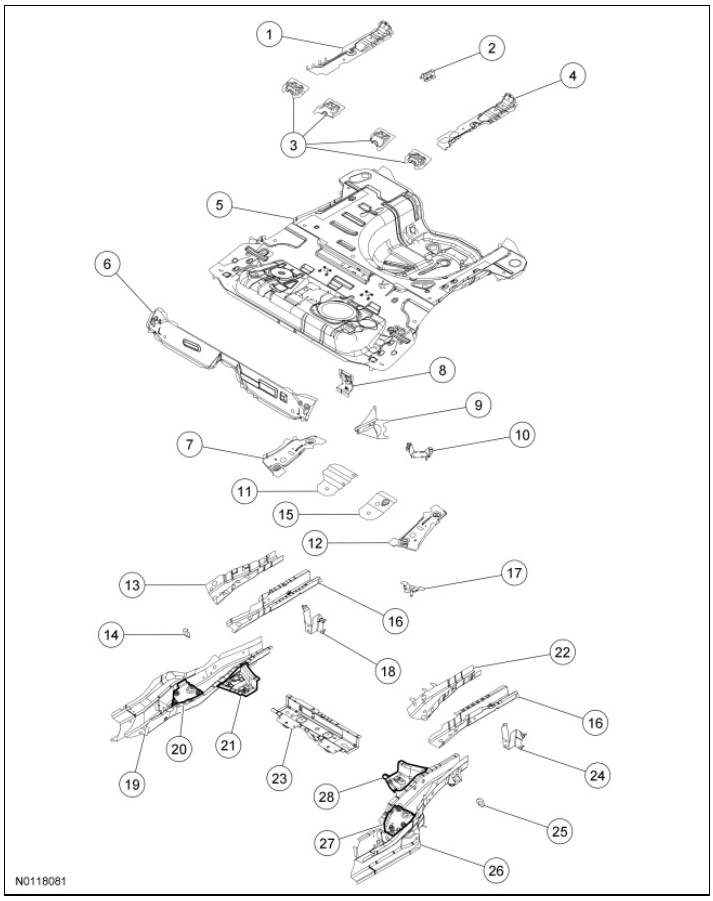
Underbody - Front Floor



Item	Part Number	Description
1	5410776A (RH)/ 5410776B (LH)	Crossmember - DP 600 steel
2	5862570	seat mounting bracket - Bake Hardened Steel (BH) 210 steel
3	5410672 (RH)/ 5410673 (LH)	Crossmember - front, upper - DP 600 steel
4	-	Bracket (part of 5410672/5410673) - mild steel
5	54111A46	Gusset (2 required) - HSLA 300 steel
6	54106A96 (RH)/ 54106A97 (LH)	Floor side member - mild steel
7		
8	-	Floor tunnel (part of 5411135) - HSLA 300 steel
9	2A697	Parking brake cable guide - mild steel
10	2L624	Parking brake cable reinforcement - mild steel
11	54111K48	Reinforcement - DP 780 steel
12	5410062	Side member extension (2 required) - DP 780 steel
13	5402038 (RH)/ 5402039 (LH)	Cowl side panel, inner - DP 780 steel
14	-	Cowl side panel, inner (part of 5402038/5402039 - DP 600 steel

15	5410116 (RH)/ 5410117 (LH)	Rocker panel reinforcement - DP 780 steel
16	58108K38	Crossmember - mild steel

Underbody - Rear Floor



Item	Part Number	Description
1	-	Brace (part of 5411215) - mild steel DP 600 steel
2	5447076	Bracket - mild steel
3	-	Gusset - mild steel
4	-	Brace (part of 5411215) - DP 600 steel
5	5411215	Floor pan - mild steel
6	-	Reinforcement (part of 5411215) - HSLA 300 steel
7	-	Reinforcement (part of 5411215) - HSLA 300 steel
8	-	Bracket (part of 5411215) - mild steel
9	-	Reinforcement (part of 5411215) - mild steel
10	-	Bracket (part of 5411215) - mild steel
11	-	Bracket (part of 5411215)="top">
12	-	

				Bracket (part of 5411215) - HSLA 300 steel
13	5410125	Floor side member - HSLA 300 steel		
14	2082	Bracket (2 required) - mild steel BH 210 steel		
15	-	Bracket (part of 5411215) - mild steel		
16	5410456 (RH)/ 5410457 (LH)	Side member - DP 600 steel		
17	9N077U (4-door)/ 9N077A (5-door)	Fuel tank bracket - mild steel		
18	17A750A	Bumper mounting bracket - DP 600 steel		
19	5410124 (4-door)/ 5810124 (5-door)	Floor side member - DP 600 steel		
20	-	Reinforcement (part of 5410124/5810124) - BH 240 steel		
21	-	Bracket (part of 5410124/5810124) - HSLA 250 steel		
22	-	Reinforcement (part of 5410124/5410125/5810124/5810125) - BH 240 steel		
23	4K338	Crossmember - HSLA 300 steel		
24	17A750A	Bumper mounting bracket - mild steel DP 600 steel		
25	2082	Bracket - BH 210 steel		
26	5410125 (4-door)/ 5810125 (5-door)	Floor side member - DP 600 steel		
27	-	Reinforcement (part of 5410125/5810125) - DP 600 steel		
28	-	Bracket part of 5410125/5810125 - HSLA 250 steel		

WARNING: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may contain

damage which is not visible.

Ford does not approve use of the following:

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures approved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

Ford Motor Company does not endorse, cannot attest to, and makes no representations regarding structural repairs (frames, rails, aprons and body panels) carried out using non-genuine Ford Motor Company parts or non-Ford-approved methods. In particular, Ford makes no representations that the vehicle will meet any crash safety or anti-corrosion performance requirement. Such parts and methods have not been tested by Ford, and may not meet Ford's requirements for safety, performance, strength, quality, durability and corrosion protection.

Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

⚠ 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: 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).

⚠ WARNING: Do not carry out body side sectioning repairs in areas of laser welds. Factory laser welds cannot be duplicated with conventional welding equipment and structural integrity may be compromised. Failure to follow this instruction may result in serious injury to 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).

⚠ 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).

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.

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.

2. **NOTE:** Observe prescribed welding procedures when carrying out repairs. 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.

   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 a high quality weld-through primer between the surfaces prior to welding.
   - 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. Clean metal surfaces with metal surface prep or equivalent applying seam sealer.

4. Proceed with refinish procedures following Ford-approved paint guidelines.

5. Apply corrosion protection as necessary to repair area.

Roof Panel - 4-Door Sedan

Special Tool(s)

 ST1073-A	Heat Gun 107-R0300
 ST2738-A	Heat Treatment Induction Resistance Spot Welder 254-00001
 ST2956-A	Pro 230 MIG Welder 208-00030

Material

Item	Specification
Metal Bonding Adhesive TA-1	-
Flexible Foam Repair Fusor® 121, or equivalent; obtain locally	-
Seam Sealer TA-2	-

Roof Panel - Exploded View

.

Item	Part Number	Description
1	5450202B	Roof panel with sunroof - mild steel
2	5450202A	Roof panel without sunroof - mild steel
3	5403410	Windshield header panel - HSLA 350 steel
4	5451272	Roof bow without sunroof only - HSLA 350 steel
5	5842220	Rear roof rail - mild steel

Removal and Installation

⚠ WARNING: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipmcannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may

contain damage which is not visible.

Ford does not approve use of the following:

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures approved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

Ford Motor Company does not endorse, cannot attest to, and makes no representations regarding structural repairs (frames, rails, aprons and body panels) carried out using non-genuine Ford Motor Company parts or non-Ford-approved methods. In particular, Ford makes no representations that the vehicle will meet any crash safety or anti-corrosion performance requirement. Such parts and methods have not been tested by Ford, and may not meet Ford's requirements for safety, performance, strength, quality, durability and corrosion protection.

Ford Motor Company bears no responsibility or liability of any kind if repairs are performed using alternative structural component repair procedures and/or parts.

⚠ 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: 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: **Be sure to adequately protect all glass, exterior finish and interior trim to avoid surface contamination from repair materials.**

NOTE: The driver and passenger sides of the roof panel are laser skip-welded. Installation of a new roof panel will employ a weld-bonding technique. The use of mechanical welding and chemical bonding are both part of the installation technique.

1. Remove and discard the roof ditch mouldings.

2. Remove the windshield. For additional information, refer to Section 501-11 .

3. Remove the rear window. For additional information, refer to Section 501-11 .

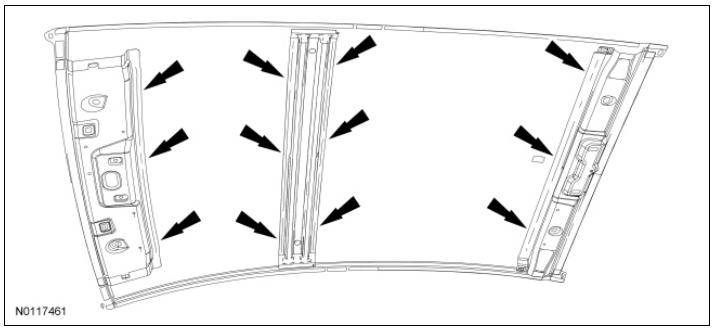
4. Remove the headliner. For additional information, refer to Section 501-05 .

5. Remove the side air curtains. For additional information, refer to Section 501-20B .

6. Remove the antenna. For additional information, refer to Section 415-00 .

7. Remove the sun roof (If equipped). For additional information, refer to Section 501-17 .

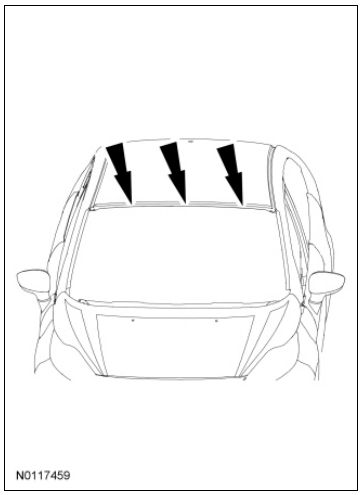
8. From inside the vehicle, leaving as much of the foam as possible intact, separate the Noise, Vibration and Harshness (NVH) foam along the front and rear header panels and roof bow (if equipped) from the roof panel using a flexible and sharp broad scraper or knife.



9. ***NOTICE:*** **Drill through the outer panel sheet metal only to avoid damage to the header panel assembly.**

   NOTE: Note the location and quantity of the spot welds to assist in installation of the new roof panel.

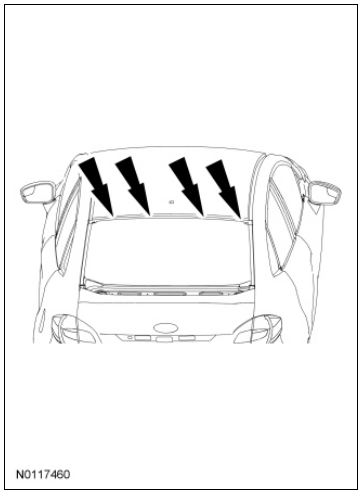
   Remove the windshield header panel spot welds.



10. ***NOTICE:*** **Drill through the outer panel sheet metal only to avoid damage to the header panel assembly.**

    NOTE: Note the location and quantity of the spot welds to assist in installation of the new roof panel.

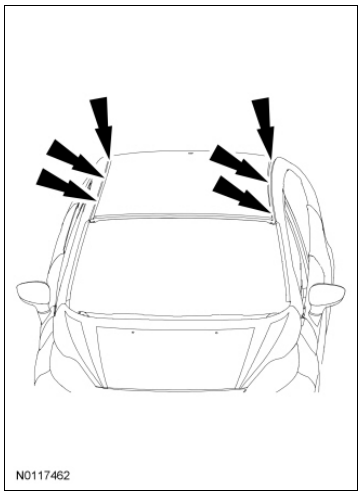
    Remove the rear header panel spot welds.



11. *NOTICE:* **Drill through the outer panel sheet metal only to avoid damage to the body side panel assembly.**

    NOTE: Note the location and quantity of the spot welds to assist in installation of the new roof panel.

    Remove the roof ditch spot welds.



12. Remove the roof panel from the vehicle.

Installation

1. Using a suitable disc grinder, clean out any remaining seam sealer and paint along the roof ditch mating surface.
2. Dress any spot weld nuggets in the roof ditch as well as the front and rear header panel mating surfaces.
3. Using the hammer and dolly method, straighten any damage caused to the mating surfaces on the vehicle during panel removal.
4. Inspect the windshield header panel, roof bow and rear header panel. Repair or replace as required.
5. Position the service replacement roof panel on the vehicle.
6. Correctly align and index mark the positioning of the panel-to-vehicle and remove the panel.

7. **NOTE:** Spot welds can be replaced with MIG plug welds. Plug welds should equal resistance spot welds in both location and quantity. Do not place a new spot or plug weld directly over an original weld location.

   Prepare the roof panel for installation:

   - If Metal Inert Gas (MIG) plug welding, drill 8 mm (0.314 in) holes along the front and rear header panel flanges.
   - If Squeeze-Type Resistance Spot Welding (STRW), remove the e-coat only in the exact locations for spot welds along the front and rear header panels flanges.

8. Remove the e-coat on the roof ditch mating surface of the service replacement roof panel.

9. Apply a bead of metal bonding adhesive on the front and rear header panels and roof bow (if equipped) and to the body side-to-roof panel flange area. Immediately reinstall the roof panel aligning it to the index marks made during test fitting.

10. Make sure good contact is made with the adhesive. Clamp the roof panel on all sides and smooth out any residual adhesive in the joints.

11. Resistance spot weld or MIG plug weld the roof panel to the front and rear header panels and allow the adhesive to cure.

12. Inspect header panels and roof bow (if equipped) to roof panel adhesive mating surfaces. If good contact is not apparent, apply flexible foam material for NVH purposes.

13. **NOTE:** Always use refinishing materials from a single paint manufacturer. Combining products from more than one manufacturer may result in refinishing material incompatibility issues and potential void of warranty for each product applied.

    Sand and prime the roof ditch repair and apply a continuous bead of seam sealer to the roof ditch area joints.

14. Refinish the entire repair area using a Ford approved refinishing system.

15. Install the side air curtains. For additional information, refer to Section 501-20B .

16. Install the sun roof (if equipped). For additional information, refer to Section 501-17 .

17. Install the antenna. For additional information, refer to Section 415-00 .

18. Install the headliner. For additional information, refer to Section 501-05 .

19. Install the windshield and rear window. For additional information, refer to Section 501-11 .

20. Install new roof ditch mouldings.

Roof Panel - 5-Door Hatchback

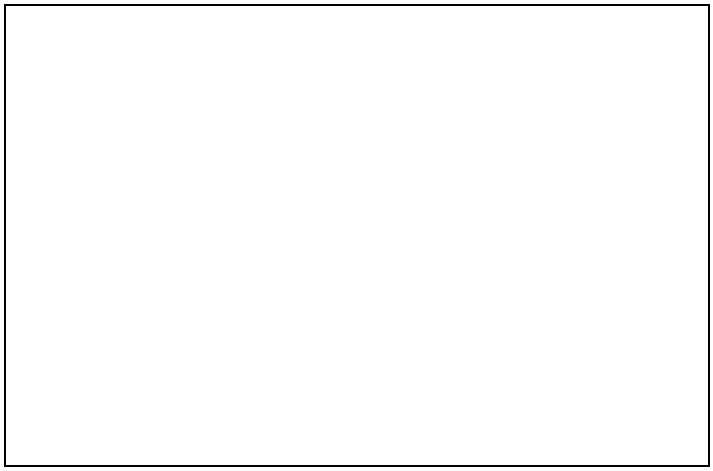
Special Tool(s)

 ST1073-A	Heat Gun 107-R0300
 ST2738-A	Heat Treatment Induction Resistance Spot Welder 254-00001
 ST2956-A	Pro 230 MIG Welder 208-00030

Material

Item	Specification
Flexible Foam Repair Fusor® 121, or equivalent; obtain locally	-
Metal Bonding Adhesive TA-1	-
Seam Sealer TA-2	-

Roof Panel - Exploded View



Item	Part Number	Description
1	5850202A	Roof panel with sunroof - mild steel
2	5850202B	Roof panel without sunroof - mild steel

3	5403410	Windshield header panel - mild steel
4	5451272	Roof bow without sunroof only - mild steel High-Strength Low Alloy (HSLA) 350 steel
5	5442220	Rear roof rail - mild steel

Removal and Installation

⚠ WARNING: Never install used or reconditioned parts (as specified below) from pre-owned, salvaged or damaged vehicles. The use of such parts could lead to serious injury.

Never use non-Ford parts or accessories for completing repairs.

Ford Motor Company does not approve or recognize body and structural repair procedures, tools, parts or anything but new genuine Ford equipment. Ford cannot attest to the safety, quality, durability or legality of non-Ford parts or accessories. Use of such parts could lead to serious personal injury as they may contain damage which is not visible.

Ford does not approve use of the fo

- Salvaged or used parts
- Major body clips or assemblies from salvage vehicles
- Aftermarket structural or body components
- Salvaged or reconditioned wheels
- Used supplemental restraint system (SRS) components
    - ♦ air bags
    - ♦ restraint system modules
    - ♦ safety belts, buckles or retractors
    - ♦ crash sensors

Returning a vehicle to pre-accident condition can only be assured if repair procedures are carried out by skilled technicians using new genuine Ford parts and Ford-approved methods. Structural component repair procedures approved by Ford, using genuine Ford parts, have been validated by Ford Motor Company engineers.

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⚠ 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.

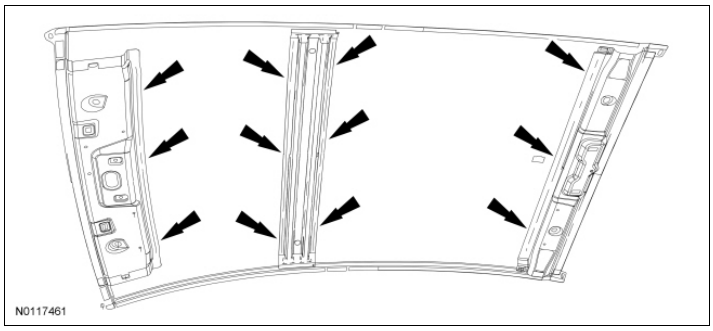
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⚠ WARNING: Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

NOTICE: **Be sure to adequately protect all glass, exterior finish and interior trim to avoid surface contamination from repair materials.**

NOTE: The driver and passenger sides of the roof panel are laser skip-welded. Installation of a new roof panel will employ a weld-bonding technique. The use of mechanical welding and chemical bonding are both part of the installation technique.

1. Remove the spoiler. For additional information, refer to Section 501-08 .
2. Remove and discard the roof ditch mouldings.
3. Remove the windshield. For additional information, refer to Section 501-11 .
4. Remove the rear luggage compartment lid. For additional information, refer to Section 501-03 .
5. Remove the headliner. For additional information, refer to Section 501-05 .
6. Remove the side air curtains. For additional information, refer to Section 501-20B .
7. Remove the antenna. For additional information, refer to Section 415-00 .
8. Remove the sun roof (if equipped). For additional information, refer to Section 501-17 .
9. From inside the vehicle, leaving as much of the foam as possible intact, separate the Noise, Vibration and Harshness (NVH) foam along the front and rear header panels and roof bow (if equipped) from the roof panel using a flexible and sharp broad scraper or knife.



10. ***NOTICE:*** **Drill through the outer panel sheet metal only to avoid damage to the header panel assembly.**

    NOTE: Note the location and quantity of the spot welds to assist in installation of the new roof panel.

    Remove the windshield header panel spot welds.

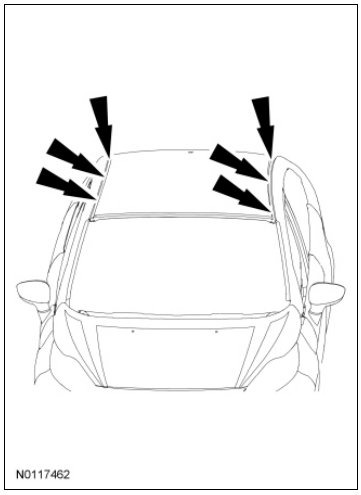


11. *NOTICE:* **Drill through the outer panel sheet metal only to avoid damage to the header panel assembly.**

    NOTE: Note the location and quantity of the spot welds to assist in installation of the new roof panel.

    Remove the rear header panel spot welds.

12. Remove the roof ditch spot welds.



13. Remove the roof panel from the vehicle.

Installation

1. Using a suitable disc grinder, clean out any remaining seam sealer and paint along the roof ditch mating surface.

2. Dress any spot weld nuggets in the roof ditch as well as the front and rear header panel mating surfaces.

3. Using the hammer and dolly method, straighten any damage caused to the mating surfaces on the vehicle during panel removal.

4. Inspect the windshield header panel, roof bow and rear header panel. Repair or replace as required.

5. Position the service replacement roof panel on the vehicle.

6. Correctly align and index mark the positioning of the panel-to-vehicle and remove the panel.

7. **NOTE:** Spot welds can be replaced with Squeeze-Type Resistance Spot Welding (STRW) or Metal Inert Gas (MIG) plug welds. Plug welds should equal resistance spot welds in both location and quantity. Do not place a new spot or plug weld directly over an original weld location.

   Prepare the roof panel for installation:

   - If MIG plug welding, drill 8 mm (0.314 in) holes along the front and rear header panel flanges.
   - If Squeeze-Type Resistance Spot Welding (STRW), remove the e-coat only in the exact locations for spot welds along the front and rear header panels flanges.

8. Remove the e-coat on the roof ditch mating surface of the service replacement roof panel.

9. Apply a bead of metal bonding adhesive on the front and rear header panels and roof bow (if equipped) and to the body side-to-roof panel flange area. Immediately reinstall the roof panel aligning it to the index marks made during test fitting.

10. Resistance spot weld or MIG plug weld the roof panel to the front and rear header panels and allow adhesive to cure.

11. Inspect header panels and roof bow (if equipped) to roof panel adhesive mating surfaces. If good contact is not apparent, apply flexible foam material for NVH purposes.

12. **NOTE:** Always use refinishing materials from a single paint manufacturer. Combining products from more than one manufacturer may result in refinishing material incompatibility issues and potential void of warranty for each product applied.

    Sand and prime the roof ditch repair and apply a continuous bead of seam sealer to the roof ditch area joints.

13. Refinish the entire repair area using a Ford approved refinishing system.

14. Install the antenna. For additional information, refer to Section 415-00 .

15. Install the side air curtains. For additional information, refer to Section 501-20B .

16. Install the sun roof (if equipped). For additional information, refer to Section 501-17 .

17. Install the headliner. For additional information, refer to Section 501-05 .

18. Install the windshield. For additional information, refer to Section 501-11 .

19. Install the rear luggage compartment lid. For additional information, refer to Section 501-03 .

20. Install new roof ditch mouldings.

21. Install the spoiler. For additional information, refer to Section 501-08 .

Torque Specifications

Description	Nm	lb-ft	lb-in
Ball joint nuts	52	38	-
Engine roll restrictor bolt	70	52	-
Stabilizer bar link lower nuts	48	35	-
Steering shaft pinch bolt	32	24	-
Subframe brace bolts	48	35	-
Subframe forward bolts	60	44	-
Subframe rearward bolts [a]	-	-	-
Tie-rod end nuts	55	41	-

[a] Refer to the procedure in this section.

Subframe and Mounting Systems

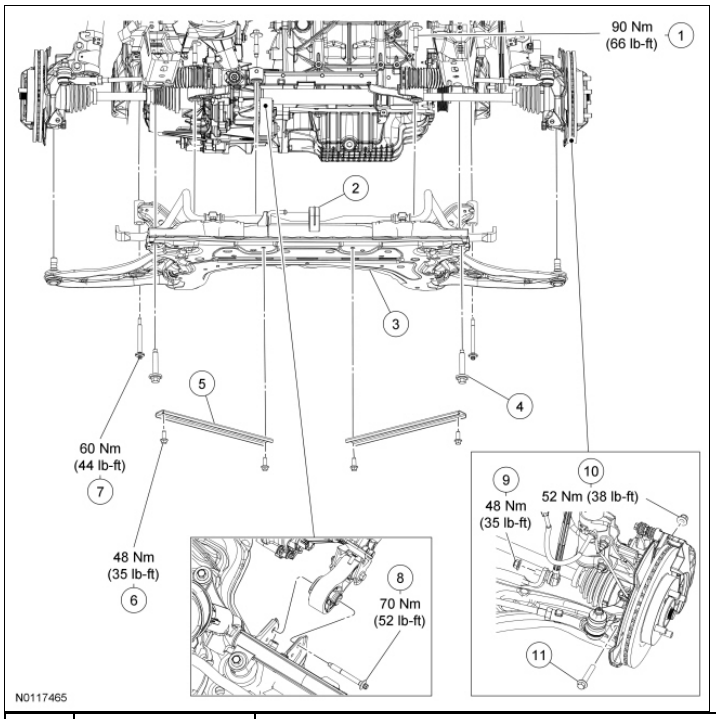
The front subframe is bolted to the body and is used to:

- aid in structural support.
- provide mounting surfaces for the steering system.
- provide mounting surfaces for the front suspension lower control arms, the engine mounts and for the front stabilizer bar.

Subframe - Front

Special Tool(s)

 ST1682-A	Powertrain Lift 300-OTC1585AE or equivalent
 ST1106-A	Remover, Tie-Rod End 211-001 (TOOL-3290-D)



Item	Part Number	Description
1	W712486	Steering gear bolt (3 required) (install new)
2	5A262	Exhaust insulator
3	5019	Subframe assembly
4	W714343	Subframe rearward bolt (2 required) (install new)
5	5A104	Subframe brace (2 required)
6	W500233	
7	W714404	Subframe forward bolt (2 required)
8	W715185	Roll restrictor bolt
9	W520103	Stabilizer bar link lower nut (2 required) (install new)
10	W520203	Ball joint nut (2 required) (install new)
11	W709618	Ball joint bolt (2 required) (install new)

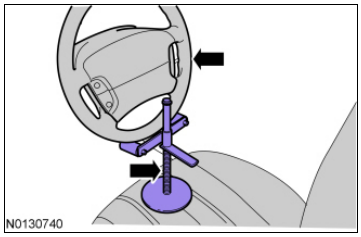
Removal

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 where specified 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.**

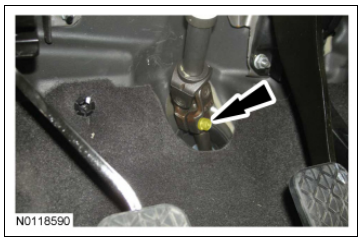
1. With the vehicle in NEUTRAL, position on a hoist. For additional information, refer to Section 100-02 .

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.

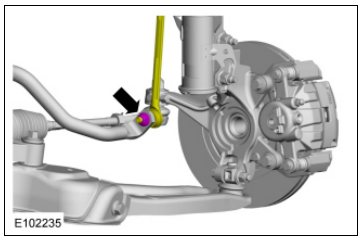


3. Remove the pinch bolt and disconnect the steering shaft.
   - Discard the bolt.

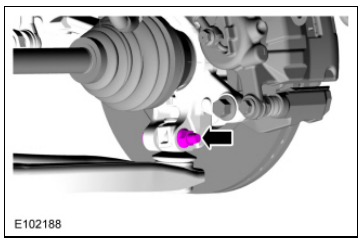


4. Remove the front tires and wheels. For additional information, refer to Section 204-04 .

5. Remove the nuts and disconnect the lower stabilizer bar links.



6. Remove the bolts and disconnect the ball joints from the steering knuckles.
   - Discard the bolts.

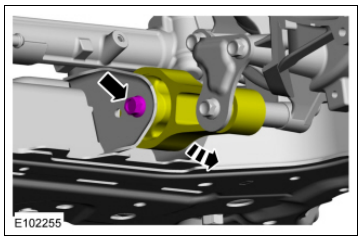


7. Remove the nuts and disconnect the tie-rod ends from the steering knuckle.

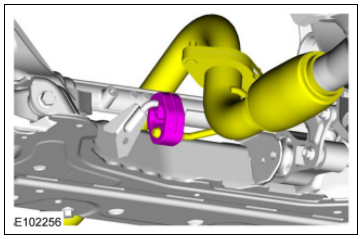
- Discard the nuts.



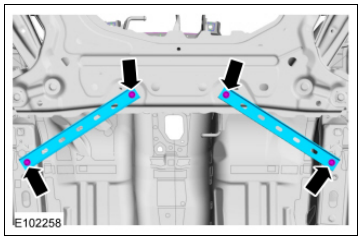
8. Remove the engine roll restrictor bolt from the subframe.



9. Disconnect the exhaust hanger.

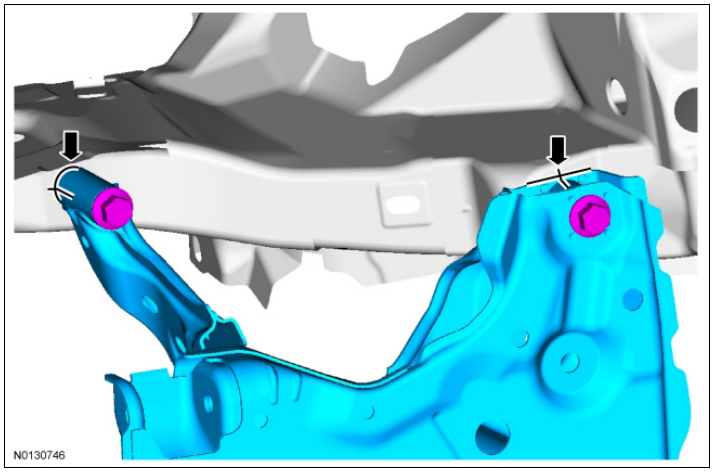


10. Remove the bolts and subframe braces.

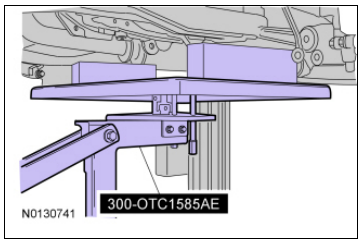


11. **NOTE:** This step is not necessary if the subframe assembly is replaced.

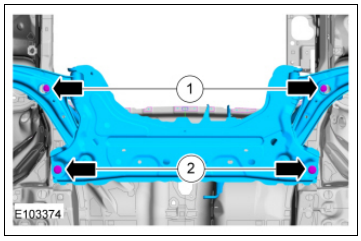
    Mark the position of the subframe-to-frame mounting location at each mounting point on the frame rails on both sides of the vehicle to aide in installation.



12. Position the Powertrain Lift under the subframe assembly.



13. Remove the forward and rearward subframe bolts.
    1. Remove the forward bolts.
    2. Remove the rearward bolts.
    - Discard the rearward bolts.



14. Carefully lower the subframe assembly from the vehicle.

Installation

1. Position the subframe to the vehicle and loosely install the 2 new rearward bolts and the forward bolts.

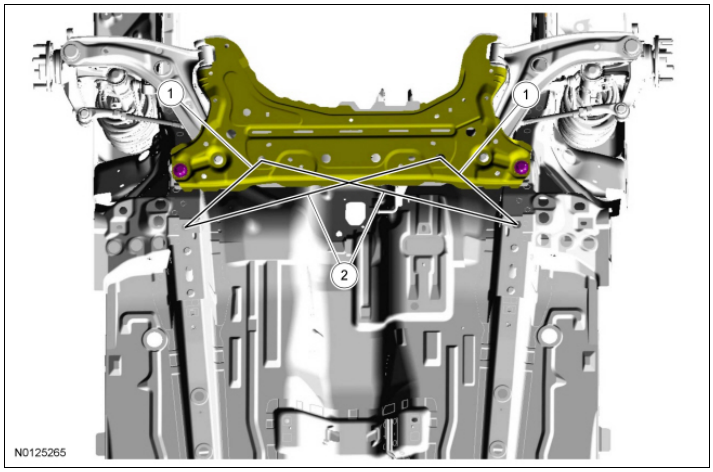
2. Remove the Powertrain Lift.

3. If installing the subframe that was previously removed, align the subframe to the locating marks made during removal.

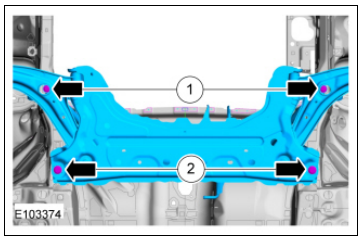
4. **NOTE:** RH and LH dimensions are identical. All measurements on center.

   If installing a new subframe, measure for correct positioning of the subframe to vehicle underbody.

   1. Location 1 - 260 mm (10.236 in).
   2. Location 2 - 666 mm (26.22 in).

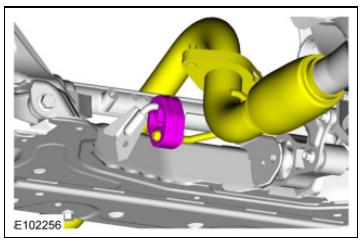


5. Tighten the subframe bolts.
    1. Tighten the forward bolts to 60 Nm (44 lb-ft).
    2. Tighten the new rearward bolts to 100 Nm (74 lb-ft).
    - Tighten the rearward bolts an additional 240 degrees.

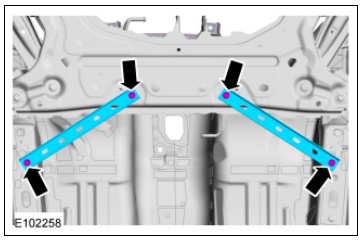


6. Install the engine roll restrictor bolt.
    - Tighten to 50 Nm (37 lb-ft).

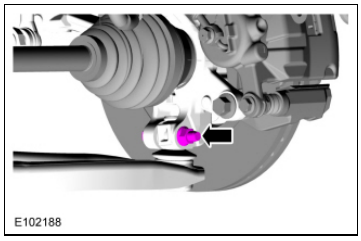
7. Connect the exhaust hanger.



8. Install the subframe braces and bolts.
    - Tighten to 48 Nm (35 lb-ft).

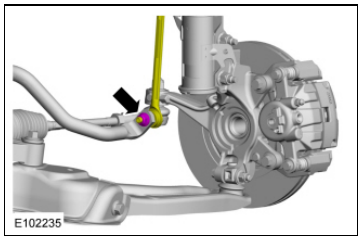


9. Connect the ball joints to the steering knuckles.
    - Install new bolts.
    - Tighten to 52 Nm (38 lb-ft).



10. Connect the tie-rod ends to the steering knuckle.
    - Install new nuts.
    - Tighten to 55 Nm (41 lb-ft).

11. Connect the lower stabilizer bar links and install the nuts.
    - Tighten to 48 Nm (35 lb-ft).

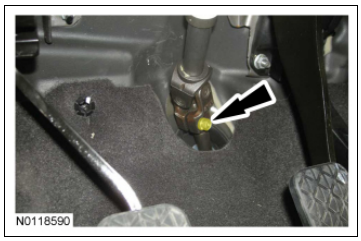


12. Install the front tires and wheels. For additional information, refer to Section 204-04 .

13. **⚠ WARNING: Do not reuse steering column shaft bolts. This may result in fastener failure and steering column shaft detachment or loss of steering control. Failure to follow this instruction may result in serious injury to vehicle occupant(s).**

    Connect the steering shaft and install a new pinch bolt.

    - Tighten to 32 Nm (24 lb-ft).



14. If installing a new subframe, check wheel alignment. For additional information, refer to Section 204-00 .

Material

Item	Specification	Fill Capacity
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	-
Threadlock 262 TA-26	WSK-M2G351-A6	-

Torque Specifications

Description	Nm	lb-ft
Flywheel retaining bolts [a]	-	-

[a] Refer to the procedure in this section.

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: Th 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.

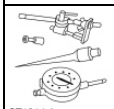
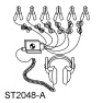
The engine, fuel system, ignition system, emissions system and exhaust system all affect exhaust emission levels and must be maintained according to the maintenance schedule. Refer to the scheduled Maintenance Guide.

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 .

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
 ST2312-A	EngineEAR 107-R21003 or equivalent
 ST2048-A	EngineEAR/ChassisEAR 107-R2102 or equivalent
 ST1296-A	Oil Pressure Gauge 303-088 (T73L-6600-A)
 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

There are 2 diagnostic paths that can be followed depending on the type of engine concern. Carry out either 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
• Engine coolant leaks • Engine oil leaks • Fuel leaks • Damaged or severely worn parts • Loose mounting bolts, studs and nuts

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. If the DTCs retrieved are related to the concern, go to the DTC Chart, refer to Section 419-10 .

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

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
• Loose mounting bolts, studs and nuts • Damaged or leaking powertrain mounts • Damaged or disconnected vacuum hoses • Obstruction of cooling fan • Obstruction of Front End Accessory Drive (FEAD) • Damaged or disconnected air intake components

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, go to the DTC Chart, 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:

- 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 visually inspect the valve train 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 lower cylinder block. 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 flywheel/flexplate. Inspection of the flywheel/flexplate will be necessary.

If equipped, the Rear End Accessory Drive (READ) can also be a source of noise from the rear of the engine (squeal or chirp). The READ consists of the coolant pump and belt.

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 the noise is suspected to be internal to the engine. Some disassembly of the engine may be required to inspect for damage or wear.

13. After the noise is localized, 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 p>

Symptom Chart - Engine Performance

	• Worn piston rings	• INSTALL new piston rings. TEST the system for normal operation after the repair.
	• Worn cylinder	• INSTALL a new cylinder block. TEST the system for normal operation after the repair.
	• Damaged head gasket	• INSTALL a new cylinder head gasket. TEST the system for normal operation after the repair.
	• Inoperative or damaged cooling system	• REFER to Section 303-03 .
	• Fail-safe cooling invoked (if equipped)	• REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
• Poor idling	• Vacuum leaks	• Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
	• Inoperative or damaged ignition system	• REFER to Section 303-07 .
	• Inoperative or damaged cooling system • Inoperative or damaged fuel system	• Refer to the appropriate section in Group 303 for the procedure.
	• Fail-safe cooling invoked (if equipped)	• REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
	• Incorrect valve clearance	• ADJUST valve clearance. REFER to Section 303-01 . TEST the system for normal operation

		after the repair.
	• Incorrect valve-to-valve seat contact	• INSTALL a new cylinder head. TEST the system for normal operation after the repair.
	• Damaged head gasket	• INSTALL a new cylinder head gasket. TEST the system for normal operation after the repair.
• Engine runs rough	• Inoperative or damaged fuel system • Air or vacuum leaks • Inoperative or damaged cooling system • Inoperative or damaged ignition system	• Refer to the appropriate section in Group 303 for the procedure.
	• Fail-safe cooling invoked (if equipped)	• REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
	• Burnt or sticking valve	• INSTALL a new cylinder head. TEST the system for normal operation after the repair.
	• Weak or broken valve spring	• INSTALL a new valve spring. TEST the system for normal operation after the repair.
	• Carbon accumulation in combustion chamber	• ELIMINATE carbon buildup. TEST the system for normal operation after the repair.
• Excessive oil consumption	• Leaking oil	• REPAIR oil leakage. TEST the system for normal operation after the repair.
	• Inoperative PCV system	• REPAIR or INSTALL new components as necessary. TEST the system for normal operation after the repair.
	• Incorrect oil	• CHANGE oil to correct specification.
	• Worn valve stem seal	• INSTALL a new valve stem seal. TEST the system for normal operation after the repair.

	• Worn valve stem or valve guide	• INSTALL a new cylinder head. TEST the system for normal operation after the repair.
	• Sticking piston rings	• INSTALL new piston rings. TEST the system for normal operation after the repair.
	• Worn piston ring groove	• INSTALL a new piston and piston pin. TEST the system for normal operation after the repair.
	• Worn pistion or cylinder	• INSTALL a new piston or cylinder block. TEST the system for normal operation after the repair.
• Oil in coolant	• Leaking head gasket • Damaged cylinder block • Damaged cylinder head	• INSPECT the engine components. INSTALL new engine components as necessary. Refer to the appropriate section in Group 303 for the procedure. TEST the system for normal operation after the repair.
• Coolant in oil	• Leaking head gasket • Damaged cylinder block • Damaged cylinder head	• INSPECT the engine components. INSTALL new engine components as necessary. Refer to the appropriate section in Group 303 for the procedure. TEST the system for normal operation after the repair.
• Insufficient power	• Inoperative or damaged ignition system • Air intake system blockage • Lubrication system blockage • Inoperative/blocked or damaged fuel system	• Refer to the appropriate section in Group 303 for the procedure.
	• Oil level too high	• DRAIN oil to correct level. TEST the system for normal operation after the repair.
	• Incorrect engine oil	• INSTALL correct specification engine oil. TEST the system for normal operation after the repair.
	• Excessive accessory drive belt loading • Inoperative or damaged	• Refer to the appropriate section in Group 303 for the procedure.

	cooling system	
	• Fail-safe cooling invoked (if equipped)	• REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
	• Damaged or plugged exhaust system	• INSPECT exhaust system.
	• Incorrect tire size	• REFER to Section 204-00 .
	• Dragging brakes	• REFER to Section 206-00 .
	• Slipping transmission	• REFER to Section 307-11 .
	• Incorrect valve clearance	• ADJUST valve clearance. REFER to Section 303-01 . TEST the system for normal operation after the repair.
	• Worn or damaged valve tappet	• INSTALL a new valve tappet. TEST the system for normal operation after the repair.
	• Damaged valve guide • Compression leakage at valve seat • Seized valve stem	• INSTALL a new cylinder head assembly. TEST the system for normal operation after the repair.
	• Weak or broken valve spring	• INSTALL a new valve spring. TEST the system for normal operation after the repair.
	• Worn or damaged cam	• INSTALL a new camshaft. TEST the system for normal operation after the repair.
	• Damaged head gasket	• INSTALL a new head gasket. TEST the system for normal operation after the repair.
	• Cracked or distorted cylinder head	• INSTALL a new cylinder head assembly. TEST the system for normal operation after the repair.
	• Damaged, worn or sticking piston ring(s)	• INSTALL a new piston ring(s). TEST the system for normal operation after the repair.

	• Worn or damaged piston	• INSTALL a new piston and piston pin. TEST the system for normal operation after the repair.

Symptom Chart - NVH

Symptom Chart - NVH

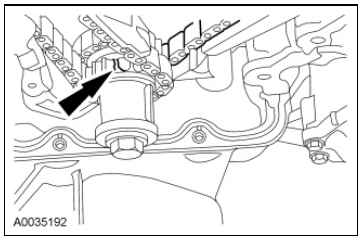
NOTE: NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible that any one of multiple systems may be the cause of the symptom, it may be necessary 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.

Sprockets

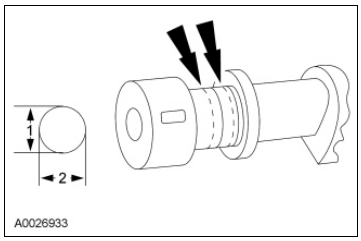
1. Inspect the sprockets for cracks and worn or chipped teeth.



Camshaft Bearing Journal Diameter

NOTE: Refer to the appropriate Section 303-01 for the specification.

1. Measure each camshaft journal diameter in 2 directions.



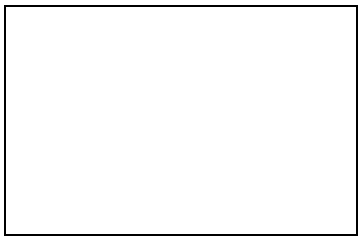
Camshaft Journal to Bearing Clearance - OHC Engines

NOTE: Refer to the appropriate Section 303-01 for the specification.

1. **NOTE:** The camshaft journals must meet specifications before checking camshaft journal clearance.

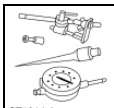
   Measure each camshaft bearing in 2 directions.

   - Subtract the camshaft journal diameter from the camshaft bearing diameter.



Camshaft End Play - OHC Engines

Special Tool(s)

 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent

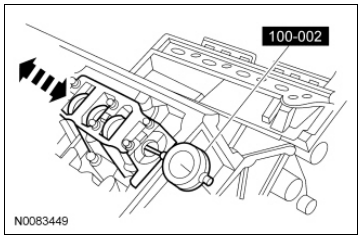
NOTE: Refer to the appropriate Section 303-01 for the specification.

1. Using the Dial Indicator Gauge with Holding Fixture, measure the camshaft end play.

2. Position the ft to the rear of the cylinder head.

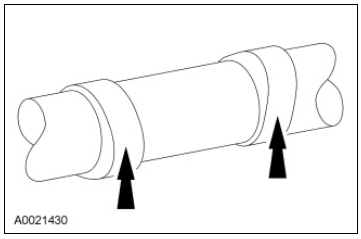
3. Zero the Dial Indicator Gauge.

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.



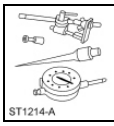
Camshaft Surface Inspection

1. Inspect camshaft lobes for pitting or damage in the contact area. Minor pitting is acceptable outside the contact area.



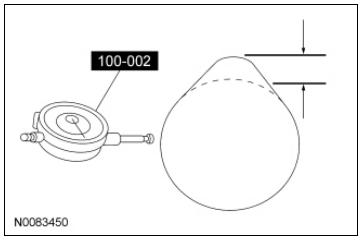
Camshaft Lobe Lift

Special Tool(s)

 ST1214-A	Dial Indicator Gauge wi Holding Fixture 100-002 (TOOL-4201-C) or equivalent

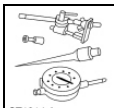
NOTE: Refer to the appropriate Section 303-01 for the specification.

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)

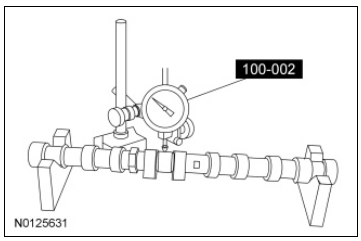
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent

NOTE: Refer to the appropriate Section 303-01 for the specification.

1. **NOTE:** Camshaft journals must be within specifications before checking runout.

   Using the Dial Indicator Gauge with Holding Fixture, measure the camshaft runout.

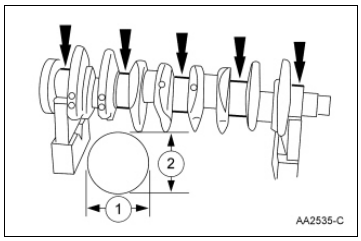
   - Camshaft must be supported on the first and last camshaft bearing journal.
   - Rotate the camshaft and subtract the lowest Dial Indicator Gauge reading from the highest Dial Indicator Gauge reading.



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.



>

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.

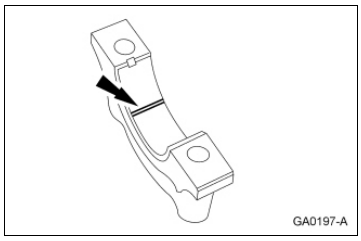
Crankshaft Main Bearing Journal-to-Bearing Clearance

NOTE: Refer to the appropriate Section 303-01 for the specification.

NOTE: Crankshaft main bearing journals must be within specifications before checking journal clearance.

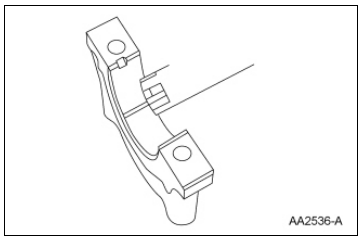
1. Remove the crankshaft main bearing caps and crankshaft main bearing.

2. Lay a piece of Plastigage across the face of each crankshaft main bearing surface.



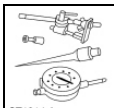
3. **NOTE: Install and remove the crankshaft main bearing cap.**

4. Verify the crankshaft journal clearance.



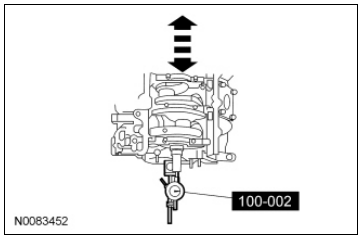
Crankshaft End Play

Special Tool(s)

 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent

NOTE: Refer to the apppriate Section 303-01 for the specification.

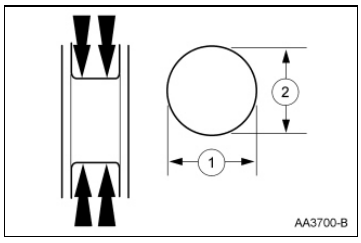
1. Install the Dial Indicator Gauge with Holding Fixture.
2. Position the crankshaft to the rear of the cylinder block.
3. Zero the Dial Indicator Gauge.
4. Move the crankshaft to the front of the cylinder block. Note and record the crankshaft end play.



Connecting Rod Bearing Journal Taper and Out-of-Round

NOTE: Refer to the appropriate Section 303-01 for the specification.

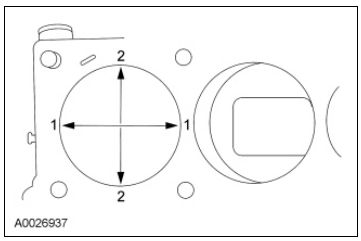
1. Measure the crankshaft connecting rod journal diameters in 2 directions perpendicular to one another at each end of the connecting rod journal. The difference in the measurements from one end to the other is the taper. Verify measurement is within the wear limit.



Cylinder Bore Taper

NOTE: Refer to the appropriate Section 303-01 for the specification.

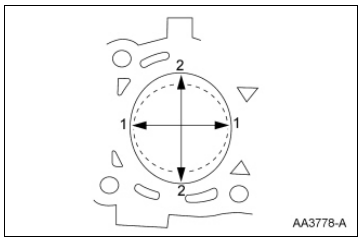
1. Measure the cylinder bore at the top, middle and bottom of piston ring travel in 2 directions as indicated. Verify the cylinder bore is within the wear limit. The difference indicates the cylinder bore taper. If the cylinder bore taper does not meet specification, bore the cylinder to the next oversize 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.



&sp;

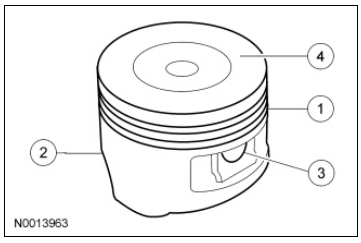
Piston Inspection

Special Tool(s)

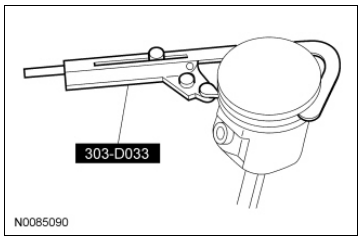
 ST1279-A	Scraper, Piston Ring Groove 303-D033 (D81L-6002-D) or equivalent

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.

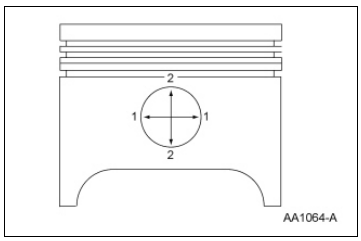


Piston Pin Bore Diameter

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.

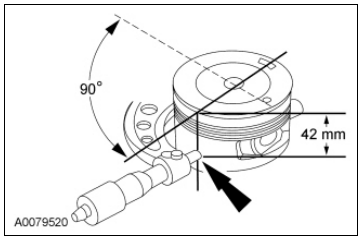


/body>

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

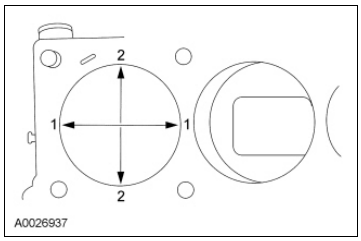
NOTE: Refer to the appropriate Section 303-01 for the specification.

1. Subtract the piston diameter from the cylinder bore diameter to find the piston-to-cylinder bore clearance.

Piston Selection

NOTE: The cylinder bore must be within the specifications for taper and out-of-round before fitting a piston.

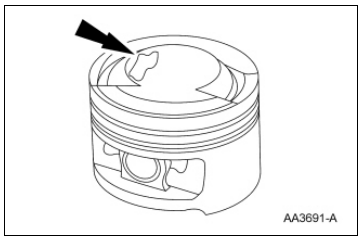
1. Select a piston size based on the cylinder bore.



2. **NOTE:** For precision fit, new pistons are divided into 3 categories within each size range based on their relative positi 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.



Piston Ring End Gap

Special Tool(s)

 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent

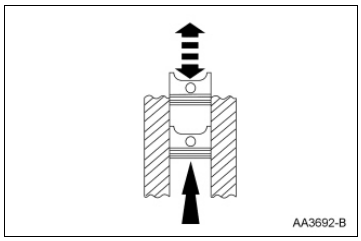
NOTICE: **Use care when fitting piston rings to avoid possible damage to the piston ring the cylinder bore.**

NOTE: Piston rings should not be transferred from one piston to another.

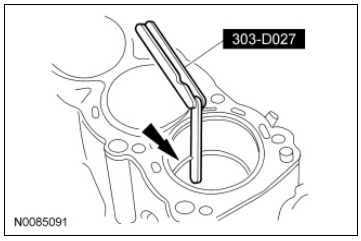
NOTE: Refer to the appropriate Section 303-01 for the specification.

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.



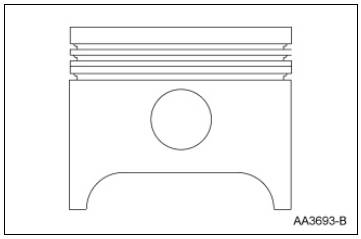
Piston Ring-to-Groove Clearance

Special Tool(s)

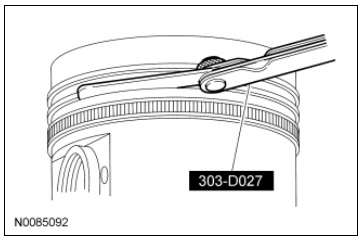
 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent

NOTE: Refer to the appropriate Section 303-01 for the specificatio

1. Inspect the piston for ring land damage or accelerated wear.



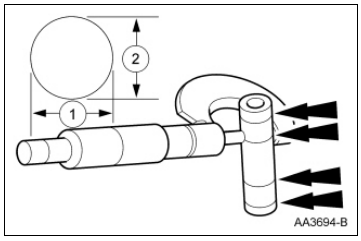
2. Using the Feeler Gauge Set, measure the piston ring-to-groove clearance.



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.



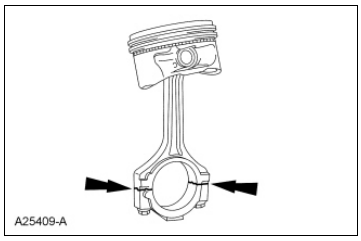
&sp;

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

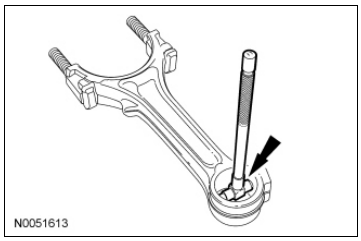
NOTE: Refer to the appropriate Section 303-01 for the specification.

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.

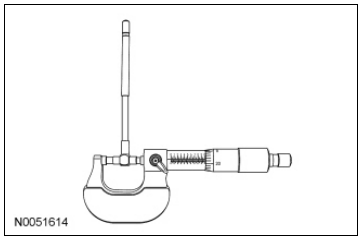
Connecting Rod Bushing Diameter

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.



Connecting Rod Bend

Special Tool(s)

 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent

NOTE: Refer to the appropriate Section 303-01 for the specification.

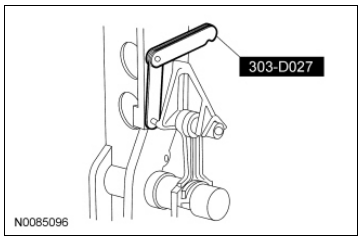
Connecting Rod Twist

Special Tool(s)

 ST1271-A	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.



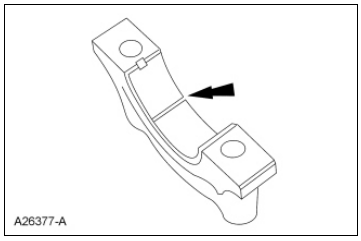
Connecting Rod Bearing Journal-to-Bearing Clearance

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.

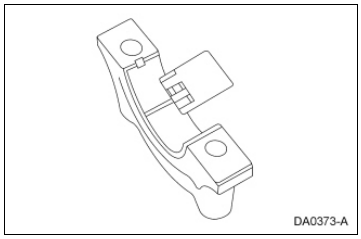
2. Position a piece of Plastigage across the bearing surface.



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.



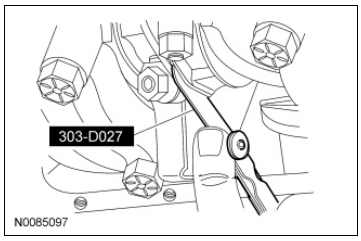
Connecting Rod to Crankshaft Side Clearance

Special Tool(s)

 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent

NOTE: Refer to the appropriate Section 303-01 for the specification.

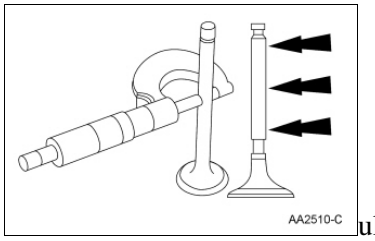
1. Using the Feeler Gauge Set, measure the clearance between the connecting rod and the crankshaft. Verify the measurement is within specification.



Valve Stem Diameter

NOTE: Refer to the appropriate Section 303-01 for the specification.

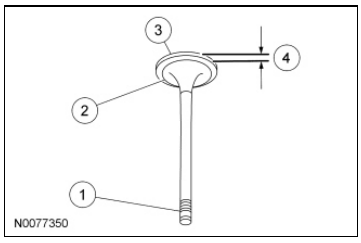
1. Measure the diameter of each intake and exhaust valve stem at the points shown. Verify the diameter is within specification.



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Valve 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.

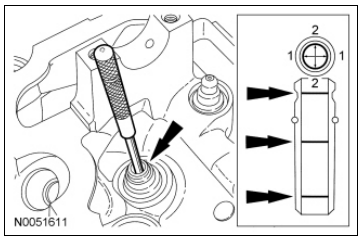


Valve Guide Inner Diamer

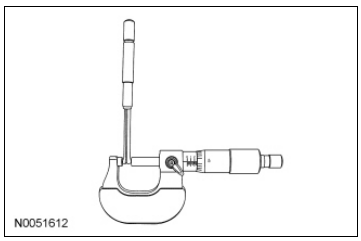
NOTE: Refer to the appropriate Section 303-01 for the specification.

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.



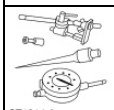
2. Measure the ball gauge with a micrometer.



3. If the valve guide is not within specifications, install a new cylinder head assembly.

Valve Stem to Valve Guide Clearance

Special Tool(s)

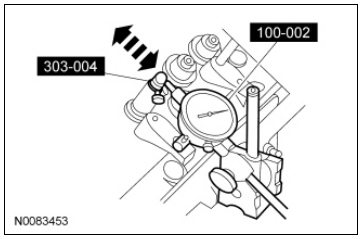
	Clearance Gauge, Valve Guide 303-004 (TOOL-6505-E) or equivalent
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent

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.

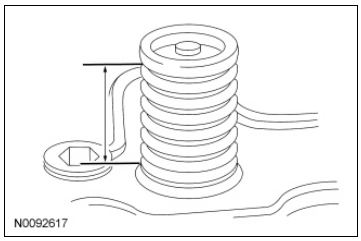


2. Move the Valve Guide Clearance Gauge toward the Dial Indicator Gauge with Holding Fixture and zero the Dial Indicator Gauge. Move the Valve Guide Clearance Gauge away from the Dial Indicator Gauge with Holding Fixture and note the reading. The reading will be DOUBLE the valve stem-to-valve guide clearance.

Valve Spring Installed Length

NOTE: Refer to the appropriate Section 303-01 for the specification.

1. Measure the installed length of each valve spring.

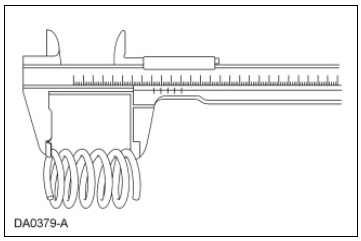


&nbs

Valve Spring Free Length

NOTE: Refer to the appropriate Section 303-01 for the specification.

1. Measure the free length of each valve spring.



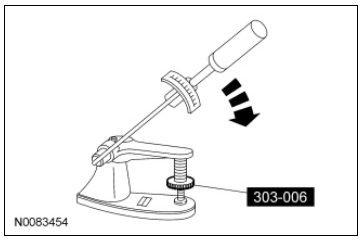
Valve Spring Strength

Special Tool(s)

 ST1278-A	Pressure Gauge, Valve/Clutch Spring 303-006 (TOOL-6513-DD) or equivalent

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.



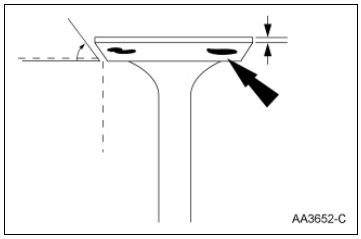
Valve Seat Inspection

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.

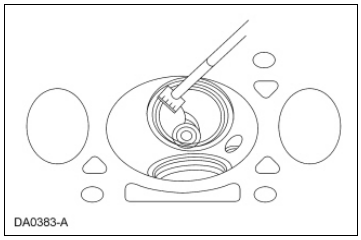


2. Inspect for abnormalities on the valve face and seat. Install a new cylinder head assembly if abnormalities are found.

Valve Seat Width

NOTE: Refer to the appropriate Section 303-01 for the specification.

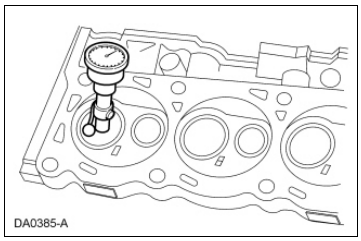
1. Measure the valve seat width. If necessary, grind the valve seat to specification.
    - Measure the intake valve seat width.
    - Measure the exhaust valve seat width.
    - Recheck the valve spring installed length after the seats have been ground, and shim the valve springs as necessary to achieve the correct installed spring length.
    - Depending on the engine, check the valvlash. Refer to General Procedures in Section 303-01.



Valve Seat Runout

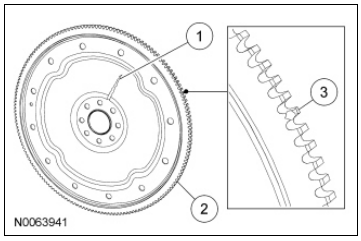
NOTE: Refer to the appropriate Section 303-01 for the specification.

1. Use a valve seat runout gauge to check valve seat runout.



Flexplate Inspection

1. Inspect the flexplate for:
    1. any cracks.
    2. worn ring gear teeth.
    3. chipped or cracked ring gear teeth.



Cylinder Head Distortion

Special Tool(s)

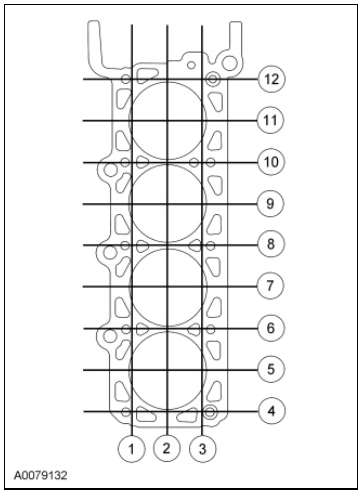
 ST1271-A	Feeler Gae Set 303-D027 (D81L-4201-A) or equivalent

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.



Cylinder Block Distortion

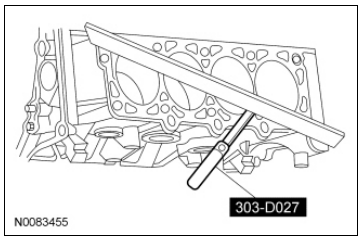
Special Tool(s)

 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent

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 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.**

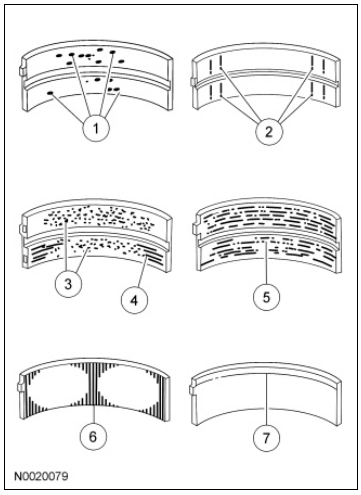
   Clean the cylinder bores with soap or detergent and water.

2. Thoroughly rinse with clean water and wipe dry with a clean, lint-free cloth.

3. Use a clean, lint-free cloth and lubre the cylinder bores.
   - Use clean engine oil meeting Ford specification.

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



Exhaust Manifold Cleaning and Inspection

Special Tool(s)

 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent

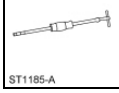
1. Clean the exhaust manifold using a suitable solvent. Use a plastic scraping tool to clean the gasket sealing surfaces.

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.

4>Core Plug Replacement
Special Tool(s)

 ST1185-A	Slide Hammer 100-001 (T50T-100-A)

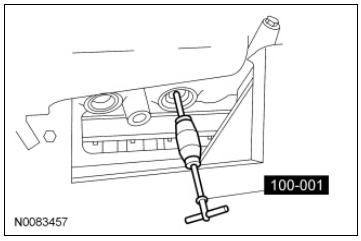
Material

Item	Specification
Threadlock 262 TA-26	WSK-M2G351-A6

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.

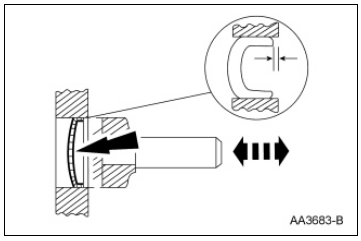
   Inspect the core plug bore for any damage that would interfere with the correct sealing of the plug. If the core plug bore is damaged, bore for the next oversize plug.

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.

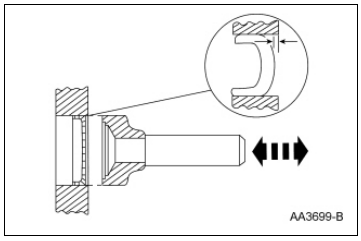
   Coat the cup-type core plug and bore lightly with sealant and install the core plug using a freeze plug installer.



Expansion-type

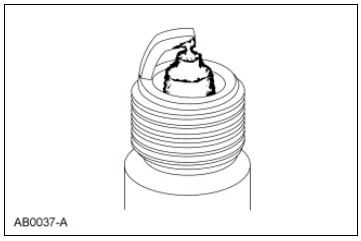
4. ***NOTICE:*** **Do not contact the crown when installing an expansion-type core plug. This could expand the plug before seating and result in leakage.**

   Coat the expansion-type core plug and bore lightly with sealant and install the core plug using a freeze plug installer.

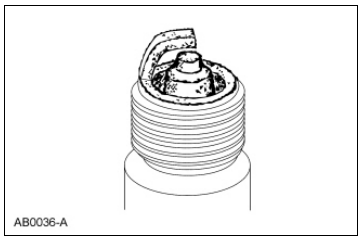


Spark Plug Inspection

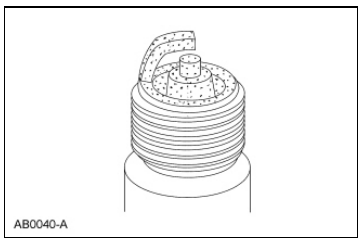
1. Inspect the spark plug for a bridged gap.
    - Check for deposit build-up closing the gap between the electrodes. Deposits are caused by oil or carbon fouling.
    - Install a new spark plug.



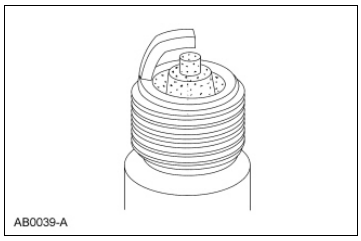
2. Check for oil fouling.
    - Check for wet, black deposits on the insulator shell bore electrodes, caused by excessive oil entering the combustion chamber through worn rings and pistons, excessive valve-to-guide clearance or worn or loose bearings.
    - Correct the oil leak concern.
    - Install a new spark plug.



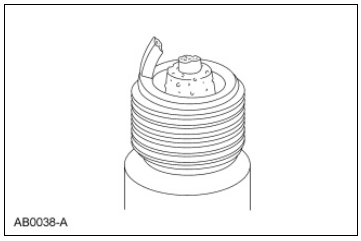
3. Inspect for carbon fouling. Look for black, dry, fluffy carbon deposits on the insulator tips, exposed shell surfaces and electrodes, caused by a spark plug with an incorrect heat range, dirty air cleaner, too rich a fuel mixture or excessive idling.
    - Install new spark plugs.



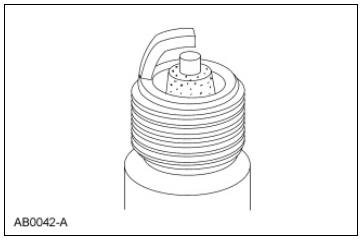
4. Inspect for normal burning.
    - Check for light tan or gray deposits on the firing tip.



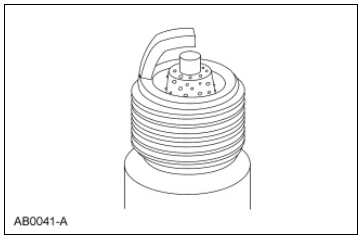
5. Inspect for pre-ignition, identified by melted electrodes and a possibly damaged insulator. Metallic deposits on the insulator indicate engine damage. This may be caused by incorrect ignition timing, wrong type of fuel or the unauthorized installation of a heli-coil insert in place of the spark plug 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.

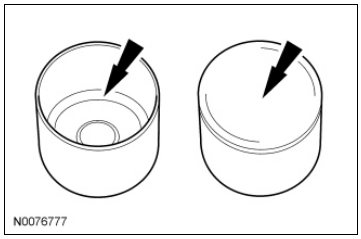


7. Inspect for fused deposits, identified by melted or spotty deposits resembling bubbles or blisters. These are caused by sudden acceleration.
    - Install new spark plugs.



Valve Tappet Inspection

1. Inspect the valve tappet for damage, especially in the indicated areas. If any damage is evident, inspect the camshaft lobes and valves for damage. Install new components as necessary.



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 100-02 .

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 mous 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	-
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C	-
Motorcraft® Metal Surface Prep ZC-31-A	-	-
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	4.05L (4.3 qt) includes filter change / 3.75L (3.96 qt) without filter change
Motorcraft® Specialty Orange Engine Coolant VC-3-B (US); CVC-3-B (Canada)	WSS-M97B44-D	-
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B	-
Silicone Brake Caliper Grease and Dielectric Compound ESE-M1C171-A	-	
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2	-

General Specifications

Item	Specification
Engine	
Displacement	1.6L
No. of cylinders	4
Bore/stroke	79.0/81.4 mm (3.11/3.20 in)
Firing order	1-3-4-2
Oil pressure (hot @ 800 rpm)	100 kPa (14.5 psi)
Oil pressure (hot @ 2,000 rpm)	200 kPa (29.0 psi)

Compression ratio	11:1	
Engine weight - (with flexplate)	81.0 kg (178.6 lb)	
Engine and transaxle weight - automatic transaxle	157.2 kg (346.6 lb)	
Engine weight - (with flywheel)	90.5 kg (199.5 lb)	
Engine and transaxle weight - manual transaxle	166.6 kg (367.5 lb)	
ock		
Cylinder bore diameter	79.005-79.025 mm (3.110-3.111 in)	
Cylinder bore maximum out-of-round	0.008 mm (0.0003 in)	
Main bearing bore diameter	54.000-54.018 mm (2.126-2.127 in)	
Head gasket surface flatness	0.1 mm/general 0.05 mm/200 x 200 (0.004 in/general) (0.0019 in/7.87 x 7.87)	
Piston		
Piston diameter (single grade)	78.977 - 78.991 mm (3.1093 - 3.1099 in)	
Piston-to-cylinder bore clearance	0.0135 - 0.0485 mm (0.0005 - 0.0019 in)	
Ring groove width - top	1.23-1.25 mm (0.048-0.049 in)	
Ring groove width - 2nd	1.52-1.54 mm (0.059-0.060 in)	
Ring groove width - oil	2.01-2.03 mm (0.079-0.080 in)	
Piston skirt coating thickness	Tin Plating	
Piston Pin		
Diameter	17.996-18.000 mm (0.7085-0.7086 in)	
Length	51.0-51.3 mm (2.00-2.01 in)	
Piston-to-pin clearance	0.012-0.020 mm (0.0005-0.0008 in)	
Press fit		
Cylinder Head		
Cylinder head flatness	0.1 mm (0.003 in) overall	
Valve lift @ zero lash (exhaust)	8.6 mm (0.338 in)	
Valve lift @ zero lash (intake)	8.7 mm (0.342 in)	
Valve guide diameter	6.000-6.030 mm (0.242-0.244 in)	
Valve seat width - intake/exhaust	1 mm ± 0.15 mm (0.039 in ± 0.006 in)	
Valve seat angle	45 degrees	
Valve seat runout	0.029 mm (0.001 in)	
Valve tappet bore diameter	28.8-29.2 mm (1.13-1.15 in)	
Cam bore diameter	25.0-25.03 mm (0.98-.099 in)	
Valve		
Valve head diameter - intake	30.1 mm ± 0.15 mm (1.18 in ± 0.006 in)	
Valve head diameter - exhaust	24.1 mm ± 0.15 mm (0.95 in ± 0.006 in)	
Valve stem diameter - intake	5.968 mm ± 0.0075 mm (0.235 in ± 0.0003 in)	
Valve stem diameter - exhaust	5.958 mm ± 0.0075 mm (0.234 in ± 0.0003 in)	0.0245-0.0695 mm (0.0010-0.0027 in)
Valve stem-to-guide clearance - exhaust	0.0295-0.0745 mm (0.0011-0.003 in)	

Valve face runout	0.03 mm (0.001 in)
Valve face angle	44.5 degrees ± 0.15 mm (0.005 in)
Valve Spring - Compression Pressure	
Intake and exhaust (installed)	180 N ± 11 N
Intake (valve open) 8.9 mm (0.35 in) of lift	320 N ± 20 N
Exhaust (valve open) 8.94 mm (0.351 in) of lift	320 N ± 20 N
Free length	48.7 mm ± 0.8 mm (1.92 in ± 0.031 in)
Assembled height	35.60 mm (1.401 in)
Crankshaft	
Main bearing journal diameter	47.980-48.000 mm (1.888-1.889 in)
Production repair	47.730-47.750 mm (1.878-1.879 in)
Main bearing clearance	0.024-0.044 mm (0.0009-0.0017 in)
Connecting rod journal diameter	43.980-44.000 mm (1.731-1.732 in)
Production repair	43.730-43.750 mm (1.721-1.722 in)
End play	0.2-0.43 mm (0.008-0.017 in)
Rings	
Width - top	1.19-1.23 mm (0.0468-0.0484 in)
Width - 2nd	1.495-1.53 mm (0.059-0.060 in)
Width - oil	2 mm (0.078 in)
Ring gap (in bore) - top	0.16-0.26 mm (0.0062-0.0102 in)
Ring gap (in bore) - 2nd	0.7-0.9 mm (0.0275-0.0295 in)
Ring gap (in bore) - oil	0.2-0.9 mm (0.0078-0.0295 in)
Valve Tappet	
Diameter	27.965-27.980 (1.100-1.101 in)
Tappet-to-valve clearance - intake	0.17-0.23 mm (0.007-0.009 in)
Tappet-to-valve clearance - exhaust	0.31-0.37 mm (0.012-0.015 in)
Tappet-to-bore clearance	0.020-0.065 mm (0.0008-0.0025 in)
Camshaft	
End play	0.07-0.20 mm (0.003-0.008 in)
Lobe lift - intake	8.9 mm (0.35 in)
Lobe lift - exhaust p" align="center">8.94 mm (0.351 in)	
Runout (1) [a]	0.02 mm (0.0008 in)
Thrust clearance	30.960-30.980 mm (1.21-1.22 in)
Journal diameter	24.97 mm ± 0.01 mm (0.98 in ± 0.0004 in)
Journal-to-bore clearance	0.020-0.070 mm (0.0008-0.0027 in)
Connecting Rod	
Running clearance	0.024-0.044 mm (0.0009-0.0017 in)
Bearing clearance	0.024-0.044 mm (0.0009-0.0017 in)
Bearing thickness (grade 1)	1.499-1.506 mm (0.0590-0.0592 in)
Bearing thickness (grade 2)	1.506-1.513 mm (0.0592-0.0595 in)
Bearing thickness (grade 3)	1.513-1.520 mm (0.0595-0.0598 in)

Bearing thickness (grade 4)	1.520-1.527 mm (0.0598-0.0601 in)
Crank bore diameter	47.025-47.045 mm (1.851-1.852 in)
Pin bore diameter	17.965-17.985 mm (0.7072-0.7080 in)
Length (center to center)	137 mm (5.393 in)

[a] No. 3 Journal - Supported by No. 1 and No. 5 journals.

DescriptionNmlb-ftlb-in Accessory drive belt idler pulley bracket bolts (without A/C only)2418-Accessory drive belt splash shield bolts9-80A/C compressor bolts and stud bolt2518-A/C line bracket nut9-80Battery tray bolts10-89Battery tray bracket nuts10-89Bellhousing-to-engine bolts4835-Block heater nut3-27Camshaft bearing caps [a]--Camshaft phaser and sprocket bolts - Exhaust [a]---Camshaft phaser and sprocket bolts - Intake [a]---Camshaft phaser and sprocket plugs16-142Camshaft Position (CMP) bolts9-80Camshaft trigger wheel bolts2115-Catalytic converter bracket-to-catalytic converter bolts2518-Catalytic converter bracket-to-engine bolts5037-Catalytic converter-to-cylinder head studs17-150Catalytic converter heat shield bolts10-89Catalytic converter nuts and bolt [a] ter">---Catalytic converter-to-muffler bolts4835-Clutch pressure plate [a]---Connecting rod cap bolts [a]---Coolant outlet bolts19-168Coolant outlet bracket nut and bolt6-53Coolant pump bolts [a]---Coolant pump pulley bolts20-177Crankshaft rear seal bolts [a]---Crankshaft Position (CKP) sensor bolts8-71Crankshaft pulley bolt [a]--Crankcase vent oil separator bolts9-80Cylinder head bolts [a]---Engine ground wire bolt10-89Engine lifting eye bolts - LH19-168Engine mount bolts4835-Engine mount bracket bolts [a]---Engine mount nuts [a]---Engine mount studs8-71Engine Oil Pressure (EOP) switch18-159Engine plug bolt20-177o-bellhousing bolts4835-Evaporative Emission (EVAP) canister purge valve bolt9-80Flexplate bolts [a]---Flexplate-to-clutch nuts [a]---Flywheel bolts [a]---Fuel rail bolts11-97Halfshaft bracket lower bolts2418-Halfshaft bracket upper bolt4835-Heated Oxygen Sensor (HO2S) electrical connector bracket nut8-71Ignition coil screws6-53Intake manifold bolts 18-159Main bearing beam bolts [a]---Knock Sensor (KS)20-177Oil cooler bolt5641-Oil filter15-133Oil level indicator tube screw4-35Oil pan drain plug2821-Oil pan bolts [a]---Oil pan-to-bellhousing bolts4835-Oil pump bolts [a]---Oil pump screen and pickup tube bolts9-80eft">PCM cover bolt5.4-47.8Positive battery cable nut10-89Selector lever cable bolt10-89Selector lever cable bracket bolts2518-Spark plugs15-133Starter motor bolts4835-Starter motor electrical terminals nuts10-89Thermostat housing bolts [a]---Timing belt cover backplate bolts9-80Timing belt cover bolts - Lower9-80Timing belt cover bolts - Upper-80Timing belt tensioner bolt2518-Transaxle fill plug3526-Transaxle support insulator bolts9066-Transaxle support insulator nuts12592-Transaxle roll-restrictor bolts7052-Valve cover retainers [a]---Variable Camshaft Timing (VCT) bridge bolts [a]---VCT solenoid bolts8-71Windage tray bolts9-80

a

Engine

The 1.6L 4-cylinder engine has the following features:

- Dual overhead camshaft
- Four valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- Aluminum cylinder head
- Aluminum cylinder block
- Twin independent Variable Camshaft Timing (VCT) system
-

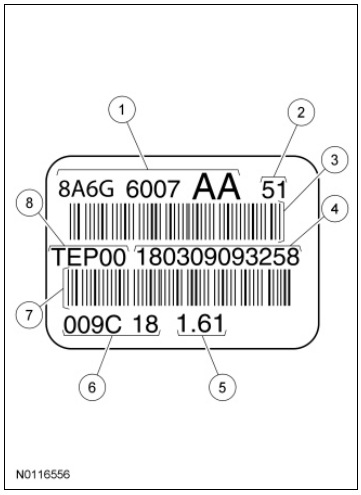
The 1.6L engine is a 4 valve-per-cylinder, dual overhead camshaft engine. The engine uses an ignition coil and spark plug wires. The cylinder block is made of aluminum and the bearing caps are integrated into the ladder assembly. An aluminum oil pan bolts to the bottom of the lower cylinder block and to the transmission to provide greater strength. The camshafts are mounted in the cylinder head and act against valve tappets to open and close the valves. The camshafts are driven off the front of the cylinder head by one timing belt. The belt is driven by a sprocket that is located on the crankshaft. The piston assembly is an aluminum piston with a sinter forged carbon steel connecting rod. The oil pump is driven by the crankshaft.

Engine Identification

Always refer to these labels when installa 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 the correct parts are obtained. These codes contain all the pertinent information relating to the dates, optional equipment and revisions.

Engine Code Information Label

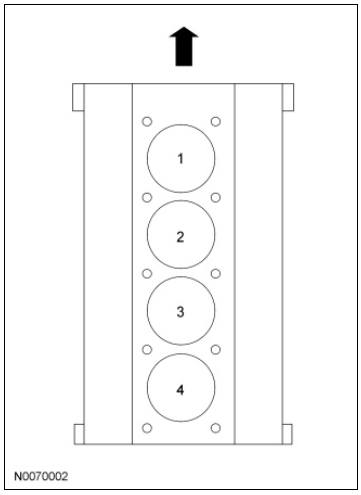
The engine code information label, located on the front side of the timing cover, contains the following:



Item	Description
1	Engine part number
2	Derivative of build

3	Bar code
4	Engine build date and time
5	Engine displacement
6	Engine build date (YYMMDD)
7	Bar code
8	Plant code (Taubate)

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 4 solenoid-operated fuel injectors:

- are mounted in the cylinder head.
- 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.
- supply fuel from the fuel tank with a fuel pump mounted in the fuel tank.

Twin Independent Variable Camshaft Timing (VCT) System

The twin independent VCT system allows variable control of intake valve closing which optimizes combustion at full load providing improved power and low speed torque (broadening the torque curve) which enables variable valve overlap which provides better fuel economy and emissions and provides optimized cold start operation with improved exhaust emissions.

PCV System

All engines are equipped with a closed-type PCV system recycling the crankcase vapors to the 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 and is cooled by an oil cooler.
- Oil enters the main gallery where it is distributed to the crankshaft main journals and to the cylinder head.
- 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.

Engine

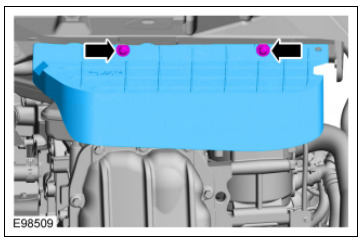
Refer to Section 303- for basic mechanical concerns or refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for driveability concerns.

Valve Clearance Check

1. Remove the valve cover. For additional information, refer to Valve Cover in this section.

2. Remove the 4 spark plugs. For additional information, refer to Section 303-07 .

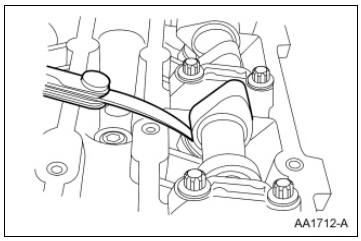
3. Remove the 2 bolts and accessory drive belt splash shield.
   - To install, tighten to 9 Nm (80 lb-in).



4. **NOTE:** Turn the engine clockwise only, and use the crankshaft bolt only.

   NOTE: Measure each valve's clearance at base circle, with the lobe pointed away from the tappet, before removing the camshafts. Failure to measure all clearances prior to removing the camshafts will necessitate repeated removal and installation and wasted labor time.

   Use a feeler gauge to measure each valve's clearance and record its location.



5. **NOTE:** The number on the valve tappet only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

   NOTE: The nominal clearance is 0.20 mm (0.0079 in) for intake and 0.34 mm (0.0133 in) for exhaust.

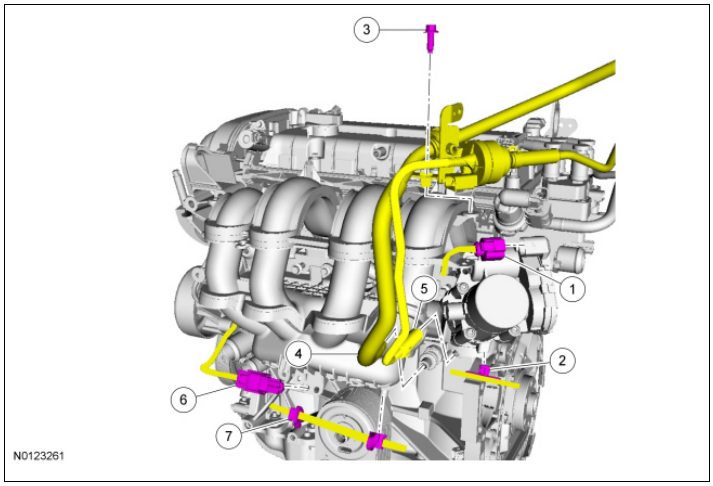
   NOTE: The acceptable clearances after being fully installed is 0.17-0.23 mm (0.007-0.009 in) for intake and 0.31-0.37 mm (0.012-0.015 in) for exhaust.

   Select tappets using this formula: tappet thickness = measured clearance + the existing tappet thickness - nominal clearance.
   Select the closest tappet size to the ideal tappet thickness available and mark the installation location.

6. If any tappets do not measure within specifications, install new tappets in these locations. For additional information, refer to Valve Train Components - Exploded View and Valve Tappets in this section.

Intake Manifold

Intake Manifold (View 1 of 2)

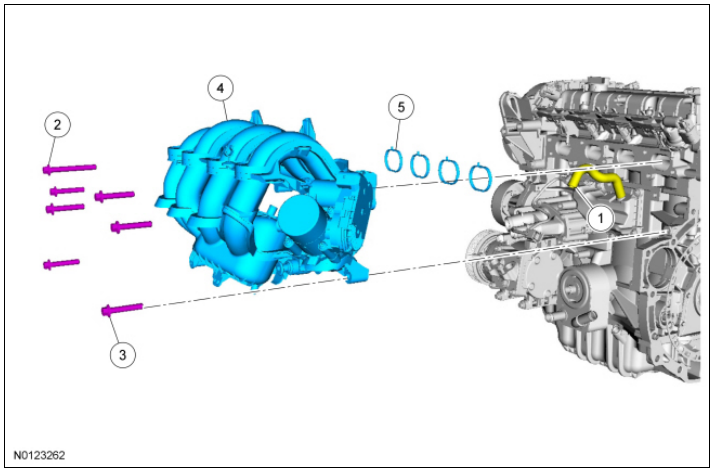


Item	Part Number	Description
1	-	Throttle Body (TB) electrical connector (part of 12A581)
2	-	TB wiring harness retainer (part of 12A581)
3	W500213	Evaporative Emission (EVAP) canister purge valve bolt - 9 Nm (80 lb-in)
4	9C490	Brake booster vacuum tube
5	9C047	EVAP canister purge valve tube
6	-	Knock Sensor (KS) electrical connector (part of 12A581)
7	-	Wiring harness retainer (part of 12A581) (2 required)

Intake Manifold (View 2 of 2)

NOTE: Refer to the on-line Workshop Manual to view this illustration as an interactive exploded view, requires Adobe® Acrobat® 8.0 or higher.

NOTE: Refer to the on-line Workshop Manual to learn about using an Interactive Illustration.

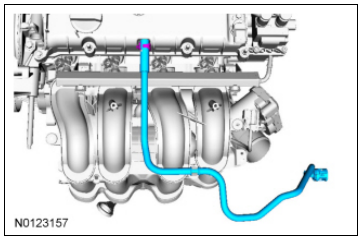


Item	Part Number	Description
1	6N664	PCV hose
2	W500117	Intake manifold bolt - 1159 lb-in)
3	W500112	Intake manifold bolt (7 required) - 18 Nm (159 lb-in)
4	9424	Intake manifold
5	9439	Intake manifold gasket (4 required)

Removal

1. Remove the air cleaner outlet tube. For additional information, refer to Section 303-12 .

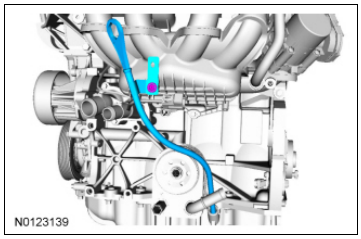
2. Disconnect the crankcase vent tube from the valve cover.
   - Detach the 2 crankcase vent tube retainers.



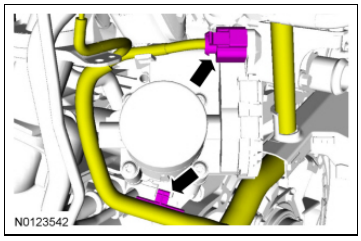
3. Remove the fuel rail. For additional information, refer to Section 303-04 .

4. Remove the generator. For additional information, refer to Section 414-00 .

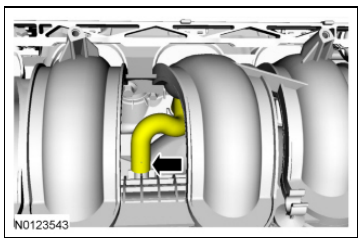
5. Remove the screw and the oil level indicator and tube.
   - Inspect and replace the O-ring seal, if necessary.



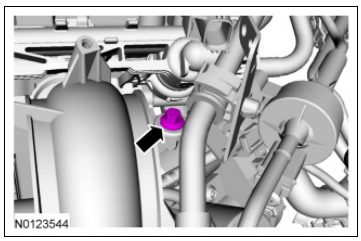
6. Disconnect the Throttle Body (TB) electrical connector.
   - Detach the wiring harness retainer from the TB .



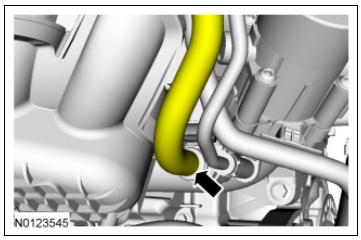
7. Disconnect the PCV hose from the intake manifold.



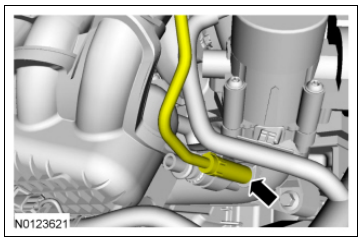
8. Remove the bolt for the Evaporative Emission (EVAP) canister purge valve.



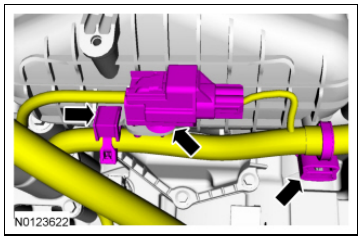
9. Disconnect the brake booster vacuum tube from the intake manifold.



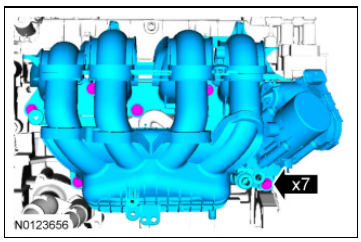
10. Disconnect the EVAP canister purge valve tube from the intake manifold and position the EVAP canister purge valve aside.



11. Detach the Knock Sensor (KS) electrical connector from the bottom of the intake manifold.
    - Detach the 2 wiring harness retainers from the bottom of the intake manifold.



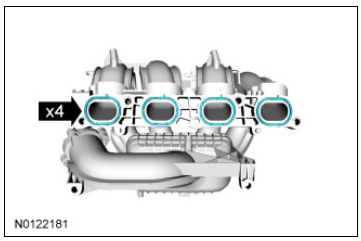
12. Remove the 7 bolts for the intake manifold.



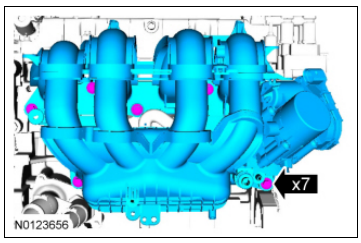
Installation

NOTICE: **If the engine is repaired or replaced because of upper engine failure, typically including valve or piston damage, check the intake manifold for metal debris. If metal debris is found, install a new intake manifold. Failure to follow these instructions can result in engine damage.**

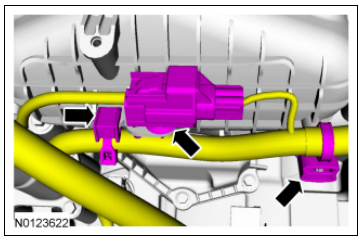
1. Inspect and install new intake manifold gaskets, if necessary.



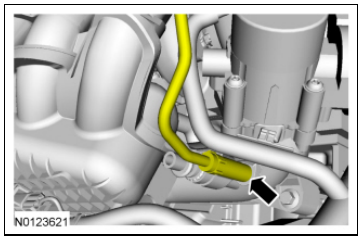
2. Install the intake manifold and the 7 bolts.
   - Tighten to 18 Nm (159 lb-in).



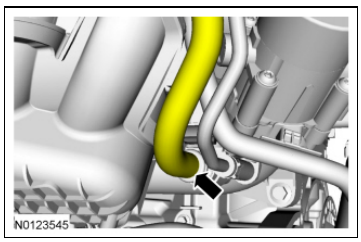
3. Attach the KS electrical connector to bottom of the intake manifold.
   - Attach the 2 wiring harness retainers to the bottom of the intake manifold.



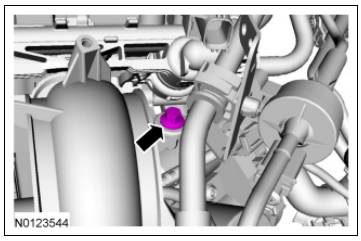
4. Position and connect the EVAP canister purge valve tube to the intake manifold.



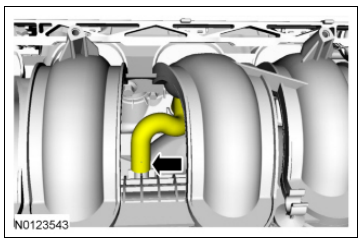
5. Connect the brake booster vacuum tube to the intake manifold.



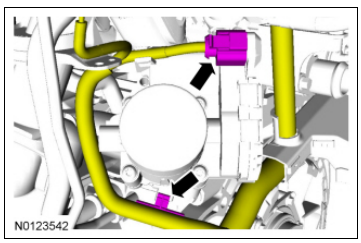
6. Install the bolt for the EVAP canister purge valve.
   - Tighten to 9 Nm (80 lb-in).



7. Connect the PCV hose to the intake manifold.



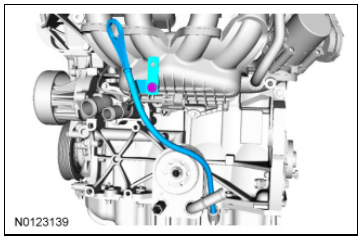
8. Connect the TB electrical connector.
   - Attach the wiring harness retainer to the TB .



9. **NOTE:** Lubricate the O-ring seal with clean engine oil.

   Install the oil level indicator and tube and the screw.

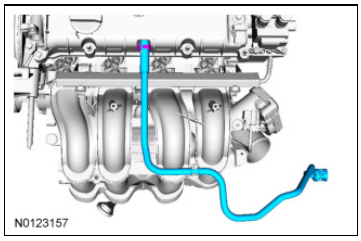
   - Tighten to 4 Nm (35 lb-in).



10. Install the generator. For additional information, refer to Section 414-00 .

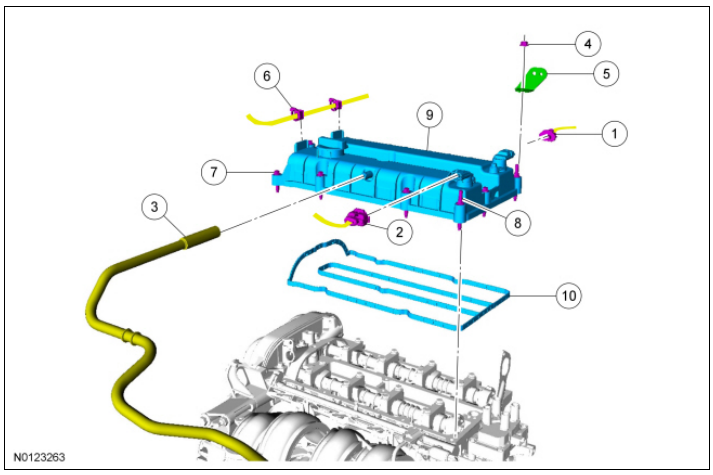
11. Install the fuel rail. For additional information, refer to Section 303-04 .

12. Connect the crankcase vent tube to the valve cover.
    - Attach the 2 crankcase vent tube retainers.



13. Install the air cleaner outlet tube. For additional information, refer to Section 303-12 .

Valve Cover



Item	Part Number	Description
1	-	Exhaust Camshaft Position (CMP) sensor electrical connector (part of 12A581)
2	-	Intake CMP sensor electrical connector (part of 12A581)
3	6A664	Crankcase vent tube
4	W520412	Heated Oxygen Sensor (HO2S) connector bracket nut - 8 Nm (71 lb-in)
5	14A163	HO2S connector bracket
6	-	Wiring harness retainer (part of 12A581) (2 required)
7	-	Valve cover bolt (8 required) (part of 6M293) - 9 Nm (80 lb-in)
8	-	Valve cover stud bolt (4 required) (part of 6M293) - 9 Nm (80 lb-in)
9	6582	Valve cover
10	6584	Valve cover gasket

Removal

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 can cause engine failure.**

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.**

1. Remove the 2 Variable Camshaft Timing (VCT) oil control solenoids. For additional information, refer to Section 303-14 .

2. Disconnect the 2 Camshaft Position (CMP) sensor electrical connectors.

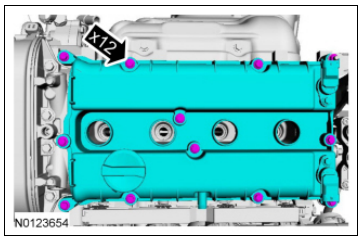
3. Remove the spark plug wires. For additional information, refer to Section 303-07 .

4. Disconnect the crankcase vent tube from the valve cover.

5. Remove the nut and the Heated Oxygen Sensor (HO2S) electrical connector bracket.

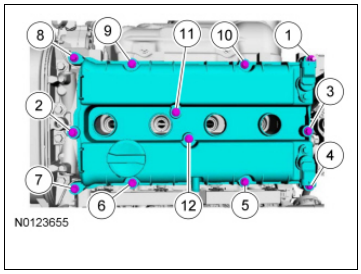
6. Detach all the wiring harness retainers from the valve cover.

7. Loosen the 12 retainers and remove the valve cover.
   - Discard the gasket.



Installation

1. Using a new gasket, install the valve cover and tighten the retainers in sequence shown.
   - Tighten to 9 Nm (80 lb-in).



2. Attach all the wiring harness retainers to the valve cover.

3. Install the Heated Oxygen Sensor (HO2S) electrical connector bracket and nut.
   - Tighten to 8 Nm (71 lb-in).

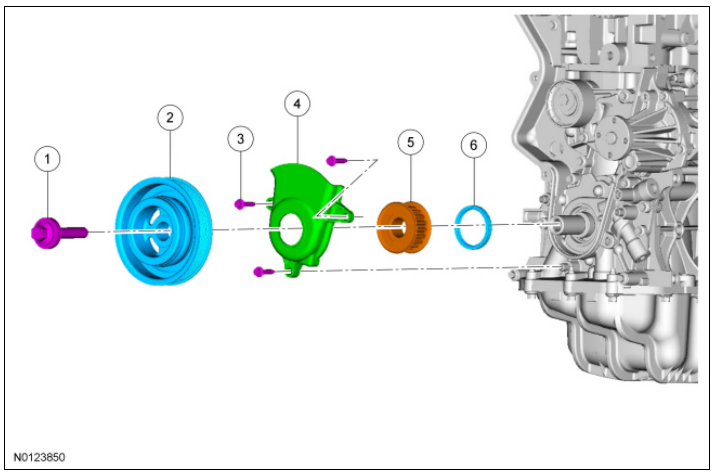
4. Connect the crankcase vent tube to the valve cover.

5. Install the spark plug wires. For additional information, refer to Section 303-07 .

6. Connect the Camshaft Position (CMP) sensor electrical connectors.

7. Install the 2 Variable Camshaft Timing (VCT) oil control solenoids. For additional information, refer to Section 303-14 .

Crankshaft Pulley and Crankshaft Front Seal - Exploded View



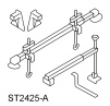
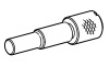
Item	Part Number	Description
1	6A340	Crankshaft pulley bolt
2	6312	Crankshaft pulley
3	W500215	Lower timing belt cover bolt (3 required)
4	6019	Lower timing belt cover
5	6306	Crankshaft sprocket gear
6	6700	Crankshaft front seal

Removal and Installation

1. Refer to the procedures and/ded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Crankshaft Pulley

Special Tool(s)

 ST2425-A	Engine Support Bar 303-F072
 ST1595-A	Lifting Bracket, Engine 303-050 (T70P-6000)
 ST3262-A	Pin, Crankshaft Top Dead Center (TDC) 303-748
 ST3261-A	Tool, Variable Camshaft Timing (VCT) Alignment 303-1097
 ST1438-A	Strap Wrench 303-D055 (D85L-6000-A) or equivalent

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

NOTICE: **Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.**

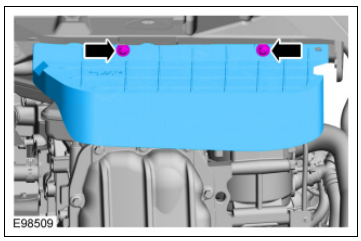
NOTICE: **During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passag, coolant passages or the oil pan can cause engine failure.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

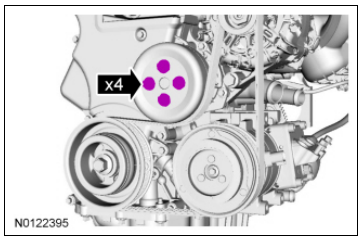
2. Remove the upper and lower cowl panel grilles. For additional information, refer to Section 501-02 .

3. Remove the RH front wheel and tire. For additional information, refer to Section 204-04 .

4. Remove the 2 bolts and accessory drive belt splash shield.

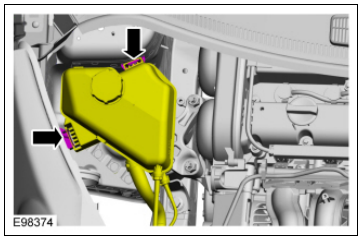


5. Loosen the 4 coolant pump bolts.

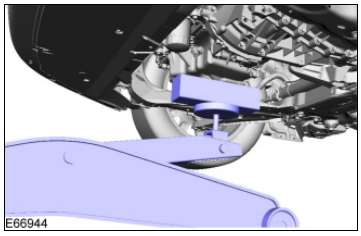


6. Remove the generator. For additional information, refer to Section 414-00 .

7. Release the 2 tabs and position the degas bottle aside.



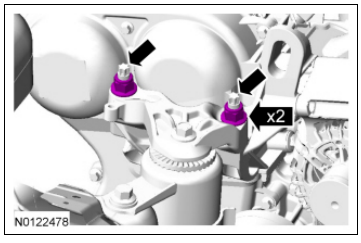
8. Using a floor jack and a block of wood, support the engine.



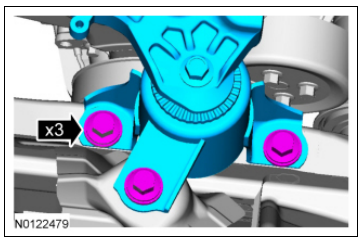
9. ***NOTICE:*** **The engine mount studs must be held while removing the engine mount nuts or damage to the powertrain may occur.**

   NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.

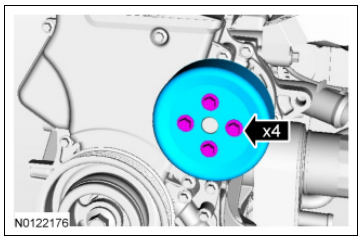
   Use the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.



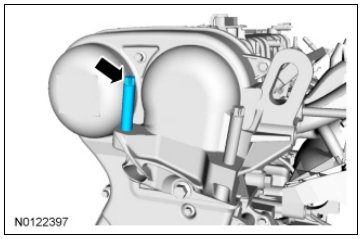
10. Remove the 3 bolts and the engine mount.



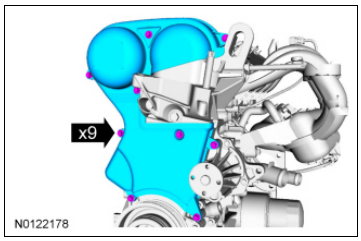
11. Remove the 4 bolts and coolant pump pulley.



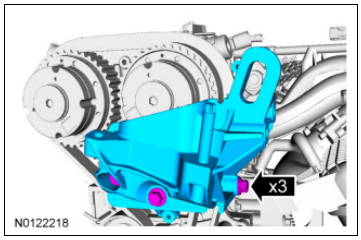
12. Remove the 1 engine mount stud.



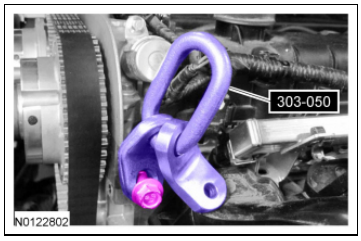
13. Remove the 9 bolts and the timing belt cover.



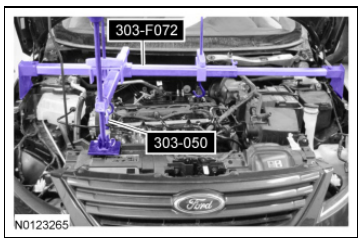
14. Remove the 3 bolts and the engine mount bracket.



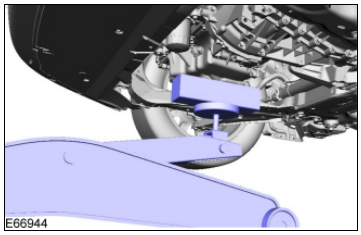
15. Using an engine mount bracket bolt, install the Engine Lifting Bracket.



16. Install the Engine Support Bar and support the engine.

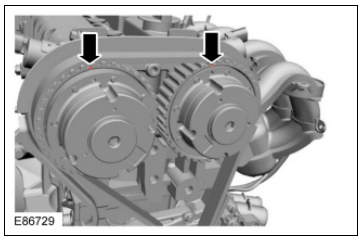


17. Remove the floor jack and block of wood.

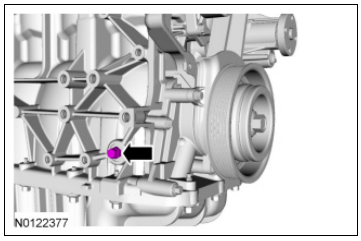


18. ***NOTICE:*** **Only rotate the crankshaft in a clockwise direction.**

    Using the crankshaft pulley bolt, turn the crankshaft clockwise until the markings on the camshaft phaser and sprockets are at the 11 o'clock position as shown.

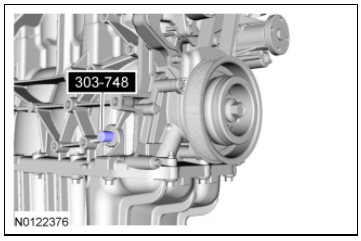


19. Remove the engine plug bolt.



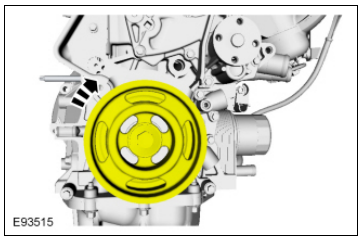
20. **NOTE:** The Crankshaft Top Dead Center (TDC) Timing Pin will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the crankshaft pulley removal and installation.

    Install the Crankshaft TDC Pin.

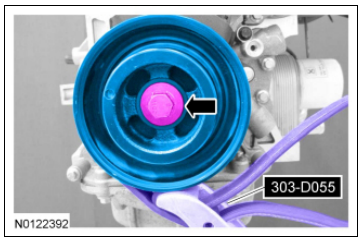


21. **NOTE:** Only rotate the crankshaft clockwise direction.

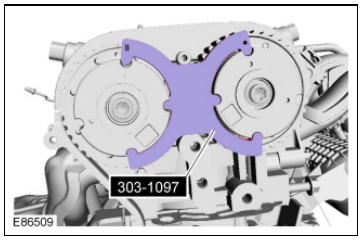
    Rotate the crankshaft until it contacts Crankshaft TDC Pin.



22. Using the Strap Wrench, remove the crankshaft pulley bolt and the crankshaft pulley.
    - Discard the crankshaft pulley bolt.

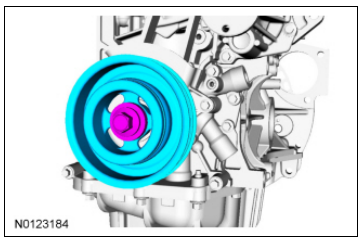


23. Install the VCT Alignment Tool.

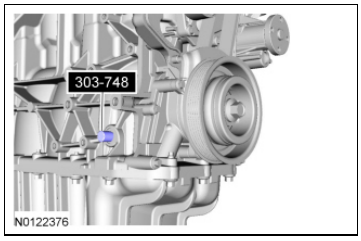


Installation

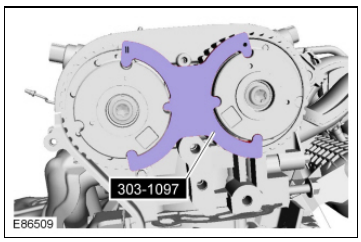
1. Install the crankshaft pulley and the new bolt.
    - Tighten to 100 Nm (74 lb-ft).
    - The final torque of the crankshaft will be completed in following steps.



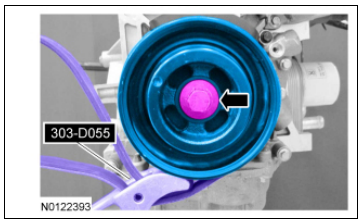
2. Remove the Crankshaft TDC Timing Pin.



3. Remove the VCT Alignment Tool.

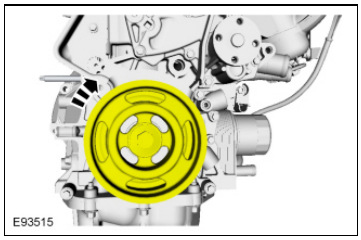


4. Tighten the crankshaft bolt in the following 3 stages.
    1. Stage 1: Using the Strap wrench, tighten an additional 90 degrees.
    2. Stage 2: Wait for 10 seconds.
    3. Stage 3: Using the Strap wrench, tighten an additional 15 degrees.

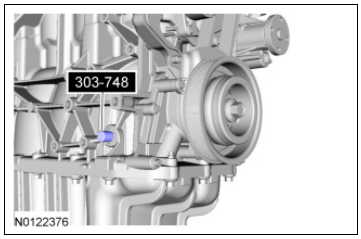


5. **NOTE:** Only rotate the crankshaft clockwise direction.

    Rotate the crankshaft about 1 3/4 turns.

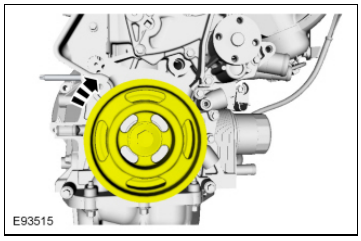


6. Install the Crankshaft TDC Timing Pin.



7. **NOTE:** Only rotate the crankshaft clockwise direction.

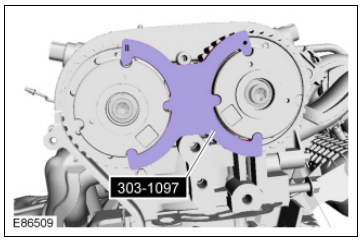
    Rotate the crankshaft until it stops against the Crankshaft TDC Timing Pin.



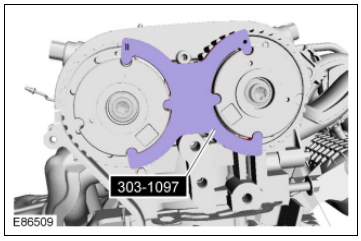
8. **NOTE:** The special tool can only be installed if the valve timing is correct.

   Install the VCT Alignment Tool.

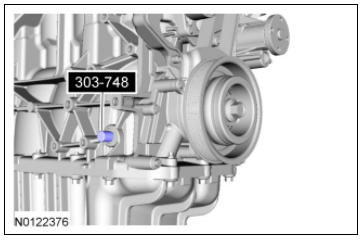
   - If the special tool cannot be installed, repeat the adjustment according to the preceding steps.



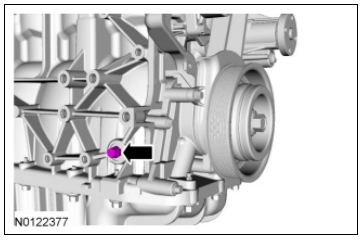
9. Remove the VCT Alignment Tool.



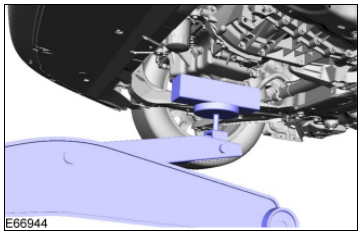
10. Remove the Crankshaft TDC Timing Pin.



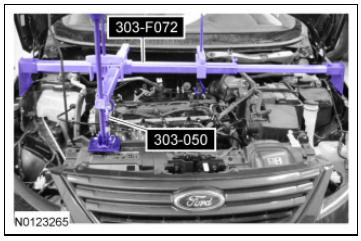
11. Install the engine plug bolt.
    - Tighten to 20 Nm (177 lb-in).



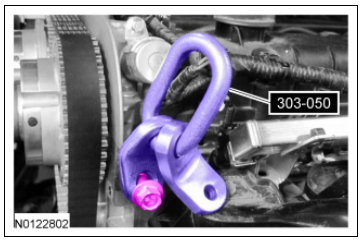
12. Using a floor jack and a block of wood, support the engine.



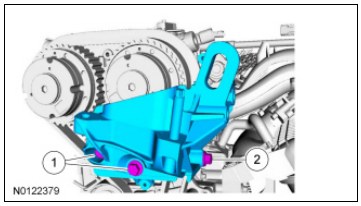
13. Remove the Engine Support Bar.



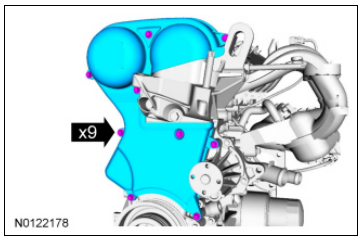
14. Remove the bolt and the Engine Lifting Bracket.



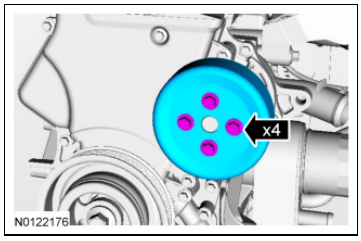
15. Install the engine mount bracket and the 3 bolts finger tight.
    1. Tighten the 2 bolts to 55 Nm (41 lb-ft).
    2. Tighten the bolt to 55 Nm (41 lb-ft).



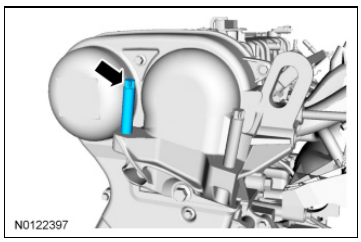
16. Install the timing belt cover and the 9 bolts.
    - Tighten to 9 Nm (80 lb-in).



17. Install the coolant pump pulley and the 4 bolts finger tight.



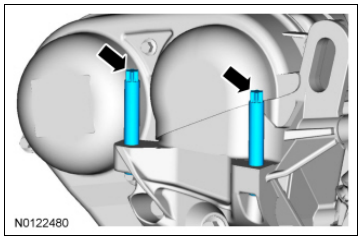
18. Install the 1 engine mount stud finger tight.



19. ***NOTICE:*** **The 2 engine mount studs must be torqued or damage to the powertrain may occur.**

    Torque the 2 engine mount studs before installing the engine mount nuts.

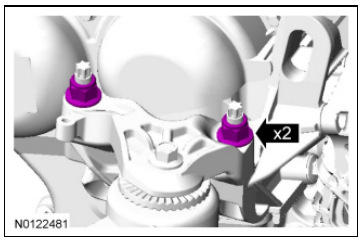
    - Tighten to 8 Nm (71 lb-in).



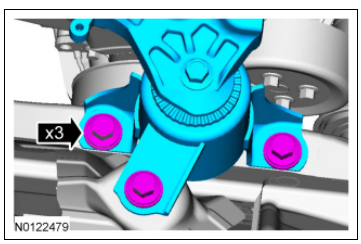
20. **NOTE:** Do not loosen the engine mount center bolt or the engine may become improperly positioned.

    Install the engine mount and the 2 nuts.

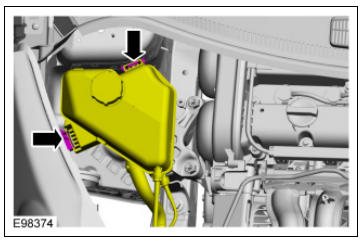
    - Tighten the 2 nuts to 80 Nm (59 lb-ft).



21. Install the 3 engine mount bolts.
    - Tighten to 48 Nm (35 lb-ft).

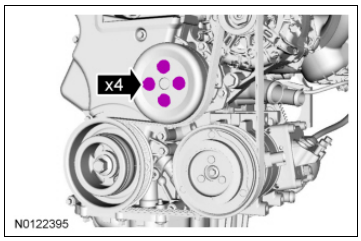


22. Position the degas bottle on the 2 retainer tabs.

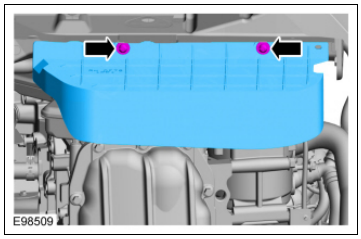


23. Install the generator. For additional information, refer to Section 414-00 .

24. Tighten the 4 coolant pump bolts to 20 Nm (177 lb-in).



25. Install the accessory drive belt splash shield and the 2 bolts.
    - Tighten to 9 Nm (80 lb-in).

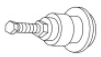


26. Install the RH front wheel and tire. For additional information, refer to Section 204-04 .

27. Install the upper and lower cowl panel grilles. For additional information, refer to Section 501-02 .

Crankshaft Front Seal

Special Tool(s)

 ST1378-A	Installer, Crankshaft Vibration Damper 303-175 (T82L-6316-B)
 ST1328-A	Installer, Front Cover Oil Seal 303-335 (T88T-6701-A)
 ST3260-A	Replacer, Front Crankshaft Seal 303-420 (T92P-6701-BH)
 ST2417-A	Remover, Input Shaft Oil Seal 308-375
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)

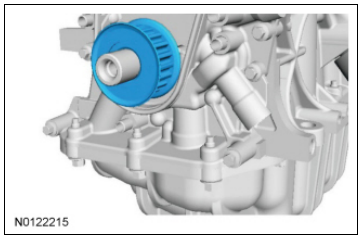
Material

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

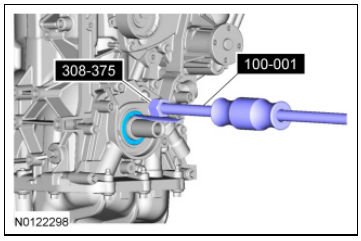
Removal

1. Remove the timing belt. For additional information, refer to Timing Belt in this section.

2. Remove the crankshaft sprocket gear.


N0122215

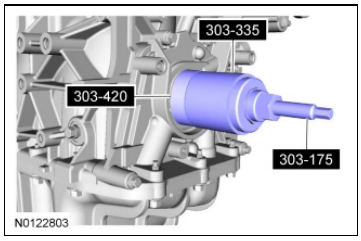
3. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the crankshaft front oil seal.



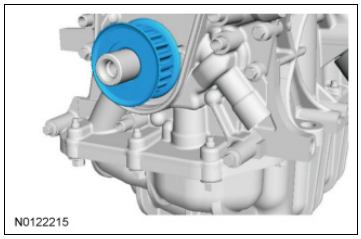
Installation

1. **NOTE:** Lubricate the oil seal with clean engine oil.

   Using the Crankshaft Vibration Damper Installer, Front Cover Oil Seal Installer and Front Crankshaft Seal Replacer, install the crankshaft front oil seal.

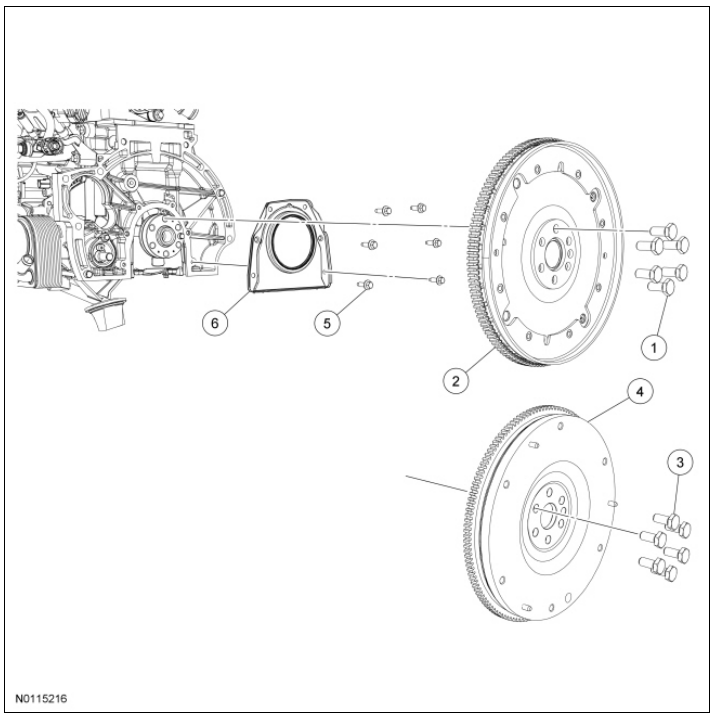


2. Install the crankshaft sprocket gear.



3. Install the timing belt. For additional information, refer to Timing Belt in this section.

Flexplate or Flywheel and Crankshaft Rear Seal - Exploded View

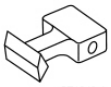


Item	Part Number	Description
1	6379	Flexplate bolt (6 required)
2	6375	Flexplate
3	6379	Flywheel bolt (6 required)
4	6375	Flywheel
5	W500213	Crankshaft rear oil seal with retainer plate bolt (6 required)
6	6K301	Crankshaft rear oil seal with retainer plate

Removal and Installation

Flexplate

Special Tool(s)

 ST1840-A	Tool, Flywheel Holding 303-103

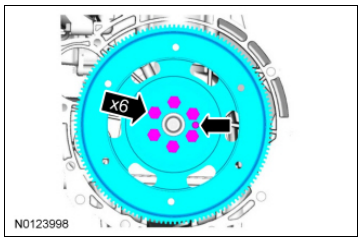
Removal

1. Remove the automatic transaxle. For additional information, refer to Section 307-11 .

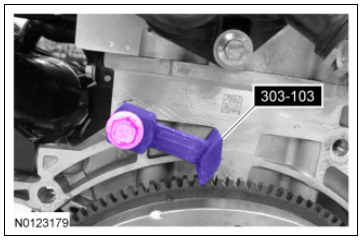
2. Remove the 6 bolts and the flexplate.
   - Discard the bolts.

Installation

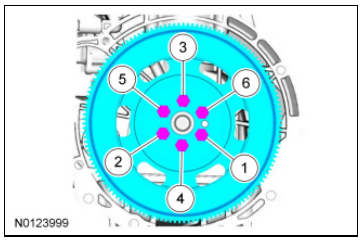
1. Align the flexplate and crankshaft using the dowel pin location hold install the new bolts finger tight.



2. Install the Flywheel Holding Tool.



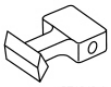
3. Tighten the bolts in the sequence shown in 2 stages:
   - Stage 1: Tighten to 30 Nm (22 lb-ft).
   - Stage 2: Tighten an additional 80 degrees.



4. Install the automatic transaxle. For additional information, refer to Section 307-11 .

Flywheel

Special Tool(s)

 ST1840-A	Tool, Flywheel Holding 303-103

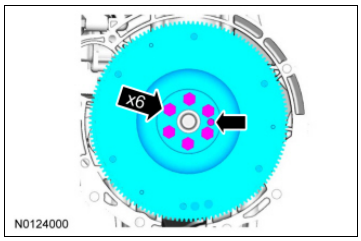
Removal

1. Remove the clutch disc and pressure plate. For additional information, refer to Section 308-01 .

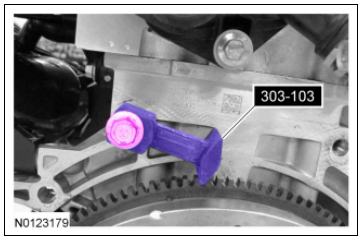
2. Remove the 6 bolts and the flywheel.
   - Discard the bolts.

Installation

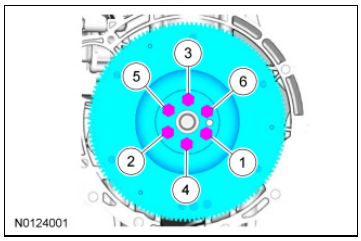
1. Align the flywheel and crankshaft using the dowel pin locatiole and install the new bolts finger tight.



2. Install the Flywheel Holding Tool.



3. Tighten the bolts in the sequence shown in 2 stages:
   - Stage 1: Tighten to 30 Nm (22 lb-ft).
   - Stage 2: Tighten an additional 80 degrees.



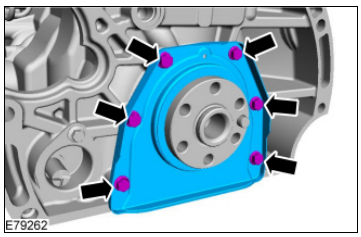
4. Install the clutch disc and pressure plate. For additional information, refer to Section 308-01 .

Crankshaft Rear Seal

Removal

1. Remove the flexplate or flywheel. For additional information, refer to Flexplate or Flywheel in this section.

2. Remove the oil pan. For additional information, refer to Oil Pan in this section.



4. Clean the sealing surface of the crankshaft rear seal and crankshaft.

Installation

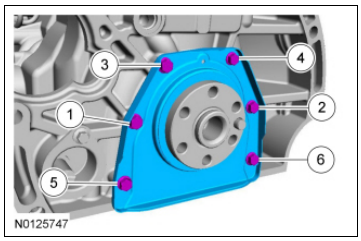
1. **NOTE:** New crankshaft rear seal is supplied with an alignment sleeve which must be removed after installation.

   NOTE: Do not remove the alignment sleeve from the crankshaft rear seal prior to installation on the crankshaft.

   NOTE: Do not lubricate the new crankshaft rear seal.

   Align the crankshaft rear seal and alignment sleeve on the crankshaft and push the crankshaft rear seal off the alignment sleeve onto the crankshaft without stopping until the crankshaft rear seal meets the cylinder block.

   - Install the 6 bolts and tighten in sequence shown in 2 stages.
     - Stage 1: Tighten bolts 1 through 6 to 4 Nm (35 lb-in).
     - Stage 2: Tighten bolts 1 through 6 to 9 Nm (80 lb-in).

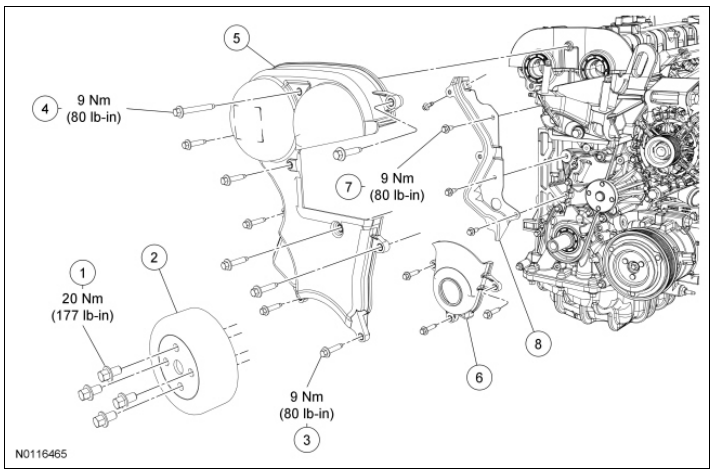


2. Remove the alignment sleeve taking care not to touch the sealing lip.

3. Install the oil pan. For additional information, refer to Oil Pan in this section.

4. Install the flexplate or flywheel. For additional information, refer to Flexplate or Flywheel in this section.

Timing Belt Cover



Item	Part Number	Description
1	W714914	Coolant pump pulley bolt (3 required)
2	8509	Coolant pump pulley
3	W500215	Upper and lower timing belt cover bolt (12 required)
4	W500303	Upper timing belt cover bolt
5	6019	Upper timing belt cover
6	6019	Lower timing belt cover
7	W702251	Timing belt cover backplate bolt (4 required)
8	6019	

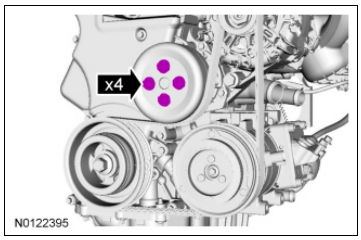
Removal

All timing belt covers

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

Upper timing belt cover

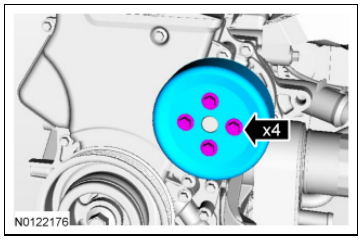
2. Loosen the 4 coolant pump pulley bolts.



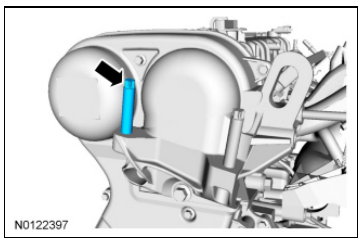
3. Remove the accessory drive belt. For additional information, refer to Section 303-05 .

4. Remove the engine mount. For additional information, refer to Engine Mount in this section.

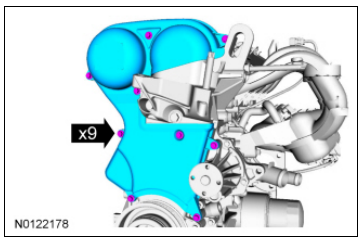
5. Remove the 4 bolts and coolant pump pulley.



6. Remove the 1 engine mount stud.



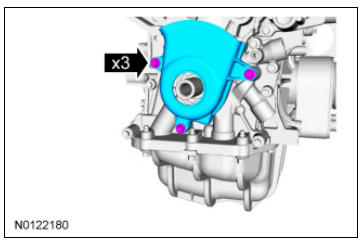
7. Remove the 9 bolts and the upper timing belt cover.



Lower timing belt cover

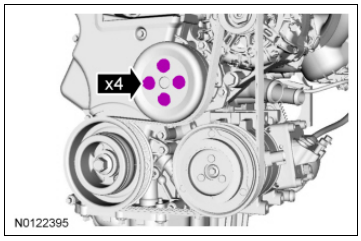
8. Remove the crankshaft pulley. For additional information, refer to Crankshaft Pulley in this section.

9. Remove the 3 bolts and the lower timing belt cover.



Timing belt cover backplate

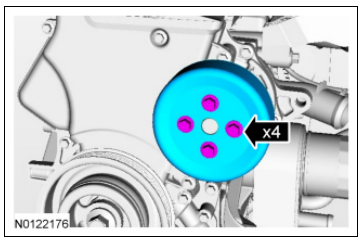
10. Loosen the 4 coolant pump pulley bolts.



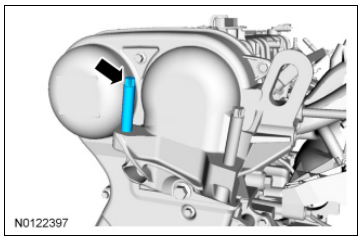
11. Remove the accessory drive belt. For additional information, refer to Section 303-05 .

12. Remove the engine mount. For additional information, refer to Engine Mount in this section.

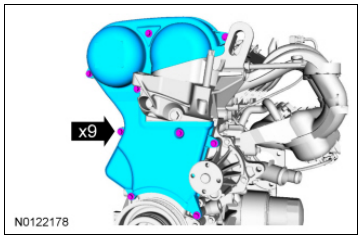
13. Remove the 4 bolts and coolant pump pulley.



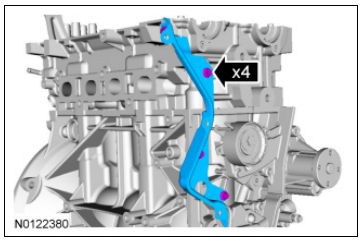
14. Remove the 1 engine mount stud.



15. Remove the 9 bolts and the upper timing belt cover.



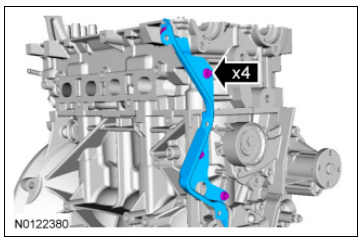
16. Remove the 4 bolts and the timing belt cover backplate.



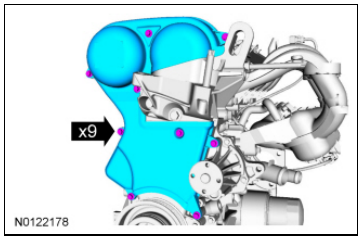
Installation

Timing belt cover backplate

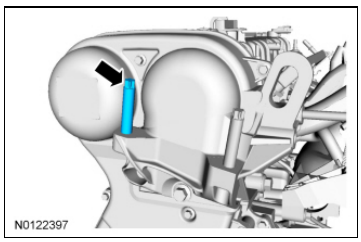
1. Install the timing belt cover backplate and the 4 bolts.
   - Tighten to 9 Nm (80 lb-in).



2. Install the upper timing belt cover and the 9 bolts.
   - Tighten to 9 Nm (80 lb-in).



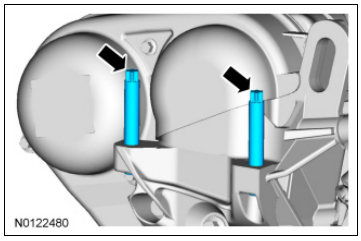
3. Install the 1 engine mount stud finger tight.



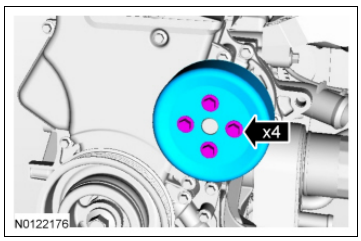
4. ***NOTICE:*** **The 2 engine mount studs must be torqued or damage to the powertrain may occur.**

   Torque the 2 engine mount studs before installing the engine mount nuts.

   - Tighten to 8 Nm (71 lb-in).



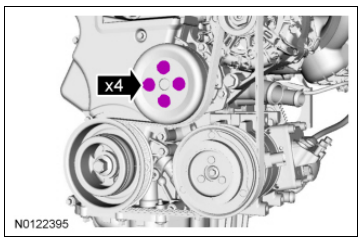
5. Install the coolant pump pulley and the 4 bolts.
   - Do not torque at this time.



6. Install the engine mount. For additional information, refer to Engine Mount in this section.

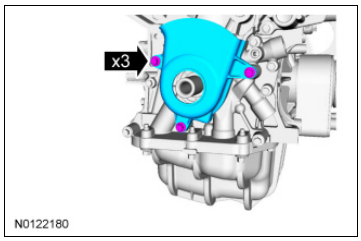
7. Install the accessory drive belt. For additional information, refer to Section 303-05 .

8. Tighten the 4 coolant pump pulley bolts to 20 Nm (177 lb-in).



Lower timing belt cover

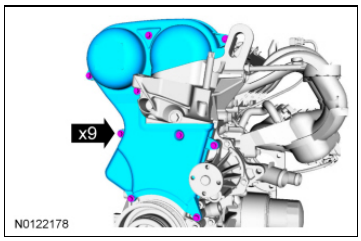
9. Install the lower timing belt cover and the 3 bolts.
   - Tighten to 9 Nm (80 lb-in).



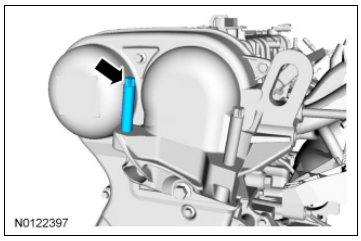
10. Install the crankshaft pulley. For additional information, refer to Crankshaft Pulley in this section.

Upper timing belt cover

11. Install the upper timing belt cover and the 9 bolts.
    - Tighten to 9 Nm (80 lb-in).



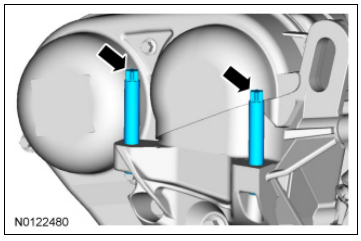
12. Install the 1 engine mount stud finger tight.



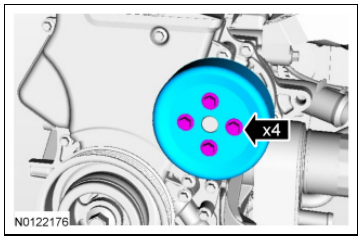
13. ***NOTICE:*** **The 2 engine mount studs must be torqued or damage to the powertrain may occur.**

    Torque the 2 engine mount studs before installing the engine mount nuts.

    - Tighten to 8 Nm (71 lb-in).



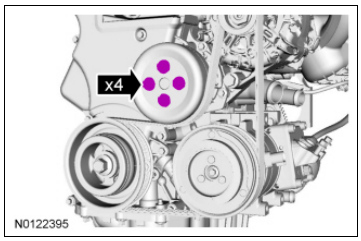
14. Install the coolant pump pulley and the 4 bolts.
    - Do not torque at this time.



15. Install the engine mount. For additional information, refer to Engine Mount in this section.

16. Install the accessory drive belt. For additional information, refer to Section 303-05 .

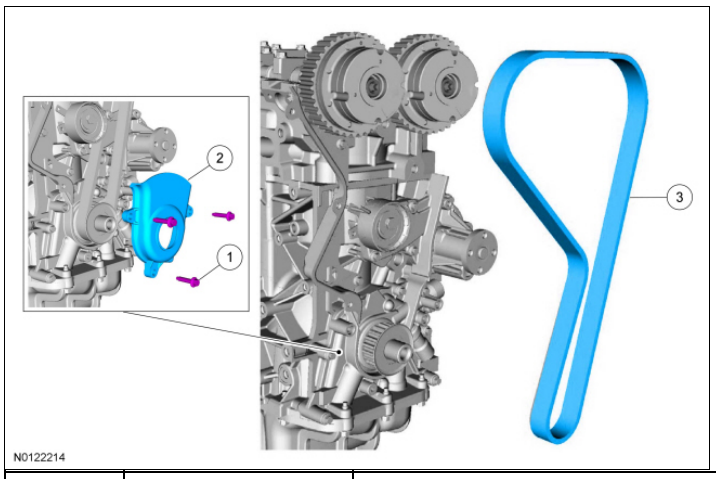
17. Tighten the 4 coolant pump pulley bolts to 20 Nm (177 lb-in).



Timing Belt

Special Tool(s)

 ST3261-A	Tool, Variable Camshaft Timing (VCT) Alignment 303-1097



Item	Part Number	Description
1	W500215	Lower timing belt cover bolt (3 required)
2	6019	Lower timing belt cover <
3	6268	Timing belt

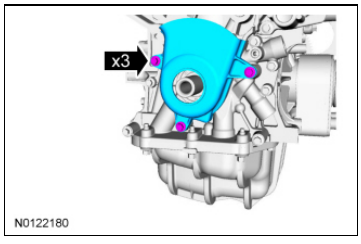
Removal and Installation

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 can cause engine failure.**

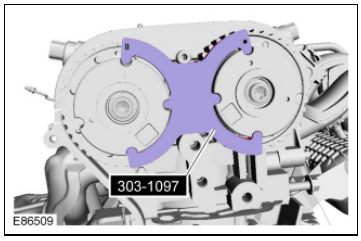
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the crankshaft pulley. For additional information, refer to Crankshaft Pulley in this section.

3. Remove the 3 bolts and the lower timing belt cover.



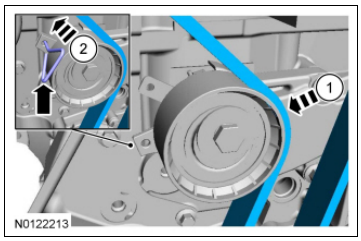
4. Install the VCT Alignment Tool.



5. ⚠ **WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.**

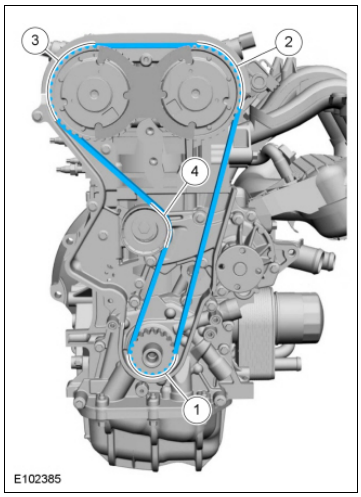
   Remove the timing belt.

   1. Rotate the timing belt tensioner clockwise.
   2. Align the 2 holes on the tensioner and install a small screwdriver or holding pin.
      - ♦ Remove the timing belt.



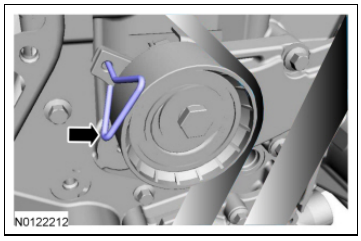
Installation

1. Install the timing belt in the sequence shown.

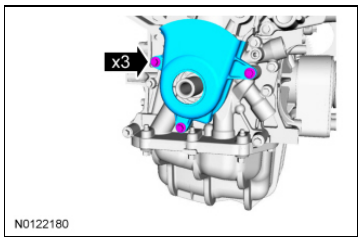


2. ⚠ **WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.**

   Remove the timing belt tensioner holding tool.



3. Install the lower timing belt cover and the 3 bolts.
    - Tighten to 9 Nm (80 lb-in).

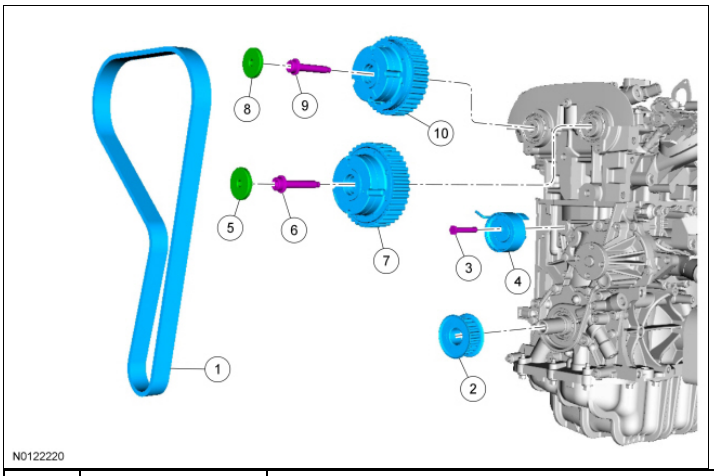


4. Install the crankshaft pulley. For additional information, refer to Crankshaft Pulley in this section.

Timing Drive Components

Special Tool(s)

 ST3261-A	Tool, Variable Camshaft Timing (VCT) Alignment 303-1097
 ST3259-A	Alignment Plate, Camshaft 303-376B



Item	Part Number	Description
1	6268	Timing belt
2	6306	Crankshaft sprocket gear
3	6A340	Timing belt tensioner bolt
4	6K254	Timing belt tensioner
5	W710954	Intake camshaft phaser and sprocket plug and seal
6	6279	Intake camshaft phaser and sprocket bolt
7	6256	Intake camshaft phaser and sprocket
8	W710954	Exhaust camshaft phaser and sprocket plug and seal
9	6279	Exhaust camshaft phaser and sprocket bolt
10	6256	Exhaust camshaft phaser and sprocket

Removal

NOTICE: **Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.**

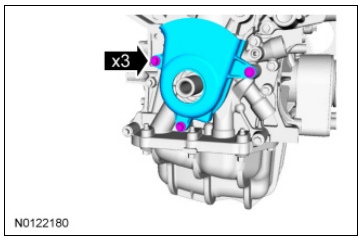
NOTICE: **During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

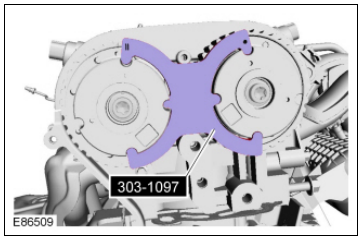
2. Remove the valve cover. For additional information, refer to Valve Cover in this section.

3. Remove the crankshaft pulley. For additional information, refer to Crankshaft Pulley in this section.

4. Remove the 3 bolts and the lower timing belt cover.



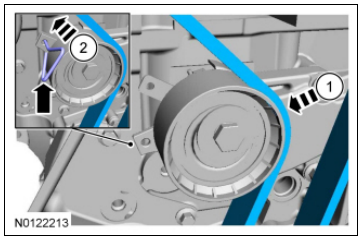
5. Install the VCT Alignment Tool.



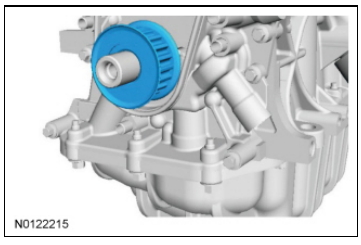
6. ⚠ **WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.**

   Remove the timing belt.

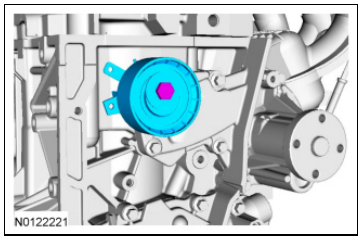
   1. Rotate the timing belt tensioner clockwise.
   2. Align the 2 holes on the tensioner and install a small screwdriver or holding pin.
      - ♦ Remove the timing belt.



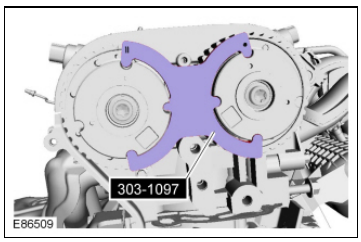
7. Remove the crankshaft sprocket gear.



8. Remove the bolt and the timing belt tensioner.

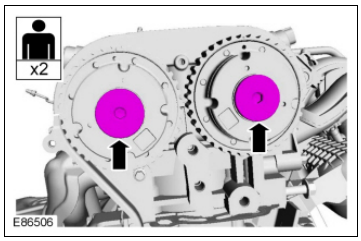


9. Remove the VCT Alignment Tool.



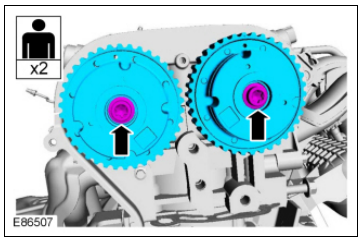
10. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

    Remove the 2 camshaft phaser and sprocket plugs.



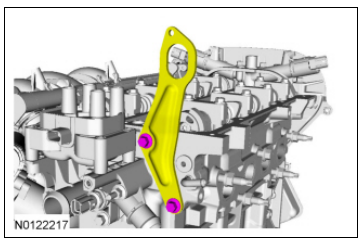
11. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

    Remove the 2 bolts and the camshaft phaser and sprockets.

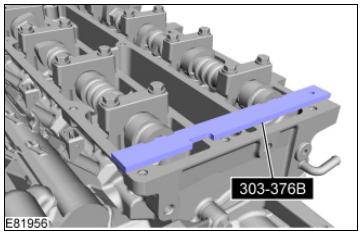


Installation

1. Loosen the 2 bolts for the LH engine lift eye.



2. Install the Camshaft Alignment Plate into the end of the camshafts.

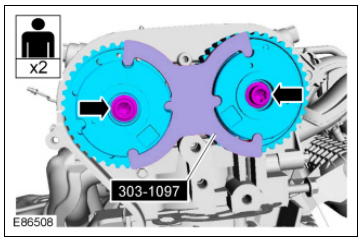


3. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

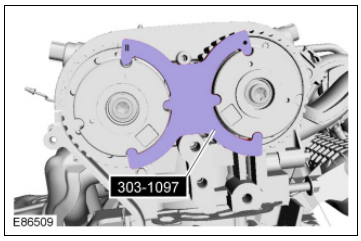
   NOTE: The timing marks of the camshaft phaser and sprocket must be at the 12 o'clock position.

   Install the 2 camshaft phaser and sprockets, bolts and the VCT Alignment Tool.

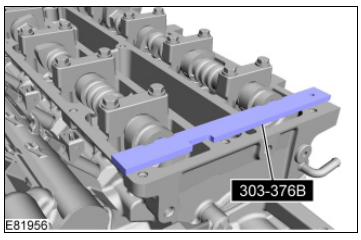
   - Tighten the 2 bolts to 25 Nm (18 lb-ft).



4. Remove the VCT Alignment Tool.

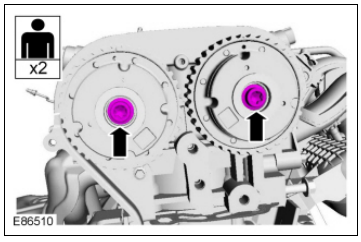


5. Remove the Camshaft Alignment Plate.



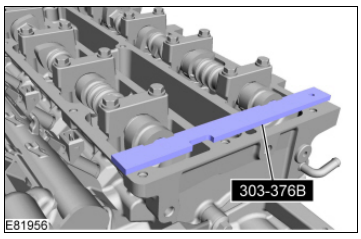
6. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

   Tighten to 2 camshaft phaser and sprocket bolts an additional 75 degrees.



7. **NOTE:** The special tool can only be installed if the valve timing is correct.

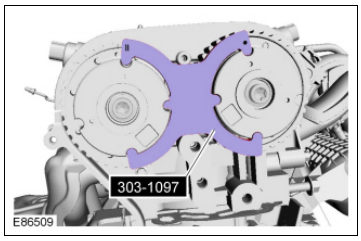
   Install the Camshaft Alignment Plate into the end of the camshafts.



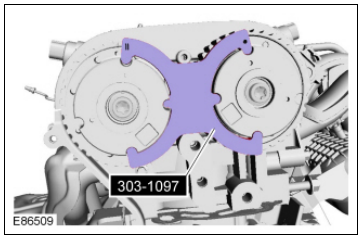
8. **NOTE:** The special tool can only be installed if the valve timing is correct.

   Install the VCT Alignment Tool.

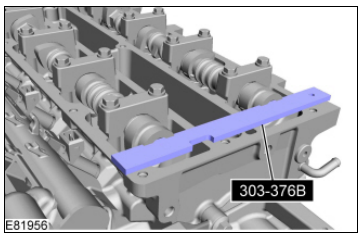
   - If the special tools cannot be installed, repeat the adjustment according to the preceding steps.



9. Remove the VCT Alignment Tool.



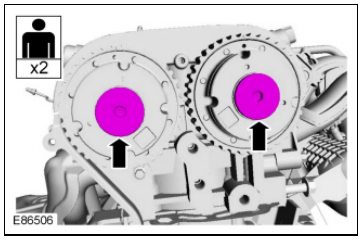
10. Remove the Camshaft Alignment Plate.



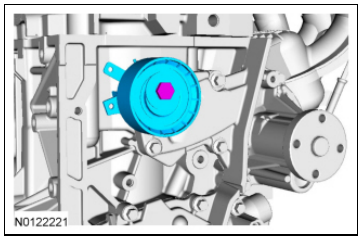
11. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

    Install the 2 camshaft phaser and sprocket plugs.

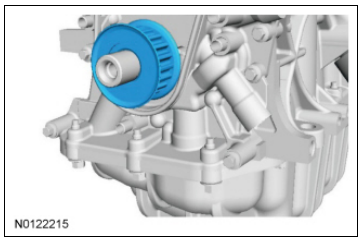
    - Tighten to 16 Nm (142 lb-in).



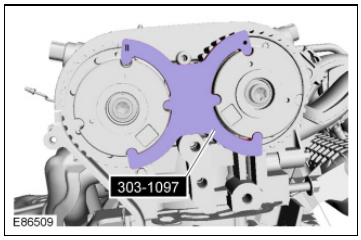
12. Install the timing belt tensioner and the bolt.
    - Tighten to 25 Nm (18 lb-ft).
    - Rotate the timing belt tensioner clockwise and align the 2 holes on the tensioner and install a small screwdriver or holding pin.



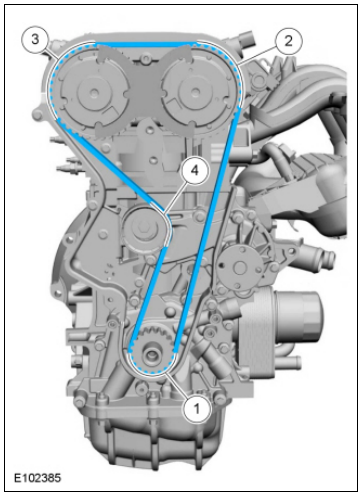
13. Install the crankshaft sprocket gear.



14. Install the VCT Alignment Tool.

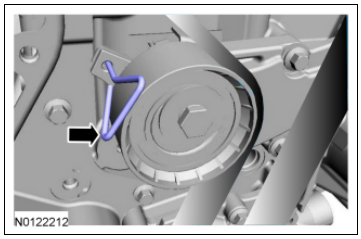


15. Install the timing belt in the sequence shown.

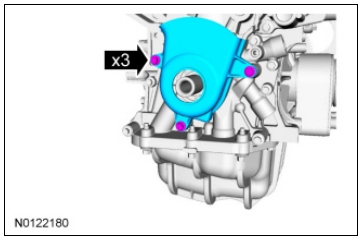


16. ⚠ **WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.**

    Remove the timing belt tensioner holding tool.

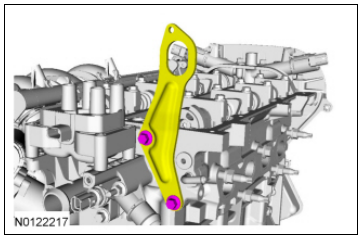


17. Install the lower timing belt cover and the 3 bolts.
    - Tighten to 9 Nm (80 lb-in).



18. Install the crankshaft pulley. For additional information, refer to Crankshaft Pulley in this section.

19. Tighten the 2 bolts for the LH engine lift eye.
    - 19 Nm (168 lb-in).

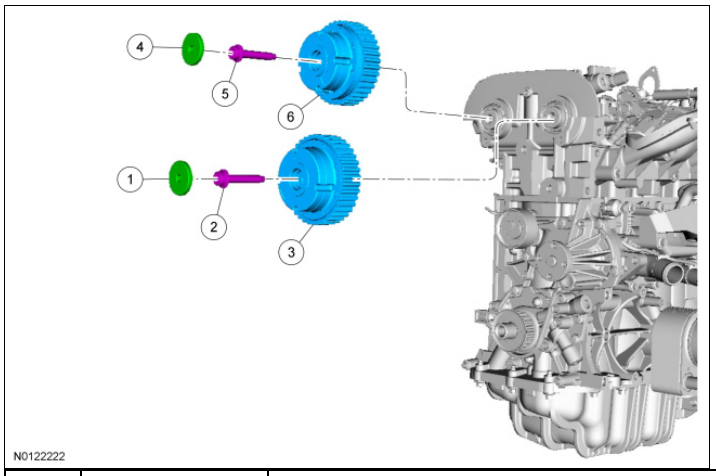


20. Install the valve cover. For additional information, refer to Valve Cover in this section.

Camshaft Phaser and Sprocket

Special Tool(s)

 ST3259-A	Alignment Plate, Camshaft 303-376B
 ST3261-A	Tool, Variable Camshaft Timing (VCT) Alignment 303-1097



Item	Part Number	Description
1	W710954	Intake camshaft phaser and sprocket plug and seal
2	6279	Intake camshaft phaser and sprocket bolt
3	6256	Intake camshaft phaser and sprocket
4	W710954	Exhaust camshaft phaser and sprocket plug and seal
5	6279	Exhaust camshaft phaser and sprocket bolt
6	6256	Exhaust camshaft phaser and sprocket

Removal

NOTICE: **Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.**

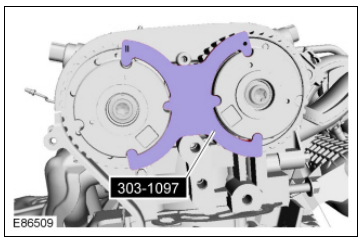
NOTICE: **During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the valve cover. For additional information, refer to Valve Cover in this section.

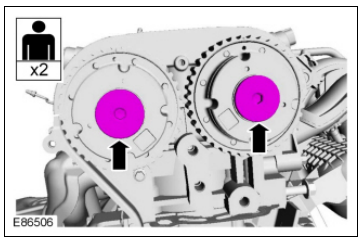
3. Remove the timing belt. For additional information, refer to Timing Belt in this section.

4. Remove the VCT Alignment Tool.



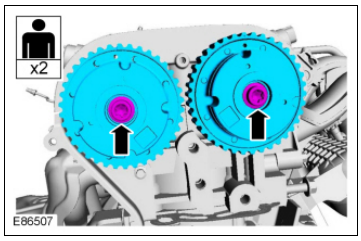
5. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

   Remove the 2 camshaft phaser and sprocket plugs.



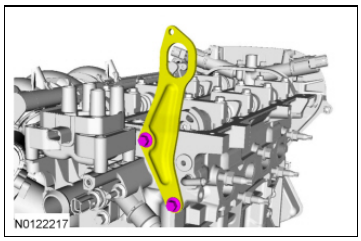
6. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

   Remove the 2 bolts and the camshaft phaser and sprockets.



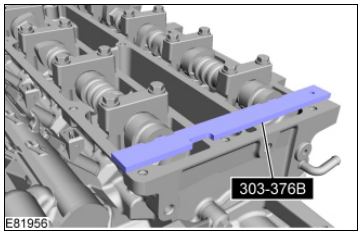
Installation

1. Loosen the 2 bolts for the LH engine lift eye.



2. ***NOTICE:*** **It may be necessary to use an open-ended wrench to turn the camshafts by the hexagon to align the camshafts.**

   Install the Camshaft Alignment Plate into the end of the camshafts.

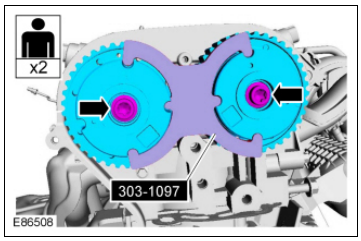


3. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

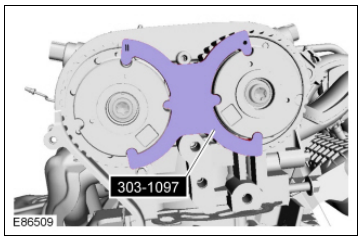
   NOTE: The timing marks of the camshaft phaser and sprocket must be at the 12 o'clock position.

   Install the 2 camshaft phaser and sprocket, bolts and the VCT Alignment Tool.

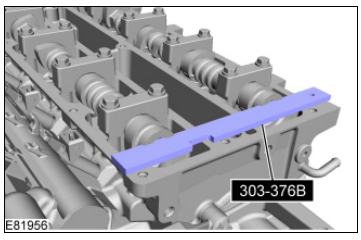
   - Tighten the 2 bolts to 25 Nm (18 lb-ft).



4. Remove the VCT Alignment Tool.

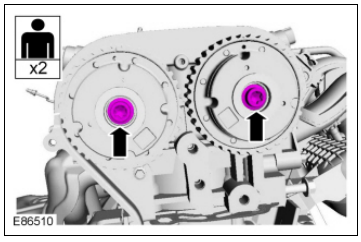


5. Remove the Camshaft Alignment Plate.



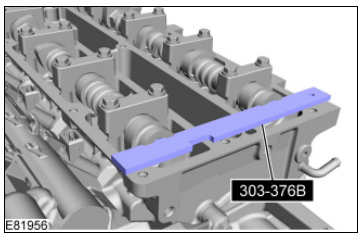
6. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

   Tighten the 2 camshaft phaser and sprocket bolts an additional 75 degrees.



7. **NOTE:** The special tool can only be installed if the valve timing is correct.

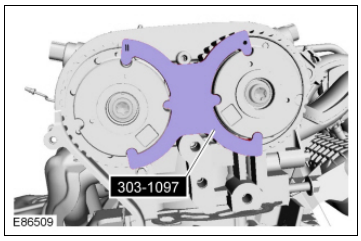
   Install the Camshaft Alignment Plate into the end of the camshafts.



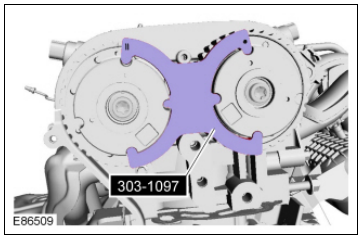
8. **NOTE:** The special tool can only be installed if the valve timing is correct.

   Install the VCT Alignment Tool.

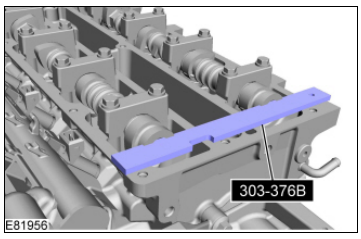
   - If the special tools cannot be installed, repeat the adjustment according to the preceding steps.



9. Remove the VCT Alignment Tool.



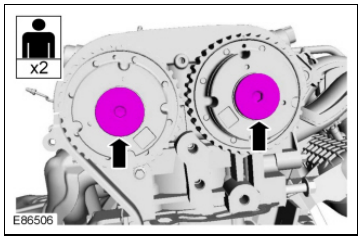
10. Remove the Camshaft Alignment Plate.



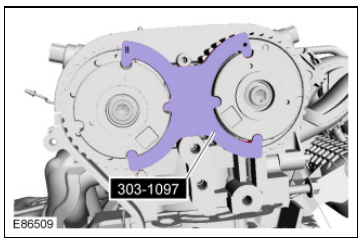
11. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

    Install the 2 camshaft phaser and sprocket plugs.

    - Tighten to 16 Nm (142 lb-in).

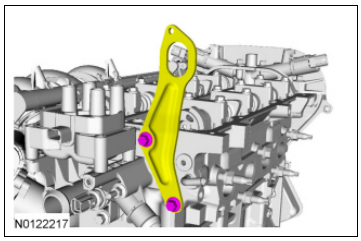


12. Install the VCT Alignment Tool.



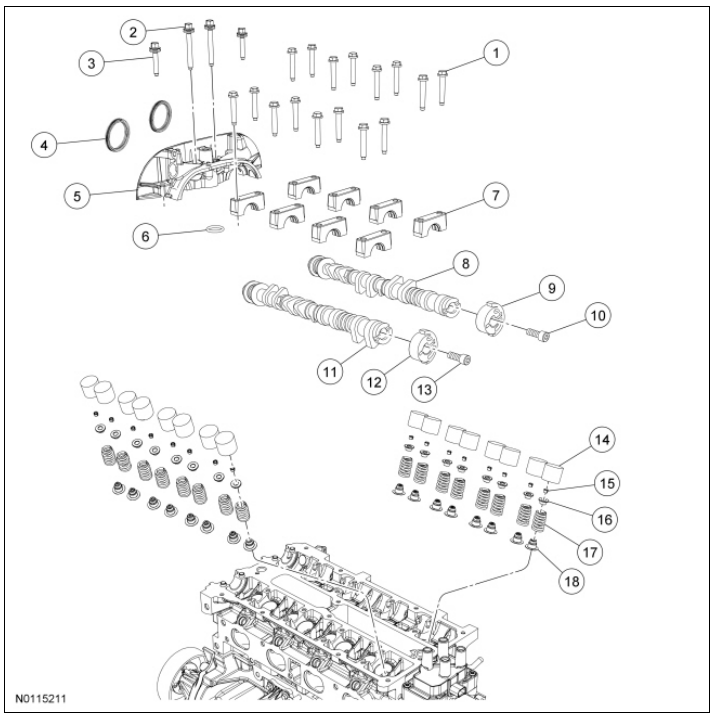
13. Install the timing belt. For additional information, refer to Timing Belt in this section.

14. Tighten the 2 bolts for the LH engine lift eye.
    - Tighten to 19 Nm (168 lb-in).



15. Install the valve cover. For additional information, refer to Valve Cover in this section.

Valve Train Components - Exploded View



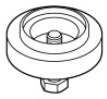
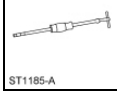
Item	Part Number	Description
1	W706225	Camshaft cap bolt (16 required)
2	W710294	Variable Camshaft Timing (VCT) bridge bolt (2 required)
3	W710295	VCT bridge bolt (2 required)
4	6K292	Camshaft oil seal (2 required)
5	-	VCT bridge (part of 6049)
6	W708317	VCT bridge O-ring seal
7	-	Camshaft cap (8 required) (part of 6049)
8	6250	Exhaust camshaft
9	-	Exhaust camshaft trigger wheel (part of 6250)
10	-	Exhaust camshaft trigger wheel bolt (part of 6250)
11	6250	Intake camshaft
12	-	Intake camshaft trigger wheel (part of 6250)
13	-	Intake camshaft trigger wheel bolt (part of 6250)
14	6500	Valve tappet (16 required)
15	6518	Valve collet (16 required)
16	6514	Valve spring retainer (16 required)
17	6513	Valve spring (16 required)
18	6571	Valve seal (16 required)

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of

removal.

Camshafts

Special Tool(s)

 ST3263-A	Installer, Camshaft Seal 303-1532
 ST2417-A	Remover, Input Shaft Oil Seal 308-375
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)

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
Gasket Maker TA-16	WSK-M2G348-A5

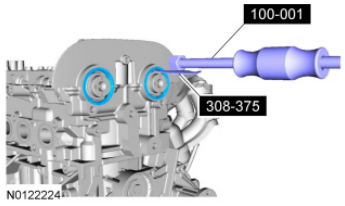
Removal

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 can cause engine failure.**

NOTICE: **Do not rotate the camshafts unless instructed to in this procedure. Rotating the camshafts or crankshaft with timing components loosened or removed can cause serious damage to the valves and pistons.**

1. Remove the camshaft phaser and sprockets. For additional information, refer to Camshaft Phaser and Sprocket in this section.

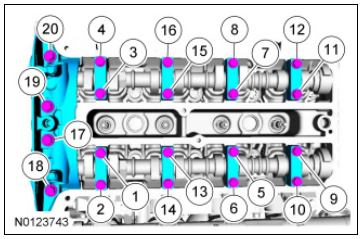
2. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the 2 camshaft oil seals.



3. **NOTE:** Note the position of each component before removal.

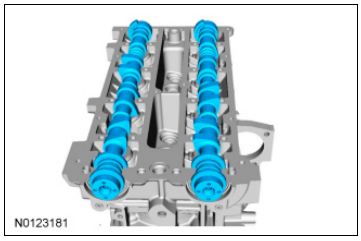
   Remove the bolts for the camshaft bearing caps and Variable Camshaft Timing (VCT) bridge in the sequence shown.

   - Inspect and replace the VCT bridge O-ring seal, if necessary.

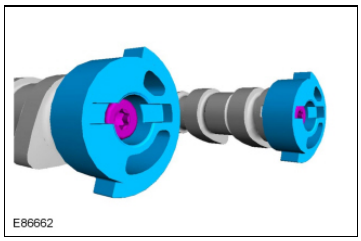


4. ***NOTICE:*** **Do not pry on camshafts when removing or damage to the camshafts may occur.**

   Remove the 2 camshafts from the cylinder head.

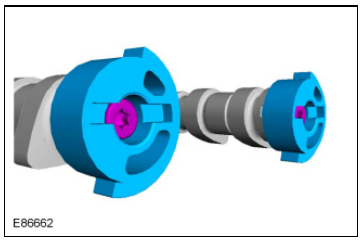


5. If necessary, remove the 2 bolts and the camshaft trigger wheels.



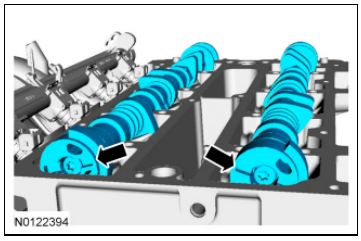
Installation

1. If removed, install the camshaft trigger wheels and the 2 bolts.
   - Tighten to 21 Nm (15 lb-ft).

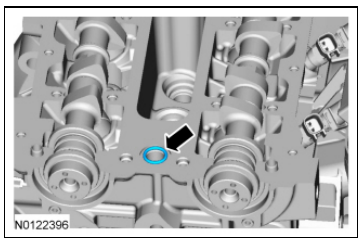


2. **NOTE:** Lubricate the camshafts with clean engine oil.

   Install the camshafts as shown.

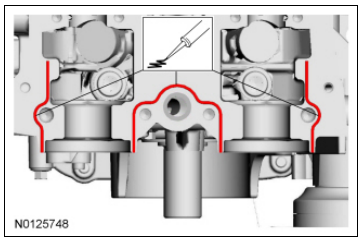


3. Install the VCT bridge O-ring seal.



4. **NOTE:** The VCT bridge must be installed within 5 minutes of applying the gasket maker to the cylinder head.

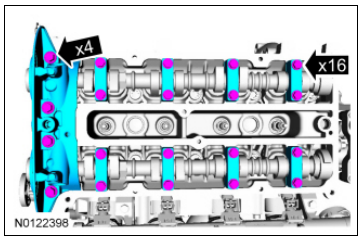
   Apply a 1.5 mm (0.059 in) bead of gasket maker to the cylinder head as shown.



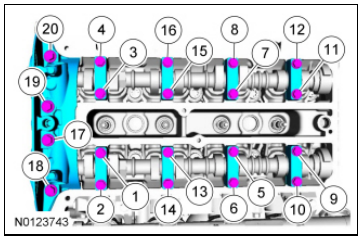
5. ***NOTICE:*** **Make sure that the camshafts and camshaft bearing caps are installed in their original locations or damage to the engine may occur.**

   NOTE: Apply clean engine oil to the bearing surfaces of the camshaft bearing caps and the VCT bridge.

   Install the camshaft bearing caps, VCT bridge and the bolts finger tight.

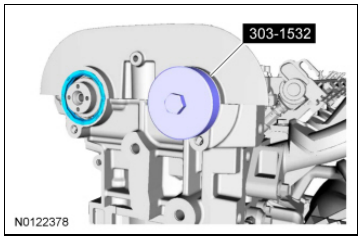


6. Tighten the bolts in the sequence shown in 6 stages.
   - Stage 1: Tighten the bolts evenly, half a turn at a time, until the camshaft bearing caps and the VCT bridge are seated against the cylinder head.
   - Stage 2: Tighten bolts 1 through 16 to 7 Nm (62 lb-in).
   - Stage 3: Tighten bolts 17 through 20 to 10 Nm (89 lb-in).
   - Stage 4: Tighten bolts 1 through 16 an additional 45 degrees.
   - Stage 5: Tighten bolts 17 and 19 an additional 70 degrees.
   - Stage 6: Tighten bolts 18 and 20 an additional 53 degrees.



7. If the cylinder head, camshafts or valve tappets were replaced, check the valve clearance. For additional information, refer to Valve Clearance Check in this section.

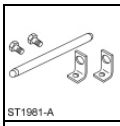
8. Using the Camshaft Seal Installer, install the 2 camshaft oil seals.



9. Install the camshaft phaser and sprocket. For additional information, refer to Camshaft Phaser and Sprocket in this section.

Valve Springs

Special Tool(s)

 ST1981-A	Compressor, Valve Spring 303-300 (T87C-6565-A)
 ST1907-A	Compressor, Valve Spring 303-350 (T89P-6565-A)
 ST1902-A	Compressor, Valve Spring 303-1418

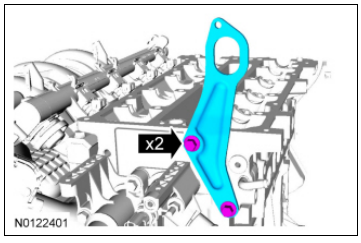
Material

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
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

Removal

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 can cause engine failure.**

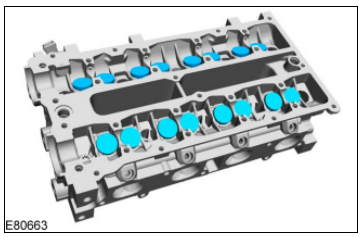
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .
2. Remove the camshafts. For additional information, refer to Camshafts in this section.
3. Remove the ignition coil. For additional information, refer to Section 303-07 .
4. Remove the 2 bolts and the LH engine lift eye.



5. **NOTE:** If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

   NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

   Remove and inspect the valve tappets. For additional information, refer to Section 303-00 .



6. ***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 in the spark plug well before removing the spark plugs.

   Remove the 4 spark plugs.

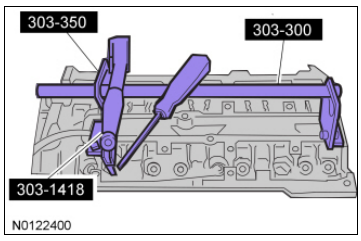
7. ***NOTICE:*** **Use compressed air at 7 to 10 bars (100-150 psi). Do not disconnect the compressed air from the cylinder until the valve spring, valve spring retainer and valve collet is installed. Any loss of air pressure will allow the valve to fall into the cylinder.**

   Connect the compressed air supply to the No. 1 cylinder.

8. **NOTE:** Place all parts in order to one side.

   Apply compressed air to the cylinder and remove the valve spring.

   - Using the Valve Spring Compressors, compress the valve spring and remove the valve collet, using some multi-purpose grease and a small screwdriver.
   - Remove the valve spring retainer and the valve spring.



9. Repeat the appropriate removal steps for all of the other cylinders.

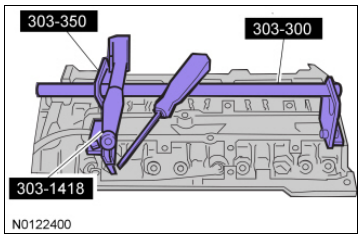
Installation

1. **NOTE:** Check the seating of the valve collet.

   Using the Valve Spring Compressors, install the valve spring.

   - Insert the valve spring and the valve spring retainer.

- Compress the valve spring and install the valve collet using some multi-purpose grease and a small screwdriver.



2. Disconnect the compressed air supply.

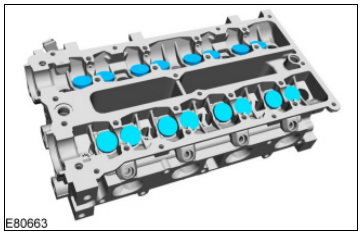
3. Repeat the appropriate installation steps for all of the other cylinders.

4. ***NOTICE:*** **Only use hand tools when removing or installing the spark plugs, or damage can occur to the cylinder head or spark plug.**

   Install the 4 spark plugs.

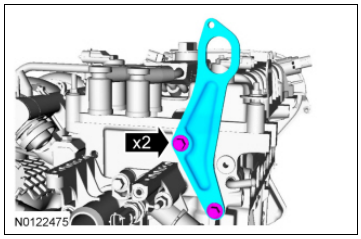
   - Tighten to 15 Nm (133 lb-in).

5. Coat the valve tappets with clean engine oil and install them in the cylinder head in their original position.



6. Install the camshafts. For additional information, refer to Camshafts in this section.

7. Install the LH engine lift eye and the 2 bolts.
   - Tighten to 19 Nm (168 lb-in).



8. Install the ignition coil. For additional information, refer to Section 303-07 .

Valve Seals

Material

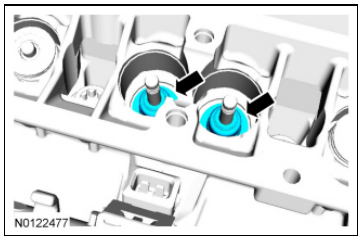
Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

Removal

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 can cause engine failure.**

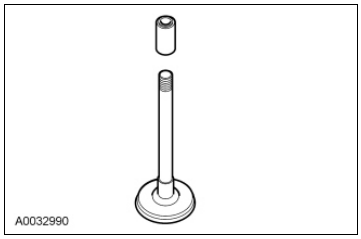
1. Remove the valve springs. For additional information, refer to Valve Springs in this section.
2. **NOTE:** Use valve stem seal pliers (such as Snap-on® YA-8230 or ent).

   Using valve stem seal pliers, remove and discard the valve seals.



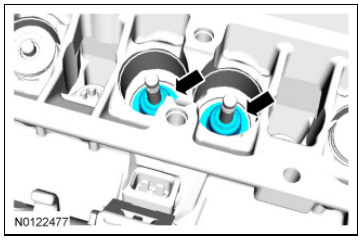
Installation

1. Install the valve stem seal installation sleeve.



2. **NOTE:** Lubricate the valve stem seal with clean engine oil prior to installation.

   Using valve stem seal pliers, install the valve seals.



3. Install the valve springs. For additional information, refer to Valve Springs in this section.

Valve Tappets

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

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 can cause engine failure.**

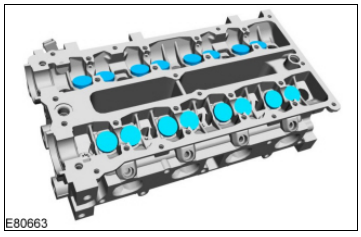
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the camshafr additional information, refer to Camshafts in this section.

3. **NOTE:** If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

   NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

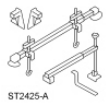
   Remove and inspect the valve tappets. For additional information, refer to Section 303-00 .



4. To install, reverse the removal procedure.
   - Coat the valve tappets with clean engine oil prior to installation.

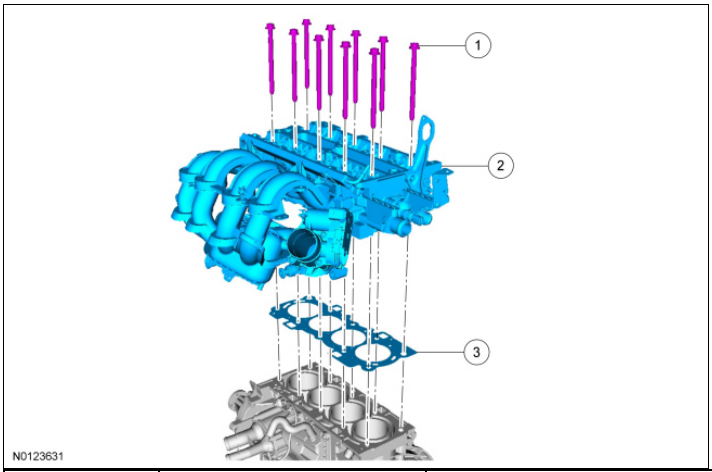
Cylinder Head

Special Tool(s)

 ST2425-A	Engine Support Bar 303-F072
 ST1595-A	Lifting Bracket, Engine 303-050 (T70P-6000)

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
Motorcraft® Metal Surface Prep ZC-31-A	-



Item	Part Number	Description
1	6065	Cylinder head bolt (10 required)
2	6049	Cylinder head
3	6051	Cylinder head gasket

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Release the fuel system pressure. For additional information, refer to Section 310-00 .

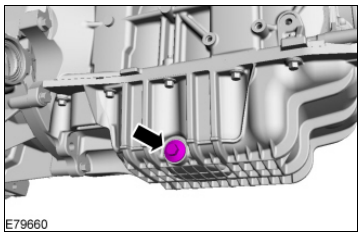
3. Disconnect the battery ground cable. For additional information, refer to Section 414-01 .

4. Remove the Air Cleaner (ACL) outlet tube. For additional information, refer to Section 303-12 .

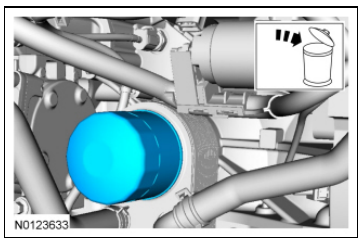
5. Remove the Heated Oxygen Sensor (HO2S). For additional information, refer to Section 303-14 .

6. Drain the engine cooling system. For additional information, refer to Section 303-03 .

7. Drain the engine oil.
   - Install the drain plug.
   - Tighten to 28 Nm (21 lb-ft).

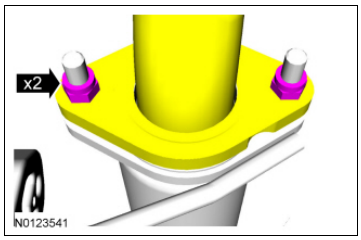


8. Remove and discard the engine oil filter.



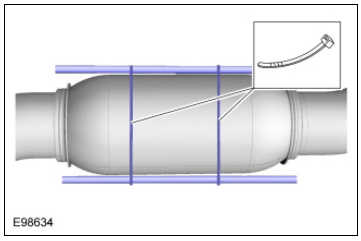
9. Remove the Catalyst Monitor Sensor (CMS). For additional information, refer to Section 303-14 .

10. Remove the 2 catalytic converter-to-muffler nuts and separate the catalytic converter from the muffler.
    - Discard the gasket.

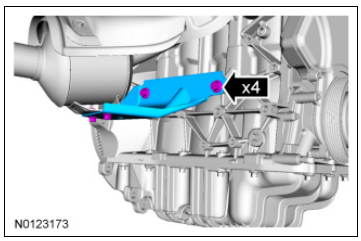


11. ***NOTICE:*** **Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

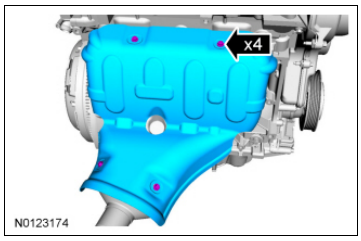
    Support the exhaust flexible pipe with a support wrap or suitable splint.



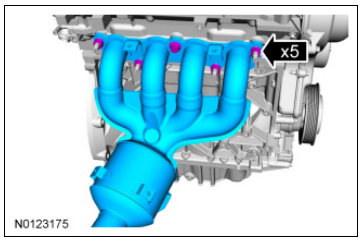
12. Remove the 4 bolts and the lower catalytic converter bracket.



13. Remove the 4 bolts and the catalytic converter heat shield.



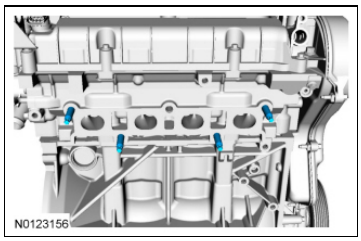
14. Remove the 4 catalytic converter nuts and bolt.
    - Discard the 4 nuts and bolt.



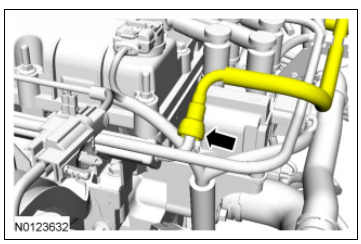
15. Position the catalytic converter back and secure with mechanic wire.
    - Discard the catalytic converter gasket.

16. If equipped, disconnect the block heater electrical connector.

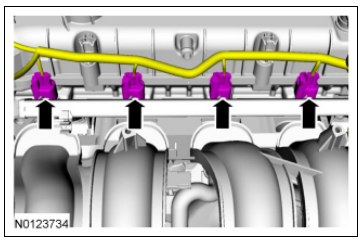
17. Remove the 4 catalytic converter studs and discard.



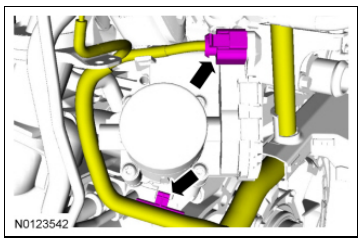
18. Disconnect the fuel tube spring lock couplings from the fuel rail. For additional information, refer to Section 310-00 .



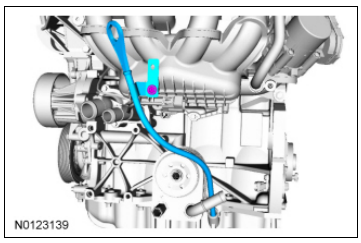
19. Disconnect the 4 fuel injector electrical connectors.



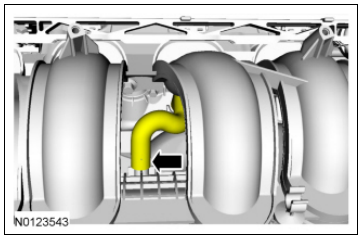
20. Disconnect the Throttle Body (TB) electrical connector.
    - Detach the wiring harness retainer from the TB .



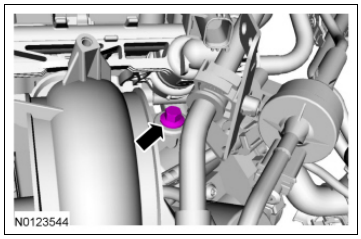
21. Remove the screw and the oil level indicator and tube.
    - Inspect and replace the O-ring seal, if necessary.



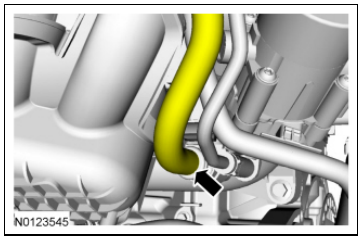
22. Disconnect the PCV hose from the intake manifold.



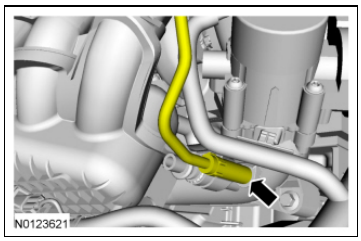
23. Remove the bolt for the Evaporative Emission (EVAP) canister purge valve.



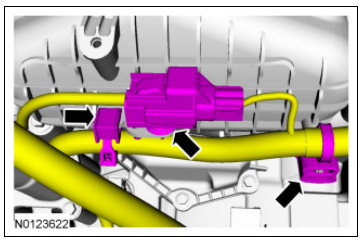
24. Disconnect the brake booster vacuum tube from the intake manifold.



25. Disconnect the EVAP canister purge valve tube from the intake manifold and position the EVAP canister purge valve aside.

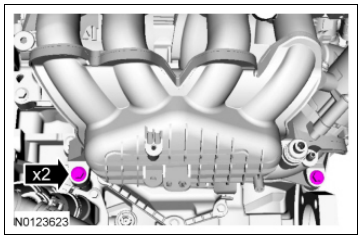


26. Detach the Knock Sensor (KS) electrical connector from the bottom of the intake manifold.
    - Detach the 2 wiring harness retainers from the bottom of the intake manifold.

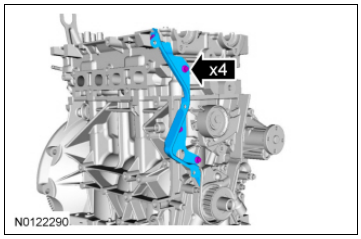


27. Remove the valve tappets. For additional information, refer to Valve Tappets in this section.

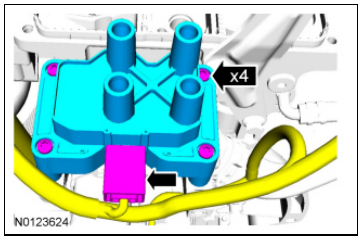
28. Remove the 2 lower bolts for the intake manifold.



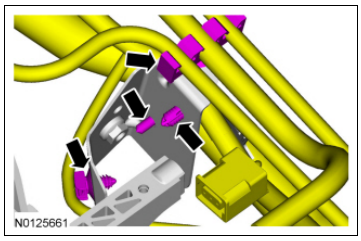
29. Remove the 4 bolts and the timing belt cover backplate.



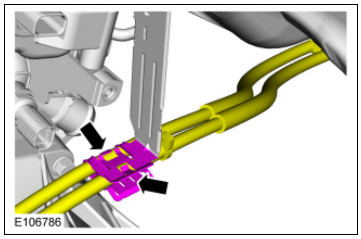
30. Disconnect the ignition coil electrical connector and remove the 4 screws and the ignition coil.



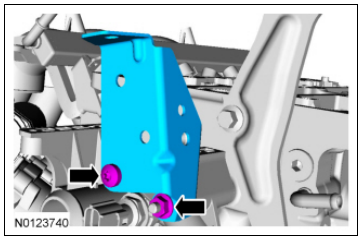
31. Detach the fuel tube retainer from the coolant outlet bracket.
    - Detach the 2 wiring harness retainers and the coolant hose retainer from the coolant outlet bracket.



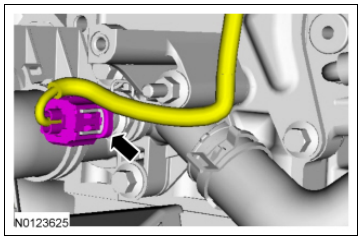
32. If equipped with a manual transaxle, remove the transaxle shift cables from the clip.



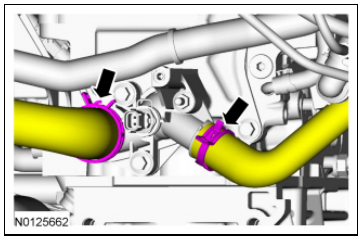
33. Remove the nut, bolt and the bracket from the coolant outlet.



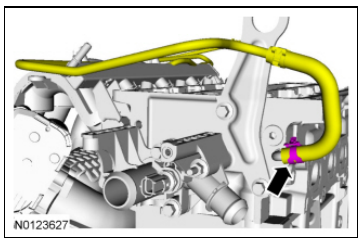
34. Disconnect the Engine Coolant Temperature (ECT) sensor electrical connector.



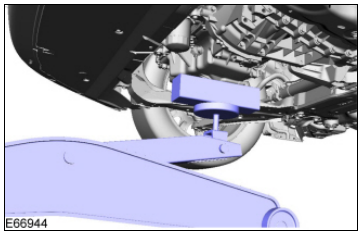
35. Disconnect the 2 coolant hoses from the coolant outlet.



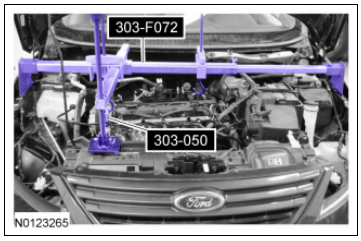
36. Disconnect the coolant return hose from the cylinder head.



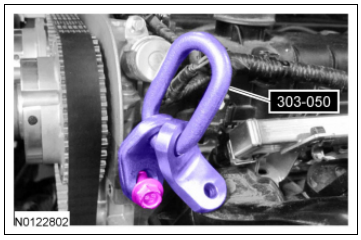
37. Using a floor jack and a block of wood, support the engine.



38. Remove the Engine Support Bar.



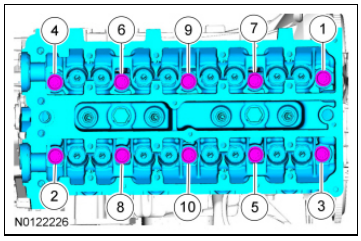
39. Remove the bolt and the Engine Lifting Bracket.



40. **NOTE:** Make sure that the cylinder head is at ambient air temperature before removing the cylinder head bolts.

    Remove the 10 cylinder head bolts in the sequence shown.

    - Remove the cylinder head.
    - Discard the cylinder head bolts and gasket.



41. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to Section 303-00 .

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 that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.**

   NOTE: If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

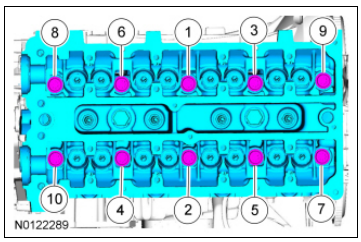
   Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block in the following sequence.

   1. Remove any large deposits of gasket material with a plastic scraper.
   2. Apply metal surface prep, following package directions, to remove any 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.

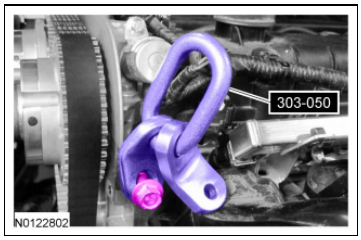
2. **NOTE:** Lubricate the bolts with clean engine oil prior to installation.

   Install the cylinder head gasket, cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in 4 stages:

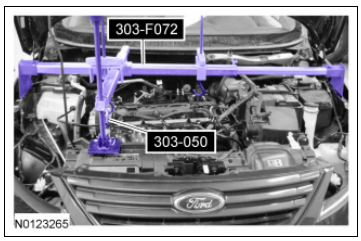
   - Stage 1: Tighten to 5 Nm (44 lb-in).
   - Stage 2: Tighten to 15 Nm (133 lb-in).
   - Stage 3: Tighten to 35 Nm (26 lb-ft).
   - Stage 4: Tighten an additional 75 degrees.



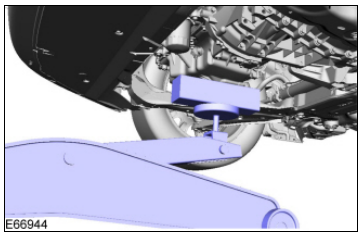
3. Using a engine mount bracket bolt, install the Engine Lifting Bracket.



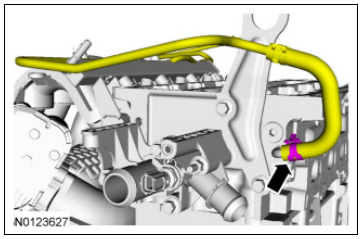
4. Install the Engine Support Bar and support the engine.



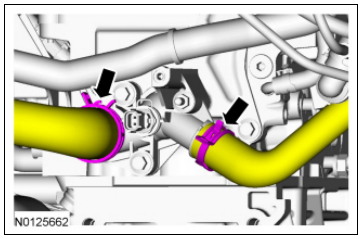
5. Remove the floor jack and block of wood.



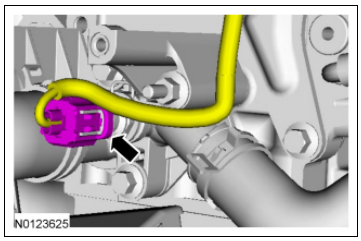
6. Connect the coolant return hose to the cylinder head.



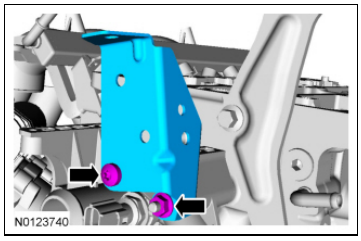
7. Connect the 2 coolant hoses to the coolant outlet.



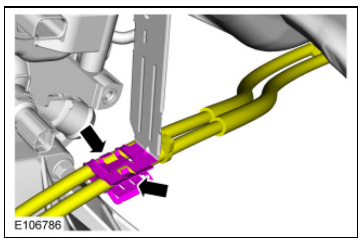
8. Connect the ECT sensor electrical connector.



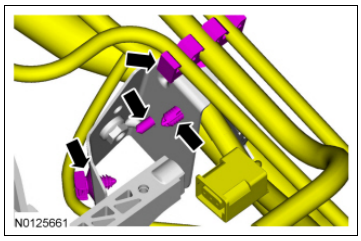
9. Install the coolant outlet bracket, nut and the bolt.
    - Tighten to 6 Nm (53 lb-in).



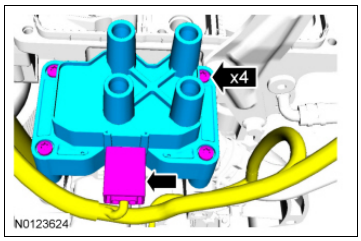
10. If equipped with a manual transaxle, install the transaxle shift cables to the clip.



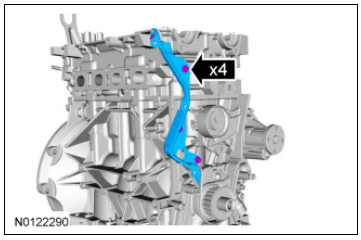
11. Attach the fuel tube retainer to the coolant outlet bracket.
    - Attach the 2 wiring harness and coolant hose retainers to the coolant outlet bracket.



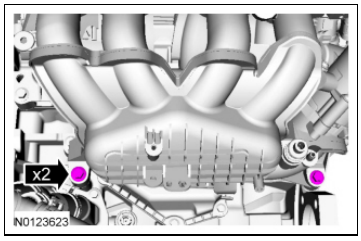
12. Install the ignition coil, 4 screws and connect the ignition coil electrical connector.
    - Tighten to 6 Nm (53 lb-in).



13. Install the timing belt cover backplate and the 4 bolts.
    - Tighten to 9 Nm (80 lb-in).

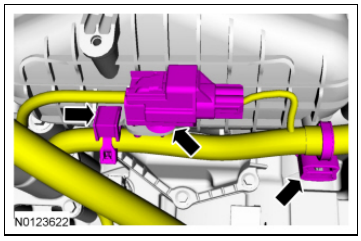


14. Install the 2 lower bolts for the intake manifold.
    - Tighten to 18 Nm (159 lb-in).

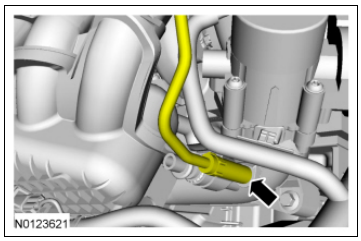


15. Install the valve tappets. For additional information, refer to Valve Tappets in this section.

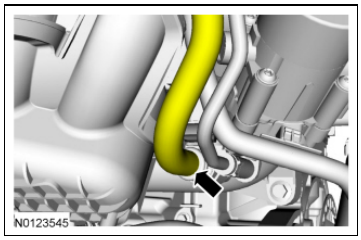
16. Attach the KS electrical connector to bottom of the intake manifold.
    - Attach the 2 wiring harness retainers to the bottom of the intake manifold.



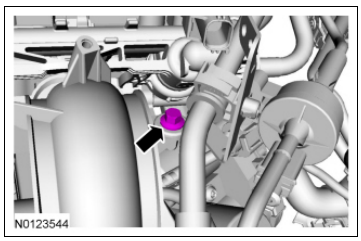
17. Position and connect the EVAP canister purge valve tube to the intake manifold.



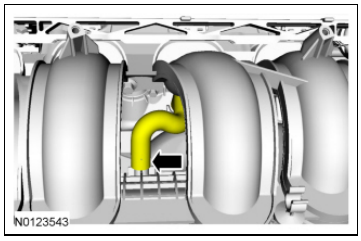
18. Connect the brake booster vacuum tube to the intake manifold.



19. Install the bolt for the EVAP canister purge valve.
    - Tighten to 9 Nm (80 lb-in).



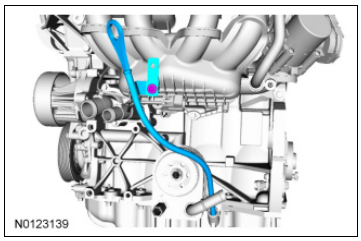
20. Connect the PCV hose to the intake manifold.



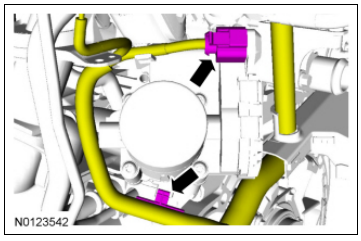
21. **NOTE:** Lubricate the O-ring seal with clean engine oil.

    Install the oil level indicator and tube and the screw.

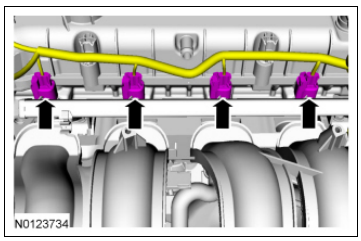
    - Tighten to 4 Nm (35 lb-in).



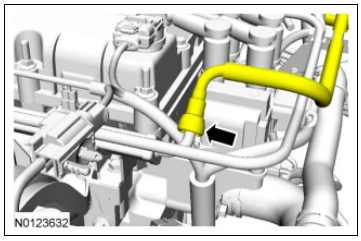
22. Connect the TB electrical connector.
    - Attach the wiring harness retainer to the TB .



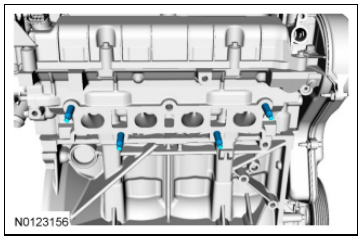
23. Connect the 4 fuel injector electrical connectors.



24. Connect the fuel tube spring lock couplings to the fuel rail. For additional information, refer to Section 310-00 .

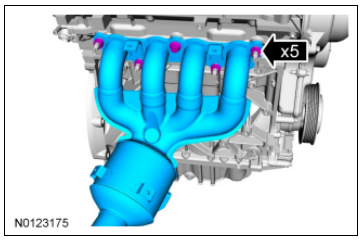


25. Install the 4 new catalytic converter studs.
    - Tighten to 17 Nm (150 lb-in).



26. If equipped, connect the block heater electrical connector.

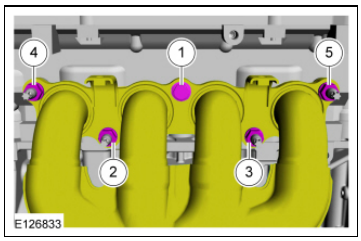
27. Using a new gasket, position the catalytic converter and install the 4 new nuts and bolt finger tight.



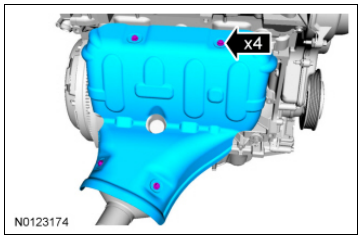
28. ***NOTICE:*** **Failure to tighten the catalytic converter manifold fasteners in 20 Nm increments until reaching final torque of 55 Nm will cause the converter to develop an exhaust leak.**

    Tighten the bolt and 4 nuts in the sequence shown, in 3 stages.

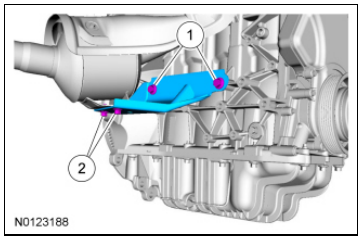
    - Stage 1: Tighten all fasteners in sequence to 20 Nm (177 lb-in).
    - Stage 2: Tighten all fasteners in sequence to 40 Nm (30 lb-ft).
    - Stage 3: Tighten all fasteners in sequence to 55 Nm (41 lb-ft).



29. Install the catalytic converter heat shield and the 4 bolts.
    - Tighten to 10 Nm (89 lb-in).

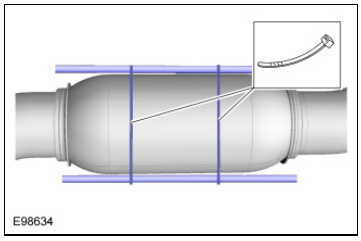


30. Install the lower catalytic converter bracket and the 4 bolts and tighten in sequence shown.
    1. Tighten the catalytic converter bracket-to-engine block bolts to 50 Nm (37 lb-ft).
    2. Tighten the catalytic converter bracket-to-catalytic converter bolts to 25 Nm (18 lb-ft).

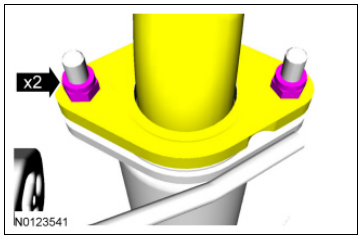


31. *NOTICE:* **Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

    Remove the support for the exhaust flexible pipe.



32. Using a new gasket, position the catalytic converter to the muffler and install the 2 catalytic converter nuts.
    - Tighten to 48 Nm (35 lb-ft).

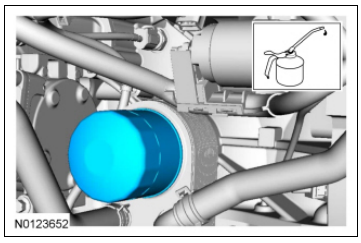


33. Install the CMS . For additional information, refer to Section 303-14 .

34. **NOTE:** Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

    Install a new engine oil filter.

    - Tighten to 15 Nm (133 lb-in).



35. Install the HO2S . For additional information, refer to Section 303-14 .

36. Install the ACL outlet tube. For additional information, refer to Section 303-12 .

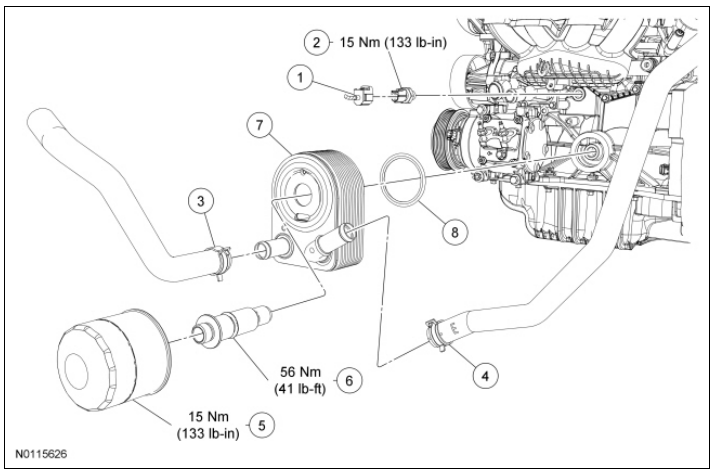
37. Connect the battery ground cable. For additional information, refer to Section 414-01 .

38. Fill the engine with clean engine oil.

39. Fill the engine cooling system. For additional information, refer to Section 303-03 .

Engine Lubrication Components - Exploded View

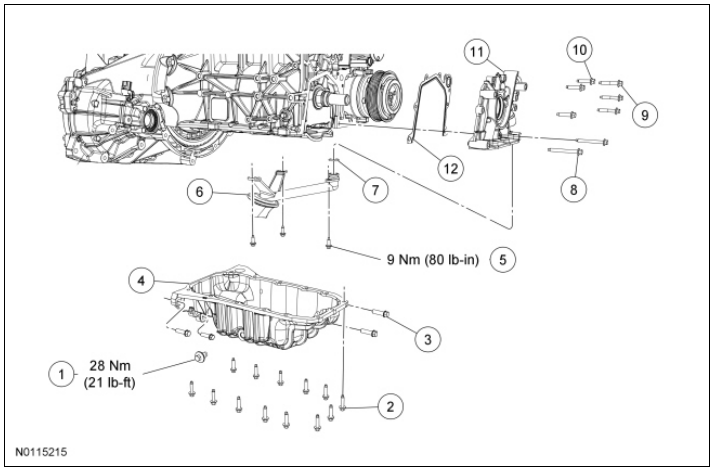
Oil Filter, Oil Cooler and Engine Oil Pressure (EOP) Switch



Item	Part Number	Description
1	-	Engine Oil Pressure (EOP) switch electrical connector (part of 12A522)
2	9278	EOP switch
3	8K276	Oil cooler coolant hose
4	18472	Oil cooler coolant hose
6731	Oil filter	
6	6L626	Oil cooler mounting bolt
7	6A642	Oil cooler
8	6L621	Oil cooler gasket

Oil Pan, Oil Pump and Oil Pump Screen and Pickup Tube

NOTE: Automatic transaxle shown, manual transaxle similar.



Item	Part Number	Description
1	6730	Oil pan drain plug
2	W500225	Oil pan bolt (13 required)
3	W701069	Oil pan bolt (4 required)
4	6675	Oil pan
5	W703311	Oil pump screen and pickup tube bolt (3 required)
6	6622	Oil pump screen and pickup tube
7	6626	Oil pump screen and pickup tube O-ring seal
8	W500300	Oil pump bolt (2 required)
9	W500301	Oil pump bolt (3 required)
10	W500215	Oil pump bolt (3 required)
11	6600	Oil pump
12	6659	Oil pump gasket

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Oil Cooler

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
Motorcraft® Specialty Orange Engine Coolant VC-3-B (US); CVC-3-B (Canada)	WSS-M97B44-D

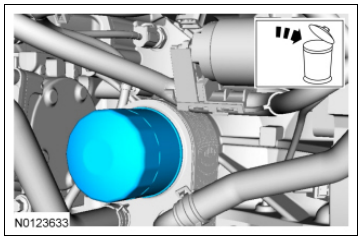
Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. **NOTE:** Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

   Remove the engine oil filter aard.

   - To install, tighten to 15 Nm (133 lb-in).



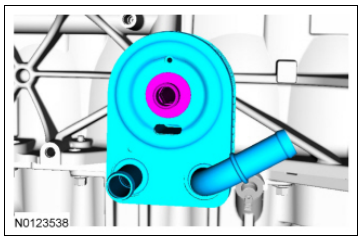
3. Using hose clamp pliers, clamp the 2 oil cooler coolant hoses and remove the 2 coolant hoses from the oil cooler.



4. ***NOTICE:*** **If metal or aluminum material is present in the oil cooler, mechanical concerns exist. Failure to correct these concerns may cause engine failure. To diagnose mechanical concerns, refer to Section 303-00 .**

   Remove the oil cooler mounting bolt and the oil cooler.

- Inspect the oil cooler gasket, replace if necessary.
- To install, tighten to 56 Nm (41 lb-ft).



5. To install, reverse the removal procedure.
    - Inspect and adjust the coolant level in the degas bottle.

Engine Oil Pressure (EOP) Switch

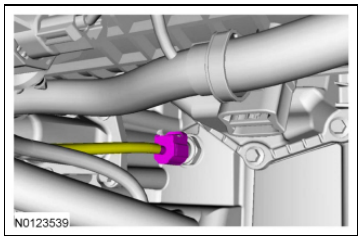
Material

Item	Specification
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

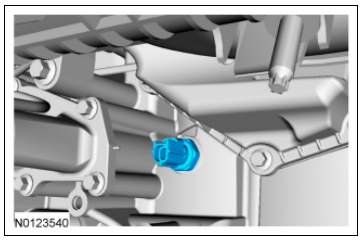
Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Disconnect the EOP switch electrical connector.



3. Remove the EOP switch.
   - To install, tighten to 18 Nm (159 lb-in).



4. To install, reverse the removal procedure.
   - Apply thread sealant to the EOP switch threads.

Oil Pan

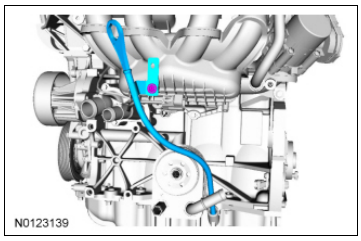
Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
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
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

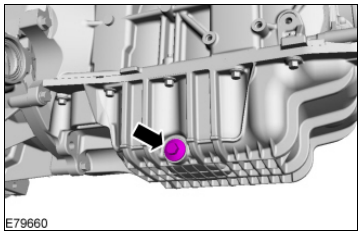
Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

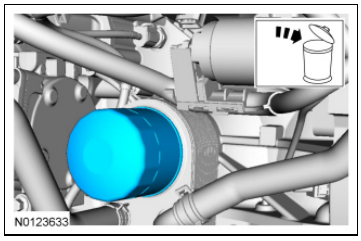
2. Remove the screw and the oil level indicator and tube.
   - Inspect and replace the O-ring necessary.



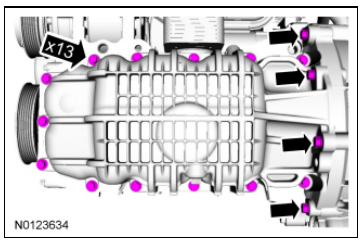
3. Drain the engine oil.
   - Install the drain plug.
   - Tighten to 28 Nm (21 lb-ft).



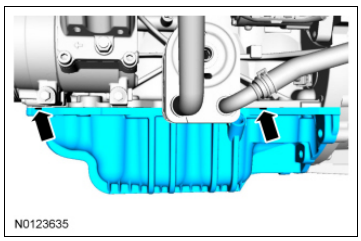
4. Remove and discard the engine oil filter.



5. Remove the 17 bolts from the oil pan.



6. Using the 3 pry pads (2 shown), remove the oil pan.

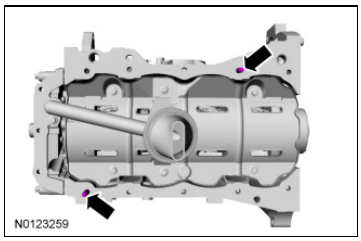


Installation

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 traces of sealant.**

   Clean and inspect all mating surfaces using silicone gasket remover.

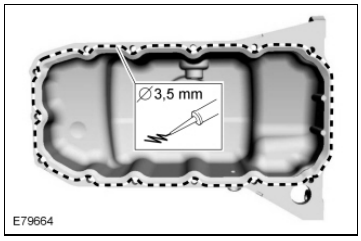
2. Install 2 M8x20 studs for oil pan alignment.



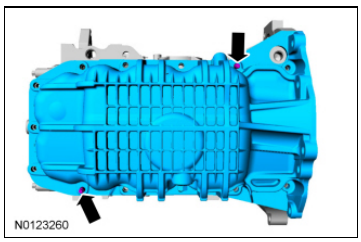
3. **NOTE:** The oil pan must be installed within 5 minutes of applying the sealant.

   NOTE: If the oil pan is not secured within 5 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface prep. Allow to dry until there is no sign of wetness, or 5 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage

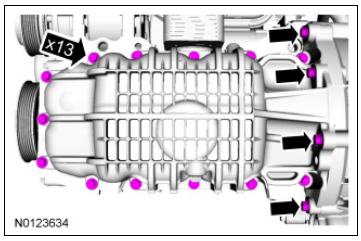
   Apply a 3.5 mm (0.137 in) bead of sealant to the oil pan.



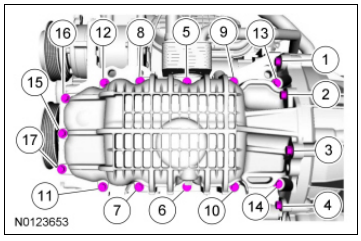
4. Install the oil pan using the 2 studs for alignment.



5. Install 15 bolts finger tight and remove the 2 alignment studs and install the remaining 2 bolts finger tight.



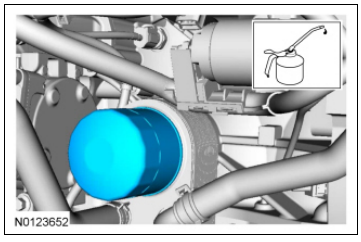
6. Tighten the oil pan bolts in the following sequence in 3 stages.
   - Stage 1: Tighten bolts 1 through 4 to 48 Nm (35 lb-ft).
   - Stage 2: Tighten bolts 5 through 17 to 10 Nm (89 lb-in).
   - Stage 3: Tighten bolts 5 through 17 to 20 Nm (177 lb-in).



7. **NOTE:** Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

   Install a new engine oil filter.

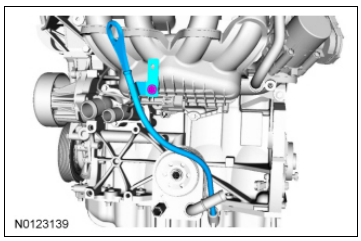
   - Tighten to 15 Nm (133 lb-in).



8. **NOTE:** Lubricate the O-ring seal with clean engine oil.

Install the oil level indicator and tube and the screw.

- Tighten to 4 Nm (35 lb-in).



9. Fill the engine with clean engine oil.

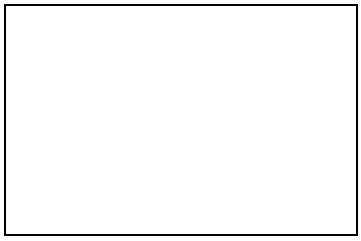
Oil Pump Screen and Pickup Tube

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the engine oil pan. For additional information, refer to Oil Pan in this section.

3. Remove the 3 bolts and the oil pump screen and pickup tube.
   - Inspect and replace the O-ring seal, if necessary.
   - To install, tighten to 9 Nm (80 lb-in).



4. To install, reverse the removal procedure.

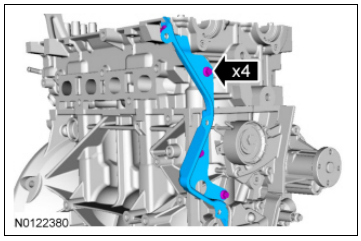
Oil Pump

Removal

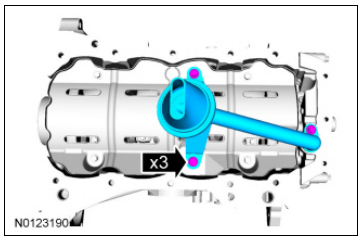
1. Remove the crankshaft front seal. For additional information, refer to Crankshaft Front Seal in this section.

2. Remove the oil pan. For additional information, refer to Oil Pan in this section.

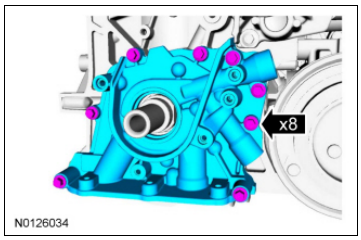
3. Remove the 4 bolts and the timing belt cover backplate.



4. Remove the 3 bolts and the oil pump screen and pickup tube.
    - Inspect and replace the oil pump screen and pickup tube O-ring seal, if necessary.

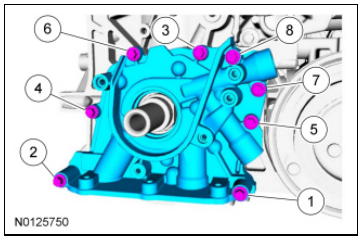


5. Remove the 8 bolts and the oil pump.
    - Remove and discard the oil pump gasket.

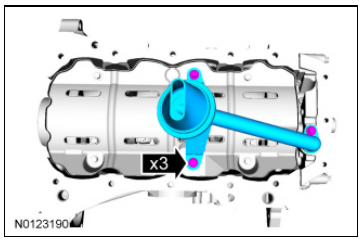


Installation

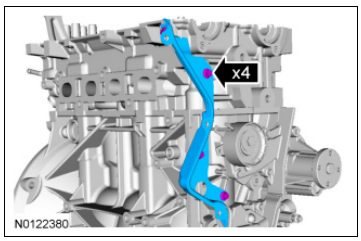
1. Install a new gasket, the oil pump and the 8 bolts in their original position and tighten in sequence shown in 2 stages.
    - Stage 1: Tighten to 6 Nm (53 lb-in).
    - Stage 2: Tighten to 9 Nm (80 lb-in).



2. Install the oil pump screen and pickup tube and 3 bolts.
    - Tighten to 9 Nm (80 lb-in).



3. Install the timing belt cover backplate and the 4 bolts.
    - Tighten to 9 Nm (80 lb-in).



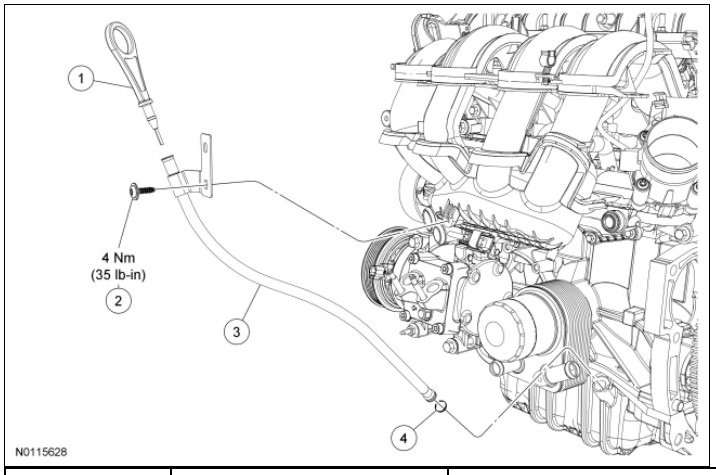
4. Install the oil pan. For additional information, refer to Oil Pan in this section.

5. Install the crankshaft front seal. For additional information, refer to Crankshaft Front Seal in this section.

Oil Level Indicator and Tube

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



Item	Part Number	Description
1	6750	Oil level indicator
2	W709843	Oil level indicator tube screw
3	6754	Oil level indicator tube
4	O-ring seal	

Removal and Installation

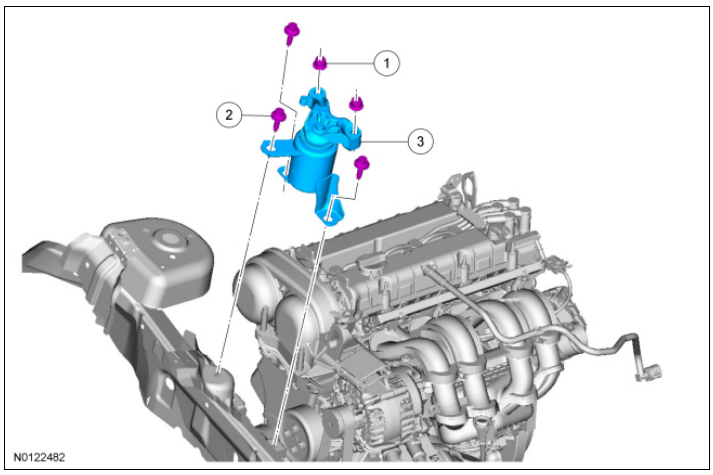
1. Remove the oil level indicator.

2. Remove the oil level indicator tube screw.
   - To install, tighten to 4 Nm (35 lb-in).

3. Remove the oil level indicator tube.
   - Inspect and replace the O-ring seal, if necessary.
   - To install, lubricate the O-ring seal with clean engine oil.

4. To install, reverse the removal procedure.

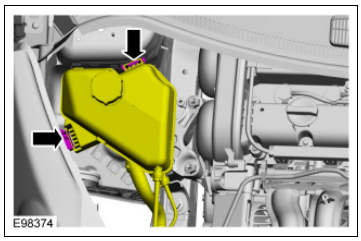
Engine Mount



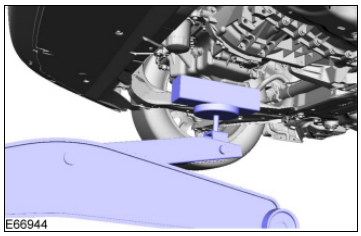
Item	Part Number	Description
1	W520214	Engine mount nut (2 required)
2	W706408	Engine mount bolt (3 required)
3	6038	Engine mount

Removal

1. Release the 2 tabs and position the degas bottle aside.



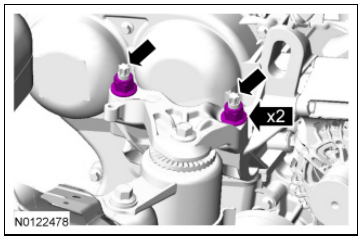
- Using a floor jack and a wooden block, support the engine.



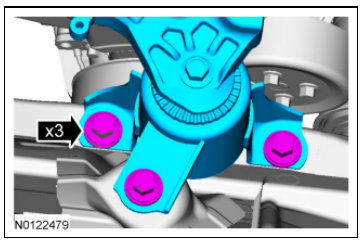
3. *NOTICE:* **The engine mount studs must be held while removing the engine mount nuts or damage to the powertrain may occur.**

   NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.

   Use the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.



4. Remove the 3 bolts and the engine mount.

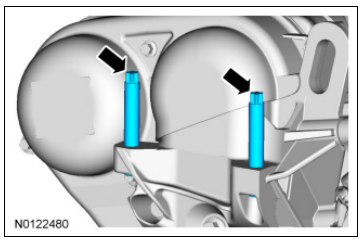


Installation

1. ***NOTICE:*** **The engine mount studs must be torqued or damage to the powertrain may occur.**

   Torque the engine mount studs before installing the engine mount.

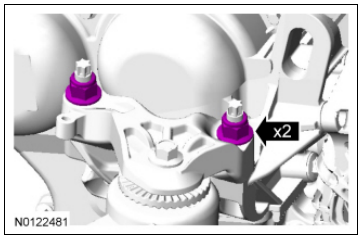
   - Tighten to 8 Nm (71 lb-in).



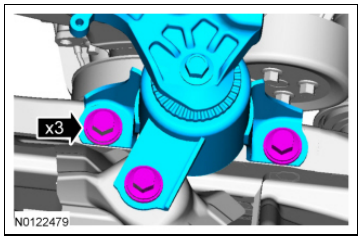
2. **NOTE:** Do not loosen the engine mount center bolt or the engine may become improperly positioned.

   Install the engine mount and the 2 nuts.

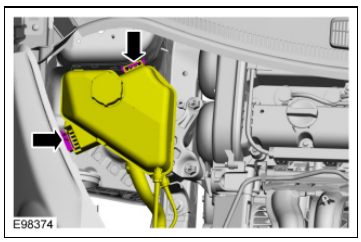
   - Tighten the 2 nuts to 80 Nm (59 lb-ft).



3. Install the 3 engine mount bolts.
   - Tighten to 48 Nm (35 lb-ft).

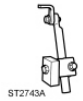


4. Position the degas bottle on the 2 retainer tabs.



Engine - Automatic Transaxle

Special Tool(s)

 ST1341-A	2,200# Floor Crane, Fold Away 300-OTC1819E
 ST1682-A	Powertrain Lift 300-OTC1585AE
 ST1602-A	Spreader Bar 303-D089 (D93P-6001-A3) or equivalent
 ST2743A	Adjustable Grip Arm, 1735A 014-00001

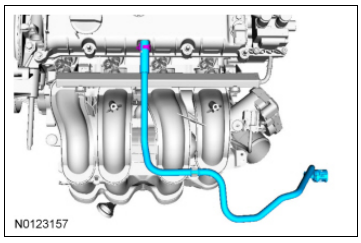
All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

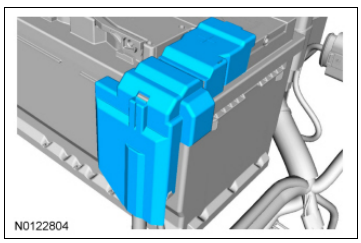
2. Release the fuel system pressure. For additional information, refer to Section 310-00 .

3. Remove the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to Section 303-12 .

4. Disconnect the crankcase vent tube from the valve cover.
   - Detach the 2 crankcase vent tube retainers and remove the tube.

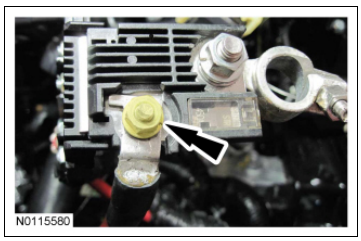

N0123157

5. Remove the positive battery cable cover.

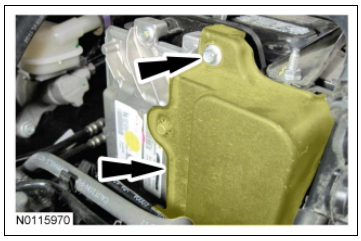

N0122804

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

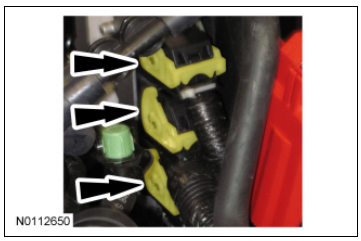
7. Remove the nut and cable from the positive battery cable terminal.



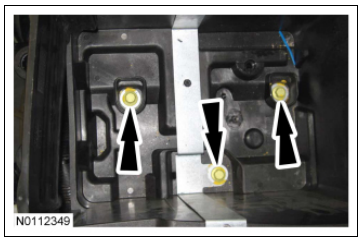
8. Remove the bolt and the PCM cover.



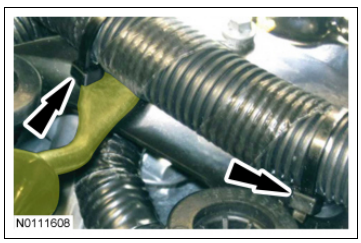
9. Disconnect the 3 PCM electrical connectors.



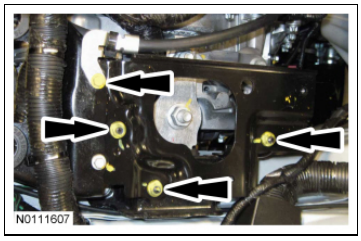
10. Remove the 3 bolts and the battery tray.



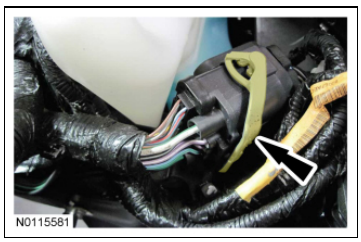
11. Detach the 2 positive battery cable wire harness retainers from battery tray bracket.



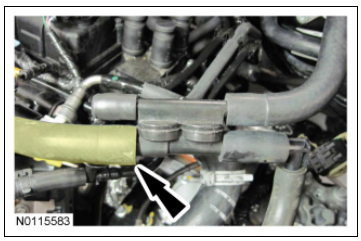
12. Remove the selector lever cable bolt, 3 battery tray nuts and the battery tray bracket.
    - Detach the 2 wiring harness retainers from the battery tray bracket.



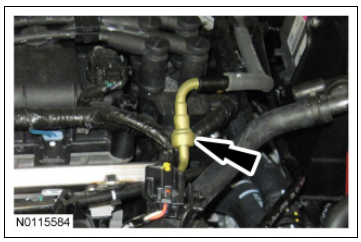
13. Disconnect the engine harness electrical connector.



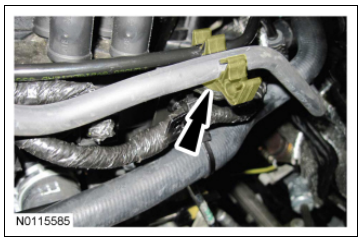
14. Disconnect the brake booster vacuum hose.



15. Disconnect the fuel tube spring lock couplings from the fuel rail. For additional information, refer to Section 310-00 .



16. Detach the fuel tube from the coolant outlet bracket retainer.

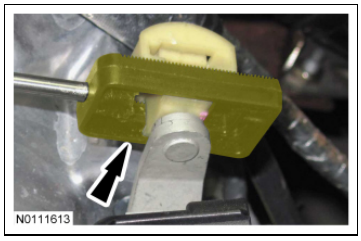


17. Remove the generator. For additional information, refer to Section 414-00 .

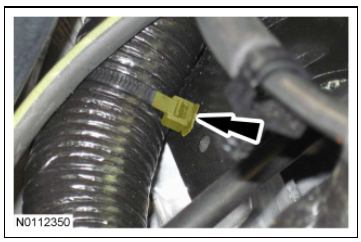
18. Drain the cooling system. For additional information, refer to Section 303-03 .

19. Remove the degas bottle. For additional information, refer to Section 303-03 .

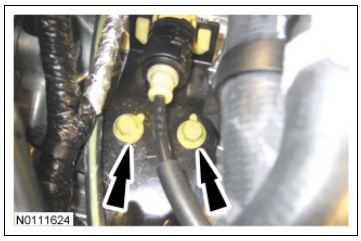
20. Disconnect the selector lever cable from the control lever.



21. Detach the wiring harness retainer from the selector lever cable bracket.

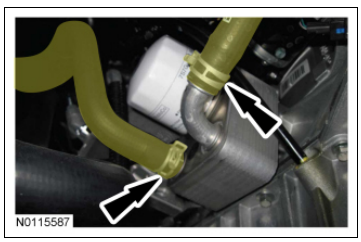


22. Remove the 2 selector lever cable bracket bolts from the transaxle and position the selector lever cable and bracket aside.



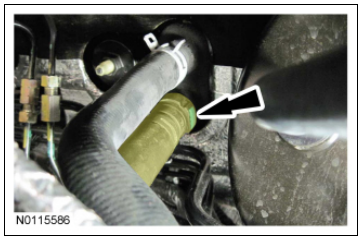
23. Remove the cooling fan motor and shroud. For additional information, refer to Section 303-03 .

24. Disconnect the 2 coolant hoses from the engine oil cooler.
    - Detach the oil cooler hose retainer from the upper radiator hose.

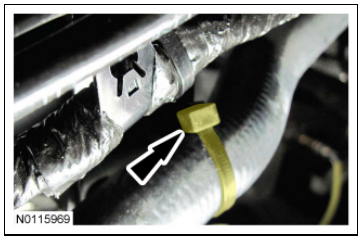


25. Remove the Heated Oxygen Sensor (HO2S). For additional information, refer to Section 303-14 .

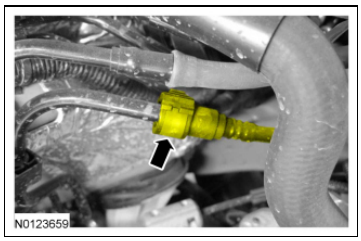
26. Disconnect the lower heater hose from the heater core.



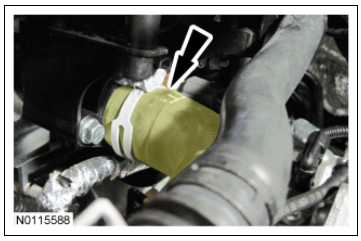
27. Detach the coolant hose retainer from the coolant outlet bracket.



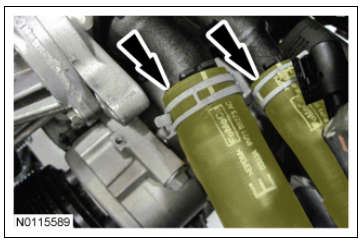
28. Disconnect the Evaporative Emission (EVAP) tube quick connect coupling near the bulk head. For additional information, refer to Section 310-00 .



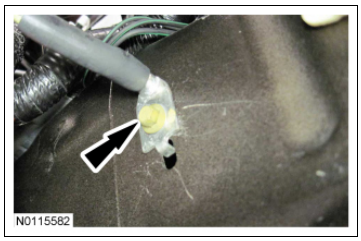
29. Disconnect the upper radiator hose from the engine.



30. Disconnect the lower radiator hose and coolant hose from the thermostat housing.



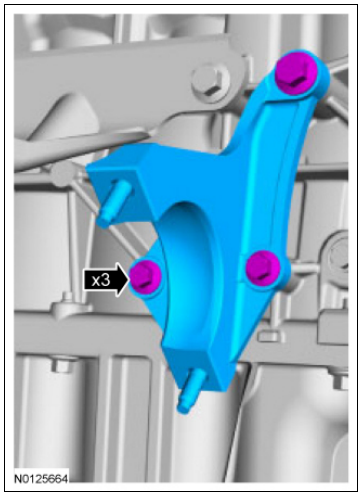
31. Remove the bolt and position the engine ground wire aside.



32. Drain the transmission. For additional information, refer to Section 307-11 .

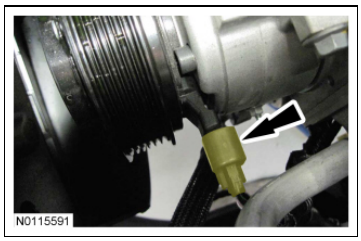
33. Remove the RH and LH halfshafts. For additional information, refer to Section 205-04 .

34. Remove the 3 bolts and the halfshaft bracket.

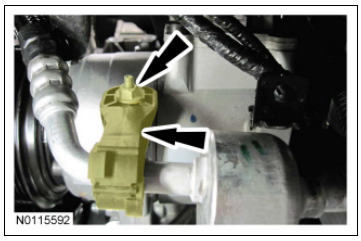


Vehicles with A/C

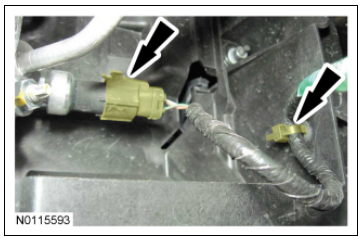
35. Disconnect the A/C compressor electrical connector.



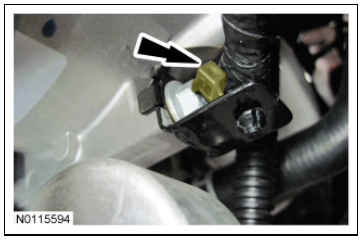
36. Remove the nut and position the A/C line bracket aside.



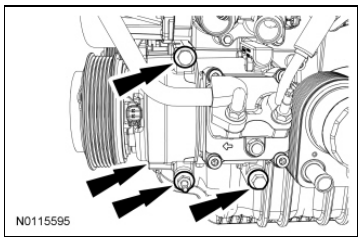
37. Disconnect the A/C pressure transducer electrical connector.
    - Detach the wiring harness retainer.



38. Detach the wiring harness retainer from the lower A/C compressor bracket.

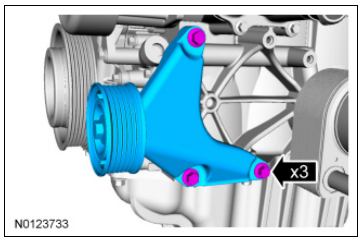


39. Remove the 2 bolts, stud bolt and position the A/C compressor aside and support with a length of mechanic's wire.



Vehicles without A/C

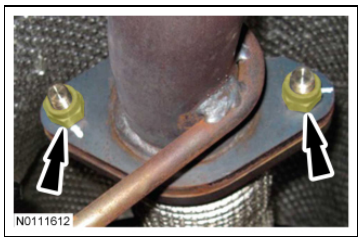
40. Remove the 3 bolts and the accessory drive belt idler pulley bracket.



All vehicles

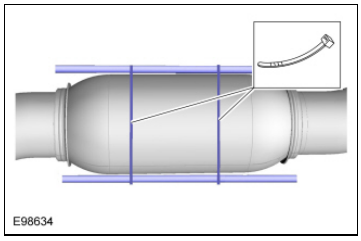
41. Remove the Catalyst Monitor Sensor (CMS). For additional information, refer to Section 303-14 .

42. Remove the 2 catalytic converter-to-muffler nuts and separate.
    - Discard the gasket.

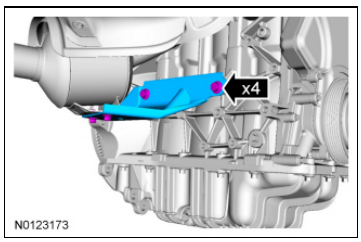


43. ***NOTICE:*** **Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

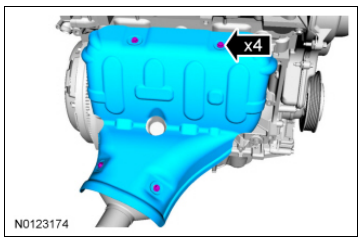
    Support the exhaust flexible pipe with a support wrap or suitable splint.



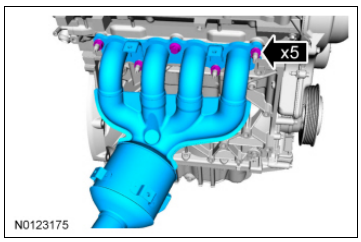
44. Remove the 4 bolts and the lower catalytic converter bracket.



45. Remove the 4 bolts and the catalytic converter heat shield.



46. Remove the 4 catalytic converter nuts and bolt.
    - Discard the bolt and 4 nuts.

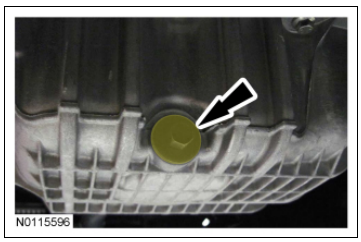


47. Position the catalytic converter back and secure with mechanic wire.
    - Discard the catalytic converter gasket.

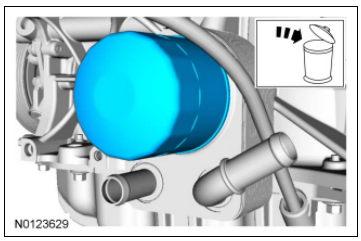
48. Clean and inspect the catalytic converter flange. For additional information, refer to exhaust manifold cleaning and inspection in Section 303-00 .

49. If equipped, disconnect the block heater electrical connector.

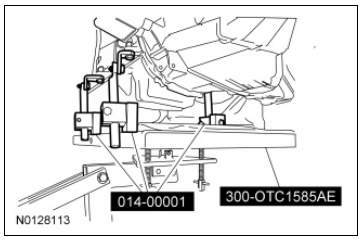
50. Drain the engine oil.
    - Install the drain plug and tighten to 28 Nm (21 lb-ft).



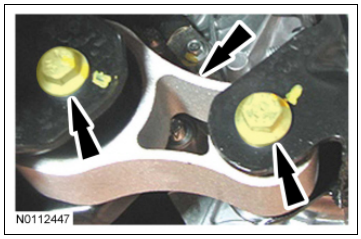
51. Remove and discard the engine oil filter.



52. Using the Powertrain Lift and Adjustable Grip Arms, secure the engine to the lift table.



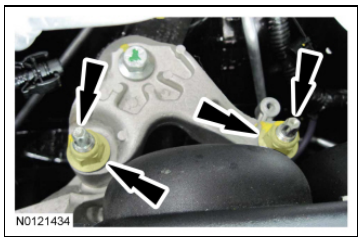
53. Remove the 2 bolts and the transaxle roll restrictor.



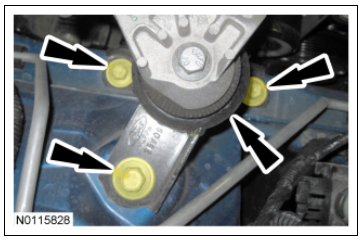
54. ***NOTICE:*** **The engine mount studs must be held while removing the engine mount nuts or damage to the powertrain may occur.**

    NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.

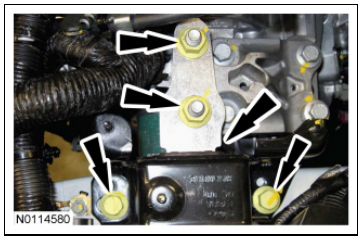
    Use the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.



55. Remove the 3 bolts and the engine mount.

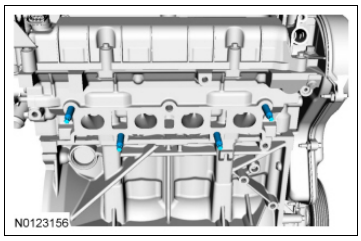


56. Remove the 2 bolt, 2 nuts and the transaxle support insulator.

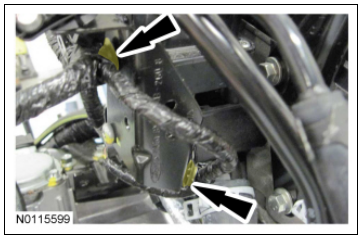


57. Lower the engine and transaxle assembly from the vehicle.

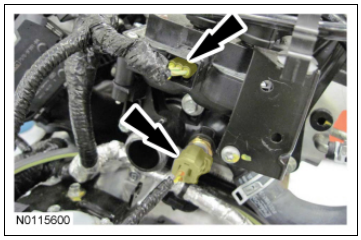
58. Remove the 4 catalytic converter studs and discard.



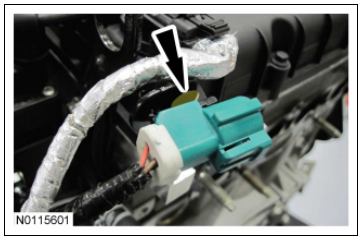
59. Detach the 2 wiring harness retainers from the coolant outlet bracket.



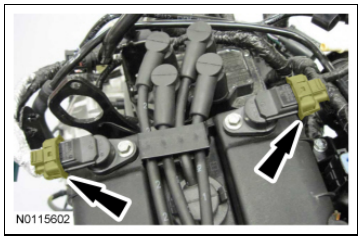
60. Disconnect the ignition coil and Engine Coolant Temperature (ECT) sensor electrical connectors.



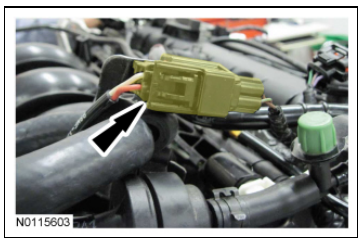
61. Detach the HO2S sensor electrical connector pin-type retainer from the bracket.



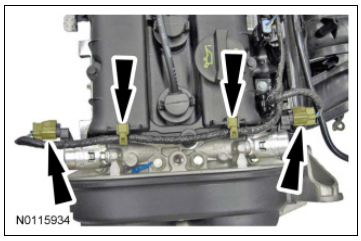
62. Disconnect the 2 Camshaft Position (CMP) sensor electrical connectors.



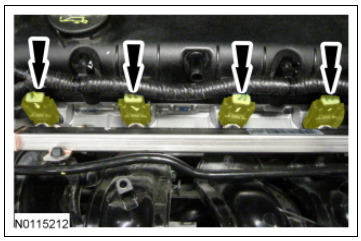
63. Detach and disconnect the LH Knock Sensor (KS) electrical connector.



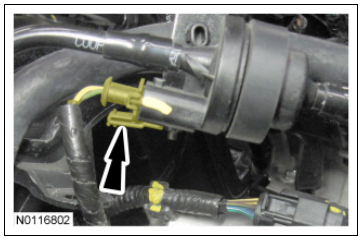
64. Disconnect the Variable Camshaft Timing (VCT) oil control solenoid electrical connectors.
    - Detach the 2 wiring harness retainers.



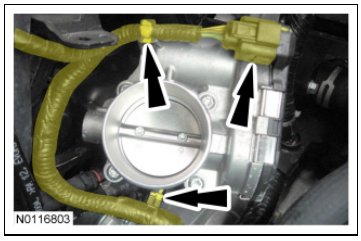
65. Disconnect the 4 fuel injector electrical connectors.
    - Detach the wiring harness retainers from the valve cover stud bolts.



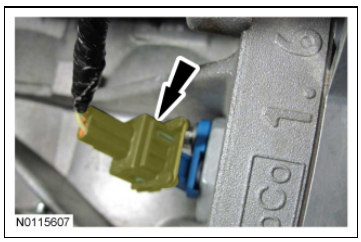
66. Disconnect the EVAP canister purge valve electrical connector.



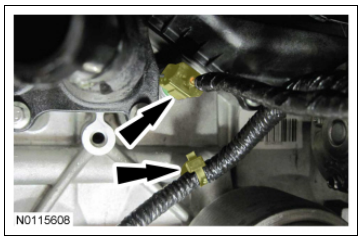
67. Disconnect the Throttle Body (TB) electrical connector.
    - Detach the 2 wiring harness retainers from the TB .



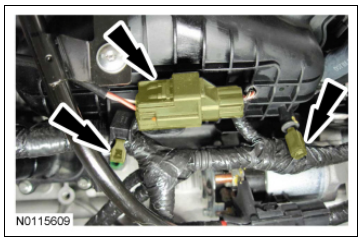
68. Disconnect the Crankshaft Position (CKP) sensor electrical connector.



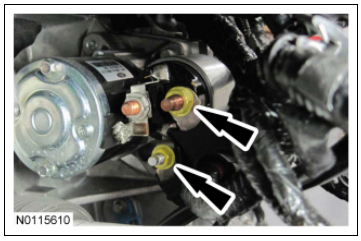
69. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
    - Detach the wiring harness retainer from the engine block.



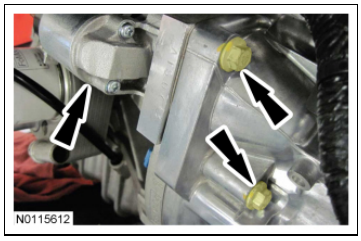
70. Disconnect the RH KS electrical connector.
    - Detach the 2 wiring harness retainers from the intake manifold.



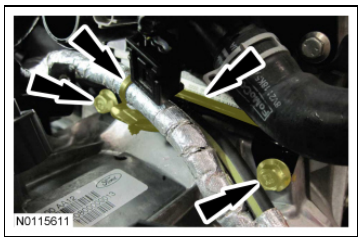
71. Remove the 2 nuts and disconnect the starter motor electrical terminals.



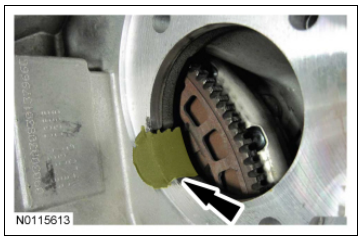
72. Remove the 3 bolts (2 shown) and the starter motor.



73. Detach the wiring harness pin-type retainer and remove the 2 upper bellhousing-to-engine bolts and bracket.



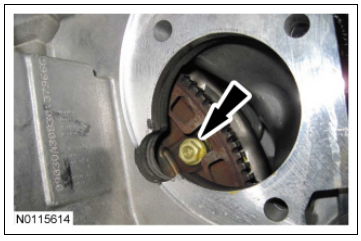
74. Remove the clutch nut access cover.



75. ***NOTICE:*** **Rotate the engine in a clockwise direction only or engine damage may occur.**

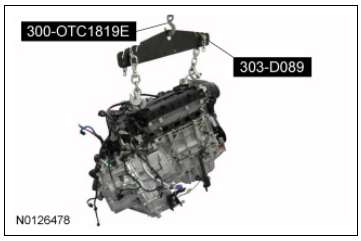
    NOTE: Mark one stud and the flexplate for installation reference.

    Remove the 6 flexplate-to-clutch nuts and discard.

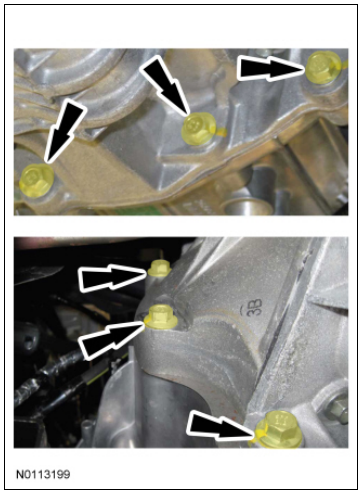


76. **NOTE:** Lower the engine to within a few inches of the floor.

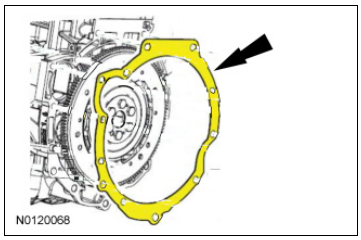
    Using the Floor Crane and Spreader Bar, remove the engine and transaxle assembly from the lift table.



77. Remove the 6 clutch housing-to-engine bolts and separate the engine and transaxle.

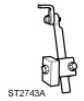


78. Remove and discard the engine-to-transaxle separator plate.



Engine - Manual Transaxle

Special Tool(s)

 ST1341-A	2,200# Floor Crane, Fold Away 300-OTC1819E
 ST1682-A	Powertrain Lift 300-OTC1585AE
 ST1602-A	Spreader Bar 303-D089 (D93P-6001-A3) or equivalent
 ST2743A	Adjustable Grip Arm, 1735A 014-00001

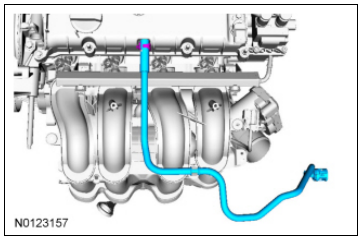
All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

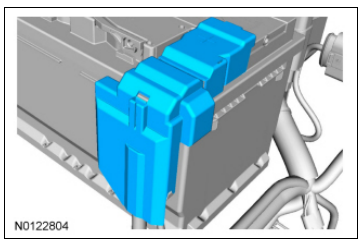
2. Release the fuel system pressure. For additional information, refer to Section 310-00 .

3. Remove the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to Section 303-12 .

4. Disconnect the crankcase vent tube from the valve cover.
   - Detach the 2 crankcase vent tube retainers and remove the tube.

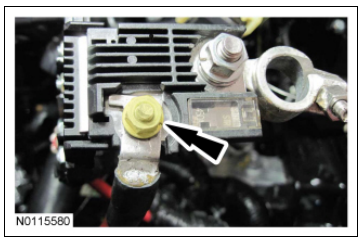

N0123157

5. Remove the positive battery cable cover.

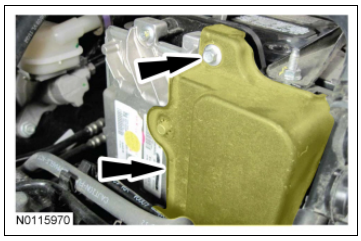

N0122804

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

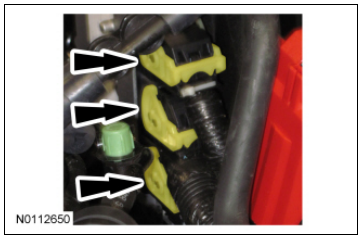
7. Remove the nut and cable from the positive battery cable terminal.



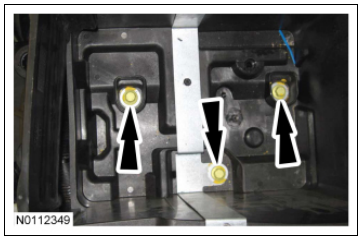
8. Remove the bolt and the PCM cover.



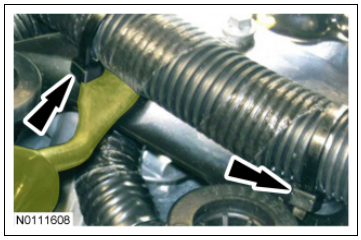
9. Disconnect the 3 PCM electrical connectors.



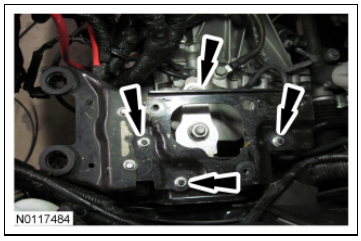
10. Remove the 3 bolts and the battery tray.



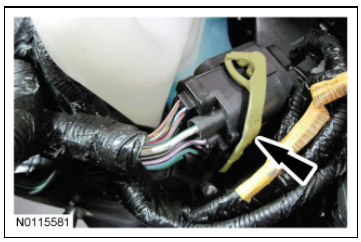
11. Detach the 2 positive battery cable wire harness retainers from battery tray bracket.



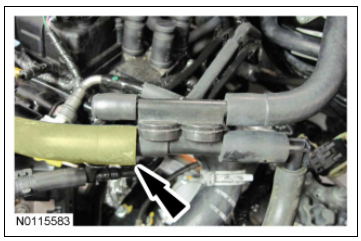
12. Remove the 3 battery tray nuts and the battery tray bracket.
    - Detach the 2 wiring harness retainers from the battery tray bracket.



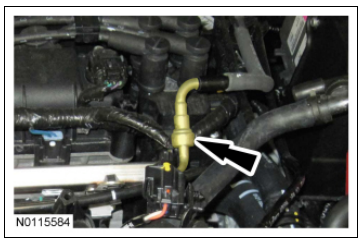
13. Disconnect the engine harness electrical connector.



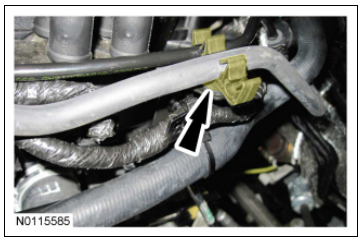
14. Disconnect the brake booster vacuum hose.



15. Disconnect the fuel tube spring lock couplings from the fuel rail. For additional information, refer to Section 310-00 .



16. Detach the fuel tube from the coolant outlet bracket retainer.

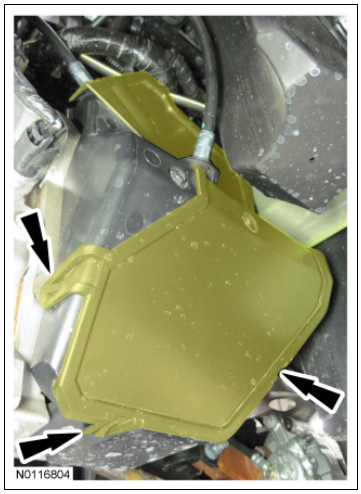


17. Remove the generator. For additional information, refer to Section 414-00 .

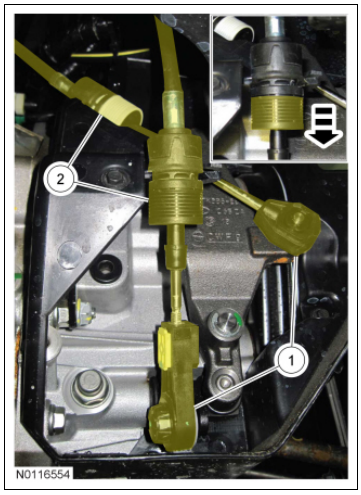
18. Drain the cooling system. For additional information, refer to Section 303-03 .

19. Remove the degas bottle. For additional Information, refer to Section 303-03 .

20. Release the 7 retainers (2 shown) and remove the gearshift cable cover.

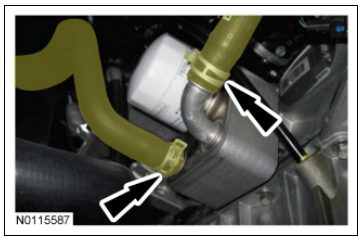


21. Remove the gearshift cables.
    1. Using a suitable tool, lightly pry the gearshift cables off the transaxle shift control levers.
    2. Remove the gearshift cable by pulling the lower part of abutment down and removing from the brackets.



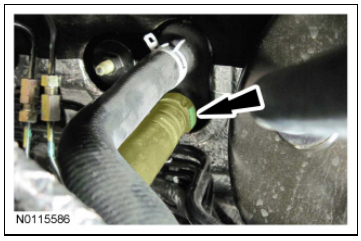
22. Remove the cooling fan motor and shroud. For additional information, refer to Section 303-03 .

23. Disconnect the 2 coolant hoses from the engine oil cooler.
    - Detach the oil cooler hose retainer from the upper radiator hose.

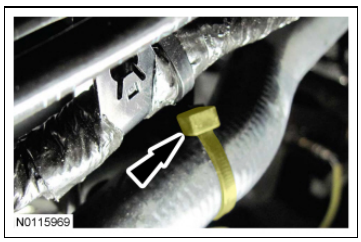


24. Remove the Heated Oxygen Sensor (HO2S). For additional information, refer to Section 303-14 .

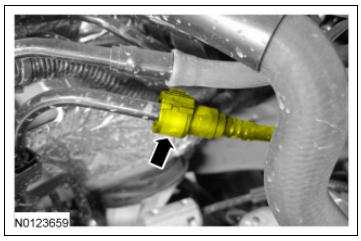
25. Disconnect the lower heater hose from the heater core.



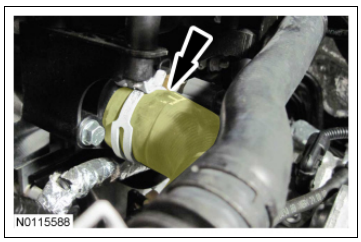
26. Detach the coolant hose retainer from the coolant outlet bracket.



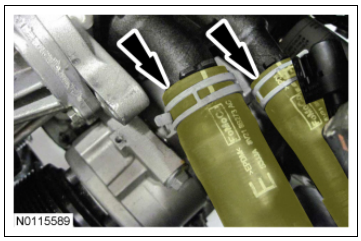
27. Disconnect the Evaporative Emission (EVAP) tube quick connect coupling near the bulk head. For additional information, refer to Section 310-00 .



28. Disconnect the upper radiator hose from the engine.



29. Disconnect the lower radiator hose and coolant hose from the thermostat housing.

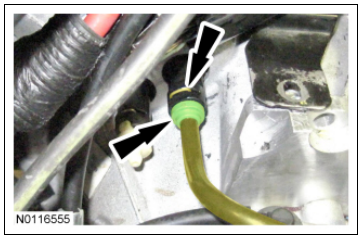


30. ⚠ **WARNING: Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.**

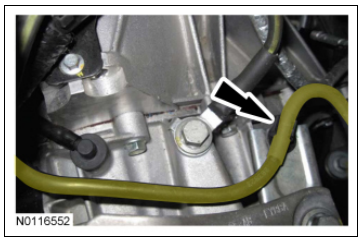
NOTICE: **Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface**

with water.

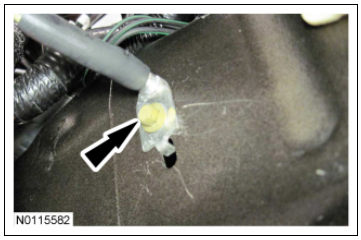
Remove the clip and disconnect the clutch hydraulic hose.



31. Detach the clutch hydraulic hose from the transaxle retainer.

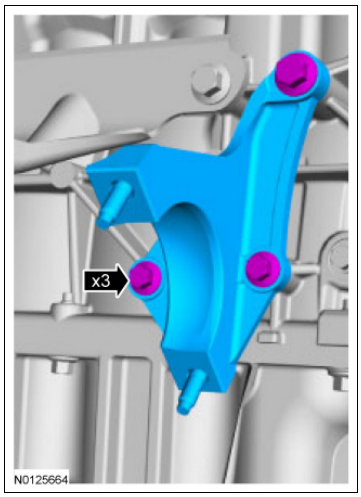


32. Remove the bolt and position the engine ground wire aside.



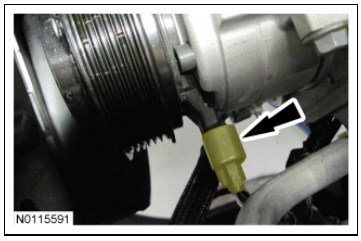
33. Remove the RH and LH halfshafts. For additional information, refer to Section 205-04 .

34. Remove the 3 bolts and the halfshaft bracket.

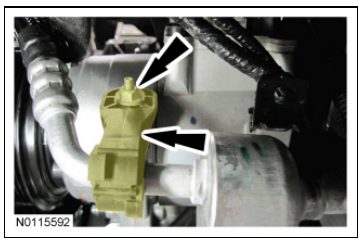


Vehicles with A/C

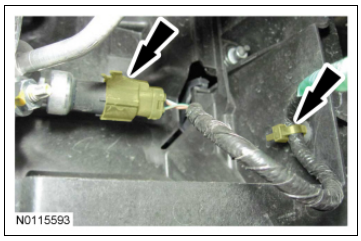
35. Disconnect the A/C compressor electrical connector.



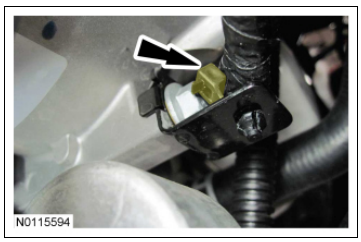
36. Remove the nut and position the A/C line bracket aside.



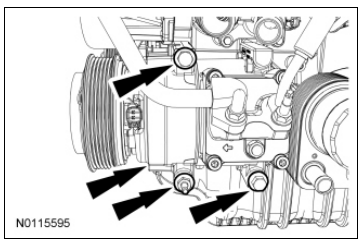
37. Disconnect the A/C pressure transducer electrical connector.
    - Detach the wiring harness retainer.



38. Detach the wiring harness retainer from the lower A/C compressor bracket.

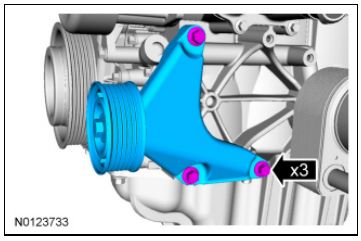


39. Remove the 2 bolts, stud bolt and position the A/C compressor aside and support with a length of mechanic's wire.



Vehicles without A/C

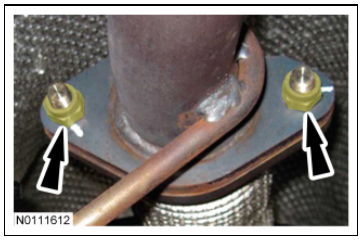
40. Remove the 3 bolts and the accessory drive belt idler pulley bracket.



All vehicles

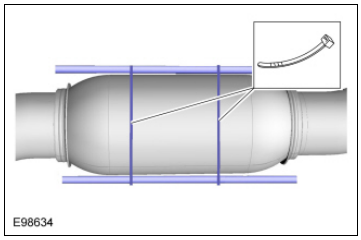
41. Remove the Catalyst Monitor Sensor (CMS). For additional information, refer to Section 303-14 .

42. Remove the 2 catalytic converter-to-muffler nuts and separate.
    - Discard the gasket.

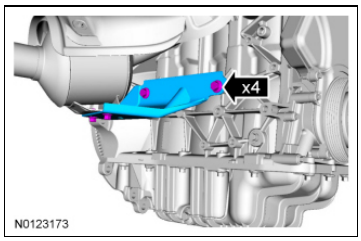


43. ***NOTICE:*** **Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

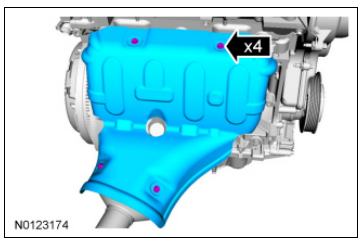
    Support the exhaust flexible pipe with a support wrap or suitable splint.



44. Remove the 4 bolts and the lower catalytic converter bracket.

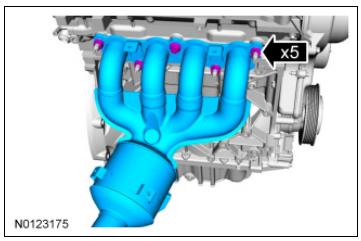


45. Remove the 4 bolts and the catalytic converter heat shield.



46. Remove the 4 catalytic converter nuts and bolt.

- Discard the bolt and 4 nuts.

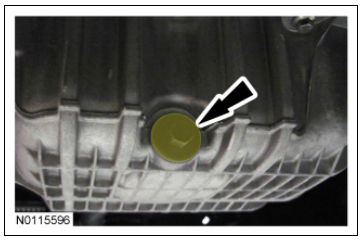


47. Position the catalytic converter back and secure with mechanic wire.
    - Discard the catalytic converter gasket.

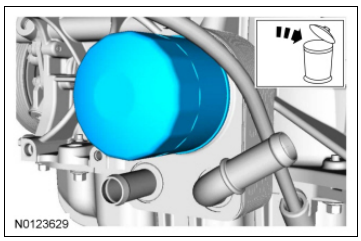
48. Clean and inspect the catalytic converter flange. For additional information, refer to exhaust manifold cleaning and inspection in Section 303-00 .

49. If equipped, disconnect the block heater electrical connector.

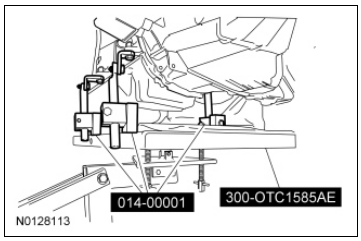
50. Drain the engine oil.
    - Install the drain plug and tighten to 28 Nm (21 lb-ft).



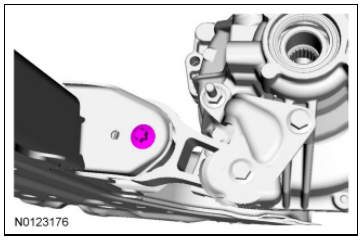
51. Remove and discard the engine oil filter.



52. Using the Powertrain Lift and Adjustable Grip Arms, secure the engine to the lift table.



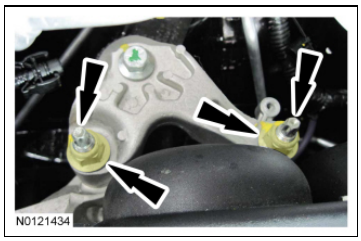
53. Remove the bolt for the transaxle roll restrictor.



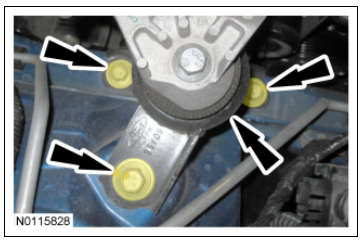
54. *NOTICE:* **The engine mount studs must be held while removing the engine mount nuts or damage to the powertrain may occur.**

    NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.

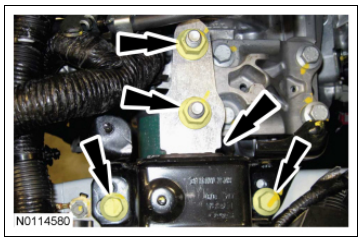
    Use the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.



55. Remove the 3 bolts and the engine mount.

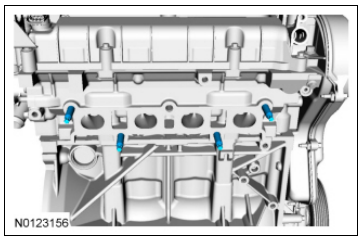


56. Remove the 2 bolt, 2 nuts and the transaxle support insulator.

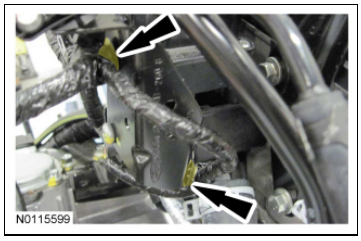


57. Lower the engine and transaxle assembly from the vehicle.

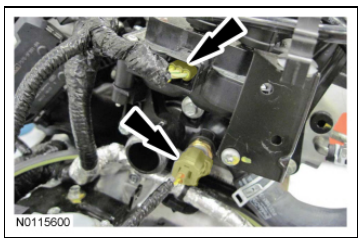
58. Remove the 4 catalytic converter studs and discard.



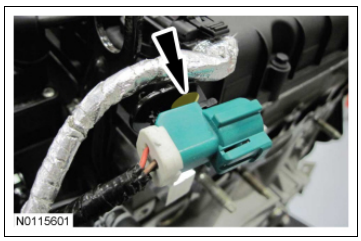
59. Detach the 2 wiring harness retainers from the coolant outlet bracket.



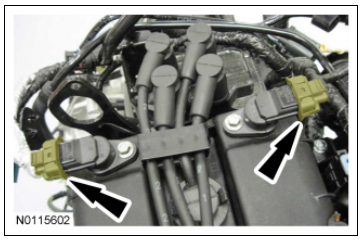
60. Disconnect the ignition coil and Engine Coolant Temperature (ECT) sensor electrical connectors.



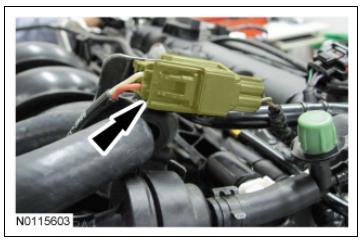
61. Detach the HO2S sensor electrical connector pin-type retainer from the bracket.



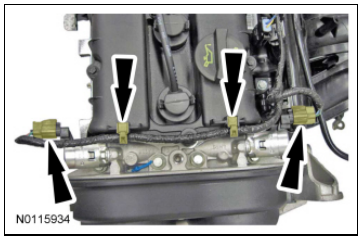
62. Disconnect the 2 Camshaft Position (CMP) sensor electrical connectors.



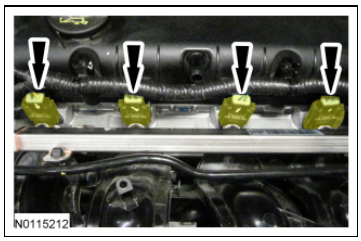
63. Detach and disconnect the LH Knock Sensor (KS) electrical connector.



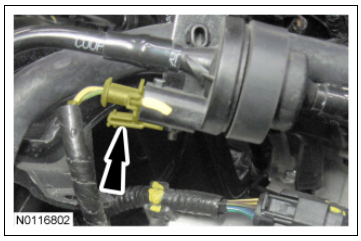
64. Disconnect the Variable Camshaft Timing (VCT) oil control solenoid electrical connectors.
    - Detach the 2 wiring harness retainers.



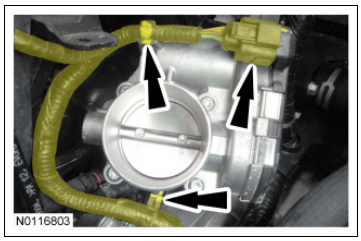
65. Disconnect the 4 fuel injector electrical connectors.
    - Detach the wiring harness retainers from the valve cover stud bolts.



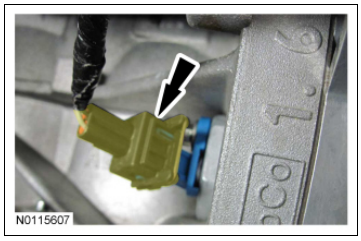
66. Disconnect the EVAP canister purge valve electrical connector.



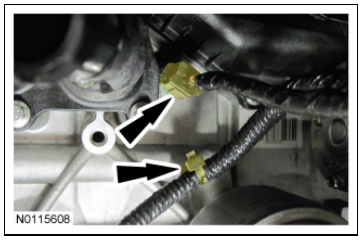
67. Disconnect the Throttle Body (TB) electrical connector.
    - Detach the 2 wiring harness retainers from the TB .



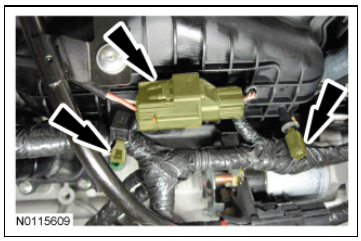
68. Disconnect the Crankshaft Position (CKP) sensor electrical connector.



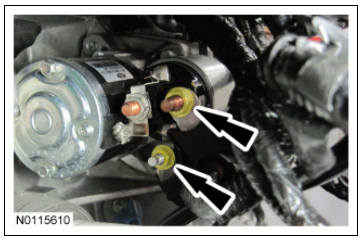
69. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
    - Detach the wiring harness retainer from the engine block.



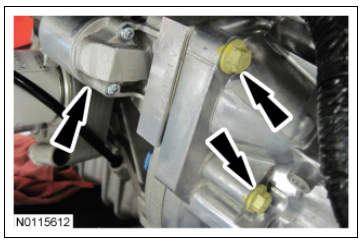
70. Disconnect the RH KS electrical connector.
    - Detach the 2 wiring harness retainers from the intake manifold.



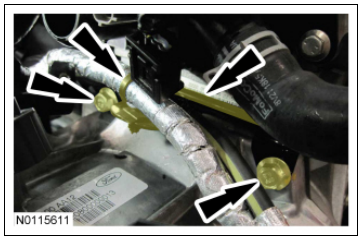
71. Remove the 2 nuts and disconnect the starter motor electrical terminals.



72. Remove the 3 bolts (2 shown) and the starter motor.

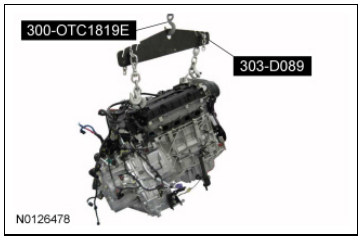


73. Detach the wiring harness pin-type retainer and remove the 2 upper bellhousing-to-engine bolts and bracket.

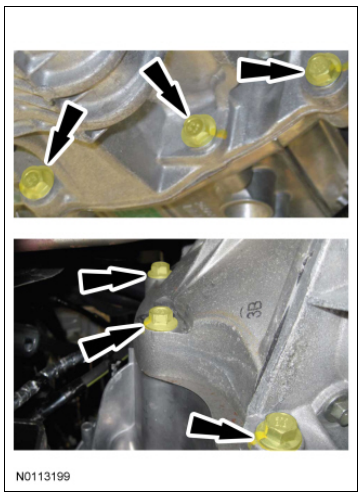


74. **NOTE:** Lower the engine to within a few inches of the floor.

    Using the Floor Crane and Spreader Bar, remove the engine and transaxle assembly from the lift table.

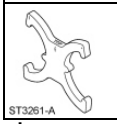


75. Remove the 6 clutch housing-to-engine bolts and separate the engine and transaxle.



Engine

Special Tool(s)

 ST1910-A	Engine Stand 014-00232 or equivalent
 ST1982-A	Installer, Connecting Rod 303-462 (T94P-6136-AH)
 ST3262-A	Pin, Crankshaft Top Dead Center (TDC) 303-748
 ST2417-A	Remover, Input Shaft Oil Seal 308-375
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST1438-A	Strap Wrench 303-D055 (D85L-6000-A) or equivalent
 ST3261-A	Tool, Variable Camshaft Timing (VCT) Alignment 303-1097

⚠ WARNING: Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.

NOTICE: **Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.**

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, can cause engine failure.**

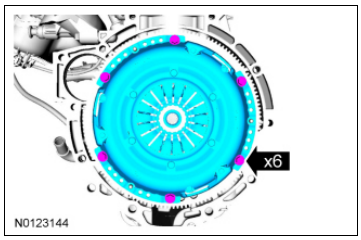
NOTE: For additional information, refer to the exploded view under the Assembly procedure in this section.

Vehicles with manual transaxle

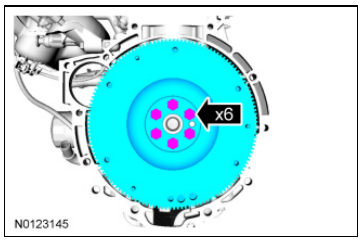
1. ⚠ **WARNING: The clutch disc and clutch pressure plate are heavy and may fall if not held when the bolts are removed. Failure to follow this instruction may result in serious personal injury.**

   NOTE: Loosen the clutch pressure plate retaining bolts evenly, by two turns at a time.

   Remove and discard the 6 clutch pressure plate retaining bolts, remove the clutch disc and pressure plate.

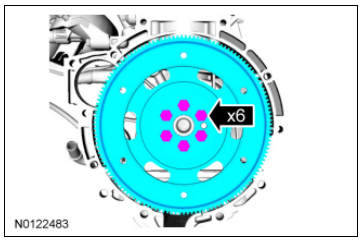


2. Remove the bolts and the flywheel.
   - Discard the bolts.



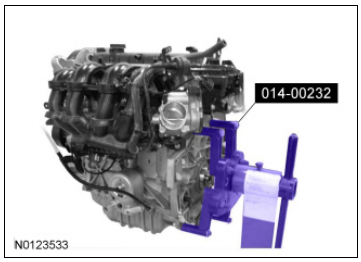
Vehicles with automatic transaxle

3. Remove the bolts and the flexplate.
   - Discard the bolts.

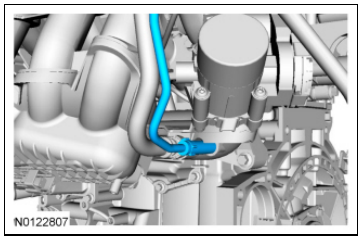


All vehicles

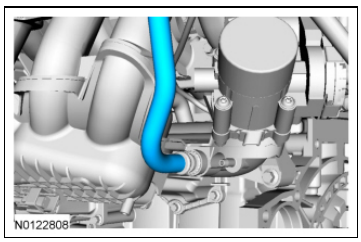
4. Mount the engine on a Engine Stand.



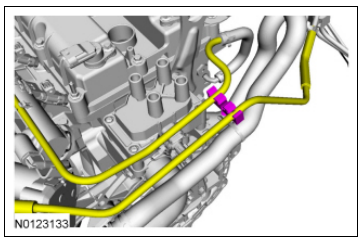
5. Disconnect the Evaporative Emission (EVAP) canister purge valve tube from the intake manifold.



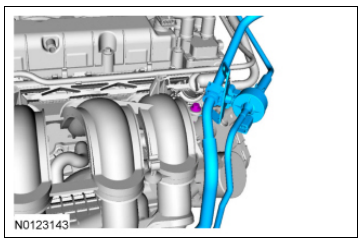
6. Disconnect the brake booster vacuum tube from the intake manifold.



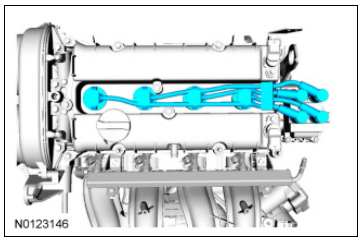
7. Detach the EVAP tube and coolant tube from the coolant outlet bracket retainer.



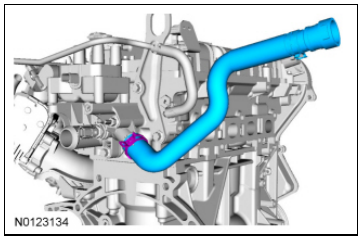
8. Remove the bolt for the EVAP canister purge valve and remove the brake booster vacuum tube and EVAP canister purge valve as an assembly.



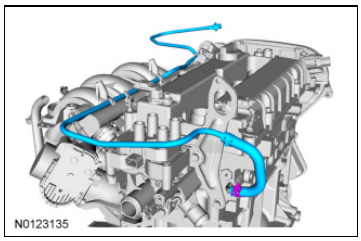
9. Remove the 4 spark plug wires.



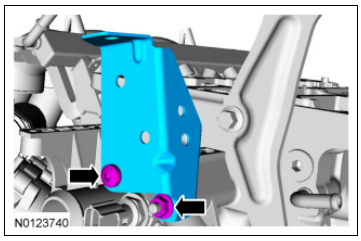
10. Disconnect the coolant hose from the coolant outlet.



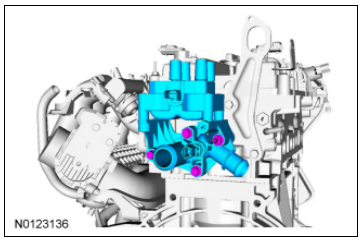
11. Disconnect the coolant return hose from the cylinder head.
    - Detach the coolant tube from the fuel rail retainers.



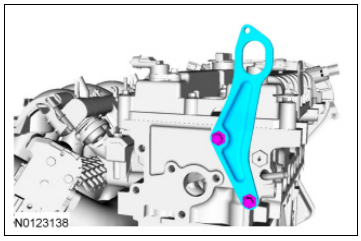
12. Remove the nut, bolt and the bracket from the coolant outlet.



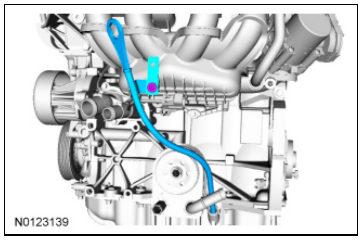
13. Remove the 4 bolts and the coolant outlet and ignition coil assembly.
    - Inspect and replace the gasket, if necessary.



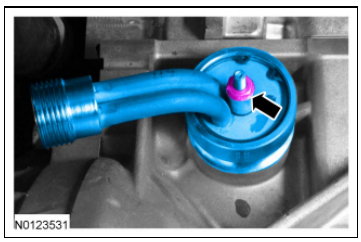
14. Remove the 2 bolts and the engine lift eye.



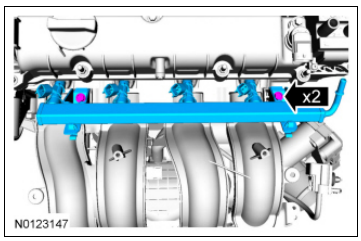
15. Remove the screw and the oil level indicator and tube.
    - Inspect and replace the O-ring seal, if necessary.



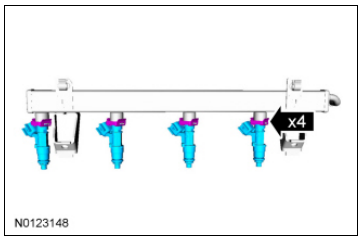
16. If equipped, remove the engine block heater.



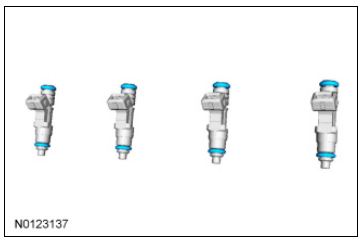
17. Remove the 2 bolts and the fuel rail assembly.



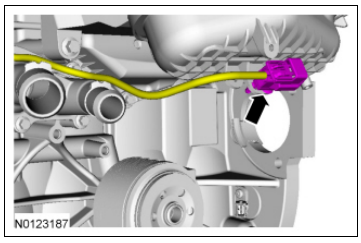
18. Remove the 4 fuel injector clips and the 4 fuel injectors.



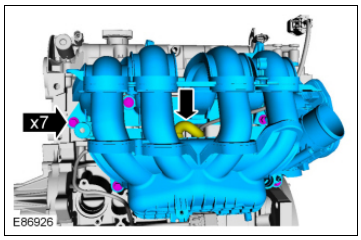
19. Remove and discard the 8 fuel injector O-ring seals.



20. Detach the Knock Sensor (KS) from the bottom of the intake manifold.



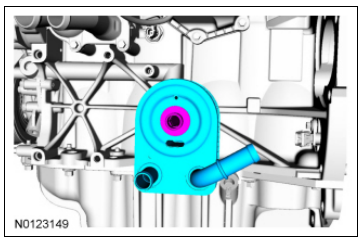
21. Remove the 7 bolts and the intake manifold.
    - Disconnect the PCV hose from the intake manifold.



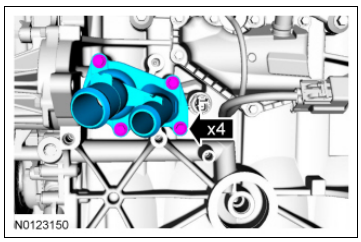
22. ***NOTICE:*** **A new oil cooler must be installed or severe damage to the engine can occur.**

    Remove the bolt and the oil cooler.

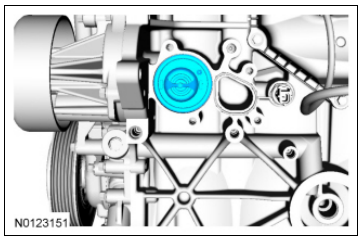
    - Discard the oil cooler.



23. Remove the 4 bolts and the thermostat housing
    - Inspect and replace the gasket, if necessary.

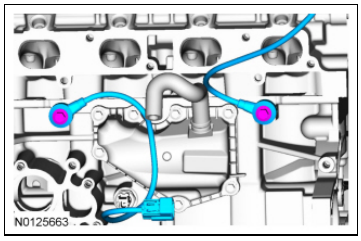


24. Remove the thermostat from the engine block.
    - Inspect the thermostat seal and replace, if necessary.

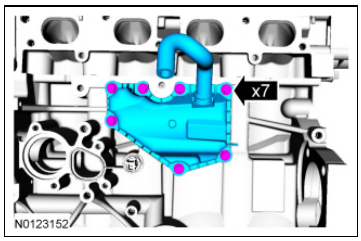


25. **NOTE:** Mark the location of the 2 KS for installation.

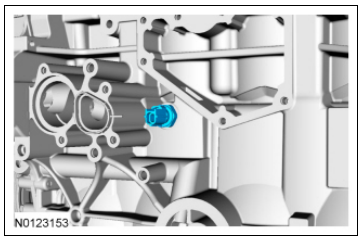
    Remove the 2 bolts and the 2 KS .



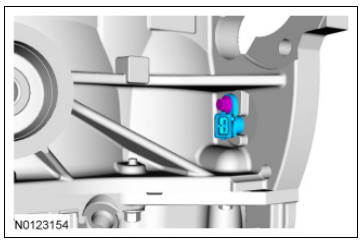
26. Remove the bolts and the crankcase vent oil separator.
    - Inspect and replace the gasket, if necessary.



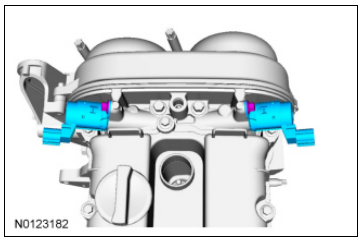
27. Remove the Engine Oil Pressure (EOP) switch.



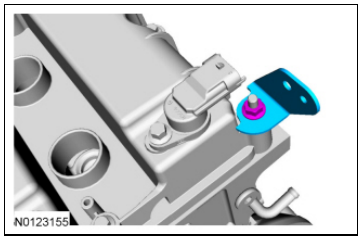
28. Remove the bolt and the Crankshaft Position (CKP) sensor.



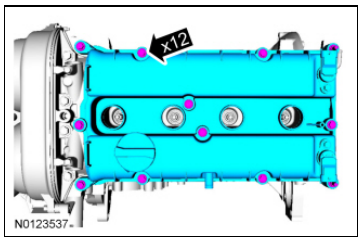
29. Remove the 2 bolts and the Variable Camshaft Timing (VCT) oil control solenoids.



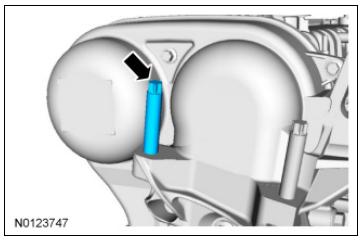
30. Remove the nut and the Heated Oxygen Sensor (HO2S) electrical connector bracket.



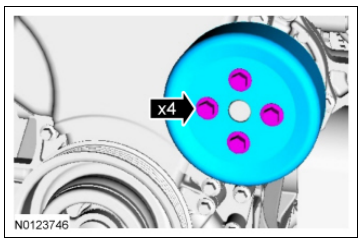
31. Loosen the 12 retainers and remove the valve cover.
    - Discard the gasket.



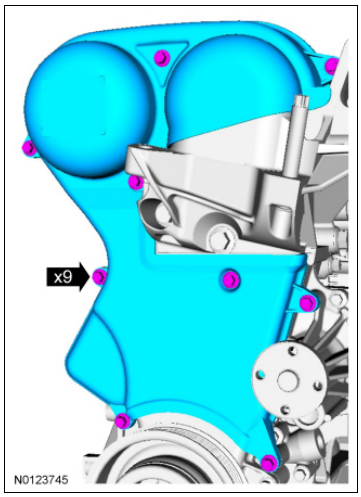
32. Remove the 1 engine mount stud.



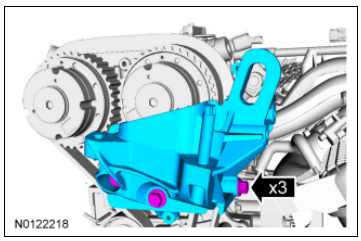
33. Remove the 4 bolts and coolant pump pulley.



34. Remove the 9 bolts and the timing belt cover.

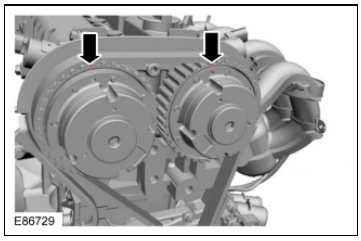


35. Remove the 3 bolts and the engine mount bracket.

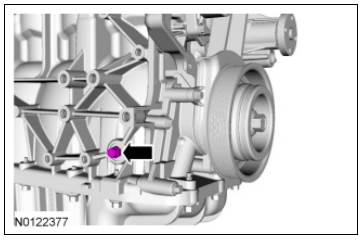


36. ***NOTICE:*** **Only rotate the crankshaft in a clockwise direction.**

    Using the crankshaft pulley bolt, turn the crankshaft clockwise until the markings on the camshaft phaser and sprockets are at the 11 o'clock position as shown.

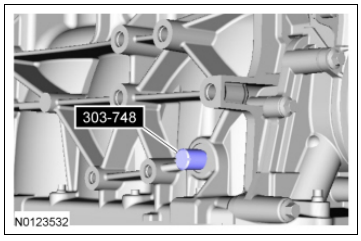


37. Remove the engine plug bolt.



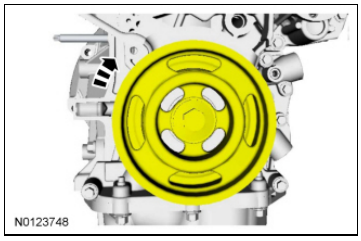
38. **NOTE:** The Crankshaft Top Dead Center (TDC) Timing Pin will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the crankshaft pulley removal and installation.

    Install the Crankshaft TDC Pin.

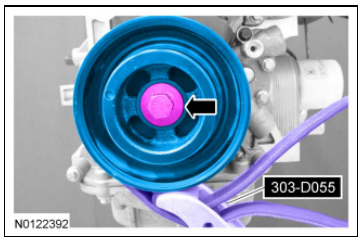


39. **NOTE:** Only rotate the crankshaft clockwise direction.

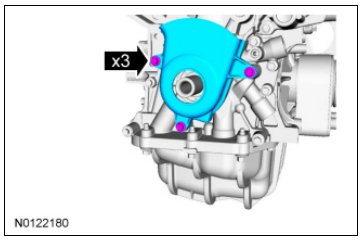
    Rotate the crankshaft until it contacts the Crankshaft TDC Pin.



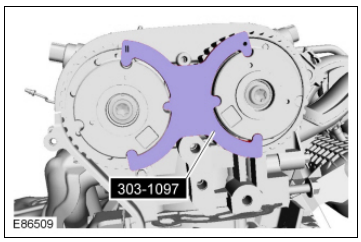
40. Using the Strap Wrench, remove the crankshaft pulley bolt and the crankshaft pulley.
    - Discard the crankshaft pulley bolt.



41. Remove the 3 bolts and the lower timing belt cover.



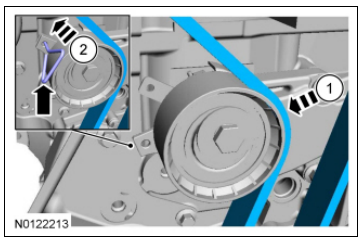
42. Install the VCT Alignment Tool.



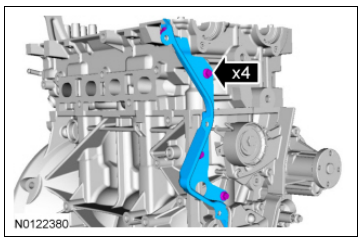
43. ⚠ **WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.**

    Remove the timing belt.

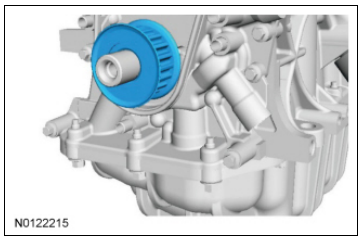
    1. Rotate the timing belt tensioner clockwise.
    2. Align the 2 holes on the tensioner and install a small screwdriver or holding pin.
        - ♦ Remove the timing belt.



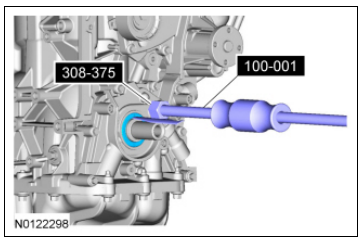
44. Remove the 4 bolts and the timing belt cover backplate.



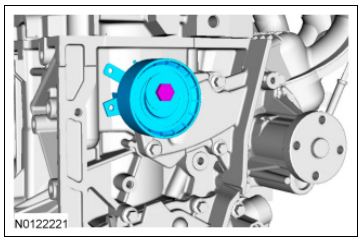
45. Remove the crankshaft sprocket gear.



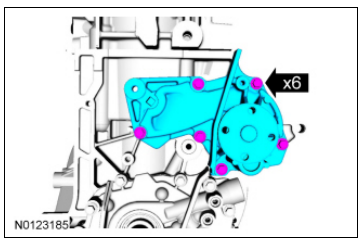
46. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the crankshaft front oil seal.



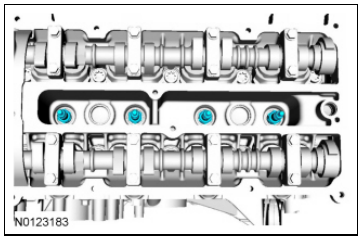
47. Remove the bolt and the timing belt tensioner.



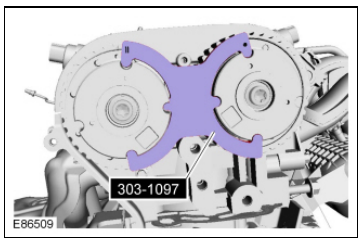
48. Remove the 6 bolts and the coolant pump.
    - Discard the gasket.



49. Remove the 4 spark plugs.

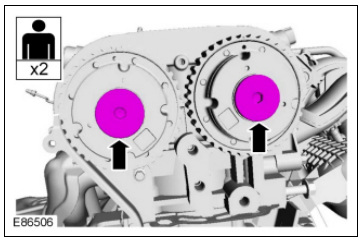


50. Remove the VCT Alignment Tool.



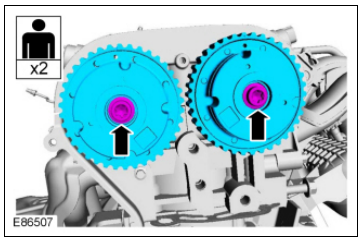
51. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

    Remove the 2 camshaft phaser and sprocket plugs.

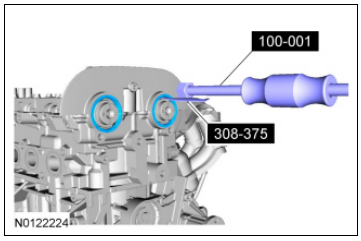


52. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

    Remove the 2 bolts and the camshaft phaser and sprockets.

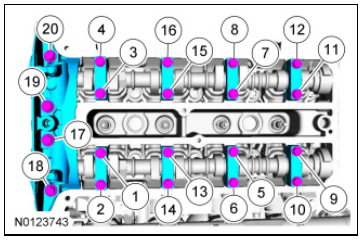


53. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the 2 camshaft oil seals.

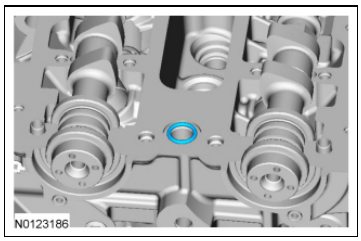


54. **NOTE:** Note the position of each component before removal.

    Remove the bolts for the camshaft bearing caps and VCT bridge in the sequence shown.

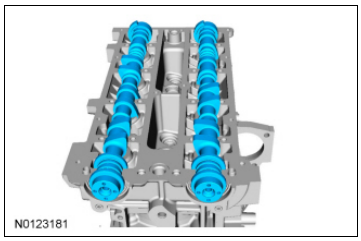


55. Remove the VCT bridge O-ring seal.
    - Inspect and replace the VCT bridge O-ring seal, if necessary.

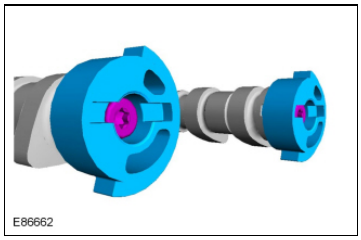


56. ***NOTICE:*** **Do not pry on camshafts when removing or damage to the camshafts may occur.**

    Remove the 2 camshafts from the cylinder head.



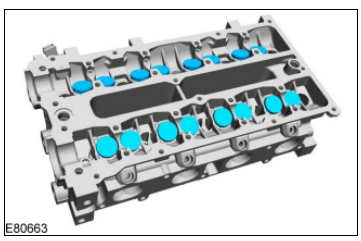
57. If necessary, remove the 2 bolts and the camshaft trigger wheels.



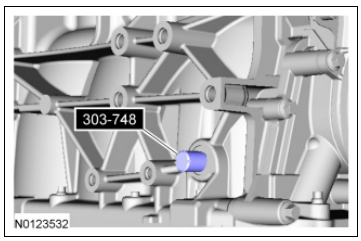
58. **NOTE:** If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

    NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

    Remove and inspect the valve tappets. For additional information, refer to Section 303-00 .



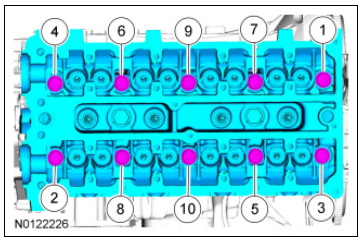
59. Remove the Crankshaft TDC Pin.



60. **NOTE:** Make sure that the cylinder head is at ambient air temperature before removing the cylinder head bolts.

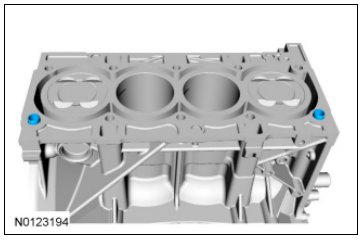
    Remove the 10 cylinder head bolts in the sequence shown.

    - Remove the cylinder head.
    - Discard the cylinder head bolts and gasket.

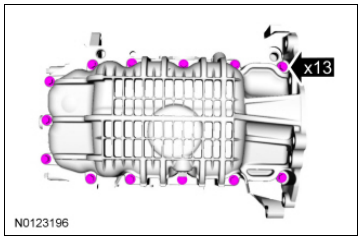


61. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to Section 303-00 .

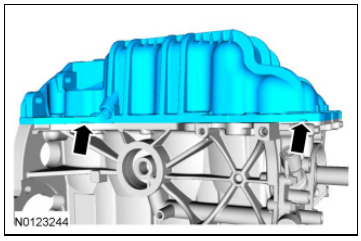
62. Remove the cylinder head alignment dowels.



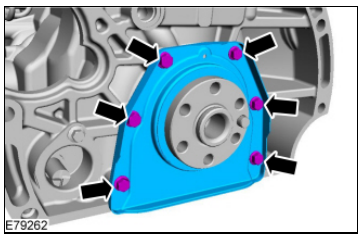
63. Remove the 13 bolts from the oil pan.



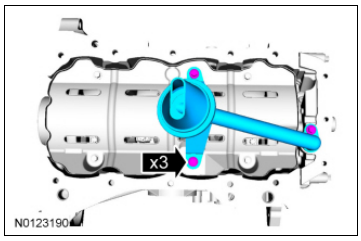
64. Using the pry pads, remove the oil pan.



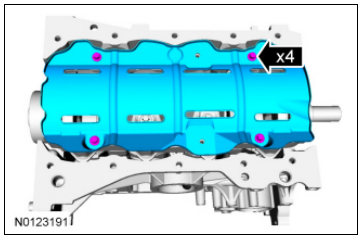
65. Remove the 6 bolts and the crankshaft rear seal.



66. Remove the 3 bolts and the oil pump screen and pickup tube.
    - Inspect and replace the O-ring seal, if necessary.



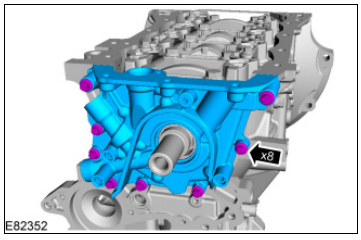
67. Remove the 4 bolts and the windage tray.



68. **NOTE:** Mark the location of the 3 different length bolts.

    Remove the 8 bolts and the oil pump.

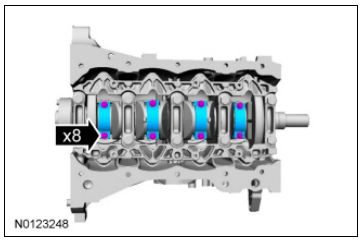
    - Discard the gasket.



69. Before removing the pistons, inspect the top of the cylinder bores. If necessary, remove the ridge or carbon deposits from each cylinder using an abrasive pad or equivalent, following manufacturer's instructions.

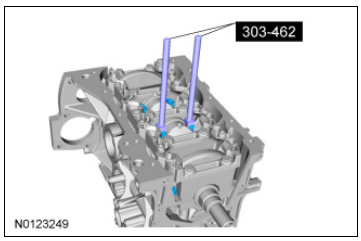
70. **NOTE:** Clearly mark the connecting rods, connecting rod caps and connecting rod bearings in numerical order for correct orientation for reassembly.

    Remove the bolts and the connecting rod cap.



71. ***NOTICE:*** **Do not scratch the cylinder walls or crankshaft journals with the connecting rod.**

    Using the Connecting Rod Installer, remove the piston/rod assembly from the engine block.



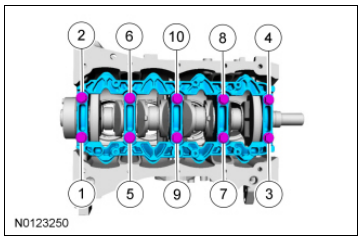
72. Repeat the previous 2 steps until all the piston/rod assemblies are removed from the engine block.

73. **NOTE:** Mark the position of the parts, so they can be installed in their original positions.

    Remove the connecting rod bearings from the connecting rod and cap.

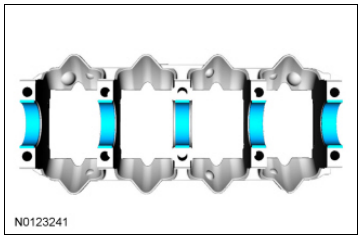
74. **NOTE:** The main bearing beam has 2 arrows pointing towards the front of engine for correct orientation for reassembly.

    Remove the 10 bolts in the sequence shown and the main bearing beam.

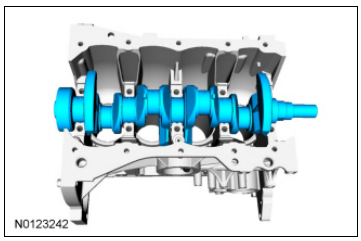


75. **NOTE:** If the main bearings are being reused, mark them in order for correct orientation and reassembly.

    Remove the main bearings from the main bearing beam.



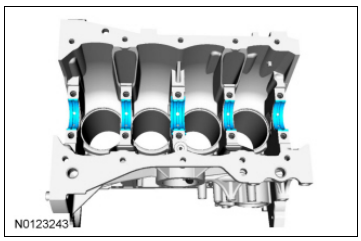
76. Remove the crankshaft from the engine block.



77. **NOTE:** If the main bearings are being reused, mark them in order for correct orientation and reassembly.

    NOTE: The center bulkhead has the thrust bearing.

    Remove the main bearings from the cylinder block.

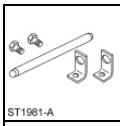


78. Inspect the cylinder block and main bearing beam.

79. Inspect the pistons and connecting rods. For additional information, refer to Section 303-00 .

Cylinder Head

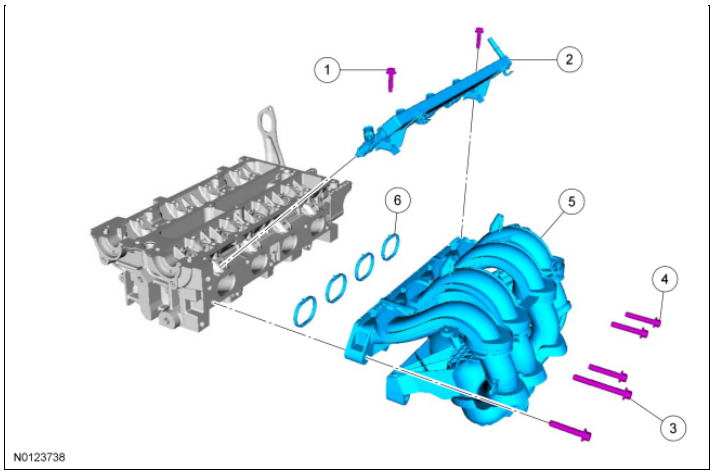
Special Tool(s)

 ST1981-A	Compressor, Valve Spring 303-300 (T87C-6565-A)
 ST1907-A	Compressor, Valve Spring 303-350 (T89P-6565-A)
 ST1902-A	Compressor, Valve Spring 303-1418

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
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

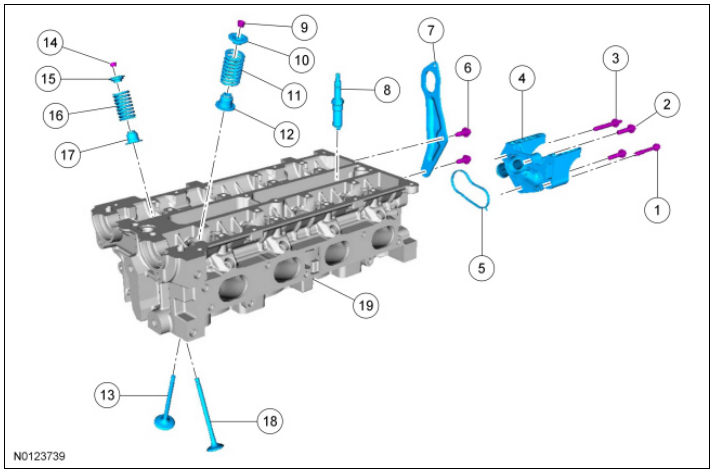
Cylinder Head (View 1 of 2)



Item	Part Number	Description
1	W704043	Fuel rail bolt (2 required) - 11 Nm (97 lb-in)
2	9D280	Fuel rail assembly
3	W500117	Intake manifold bolt - 18 Nm (159 lb-in)

4	W500112	Intake manifold bolt (4 required) - 18 Nm (159 lb-in)
5	9424	Intake manifold
6	9439	Intake manifold gasket (4 required)

Cylinder Head (View 2 of 2)



Item	Part Number	Description
1	W714169	Coolant outlet bolt - 19 Nm (168 lb-in)
2	-	Coolant outlet bolt (part of 8K556) (2 required) - 19 Nm (168 lb-in)
3	W713019	Coolant outlet stud bolt - 19 Nm (168 lb-in)
4	8K556	Coolant outlet
5	-	Coolant outlet gasket (part of 8K556)
6	W500223	Lift eye bolt (2 required) - 19 Nm (168 lb-in)
7	-	Lift eye bracket
8	12405	Spark plug (4 required)
9	6518	Intake valve collet (16 required)
10	6514	Intake valve spring retainer (8 required)
11	6513	Intake valve spring (8 required)
12	6571	Intake valve seal (8 required)
13	6507	Intake valve (8 required)
14	6518	Exhaust valve collet (16 required)
15	6514	Exhaust valve spring retainer (8 required)
16	6513	Exhaust valve spring (8 required)
17	6571	Exhaust valve seal (8 required)
18	6505	
19	6049	Cylinder head

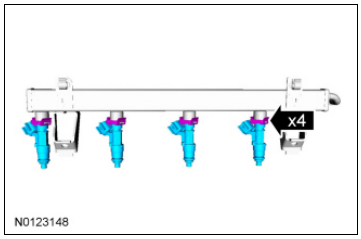
Disassembly

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 can cause engine failure.**

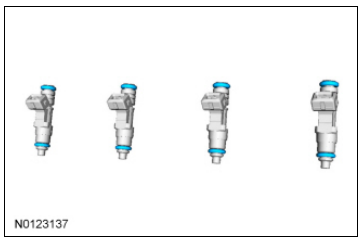
NOTE: If the components are to be reinstalled, mark the location of the components removed, they must be installed in the same location.

1. Remove the 2 bolts and the fuel rail and injectors as an assembly.

2. Remove the 4 fuel injector clips and the 4 fuel injectors.



3. Remove and discard the 8 fuel injector O-ring seals.



4. Remove the 5 bolts and the intake manifold.

5. Remove the 2 bolts and the LH engine lift eye.

6. Remove the 3 bolts, stud bolt and the coolant outlet.
   - Discard the gasket.

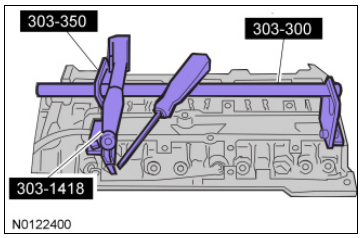
7. ***NOTICE:*** **Only use hand tools when removing or installing the spark plugs, or damage can occur to the cylinder head or spark plug.**

   NOTE: Use compressed air to remove any foreign material in the spark plug well before removing the spark plugs.

   Remove the 4 spark plugs.

8. **NOTE:** Use a small screwdriver and multi-purpose grease to remove the valve collets.

   Using the Valve Spring Compressors, compress the valve spring and remove the valve spring collets, the valve spring retainers and the valve springs.



9. Inspect the valve springs. For additional information, refer to Section 303-00 .

10. **NOTE:** Note the location of the valves if they are to be reused

Remove the valves.

11. Inspect the valves. For additional information, refer to Section 303-00 . Install new parts, as necessary.

12. **NOTE:** Use a valve stem seal pliers (such as Snap-on® YA-8230 or equivalent).

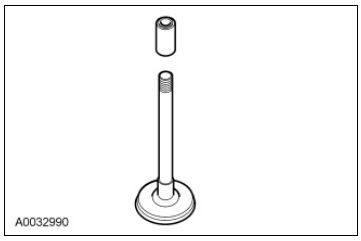
    Using valve stem seal pliers, remove and discard the valve seals.

Assembly /b>

1. **NOTE:** If installing the original valves, make sure the valves are installed in the same position from which they were removed. Coat the valve stems with clean engine oil.

   Install the valves.

2. Install the valve stem seal installation sleeve.



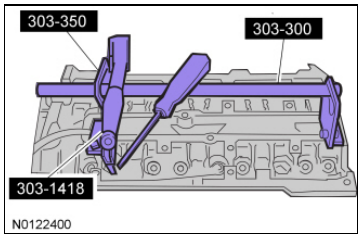
3. **NOTE:** Lubricate the valve stem, guides and valve stem seals with clean engine oil prior to installation.

   Using valve stem seal pliers, install the valve seals.

4. **NOTE:** Check the seating of the valve collet.

   Using the Valve Spring Compressors, install the valve spring.

   - Insert the valve spring and the valve spring retainer.
   - Compress the valve spring and install the valve collet using some multi-purpose grease and a small screwdriver.



5. *NOTICE:* **Only use hand tools when removing or installing the spark plugs, or damage can occur to the cylinder head or spark plug.**

   Install the 4 spark plugs.

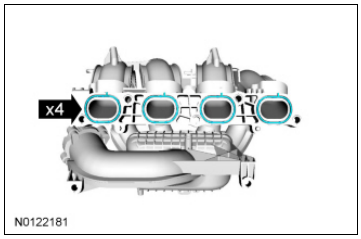
   - Tighten to 15 Nm (133 lb-in).

6. Using a new gasket, install the coolant outlet, 3 bolts and the stud bolt.

- Tighten to 19 Nm (168 lb-in).

7. Install the LH engine lift eye and the 2 bolts.
   - Tighten to 19 Nm (168 lb-in).

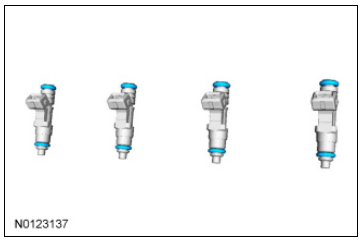
8. Inspect and install new intake manifold gaskets if necessary.



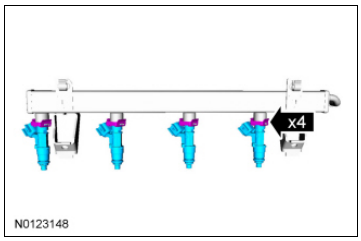
9. Install the intake manifold and the 5 bolts.
   - Tighten to 18 Nm (159 lb-in).

10. ***NOTICE:*** **Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings may cause the fuel system to leak. Do not reuse the O-ring seals.**

    Install the new O-ring seals onto the fuel injectors and lubricate them with clean engine oil.



11. Install the 4 fuel injectors and the 4 fuel injector clips into the fuel rail.

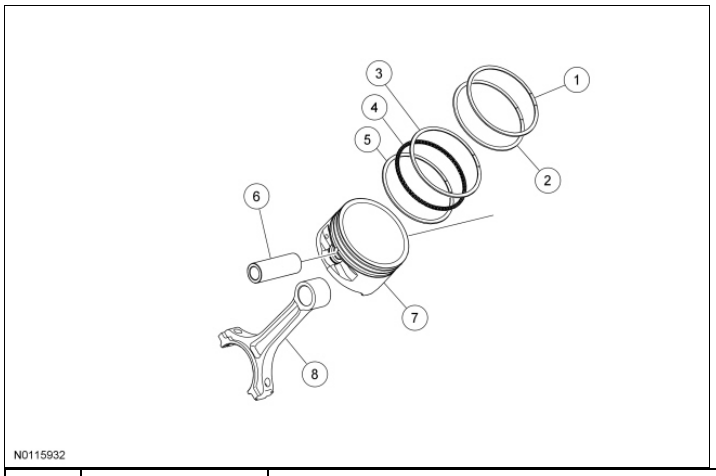


12. Install the fuel rail and fuel injectors as an assembly and install the 2 bolts.
    - Tighten to 11 Nm (97 lb-in).

Piston

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



Item	Part Number	Description
1	-	Piston compression upper ring (part of 6148)
2	-	Piston compression lower ring (part of 6148)
3	-	Piston oil control upper segmrt of 6148)
4	-	Piston oil control spacer (part of 6148)
5	-	Piston oil control lower segment ring (part of 6148)
6	6135	Piston pin
7	6108	Piston
8	6200	Connecting rod

Disassembly

1. Remove the connecting rod bearings from the connecting rod and cap.

2. Remove the piston rings from the piston.
   - Discard the piston rings.

3. **NOTE:** If the piston and connecting rod are to be reinstalled, they must be assembled in the same orientation. Mark the piston orientation to the connecting rod for reassembly.

   NOTE: Use a portable multipurpose press (such as OTC® 5180 or equivalent).

Using the portable multipurpose press, press the piston pin out of the connecting rod and piston assembly.

4. Separate the piston from the connecting rod.

5. Clean and inspect the piston and connecting rod. For additional information, refer to Section 303-00 .

Assembly

1. **NOTE:** Lubricate all parts with clean engine oil.

   Gradually heat the pin bore side of the connecting rod to approximately 300°C (572°F).

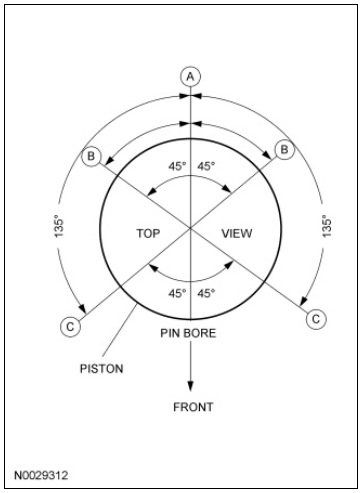
2. Align the piston-to-connecting rod orientation marks, and immediately install the piston pin.

l start="3">
• Using the portable multipurpose press, press the piston pin into the piston and connecting rod assembly.

4. **NOTE:** The upper and lower compression rings are to be fitted with the identification marks on the upper side.

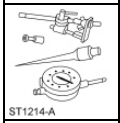
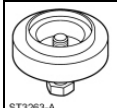
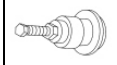
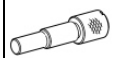
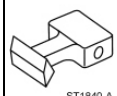
   Install the piston rings.

5. Make sure the ring gaps (oil spacer - A, oil ring - B, compression ring - C) are correctly spaced around the circumference of the piston.



Engine

Special Tool(s)

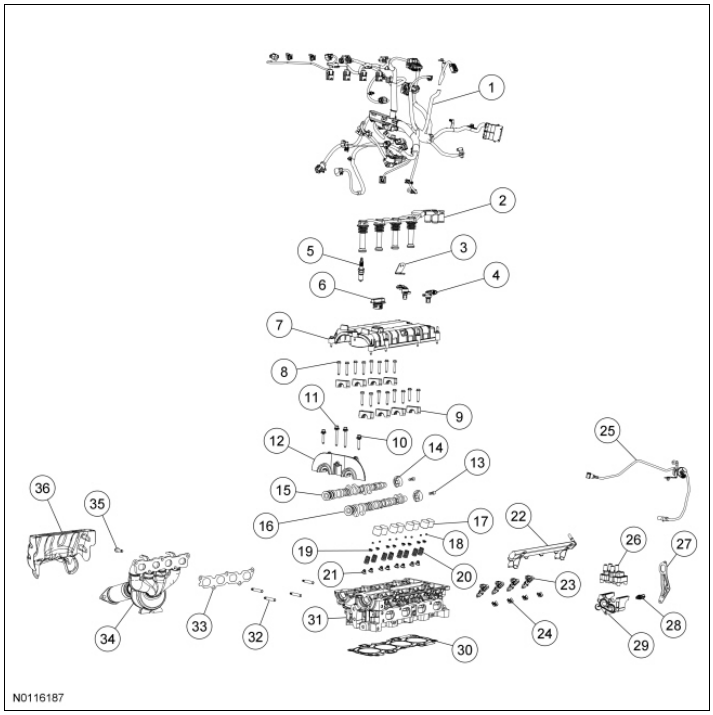
 ST3259-A	Alignment Plate, Camshaft 303-376B
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C)
 ST3263-A	Installer, Camshaft Seal 303-1532
 ST1982-A	Installer, Connecting Rod 303-462 (T94P-6136-AH)
 ST1378-A	Installer, Crankshaft Vibration Damper 303-175 (T82L-6316-B)
 ST1328-A	Installer, Front Cover Oil Seal 303-335 (T88T-6701-A)
 ST3262-A	Pin, Crankshaft Top Dead Center (TDC) 303-748
 ST3260-A	Replacer, Front Crankshaft Seal 303-420 (T92P-6701-BH)
 ST1438-A	Strap Wrench 303-D055 (D85L-6000-A) or equivalent
 ST1840-A	Tool, Flywheel Holding 303-103
 ST3261-A	Tool, Variable Camshaft Timing (VCT) Alignment 303-1097

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 (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WS945-A
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

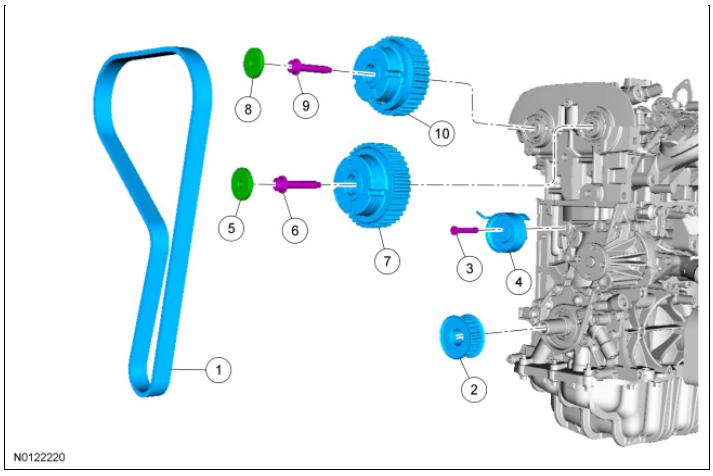
Upper Engine



Item	Part Number	Description
1	12A581	Engine wiring harness
2	12259	Spark plug wire (4 required)
3	14A163	Heated Oxygen Sensor (HO2S) connector bracket
4	6B288	Camshaft Position (CMP) sensor (2 required)
5	12405	Spark plug (4 required)
6	6766	Oil fill cap
7	6582	Valve cover
8	W706225	Camshaft cap bolt (16 required)
9	-	Camshaft cap (8 required) (part of 6049)
10	-	

		Variable Camshaft Timing (VCT) bridge bolt (2 required) (part of 6049)
11	-	VCT bridge bolt (2 required) (part of 6049)
12	-	VCT bridge (part of 6049)
13	W700279	Camshaft trigger wheel bolt (2 required) (part of 6250)
14	6M265	Camshaft trigger wheel (2 required) (part of 6250)
15	6250	Exhaust camshaft
16	6250	Intake camshaft
17	6500	Valve tappet (16 required)
18	6518	Valve collet (16 required)
19	6514	Valve spring retainer (16 required)
20	6513	Valve spring (16 required)
21	6571	Valve seal (16 required)
22	9D280	Fuel rail
23	9F593	Fuel injector (4 required)
24	9C995	Fuel injector clip (4 required)
25	9C047	Evaporative Emission (EVAP) tube
26	12029	Ignition coil
27	-	Lift eye bracket
28	12A648	Engine Coolant Temperature (ECT) sensor
29	8K556	Coolant outlet
30	6051	Cylinder head gasket
31	6049	Cylinder head
32	W703540	Catalytic converter stud bolt (4 required)
33	9448	Catalytic converter gasket
34	5G232	Catalytic converter
35	W500634	Catalytic converter bolt
36	9N454	Catalytic converter heat shield

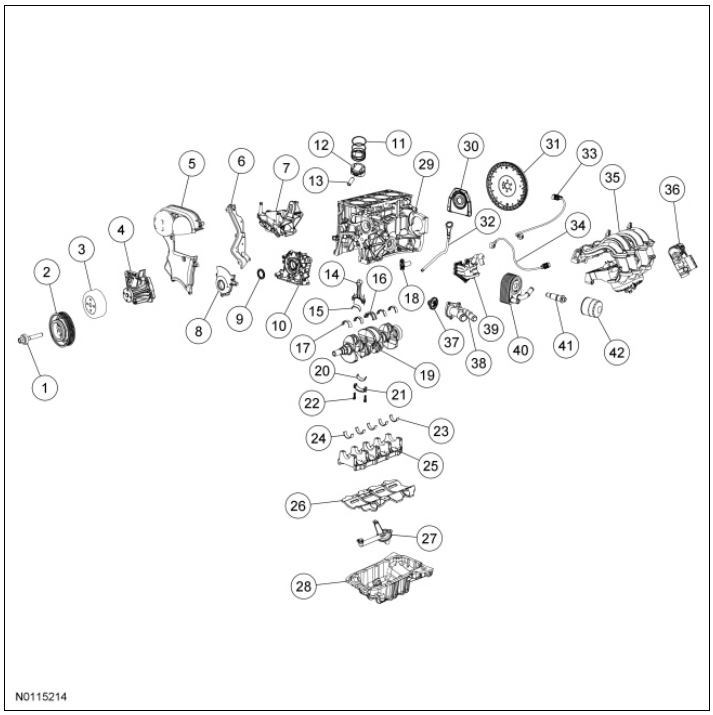
Timing Drive



Item	Part Number	Description

1	6268	Timing belt
2	6306	Crankshaft sprocket gear
3	00812	Timing belt tensioner bolt
4	6K254	Timing belt tensioner
5	W710954	Intake camshaft phaser and sprocket plug and seal
6	6279	Intake camshaft phaser and sprocket bolt
7	6256	Intake camshaft phaser and sprocket
8	W710954	Exhaust camshaft phaser and sprocket plug and seal
9	6279	Exhaust camshaft phaser and sprocket bolt
10	6256	Exhaust camshaft phaser and sprocket

Lower Engine



Item	Part Number	Description
1	6A340	Crankshaft pulley bolt
2	6312	Crankshaft pulley
3	8509	Coolant pump pulley
4	8501	Coolant pump
5	6019	Upper timing belt cover
6	6019	Timing belt cover backplate
7	6038	Engine mount bracket
8	6019	Lower timing belt cover
9	6700	Crankshaft front seal
10	6600	Oil pump
11	6148	Piston ring (5 required)
12	6108	Piston (4 required)

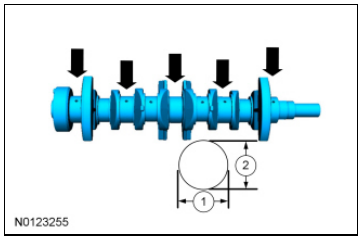
13	6135	Piston pin (4 required)
14	6200	Connecting rod (4 required)
15	6211	Upper connecting rod bearing (4 required)
16	6337	Upper main bearing
17	6333	Upper main bearing (4 required)
18	6C315	Crankshaft Position (CKP) sensor
19	6303	Crankshaft
20	6211	Lower connecting rod bearing (4 required)
21	6200	Connecting rod cap (4 required)
22	6200	Connecting rod cap bolt (8 required)
23	6333	Lower main bearing (4 required)
24	6333	Wider lower main bearing
25	-	Lower crankshaft main bearing beam (part of 6010)
26	6687	Windage tray
27	6622	Oil pump screen and pickup tube
28	6675	Oil pan
29	6010	Engine block
30	6K301	Crankshaft rear oil seal with retainer plate
31	6375	Flexplate/Flywheel
32	6754	Oil level indicator tube
33	12A699	LH Knock Sensor (KS)
34	12A699	RH KS
35	9424	Intake manifold
36	9E926	Throttle Body (TB)
37	8575	Thermostat
38	8592	Thermostat housing
39	6A785	Crankcase vent oil separator
40	6A642	Oil cooler
41 /td>	6L626	Oil cooler mounting bolt
42	6731	Oil filter

NOTICE: **During engine repair procedures, cleanliness is extremely important. All parts must be thoroughly cleaned and any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan, can cause engine failure.**

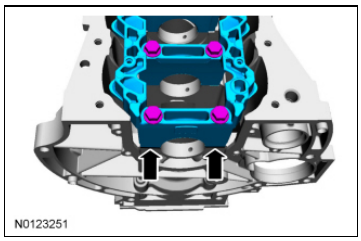
NOTE: Assembly of the engine requires various inspections/measurements of the engine components (engine block, crankshaft, connecting rods, pistons and piston rings). These inspections/measurements will aid in determining if the engine components will require replacement. For additional information, refer to Section 303-00 .

All vehicles

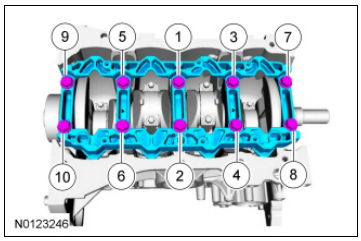
1. Measure each of the crankshaft main bearing journal diameters in at least 2 directions and record the smallest diameter for each journal.



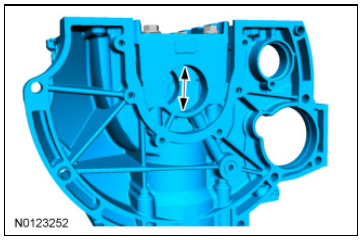
2. Position the main bearing beam in the engine block with the main bearing beam mounted flush with the rear face of the engine block and install the original main bearing beam bolts finger tight.



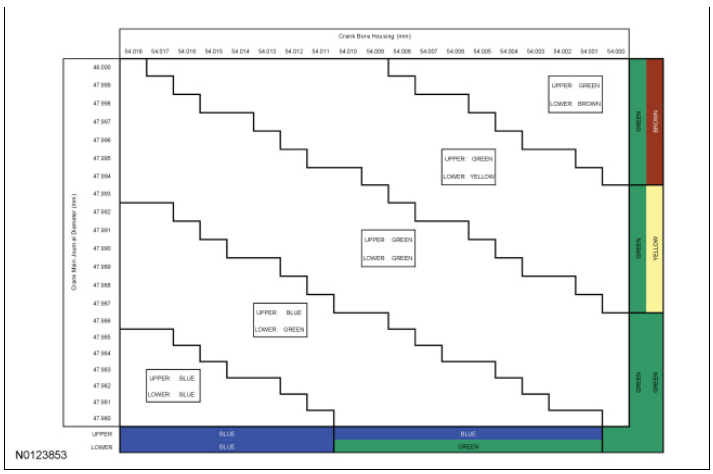
3. Tighten the 10 original main bearing beam bolts in the sequence shown in 2 stages.
   - Stage 1: Tighten to 19 Nm (168 lb-in).
   - Stage 2: Tighten an additional 60 degrees.



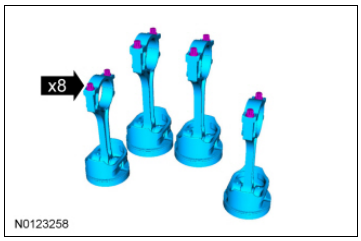
4. Measure each crankshaft block main bearing bore diameter.



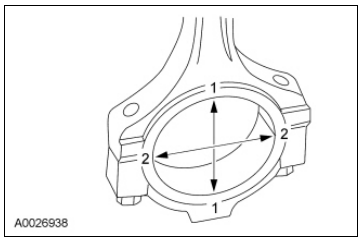
5. Using the chart, select the crankshaft main bearings.



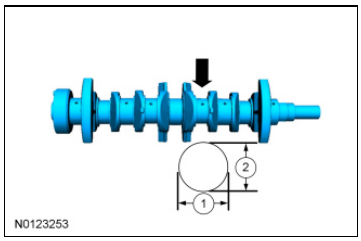
6. Using the original connecting rod cap bolts, install the connecting caps and bolts and tighten the bolts in 2 stages.
    - Stage 1: Tighten to 29 Nm (21 lb-ft).
    - Stage 2: Tighten an additional 90 degrees.



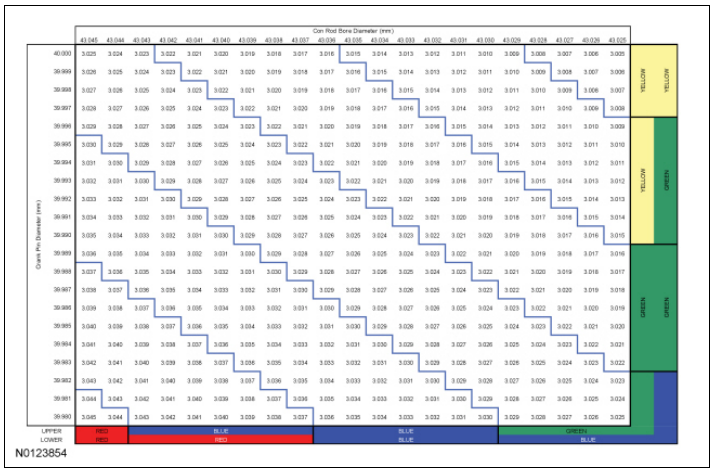
7. Measure the connecting rod large end bore in 2 directions. Record the smallest measurement for each connecting rod.
    - Remove the bolts and the connecting rod cap.
    - Discard the connecting rod cap bolts.



8. Measure each of the crankshaft connecting rod bearing journal diameters in at least 2 directions. Record the smallest measurement for each connecting rod journal.



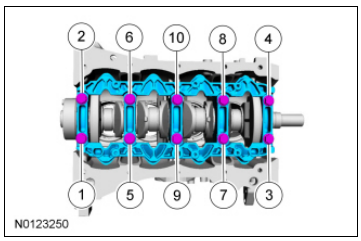
9. Using the chart, select the correct connecting rod bearings for each crankshaft connecting rod journal.



10. **NOTE:** The main bearing beam has 2 arrows pointing towards the front of engine for correct orientation for reassembly.

Remove the 10 bolts in the sequence shown and the main bearing beam.

- Discard the main bearing beam bolts.

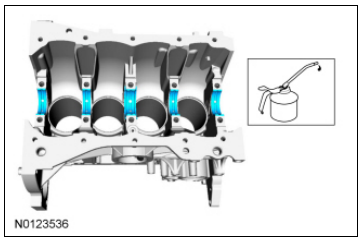


11. **NOTE:** Before assembling the cylinder block, all sealing surfaces must be free of chips, dirt, paint and foreign material. Also, make sure the coolant and oil passages are clear.

    NOTE: If reusing the crankshaft main bearings, install them in their original positions and orientation as noted during disassembly.

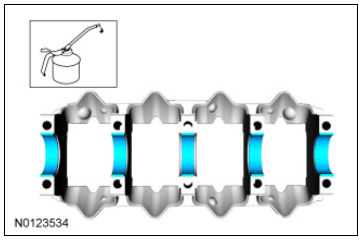
    NOTE: The center bulkhead is the thrust bearing.

    Lubricate the upper crankshaft main bearings with clean engine oil and install the 5 crankshaft main bearings in the cylinder block.



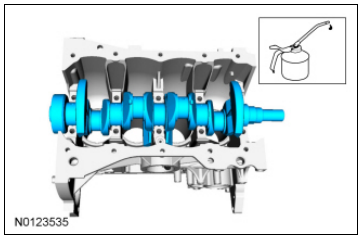
12. **NOTE:** If reusing the crankshaft main bearings, install them in their original positions and orientation as noted during disassembly.

    Lubricate the crankshaft main bearings with clean engine oil and install the 5 crankshaft main bearings in the main bearing beam.

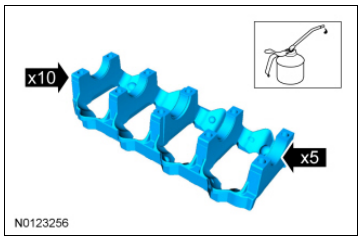


13. **NOTE:** Lubricate journals on the crankshaft with clean engine oil.

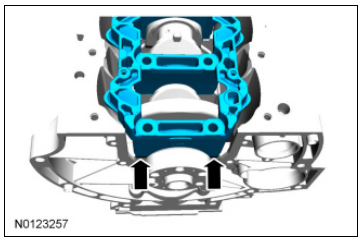
    Position the crankshaft in the cylinder block.



14. Lubricate the 10 main bearing beam side fit surfaces and the 5 main bearing beam bearings with clean engine oil.



15. Position the main bearing beam in the engine block with the main bearing beam mounted flush with the rear face of the engine block.

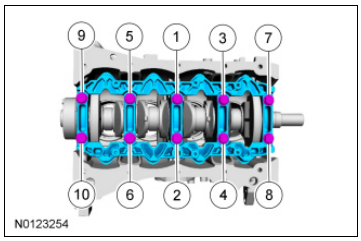


16. **NOTE:** Lubricate the main bearing beam bolts threads and under the bolt heads with clean engine oil.

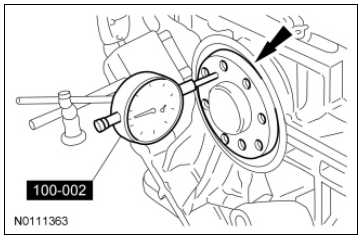
    NOTE: Position the crankshaft to the rear of the cylinder block, then position the crankshaft to the front of the cylinder block before tightening the main bearing beam bolts.

    Install and tighten the 10 new main bearing beam bolts.

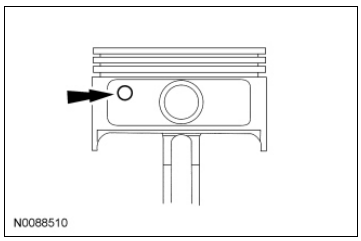
    - Tighten the bolts in the sequence shown in 2 stages.
    - Stage 1: Tighten to 19 Nm (168 lb-in).
    - Stage 2: Tighten an additional 60 degrees.



17. Using the Dial Indicator Gauge with Holding Fixture, measure crankshaft end play.
    - Position the crankshaft to the rear of the cylinder block.
    - Zero the Dial Indicator Gauge with Holding Fixture.
    - Move the crankshaft to the front of the cylinder block. Note and record the crankshaft end play.
    - Acceptable crankshaft end play is 0.2-0.43 mm (0.008-0.017 in). If the crankshaft end play exceeds the specified range, install new parts as necessary.



18. Make sure the dimple in the piston faces the front of the engine.



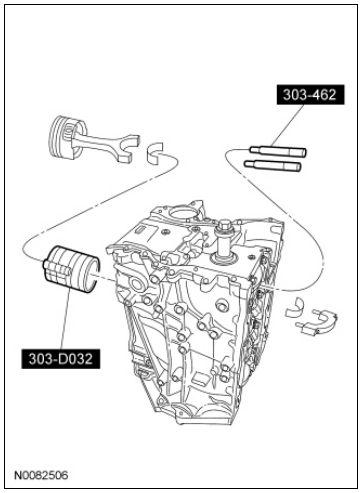
19. ***NOTICE:*** **Be sure not to scratch the cylinder wall or crankshaft journal with the connecting rod. Push the piston down until the connecting rod bearing seats on the crankshaft journal.**

    NOTE: Lubricate the pistons, piston rings, connecting rod bearings and the entire cylinder bores with clean engine oil.

    NOTE: Make sure the piston arrow on top is facing toward the front of the engine.

    Using the Piston Ring Compressor and the Connecting Rod Installer, install the piston and connecting rod assemblies.

    - When installing the pistons and connecting rod assemblies, the oil ring gaps must be positioned 60 degrees apart from each other and a minimum of 90 degrees from the expander gap.
    - The position of the upper and lower compression ring gaps are not controlled for installation.



20. ***NOTICE:*** **The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.**

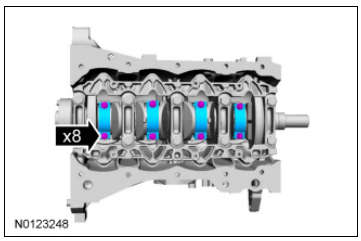
    NOTE: Install connecting rod caps and bolts on the connecting rods for cylinders 1 and 4 first and tighten. Then rotate crankshaft 180 degrees and install connecting rod caps and bolts on connecting rods for cylinders 2 and 3 and tighten.

    NOTE: After installation of each connecting rod cap, rotate the crankshaft to verify smooth operation.

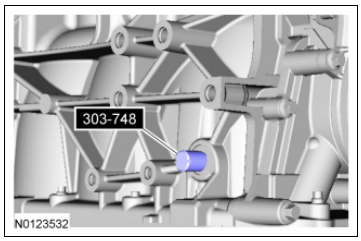
    Install the connecting rod caps and the new bolts and tighten the bolts in 3 stages.

    - Stage 1: Tighten to 18 Nm (159 lb-in).
    - Stage 2: Wait 2 seconds.

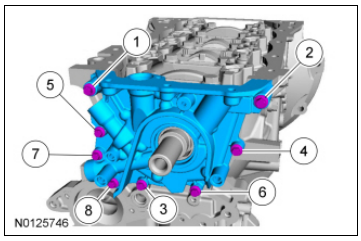
- Stage 3: Tighten an additional 35 degrees.



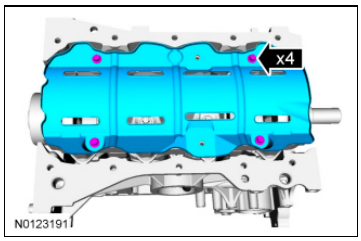
21. Install the Crankshaft Top Dead Center (TDC) Timing Pin and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft TDC Timing Pin. The engine is now at TDC .



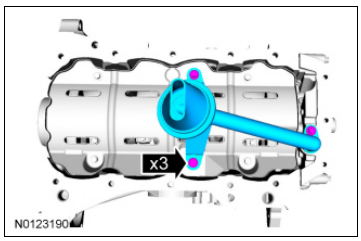
22. Install a new gasket, the oil pump and the 8 bolts in their original position and tighten in sequence shown in 2 stages.
    - Stage 1: Tighten to 6 Nm (53 lb-in).
    - Stage 2: Tighten to 9 Nm (80 lb-in).



23. Install the windage tray and the 4 bolts.
    - Tighten to 9 Nm (80 lb-in).



24. Install the oil pump screen and pickup tube and 3 bolts.
    - Tighten to 9 Nm (80 lb-in).



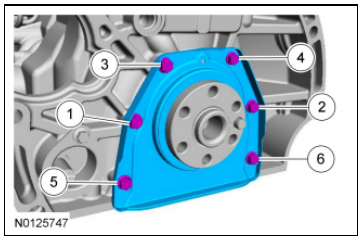
25. **NOTE:** New crankshaft rear seal is supplied with an alignment sleeve which must be removed after installation.

    NOTE: Do not remove the alignment sleeve from the crankshaft rear seal prior to installation on the crankshaft.

    NOTE: Do not lubricate the new crankshaft rear seal.

    Align the crankshaft rear seal and alignment sleeve on the crankshaft and push the crankshaft rear seal off the alignment sleeve onto the crankshaft without stopping until the crankshaft rear seal meets the cylinder block.

    - Install the 6 bolts and tighten in sequence shown in 2 stages.
        - ♦ Stage 1: Tighten bolts 1 through 6 to 4 Nm (35 lb-in).
        - ♦ Stage 2: Tighten bolts 1 through 6 to 9 Nm (80 lb-in).

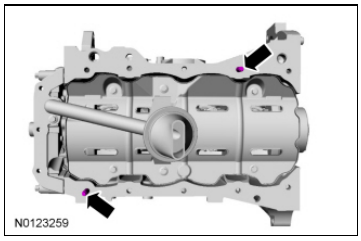


26. Remove the alignment sleeve taking care not to touch the sealing lip.

27. ***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.**

    Clean and inspect all oil pan mating surfaces.

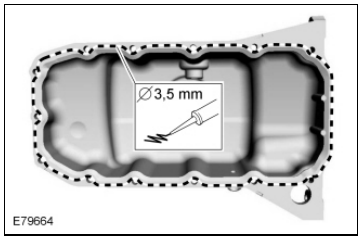
28. Install 2 M8x20 studs for oil pan alignment.



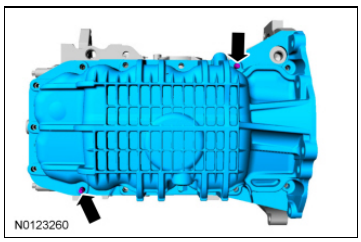
29. **NOTE:** The oil pan must be installed within 5 minutes of applying the sealant.

    NOTE: If the oil pan is not secured within 5 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface prep. Allow to dry until there is no sign of wetness, or 5 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

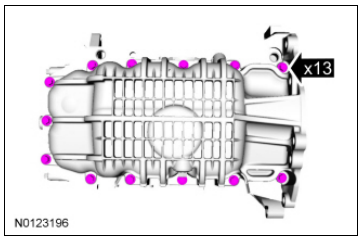
    Apply a 3.5 mm (0.137 in) bead of sealant to the oil pan.



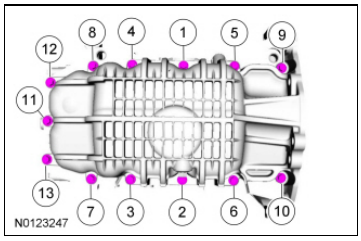
30. Install the oil pan using the 2 studs for alignment.



31. Install 11 bolts finger tight and remove the 2 alignment studs and install the remaining 2 bolts finger tight.



32. Tighten the oil pan bolts in the following sequence in 2 stages.
    - Stage 1: Tighten bolts 1 through 13 to 10 Nm (89 lb-in).
    - Stage 2: Tighten bolts 1 through 13 to 20 Nm (177 lb-in).



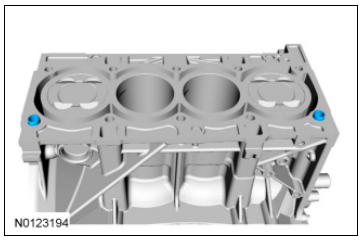
33. ***NOTICE:*** **Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.**

    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 surface of both the cylinder head and the cylinder block in the following sequence.

    1. Apply metal surface prep, following package directions, to remove any 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.
    2. Clean the cylinder head bolt holes in the cylinder block. Make sure all coolant, oil or other foreign material is removed.

34. Install the cylinder head alignment dowels.
    - Dowels must be fully seated in the cylinder block.

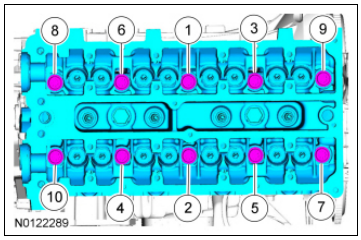


35. **NOTE:** The cylinder head bolts are torque-to-yield and must not be reused. New cylinder head bolts must be installed.

    NOTE: Lubricate the bolts with clean engine oil prior to installation.

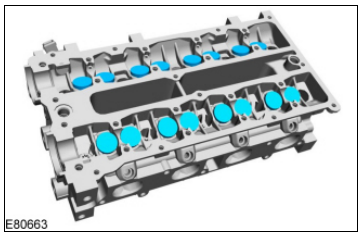
    Install the cylinder head gasket, cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in 4 stages:

    - Stage 1: Tighten to 5 Nm (44 lb-in).
    - Stage 2: Tighten to 15 Nm (133 lb-in).
    - Stage 3: Tighten to 35 Nm (26 lb-ft).
    - Stage 4: Turn 75 degrees.

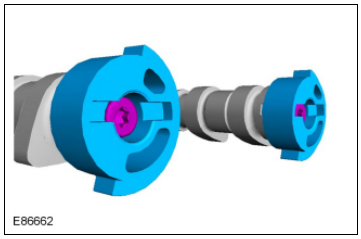


36. **NOTE:** Coat the valve tappets with clean engine oil prior to installation.

    Install the valve tappets.

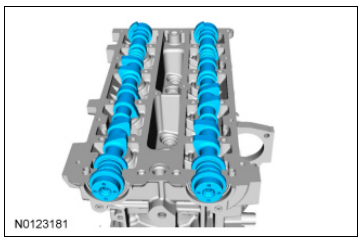


37. If removed, install the camshaft trigger wheels and the 2 bolts.
    - Tighten to 21 Nm (15 lb-ft).

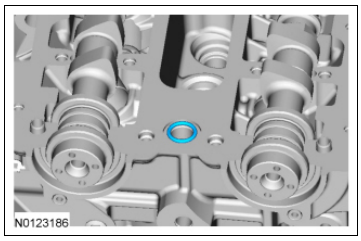


38. **NOTE:** Lubricate the camshafts with clean engine oil.

Install the camshafts as shown.

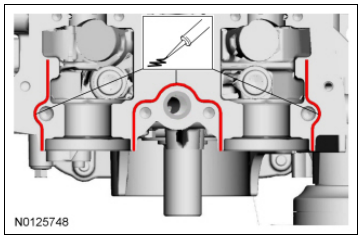


39. Install the Variable Camshaft Timing (VCT) bridge O-ring seal.



40. **NOTE:** The VCT bridge must be installed within 5 minutes of applying the gasket maker to the cylinder head.

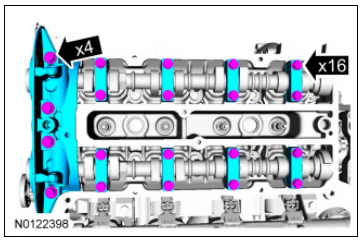
    Apply a 1.5 mm (0.059 in) bead of gasket maker to the cylinder head as shown.



41. ***NOTICE:*** **Make sure that the camshafts and camshaft bearing caps are installed in their original locations or damage to the engine may occur.**

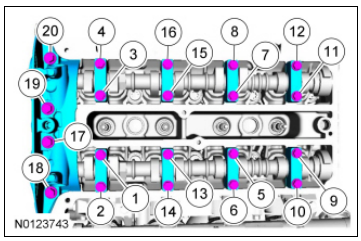
    NOTE: Apply clean engine oil to the bearing surfaces of the camshaft bearing caps and the VCT bridge.

    Install the camshaft bearing caps, VCT bridge and the bolts finger tight.



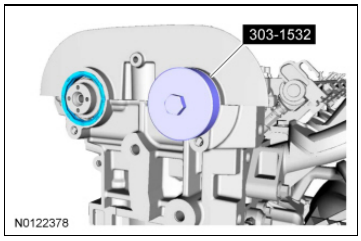
42. Tighten the bolts in the sequence shown in 6 stages.
    - Stage 1: Tighten the bolts evenly, half a turn at a time, until the camshaft bearing caps and the VCT bridge are seated against the cylinder head.
    - Stage 2: Tighten bolts 1 through 16 to 7 Nm (62 lb-in).
    - Stage 3: Tighten bolts 17 through 20 to 10 Nm (89 lb-in).
    - Stage 4: Tighten bolts 1 through 16 an additional 45 degrees.
    - Stage 5: Tighten bolts 17 and 19 an additional 70 degrees.

- Stage 6: Tighten bolts 18 and 20 an additional 53 degrees.



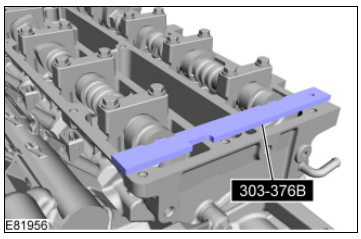
43. If the cylinder head, camshafts or valve tappets were replaced, check the valve clearance. For additional information, refer to Valve Clearance Check in this section.

44. Using the Camshaft Seal Installer, install the 2 camshaft oil seals.



45. ***NOTICE:*** **It may be necessary to use an open-ended wrench to turn the camshafts by the hexagon to align the camshafts.**

    Install the Camshaft Alignment Plate into the end of the camshafts.

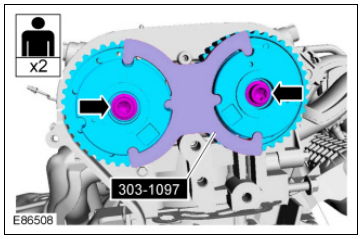


46. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

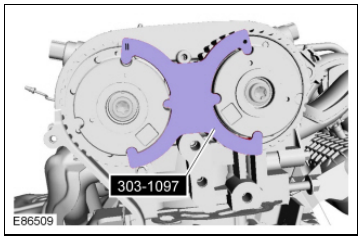
    NOTE: The timing marks of the camshaft phaser and sprocket must be at the 12 o'clock position.

    Install the 2 camshaft phaser and sprocket, bolts and the VCT Alignment Tool.

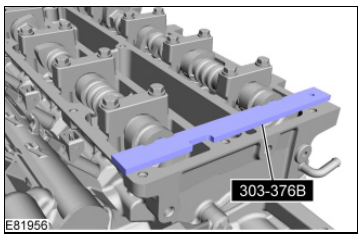
    - Tighten the 2 bolts to 25 Nm (18 lb-ft).



47. Remove the VCT Alignment Tool.

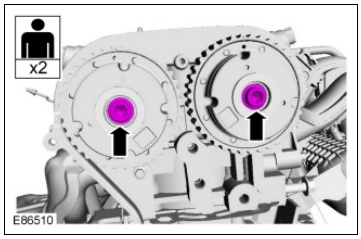


48. Remove the Camshaft Alignment Plate.



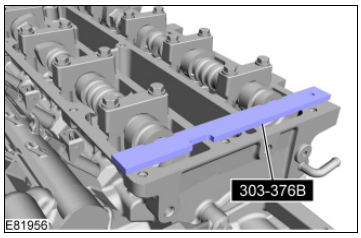
49. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

    Tighten to 2 camshaft phaser and sprocket bolts an additional 75 degrees.



50. **NOTE:** The special tool can only be installed if the valve timing is correct.

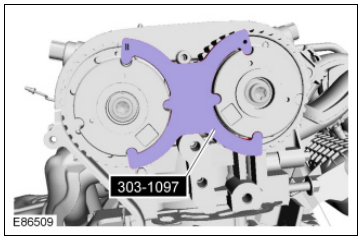
    Install the Camshaft Alignment Plate into the end of the camshafts.



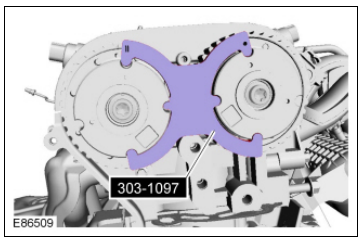
51. **NOTE:** The special tool can only be installed if the valve timing is correct.

    Install the VCT Alignment Tool.

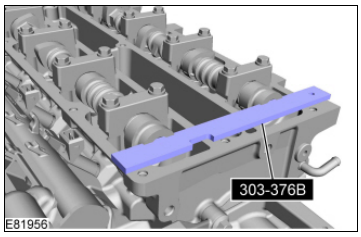
    - If the special tools cannot be installed, repeat the adjustment according to the preceding steps.



52. Remove the VCT Alignment Tool.



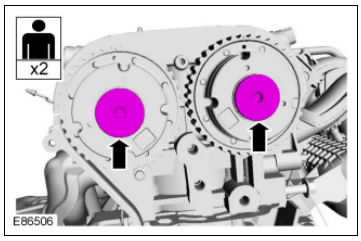
53. Remove the Camshaft Alignment Plate.



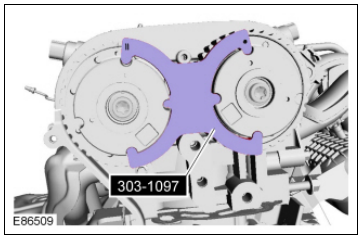
54. ***NOTICE:*** **Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.**

    Install the 2 camshaft phaser and sprocket plugs.

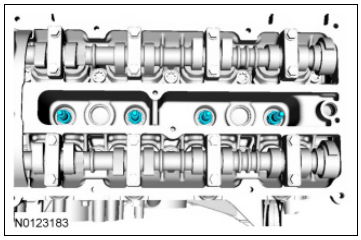
    - Tighten to 16 Nm (142 lb-in).



55. Install the VCT Alignment Tool.

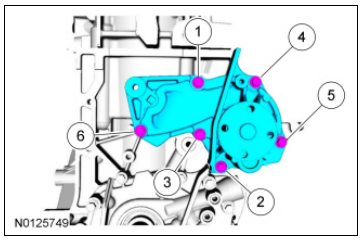


56. Install the 4 spark plugs.
    - Tighten to 15 Nm (133 lb-in).

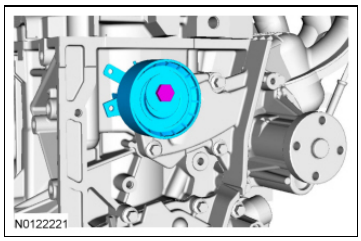


57. Using a new gasket, install the coolant pump, 6 bolts and tighten in sequence shown in 2 stages.

- Stage 1: Tighten to 6 Nm (53 lb-in).
- Stage 2: Tighten to 10 Nm (89 lb-in).

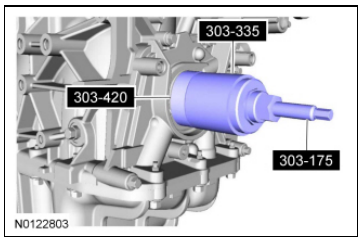


58. Install the timing belt tensioner and the bolt.
    - Tighten to 25 Nm (18 lb-ft).
    - Rotate the timing belt tensioner clockwise and align the 2 holes on the tensioner and install a small screwdriver or holding pin.

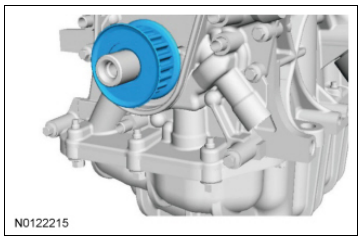


59. **NOTE:** Lubricate the oil seal with clean engine oil.

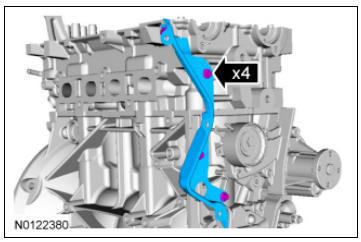
    Using the Crankshaft Vibration Damper Installer, Front Cover Oil Seal Installer and Front Crankshaft Seal Replacer, install the crankshaft front oil seal.



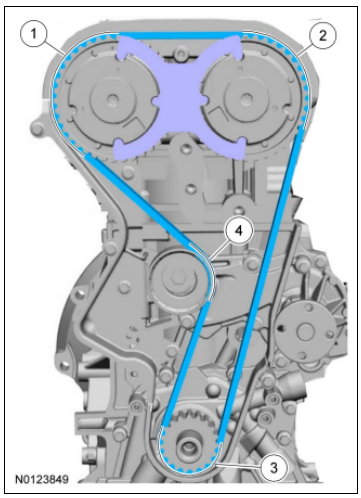
60. Install the crankshaft sprocket gear.



61. Install the timing belt cover backplate and the 4 bolts.
    - Tighten to 9 Nm (80 lb-in).

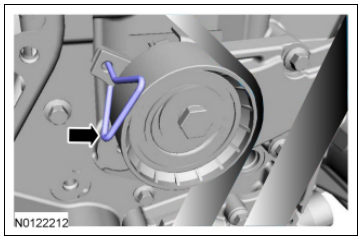


62. Install the timing belt in the sequence shown.

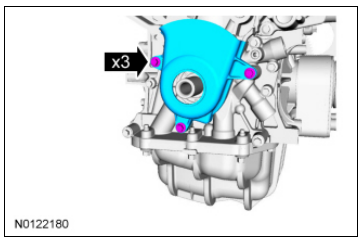


63. ⚠ **WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.**

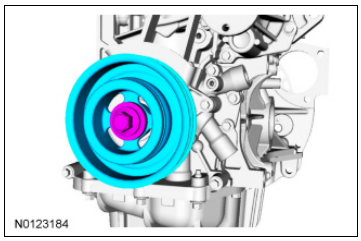
    Remove the timing belt tensioner holding tool.



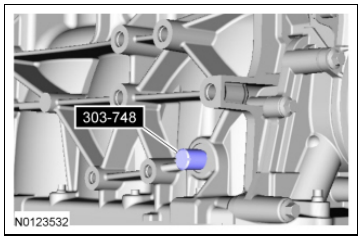
64. Install the lower timing belt cover and the 3 bolts.
    - Tighten to 9 Nm (80 lb-in).



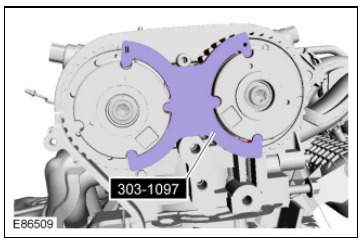
65. Install the crankshaft pulley and the new bolt.
    - Tighten to 100 Nm (74 lb-ft).
    - The final torque of the crankshaft will be completed in following steps.



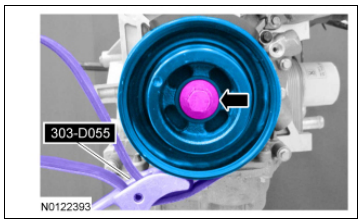
66. Remove the Crankshaft TDC Timing Pin.



67. Remove the VCT Alignment Tool.

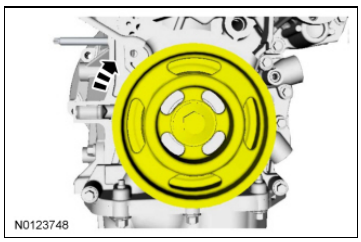


68. Tighten the crankshaft bolt in the following 3 stages.
    1. Stage 1: Using the Strap wrench, tighten an additional 90 degrees.
    2. Stage 2: Wait for 10 seconds.
    3. Stage 3: Using the Strap wrench, tighten an additional 15 degrees.

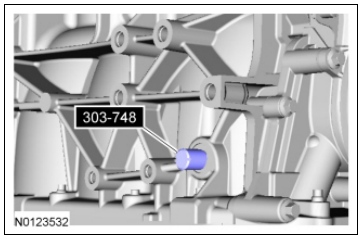


69. **NOTE:** Only rotate the crankshaft clockwise direction.

    Rotate the crankshaft about 1 3/4 turns.

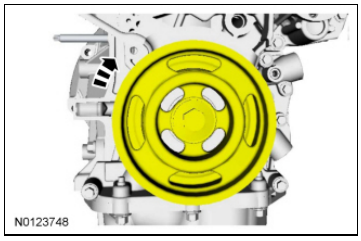


70. Install the Crankshaft TDC Timing Pin.



71. **NOTE:** Only rotate the crankshaft clockwise direction.

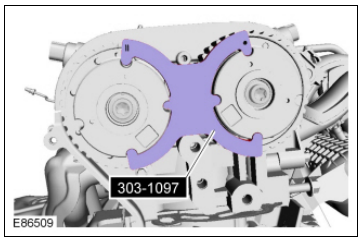
    Rotate the crankshaft until it stops against the Crankshaft TDC Timing Pin.



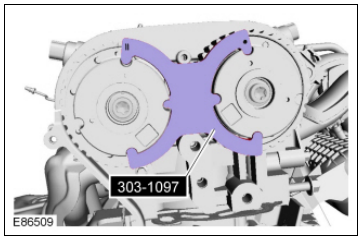
72. **NOTE:** The special tool can only be installed if the valve timing is correct.

    Install the VCT Alignment Tool.

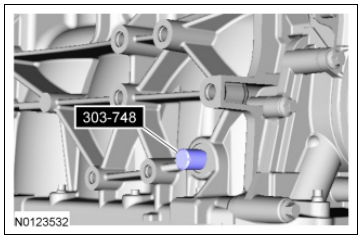
    - If the special tool cannot be installed, repeat the adjustment according to the preceding steps.



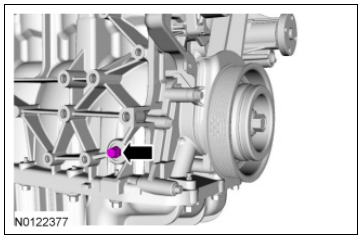
73. Remove the VCT Alignment Tool.



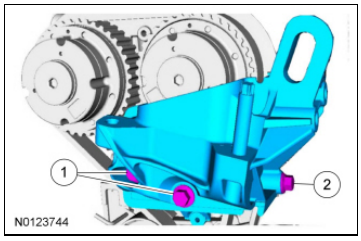
74. Remove the Crankshaft TDC Timing Pin.



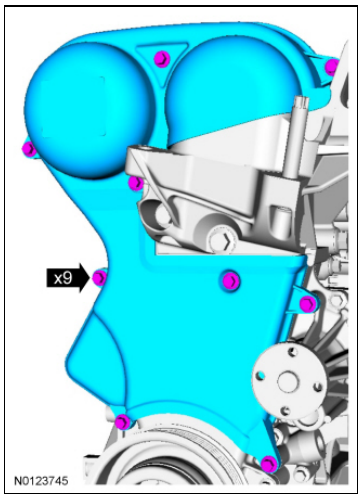
75. Install the engine plug bolt.
    - Tighten to 20 Nm (177 lb-in).



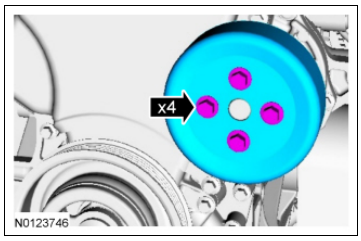
76. Install the engine mount bracket and the 3 bolts finger tight.
    1. Tighten the 2 bolts to 55 Nm (41 lb-ft).
    2. Tighten the bolt to 55 Nm (41 lb-ft).



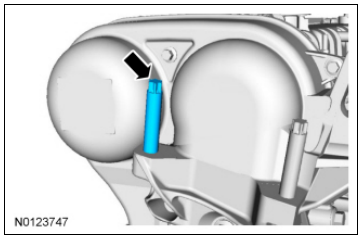
77. Install the timing belt cover and the 9 bolts.
    - Tighten to 9 Nm (80 lb-in).



78. Install the coolant pump pulley and the 4 bolts.
    - Tighten to 20 Nm (177 lb-in).



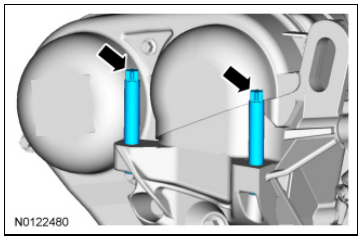
79. Install the 1 engine mount stud finger tight.



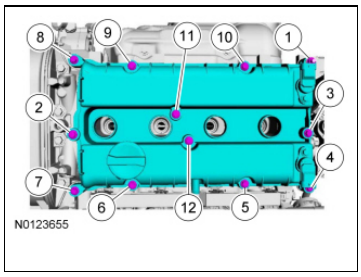
80. ***NOTICE:*** **The 2 engine mount studs must be torqued or damage to the powertrain may occur.**

    Torque the 2 engine mount studs before installing the engine mount nuts.

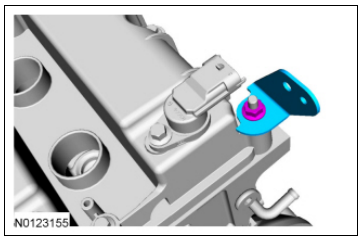
    - Tighten to 8 Nm (71 lb-in).



81. Using a new gasket, install the valve cover and tighten the retainers in sequence shown.
    - Tighten to 9 Nm (80 lb-in).



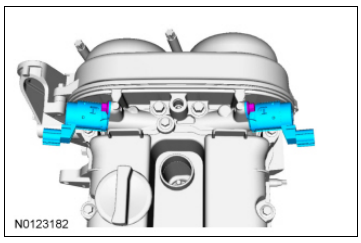
82. Install the Heated Oxygen Sensor (HO2S) electrical connector bracket and the nut.
    - Tighten to 8 Nm (71 lb-in).



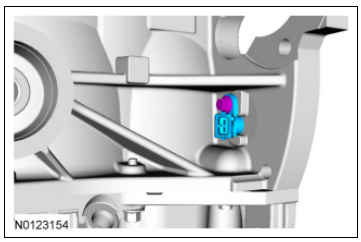
83. **NOTE:** Lubricate the O-ring seals with clean engine oil.

    Install the VCT oil control solenoids and the 2 bolts.

    - Tighten to 8 Nm (71 lb-in).



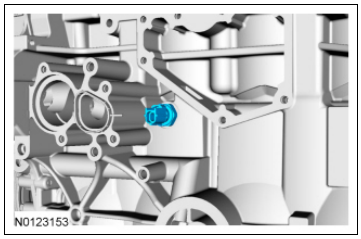
84. Install the Crankshaft Position (CKP) sensor and the bolt.
    - Tighten to 8 Nm (71 lb-in).



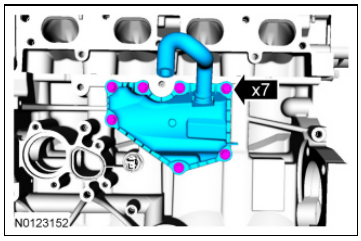
85. **NOTE:** Apply thread sealant to the Engine Oil Pressure (EOP) switch threads.

Install the EOP switch.

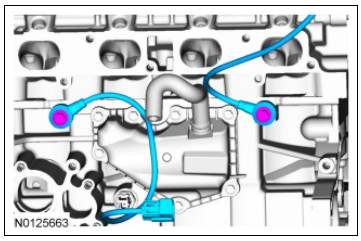
- Tighten to 18 Nm (159 lb-in).



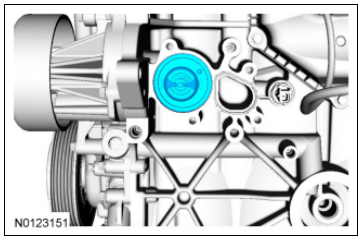
86. Install the crankcase vent oil separator and the bolts.
    - Tighten to 9 Nm (80 lb-in).



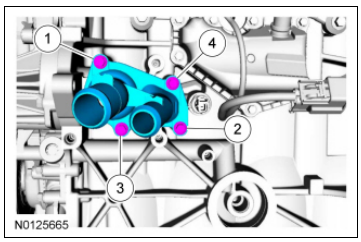
87. Install the RH Knock Sensor (KS) at the 2 o'clock position and the LH KS at the 11 o'clock position and install the bolts.
    - Tighten to 20 Nm (177 lb-in).



88. Install the thermostat and seal in the engine block.



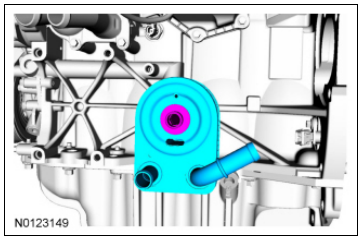
89. Install the gasket, thermostat housing and the 4 bolts finger tight. Tighten the bolts in sequence shown in 2 stages.
    - Stage 1: Tighten to 2 Nm (18 lb-in).
    - Stage 2: Tighten to 10 Nm (89 lb-in).



90. ***NOTICE:*** **A new oil cooler must be installed or severe damage to the engine can occur.**

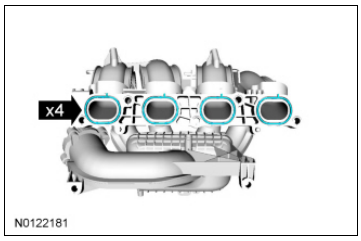
    Install the new oil cooler and the bolt.

    - Tighten to 56 Nm (41 lb-ft).

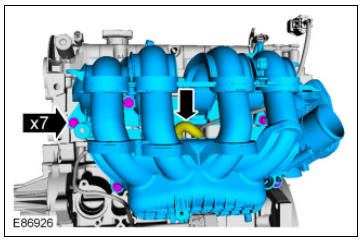


91. ***NOTICE:*** **If the engine is repaired or replaced because of upper engine failure, typically including valve or piston damage, check the intake manifold for metal debris. If metal debris is found, install a new intake manifold. Failure to follow these instructions can result in engine damage.**

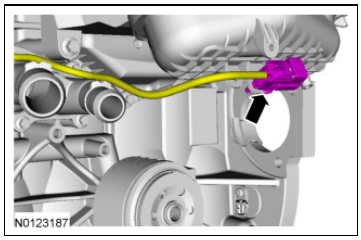
    Inspect and install new intake manifold gaskets if necessary.



92. Install the intake manifold and the 7 bolts.
    - Connect the PCV hose to the intake manifold.
    - Tighten to 18 Nm (159 lb-in).

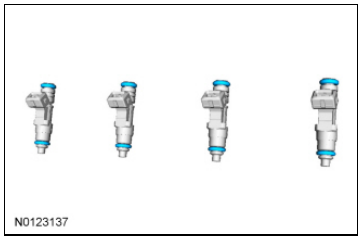


93. Attach the KS electrical connector to the intake manifold.

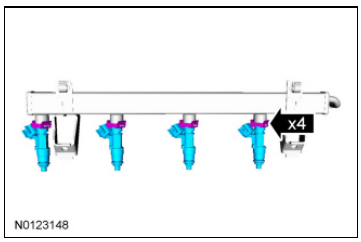


94. ***NOTICE:*** **Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings may cause the fuel system to leak. Do not reuse the O-ring seals.**

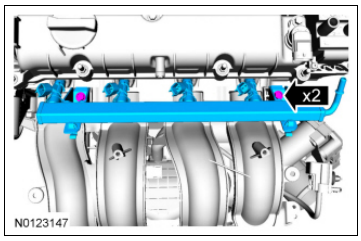
    Install the new O-ring seals onto the fuel injectors and lubricate them with clean engine oil.



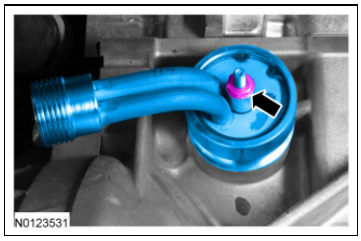
95. Install the 4 fuel injectors and the 4 fuel injector clips into the fuel rail.



96. Install the fuel rail and fuel injectors as an assembly and install the 2 bolts.
    - Tighten to 11 Nm (97 lb-in).



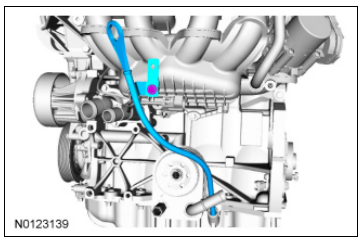
97. If equipped, position the block heater and finger-tighten the nut, making sure the block heater electrical connector points to the 8 o'clock position.
    - Tighten the nut to 3 Nm (27 lb-in).



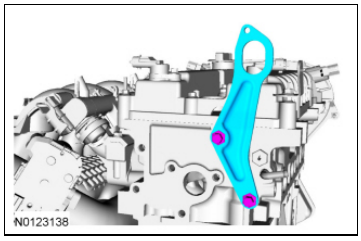
98. **NOTE:** Lubricate the O-ring seal with clean engine oil.

    Install the oil level indicator and tube and the screw.

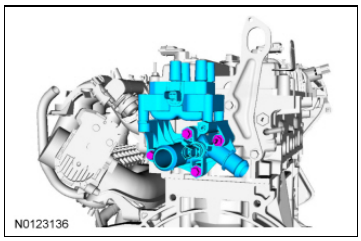
    - Tighten to 4 Nm (35 lb-in).



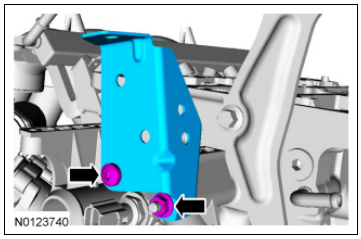
99. Install the LH engine lift eye and the 2 bolts.
    - Tighten to 19 Nm (168 lb-in).



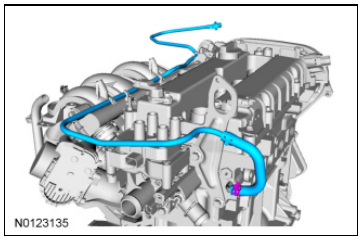
100. Install the ignition coil and coolant outlet assembly and the 4 bolts.
    - Tighten to 19 Nm (168 lb-in).



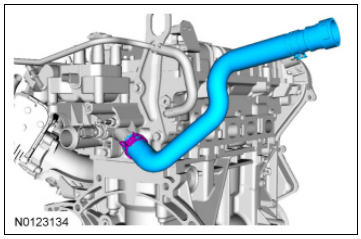
101. Install the coolant outlet bracket, nut and the bolt.
    - Tighten to 6 Nm (53 lb-in).



102. Connect the coolant return hose to the cylinder head.
    - Attach the coolant tube to the fuel rail retainers.

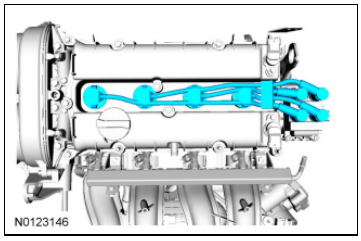


103. Connect the coolant hose to the coolant outlet.

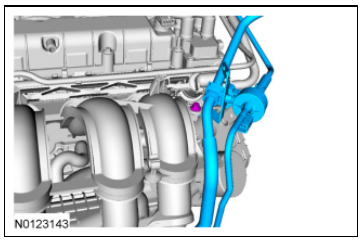


104. **NOTE:** Apply silicone dielectric compound to the inside of the spark plug wire boots.

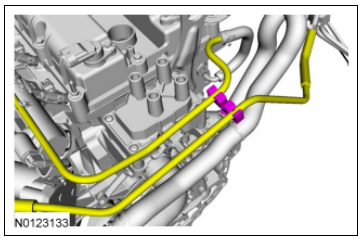
    Install the 4 spark plug wires.



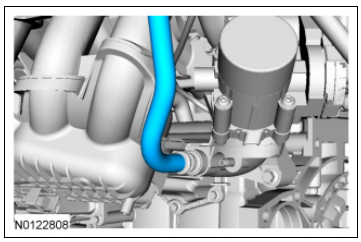
105. Install the Evaporative Emission (EVAP) canister purge valve and the bolt.
    - Tighten to 9 Nm (80 lb-in).



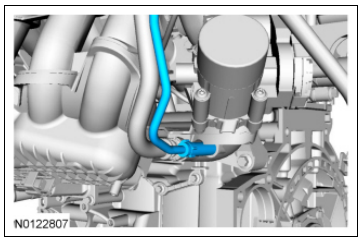
106. Attach the EVAP tube and coolant tube to the coolant outlet bracket retainer.



107. Connect the brake booster vacuum tube to the intake manifold.



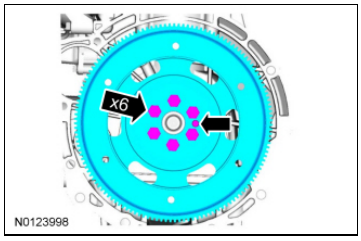
108. Connect the EVAP canister purge valve tube to the intake manifold.



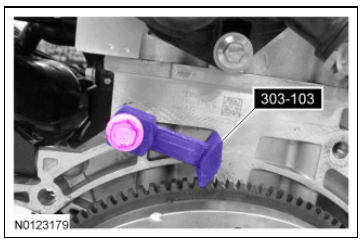
109. Using the Heavy Duty Floor Crane and Spreader Bar, remove the engine from the engine stand.

Vehicles with automatic transaxle

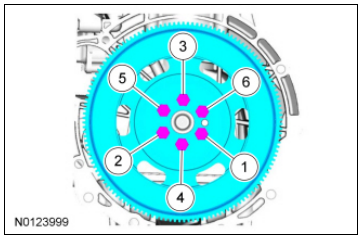
110. Align the flexplate and crankshaft using the dowel pin location hole and install the new bolts finger tight.



111. Install the Flywheel Holding Tool.

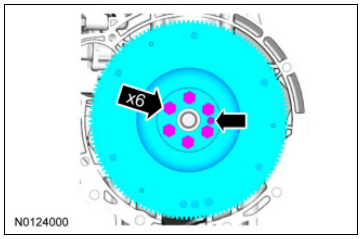


112. Tighten the bolts in the sequence shown in 2 stages:
    - Stage 1: Tighten to 30 Nm (22 lb-ft).
    - Stage 2: Tighten an additional 80 degrees.

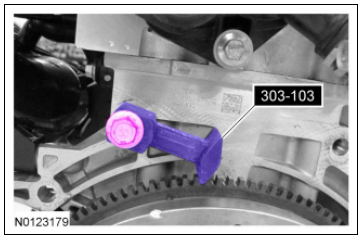


Vehicles with manual transaxle

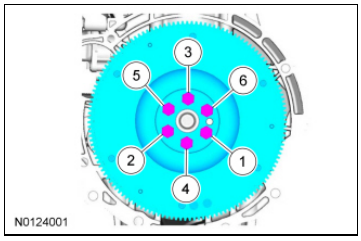
113. Align the flywheel and crankshaft using the dowel pin location hole and install the new bolts finger tight.



114. Install the Flywheel Holding Tool.



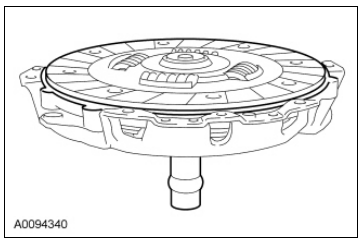
115. Tighten the bolts in the sequence shown in 2 stages:
    - Stage 1: Tighten to 30 Nm (22 lb-ft).
    - Stage 2: Tighten an additional 80 degrees.



116. ***NOTICE:*** **Be sure the clutch is installed correctly in the pressure plate. The side of the clutch marked gearbox side faces the pressure plate fingers. Failure to install the clutch plate will damage the clutch assembly during installation on the flywheel.**

    NOTICE: **Do not use cleaners with a petroleum base and do not immerse the clutch pressure plate in solvent or damage may occur.**

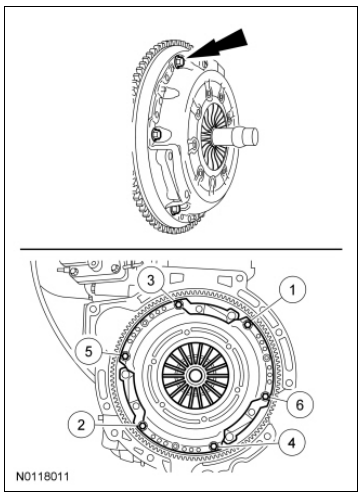
    Position the clutch disc on the clutch pressure plate with the side of the clutch marked gearbox side facing the pressure plate fingers. Using a suitable clutch aligner, centralize the clutch disc to the clutch pressure plate.



117. **NOTE:** Use a clutch disc aligner (such as OTC® Clutch Alignment Tool Set 4528 or equivalent).

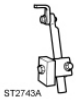
    Using a clutch disc aligner, position the clutch disc and clutch pressure plate on the flywheel. Install the 6 new clutch pressure plate-to-flywheel bolts.

    - Tighten the bolts evenly two turns at a time in the pattern shown.
    - Tighten to 29 Nm (21 lb-ft).



Engine - Automatic Transaxle

Special Tool(s)

 ST1341-A	2,200# Floor Crane, Fold Away 300-OTC1819E
 ST1682-A	Powertrain Lift 300-OTC1585AE
 ST1602-A	Spreader Bar 303-D089 (D93P-6001-A3) or equivalent
 ST2743A	Adjustable Grip Arm, 1735A 014-00001

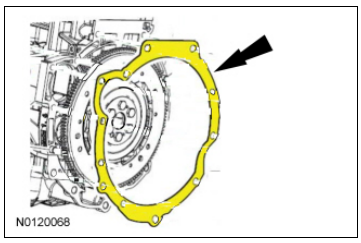
Material

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

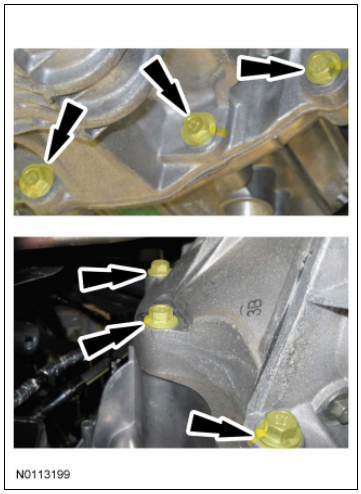
All vehicles

1. ***NOTICE:*** **Use caution not to damage the engine-to-transaxle separator plate or damage can occur.**

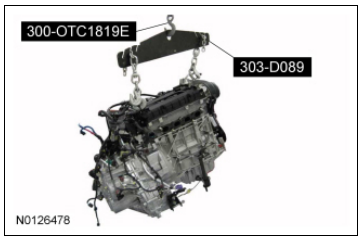
   Install the new engine-to-transaxle separator plate.



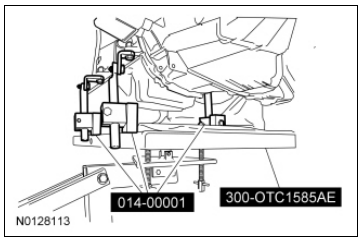
2. Using the Heavy Duty Floor Crane and Spreader Bar, position the engine and transaxle together. Install the 6 engine-to-bellhousing bolts.
   - Tighten to 48 Nm (35 lb-ft).



3. Using the Floor Crane and Spreader Bar, raise the engine and transaxle assembly onto the lift table.



4. Using the Powertrain Lift and Adjustable Grip Arms, secure the engine and transaxle assembly to the lift table.



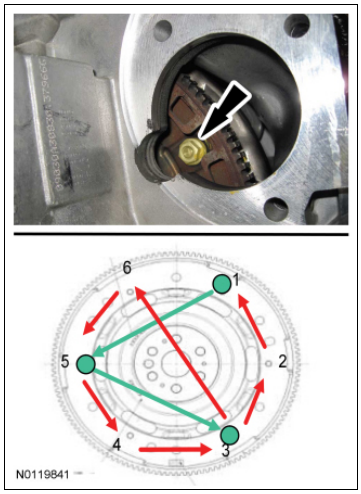
5. ***NOTICE:*** **Rotate the engine in a clockwise direction only or engine damage will occur.**

   NOTICE: **Tighten the flexplate-to-clutch nuts in a star pattern or transaxle damage can occur.**

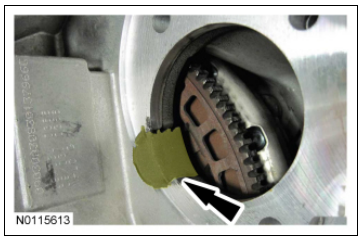
   NOTE: Using a magnetic socket will help ensure ease of installation. If the nuts are dropped in the clutch housing, the transaxle will have to be removed to retrieve them.

   Install the 6 new flexplate-to-clutch nuts. Tighten the nuts in a star pattern in 2 stages.

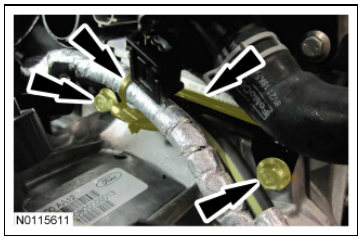
   - Stage 1: Tighten nuts 1, 5 and 3 to 12 Nm (106 lb-in).
   - Stage 2: Tighten all nuts to 25 Nm (18 lb-ft).



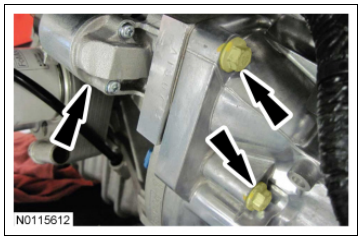
6. Install the flexplate-to-clutch nut access cover.



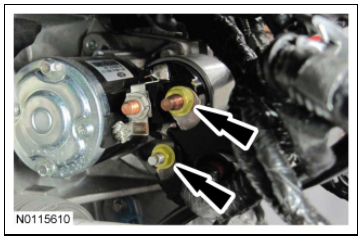
7. Install the 2 upper bellhousing-to-engine bolts and bracket.
    - Tighten to 48 Nm (35 lb-ft).
    - Attach the wiring harness pin-type retainer to the bracket.



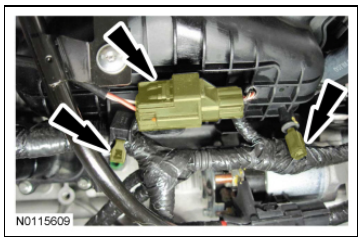
8. Install the starter motor and the 3 bolts (2 shown).
    - Install the 3 bolts finger-tight.
    - Tighten the 2 upper bolts to 48 Nm (35 lb-ft).
    - Tighten the lower bolt to 48 Nm (35 lb-ft).



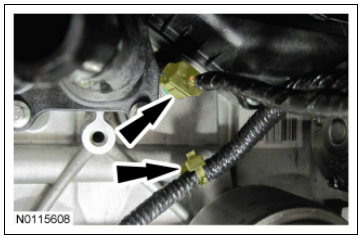
9. Connect the starter motor electrical terminals and install the 2 nuts.
    - Tighten to 10 Nm (89 lb-in).



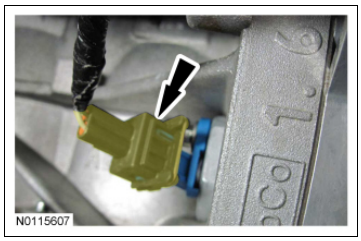
10. Connect the RH Knock Sensor (KS) electrical connector.
    - Attach the 2 wiring harness retainers to the intake manifold.



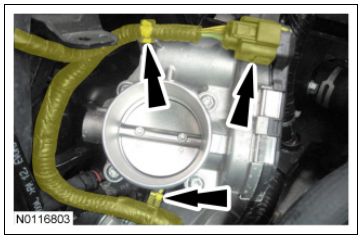
11. Connect the Engine Oil Pressure (EOP) switch electrical connector.
    - Attach the wiring harness retainer to the engine block.



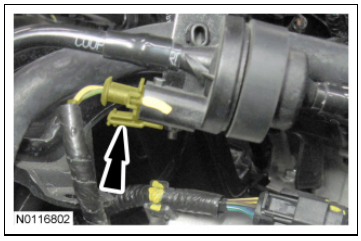
12. Connect the Crankshaft Position (CKP) sensor electrical connector.



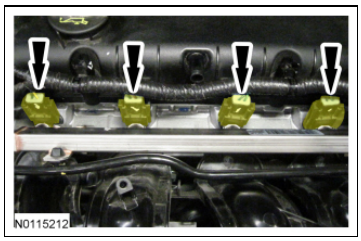
13. Connect the Throttle Body (TB) electrical connector.
    - Attach the 2 wiring harness retainers to the TB .



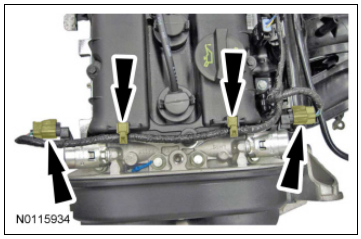
14. Connect the Evaporative Emission (EVAP) canister purge valve electrical connector.



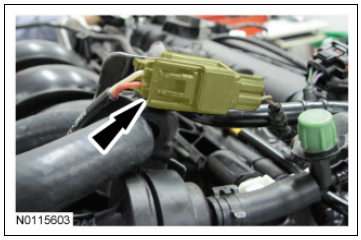
15. Connect the 4 fuel injector electrical connectors.
    - Attach the 2 wiring harness retainers to the valve cover stud bolts.



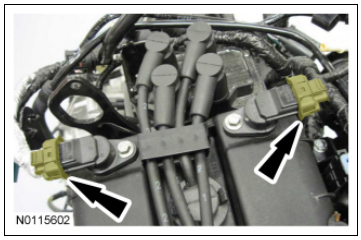
16. Connect the 2 Variable Camshaft Timing (VCT) oil control solenoid electrical connectors.
    - Attach the 2 wiring harness retainers.



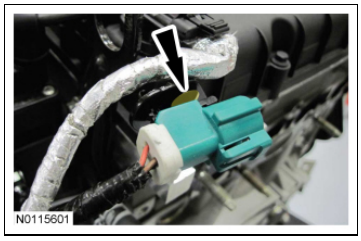
17. Connect and attach the LH KS electrical connector.



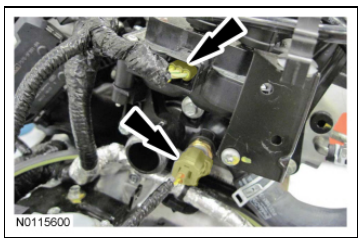
18. Connect the 2 Camshaft Position (CMP) sensor electrical connectors.



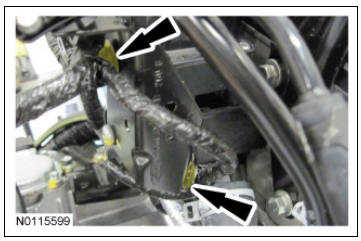
19. Attach the Heated Oxygen Sensor (HO2S) sensor electrical connector pin-type retainer to the bracket.



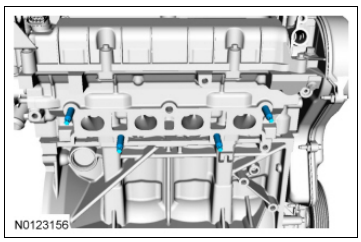
20. Connect the ignition coil and Engine Coolant Temperature (ECT) sensor electrical connectors.



21. Attach the 2 wiring harness retainers to the coolant outlet bracket.



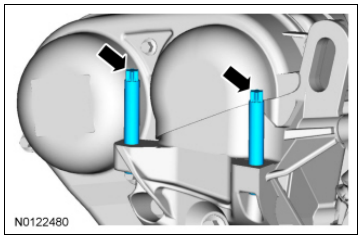
22. Install the 4 new catalytic converter studs.
    - Tighten to 17 Nm (150 lb-in).



23. ***NOTICE:*** **The engine mount studs must be torqued or damage to the powertrain may occur.**

    Torque the engine mount studs before installing the engine mount nuts.

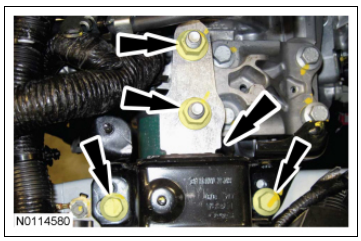
    - Tighten to 8 Nm (71 lb-in).



24. Using the lift table, position the engine and transaxle assembly in the vehicle.

25. Align the transaxle support insulator, install and tighten the 2 nuts and 2 bolts.
    - Tighten the 2 nuts to 125 Nm (92 lb-ft).

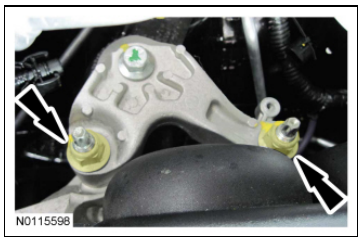
- Tighten the 2 bolts to 90 Nm (66 lb-ft).



26. **NOTE:** Do not loosen the engine mount center bolt or the engine may become improperly positioned.

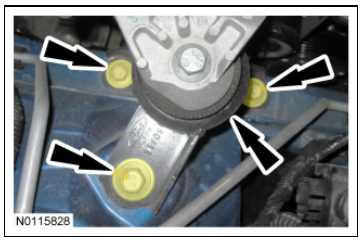
    Install the engine mount and the 2 nuts.

    - Tighten the 2 nuts to 80 Nm (59 lb-ft).

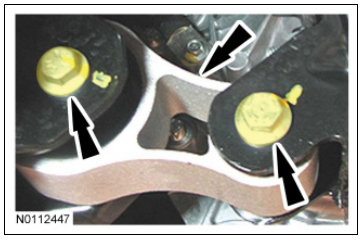


27. Lower the powertrain to the installed position.

28. Install the 3 engine mount bolts.
    - Tighten to 48 Nm (35 lb-ft).



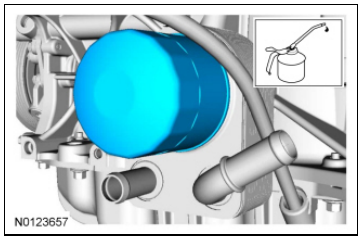
29. Install the transaxle roll restrictor and the 2 bolts.
    - Tighten to 70 Nm (52 lb-ft).



30. **NOTE:** Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

    Install a new engine oil filter.

    - Tighten to 15 Nm (133 lb-in).

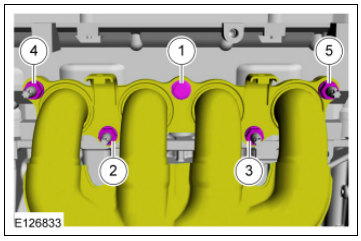


31. If equipped, connect the block heater electrical connector.

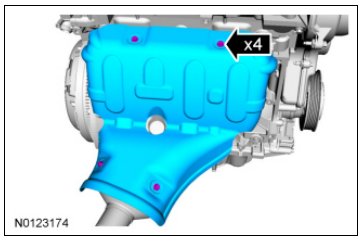
32. ***NOTICE:*** **Failure to tighten the catalytic converter manifold fasteners in 20 Nm increments until reaching final torque of 55 Nm will cause the converter to develop an exhaust leak.**

    Tighten the bolt and 4 nuts in the sequence shown, in 3 stages.

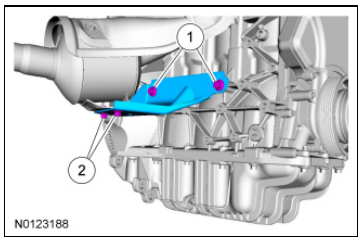
    - Stage 1: Tighten all fasteners in sequence to 20 Nm (177 lb-in).
    - Stage 2: Tighten all fasteners in sequence to 40 Nm (30 lb-ft).
    - Stage 3: Tighten all fasteners in sequence to 55 Nm (41 lb-ft).



33. Position the catalytic converter heat shield and install the 4 bolts.
    - Tighten to 10 Nm (89 lb-in).

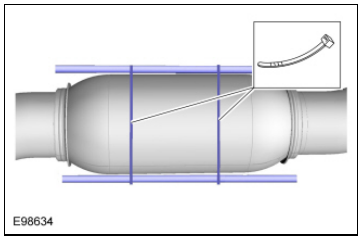


34. Install the lower catalytic converter bracket and the 4 bolts and tighten in sequence shown.
    1. Tighten the catalytic converter bracket-to-engine block bolts to 50 Nm (37 lb-ft).
    2. Tighten the catalytic converter bracket-to-catalytic converter bolts to 25 Nm (18 lb-ft).

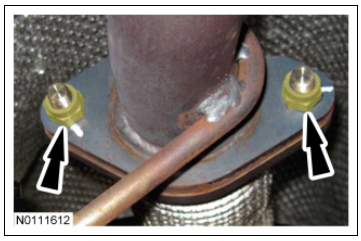


35. ***NOTICE:*** **Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

    Remove the support for the exhaust flexible pipe.



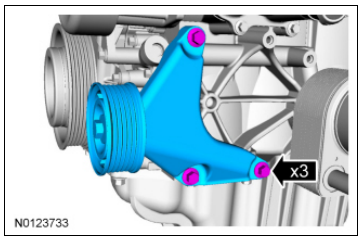
36. Using a new gasket, position the catalytic converter to the muffler and install the 2 catalytic converter nuts.
    - Tighten to 48 Nm (35 lb-ft).



37. Install the Catalyst Monitor Sensor (CMS). For additional information, refer to Section 303-14 .

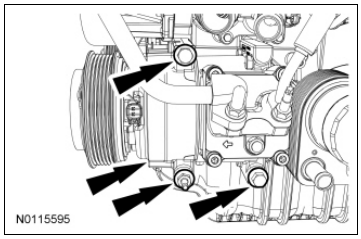
Vehicles without A/C

38. Install the accessory drive belt idler pulley bracket and the 3 bolts.
    - Tighten to 24 Nm (18 lb-ft).

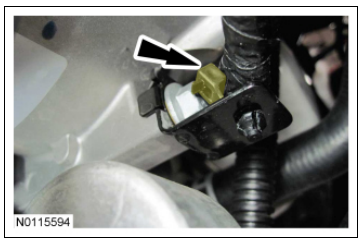


Vehicles with A/C

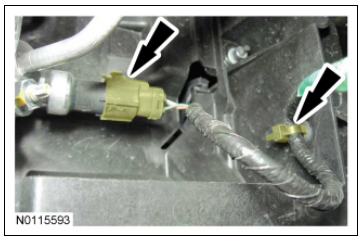
39. Position the A/C compressor and install the 2 bolts and stud bolt.
    - Tighten to 25 Nm (18 lb-ft).



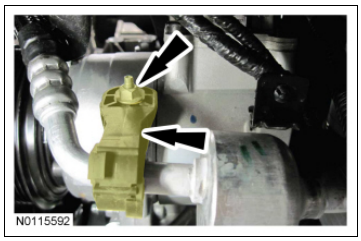
40. Attach the wiring harness retainer to the lower A/C compressor bracket.



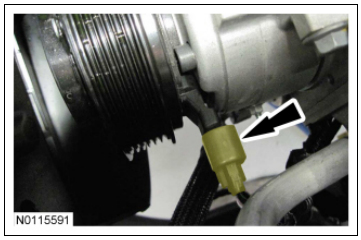
41. Connect the A/C pressure transducer electrical connector.
    - Attach the wiring harness retainer.



42. Position the A/C line bracket and install the nut.
    - Tighten to 9 Nm (80 lb-in).

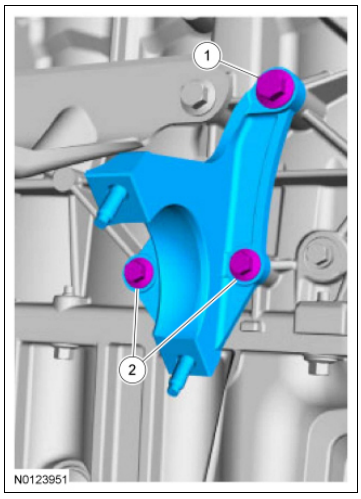


43. Connect the A/C compressor electrical connector.



All vehicles

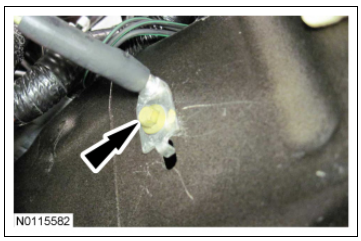
44. Install the halfshaft bracket and the 3 bolts and tighten in sequence shown.
    1. Tighten the top bolt to 48 Nm (35 lb-ft).
    2. Tighten the 2 bottom bolts to 24 Nm (18 lb-ft).



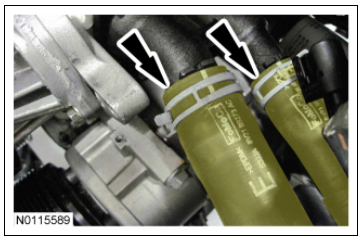
45. Install the RH and LH halfshafts. For additional information, refer to Section 205-04 .

46. Position the engine ground wire and install the bolt.

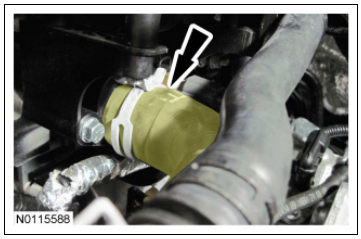
- Tighten to 10 Nm (89 lb-in).



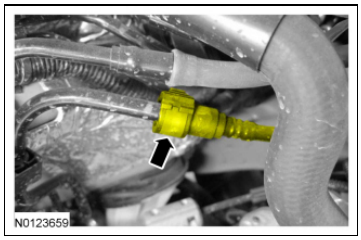
47. Connect the lower radiator hose and coolant hose to the thermostat housing.



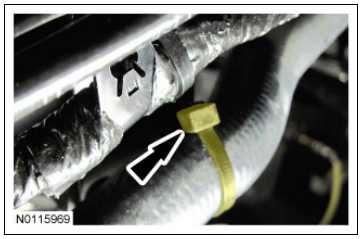
48. Connect the upper radiator hose to the engine.



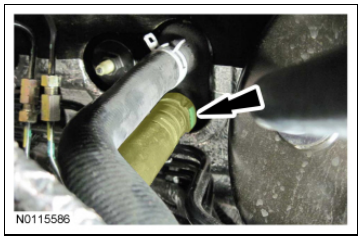
49. Connect the EVAP tube quick connect coupling near the bulk head. For additional information, refer to Section 310-00 .



50. Attach the coolant hose retainer to the coolant outlet bracket.

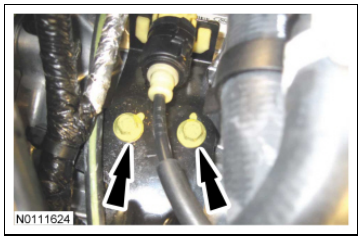


51. Connect the lower heater hose to the heater core.

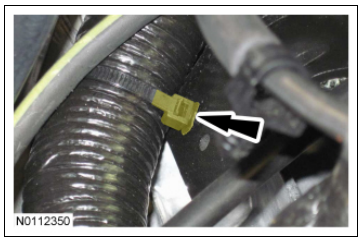


52. Install the HO2S . For additional information, refer to Section 303-14 .

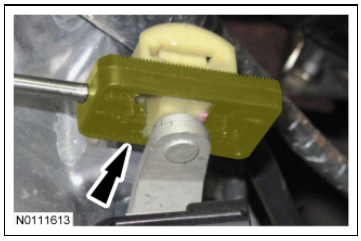
53. Position the selector lever cable and bracket and install the 2 bolts.
    - Tighten to 25 Nm (18 lb-ft).



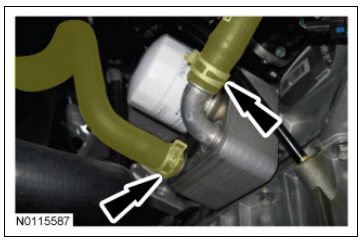
54. Attach the wiring harness retainer to the selector lever cable bracket.



55. Connect the selector lever cable to the control lever.



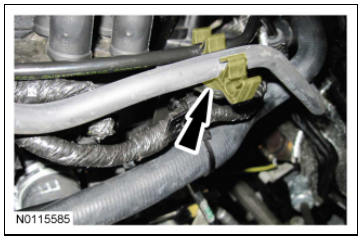
56. Connect the 2 coolant hoses to the engine oil cooler.
    - Attach the oil cooler hose retainer to the upper radiator hose.



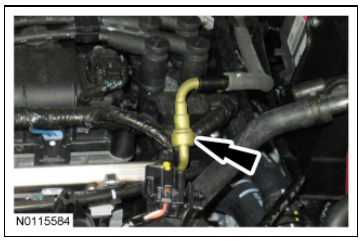
57. Install the cooling fan motor and shroud. For additional information, refer to Section 303-03 .

58. Install the generator. For additional information, refer to Section 414-00 .

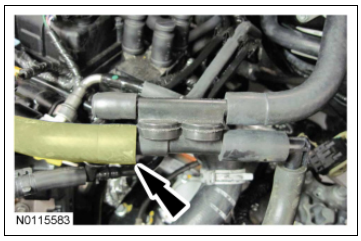
59. Attach the fuel tube to the coolant outlet bracket retainer.



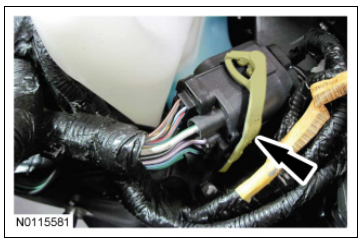
60. Connect the fuel tube spring lock couplings to the fuel rail. For additional information, refer to Section 310-00 .



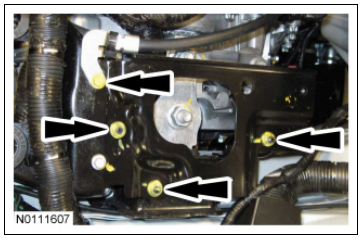
61. Connect the brake booster vacuum hose.



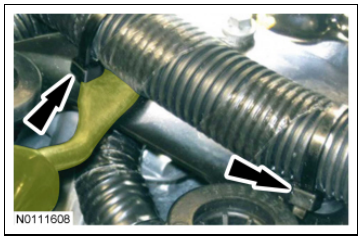
62. Connect the engine harness electrical connector.



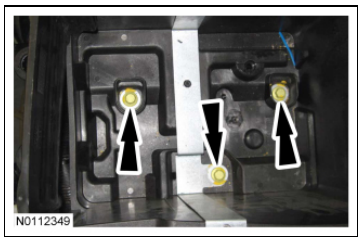
63. Install the battery tray bracket, 3 battery tray nuts and the selector lever cable bolt.
    - Attach the 2 wiring harness retainers to the bottom of the battery tray bracket.
    - Tighten nuts and bolt to 10 Nm (89 lb-in).



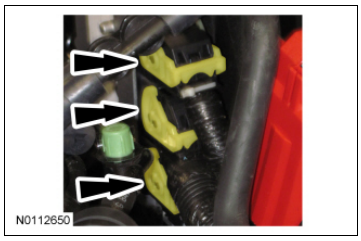
64. Attach the 2 positive battery cable wire harness retainers to battery tray bracket.



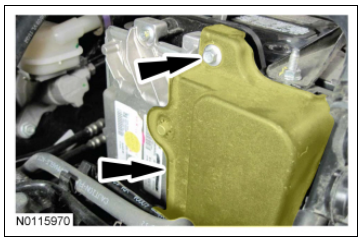
65. Install the battery tray and the 3 bolts.
    - Tighten to 10 Nm (89 lb-in).



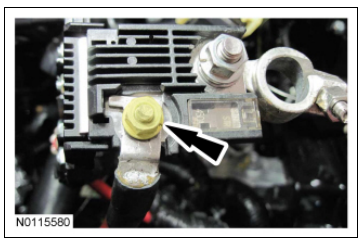
66. Connect the 3 PCM electrical connectors.



67. Install the PCM cover and the bolt.
    - Tighten to 5.4 Nm (47.8 lb-in).

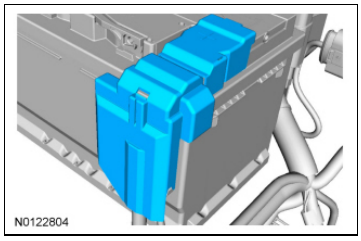


68. Connect the cable and nut to the positive battery cable terminal.
    - Tighten to 10 Nm (89 lb-in).

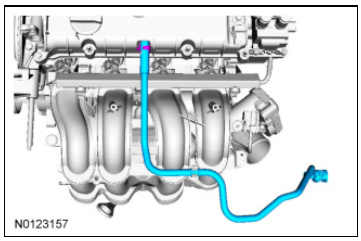


69. Install the battery. For additional information, refer to Section 414-01 .

70. Install the positive battery cable cover.



71. Connect the crankcase vent tube to the valve cover.
    - Attach the crankcase vent tube to the 2 retainers.



72. Install the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to Section 303-12 .

73. Fill the engine with clean engine oil.

74. Install the degas bottle. For additional information, refer to Section 303-03 .

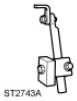
75. Fill the and bleed cooling system. For additional information, refer to Section 303-03 .

76. Fill the transaxle with transmission fluid. For additional information, refer to Section 307-11 .

77. Adjust the selector lever cable. For additional information, refer to Section 307-05 .

Engine - Manual Transaxle

Special Tool(s)

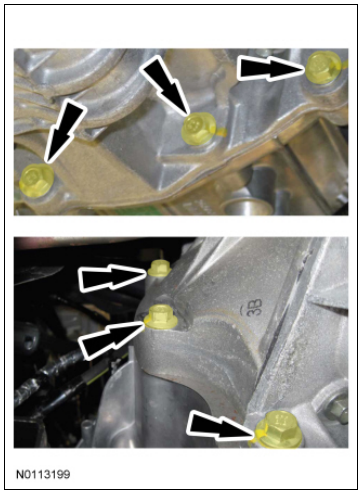
 ST1341-A	2,200# Floor Crane, Fold Away 300-OTC1819E
 ST1682-A	Powertrain Lift 300-OTC1585AE
 ST1602-A	Spreader Bar 303-D089 (D93P-6001-A3) or equivalent
 ST2743A	Adjustable Grip Arm, 1735A 014-00001

Material

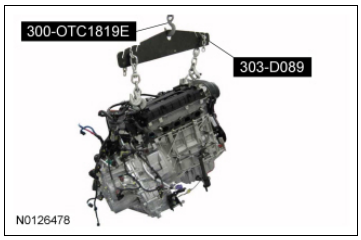
Item	Specification
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

All vehicles

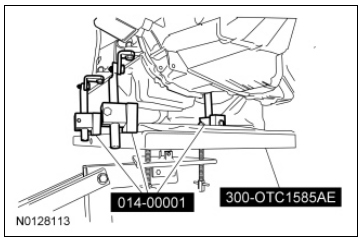
1. Using the Heavy Duty Floor Crane and Spreader Bar, position the engine and transaxle together. Install the 6 engine-to-bellhousing bolts.
    - Tighten to 48 Nm (35 lb-ft).



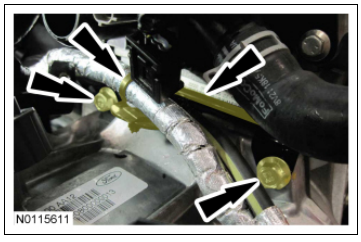
2. Using the Floor Crane and Spreader Bar, raise the engine and transaxle assembly onto the lift table.



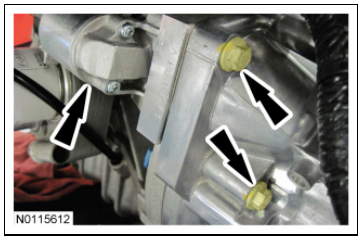
3. Using the Powertrain Lift and Adjustable Grip Arms, secure the engine and transaxle assembly to the lift table.



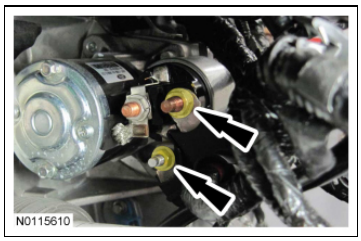
4. Install the 2 upper bellhousing-to-engine bolts and bracket.
    - Tighten to 48 Nm (35 lb-ft).
    - Attach the wiring harness pin-type retainer to the bracket.



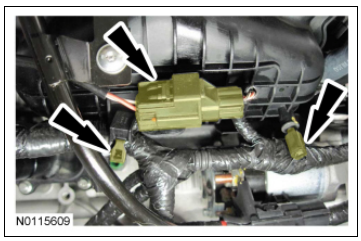
5. Install the starter motor and the 3 bolts (2 shown).
    - Install the 3 bolts finger-tight.
    - Tighten the 2 upper bolts to 48 Nm (35 lb-ft).
    - Tighten the lower bolt to 48 Nm (35 lb-ft).



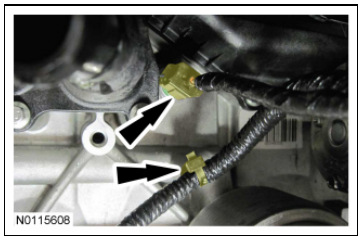
6. Connect the starter motor electrical terminals and install the 2 nuts.
    - Tighten to 10 Nm (89 lb-in).



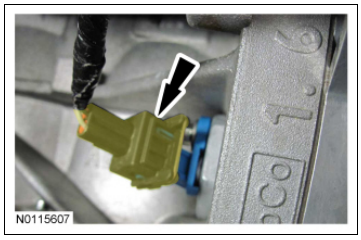
7. Connect the RH Knock Sensor (KS) electrical connector.
    - Attach the 2 wiring harness retainers to the intake manifold.



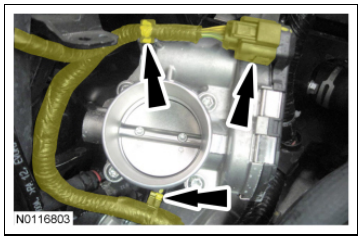
8. Connect the Engine Oil Pressure (EOP) switch electrical connector.
    - Attach the wiring harness retainer to the engine block.



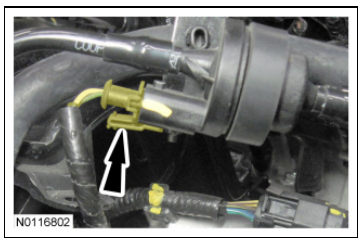
9. Connect the Crankshaft Position (CKP) sensor electrical connector.



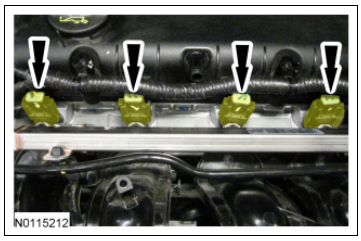
10. Connect the Throttle Body (TB) electrical connector.
    - Attach the 2 wiring harness retainers to the TB .



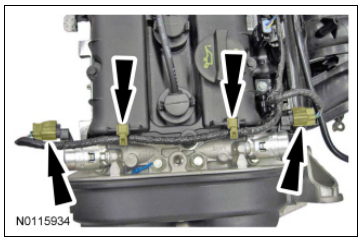
11. Connect the Evaporative Emission (EVAP) canister purge valve electrical connector.



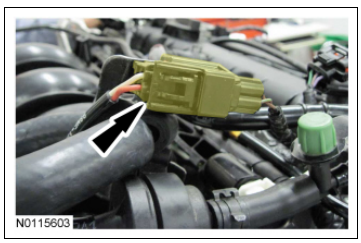
12. Connect the 4 fuel injector electrical connectors.
    - Attach the wiring harness retainers to the valve cover stud bolts.



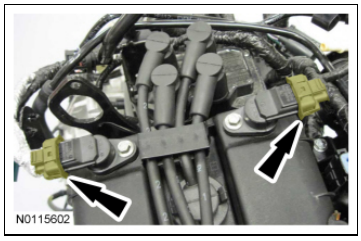
13. Connect the 2 Variable Camshaft Timing (VCT) oil control solenoid electrical connectors.
    - Attach the 2 wiring harness retainers.



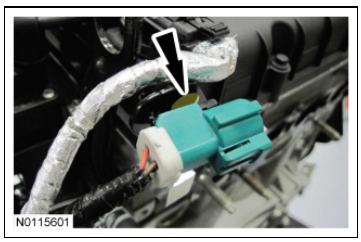
14. Connect and attach the LH KS electrical connector.



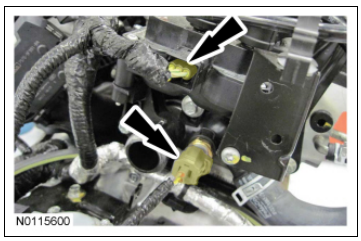
15. Connect the 2 Camshaft Position (CMP) sensor electrical connectors.



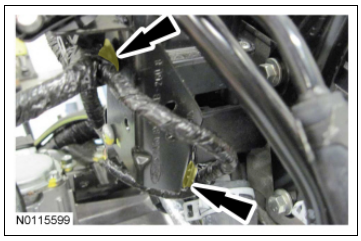
16. Attach the Heated Oxygen Sensor (HO2S) sensor electrical connector pin-type retainer to the bracket.



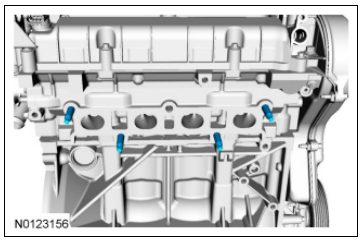
17. Connect the ignition coil and Engine Coolant Temperature (ECT) sensor electrical connectors.



18. Attach the 2 wiring harness retainers to the coolant outlet bracket.



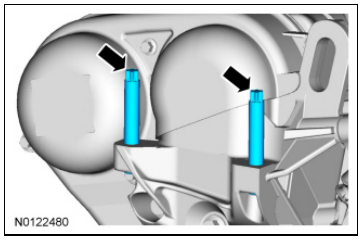
19. Install the 4 new catalytic converter studs.
    - Tighten to 17 Nm (150 lb-in).



20. ***NOTICE:*** **The engine mount studs must be torqued or damage to the powertrain may occur.**

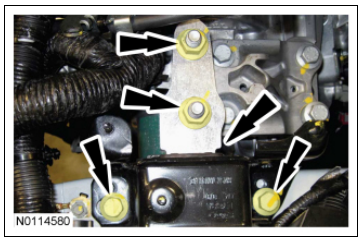
    Torque the engine mount studs before installing the engine mount nuts.

    - Tighten to 8 Nm (71 lb-in).



21. Using the lift table, position the engine and transaxle assembly in the vehicle.

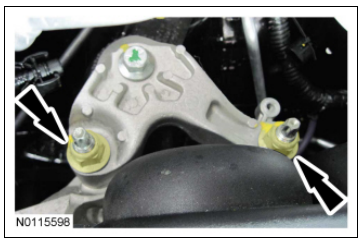
22. Align the transaxle support insulator, install and tighten the 2 nuts and 2 bolts.
    - Tighten the 2 nuts to 125 Nm (92 lb-ft).
    - Tighten the 2 bolts to 90 Nm (66 lb-ft).



23. **NOTE:** Do not loosen the engine mount center bolt or the engine may become improperly positioned.

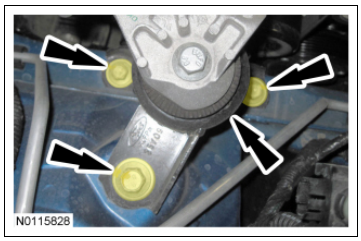
    Install the engine mount and the 2 nuts.

    - Tighten the 2 nuts to 80 Nm (59 lb-ft).

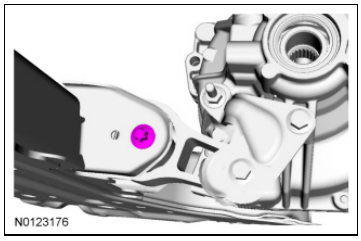


24. Lower the powertrain to the installed position.

25. Install the 3 engine mount bolts.
    - Tighten to 48 Nm (35 lb-ft).



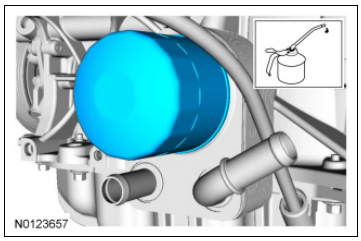
26. Install the transaxle roll restrictor bolt.
    - Tighten to 70 Nm (52 lb-ft).



27. **NOTE:** Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

    Install a new engine oil filter.

    - Tighten to 15 Nm (133 lb-in).

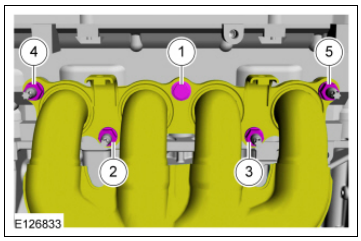


28. If equipped, connect the block heater electrical connector.

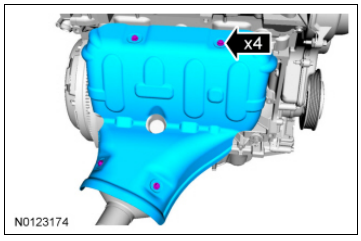
29. ***NOTICE:*** **Failure to tighten the catalytic converter manifold fasteners in 20 Nm increments until reaching final torque of 55 Nm will cause the converter to develop an exhaust leak.**

    Tighten the bolt and 4 nuts in the sequence shown, in 3 stages.

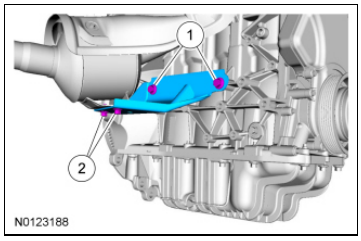
    - Stage 1: Tighten all fasteners in sequence to 20 Nm (177 lb-in).
    - Stage 2: Tighten all fasteners in sequence to 40 Nm (30 lb-ft).
    - Stage 3: Tighten all fasteners in sequence to 55 Nm (41 lb-ft).



30. Position the catalytic converter heat shield and install the 4 bolts.
    - Tighten to 10 Nm (89 lb-in).

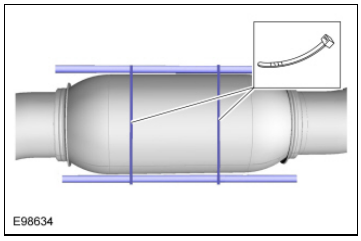


31. Install the lower catalytic converter bracket and the 4 bolts and tighten in sequence shown.
    1. Tighten the catalytic converter bracket-to-engine block bolts to 50 Nm (37 lb-ft).
    2. Tighten the catalytic converter bracket-to-catalytic converter bolts to 25 Nm (18 lb-ft).

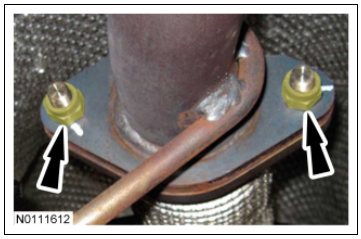


32. *NOTICE:* **Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

    Remove the support for the exhaust flexible pipe.



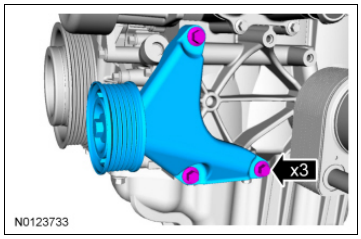
33. Using a new gasket, position the catalytic converter to the muffler and install the 2 catalytic converter nuts.
    - Tighten to 48 Nm (35 lb-ft).



34. Install the Catalyst Monitor Sensor (CMS). For additional information, refer to Section 303-14 .

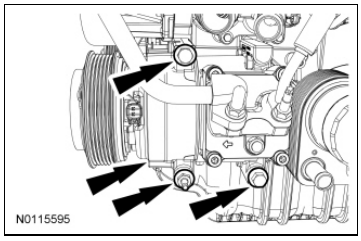
Vehicles without A/C

35. Install the accessory drive belt idler pulley bracket and the 3 bolts.
    - Tighten to 24 Nm (18 lb-ft).

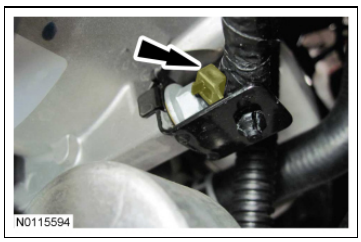


Vehicles with A/C

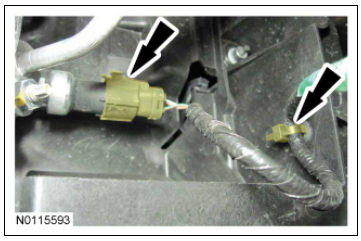
36. Position the A/C compressor and install the 2 bolts and stud bolt.
    - Tighten to 25 Nm (18 lb-ft).



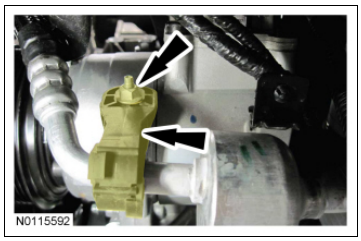
37. Attach the wiring harness retainer to the lower A/C compressor bracket.



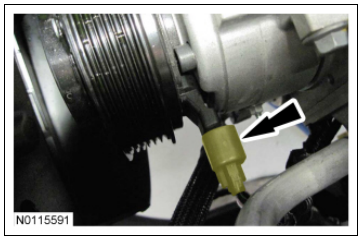
38. Connect the A/C pressure transducer electrical connector.
    - Attach the wiring harness retainer.



39. Position the A/C line bracket and install the nut.
    - Tighten to 9 Nm (80 lb-in).

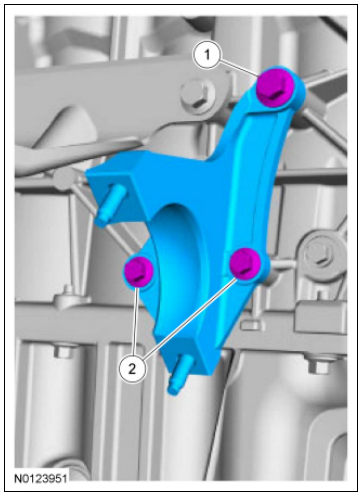


40. Connect the A/C compressor electrical connector.



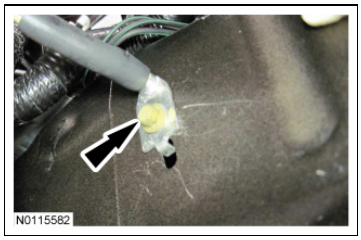
All vehicles

41. Install the halfshaft bracket and the 3 bolts and tighten in sequence shown.
    1. Tighten the top bolt to 48 Nm (35 lb-ft).
    2. Tighten the 2 bottom bolts to 24 Nm (18 lb-ft).

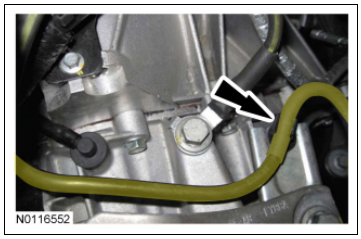


42. Install the RH and LH halfshafts. For additional information, refer to Section 205-04 .

43. Position the engine ground wire and install the bolt.
    - Tighten to 10 Nm (89 lb-in).



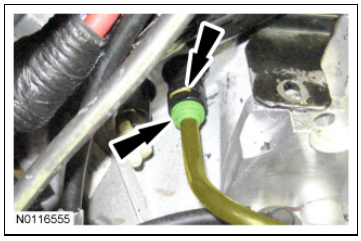
44. Attach the clutch hydraulic hose to the transaxle retainer.



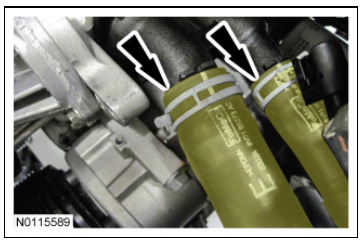
45. ⚠ **WARNING: Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure 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.**

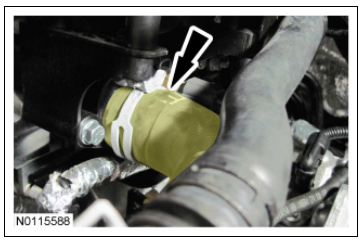
    Connect the clutch hydraulic hose and install the clip.



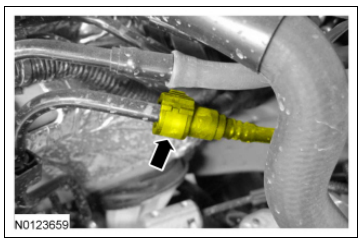
46. Connect the lower radiator hose and coolant hose to the thermostat housing.



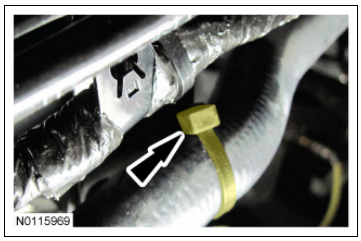
47. Connect the upper radiator hose to the engine.



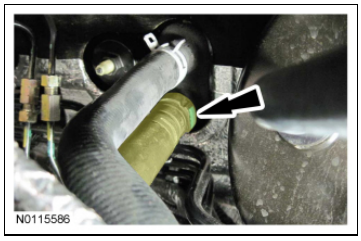
48. Connect the EVAP tube quick connect coupling near the bulk head. For additional information, refer to Section 310-00 .



49. Attach the coolant hose retainer to the coolant outlet bracket.

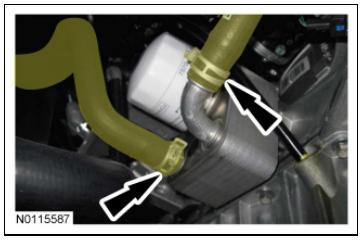


50. Connect the lower heater hose to the heater core.



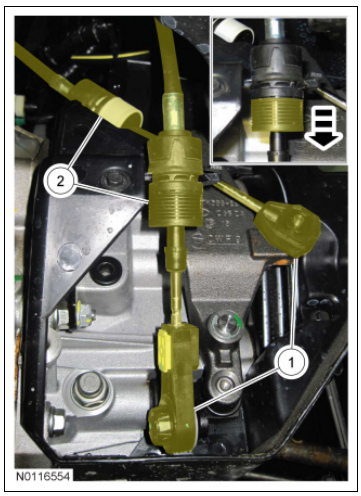
51. Install the HO2S . For additional information, refer to Section 303-14 .

52. Connect the 2 coolant hoses to the engine oil cooler.
    - Attach the oil cooler hose retainer to the upper radiator hose.



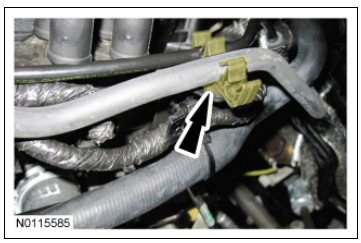
53. Install the cooling fan motor and shroud. For additional information, refer to Section 303-03 .

54. Install the gearshift cables.
    1. Attach the gearshift cables to the transaxle gearshift control levers.
    2. Install the gearshift cable by pulling the lower part of abutment down and installing them in the brackets.

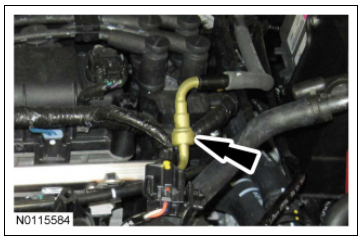


55. Install the generator. For additional information, refer to Section 414-00 .

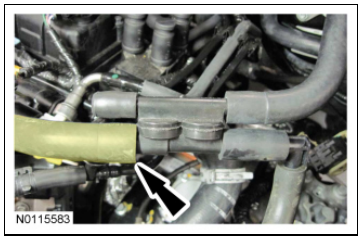
56. Attach the fuel tube to the coolant outlet bracket retainer.



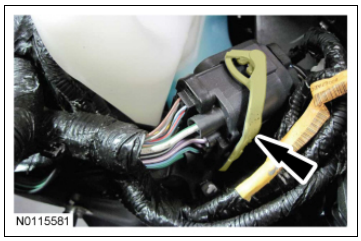
57. Connect the fuel tube spring lock couplings to the fuel rail. For additional information, refer to Section 310-00 .



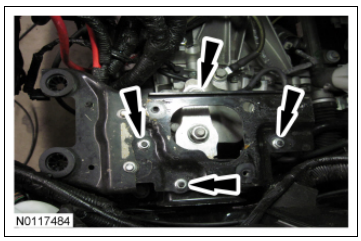
58. Connect the brake booster vacuum hose.



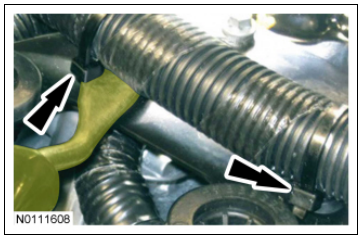
59. Connect the engine harness electrical connector.



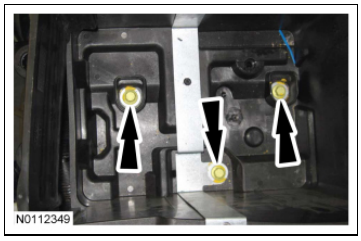
60. Install the battery tray bracket and the 3 battery tray nuts.
    - Attach the 2 wiring harness retainers to the bottom of the battery tray bracket.
    - Tighten nuts and bolt to 10 Nm (89 lb-in).



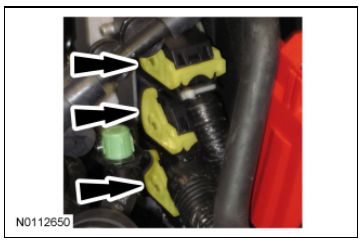
61. Attach the 2 positive battery cable wire harness retainers to battery tray bracket.



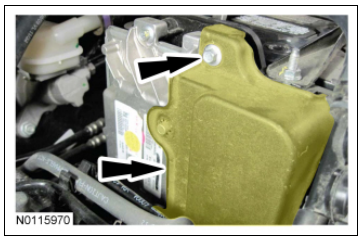
62. Install the battery tray and the 3 bolts.
    - Tighten to 10 Nm (89 lb-in).



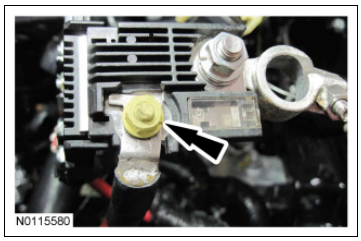
63. Connect the 3 PCM electrical connectors.



64. Install the PCM cover and the bolt.
    - Tighten to 5.4 Nm (47.8 lb-in).

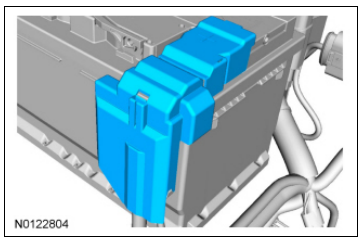


65. Install the cable and nut to the positive battery cable terminal.
    - Tighten to 10 Nm (89 lb-in).

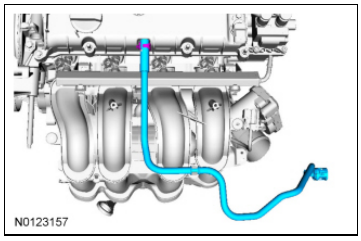


66. Install the battery. For additional information, refer to Section 414-01 .

67. Install the positive battery cable cover.



68. Connect the crankcase vent tube to the valve cover.
    - Attach the crankcase vent tube to the 2 retainers.



69. Install the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to Section 303-12 .

70. Fill the engine with clean engine oil.

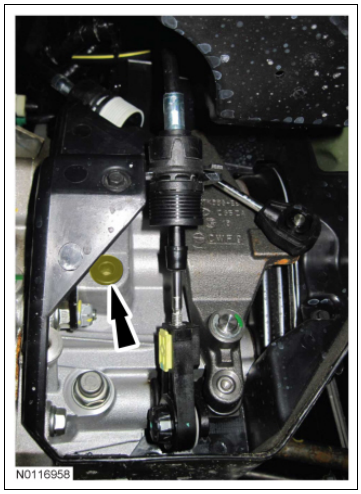
71. Install the degas bottle. For additional information, refer to Section 303-03 .

72. Fill the and bleed cooling system. For additional information, refer to Section 303-03 .

73. **NOTE:** Before removing, clean the area around the fill plug.

    Remove the fill plug and using a fluid suction gun, fill the transaxle with manual transmission fluid until fluid level is 0.0-5.0 mm (0.0-0.2 in) below the lower edge of the fill hole.

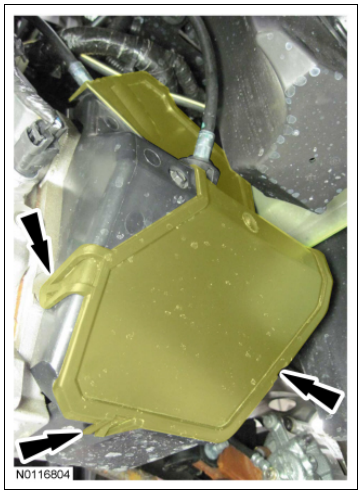
    - Install the fill plug and tighten to 35 Nm (26 lb-ft).



74. Bleed the clutch hydraulic system. For additional information, refer to Section 308-00 .

75. Adjust the gearshift cables. For additional information, refer to Section 308-00 .

76. Install the gearshift cable cover and attach the 7 retainers (2 shown).


N0116804

Material

Item	Specification	Fill Capacity
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® Premium Cooling System Flush VC-1	ESR-M14P7-A	-
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D	5.5L (5.8 qt)

General Specifications

Item	Specification
Pressure Tests	
Complete cooling system maximum pressure	138 kPa (20 psi)
Pressure relief cap	145-159 kPa (21-23 psi)
Radiator (out of vehicle)	138 kPa (20 psi)
Thermostat Opening Temperatures	
Thermostat starts to open	82°C (180°F)
Thermostat fully open	97°C (207°F)

Torque Specifications

Description	Nm	lb-ft	lb-in
A/C compressor bolts and studbolt	24	18	-
A/C tube bracket nut	10 gn="top" align="center">-	89	
Accessory drive belt idler pulley bracket bolts	24	18	-
Block heater [a]	3	-	27
Coolant connection bolts	10	-	89
Coolant pump bolts [b]	-	-	-
Coolant pump pulley bolts	20	-	177
Engine mount bolts	48	35	-
Engine mount nuts	80	59	-
Engine mount studs	8	-	71
Engine plug bolt	20	-	177

Timing belt cover bolts	9	-	80
	20	-	177

[a] V-lock design only. Do not install or reinstall a split ring design block heater. Refer to the procedure.
[b] Refer to the procedure.

Engine Cooling

NOTICE: **The engine cooling system is filled with Motorcraft® Specialty Orange Engine Coolant. Do not mix coolant types. Mixing coolant types degrades the corrosion protection of Motorcraft® Specialty Orange Engine Coolant. Failure to follow these instructions may damage the engine or cooling system.**

NOTE: During rmal vehicle operation, Motorcraft Specialty Orange Engine Coolant may change color from orange to pink or light red. As long as the engine coolant is clear and uncontaminated, this color change does not indicate the engine coolant has degraded nor does it require the engine coolant to be drained, the system to be flushed, or the engine coolant to be replaced.

The cooling system components include the:

- radiator
- cooling fan motor and shroud
- degas bottle
- radiator drain valve
- coolant pump
- thermostat housing
- block heater (if equipped)

The engine uses a cold side thermostat. This means the thermostat is located at the lower radiator hose connection to the engine, where coolant enters the engine after being cooled by the radiator. During initial warm-up, the cooler coolant from the radiator quickly closes the thermostat after the warm coolant in the engine opens the thermostat slightly. The thermostat opens and closes several times before the coolant coming from the radiator is warm enough to allow the thermostat to remain open. The engine must run much longer than a vehicle with a hot side thermostat before the thermostat remains fully opened.

Engine coolant provides freeze protection, boil protection, corrosion protection and cooling efficiency to the engine and cooling components. In order to obtain these protections, maintain the engine coolant at the correct concentration and fluid level in the degas bottle.

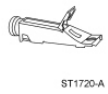
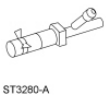
When adding engine coolant, use a 50/50 mixture of engine coolant and distilled water. A coolant concentration of 50% will provide freeze point protection down to -37°C (-34°F).

To maintain the integrity of the coolant and the cooling system:

- Add Motorcraft® Specialty Orange Engine Coolant or equivalent meeting Ford specification WSS-M97B44-D (orange color).
- Do not add or mix with any other engine coolant. Mixing coolants degrades the coolant cosion 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 originally equipped with Motorcraft® Specialty Orange Engine Coolant since a Ford-approved recycling process is not yet available.

Engine Cooling

Special Tool(s)

 ST3106-A	3-Way HD Antifreeze Coolant Test Kit 328-00001 or equivalent
 ST1720-A	Coolant/Battery Refractometer ROB75240 or equivalent
 ST3280-A	D-Gas Adapter 300-OTC-014-R1068 or equivalent
 ST3281-A	Radiator Tester 300-OTC-014-R1072 or equivalent
 ST3254-A	UView® Combustion Leak Tester UVU560000-R
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware or equivalent scan tool

Material

Item	Specification
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D

Principles of Operation

Engine coolant flows primarily from the engine to the radiator circuit and back to the coolant pump. Coolant is sent from the coolant pump 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 flows through the radiator circuit to transfer engine generated heat to the outside air.

The degas bottle removes air from the cooling system, 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 executes once per drive cycle and has a monitor run duration of 300-800 seconds. If a malfunction occurs, DTC P0125 or P0128 is st, and the Malfunction Indicator Lamp (MIL) is illuminated.

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® Specialty Orange Engine Coolant. Always fill the cooling system with the manufacturer's specified coolant. Chemically flush the cooling system if a non-specified coolant has been used. Refer to Cooling System Flushing in this section. Failure to follow these instructions may damage the engine or cooling system.**

NOTE: During normal vehicle operation, Motorcraft Specialty Orange Engine Coolant may change color from orange to pink or light red. As long as the engine coolant is clear and uncontaminated, this color change does not indicate the engine coolant has degraded nor does it require the engine coolant to be drained, the system to be flushed, or the engine coolant to be replaced.

NOTE: Vehicles have the pressure relief cap on the degas bottle and n radiator cap.

1. Verify the customer concern.
2. Visually check the engine coolant level at the degas bottle 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 concern by operating the engine to duplicate the condition.
6. Visually inspect for obvious signs of any mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Leaks or weeps at: ♦ Hoses ♦ Tubes ♦ Clamp joints ♦ Gaskets ♦ O-rings ♦ Thermostat coolant connection	• Inoperative or damaged: ♦ Electric cooling fan ♦ Wiring, connectors, relays or modules ♦ Cylinder Head Temperature (CHT) sensor

♦ Radiator ♦ Pressure relief cap ♦ Coolant pump ♦ Oil cooler (may leak internally or externally) ♦ Heater core (wet floor or coolant odor in vehicle) ♦ Degas bottle ♦ Cylinder block core plugs ♦ Cylinder head core plugs ♦ Block heater (if equipped) • Cracked or damaged: ♦ Hoses ♦ Tubes ♦ Hose clamps ♦ Thermostat coolant connection ♦ Radiator ♦ Pressure relief cap ♦ Cooling fan ♦ Coolant pump ♦ Oil cooler ♦ Degas bottle ♦ Cylinder block core plugs ♦ Cylinder head core plugs ♦ Block heater (if equipped) • Restricted airflow through the A/C condenser/radiator • Drive belt loose, worn or installed incorrectly • Broken or weak drive belt tensioner • Excessive white or light gray exhaust smoke (may have burnt coolant odor) • Coolant in engine oil • Engine oil in coolant	♦ Vehicle Speed Sensor (VSS)

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.
    1. Inspect the coolant color.
        - ♦ Discoloration may indicate that incorrect coolant may have been added to the system. Use of incorrect (green or yellow in color) coolant degrades the corrosion protection of Motorcraft® Specialty Orange Engine Coolant. Addition of Motorcraft® Specialty Green Engine Coolant may cause the color to appear to be a murky green-brown color. The addition of Motorcraft® Premium Gold Engine Coolant, however, may not change the color or appearance of the orange colored coolant. Detection of contamination with Motorcraft® Premium Gold Engine Coolant is determined by the presence of nitrite. If contamination with Motorcraft® Premium Gold Engine Coolant is suspected, test the coolant with the 3-Way HD Antifreeze Coolant Test Kit. Follow the directions on the packaging. If the incorrect coolant has been added to the cooling system, flush the system and refill with the correct mixture of distilled water and Motorcraft® Specialty Orange Engine Coolant. Refer to Cooling System Flushing in this section.
        - ♦ A darker orange with the presence of debris could indicate a commercially available stop leak may have been used and could result in loss of coolant flow to critical parts of the engine. If sediment is present, flush the system and refill with the correct

mixture of distilled water and Motorcraft® Specialty Orange Engine Coolant. Refer to Cooling System Flushing in this section.

- 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® Specialty Orange Engine Coolant. Refer to Cooling System Flushing in this section.
- An iridescent sheen on top of the coolant could indicate a trace of oil is entering the system. For engine diagnosis, refer to Section 303-00 . Flush the system and refill with e correct mixture of distilled water and Motorcraft® Specialty Orange Engine Coolant. Refer to Cooling System Flushing in this section.
- 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. For engine diagnosis, refer to Section 303-00 . Flush the system and refill with the correct mixture of distilled water and Motorcraft® Specialty Orange Engine Coolant. Refer to Cooling System Flushing in this section.

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 of -50°C to -26°C (-58°F to -15°F). If the vehicle is driven in cold climates less than -37°C (-34°F), it may be necessary to increase the coolant concentration to get adequate freeze protection. Recommended coolant concentration is 50/50 ethylene glycol lled 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 PCM DTCs, refer to Section 303-14 .

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

DTC Chart

PCM DTC Chart

DTC	Description	Action
P0125	Insufficient Coolant Temp For Closed Loop Fuel Control	GO to Pinpoint Test C .
P0128	Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature)	GO to Pinpoint Test C .
P0480	Fan 1 Control Circuit	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0481	Fan 2 Control Circuit	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0691	Fan 1 Control Circuit Low	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0692	Fan 1 Control Circuit High	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0693	Fan 2 Control Circuit Low	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0694	Fan 2 Control Circuit High	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
All Other PCM DTCs	-	REFER to Section 303-14 .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: Loss of Coolant

Normal Operation

The engine cooling system is a closed system providing for coolant expansion and contraction as well as changes in pressure as coolant warms and cools with engine operation. Various gaskets, seals, hoses and

clamps contain coolant within the cooling system and keep other fluids and contaminants from entering the cooling system.

Coolant loss can be attributed to external or internal leaks anywhere within the cooling system.

This pinpoint test is intended to diagnose the following:

- Coolant hoses or tubes
- Hose clamps
- Thermostat coolant connection O-ring seal or gasket
- Thermostat coolant connection
- Coolant pump gasket
- Radiator
- Pressure relief cap
- Coolant pump
- Oil cooler (may leak internally or externally)
- Heater core
- Engine gaskets (may leak internally or externally)
- Degas bottle
- Engine Coolant Temperature (ECT) sensor
- 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
A1 CARRY OUT INSPECTION AND VERIFICATION	
• Carry out the Inspection and Verification procedure in this section. • **Were any concerns found?**	**Yes** REPAIR as needed. TEST the system for normal operation. **No** GO to A2 .
A2 CHECK THE ENGINE COOLANT LEVEL	
NOTE: Allow the engine to cool before checking the engine coolant level. • Ignition OFF. • Visually inspect the engine coolant level at the degas bottle. • **Is the engine coolant level within specifications?**	**Yes** GO to A3 . **No** ADJUST the engine coolant level as necessary. GO to A3 .
A3 PRESSURE TEST THE ENGINE COOLING SYSTEM	
• Pressure test the engine cooling system. Refer to Component Tests, Cooling System Pressure Test in this	**Yes** REPAIR or INSTALL new components. TEST the system for

section. • **Does the engine cooling system leak externally?**	normal operation. **No** GO to A4 .
A4 CHECK THE ENGINE COOLANT FOR AN INTERNAL LEAK	
• Inspect the engine coolant in the coolant expansion tank for signs of engine oil. • **Is engine oil evident in the coolant?**	**Yes** GO to Section 303-00 for engine diagnosis. **No** GO to A5 .
A5 CHECK THE ENGINE OIL FOR COOLANT	
• Remove the oil level indicator from the engine. • **Is coolant evident in the oil?**	**Yes** GO to Section 303-00 for engine diagnosis. **No** GO to A6 .
A6 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES	
• **NOTE:** Use UView® Combustion Leak Tester part number UVU560000-R or equivalent. • Using a cooling system combustion gas leak tester, following the instructions supplied with the tester, check the coolant for combustion gases. • **Are combustion gases present?**	**Yes** GO to Section 303-00 for engine diagnosis. **No** The cooling system is operational.

Pinpoint Test B: The Engine Overheats

Normal Operation

The engine cooling system maintains the engine temperature 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 t the radiator circuit and back to the coolant pump. Coolant is sent from the coolant pump through the engine block and cylinder heads. A separate circuit from the engine also feeds the heater core with coolant. The coolant pump, operated by engine rotation through a pulley driven by the accessory drive belt circulates 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 flows through the radiator circuit 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.

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
- Radiator
- Thermostat
- Engine Coolant Temperature (ECT)
- ECT gauge
- 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
B1 CARRY OUT INSPECTION AND VERIFICATION	
• Carry out the Inspection and Verification procedure in this section. • **Were any concerns found?**	**Yes** REPAIR as needed. TEST the system for normal operation. **No** GO to B2 .
B2 CHECK FOR AN AIRFLOW OBSTRUCTION	
• Check the radiator or A/C condenser for an external obstruction such as leaves or cardboard. • **Is an obstruction present?**	**Yes** REMOVE the obstruction. TEST the system for normal operation. **No** GO to B3 .
B3 CHECK THE ENGINE COOLANT LEVEL	
NOTE: Allow the engine to cool before checking the coolant level. • Ignition OFF. • Visually check the engine coolant level in the coolant expansion tank. • **Is the engine coolant level within specification?**	**Yes** GO to B4 . **No** ADJUST the engine coolant level as necessary. GO to B4 .

B4 PRESSURE TEST THE ENGINE COOLING SYSTEM	
• Pressure test the engine cooling system. Refer to Component Tests, Cooling System Pressure Test in this section. • **Does the engine cooling system leak externally?**	**Yes** REPAIR or INSTALL new components. TEST the system for normal operation. **No** GO to B5 .
B5 CHECK THE ENGINE COOLANT FOR AN INTERNAL LEAK	
• Inspect the engine coolant in the coolant expansion tank for signs of engine oil. • **Is engine oil evident in the coolant?**	**Yes** GO to Section 303-00 for engine diagnosis. **No** GO to B6 .
B6 CHECK THE ENGINE OIL FOR COOLANT	
• Remove the oil level indicator from the engine. • **Is coolant evident in the oil?**	**Yes** GO to Section 303-00 for engine diagnosis. **No** GO to B7 .
B7 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES	
• **NOTE:** Use UView® Combustion Leak Tester part number UVU560000-R or equivalent. • Using a cooling system combustion gas leak tester, following the instructions supplied with the tester, check the coolant for combustion gases. • **Are combustion gases present?**	**Yes** GO to Section 303-00 for engine diagnosis. **No** GO to B8 .
B8 CHECK COOLANT CONDITION	
• Check the coolant for dirt, rust or contamination and check the coolant concentration. • **Is the coolant condition OK?**	**Yes** GO to B9 . **No** FLUSH the engine cooling system. REFER to Cooling System Flushing in this section. TEST the system for normal operation.
B9 CHECK THE ELECTRIC COOLING FAN OPERATION	
• Start the engine. • Place the climate control function selector in the MAX A/C position and the blower motor switch in the HI position. • **Did the electric cooling fan operate?**	**Yes** GO to B10 . **No** DIAGNOSE the electric cooling fan operation. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

B10 CHECK THE COOLANT PUMP OPERATION	
• Start the engine. • Allow the engine to run for 30 minutes. Place the climate control function selector in the MAX HEAT position. Feel the heater outlet hose. • **Is the heater outlet hose hot?**	**Yes** GO to B11 . **No** INSTALL a new coolant pump. TEST the system for normal operation.
B11 CHECK THE THERMOSTAT OPERATION	
• Start the engine. • Allow the engine to run for 30 minutes. Feel the lower radiator hose. • **Is the lower radiator hose hot?**	**Yes** CHECK the ECT gauge operation. REFER to Section 413-01 . **No** GO to B12 .
B12 VISUALLY INSPECT THE THERMOSTAT	
• Carry out the Thermostat Visual Inspection in the Component Tests portion of this section. • **Is the thermostat damaged?**	**Yes** INSTALL a new thermostat. TEST the system for normal operation. **No** 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.

Pinpoint Test C: The Engine Does Not Reach Normal Operating Temperature

Normal Operation

The engine cooling system maintains engine temperature 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. Coolant is sent from the coolant pump through the engine block and cylinder heads. A separate circuit from the engine also feeds the heater core with coolant. The coolant pump, operated by engine rotation through a pulley driven by the accessory drive belt, circulates 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 flows 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 fan operates all of 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.

- DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) - Indicates the Engine Coolant Temperature (ECT) 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]) - 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
- ECT indicator system (gauge)
- Engine cooling fan always on

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
C1 CARRY OUT INSPECTION AND VERIFICATION	
• Carry out the Inspection and Verification procedure in this section. Were any concerns found?	**Yes** REPAIR as needed. TEST the system for normal operation. **No** GO to C2 .
C2 CHECK FOR DTCs P0125 or P0128	
• Check for DTC P0125 or P0128. • **Is DTC P0125 or P0128 present?**	**Yes** GO to C3 . **No** The cooling system is operational. If an inoperative ECT gauge is suspected, CHECK the ECT gauge operation. REFER to Section 413-01 . If an inoperative climate control system is suspected, CHECK the climate control system operation. REFER to Section 412-00 . If any other DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
C3 CHECK THE ELECTRIC COOLING FAN OPERATION	
• Allow the engine to cool. • Make sure the A/C switch is OFF.	**Yes** DIAGNOSE the electric cooling fan operation. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. **No**

• Start the engine. • Check the electric cooling fan. • **Is the electric cooling fan on all the time?**	GO to C4 .
C4 CHECK THE COOLANT LEVEL	
• **NOTE:** Allow the engine to cool before checking the coolant level. • Visually check the engine coolant level in the coolant expansion tank. • **Is the engine coolant level within specification?**	**Yes** INSTALL a new thermostat. TEST the system for normal operation. **No** GO to Pinpoint Test A to diagnose a coolant leak.

Component Tests

Cooling System Pressure Test

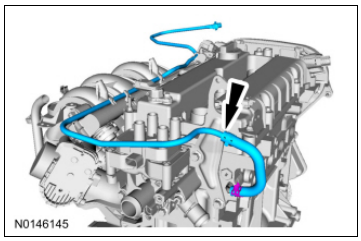
⚠ **WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. 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.

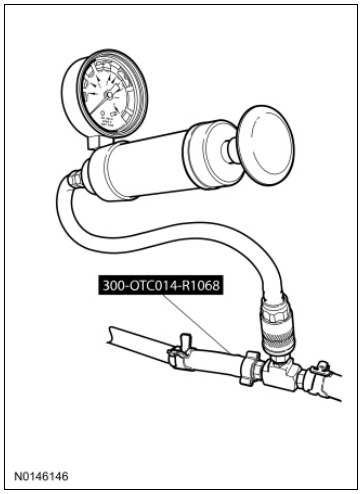
1. Turn the engine OFF.

2. Check the engine coolant level. Adjust the coolant level as necessary.

3. Disconnect the coolant return hose located at the rear of the engine.



4. Attach the D-Gas Adapter inline with the overflow hose and install the Radiator Tester to the quick connect fitting of the D-Gas Adapter.



5. *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 pressed too fast, an incorrect pressure reading results.

   Slowly press 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.

6. If the system does not hold pressure, remove the pressure relief cap and wash it in clean water to dislodge all of the foreign material from the gasket. Check the sealing surface in the filler neck of the degas bottle for nicks or cuts. Use fine sandpaper or emery cloth to remove nicks and cuts. Place a shop cloth in the filler neck to prevent debris from falling into the degas bottle. If nicks or cuts are too deep to remove, install a new degas bottle. Install the pressure relief cap.

7. Pressurize the engine cooling system as described in Step 4. Observe the gauge reading for approximately 2 minutes. Pressure should not drop during this time. If the pressure drops, inspect for leaks and repair as necessary.

8. 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.

9. 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.

10. 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.

Leak test the radiator in clean water with air pressurized to the maximum pressure listed in the Specifications.

Cooling System Draining, Filling and Bleeding

Special Tool(s)

 ST2618-A	Airlift Cooling System Tester UVU550000 or equivalent

Material

Item	Specification
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D

Draining

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. ⚠ **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. Using contaminated coolant may damag the engine or cooling system components.**

   NOTE: During normal vehicle operation, Motorcraft Specialty Orange Engine Coolant may change color from orange to pink or light red. As long as the engine coolant is clear and uncontaminated, this color change does not indicate the engine coolant has degraded nor does it require the engine coolant to be drained, the system to be flushed, or the engine coolant to be replaced.

   Release the pressure in the cooling system by slowly turning the pressure relief cap one half turn counterclockwise. When the pressure has been released, remove the pressure relief cap.

3. Place a suitable container below the lower radiator hose.
   - Release the clamp, disconnect the lower radiator hose from the radiator and allow the coolant to drain.

Filling and Bleeding with a Vacuum Cooling System Filler

NOTICE: **The engine cooling system is filled with Motorcraft® Specialty Orange Engine Coolant. 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.

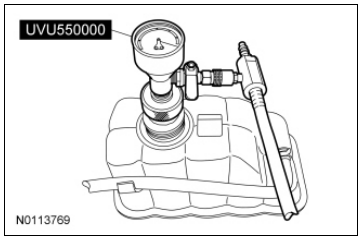
NOTICE: **Engine coolant provides freeze protection, boil protection, cooling efficiency and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the coolant expansion tank.**

To mainain the integrity of the coolant and the cooling system:

- Add Motorcraft® Specialty Orange Engine Coolant or equivalent meeting Ford specification WSS-M97B44-D (orange color).
- Do not add or mix with any other type of engine coolants. Mixing coolants degrades the coolant's corrosion protection.
- Do not add alcohol, methanol or 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 originally equipped with Motorcraft® Specialty Orange Engine Coolant since a Ford-approved recycling process is not yet available.

1. Connect the lower radiator hose to the radiator and position the clamp.

2. Install the vacuum cooling system filler and follow the manufacturer's instructions to fill and bleed the cooling system.
    - Recommended coolant concentration is 50/50 ethylene glycol to distilled water.
    - For extremely cold climates (less than -37°C [-34°F]):
        - ♦ It may be necessary to increase the coolant concentration above 50%.
        - ♦ NEVER increase the coolant concentration above 60%.
        - ♦ Maximum coolant concentration is 60/40 for cold weather areas.
        - ♦ A coolant concentration of 60% will provide freeze point protection down to -50°C (-58°F).
        - ♦ Engine coolant concentration above 60% will decrease the overheat protection characteristics of the engine coolant and may damage the engine.
    - For extremely hot climates:
        - ♦ It is still necessary to maintain the coolant concentration above 40%.
        - ♦ NEVER decrease the coolant concentration below 40%.
        - ♦ Minimum coolant concentration is 40/60 for warm weather areas.
        - ♦ A coolant concentration of 40% will provide freeze point protection down to -26°C (-15°F).
        - ♦ Engine coolant concentration below 40% will decrease the corrosion and freeze protection characteristics of the engine coolant and may damage the engine.
    - Vehicles driven year-round in non-extreme climates should use a 50/50 mixture of engine coolant and distilled water for optimum cooling system and engine protection.



Filling and Bleeding without a Vacuum Cooling System Filler

NOTICE: **The engine cooling system is filled with Motorcraft® Specialty Orange Engine Coolant. 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.**

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 maintained at the correct concentration and fluid level in the coolant expansion tank.**

To maintain the integrity of the coolant and the cooling system:

- Add Motorcraft® Specialty Orange Engine Coolant or equivalent meeting Ford specification WSS-M97B44-D (orange color).
- Do not add or mix with any other type of engine coolants. Mixing coolants degrades the coolant's corrosion protection.
- Do not add alcohol, methanol or 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 originally equipped with Motorcraft® Specialty Orange Engine Coolant since a Ford-approved recycling process is not yet available.

1. Connect the lower radiator hose to the radiator and position the clamp.

2. Fill the radiator through the degas bottle until the coolant level is at the max fill line on the degas bottle.
    - Recommended coolant concentration is 50/50 ethylene glycol to distilled water.
    - For extremely cold climates (less than -37°C [-34°F]):
        - ♦ It may be necessary to increase the coolant concentration above 50%.
        - ♦ NEVER increase the coolant concentration above 60%.
        - ♦ Maximum coolant concentration is 60/40 for cold weather areas.
        - ♦ A coolant concentration of 60% will provide freeze point protection down to -50°C (-58°F).
        - ♦ Engine coolant concentration above 60% will decrease the overheat protection characteristics of the engine coolant and may damage the engine.
    - For extremely hot climates:
        - ♦ It is still necessary to maintain the coolant concentration above 40li>
        - ♦ NEVER decrease the coolant concentration below 40%.
        - ♦ Minimum coolant concentration is 40/60 for warm weather areas.
        - ♦ A coolant concentration of 40% will provide freeze point protection down to -26°C (-15°F).
        - ♦ Engine coolant concentration below 40% will decrease the corrosion and freeze protection characteristics of the engine coolant and may damage the engine.
    - Vehicles driven year-round in non-extreme climates should use a 50/50 mixture of engine coolant and distilled water for optimum cooling system and engine protection.

3. Install the pressure relief cap.

4. ***NOTICE:*** **If the engine overheats or the fluid level in the coolant expansion tank drops below the min fill line, allow the engine to cool. Once engine is cool, add coolant to the coolant expansion tank to the max fill line. Failure to follow these instructions may damage the engine.**

   Start the engine, run and hold at 2,500 rpm for 15 minutes.

5. ***NOTICE:*** **If the engine overheats or the fluid level in the coolant expansion tank drops below**

the min fill line, allow the engine to cool. Once engine is cool, add coolant to the coolant expansion tank to the max fill line. Failure to follow these instructions may damage the engine.

Increase the engine speed to 5,000 rpm and then decrease to idle. Repeat six times.

6. ***NOTICE:*** **If the engine overheats or the fluid level in the coolant expansion tank drops below the min fill line, allow the engine to cool. Once engine is cool, add coolant to the coolant expansion tank to the max fill line. Failure to follow these instructions may damage the engine.**

   Increase the engine speed to 4,000 rpm for ten seconds, then return the engine speed to 2,5 rpm and hold for another ten minutes.

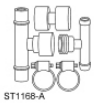
7. Decrease the engine speed to idle, shut the engine off and allow to cool.

8. Check the engine and cooling system for any leaks.

9. Check the coolant level in the degas bottle and fill as necessary.

Cooling System Flushing

Special Tool(s)

 ST1167-A	Drain Kit 164-R3662
 ST1168-A	Flush Kit 164-R3658 or equivalent
 ST2421-A	Pro Flush and Fill 023-00154 or equivalent

Material

Item	Specification
Motorcraft® Premium Cooling System Flush VC-1	ESR-M14P7-A

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 personalinjury.**

   Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. Remove the thermostat. For additional information, refer to Thermostat in this section.

3. Install the coolant hose connection without the thermostat.
   - Tighten the bolts to 10 Nm (89 lb-in).

4. **NOTE:** Refer to the cooling system Pro Flush and Fill operating instructions for specific vehicle hook-up.

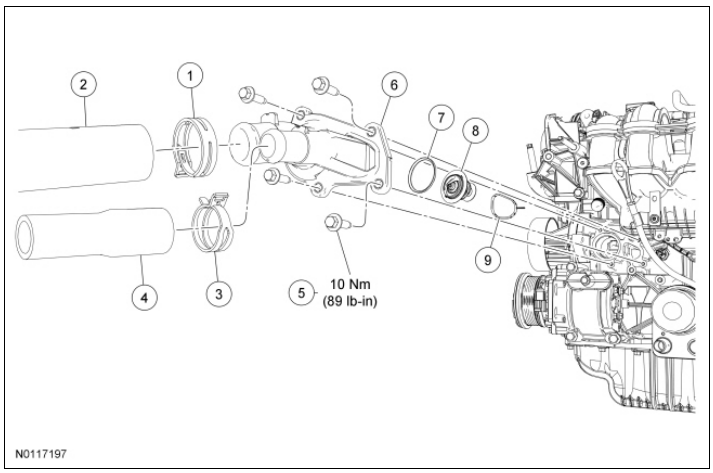
   Use cooling system Pro Flush and Fill, Flush Kit and Drain Kit to flush the cooling system.

   - Use Motorcraft® Premium Cooling System Flush. Follow the directions on the packaging.

5. Install the thermostat. For additional information, refer to Thermostat in this section.

6. Fill the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

Thermostat



Item	Part Number	Description
1	W527338	Lower radiator hose clamp
2	8286	Lower radiator hose
3	W527314	Oil cooler hose clamp
4	8K276	Oil cooler hose
5	W500214	Coolant connection bolt (4 required)
6	8592	Coolant connection
7	8255	Thermostat O-ring seal (part of 8575)
8	8575	Thermostat
9	6840	Coolant connection gasket (part of 8592)

Removal

1. Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. Remove the generator. For additional information, refer to Section 414-00 .

3. Release the clamp and disconnect the lower radiator hose from the coolant connection.

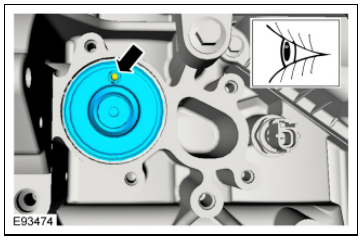
4. Release the clamp and disconnect the oil cooler hose from the coolant connection.

5. Remove the 4 bolts, the coolant connection and the gasket.
   - Discard the gasket.

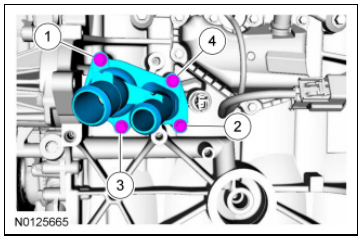
6. Remove the thermostat and the O-ring seal.
   - Discard the O-ring seal.

Installation

1. Position the thermostat and an new O-ring seal.
   - Position the thermostat with the weep hole at the 12 o'clock position.



2. Position a new gasket, the coolant connection and install the 4 bolts finger tight. Tighten the bolts in the sequence shown in 2 stages.
    - Stage 1: Tighten to 2 Nm (18 lb-in).
    - Stage 2: Tighten to 10 Nm (89 lb-in).



3. Connect the oil cooler hose to the coolant connection and position the clamp.

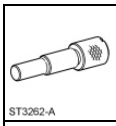
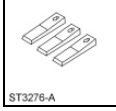
4. Connect the lower radiator hose to the coolant connection and position the clamp.

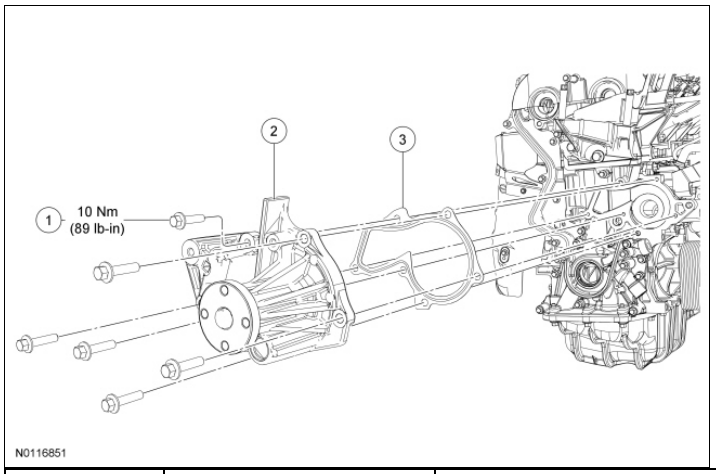
5. Install the generator. For additional information, refer to Section 414-00 .

6. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

Coolant Pump

Special Tool(s)

 ST3262-A	Pin, Crankshaft Top Dead Center (TDC) 303-748
 ST3276-A	Tool, Timing Belt Holding 303-1556



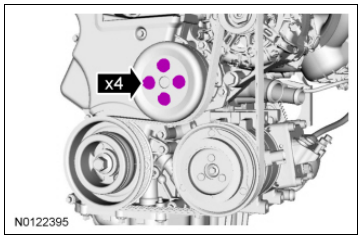
Item	Part Number	Description
1	W713043	Coolant pump bolt (6 required)
2	8501	Coolant pump
3	8507	Coolant pump gasket

Removal

All vehicles

1. Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

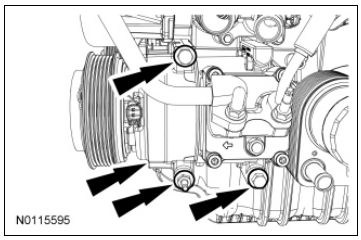
2. Loosen the 4 coolant pump pulley bolts.



3. Remove the accessory drive belt. For additional information, refer to Section 303-05 .

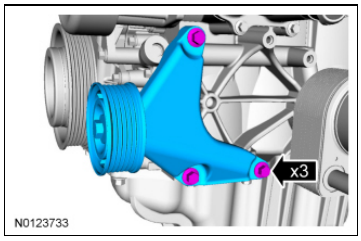
Vehicles with A/C

4. Remove the 2 bolts, the studbolt, position the A/C compressor aside and support it with a length of mechanic's wire.



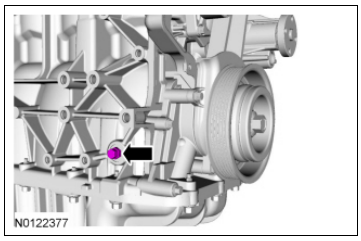
Vehicles without A/C

5. Remove the 3 bolts and the accessory drive belt idler pulley bracket.



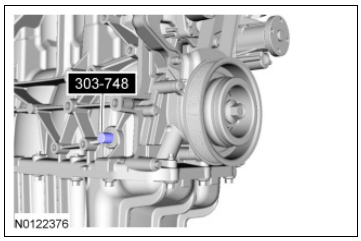
All vehicles

6. Remove the engine plug bolt.



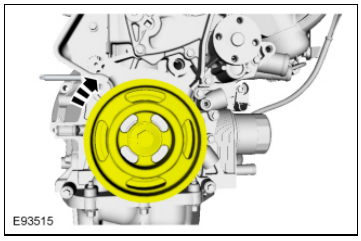
7. **NOTE:** The Crankshaft Top Dead Center (TDC) Pin will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the coolant pump removal and installation.

   Install the Crankshaft TDC Pin.



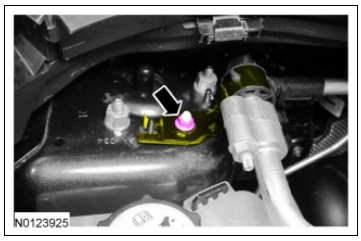
8. **NOTE:** Only rotate the crankshaft in the clockwise direction.

   Rotate the crankshaft until it stops against the Crankshaft TDC Pin.



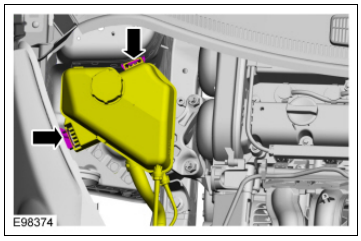
Vehicles with A/C

9. Remove the nut and position the A/C bracket aside.



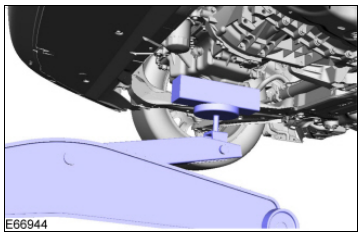
All vehicles

10. Release the 2 tabs and position the degas bottle aside.



11. ***NOTICE:*** **Use a wooden block to protect the oil pan when supporting the engine**

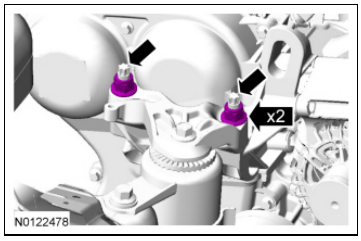
    Using a floor jack and a block of wood, support the engine.



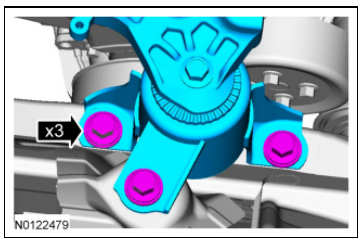
12. ***NOTICE:*** **Hold the engine mount studs while removing the engine mount nuts or the powertrain may be damaged.**

    NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.

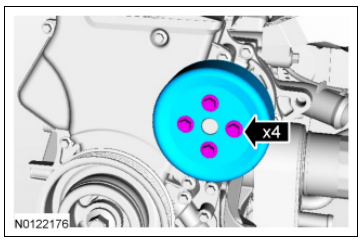
    Using the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.



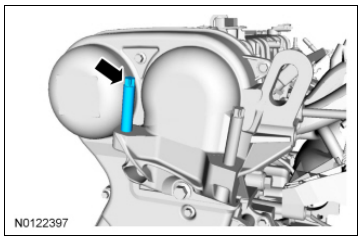
13. Remove the 3 bolts and the engine mount.



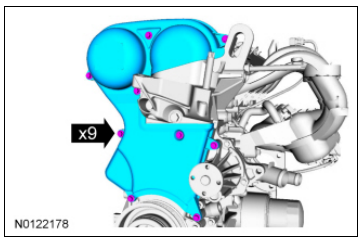
14. Remove the 4 bolts and the coolant pump pulley.



15. Remove the 1 engine mount stud.



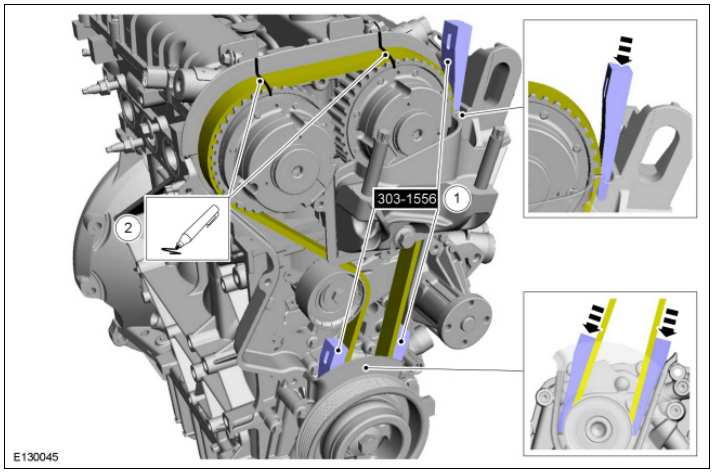
16. Remove the 9 bolts and the timing belt cover.



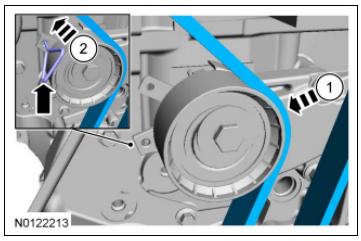
17. ***NOTICE:*** **Do not rotate the crankshaft while installing the special tool or the engine may be damaged.**

    Hold the timing belt in position.

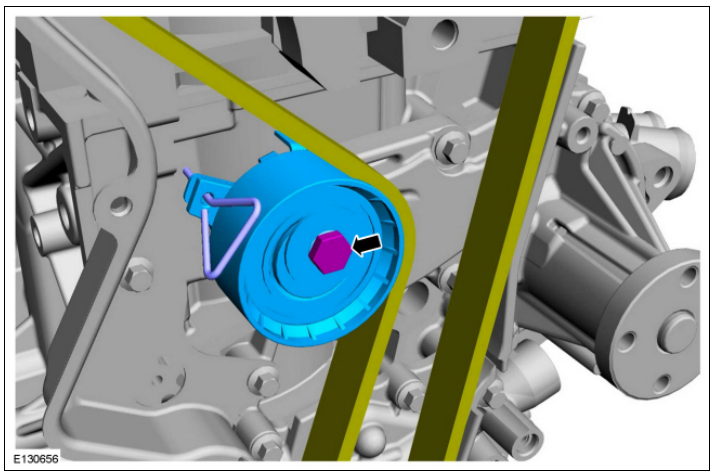
    1. Install the Timing Belt Holding Tools in 3 places as shown.
    2. Mark the position of the timing belt for assembly reference.



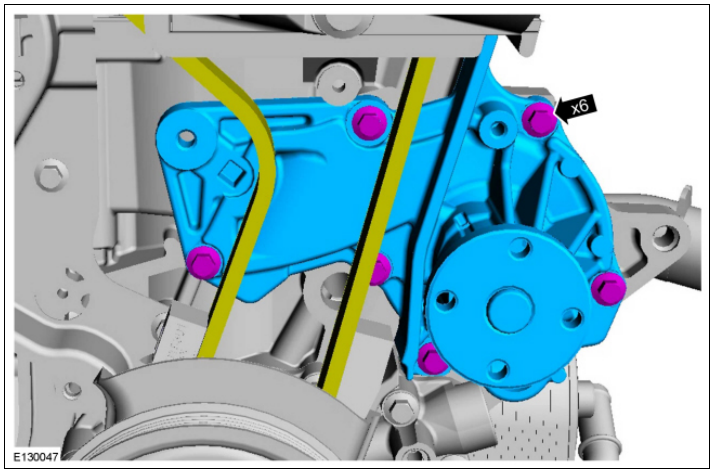
18. Release the timing belt tension.
    1. Rotate the timing belt tensioner clockwise.
    2. Align the 2 holes on the tensioner and install a small screwdriver or holding pin.



19. Remove the bolt and the timing belt tensioner.
    - Discard the bolt.



20. Remove the 6 bolts, the coolant pump and the gasket.
    - Discard the gasket.

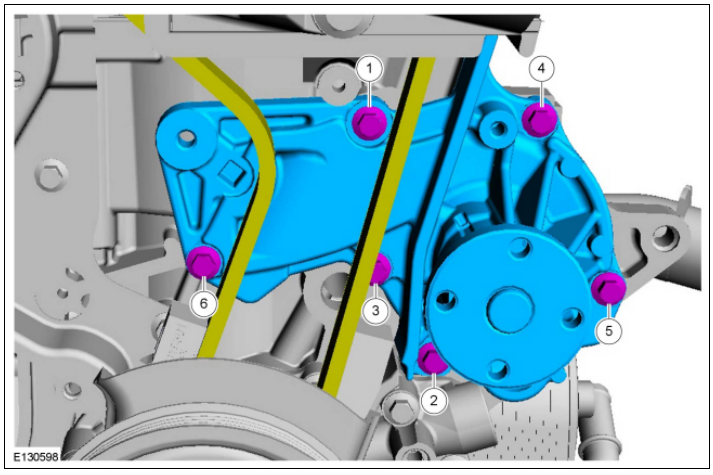


Installation

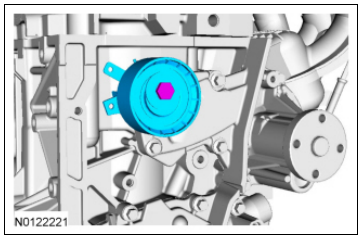
All vehicles

1. Clean the sealing surfaces with metal surface prep. Follow the directions on the packaging.

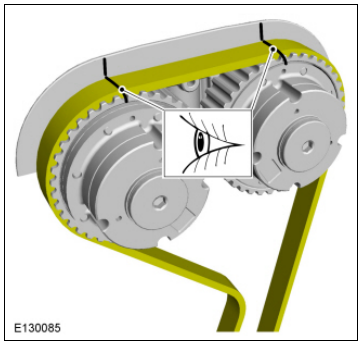
2. Install a new gasket, the coolant pump and the 6 bolts.
   - Tighten the bolts in the sequence shown to 10 Nm (89 lb-in).



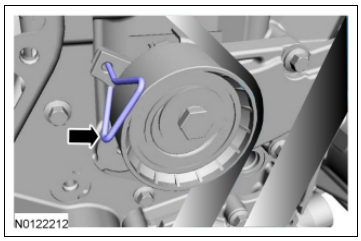
3. Position the timing belt tensioner and install a new bolt.
   - Tighten to 20 Nm (177 lb-in).



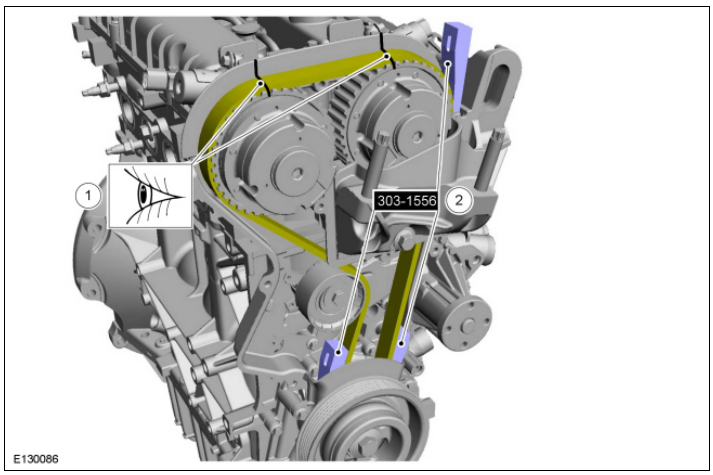
4. Make sure the timing belt is in the position noted during removal.



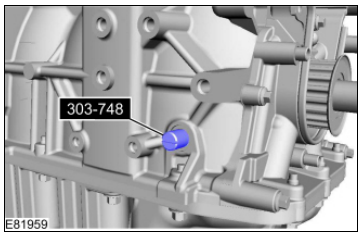
5. Remove the timing belt tensioner holding tool.



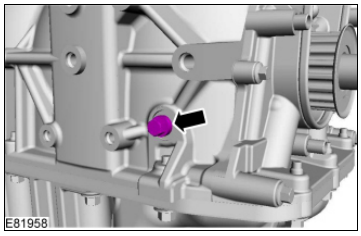
6. Remove the Timing Belt Holding Tools.
    1. Make sure the timing belt is in the position noted during removal.
    2. Remove the 3 Timing Belt Holding Tools.



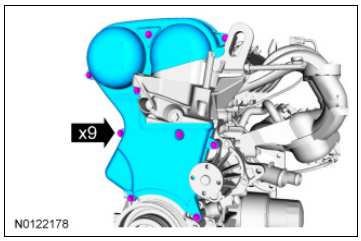
7. Remove the Crankshaft TDC Pin.



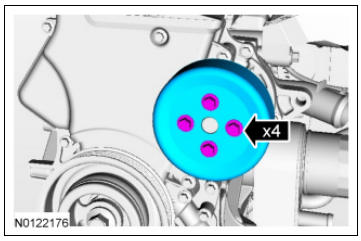
8. Install the engine plug bolt.
    - Tighten to 20 Nm (177 lb-in).



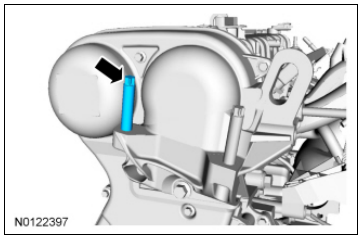
9. Position the timing belt cover and install the 9 bolts.
    - Tighten to 9 Nm (80 lb-in).



10. Position the coolant pump pulley and install the 4 bolts finger tight.



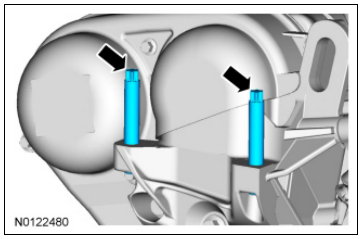
11. Install the 1 engine mount stud finger tight.



12. ***NOTICE:*** **The 2 engine mount studs must be tightened to specification or the powertrain may be damaged.**

    Tighten the 2 engine mount studs to specification before installing the engine mount nuts.

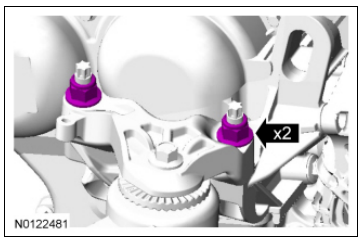
    - Tighten to 8 Nm (71 lb-in).



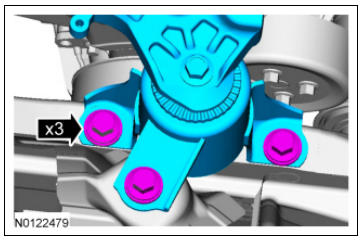
13. **NOTE:** Do not loosen the engine mount center bolt or the engine may become improperly positioned.

    Position the engine mount and install the 2 nuts.

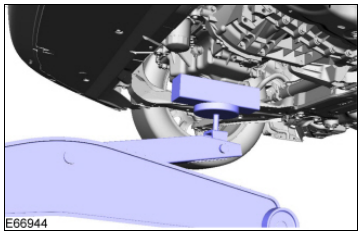
- Tighten to 80 Nm (59 lb-ft).



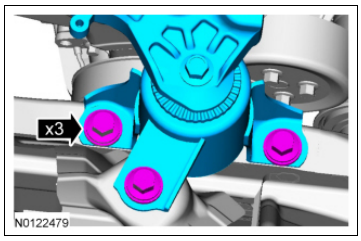
14. Install the 3 engine mount bolts finger tight.



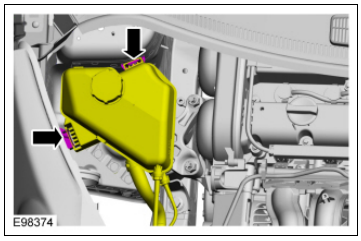
15. Remove the jack and the wood block.



16. Tighten the 3 engine mount bolts.
    - Tighten to 48 Nm (35 lb-ft).

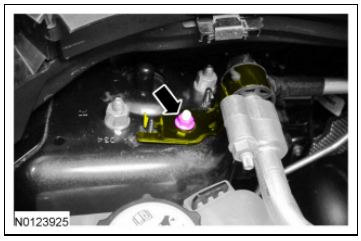


17. Install the degas bottle.

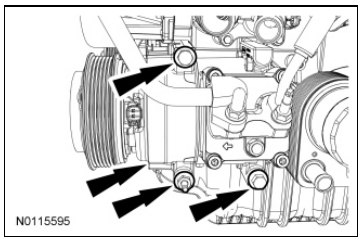


Vehicles with A/C

18. Position the A/C bracket and install the nut.
    - Tighten to 10 Nm (89 lb-in).

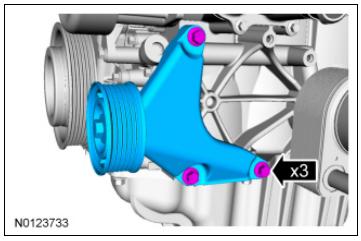


19. Position the A/C compressor and install the 2 bolts and the studbolt.
    - Tighten to 24 Nm (18 lb-ft).



Vehicles without A/C

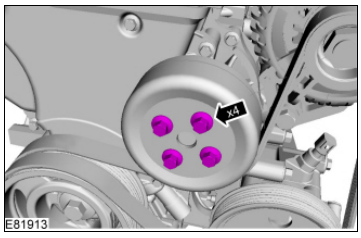
20. Position the accessory drive belt idler pulley bracket and install the 3 bolts.
    - Tighten to 24 Nm (18 lb-ft).



All vehicles

21. Install the accessory drive belt. For additional information, refer to Section 303-05 .

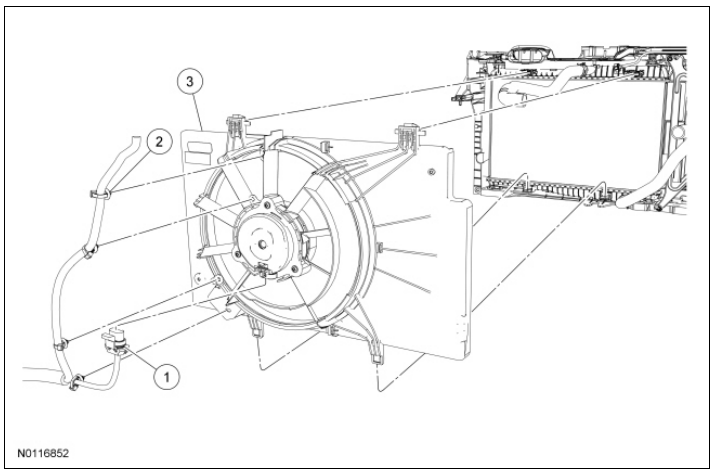
22. Tighten the 4 coolant pump pulley bolts.
    - Tighten to 20 Nm (177 lb-in).



23. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

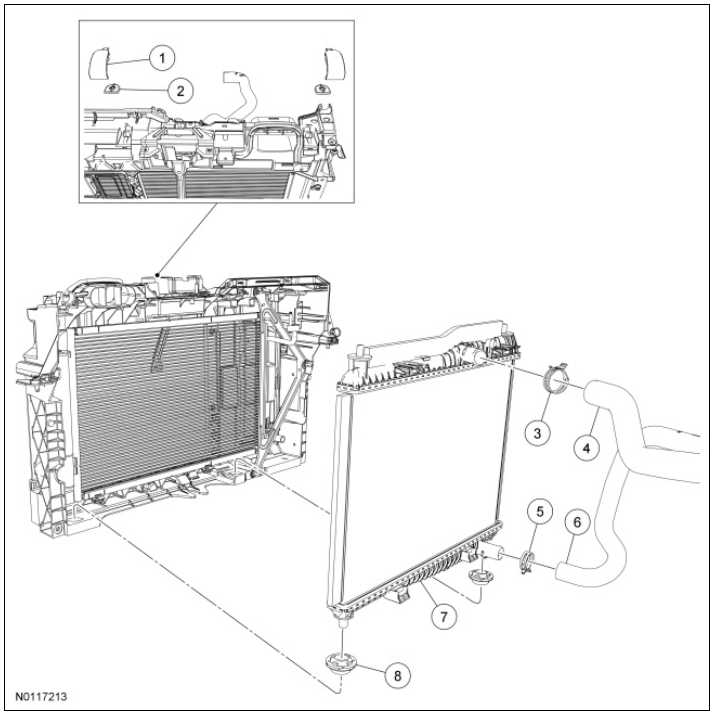
Radiator and Cooling Fan - Exploded View

Cooling Fan Motor and Shroud



Item	Part Number	Description
1	14A464	Cooling fan electrical connector (part of 14K021)
2	14A169	Cooling fan wiring harness retainer (part of 14K021)
3	8C607	Cooling fan motor and shroud

Radiator and Hoses



Item	Part Number	Description

1	8B069	Radiator mounting bracket (2 required)
2	8124A	Upper radiator insulator (2 required)
3	W527317	Upper radiator hose clamp
4	8B274	Upper radiator hose
5	W527317	Lower rtor hose clamp
6	8286	Lower radiator hose
7	8005	Radiator
8	8124B	Lower radiator insulator (2 required)

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Radiator

Removal

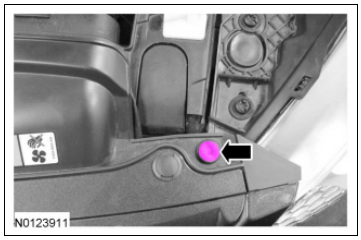
All vehicles

1. Remove the cooling fan motor and shroud. For additional information, refer to Cooling Fan Motor and Shroud in this section.

2. Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

3. Release the clamp and disconnect the upper radiator hose from the radiator.

4. Remove the trim pushpin on the LH side of the grille.



5. Remove the 2 radiator clips and the 2 rubber grommets.

Vehicles with A/C

6. Release the 2 A/C condenser condenser clips from the radiator and push the radiator up and the A/C condenser down to detach the condenser from the radiator.

All vehicles

7. Tilt the top of the radiator toward the engine, lift the radiator off the radiator supports and remove the radiator.

Installation

Vehicles with A/C

1. Position the radiator in the vehicle, slide the A/C condenser into the top slots on the radiator and clip the A/C condenser to the bottom of the radiator.

2. Position the radiator and A/C condenser assembly on the radiator supports.

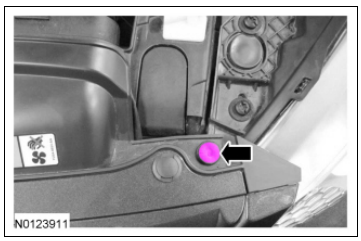
Vehicles without A/C

3. Position the radiator on the radiator supports.

All vehicles

4. Install the 2 rubber grommets and the 2 radiator clips.

5. Install the trim pushpin on the LH side of the grille.



6. Connect the upper radiator hose and position the clamp.

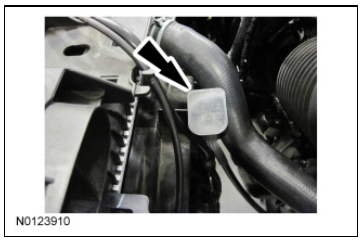
7. Install the cooling fan motor and shroud. For additional information, refer to Cooling Fan Motor and Shroud in this section.

8. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

Cooling Fan Motor and Shroud

Removal and Installation

1. Remove the air cleaner. For additional information, refer to Section 303-12 .
2. Detach the transmission vent hose from the cooling fan and shroud.


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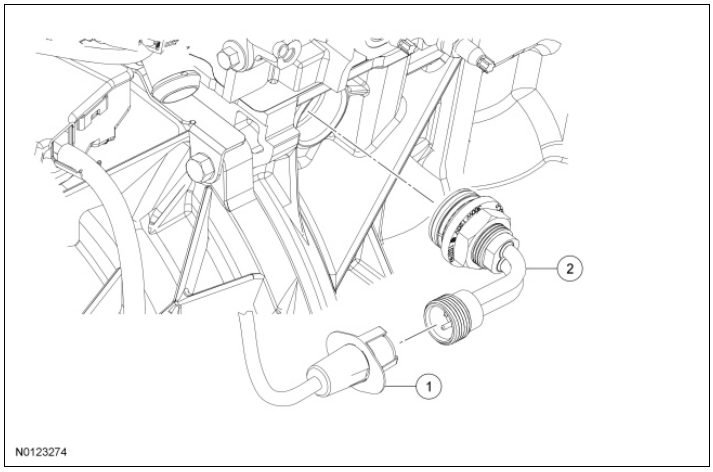
3. Detach the upper 2 wiring harness pushpins from the cooling fan shroud.
4. Release the 2 cooling fan shroud clips.
5. Detach the lower 2 wiring harness pushpins from the cooling fan shroud and disconnect the cooling fan electrical connector.
6. Remove the cooling fan and shroud.
7. To install, reverse the removal procedure.

Block Heater

Material

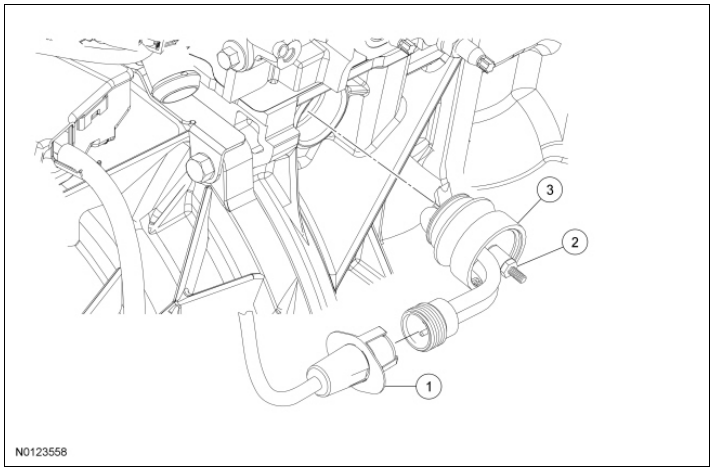
Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D

Split Ring Design



Item	Part Number	Description
1	6B018	Block heater wiring harness
2	6A051	Block heater

V-Lock Design



Item	Part Number	Description
1	6B018	Block heater wiring harness
2	-	Block heater retaining nut (part of 6A051) 3 Nm (27 lb-in)
3	6A051	Block heater

Removal

All vehicles

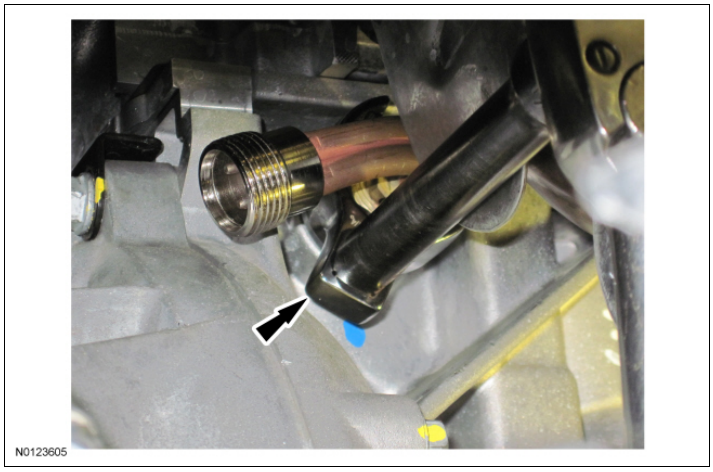
1. Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. Disconnect the block heater electrical connector.

Vehicles equipped with a split ring design block heater

3. **NOTE:** Use a 1 1/4 in, 12-point flare nut crowfoot wrench (such as Snap-on® stock number AN850820B, or equivalent) to remove the block heater.

   Remove the block heater.



Vehicles equipped with a V-lock design block heater

4. Remove the block heater retaining nut and the block heater, then remove the V-lock and the threaded rod.

Installation

NOTE: Install only a V-lock design block heater.

1. Clean the engine block mating surface with Motorcraft® Metal Surface Prep. Follow the directions on the packaging.

2. Position the block heater and finger-tighten the nut, making sure the block heater electrical connector points to the 8 o'clock position.

3. Tighten the block heater nut.
   - Tighten to 3 Nm (27 lb-in).

4. ***NOTICE:*** **Route the block heater power cable away from hot or rotating components, or the cable can be damaged.**

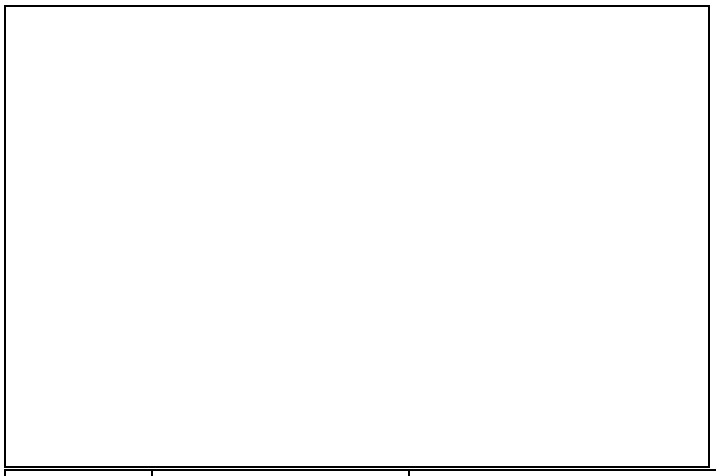
   Connect the electrical connector.

5. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

Degas Bottle

Material

Item	Specification
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D



Item	Part Number	Description
1	W520412	A/C tube bracket nut
2	19D626	A/C tube bracket
3	8100	Pressure relief cap
4	W527311	Degas bottle-to-engine hose clamp
5	8K276	Degas bottle-to-engine hose
6	8B081	Engine-to-degas bottle hose
7	8A080	Degas bottle

Removal and Installation

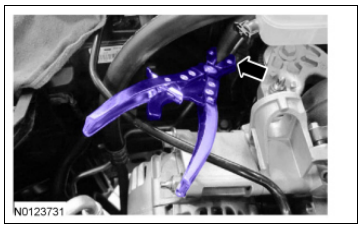
1. Remove the A/C tube bracket nut and detach the bracket from the stud.
   - To install, tighten to 10 Nm (89 lb-in).

2. ⚠ **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: During normal vehicle operation, Motorcraft Specialty Orange Engine Coolant may change color from orange to pink or light red. As long as the engine coolant is clear and uncontaminated, this color change does not indicate the engine coolant has degraded nor does it require the engine coolant to be drained, the system to be flushed, or the engine coolant to be replaced.

Release the pressure in the cooling system by slowly turning the pressure relief cap one half turn counterclockwise. When the pressure has been released, remove the pressure relief cap.

3. Using hose pinch pliers, clamp the degas bottle-to-engine hose.



4. Using a suitable suction device, siphon the coolant from the degas bottle.

5. Squeeze the tabs and disconnect the engine-to-degas bottle hose.

6. Release the 2 clips and lift the degas bottle hose to access the degas bottle-to-engine hose.

7. Release the clamp, disconnect the degas bottle-to-engine hose and remove the degas bottle.

8. To install, reverse the removal procedure.

9. Fill the degas bottle with a 50/50 mixture of Motorcraft® Specialty Orange Engine Coolant and distilled water.

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	-

Torque Specifications

Description	Nm	lb-in
Fuel Pump (FP) control module nuts	5	44
Fuel rail bolts	11	97
Throttle Body (TB) bolts	8	71

&nb

Fuel Charging and Controls

Sequential Multi-Port Fuel Injection (SFI)

System Overview

⚠ 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.

The fuel charging and controls system is:

- a Sequential Multi-Port Fuel Injection (SFI) system.
- Pulse Width Modulated (PWM).
- Mass Air Flow (MAF) sensor controlled.

Component List

The fuel charging and controls system consists of the:

- Throttle Body (TB)
- fuel injectors
- Fuel Pump (FP) control module

System Components

Throttle Body (TB)

The TB :

- controls air supply to the intake manifold by electronically positioning the throttle plate.
- is not adjustable.
- cannot be cleaned.

Fuel Injectors

The fuel injectors:

NOTICE: **Handle the fuel injectors and fuel rail with extreme care to prevent damage to sealing areas and sensitive fuel-metering orifices.**

- are electronically operated by the PCM.
- atomize the fuel as the fuel is delivered.
- each have an internal solenoid that opens a needle valve, injecting fuel into the intake port in the cylinder head.
- are deposit resistant.

Fuel Rail

The fuel rail receives fuel from the fuel supply tube and delivers fuel to the fuel injectors

NOTICE: **Handle the fuel injectors and fuel rail with extreme care to prevent damage to sealing areas and sensitive fuel-metering orifices.**

Fuel Pump (FP) Control Module

The FP control module is electronically operated by the PCM and controls voltage to the FP depending on engine load.

System Operation

Fuel is metered into each intake port in a sequential firing order. Fuel injectors pulse to follow engine firing order, in accordance with engine demand on a tuned intake manifold.

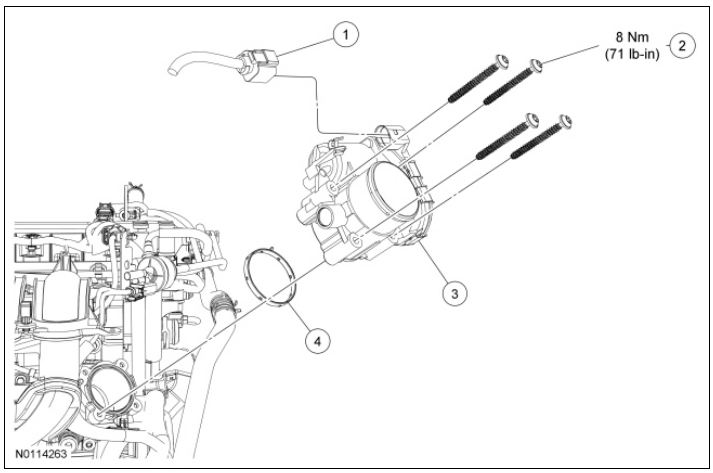
The basic fuel requirement of the engine is determined from the data supplied to the PCM by the MAF sensor. The MAF sensor measures the amount of air being drawn into the engine.

The various sensors detect any changes in the operating conditions and send signals to the PCM. This permits the PCM to control the opening duration (pulse width) of the fuel injectors and maintain optimum exhaust emission control and engine performance for all operating conditions.

Fuel Charging and Controls

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Throttle Body



Item	Part Number	Description
1	-	Electronic throttle control electrical connector (part of 12A581)
2	W708972	Throttle Body (TB) bolt (4 required)
3	9E926	TB
4	9E936	TB gasket

Removal and Installation

1. Remove the Air Cleaner (ACL) outlet pipe. ditional information, refer to Section 303-12 .

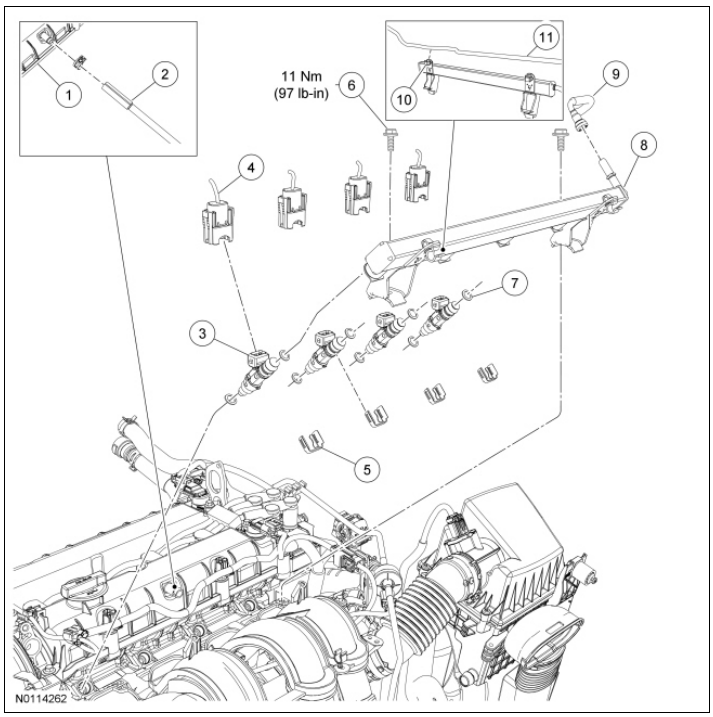
2. Disconnect the electronic throttle control electrical connector.

3. Remove the 4 bolts and the Throttle Body (TB).
   - Remove and discard the TB gasket.
   - To install, tighten to 8 Nm (71 lb-in).

4. To install, reverse the removal procedure.
   - Install a new TB gasket.

5. If the TB was replaced, turn the key ON without cranking the engine for 1 minute to allow the PCM to learn the adaptive table values for the new TB .

Fuel Rail and Fuel Injector - Exploded View



Item	Part Number	Description
1	6582	Valve cover
2	6A664	Valve cover vent hose
3	9F593	Fuel injector (4 required)
4	-	Fuel injector electrical connector (4 required) (part of 12A581)
5	9C995	Fuel injector clip (4 required)
6	W704043	Fuel rail bolt (2 required)
7	9229	Fuel injector O-ring seals (2 required per injector)
9D280	Fuel rail	
9	-	Fuel tube-to-fuel rail spring lock coupling (part of 9L291)
10	00817	Degas bottle vent hose clip
11	8B081	Degas bottle vent hose

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Fuel Rail

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: 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: 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.

⚠ 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.

NOTE: Refer to the on-line Workshop Manual to view this illustration as an interactive exploded view, requires Adobe® Acrobat® 8.0 or higher.

NOTE: Refer to the on-line Workshop Manual to learn about using an Interactive Illustration.

1. 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 4-01 .
3. Disconnect the valve cover vent hose from the valve cover and position the hose out of the way.
4. Disconnect the degas bottle vent hose from the two clips on the fuel rail.

5. Disconnect the fuel tube-to-fuel rail spring lock coupling. For additional information, refer to Section 310-00 .

6. Disconnect the 4 fuel injector electrical connectors.

7. Remove the 2 bolts, the fuel rail and the 4 injectors.
   - To install, tighten to 11 Nm (97 lb-in).

8. ***NOTICE:*** **Use O-ring seals that are made of special fuel resistant material. Use of ordinary O-rings can cause the fuel system to leak. Do not reuse the O-ring seals.**

   Remove the fuel injector retaining clips and the fuel injectors.

   - Remove and discard the O-ring seals.

9. **NOTE:** Install new O-ring seals and lubricate them with clean engine oil.

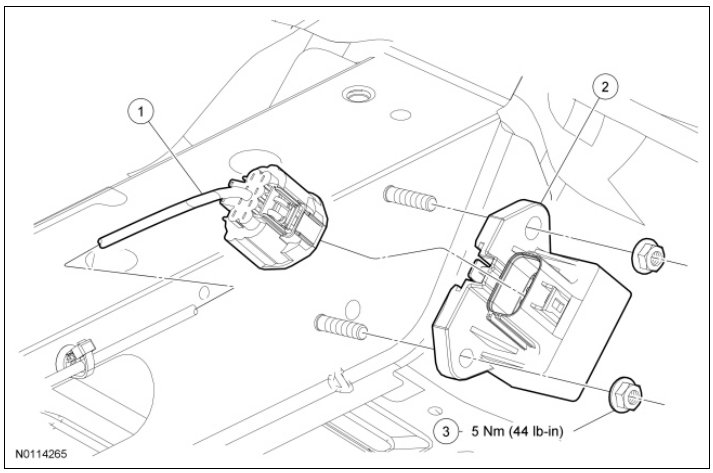
   To install, reverse the removal procedure.

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 Control Module



Item	Part Number	Description
1	-	Fuel Pump (FP) control module electrical connector (part of 14A005)
2	9D370	FP control module
3	W711330	FP control module nut (2 required)

Removal and Installation

1. Remove the LH front seat. For additional information, refer to Section 501-10 .
2. Remove the scuff plate trim panel and the cowl side trim panel. For additional information, refer to Section 501-05 .
3. **NOTE:** The Fuel Pump (FP) control module is located on the rear surface of the LH front seat mount.

   Disconnect the FP control module electrical connector.
4. ***NOTICE:*** **Do not overtighten the fasteners or damage to the module may occur.**

   Remove the 2 FP control module nuts.

   - To install, tighten to 5 Nm (44 lb-in).
5. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-ft	lb-in
Accessory drive belt idler pulley bolt (without A/C only)	24	18	-
Accessory drive belt idler pulley bracket bolt (without A/C only)	24	18	-
Accessory drive belt splash shield bolts	9	-	80

Accessory Drive

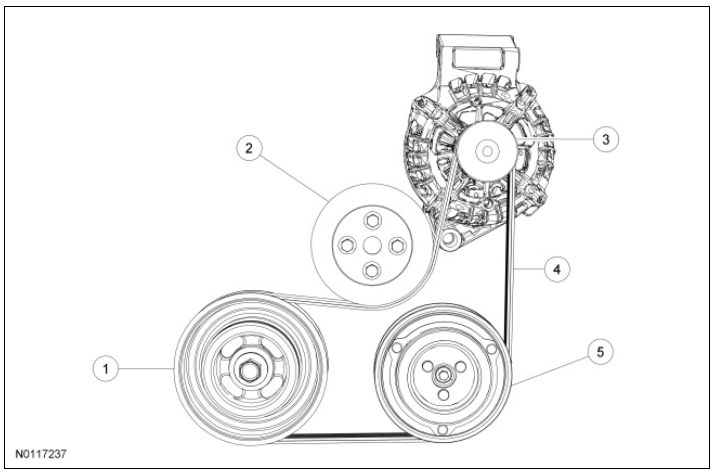
The accessory drive:

- has a single serpentine drive belt with 6 ribs.
- is not adjustable.

The accessory drive system provides power to operate components which power other systems. These could include components such as the generator 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. 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.

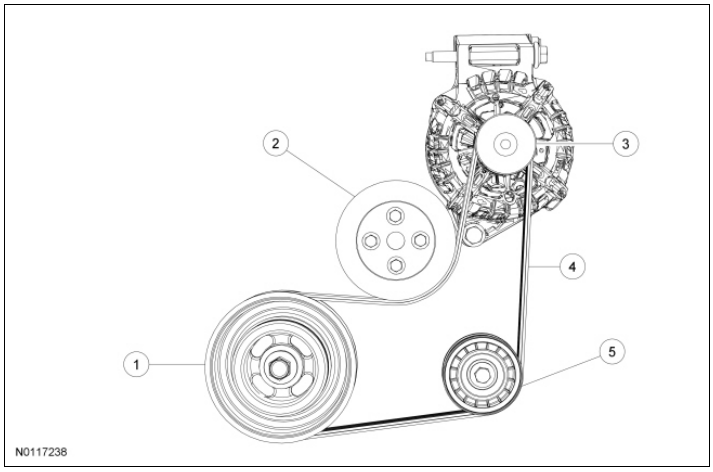
Accessory Drive Belt Routing

With A/C



Item	Part Number	Description
1	6316	Crankshaft pulley
2	8509	Coolant pump pulley
3	10344	Generator pulley
4	6C301	Accessory drive belt
5	19D784	A/C compressor pulley

Without A/C



Item	Part Number	Description
1	6316	Crankshaft pulley
2	8509	Coolant pump pulley
3	10344	Generator pulley
4	6C301	Accessory drive belt
5	6C344	Accessory drive belt Idler pulley

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.

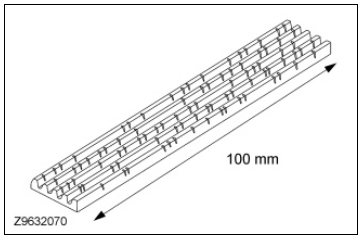
Visual Inspection Chart

Mechanical
• Drive belt cracking/chunking/wear • Belt/pulley contamination • Incorrect accessory drive belt • Incorrectly routed accessory drive belt • Pulley misalignment or excessive pulley runout • Loose or mislocated hardware • Loose accessory drive belt • Damaged pulleys

3. 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.

4. If a concern is found, correct the condition before proceeding to the next step.

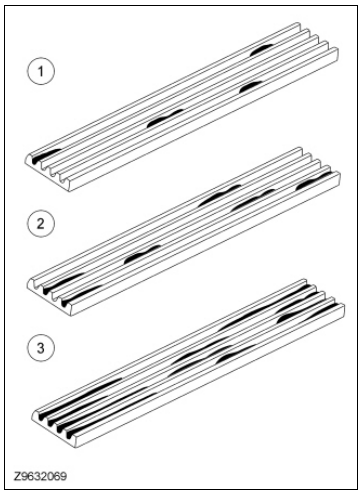
V-Ribbed Serpentine Drive Belt With Cracks Across Ribs



5. 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.

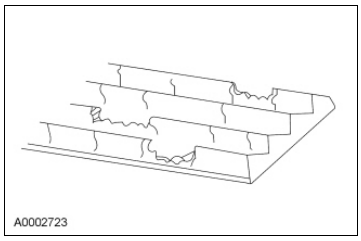
V-Ribbed Serpentine Belt With Piling

NOTE: Piling is an excessive buildup in the V-grooves of the belt.



6. 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



7. There should be no chunks missing from the belt ribs. If the belt shows any evidence of this, install a new accessory drive belt.

8. 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 oressing 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:

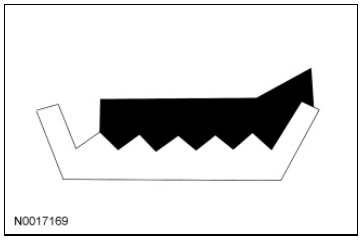
- if the A/C discharge pressure goes above specifications:
    - ♦ the A/C system is overcharged.
    - ♦ the A/C condenser core airflow is blocked.
    - ♦ the A/C anti-slugging strategy executes after a long hot heat soak.
- if the A/C off equalized pressure (the common discharged and suction pressure 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.
- Install a new accessory drive belt if the drive belt is worn or damaged.

Drive Belt - Incorrect Installation

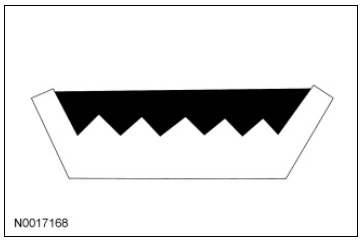
NOTICE: **Incorrect accessory drive belt installation will cause excessive drive belt wear and may cause the drive belt to come off the pulleys.**

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



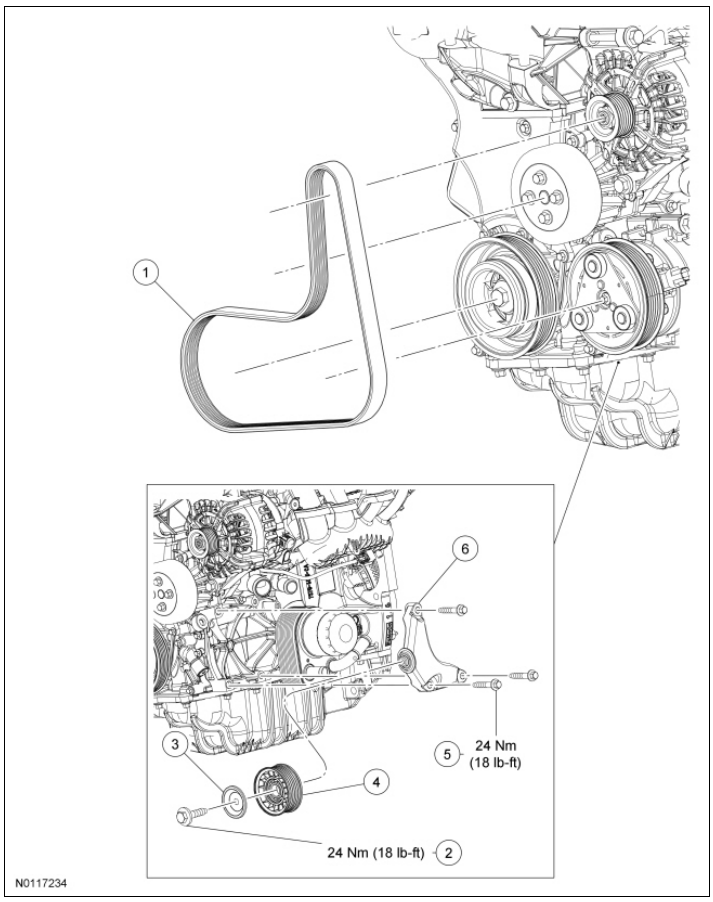
Correct Installation



With the engine running, check accessory drive belt tracking on all pulys. 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.

Front End Accessory Drive (FEAD) - Exploded View



Item	Part Number	Description
1	6C301	Accessory drive belt
2	W709601	Accessory drive belt idler pulley (without A/C only)
3	8687	Accessory drive belt idler pulley washer (without A/C only)
4	6C344	Accessory drive belt idler pulley (without A/C only)
5	W500311	Accessory drive belt idler pulley bracket bolt (without A/C only) (3 required)
6	8680	Accessory drive belt idler pulley bracket (without A/C only)

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

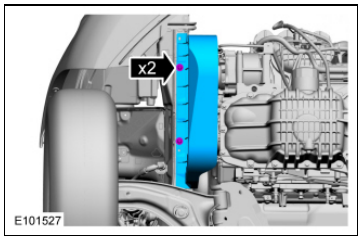
Accessory Drive Belt

Removal

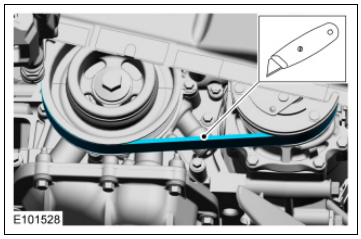
NOTICE: **Under no circumstances should the accessory drive belt, tensioner or pulleys be lubricated as potential damage to the belt material and tensioner damping mechanism will occur. Do not apply any fluids or belt dressing to the accessory drive belt or pulleys.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the 2 bolts and the accessory drive belt splash shield.



3. Cut and discard accessory drive belt.

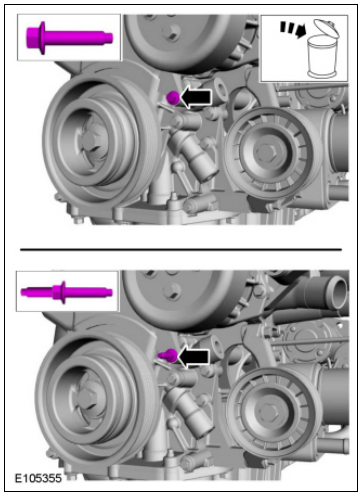


Installation

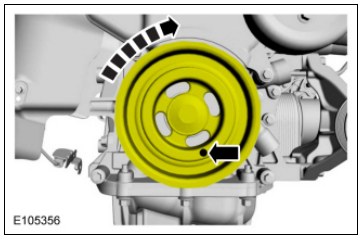
NOTICE: **Under no circumstances should the accessory drive belt, tensioner or pulleys be lubricated as potential damage to the belt material and tensioner damping mechanism will occur. Do not apply any fluids or belt dressing to the accessory drive belt or pulleys.**

NOTICE: **Only rotate the crankshaft clockwise or damage to the engine can occur.**

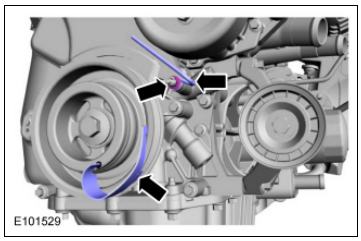
1. Remove and discard the bolt. Install the stud bolt supplied with the new accessory drive belt.
    - Tighten the stud bolt to 9 Nm (80 lb-in).



2. Rotate the crankshaft clockwise until the designated hole is at the 5 o'clock position.

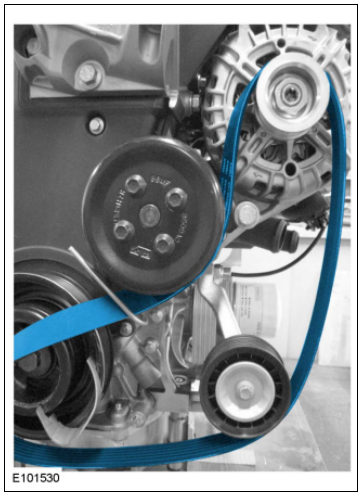


3. Install the tools supplied with the new accessory drive belt as shown.
    - Install the supplied nut finger tight.



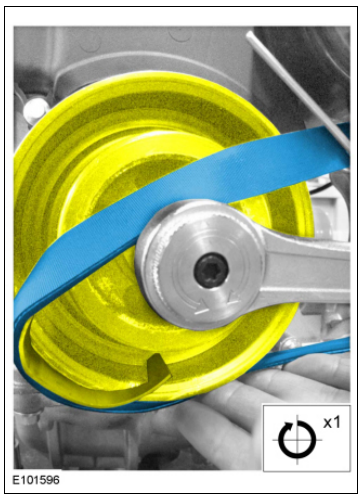
4. **NOTE:** Without A/C shown, with A/C similar.

    Position the accessory drive belt onto the coolant pump, generator and idler pulleys as shown.

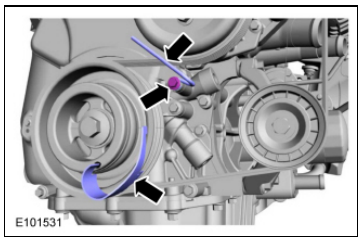


5. **NOTE:** After installation, verify the accessory drive belt is correctly seated on all of the pulleys.

Rotate the crankshaft clockwise 1 full rotation.

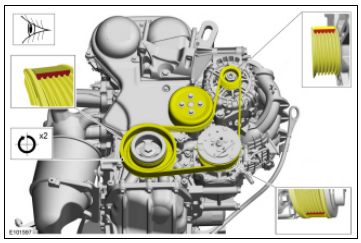


6. Remove the nut and the special tools. Leave the stud bolt installed.

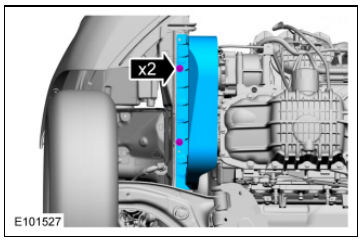


7. **NOTE:** With A/C shown, without A/C similar.

Verify the accessory drive belt is correctly seated on all of the pulleys.



8. Position the accessory drive belt splash shield and install the 2 bolts.
   - Tighten to 9 Nm (80 lb-in).



Torque Specifications

Description	Nm	lb-ft	lb-in
Starter motor bolts	48	35	-
Starter motor solenoid battery cable nut	10	-	89
Starter motor solenoid wire nut	10	-	89

Starting System

The starting system consists of the following:

Without Intelligent Access

- Battery
- Battery cables
- Ignition switch
- Starter motor
- Starter relay (located in the Battery Junction Box (BJB)
- PCM (located in the engine compartment attached to the battery tray)
- Transmission Range (TR) sensor (automatic transaxle-equipped vehicles) (located on the transaxle)
- Clutch Pedal Position (CPP) switch (manual transmission-equipped vehicles) (located on the clutch pedal)
- Transmission Control Module (TCM) (located on the transaxle)
- Integrated Keyhead Transmitters (IKTs)

With Intelligent Access

- Battery
- Battery cables
- Start/stop switch
- Starter motor
- Starter relay (located in the BJB
- PCM (located in the engine compartment attached to the battery tray)
- Brake pedal switch (automatic transaxle)
- TR sensor (automatic transaxle-equipped vehicles) (located on the transaxle)
- CPP switch (manual transmission-equipped vehicles) (located on the clutch pedal)
- TCM (located on the transaxle)
- Intelligent Access (IA) key
- Remote Function Actuator (RFA) module

Starting System

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST3094-A	Test Light SGT27000 or equivalent 250-300 mA incandescent bulb test lamp
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Principles of Operation - Without Intelligent Access (IA)

NOTE: This vehicle is equipped with Passive Anti-Theft System (PATS) that disables the engine if an unprogrammed PATS key is used or an invalid PCM ID is received. PATS is controlled by the Instrument Panel Cluster (IPC). If there is a PATS concern that caused the engine to be disabled, the anti-theft light flashes rapidly in the IPC . Refer to Section 419-01B to diagnose a PATS concern.

The starting system is electronically controlled by the PCM. The PCM receives the following inputs:

- Correctly coded ignition key from the IPC
- Clutch pedal applied from the Clutch Pedal Position (CPP) switch (vehicles equipped with manual transaxle)
- Transaxle in PARK or NEUTRAL from the Transmission Range (TR)ensor (vehicles equipped with automatic transaxle)
- Request to start the engine, ignition switch in the START position

Under normal operation when the ignition is turned to the START position the IPC generates a key verification message. It sends this message to the PATS transceiver. The transceiver reads the key and sends a key verification message back to the IPC . If the message received does not match the key verified in the IPC memory, the engine will not crank and start. Once the IPC determines the correct programmed key was used to START the vehicle, the IPC sends the PCM a request to crank and start the engine. When the PCM receives the message, it generates a response and sends it back to the IPC . If the response from the PCM does not match the response in the IPC memory, PATS is not enabled and the engine does not crank. If both the key verification and PCM ID pass, PATS is enabled. The PCM recognizes the correct electronically coded passive key and provides voltage and ground to the starter relay coil. The starter relay coil is energized causing the relay contacts to close providing voltage to the starter solenoid, allowing the starter motor to crank and start the engine. The PCM disengages the starter once an engine rpm threshold is reached, a set crank time is exceeded or the ignition is turned OFF. For additional information, refer to Section 419-01B .

Vehicles equipped with an automatic transaxle have a TR sensor. The TR sensor prevents operation of the starter unless the transaxle is in NEUTRAL or PARK.

Vehicles equipped a manual transaxle have a CPP switch. The CPP switch prevents operation of the starter unless the clutch pedal is fully pressed.

Principles of Operation - With Intelligent Access (IA)

NOTE: This vehicle is equipped with Passive Anti-Theft System (PATS) that disables the engine if an unprogrammed PATS key is used or an invalid PCM ID is received. PATS is controlled by the Remote Function Actuator (RFA) module. If there is a PATS concern that caused the engine to be disabled, the anti-theft light flashes rapidly in the Instrument Panel Cluster (IPC). Refer to Section 419-01B to diagnose a PATS concern.

The Intelligent Access (IA) starting system is electronically controlled by the RFA module which acts as the PATS control function. The RFA module receives the following inputs:

- Correctly coded ignition key from PATS
- Clutch pedal applied input from the Clutch Pedal Position (CPP) switch (vehicles equipped with manual transaxle)
- Transaxle in PARK or NEUTRAL from the Transmission Control Module (TCM) (vehicles equipped with automatic transaxle)
- Request to start the engine, start/stop switch is pushed
- Brake pedal applied input (automatic transaxle)

During a start event, the start/stop button is pushed in combination with either the brake or clutch pedal input. The RFA module receives a request to start the engine. The RFA module recognizes the correct electronically coded passive key and provides voltage to the starter relay coil and signals the PCM. The PCM recognizes the correct inputs and provides ground to energize the relay coil and close the relay contacts. The starter relay contacts close, providing voltage to the starter solenoid, allowing the starter to crank and start the engine. The PCM disengages the starter once an engine rpm threshold is reached, a set crank time is exceeded or the stop/start button is pressed indicating an engine shutdown request.

Vehicles equipped with an automatic transaxle have a TR sensor. The TR sensor prevents operation of the starter unless the transaxle is in NEUTRAL or PARK.

Vehicles equipped a manual transaxle have a CPP switch. The CPP switch prevents operation of the starter unless the clutch pedal is fully pressed.

Inspection and Verification

⚠ 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: Make sure the anti-theft system is functioning correctly before carrying out a logical starting system diagnosis. Address anti-theft system concerns before continuing. Refer to Section 419-01B .

1. Verify the customer concern.

2. Remove the accessory drive belt. Refer to Section 303-05 . Verify the crankshaft and each of the

components driven by the accessory drive belt rotate and are not seized or damaged.

3. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Starter motor • Starter motor bolts • IA key (with Intelligent access) • Start/stop button (with IA)	• Battery • Battery cables • High-current Battery Junction Box (BJB) mega fuse 1 (450A) • BJB fuse 11(30A) • Wiring, terminals or connectors • Starter relay • PATS • Loose or corroded connections

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

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. For vehicles **without Intelligent Access,** 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. For vehicles **with Intelligent Access,** if the scan tool does not communicate with the vehicle:
   - verify the ignition is in the ON mode.
     - ♦ 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.
   - 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, proceed with module self-test diagnostics.

10. Carry out the self-test diagnostics for the Transmission Control Module (TCM) (if equipped), RFA module (if equipped) and the PCM.

11. If the DTCs retrieved are related to the concern, go to DTC Charts.

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

DTC Chart

PCM DTC Chart

DTC	Description	Action
P0617:12	Starter Relay Circuit High: Circuit Short To Battery	GO to Pinpoint Test C .
P0850:00	Park / Neutral Switch Input Circuit: No Sub Type Information	For vehicles without Intelligent Access (IA), GO to Pinpoint Test A . For vehicles with IA , GO to Pinpoint Test B .
P0851:00	Park / Neutral Switch Input Circuit Low: No Sub Type Information	For vehicles without IA , GO to Pinpoint Test A . For vehicles with IA , GO to Pinpoint Test B .
All other DTCs	-	REFER to Section 303-14 .

Transmission Control Module (TCM) DTC Chart

DTC	Description	Action
P0706:00	Transmission Range Sensor A Circuit Range/Performance: No Sub Type Information	REFER to Section 307-11 .
P0707:00	Transmission Range Sensor A Circuit Low: No Sub Type Information	REFER to Section 307-11 .
P0708:00	Transmission Range Sensor A Circuit High: No Sub Type Information	REFER to Section 307-11 .
P0709:00	Transmission Range Sensor A Circuit Intermittent: No Sub Type Information	REFER to Section 307-11 .
P2801:00	Transmission Range Sensor B Circuit Range/Performance: No Sub Type Information	REFER to Section 307-11 .
P2802:00	Transmission Range Sensor B Circuit Low: No Sub Type Information	REFER to Section 307-11 .
P2803:00	Transmission Range Sensor B Circuit High: No Sub Type Information	REFER to Section 307-11 .
P2804:00	Transmission Range Sensor B Circuit Intermittent: No Sub Type Information	REFER to Section 307-11 .
	-	

All other DTCs		REFER to Section 307-11

Remote Function Actuator (RFA) Module DTC Chart

Description	Action	
P0615:12	Starter Relay Circuit: Circuit Short to Battery	GO to Pinpoint Test C .
P1708:62	Clutch Switch Circuit: Signal Compare Failure	GO to Pinpoint Test B .
P1571:62	Brake Switch: Signal Compare Failure	GO to Pinpoint Test D .
All other DTCs	-	REFER to Section 419-01B .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: The Engine Does Not Crank - Without Intelligent Access

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

Normal Operation

Under normal operation the ignition switch is turned to the START position, the PCM receives a request to start the engine. The PCM receives a signal from theTransmission Control Module (TCM) that the vehicle is in PARK or NEUTRAL as determined by the TR sensor (vehicles equipped with an automatic transaxle) or from the Clutch Pedal Position (CPP) switch indicating the clutch pedal is fully pressed (vehicles equipped with manual transaxle). The PCM supplies voltage and ground to energize the starter relay coil. The energized coil causes the starter relay contacts to close. This allows voltage to be supplied from Batte Junction Box (BJB) fuse 11 (30A) to the starter solenoid. The starter solenoid is grounded at the starter. Energizing the starter solenoid closes the solenoid contacts allowing voltage directly from the battery to the starter, engaging the starter drive into the ring gear causing the engine to crank and start. The PCM disengages the starter once an engine rpm threshold is reached, a set crank time is exceeded or the ignition is turned OFF.

- DTC P0850:00 (Park/Neutral Switch Input Circuit: No Sub Type Information) - sets when the message from the P/N_SW CLUTCH 2 circuit is invalid causing a mismatch with the High Speed Controller Area Network (HS-CAN) message from the TCM .
- DTC P0851:00 (Park/Neutral Switch Input Circuit Low: No Sub Type Information) - sets when the PCM detects a short to ground on the P/N_SW/CLUTCH 2 circuit.

This pinpoint test is intended to diagnose the following:

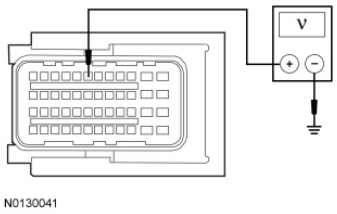
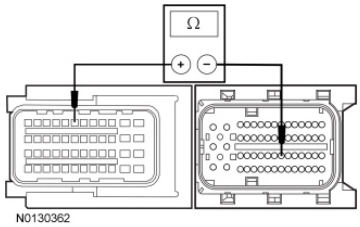
- Battery
- Battery cables
- Passive Anti-Theft System (PATS)
- Ignition switch

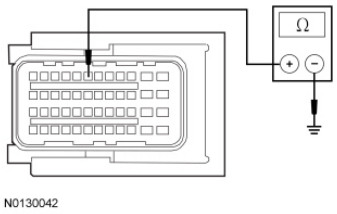
- Fuse
- Starter motor
- Starter relay
- Wiring, terminals or connectors
- PCM
- TCM (automatic transaxle)
- Clutch Pedal Position (CPP) switch (manual transaxle only)

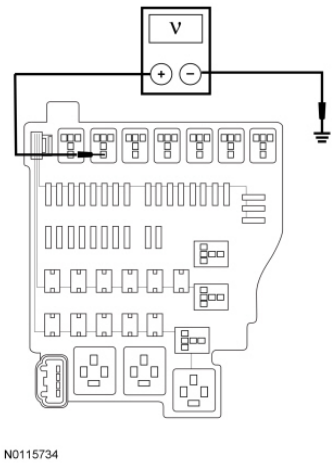
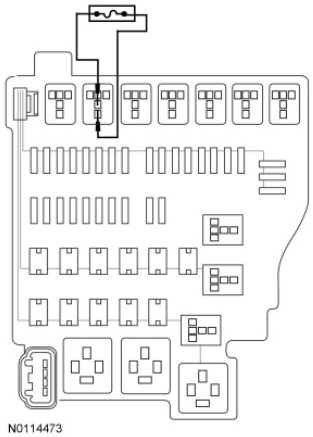
PINPOINT TEST A: THE ENGINE DOES NOT CRANK - WITHOUT INTELLIGENT ACCESS

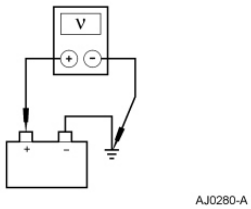
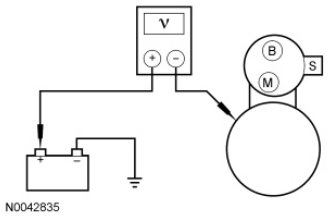
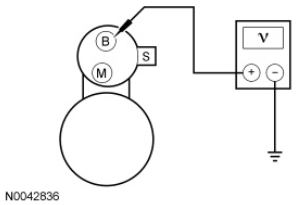
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

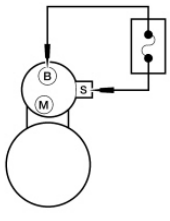
Test Step	Result / Action to Take
A1 CHECK THE BATTERY	
• Check the battery condition and state of charge. Refer to Diagnosis and Testing in Section 414-01 . • **Is the battery OK?**	**Yes** GO to A2 . **No** CHARGE or INSTALL a new battery as necessary. REFER to Section 414-01 . TEST the system for normal operation.
A2 RETRIEVE DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM - Self-Test. • Enter the following diagnostic mode on the scan tool: IPC - Self-Test. • Enter the following diagnostic mode on the scan tool: TCM - Self-Test. • **Were DTCs retrieved on-demand during self-test?**	**Yes** For IPC DTCs, REFER to Section 413-01 . For all TCM DTCs, REFER to Section 307-11 . For PCM DTC P0617:12, GO to Pinpoint Test C . For PCM DTC P0850:00, GO to A4 . For DTC P0851:00, GO to A7 . For all other PCM DTCs, REFER to Section 303-14 . **No** For automatic transaxle, GO to A3 . For manual transaxle, GO to A9 .
A3 CHECK THE PCM TRANSMISSION PARK OR NEUTRAL RANGE SWITCH (TRP/N) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger - PCM. • While observing the TRP/N PID, place the gear selector in NEUTRAL and then PARK. • **Does the PID indicate YES with the gear selector in NEUTRAL or PARK?**	**Yes** GO to A10 . **No** GO to A4 .
A4 CHECK THE P/N_SW/CLUTCH 2 CIRCUIT FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: PCM C175B. • Disconnect: TCM C1750A. • Ignition ON. • Measure the voltage between PCM C175B-7, circuit CE903 (BU/OG), harness side and ground.  N0130041 • **Is any voltage present?**	**Yes** REPAIR circuit CE903 (BU/OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to A5 .
A5 CHECK THE P/N_SW/CLUTCH 2 CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between PCM C175B-7, circuit CE903 (BU/OG), harness side and TCM C1750A-39, circuit CE903 (BU/OG), harness side.  N0130362 • **Is the resistance less than 5 ohms?**	**Yes** GO to A6 . **No** REPAIR circuit CE903 (BU/OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A6 CHECK THE TCM TRANSMISSION RANGE INPUT ALLOWING ENGINE START (TR_CRANK) AND PCM TRANSMISSION PARK OR NEUTRAL RANGE SWITCH (TRP/N) PIDs	
• Connect: PCM C175B. • Connect: TCM C1750A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - TCM . • While observing the TR_CRANK PID, place the gear selector in NEUTRAL and then PARK. • Enter the following diagnostic mode on the scan tool: DataLogger - PCM. • While observing the TRP/N PID, place the gear selector in NEUTRAL and then PARK. • **Do the PIDs indicate YES with the gear selector position in NEUTRAL or PARK?**	**Yes** 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. TEST the system for normal operation. **No** If the concern is with TRP/N PID, INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. If the concern is with TR_CRANK PID, INSTALL a new TCM . REFER to

	Section 307-11 . TEST the system for normal operation.
A7 CHECK FOR DTC WITH TCM DISCONNECTED	
A8 CHECK THE P/N_SWITCH CLUTCH 2 CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: PCM C175B. • Measure the resistance between PCM C175B-7, circuit CE903 (BU/OG), harness side and ground.  N0130042 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. **No** REPAIR circuit CE903 (BU/OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A9 CHECK THE PCM CLUTCH PEDAL AT OR NEAR BOTTOM OF TRAVEL (CPP_BOT) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger - PCM. • While observing the CPP_BOT PID, fully disengage the clutch. • **Does the PID change from NO to YES?**	**Yes** GO to A10 . **No** GO to A23 .
A10 CHECK THE PCM STARTER RELAY ENABLE (STRT_RLY) PID	
• Enter e following diagnostic mode on the scan tool: DataLogger - PCM. • **NOTE:** For manual transaxle, fully disengage the clutch. • Monitor the STRT_RLY PID while holding the key in the START position. • **Does the PID change from DISENGAGED to ENGAGED?**	**Yes** GO to A11 . **No** GO to A21 .
A11 CHECK THE STARTER RELAY	
• Swap the starter relay with a known good relay and attempt to crank the engine. • **Does the engine crank?**	**Yes** INSTALL a new starter relay. TEST the system for normal operation. **No** GO to A12 .
A12 CHECK THE VOLTAGE TO THE STARTER RELAY	

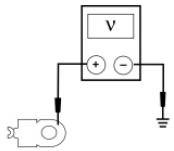
• Ignition OFF. • Disconnect: Starter Relay. • Measure the voltage betweeBattery Junction Box (BJB) starter relay cavity pin 3, circuit SBB11 (BU/RD), harness side and ground.  N0115734 • **Is the voltage greater than 10 volts?**	**Yes** GO to A13 . **No** VERIFY BJB fuse 11 (30A) is OK. If OK, REPAIR circuit SBB11 (BU/RD) 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.
A13 CHECK THE STARTER MOTOR OPERATION AT THE STARTER RELAY	
• Ignition OFF. • With the transaxle in PARK or NEUTRAL, connect one end of a fused jumper wire to BJB starter relay cavity 3, circuit SBB11 (BU/RD) and momentarily connect the other end of the fused jumper wire to BJB starter relay cavity 5, circuit CDC26 (GY/OG).  N0114473 • **Did the starter engage and the engine crank?**	**Yes** GO to A19 . **No** GO to A14 .
A14 CHECK THE BATTERY GROUND CABLE	

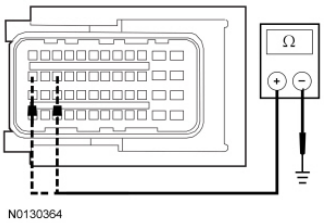
• Measure the voltage between the positive battery post and the battery ground cable connection at the engine.  AJ0280-A • **Is the voltage greater than 10 volts?**	**Yes** GO to A15 . **No** CARRY OUT the Starter Motor - Ground Circuit Test. REFER to Component Test in this section. TEST the system for normal operation.
A15 CHECK THE STARTER MOTOR GROUND	
• Measure the voltage between the positive battery post and the starter motor case.  N0042835 • **Is the voltage greater than 10 volts?**	**Yes** GO to A16 . **No** CLEAN the starter motor mounting flange and make sure the starter motor is correctly mounted. TEST the system for normal operation.
A16 CHECK THE VOLTAGE TO THE STARTER MOTOR	
• Measure the voltage between starter solenoid C197A, circuit SBF01 (RD) and ground.  N0042836 • **Is the voltage greater than 10 volts?**	**Yes** GO to A17 . **No** INSTALL a new positive battery cable. REFER to Section 414-01 . TEST the system for normal operation.
A17 CHECK THE STARTER MOTOR	
• Connect one end of a fused jumper wire to starter solenoid C197A, circuit SBF01 (RD) and momentarily connect the other end of the fused jumper wire to starter solenoid C197B, circuit CDC26 (GY/OG).	**Yes** GO to A18 . **No** INSTALL a new starter motor. REFER to Starter Motor in this section. TEST the system for normal operation.



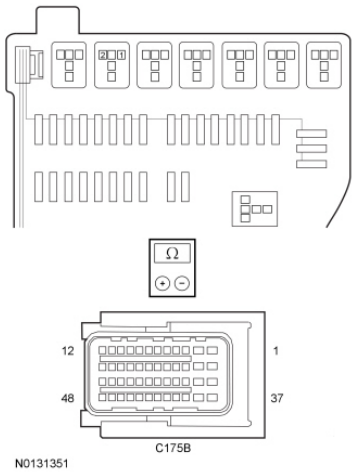
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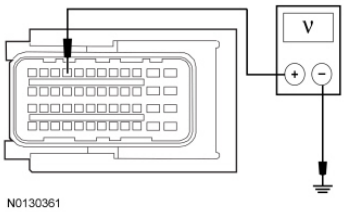
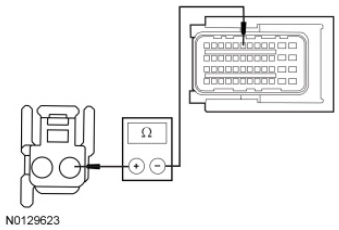
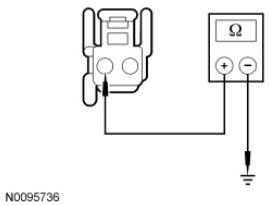
- **Did the starter engage and the engine crank?**

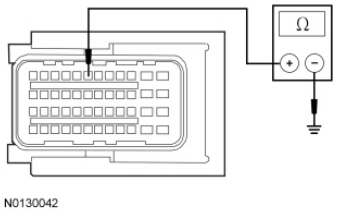
A18 CHECK FOR START INPUT AT THE STARTER	
• Connect: Starter Relay. • Disconnect: Starter Solenoid C197B. • Measure the voltage between the starter solenoid C197B-1, circuit CDC26 (GY/OG) and ground, while holding the key in the START position.  N0115632 • **Is the voltage greater than 10 volts?**	**Yes** CLEAN the starter solenoid "S" terminal and connector. CHECK the wiring and the starter motor for a loose or intermittent connection. TEST the system for normal operation. **No** REPAIR circuit CDC26 (GY/OG) for an open. TEST the system for normal operation.
A19 CHECK THE PCM START CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: PCM C175B. • Disconnect: Starter Relay. • Disconnect: IPC C220. • Disconnect: ACM C240A (Vehicles Built After 1/14/2011). • Measure the resistance between PCM C175B, harness side and ground, using the following chart. **PCM Connector** / **Circuit** C175B-24 / CDC12 (YE) C175B-22 / CDC54 (WH/GN)	**Yes** GO to A20 . **No** REPAIR the affected circuit for a short to ground. TEST the system for normal operation.



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

A20 CHECK THE PCM START CIRCUITS FOR AN OPEN	
• Measure the resistance between PCM C175B, harness side and BJB starter relay cavity, using the following chart. **PCM Connector / Circuit / BJB** C175B-24 / CDC12 (YE) / BJB starter relay cavity 2 C175B-22 / CDC54 (WH/GN) / BJB starter relay cavity 1  • **Are the resistances less than 5 ohms?**	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. **No** REPAIR the affected circuit for an open. TEST the system for normal operation.
A21 CHECK THE START CIRCUIT FOR VOLTAGE AT THE PCM	
• Disconnect: PCM C175B. • Measure the voltage between PCM C175B-9, circuit CDC35 (BU/WH) and ground, while holding the key in the START position.	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. **No** GO to A22 .

 N0130361 • **Is the voltage greater than 10 volts?**	
A22 CHECK THE IGNITION SWITCH	
• Carry out the Ignition Switch Component Test. Refer to Wiring Diagrams Cell 149 for component testing. • **Did the ignition switch pass the component test?**	**Yes** REPAIR circuit CDC35 (BU/WH) for an open. TEST the system for normal operation. **No** INSTALL a new ignition switch. REFER to Section 211-05 . TEST the system for normal operation.
A23 CHECK THE CPP SWITCH CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: CPP Switch C257. • Disconnect: PCM C175B. • Measure the resistance between CPP switch C257-1, circuit CE903 (BU/OG), harness side and PCM C175B-7, circuit CE903 (BU/OG), harness side.  N0129623 • **Is the resistance less than 5 ohms?**	**Yes** GO to A24 . **No** REPAIR circuit CE903 (BU/OG) for an open. TEST the system for normal operation.
A24 CHECK THE CPP GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between CPP switch C257-2, circuit GD187 (BK/GN), harness side and ground.  N0095736 • **Is the resistance less than 5 ohms?**	**Yes** GO to A25 . **No** REPAIR circuit GD187 (BK/GN) for an open. TEST the system for normal operation.

A25 CHECK THE CPP SWITCH	
• Connect: CPP Switch C257. • Measure the resistance between PCM C175B-7, circuit CE903 (BU/OG), harness side and ground while depressing the clutch pedal.  N0130042 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. **No** INSTALL a new CPP switch. REFER to Section 303-14 . TEST the system for normal operation.

Pinpoint Test B: The Engine Does Not Crank - With Intelligent Access (IA)

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

Normal Operation

Under normal operation the start/stop switch, when pushed in combination with pressing either the brake or clutch pedal (depending upon transaxle), provides the Remote Function Actuator (RFA) module a request to start the engine. The RFA module and PCM receive a signal from the Transmission Control Module (TCM) that the vehicle is in PARK or NEUTRAL (vehicles equipped with an automatic transaxle) or from the Clutch Pedal Position (CPP) switch when the clutch pedal is fully pressed (vehicles equipped with manual transaxle). The RFA module supplies voltage to the starter relay coil and signals the PCM to provide ground to the relay coil. The energized coil causes the starter relay contacts to close. This allows voltage to be supplied from Battery Junction Box (BJB) fuse 11 (30A) to the starter solenoid. The starter solenoid is grounded at the starter. Energizing the starter solenoid closes the solenoid contacts allowing voltage directly from the battery to the starter, engaging the starter drive into the ring gear causing the engine to crank and start. The PCM disengages the starter once an engine rpm threshold is reached, a set crank time is exceeded or the stop/start button is pressed indicating engine shut down.

- DTC P0850:00 (Park/Neutral Switch Input Circuit: No Sub Type Information) - sets when the message from the P/N_SW CLUTCH 2 circuit is invalid causing a mismatch with the High SpeeController Area Network (HS-CAN) message from the TCM .
- DTC P0851:00 (Park/Neutral Switch Input Circuit Low: No Sub Type Information) - sets when the PCM detects a short to ground on the P/N_SW/CLUTCH 2 circuit.
- DTC P1708:62 (Clutch Switch Circuit: Signal Compare Failure) - sets when the clutch switch input to the RFA module indicates the clutch pedal is pressed but the Medium Speed Controller Area Network (MS-CAN) message transmitted by the Instrument Panel Cluster (IPC) module indicates the clutch pedal is not pressed.

This pinpoint test is intended to diagnose the following:

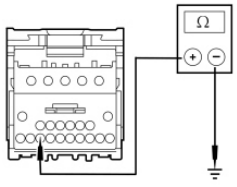
- Battery
- Battery cables
- Start/stop switch
- Cruise control deactivation switch
- Fuses
- PATS

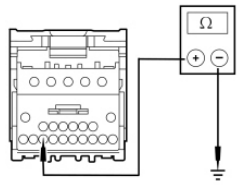
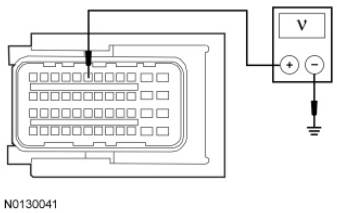
- Starter motor
- Starter relay
- Wiring, terminals or connectors
- PCM
- TCM (automatic transaxle)
- Clutch Pedal Position (CPP) switch (manual transaxle only)
- RFA module

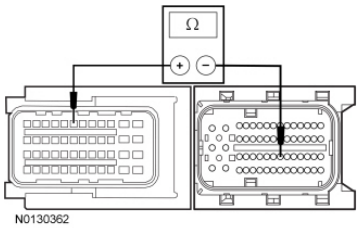
PINPOINT TEST B: THE ENGINE DOES NOT CRANK - WITH INTELLIGENT ACCESS (IA)

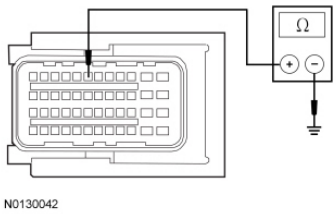
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connec**

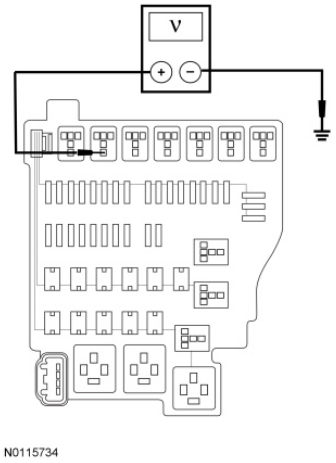
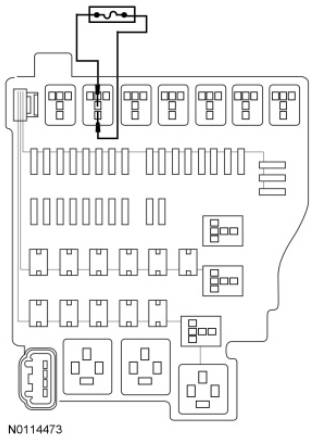
Test Step	Result / Action to Take
B1 CHECK THE BATTERY	
• Check the battery condition and state of charge. Refer to Diagnosis and Testing in Section 414-01 . • **Is the battery OK?**	**Yes** GO to B2 . **No** CHARGE or INSTALL a new battery as necessary. REFER to Section 414-01 . TEST the system for normal operation.
B2 CHECK FOR KEY NOT DETECTED	
NOTE: There are certain areas inside the vehicle where the IA key may not be detected and the message center displays KEY NOT DETECTED. If the IA key is in the far outside edges of the interior (like in a door map pocket or above a sun visor) it might not be detected. Move the IA key to a different location and try to crank the vehicle again. • Check the Front Control/Display Interface Module (FCDIM) while pressing the start/stop switch. • **Is KEY NOT DETECTED displayed?**	**Yes** REFER to Section 419-01B to diagnose KEY NOT DETECTED is displayed. **No** GO to B3 .
B3 CHECK THE IPC OPERATION	
• Observe the Instrument Panel Cluster (IPC) operation while pressing the start/stop switch. • **Do some indicators in the IPC illuminate?**	**Yes** GO to B5 . **No** GO to B4 .
B4 CHECK FOR COMMUNICATION WITH THE SCAN TOOL	
• Refer to Inspection and Verification in Section 418-00 , and follow the procedure to establish a session with the vehicle. • **Does the RFA module pass the network test?**	**Yes** REFER to Section 211-05 to diagnose no power in RUN. **No** REFER to Section 418-00 to diagnose no communication with the RFA module or PCM.

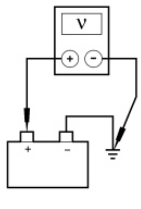
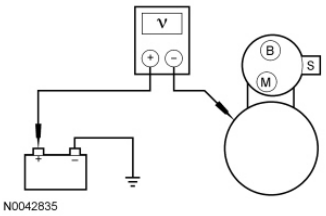
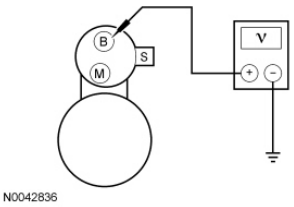
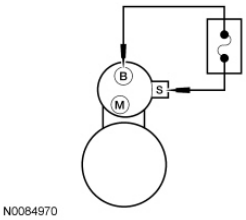
B5 RETRIEVED DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM - Self-Test. • Enter the following diagnostic mode on the scan tool: RFA module - Self-Test. • Enter the following diagnostic mode on the scan tool: TCM - Self-Test. • Enter the following diagnostic mode on the scan tool: PCM - Self-Test. • **Were DTCs retrieved on-demand during self-test?**	**Yes** For RFA module DTC P1708:62, GO to B33 . For RFA module DTC P0615:12, GO to Pinpoint Test C . For all other RFA module DTCs, REFER to Section 419-01B . For PCM DTC P0617:12, GO to Pinpoint Test C . For PCM DTC P0850:00, GO to B10 . For DTC P0851:00, GO to B13 . For all other PCM DTCs, REFER to Section 303-14 . For all TCM DTCs, REFER to Section 307-11 . **No** For automatic transaxle, GO to B6 . For manual transaxle, GO to B15 .
B6 CHECK THE RFA MODULE BRAKE SWITCH (BRAKE_SW) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger - RFA module. • While observing the BRAKE_SW PID, apply the brake pedal. • **Does the PID change from OFF to ON?**	**Yes** GO to B9 . **No** GO to B7 .
B7 CHECK THE CRUISE CONTROL DEACTIVATION CIRCUIT TO THE RFA MODULE FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: IPC C220. • Disconnect: RFA module C3503B. • Disconnect: Cruise Control Deactivation Switch C278. • Measure the resistance between RFA module C3503B-21, circuit CCA29 (GN/BU), harness side and ground.  N0116354 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to B8 . **No** REPAIR circuit CCA29 (GN/BU). TEST the system for normal operation.
B8 CHECK THE BRAKE SWITCH	

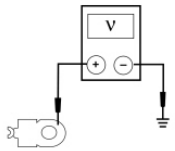
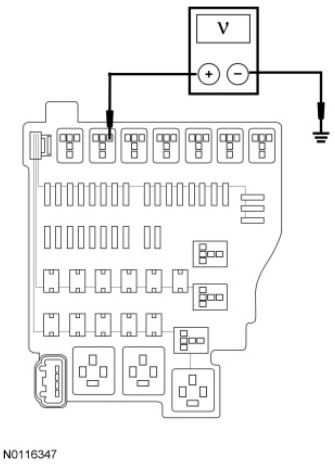
• Connect: Cruise Control Deactivation Switch C278. • Measure the resistance between RFA module C3503B-21, circuit CCA29 (GN/BU) and ground while applying the brake pedal.  N0116354 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL a new RFA module. REFER to Section 419-10 . TEST the system for normal operation. **No** INSTALL a new cruise control deactivation switch. REFER to Section 419-03 . TEST the system for normal operation.
B9 CHECK THE PCM TRANSMISSION P/N SWITCH (TRN/P) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger - PCM . • While observing the TRP/N PID, place the gear selector in NEUTRAL and then PARK. • **Does the PID indicate YES with the gear selector in NEUTRAL or PARK?**	**Yes** GO to B16 . **No** GO to B10 .
B10 CHECK THE P/N_SW/CLUTCH 2 CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: PCM C175B. • Disconnect: TCM C1750A. • Ignition ON. • Measure the voltage between PCM C175B-7, circuit CE903 (BU/OG), harness side and ground.  N0130041 • **Is any voltage present?**	**Yes** REPAIR circuit CE903 (BU/OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to B11 .
B11 CHECK THE P/N_SW/CLUTCH 2 CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between PCM C175B-7, circuit CE903 (BU/OG), harness side and TCM C1750A-39, circuit CE903 (BU/OG), harness side.	**Yes** GO to B12 . **No** REPAIR circuit CE903 (BU/OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal

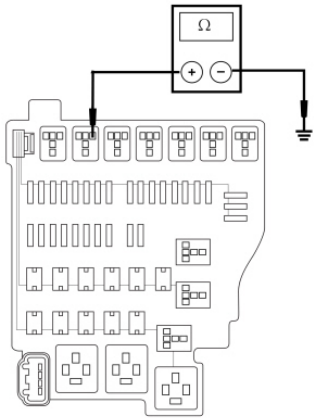
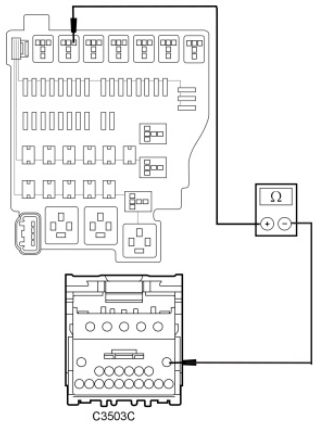
 • **Is the resistance less than 5 ohms?**	operation.
B12 CHECK THE TCM TRANSMISSION RANGE INPUT ALLOWING ENGINE START (TR_CRANK) AND PCM TRANSMISSION PARK OR NEUTRAL RANGE SWITCH (TRP/N) PIDs	
• Connect: PCM C175B. • Connect: TCM C1750A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - TCM . • While observing the TR_CRANK PID, place the gear selector in PARK and then NEUTRAL. • Enter the following diagnostic mode on the scan tool: DataLogger - PCM. • While observing the TRP/N PID, place the gear selector in PARK and then NEUTRAL. • **Do tIDs indicate YES with the gear selector in NEUTRAL or PARK?**	**Yes** 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. TEST the system for normal operation. **No** If the concern is with TRP/N PID, INSTALL a new PCM. REFER to Section 303-14 . TEST the system for correct operation. If the concern is with TR_CRANK PID, INSTALL a new TCM . REFER to Section 307-11 . TEST the system for normal operation.
B13 CHECK FOR A DTC WITH THE TCM DISCONNECTED	
• Ignition OFF. • Disconnect: TCM C1750A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM - lf-Test. • **Was DTC P0851:00 retrieved on-demand during self-test?**	**Yes** GO to B14 . **No** INSTALL a new TCM . REFER to Section 307-11 . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B14 CHECK THE P/N_SW/CLUTCH 2 CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: PCM C175B. • Measure the resistance between PCM C175B-7, circuit CE903 (BU/OG), harness side and ground.	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. **No**

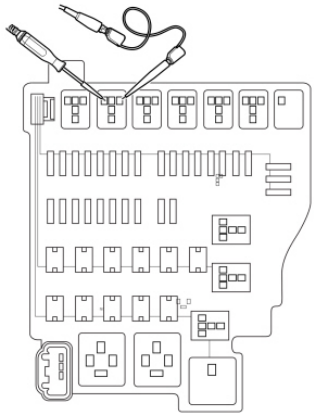
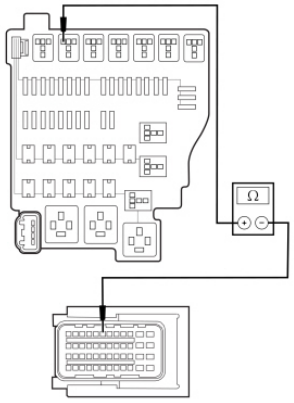
 • **Is the resistance greater than 10,000 ohms?**	REPAIR circuit CE903 (BU/OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B15 CHECK THE PCM CLUTCH PEDAL AT OR NEAR BOTTOM OF TRAVEL (CPP_BOT) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger - PCM. • While observing the CPP_BOT PID, fully disengage the clutch. • **Does the PID change from NO to YES?**	**Yes** GO to B16 . **No** GO to B30 .
B16 CHECK THE PCM STARTER RELAY ENABLE (STRT_RLY) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger - PCM. • **NOTE:** For manual transaxle, fully disengage the clutch. • Monitor the STRT_RLY PID while pressing the start/stop switch and the brake or clutch pedal. • **Does the PID change from DISENGAGED to ENGAG**	**Yes** GO to B17 . **No** REFER to Section 211-05 to diagnose the no power in start concern.
B17 CHECK THE STARTER RELAY	
• Swap the starter relay with a known good relay and attempt to crank the engine. • **Does the engine crank?**	**Yes** INSTALL a new starter relay. TEST the system for normal operation. **No** GO to B18 .
B18 CHECK THE VOLTAGE TO THE STARTER RELAY	
• Ignition OFF. • Disconnect: Starter Relay. • Measure the voltage between Battery Junction Box (BJB) starter relay cavity 3, circuit SBB11 (BU/RD), harness side and ground.	**Yes** GO to B19 . **No** VERIFY BJB fuse 11 (30A) is OK. If OK, REPAIR circuit SBB11 (BU/RD) 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.

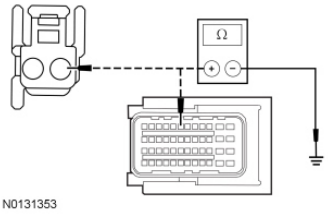
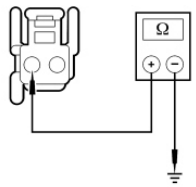
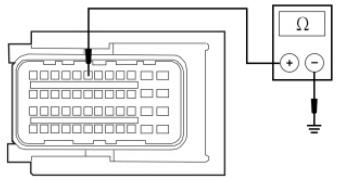
 N0115734 • **Is the voltage greater than 10 volts?**	
B19 CHECK THE STARTER MOTOR OPERATION AT THE STARTER RELAY	
• Ignition OFF. • With the transaxle in PARK or NEUTRAL, connect one end of a fused jumper wire to BJB starter relay cavity 3, circuit SBB11 (BU/RD) and momentarily connect the other end of the fused jumper wire to BJB starter relay cavity 5, circuit CDC26 (GY/OG).  N0114473 • **Did the starter engage and the engine crank?**	**Yes** GO to B25 . **No** GO to B20 .
B20 CHECK THE BATTERY GROUND CABLE	
• Measure the voltage between the positive battery post and the battery ground cable connection at the engine.	**Yes** GO to B21 . **No** CARRY OUT the Starter Motor - Ground Circuit st. REFER to Component Test in this section. TEST the system for normal operation.

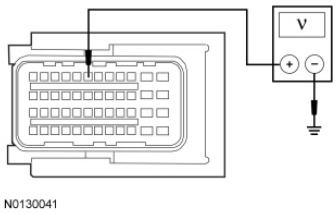
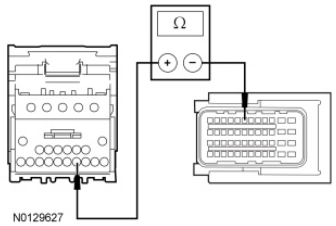
 AJ0280-A • **Is the voltage greater than 10 volts?**	
B21 CHECK THE STARTER MOTOR GROUND	
• Measure the voltage between the positive battery post and the starter motor case.  N0042835 • **Is the voltage greater than 10 volts?**	**Yes** GO to B22 . **No** CLEAN the starter motor mounting flange and make sure the starter motor is correctly mounted. TEST the system for normal operation.
B22 CHECK THE VOLTAGE TO THE STARTER MOTOR	
• Measure the voltage between starter solenoid C197A-1, circuit SBF01 (RD) and ground.  N0042836 • **Is the voltage greater than 10 volts?**	**Yes** GO to B23 . **No** INSTALL a new positive battery cable. REFER to Section 414-01 . TEST the system for normal operation.
B23 CHECK THE STARTER MOTOR FOR CORRECT OPERATION	
• Connect one end of a fused jumper wire to starter solenoid C197A-1, circuit SBF01 (RD) and momentarily connect the other end of the fused jumper wire to starter solenoid C197B, circuit CDC26 (GY/OG).  N0084970	**Yes** GO to B24 . **No** INSTALL a new starter motor. REFER to Starter Motor in this section. TEST the system for normal operation.

• **Did the starter engage and the engine crank?**	
B24 CHECK FOR START INPUT AT THE STARTER	
• Connect: Starter Relay. • Disconnect: Starter Solenoid C197B. • Measure the voltage between the starter solenoid C197B-1, circuit CDC26 (GY/OG) and ground, while pressing the start/stop switch and the brake or clutch pedal.  N0115632 • **Is the voltage greater than 10 volts?**	**Yes** CLEAN the starter solenoid "S" terminal and connector. CHECK the wiring and the starter motor for a loose or intermittent connection. TEST the system for normal operation. **No** REPAIR circuit CDC26 (GY/OG) for an open. TEST the system for normal operation.
B25 CHECK THE RFA MODULE STARTER REQUEST CIRCUIT FOR VOLTAGE	
• Measure the voltage between BJB starter relay cavity 1, circuit CDC54 (WH/GN), harness side and ground while pressing the start/stop switch and the brake or clutch pedal.  N0116347 • **Is the voltage greater than 10 volts?**	**Yes** GO to B28 . **No** GO to B26 .
B26 CHECK THE RFA MODULE STARTER REQUEST CIRCUIT FOR A SHORT TO GROUND	
• Disconnect: IPC C220. • Disconnect: RFA C3503C. • Disconnect: ACM C240A (Vehicles Built After 1/14/2011). • Measure the resistance between BJB starter relay cavity 1, circuit CDC54 (WH/GN), harness side and ground.	**Yes** GO to B27 . **No** REPAIR circuit CDC54 (WH/GN). TEST the system for normal operation.

 N0116949 • **Is the resistance greater than 10,000 ohms?**	
B27 CHECK THE RFA MODULE STARTER REQUEST CIRCUIT FOR AN OPEN	
• Measure the resistance between BJB starter relay cavity 1, circuit CDC54 (WH/GN), harness side and RFA module C3503C-6.  N0116356 • **Is the resistance less than 0.5 ohm?**	**Yes** INSTALL a new RFA module. REFER to Section 419-10 . TEST the system for normal operation. **No** REPAIR circuit CDC54 (WH/GN). TEST the system for normal operation.
B28 CHECK THE PCM STARTER CONTROL CIRCUIT	
• Connect a 12-volt test light between BJB starter relay cavity 1, circuit CDC54 (WH/GN) and BJB starter relay cavity 2, circuit CDC12 (YE), then press the brake or clutch pedal and press the start/start switch.	**Yes** INSTALL a new starter relay. TEST the system for normal operation. **No** GO to B29 .

 N0116351 • **Does the test light illuminate?**	
B29 CHECK THE STARTER CONTROL CIRCUIT FOR AN OPEN	
• Disconnect: PCM C175B. • Measure the resistance between BJB starter relay cavity 2, circuit CDC12 (YE), harness side and PCM C175B-24, circuit CDC12 (YE), harness side.  N0131352 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. **No** REPAIR circuit CDC12 (YE). TEST the system for normal operation.
B30 CHECK THE P/N_SW/CLUTCH 2 CIRCUIT FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Disconnect: CPP Switch C257. • Disconnect: RFA Module C3503B. • Disconnect: PCM C175B. • Measure the resistance between: ♦ CPP switch C257-1, circuit CE903 (BU/OG), harness side and PCM C175B-7, circuit CE903 (BU/OG), harness side. ♦ PCM C175B-7, circuit CE903 (BU/OG), harness side and ground.	**Yes** GO to B31 . **No** REPAIR circuit CE903 (BU-OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 N0131353 • **Is the resistance greater than 10,000 ohms between the PCM and ground; and less than 5 ohms between the PCM and CPP switch?**	
B31 CHECK THE CPP GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between CPP switch C257-2, circuit GD187 (BK/GN), harness side and ground.  N0095736 • **Is the resistance less than 5 ohms?**	**Yes** GO to B32 . **No** REPAIR circuit GD187 (BK/GN) for an open. CLEAR DTCs. REPEAT the self-test. TEST the system for normal operation.
B32 CHECK THE CPP SWITCH	
• Connect: CPP Switch C257. • Measure the resistance between PCM C175B-7, circuit CE903 (BU/OG), harness side and ground while pressing the clutch pedal.  N0130042 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. **No** INSTALL a new CPP switch. REFER to Section 303-14 . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B33 CHECK THE P/N_SW/CLUTCH 2 CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: CPP Switch C257. • Disconnect: RFA Module C3503B. • Disconnect: PCM C175B. • Ignition ON. • Measure the voltage between PCM C175B-7, circuit CE903 (BU/OG), harness side and ground.	**Yes** REPAIR circuit CE903 (BU-OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No**

 • **Is any voltage present?**	GO to B34 .
B34 CHECK THE P/N_SW/CLUTCH 2 INPUT CIRCUIT FOR AN OPEN BETWEEN THE PCM AND RFA MODULE	
• Ignition OFF. • Measure the resistance between RFA module C3503B-17, circuit CE903 (BU/OG), harness side and PCM C175B-7, circuit CE903 (BU/OG), harness side.  • **Is the resistance less than 5 ohms?**	**Yes** GO to B35 . **No** REPAIR circuit CE903 (BU/OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B35 CHECK THE PCM CLUTCH PEDAL AT OR NEAR BOTTOM OF TRAVEL (CPP_BOT) AND RFA MODULE CLUTCH SWITCH (CLUTCH_SW) PIDs	
• Ignition OFF. • Connect: CPP Switch C257. • Connect: RFA Module C3503B. • Connect: PCM C175B. • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger- PCM. • While observing the CPP_BOT PID, fully engage and disengage the clutch pedal. • Enter the following diagnostic mode on the scan tool: DataLogger- RFA module. • While observing the CLUTCH_SW PID, fully engage and disengage the clutch. • **Do both PIDs agree with the clutch pedal position?**	**Yes** 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. **No** If the concern is with CPP_BOT PID, INSTALL a new PCM. REFER to Section 303-14 . If the concern is with CLUTCH _SW PID, INSTALL a new RFA module. REFER to Section 419-10 . TEST the system for normal operation.

Pinpoint Test C: DTC P0615:12 or P0617:12

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

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

Normal Operation - (Without Intelligent Access)

When the ignition is turned to the START position, the PCM receives a request to start the engine and supplies voltage to the starter relay coil. The PCM monitors the start request circuit for faults. If voltage is detected on the start request circt and the starter relay is not in an active state, the PCM sets a DTC.

- DTC P0617:12 (Starter Relay Circuit High: Circuit Short to Battery) - sets when the PCM detects excessive current on the starter relay circuit and the output is not activated.

Normal Operation - With Intelligent Access (IA)

When the start/stop switch is pressed and released along with either the brake pedal (vehicles equipped with automatic transaxle) or Clutch Pedal Position (CPP) switch (vehicles equipped with manual transaxle) input, the Remote Function Actuator (RFA) module receives a request from the Intelligent Access (IA) key to start the engine. The RFA module then supplies voltage to the starter relay coil. The RFA module monitors the start request circuit for faults. If voltage is detected on the start request circuit and the starter relay is not in an active state, the RFA module sets a DTC.

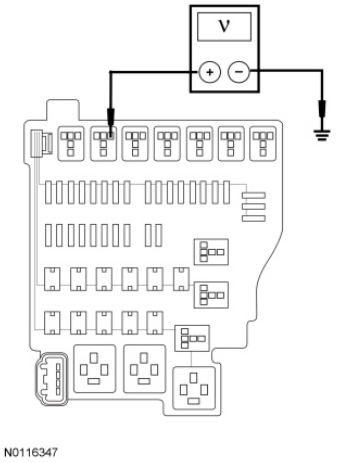
- DTC P0615:12 (Starter Relay Circuit High: Circuit Short to Battery) - sets when the RFA module detects current output above threshold on the starter relay circuit and the output is not activated.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- module
- PCM
- Starter relay

PINPOINT TEST C: DTCs P0615:12 OR P0617:12

Test Step	Result / Action to Take
C1 RETRIEVE DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM - Self-Test (vehicles without IA). • Enter the following diagnostic mode on the scan tool: Self Test - RFA Module (vehicles equipped with IA). • **Are DTCs present on-demand during self-test?**	**Yes** GO to C2 . **No** 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.
C2 CHECK THE STARTER REQUEST CIRCUIT FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: Starter Relay. • Disconnect: ACM C240A (Vehicles Built After 1/14/2011). • Disconnect: RFA module C3503C or PCM C175B. • Ignition ON. • Measure the voltage between BJB starter relay cavity 1, circuit CDC54 (WH/GN), harness side and ground.  N0116347 • **Is any voltage present?**	**Yes** REPAIR circuit CDC54 (WH/GN). CLEAR the DTCs. REPEAT the self-test. **No** GO to C3 .
C3 CHECK THE STARTER RELAY	
• Swap the starter relay with a known good relay. • Enter the following diagnostic mode on the scan tool: Self Test - RFA module or PCM. • **Was RFA DTC P0615:12 or PCM DTC P0617:12 retrieved on-demand during self-test?**	**Yes** **For vehicles without IA ,** INSTALL a new PCM. REFER to Section 303-14 . CLEAR the DTCs. REPEAT the self-test. **For vehicles with IA** INSTALL a new RFA module. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test. **No** INSTALL a new starter relay. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test D: DTC P1572:62

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

Normal Operation

The IPC sends a MS-CAN message to the PCM concerning the brake switch status sensed by the RFA . If the MS-CAN message input does not match the PCM brake input message a DTC is set.

- DTC P1571:62 (Brake Switch: SignalCompare Failure) - sets when the brake switch input to the RFA module indicates the brake pedal is pressed but the Medium Speed Controller Area Network

(MS-CAN) message transmitted by the Instrument Panel Cluster (IPC) module indicates the brake pedal is not pressed.

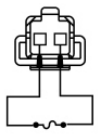
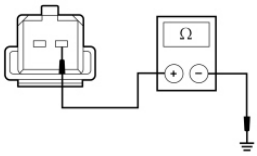
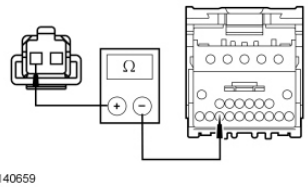
This pinpoint test is intended to diagnose the following:

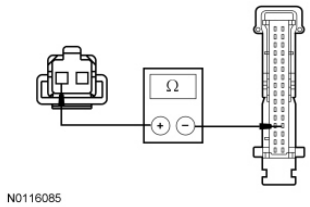
- Wiring, terminals or connectors
- Cruise Control Deactivator Switch
- RFA module

PINPOINT TEST D: DTC P1571:62

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
D1 CHECK FOR COMMUNICATION WITH THE SCAN TOOL	
• Refer to Inspection and Verification in Section 418-00 , and follow the procedure to establish a session with the vehicle. • **Does the PCM pass the network test?**	**Yes** GO to D2 . **No** REFER to Section 418-00 to diagnose no communication with the PCM.
D2 CHECK THE PCM MODULE BRAKE SWITCH (BOO) PID	
• Enter the following diagnostic mode on the scan tool: DataLogger - PCM . • While observing the BOO PID, apply the brake pedal. • **Does the PID change from OFF to ON?**	**Yes** GO to D3 . **No** REFER to Section 419-03 , PPT B, to diagnose brake switch concern.
D3 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH FOR AN OPEN	
• Ignition OFF. • Disconnect: Cruise Control Deactivator Switch C278. • Inspect both ends of the connectors for damage, pushed-out pins, corrosion, loose wires and missing or damaged seals. • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - RFA module. • CONNECT and remove a fused jumper wire between the cruise control deactivator switch C278-2, cit CCA29 (GN/BU), harness side and the cruise control deactivator switch C278-1, circuit GD187 (BK/GN), harness side, while monitoring the RFA BRAKE_SW PID.	**Yes** INSTALL a new cruise control deactivator switch. REFER to Section 419-03 . TEST the system for normal operation. **No** GO to D4 .

 N0116083 • **Does the PID status change?**	
D4 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between cruise control deactivator switch C278-1, circuit GD187 (BK/GN) and ground.  N0117050 • **Is the resistance less than 5 ohms?**	**Yes** GO to D5 . **No** REPAIR circuit GD187 (BK/GN). TEST the system for normal operation.
D5 CHECK THE INPUT CIRCUIT TO THE RFA FOR AN OPEN	
• Disconnect: RFA C3503B. • Inspect both ends of the connectors for damage, pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the resistance between RFA module C3503B-21, circuit CCA29 (GN/BU) harness side and cruise control deactivator switch C278-2, circuit CCA29 (GN/BU), harness side.  N0140659 • **Is the resistance less than 0.5 ohm?**	**Yes** GO to D6 . **No** REPAIR circuit CCA29 (GN/BU). TEST the system for normal operation.
D6 CHECK THE IPC MODULE INPUT CIRCUIT FOR AN OPEN	
• Disconnect: IPC moduleC220. • Inspect both ends of the connectors for damage, pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the resistance between IPC module C220-29, circuit CCA29 (GN/BU) harness side and cruise control deactivator	**Yes** GO to D7 . **No** REPAIR circuit CCA29 (GN/BU). TEST the system for

switchC278-2, circuit CCA29 (GN/BU), harness side.  • **Is the resistance less than 0.5 ohm?**	normal operation.
D7 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect all the RFA module connectors. • Inspect both ends of the connectors for damage, pushed-out pins, corrosion, loose wires and missing or damaged seals. • Connect all the RFA module connectors and make sure they seat correctly. • Connect the IPC module connector and make sure the connector seat correctly. • Connect the cruise control deactivator switch connector and make sure the connector seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new RFA module. 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 E: Unusual Starter Noise

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

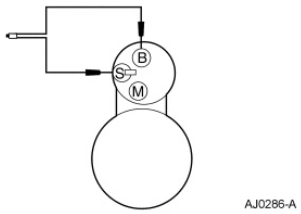
Normal Operation

Correct starter operation relies on correct mounting of the starter to the engine, alignment of the starter ring gear to the flywheel or flexplate and correct functioning of the starter assembly (internal gears, bearings).

This pinpoint test is intended to diagnose the following:
- Starter motor
- Starter motor mounting
- Starter motor engagement
- Flywheel or flexplate ring gear

PINPOINT TEST E: UNUSUAL STARTER NOISE

Test Step	Result / Action to Take
E1 CHECK THE STARTER MOTOR MOUNTING	
• Inspect the starter motor mounting bolts for looseness. • **Is the starter motor mounted correctly?**	**Yes** GO to E2 . **No** INSTALL the starter motor correctly. REFER to

	Starter Motor in this section.
E2 CHECK FOR ENGINE NOISE	
• Ignition OFF. • Connect a remote starter switch between the starter solenoid "B" and "S" terminals.  AJ0286-A • Engage the starter motor and verify the noise is due to the starter operation. • **Is the noise due to the starter motor engagement?**	**Yes** GO to E3 . **No** REFER to Section 303-00 to continue the diagnosis.
E3 CHECK FOR UNUSUAL WEAR	
• Remove the starter motor. Refer to Starter Motor in this section. • Inspect the ring gear for damaged or worn teeth. • **Is the noise due to ring gear tooth damage?**	**Yes** INSTALL a new flexplate/flywheel ring gear. EXAMINE the starter pinion teeth. If damaged, INSTALL a new starter motor. REFER to Starter Motor in this section. TEST the system for normal operation. **No** INSTALL a new starter motor. REFER to Starter Motor in this section.

Component Tests

⚠ 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.

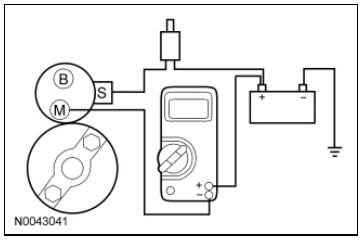
Always make the Fluke 77-IV Digital Multimeter connections at the component terminal rather than at the wiring end connector. Making a connection at the wiring end connector could result in false readings because the meter will not pick up a high resistance between the wiring connector and the component.

Starter Motor - Feed Circuit Test

1. Make sure the battery is fully charged. Carry out the battery condition test. Refer to Diagnosis and Testing in Section 414-01 .

2. Connect a remote starter switch between the starter 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 "M" terminal.



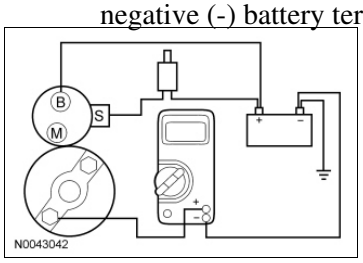
4. Engage the remote starter switch. Read and record the voltage. The voltage reading should be 0.5 volt or less.

5. If the voltage reading is 0.5 volt or less, go to the Starter Motor - Ground Circuit Component Test.
6. If the voltage reading is greater than 0.5 volt, this is an indication of excessive resistance in the connections, the positive battery cable or in the starter solenoid. Move the Fluke 77-IV Digital Multimeter negative lead to the starter 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 solenoid or in the solenoid contacts.
7. Remove the cables from 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 and 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 the solenoid "B" terminal is still greater than 0.5 volt after cleaning the cables and the connections at the solenoid, the concern is either in the positive (+) battery cable connection or in the positive battery cable itself. Clean the positive (+) battery cable connection. If this does not solve the problem, install a new positive battery cable. Refer to Section 414-01 .

Starter Motor - Ground Circuit Test

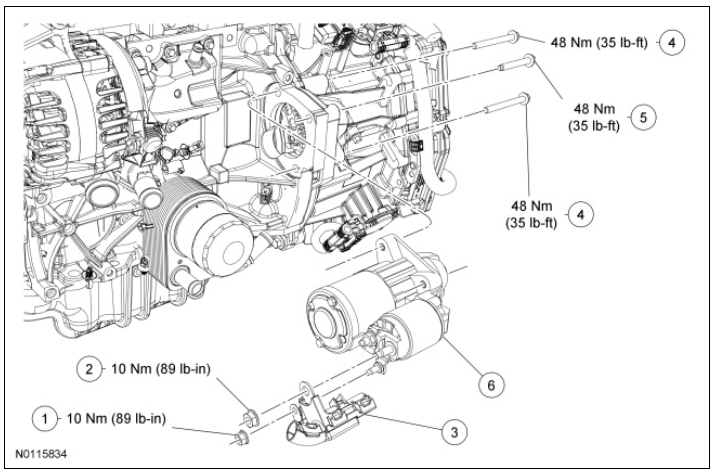
A no or slow crank condition can be caused by excessive resistance in the ground or return portion of the cranking circuit. Check the voltage drop in the ground circuit as follows:

1. Connect the Fluke 77-IV Digital Multimeter positive lead to the starter mor housing (make sure the connection is clean and free of rust or grease). Connect the negative lead to the negative (-) battery terminal.



2. Engage the remote starter switch and crank the engine. Read and record the voltage reading. The reading should be 0.5 volt or less.
3. If the voltage is greater than 0.5 volt, clean the negative cable connections at the battery, the body ground connections and the starter ground connections. Retest.
4. If the voltage is greater than 0.5 volt, install a new negative battery cable. If the voltage reading is less than 0.5 volt and the engine still does not crank or cranks slowly, install a new starter motor.

Starter Motor



Item	Part Number	Description
1	W704141	Starter solenoid wire nut
2	W701596	Starter solenoid battery cable nut
3	14A240	Starter motor solenoid wire harness terminal cover
4	W702042	Starter motor bolt (if equiped with IB5 transmission)
4	W500132	Starter motor bolt (if equiped with DPS6 transmission)
5	W500125	Starter motor bolt (if equiped with IB5 transmission)
5	W709638	Starter motor bolt (if equiped with DPS6 transmission)
6	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.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

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

3. Remove the starter solenoid wire nut.
   - To install, tighten to 10 Nm (89 lb-in).

4. Remove the starter solenoid battery cable nut and the starter motor solenoid wire harness terminal cover.
   - To install, tighten to 10 Nm (89 lb-in).

5. Remove the bolts and the starter motor.
   - To install, tighten to 48 Nm (35 lb-ft).

6. To install, reverse the removal procedure.

Material

Item	Specification	Fill Capacity
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	-

General Specifications

Item	Specification
Base ignition timing (not adjustable)	10 degrees before Top Dead Center (TDC)
Firing order	1-3-4-2
Spark plug	12405
Spark plug gap	0.7-0.8 mm (0.027-0.032 in)

Torque Specifications

Description	Nm	lb-in
Coil mounting bolts	6	53
Spark plugs	15	133

Engine Ignition

The Electronic Ignition (EI) system consists of the:

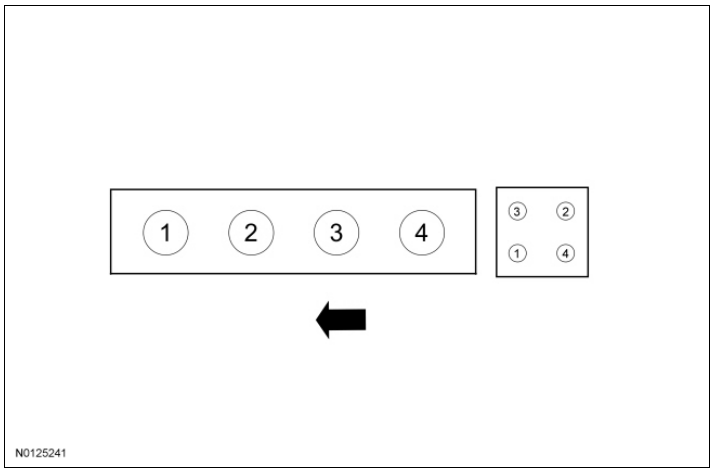
- ignition coil
- spark plug wires
- spark plugs

The ignition coil is controlled by the PCM and fires 2 spark plugs simultaneously.

The spark plug wires carry high voltage pulses from the ignition coil to the spark plugs.

The spark plug ignites the fuel and air mixture.

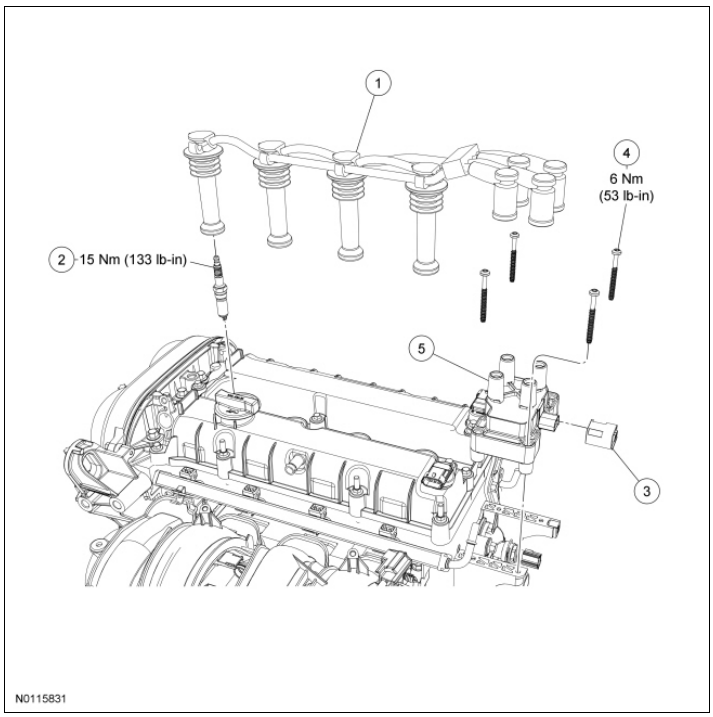
Coil Terminal-to-Cylinder Relationship



Engine Ignition

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the ignition system.

Engine Ignition Components - Exploded View



Item	Part Number	Description
1	12280	Spark plug wire (4 required)
2	12405	Spark plug (4 required)
3	-	Ignition coil electrical connector (part of 14A464)
4	W713210	Ignition coil bolt (4 required)
5	12029	Ignition coil

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Iteexploded views may not be listed in order of removal.

Ignition Coil

Material

Item	Specification
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A

Removal and Installation

1. ***NOTICE:*** **Spark plug wires must be connected correctly. For additional information, refer to the Coil Terminal-to-Cylinder Relationship illustration in the Description and Operation, Engine Ignition portion of this section. Failure to follow this instruction may result in poor engine performance.**

   NOTICE: **Do not pull on the spark plug wire as it may separate from the spark plug wire connector inside the spark plug wire boot.**

   Disconnect the spark plug wires from the ignition coil by slig twisting while pulling upwards.

2. Disconnect the ignition coil electrical connector.

3. Remove the 4 ignition coil bolts.
   - To install, tighten to 6 Nm (53 lb-in).

4. Remove the ignition coil.

5. **NOTE:** Wipe the coil towers with a clean cloth dampened with soap and water. Remove any soap film and dry with compressed air. Inspect for cracks, carbon tracking and dirt.

   To install, reverse the removal procedure.

   - Apply silicone dielectric compound to the inside of the spark plug wire boots prior to installation.

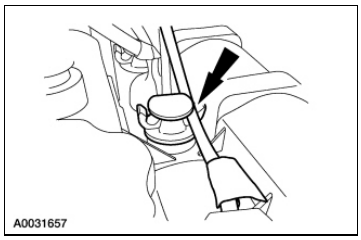
Spark Plugs

Material

Item	Specification
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A

Removal and Installation

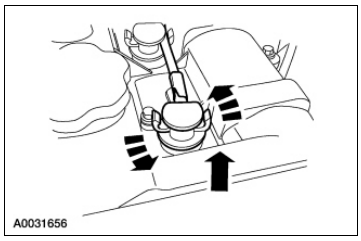
1. Detach the spark plug wire if routed through another spark plug wire.



2. ***NOTICE:*** **Spark plug wires must be connected correctly. For additional information, refer to the Coil Terminal-to-Cylinder Relationship illustration in the Description and Operation, Engine Ignition portion of this section. Failure to follow this instruction may result in poor engine performance.**

   NOTICE: **Do not pull on the spark plug wire as it may separate from the spark plug wire connector inside the spark plug wire boot.**

   Disconnect the spark plug wires from the spark plugs by slightly twisting while pulling upwards.



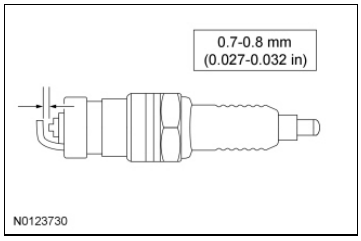
3. **NOTE:** Remove any foreign material with compressed air.

   Remove the spark plugs.

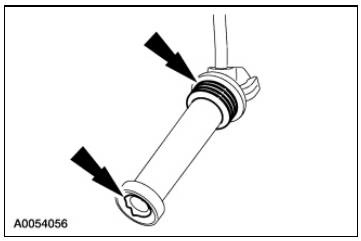
   - To install, tighten to 15 Nm (133 lb-in).

4. Inspect the spark pugs. For additional information refer to the Spark Plug Inspection procedure in Section 303-00 .

5. Check and adjust the spark plug gap as necessary.



6. To install, reverse the removal procedure.
    - Apply silicone dielectric compound to the locations shown.



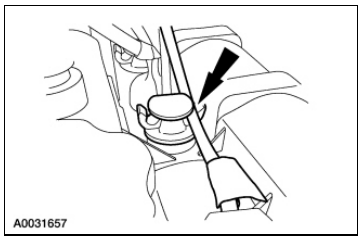
Spark Plug Wires

Material

Item	Specification
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A

Removal and Installation

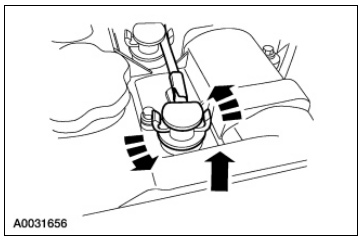
1. Detach the spark plug wire if routed through another spark plug wire.



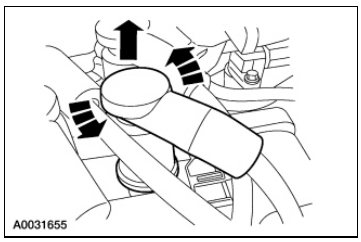
2. ***NOTICE:*** **Spark plug wires must be connected correctly. For additional information, refer to the Coil Terminal-to-Cylinder Relationship illustration in the Description and Operation, Engine Ignition portion of this section. Failure to follow this instruction may result in poor engine performance.**

   NOTICE: **Do not pull on the spark plug wire as it may separate from the spark plug wire connector inside the spark plug wire boot.**

   Disconnect the spark plug wires from the spark plugs by slightly twisting while pulling upwards.



3. Disconnect the spark plug wires from the ignition coil by slightly twisting while pulling upward.

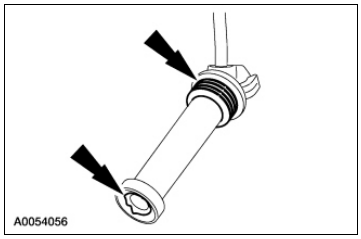


4. Remove the spark plug wires.

5. **NOTE:** Wipe the coil towers with a clean cloth dampened with soap and water. Remove any soap film and dry with compressed air. Inspect for cracks, carbon tracking and dirt.

   To install, reverse the removal procedure.

   - Apply silicone dielectric compound to the locations shown.



Torque Specifications

Description	Nm	lb-in
Crankcase vent oil separator bolts	9	80

Engine Emission Control

Crankcase Ventilation

System Overview

NOTE: The vehicle emission vacuum routing diagrams are contained in the Description and Operation subsection of Evaporative Emissions. Refer to Section 303-13 .

NOTE: 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 crankcase ventilation system gathers blow-by vapors from the crankcase and returns them to the intake manifold and air cleaner for combustion.

Component List

The crankcase ventilation system consists of the following components:

- a crankcase vent oil separator located on the engine block
- a valve cover vent hose connected to the air cleaner
- a crankcase vent oil separator hose connected to the intake manifold
- a crankcase pressure regulator located inside the crankcase vent oil separator housing

System Components

The crankcase vent oil separator removes vaporized oil from the blow-by vapors and returns the separated oil to the crankcase.

The crankcase pressure regulator controls the return of the blow-by pressure to the intake manifold through the crankcase vent oil separator hose.

The valve cover vent hose vents excessive crankcase pressure to the air cleaner and allows fresh air into the crankcase to prevent premature degradation of the engine oil.

System Operation

During high intake manifold vacuum situations the blow-by pressure flows through the crankcase pressure regulator and is returned to the intake manifold through the crankcase vent oil separator hose. During low intake manifold vacuum situations the crankcase pressure regulator restricts flow to the intake manifold causing blow-by pressure to flow through the valve cover vent hose to the air cleaner.

Engine Emission Control

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Crankcase Vent Oil Separator

Removal and Installation

NOTICE: **Clean and inspect the crankcase vent oil separator for damage prior to installation. The crankcase vent oil separator gasket cannot be reused and must be replaced prior to installation of the crankcase vent oil separator.**

1. Remove the intake manifold. For additional information, refer to Section 303-01 .

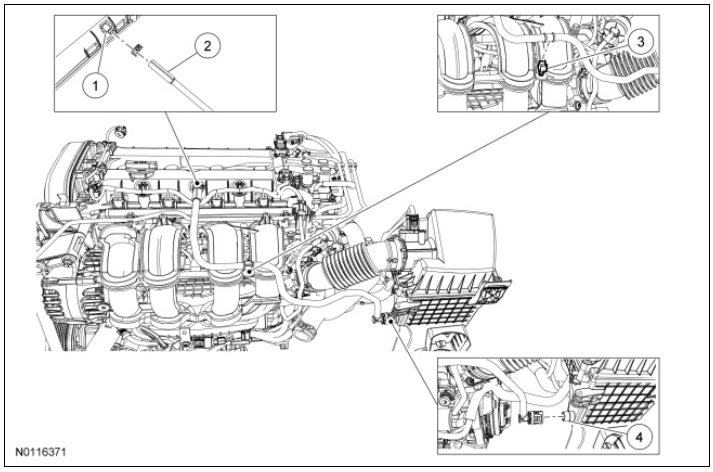
2. Remove the crankcase vent oil separator hose.

3. Remove the 7 bolts and the crankcase vent oil separator.
   - Remove and discard the crankcase vent oil separator gasket.

4. To install, reverse the removal procedure.
   1. Install a new crankcase vent oil separator gasket.
   2. Tighten the 7 crankcase vent oil separator bolts to 9 Nm (80 lb-in).

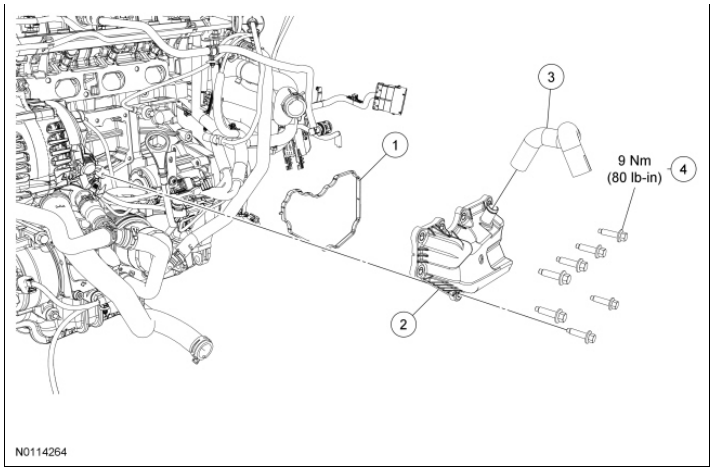
Positive Crankcase Ventilation (PCV) System Components - Exploded View

Valve Cover Vent Hose



Item	Part Number	Description
1	6582	Valve cover
2	6A664	Valve cover vent hose
3	-	Valve cover vent hose clip (part of 6A664)
4	9600	Air cleaner

Crankcase Vent Oil Separator



Item	Part Number	Description
1	-	Crankcase vent oil separator gasket
2	6A785	Crankcase vent oil separator
3	6N664	Crankcase vent oil separator hose
4	W500214	Crankcase vent oil separator bolt (7 required)

1. Refer to the procedures and/or exploded views iection for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Torque Specifications

Description	Nm	lb-in
Air Cleaner (ACL) cover screws	2	18
ACL outlet pipe clamps	3	27

Intake Air Distribution and Filtering

The air intake system consists of the following:

- Air Cleaner (ACL)
- ACL element
- Mass Air Flow (MAF) sensor
- ACL outlet pipe

The air intake system:

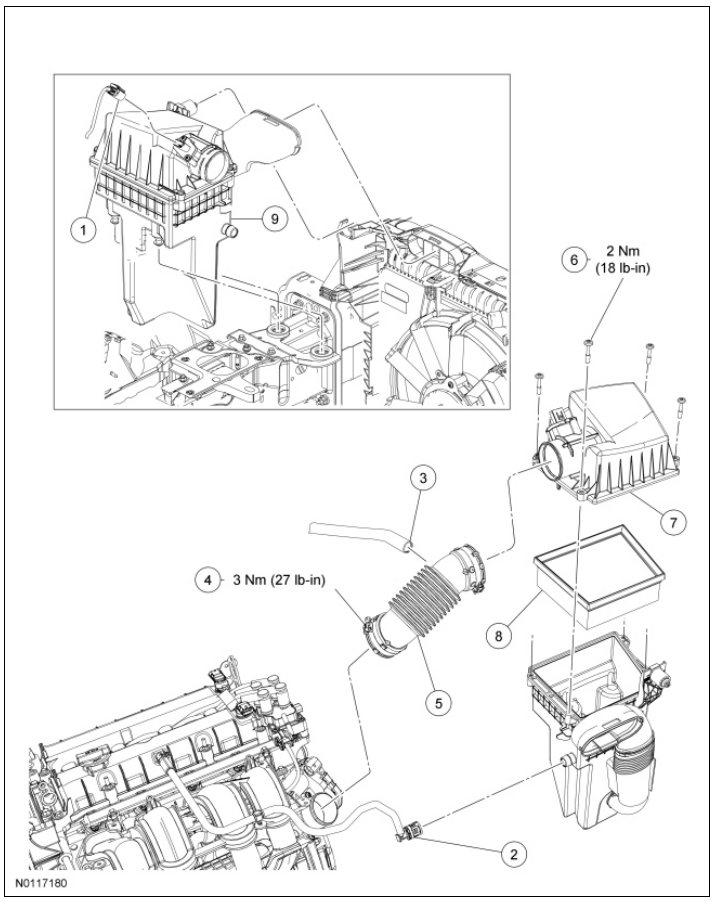
- cleans intake air with an ACL element.
- measures airflow with a MAF sensor.

The 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 the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Intake Air System Components - Exploded View



Item	Part Number	Description
1	-	Mass Air Flow (MAF) sensor electrical connector (part of 12A522)
2	6A664	Crankcase ventilation tube
3	9C490	Brake booster vacuum tube assembly
4	-	Air Cleaner (ACL) outlet pipe clamp (2 required) (part of 9R504)
5	9A624	ACL outlet pipe
6	W745236	ACL cover screw (4 required)
7	-	ACL cover (part of 9600)
8	9601	ACL element
9	9600	ACL assembly

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Torque Specifications

Description	Nm	lb-in
Evaporative Emission (EVAP) canister nuts	7	62
EVAP canister purge valve bolt	9	80
Natural vacuum leak detection module nut	7	62

Evaporative Emissions

The Evaporative Emission (EVAP) system consists of the:

- EVAP canister.
- EVAP canister purge valve.
- fuel tank.
- fuel vapor tubes
- natural vacuum leak detection module.

The EVAP system:

- prevents hydrocarbon emissions from reaching the atmosphere.
- stores fuel vapors in the EVAP canister that are generated during vehicle operation hot soak or vehicle refueling, until they can be consumed by the engine during normal engine operation.
- routes the stored fuel vapors to the engine during engine operation.

The fuel vapors are routed:

- to the EVAP canister through a vapor tube.
- to the engine when the EVAP canister purge valve is opened.

The EVAP canister:

- is located under the rear of the vehicle.
- contains activated carbon.
- stores fuel vapors.

The EVAP canister purge valve:

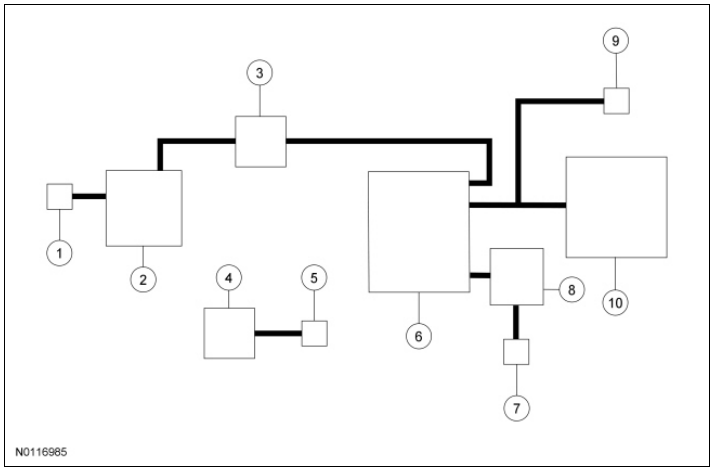
- is normally closed.
- regulates the purging of the EVAP canister.

The natural vacuum leak detection module:

- completes a series of checks to confirm the integrity of the enhanced EVAP system components in the engine running state and the ignition OFF state.

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for additional information on the EVAP system.

Vehicle Emission Vacuum Routing



Item	Part Number	Description
1	6A666	PCV valve
2	9425	Intake manifold
3	9C047	Evaporative Emission (EVAP) canister purge valve
4	6582	Valve cover
5	9R504	Air Cleaner (ACL) outlet tube
6	9D653	EVAP canister
7	9G297	Fresh air hose
8	9A228	Natural vacuum leak detection module
9	9034	Fuel tank filler pipe
10	9002	Fuel tank

Evaporative Emissions

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

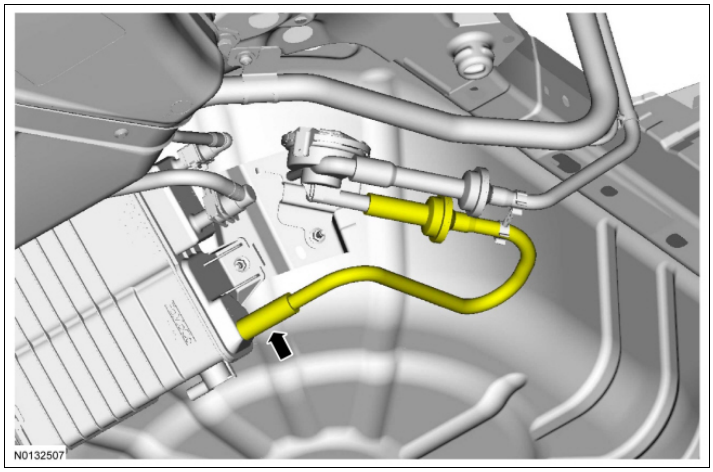
Evaporative Emission System Leak Test

Special Tool(s)

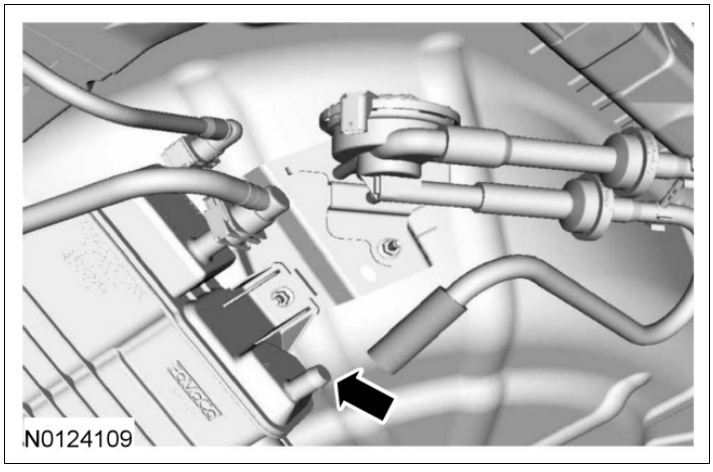
 ST2617-A	VACUTEC Smoke Machine Fuel EVAP Emissions System Tester 218-0002 or equivalent

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Disconnect the natural vacuum leak detection module hose from the carbon canister.



3. Connect the VACUTEC Smoke Machine Fuel EVAP Emissions System Tester to the carbon canister port, use a suitable adapter hose. For additional information refer to the manufacturer's instructions.



4. **NOTE:** The supplemental refueling adapter is located in the luggage compartment.

   Install the supplemental refueling adapter into the Easy Fuel ™ (capless) fuel tank filler pipe assembly.

5. **NOTE:** Direct smoke to the carbon canister port only. Smoke directed towards the natural vacuum leak detection module or filter may cause damage and/or restrict vapor lines

   Introduce smoke from the VACUTEC Smoke Machine Fuel EVAP Emissions 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.

6. Remove the supplemental refueling adapter once smoke is observed exiting the fuel tank filler pipe neck area.

7. Continue to enter smoke into the system for 60 seconds to obtain pressure.

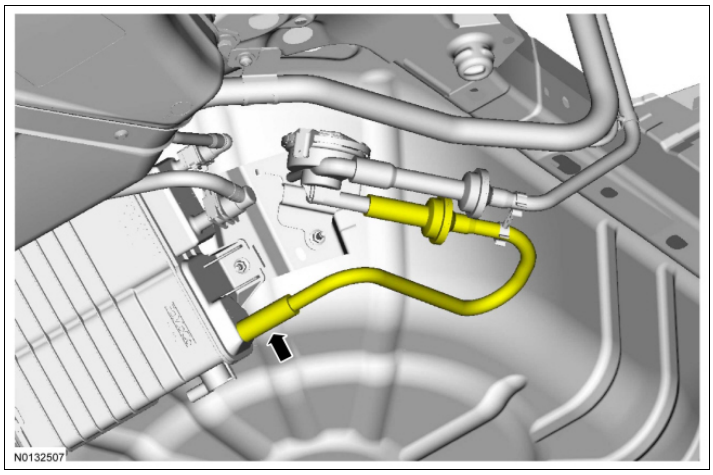
8. Press and release the remote start button in intervals of 15 seconds ON and 15 seconds OFF while checking for exiting smoke.

9. Use the halogen light provided with the VACUTEC Smoke Machine Fuel EVAP Emissions System Tester to follow the EVAP system path and look for smoke exiting at the source of the leak(s).

10. If smoke is observed at:
    - the capless fuel fill insert, clean capless insert (per SSM 21018). If leak persists, replace the fuel filler pipe assembly.
    - a vapor tube joint, disconnect and reconnect the components. If leak persists, replace both components that make up the joint.

11. **NOTE:** If the vehicle fails the IDS leak verification test but a leak cannot be found using the smoke machine, replace the natural vacuum leak detection module and fresh air hose assemblies.

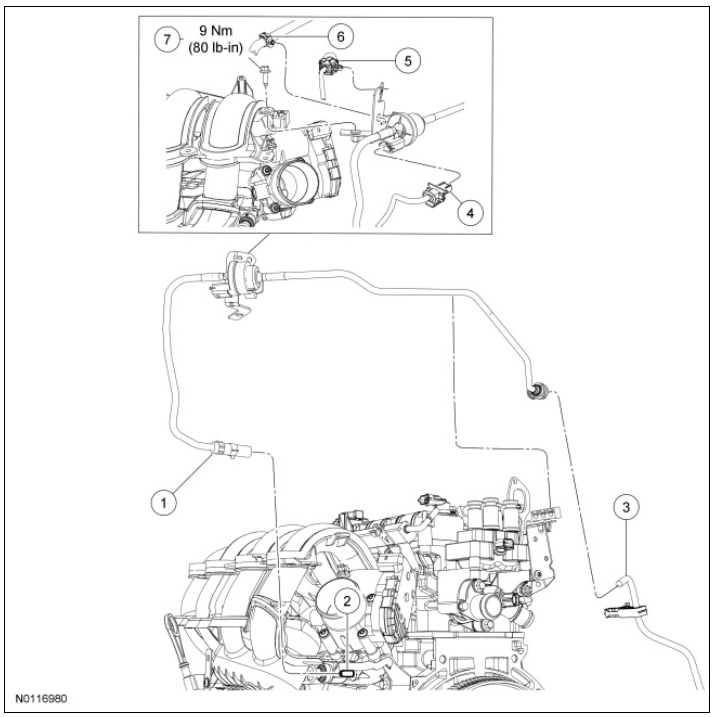
    After smoke testing is completed, reconnect the natural vacuum leak detection module vapor hose to the carbon canister.



12. Re-run the IDS leak verification test to confirm the source of the leak has been corrected.

Evaporative Emission (EVAP) System Components - Exploded View

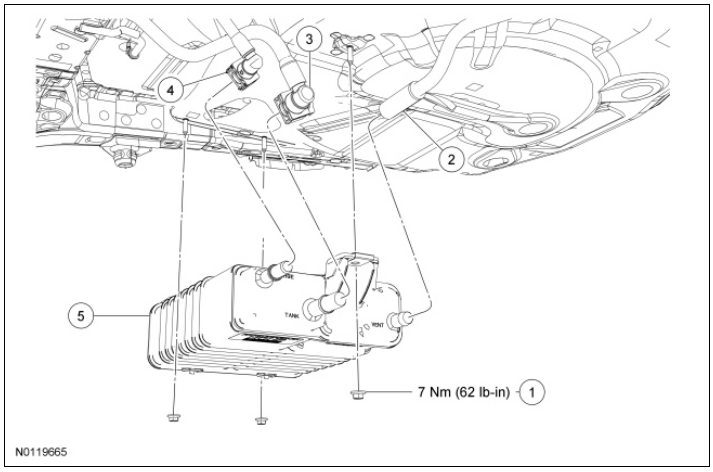
Evaporative Emission (EVAP) Canister Purge Valve



Item	Part Number	Description
1	9C047	Evaporative Emission (EVAP) canister purge valve
2	-	Intake manifold fitting (part of 9424)
3	9L291	Fuel vapor tube
4	-	EVAP canister purge valve electrical connector (part of 12B581)
5	W700475	Wiring harness retainer (part of 12B581)
6	-	Vacuum hose retainer (part of 19048)
7	W500213	EVAP canister purge valve bolt

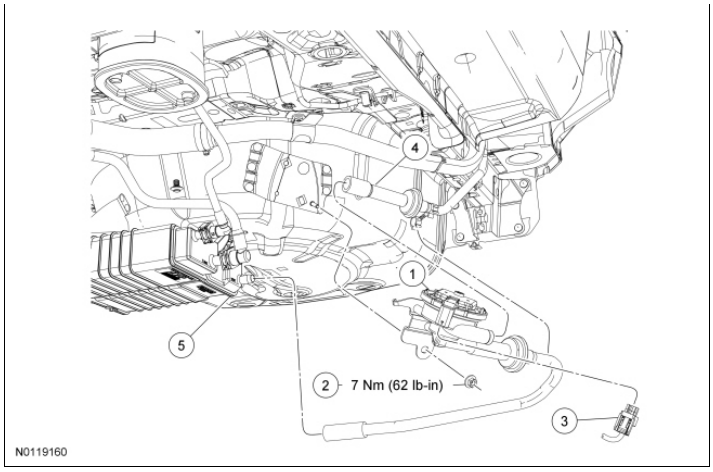
Evaporative Emission (EVAP) Canister

NOTE: Five door vehicle shown, four door vehicle similar.



Item	Part Number	Description
1	W707142	Evaporative Emission (EVAP) canister nut (3 required)
2	-	EVAP hose (part of 9A228)
3	9B033	Fuel vapor tube (to fuel tank)
4	9B337	Fuel vapor tube (to canister purge valve)
5	9D653	EVAP canister

Natural Vacuum Leak Detection Module

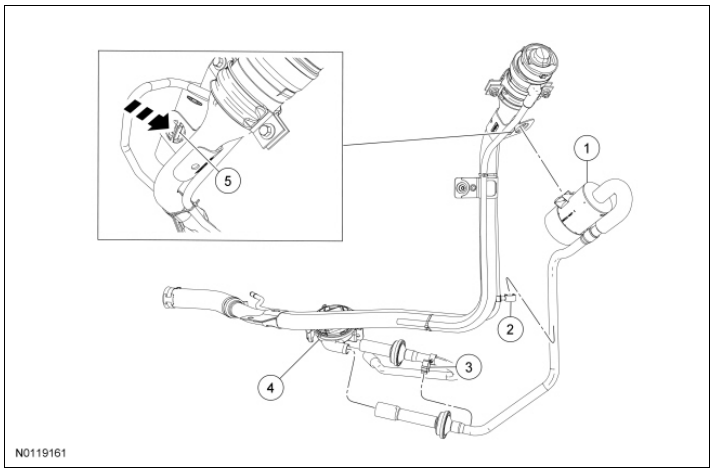


Item	Part Number	Description
1	9J279	Natural vacuum leak detection module
2	W707142	Natural vacuum leak detection module nut
3	-	Natural vacuum leak detection le electrical connector (part of 14A005)
4	9G297	Fresh air hose
5	9D653	EVAP canister

Evaporative Emission (EVAP) Fresh Air Hose

NOTE: The LH wheel liner must be positioned aside to access the fresh air hose.

NOTE: Press the release tab to disengage the fresh air hose from the fuel filler pipe bracket.



Item	Part Number	Description
1	9G297	Fresh air hose
2	W715398	Fresh air hose retainer
3	-	Hose retainer (part of 9A228)
4	9J279	Natural vacuum leak detection module
5	-	Fresh air hose release tab (part of 9G297)

⚠ WARNING: Always disconnect the battery ground cable at the battery whorking 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: 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.

NOTE: After installing an Evaporative Emission (EVAP) canister or Evaporative Emission (EVAP) canister purge valve, carry out the Evaporative Emission System Leak Test. For additional information, refer to Evaporative Emission System Leak Test in this section.

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Material

Item	Specification	Fill Capacity
High Temperature Nickel Anti-Seize Lubricant XL-2	-	-
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	-
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-	-

Torque Specifications

Description	Nm	lb-in
Camshaft Position (CMP) sensor	8	71
Catalyst Monitor Sensor (CMS) [a]	-	-
CMS electrical connector heat shield screw	-	-
Crankshaft Position (CKP) sensor [a]	8	71
Cylinder Head Temperature (CHT) sensor	12	106
Heated Oxygen Sensor (HO2S) [a]	-	-
Knock Sensor (KS)	20	177 Mass Air Flow (MAF) sensor screw 5 44
PCM bolt	5.4	47.8
PCM cover bolt	5.4	47.8
Variable Camshaft Timing (VCT) oil control solenoid	8	71

[a] Refer to the procedure for the specification.

Electronic Engine Controls

The electronic engine controls consist of the following:

- PCM
- Camshaft Position (CMP) sensor (2 required)
- Clutch Pedal Position (CPP) switch (manual transmission only)
- Crankshaft Position (CKP) sensor
- Mass Air Flow (MAF) sensor
- Heated Oxygen Sensor (HO2S)
- Catalyst Monitor Sensor (CMS)
- Knock Sensor (KS) (2 required)
- Engine Coolant Temperature (ECT) sensor
- Variable Camshaft Timing (VCT) oil control solenoid (2 required)

The PCM:

- accepts input from various engine sensors and generates output signals to control fuel injection, ignition and emissions.

The CMP sensor:

- sends the PCM a signal indicating camshaft position used for fuel synchronization.

The CPP sensor:

- sends a signal through the instrument cluster to the PCM. The PCM needs this signal to improve engine running performance during gear changes.

The CKP sensor:

- sends the PCM a signal indicating crankshaft position.

The MAF sensor:

- uses a hot-film element to measure the amount of air entering the engine.

The HO2S :

- creates a voltage signal dependent on exhaust oxygen content.
- provides feedback information to the PCM used to calculate fuel delivery.

The CMS :

- monitors oxygen content after it flows through the catalytic converter.
- provides a voltage to the PCM used to calculate catalytic converter integrity.

The KS :

- is used to detect engine detonation.
- sends a voltage signal to the PCM.

The ECT sensor:

- sends the PCM a signal indicating engine coolant temperature.
- voltage decreases as coolant temperature increases.

The VCT oil control solenoid:

- is an electronic solenoid that actuates the flow of oil to the variable camshaft. Once the PCM transmits a signal, the solenoid moves a valve spool, directing oil into the camshaft phaser cavity. This action changes valve timing by either inducing an advance or retard condition. The camshaft is, thereby repositioned in relation to crankshaft timing and allows for optimum engine performance and lower emissions

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for additional information on electronic engine control components.

Electronic Engine Controls

DTC Charts

PCM DTC Chart

DTC	Description	Action to Take
P0125:00	Insufficient Coolant Temp For Closed Loop Fuel Control: No Sub Type Information	REFER to Section 303-03 .
P0128:00	Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature): No Sub Type Information	REFER to Section 303-03 .
P0504:00	Brake Switch A/B Correlation: No Sub Type Information	REFER to Section 419-03 .
P0531:2F	A/C Refrigerant Pressure Sensor A Circuit Range/Performance: Signal Erratic	REFER to Section 412-00 .
P0532:16	A/C Refrigerant Pressure Sensor A Circuit Low: Circuit Voltage Below Threshold	REFER to Section 412-00 .
P0533:17	A/C Refrigerant Pressure Sensor A Circuit High: Circuit Voltage Above Threshold	REFER to Section 412-00 .
P0578:00	Cruise Control Multi-Function Input A Circuit Stuck: No Sub Type Information	REFER to Section 419-03 .
P0579:00	Cruise Control Multi-Function Input A Circuit Range/Performance: No Sub Type Information	REFER to Section 419-03 .
P0617:12	Starter Relay Circuit High: Circuit Short To Battery	REFER to Section 303-06 .
P0645:13	A/C Clutch Relay Control Circuit: Circuit Open	REFER to Section 412-00 .
P0646:11	A/C Clutch Relay Control Circuit Low: Circuit Short To Ground	REFER to Section 412-00 .
P0647:12	A/C Clutch Relay Control Circuit High: Circuit Short To Battery	REFER to Section 412-00 .
P065B:09	Generator Control Circuit Range/Performance: Component Failure	REFER to Section 414-00 .
P065C:09	Generator Mechanical Performance: Component Failure	REFER to Section 414-00 .
P0833:00	Clutch Pedal Switch B Circuit: No Sub Type Information	REFER to Section 419-03 .
P0850:00	Park / Neutral Switch Input Circuit: No Sub Type Information	REFER to Section 303-06 .
P0851:00	Park / Neutral Switch Input Circuit Low: No Sub Type Information	REFER to Section 303-06 .
P0A3B:19	Generator Over Temperature: Component Failure	REFER to Section 414-00 .
P162D:00	Internal Control Module Cruise Control Performance: No Sub Type Information	REFER to Section 419-03 .
P1794:16	Battery Voltage Circuit: Circuit Voltage Below Threshold	REFER to Section 414-00 .

P1794:17	Battery Voltage Circuit: Circuit Voltage Above Threshold	REFER to Section 414-00 .
U0120:88	Lost Communication with Starter/Generator Control Module: Bus Off	REFER to Section 414-00 .
U0167:00	Lost Communication With Vehicle Immobilizer Control Module: No Sub Type Information	REFER to Section 419-01B .
U0426:00	Invalid Data Received From Vehicle Immobilizer Control Module: No Sub Type Information	REFER to Section 419-01B .
U0469:09	Invalid Data Received From Starter/Generator Control Module: Component Failure	REFER to Section 414-00 .
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	REFER to Section 414-00 .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	REFER to Section 414-00 .
All Other DTCs	-	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

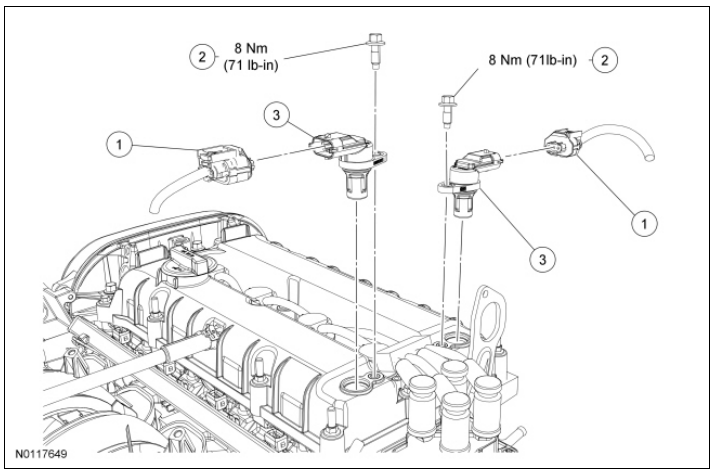
Engine Control Components - Exploded View

Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	-
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
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-

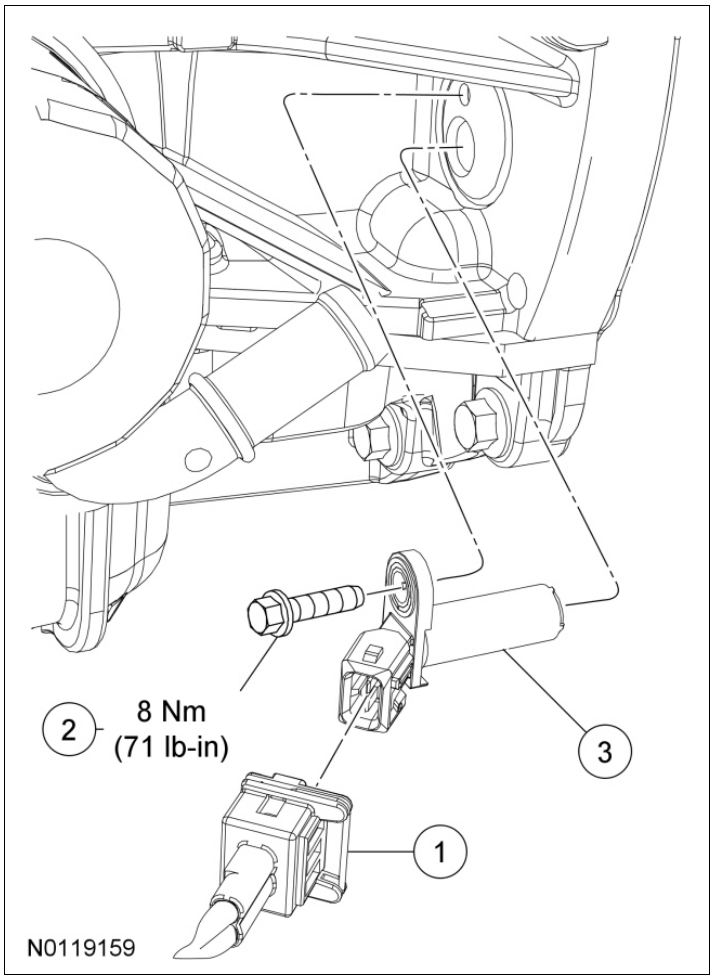
Camshaft Position (CMP) Sensor

NOTE: Lubricate the O-ring seals with clean engine oil.



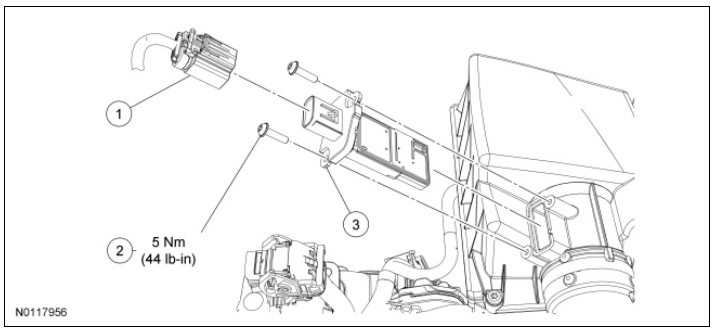
Item	Part Number	Description
1	-	Camshaft Position (CMP) sensor electrical connector (part of 12B581) (2 required)
2	W702251	CMP sensor bolt (2 required)
3	12K073	CMP sensor (2 requi

Crankshaft Position (CKP) Sensor



Item	Part Number	Description
1	-	Crankshaft Position (CKP) sensor electrical connector (part of 12B581)
2	W702251	CKP sensor bolt
3	6C315	CKP sensor

Mass Air Flow (MAF) Sensor



Item	Part Number	Description

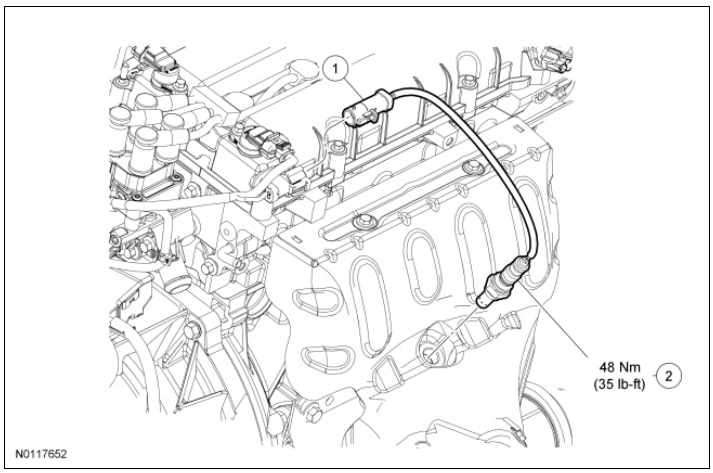
1	-	Mass Air Flow (MAF) sensor electrical connector (part of 12B581)
2	-	MAF sensor screw (2 required)
3	12B579	MAF sensor

Heated Oxygen Sensor (HO2S) Sensor

NOTE: If necessary, lubricate the HO2S with penetrating and lock lubricant to assist in removal.

NOTE: Apply anti-seize to the threads of the HO2S prior to installing.

NOTE: The correct torque wrench setting must be calculated when using a commercially available exhaust gas sensor socket to install the HO2S . Refer to the Torque Wrench Adapter Formulas in the Appendix.



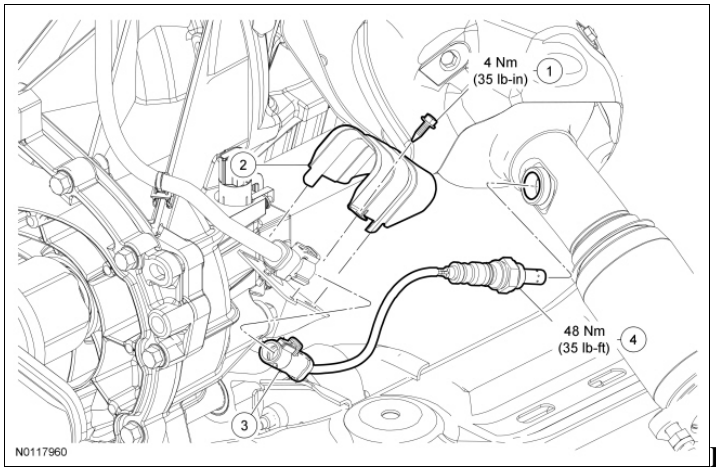
Item	Part Number	Description
1	-	Heated Oxygen Sensor (HO2S) electrical connector (part of 9G444)
2	9G444	HO2S

Catalyst Monitor Sensor (CMS)

NOTE: If necessary, lubricate the CMS with penetrating and lock lubricant to assist in removal.

NOTE: Apply anti-seize to the threads of the CMS prior to installing.

NOTE: The correct torque wrench setting must be calculated when using a commercially available exhaust gas sensor socket to install the CMS . Refer to the Torque Wrench Adapter Formulas in the Appendix.

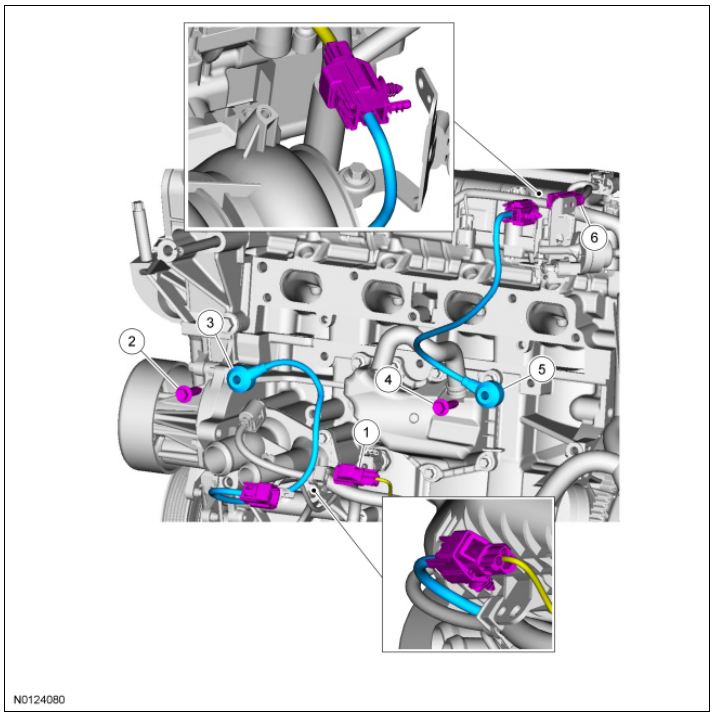


ItemPart NumberDescription1W705981Catalyst Monitor Sensor (CMS) electrical connector heat shield screw (manual transmission only)214A163CMS electrical connector heat shield (manual transmission only)3-CMS electrical connector (part of 12B581)49F472CMS

Knock Sensor (KS)

NOTICE: **The RH Knock Sensor (KS) must be installed in the 4 o'clock position and the LH KS must be installed in the 11 o'clock position. Failure to follow these instructions may result in damage to the engine.**

NOTE: The intake manifold must be removed to access the KS . For additional information, refer to Section 303-01 .



Item	Part Number	Description
1	-	RH Knock Sensor (KS) electrical connector (part of 12B581)
2	W500225	RH KS bolt - 20 Nm (177 lb-in)

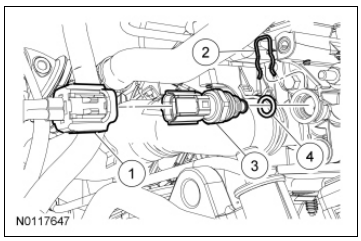
3	12A699	RH KS
4	W500225	LH KS bolt - 20 Nm (177 lb-in)
5	12A699	LH KS
6	-	LH KS electrical connector (part of 12B581)

Engine Coolant Temperature (ECT) Sensor

NOTE: Drain the engine cooling system prior to removal of the ECT sensor.

NOTE: Fill and bleed the engine cooling system after installing the ECT sensor.

NOTE: The ignition coil must be removed to access the ECT sensor. For additional information, refer to Section 303-07 .

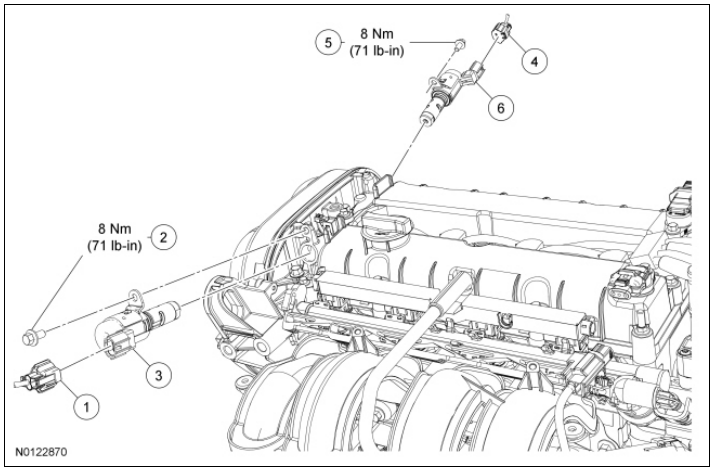


Item	Part Number	Description
1	-	Engine Coolant Temperature (ECT) sensor electrical connector (part of 12B581)
2	W703355	ECT sensor retaining clip
3	12A648	ECT sensor
	-	Engine Coolant Temperature (ECT) sensor O-ring seal (part of 12A648)

Variable Camshaft Timing (VCT) Oil Control Solenoid

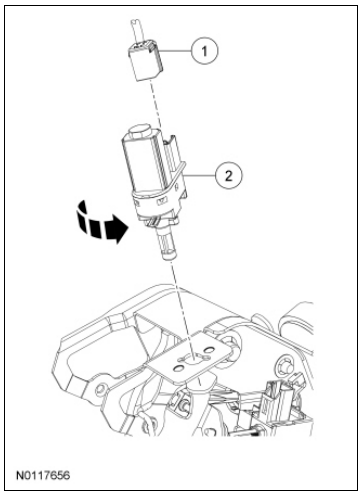
NOTE: Intake solenoid shown, exhaust solenoid similar.

NOTE: Lubricate the O-ring seals with clean engine oil.



Item	Part Number	Description
1	-	LH Variable Camshaft Timing (VCT) oil control solenoid electrical connector
2	W500011	VCT oil control solenoid bolt (2 required)
3	6L713	VCT oil control solenoid (2 required)

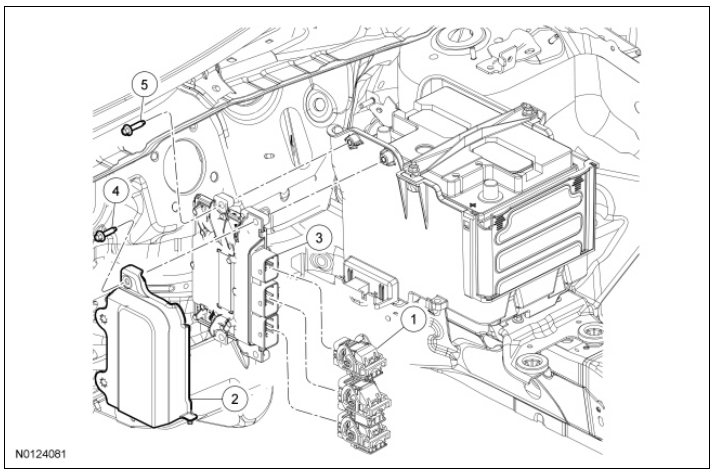
Clutch Pedal Position (CPP) Switch



Item	Part Number	Description
1	-	Clutch Pedal Position (CPP) switch electrical connector (part of 14290)
2	11A152	CPP switch

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Powertrain Control Module (PCM)



Item	Part Number	Description
1	-	PCM electrical connector (3 required)
2	12C514	PCM cover
3	12A650	PCM
4	W700005	PCM cover bolt - 5.4 Nm (47.8 lb-in)
3	W700005	PCM bolt - 5.4 Nm (47.8 lb-in)

Removal

1. **NOTE:** PCM installation DOES NOT require new keys or programming of keys, only a Parameter Reset of the Passive Anti-Theft System (PATS).

   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. Remove the bolt and the PCM cover.

3. Disconnect the 3 PCM electrical connectors.

4. Remove the bolt and the PCM.

Installation

1. ***NOTICE:*** **The PCM and PCM cover can be easily damaged by excessive fastener torque. Do not exceed 5.4 Nm (47.8 lb-in).**

   Position the PCM and install the bolt.

   - Tighten to 5.4 Nm (47.8 lb-in).

2. Connect the 3 PCM electrical connectors.

3. ***NOTICE:*** **The PCM and PCM cover can be easily damaged by excessive fastener torque. Do not**

exceed 5.4 Nm (47.8 lb-in).

Position the PCM cover and install the bolt.

- Tighten to 5.4 Nm (47.8 lb-in).

1. **NOTE:** If the Programmable Module Installation (PMI) procedure was not successful in downloading the data from the vehicles original PCM, then the oil life data of the vehicle is lost. If this occurs, and the oil life cannot be determined through service history or customer interview, it is recommended the vehicle engine oil and filter be changed and the oil change minder reset.

   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 .

5. Reprogram the PATS . Carry out the Parameter Reset procedure. For additional information, refer to Section 419-01B .

Alignment Specifications

NOTE: All alignment specifications are with the vehicle fuel tank full.

Item	LH	RH	Split	Thrust Angle
Front				
Camber [a]	-0.70° ± 0.75°	-0.70° ± 0.75°	0.00° ± 0.75°	-
Caster [a]	3.37° ± 0.75°	3.37° ± 0.75°	0° ± 0.75°	-
Toe @ curb ride height (positive value is toe in, negative value is toe out)	-	0.15° ± 0.35°	-	
Rear				
Camber [a]	-1.52° ± 0.75°	-1.52° ± 0.75°	-	-
Only total toe defined	-	-	0.31° ± 0.30°	0° ± 0.50°

[a] Nominal setting (reference only) no adjustment

Clear Vision @ Straight Drive Specification

Location	Nominal	Tolerance
Front	0.50	+/-2.00
Rear	Not applicable	Not applicable

General Specifications

Item	Specification	
Ball Joint Deflection		
Lower	0-0.2 mm (0-0.008 in)	
Ride Height		
Front	15 mm (0.59 in) ± 9 mm (0.3lign="top" align="left">Rear	39 mm (1.535 in) ± 9 mm (0.354 in)

Torque Specifications

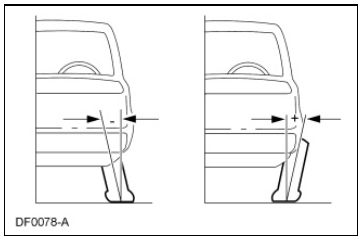
Description	Nm	lb-ft
Tie-rod end jam nut	85	63

Wheel Alignment Angles

Camber

NOTE: Wheel alignment angles can be affected by subframe position. Subframe alignment may be necessary if wheel alignment cannot be achieved.

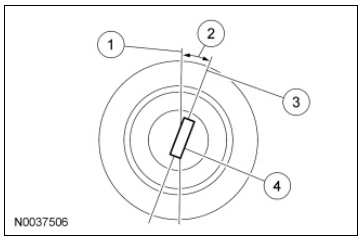
Negative and Positive Camber



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. The camber setting is not adjustable.

Caster

Caster is the deviation from vertical of an imaginary line drawn through the pivot points (top of strut and lower ball joint), when viewed from the side. The caster specifications in this section will give the vehicle the best directional stability characteristics when loaded and driven. caster setting is not related to tire wear. The caster setting is not adjustable.

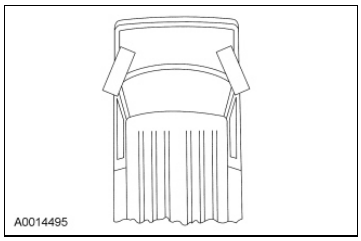


Item	Description
1	True vertical
2	Positive caster angle
3	Strut centerline
4	Pivot centerline

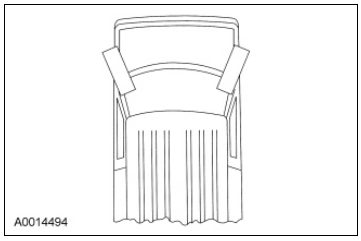
A backward tilt is positive (+) and a forward tilt is negative (-). Front caster adjustment is not a separate procedure on this vehicle.

Toe

Positive Toe (Toe In)

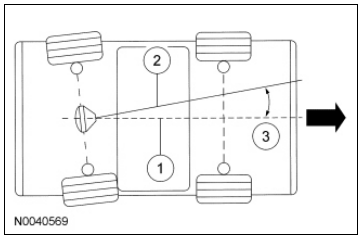


Negative Toe (Toe Out)



The vehicle toe setting affects tire wear and directional stability.

Incorrect Thrust Angle (Dogtracking)



Item	Description
1	Vertical centerline
2	Axle centerline
3	Thrust angle

Incorrect thrust angle (also known as dogtracking) is the condition in which the rear axle is not square to the chassis. Heavily crowned roads can give the illusion of dogtracking.

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 experienced 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 experienced by the driver as small rotational oscillations of the steering wheel. For wheel and tire diagnosis, refer to Section 204-04 .

Poor Returnability/Sticky Steering

Poor returnability and sticky steering are used to describe the poor return of the steering wheel to center after a turn or steering correction.

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 the hands off the steering wheel.

- A vehicle-related drift/pull on a flat road causes a consistent deviation from the straight-ahead path and requires constant steering input in the opposite direction to counteract the effect.
- Drift/pull may be induced by conditions external to the vehicle (wind or road crown).

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, GO to Symptom Chart - NVH .

2. Inspect the tires.
   - Check the tire pressures with all normal loads he 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
• Front or rear suspension components • Suspension fastener(s) • Incorrect spring usage • Spring(s) • Shock absorber(s) • Strut(s) • Suspension bushing(s) • Steering system components • Subframe • Wheel bearing and wheel hub(s) • Tires • Non-OEM parts or modifications

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, 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 suspension
- Front or rear suspension components
- INSPECT the front or rear suspension. INSTALL new components as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
- 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 or 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 noicurs mostly over bumps or while turning

- Front suspension components
- Loose or damaged front struts, 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)
- Worn or damaged upper strut mount bearing(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 .

- Strut(s) or shock absorber(s)

- INSTALL new struts or 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

- INSPECT the front suspension. REFER to Section 204-01 in this section. REPAIR or INSTALL new suspension components as necessary.

- Rough/harsh ride

- Incorrect tire pressure

- ADJUST the tire pressure. REFER to the VC label.
- Low ride height
- 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.

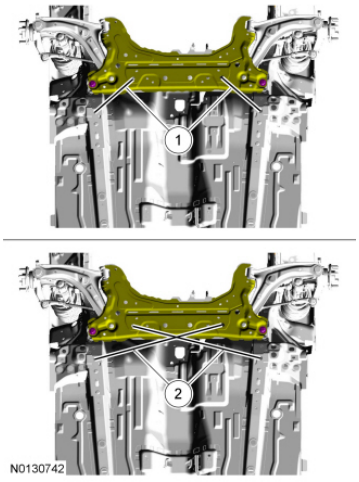
Pinpoint Tests

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
A1 CHECK FOR UNEVENLY LOADED VEHICLE	
• Visually check the vehicle for an uneven loading condition. • **Is the vehicle unevenly loaded?**	**Yes** ADVISE the customer of uneven loading condition. **No** GO to A2 .
A2 CHECK THE TIRE PRESSURES AND TIRE CONDITIONS	
• Check the tire pressures. Refer to the VC label located on the driver door jamb. Check the tires for uneven/abnormal wear. Refer to Diagnosis and Testing -Wheels and Tires in Section 204-04 . • **Are the tire pressures and tire conditions OK?**	**Yes** GO to A3 . **No** ADJUST the tire pressures to the specified pressure or INSTALL new tires as necessary.
A3 ISOLATE TIRE DRIFT/PULL CONDITION	
• **NOTE:** It is important to determine if tire forces are the cause of a drift/pull condition. Changing the	**Yes** If the vehicle drifts/pulls in the opposite direction, tire forces are causing the

position of the wheel and tire assemblies on the vehicle may correct a pull/drift condition. A tire or tires that are causing a drift/pull should not be removed from service unless it has been determined that the tire(s) are worn beyond specification. Refer to Diagnosis and Testing - Wheels and Tires in Section 204-04 • Cross the front whand tire assemblies from left-to-right. Refer to Section 204-04 . • **Does the vehicle drift/pull?**	drift/pull. ROTATE the wheel and tire assemblies front-to-rear. REFER to Section 204-04 . If the vehicle drifts/pulls in the same direction, GO to A4 . **No** Tire forces were causing the drift/pull and the concern has been corrected.
A4 CHECK SUBFRAME ALIGNMENT	
• **NOTE:** RH and LH dimensions are identical. All measurements on center. • Using the following measurements, check the subframe alignment. • Location 1 - 260 mm (10.236 in). • Location 2 - 666 mm (26.22 in).  • **Is the subframe aligned correctly?**	**Yes** GO to A5 . **No** REMOVE and DISCARD the 2 rearward subframe bolts. LOOSEN the 2 forward subframe bolts. Using the measurements listed above, ALIGN the subframe. TIGHTEN the 2 forward subframe bolts to 60 Nm (44 lb-ft). TIGHTEN the 2 new rearward subframe bolts to 100 Nm (74 lb-ft). TIGHTEN the 2 new rearward subframe bolts an additional 240 degrees. Vehicle wheel alignment must be reset after the subframe is moved. ADJUST the alignment as necessary. REFER to General Procedures in this section.
A5 CHECK FOR BRAKE DRAG	
• Spin all four wheel and tire assemblies by hand and check for brake drag. • **Do the wheels spin freely?**	**Yes** GO to A6 . **No** REFER to Section 206-00 to diagnose brake drag condition.
A6 CHECK THE WHEEL ALIGNMENT	
• Using alignment equipment and the manufacturer's instructions, check the wheel alignment. • **Is the wheel alignment out of specification?**	**Yes** ADJUST the alignment as necessary. REFER to General Procedures in this section. **No** REFER to Section 211-00 to diagnose steering system drift/pull/wander condition.

Component Tests

Ball Joint Inspection

1. Prior to inspecting the ball joints for wear, inspect the wheel bearings. Install a new wheel bearing as necessary.

2. **NOTE:** In order to obtain 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.

3. 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 .

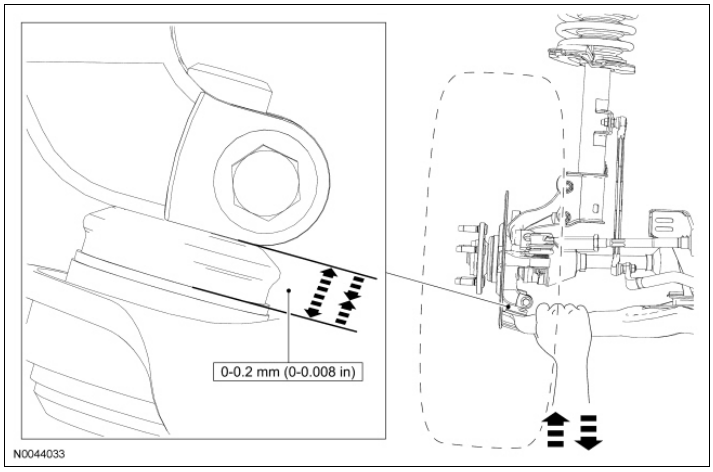
4. ***NOTICE:*** **Do not use any tools or equipment to move the wheel and tire assembly or suspension components while checking for relative movement. Suspension damage may occur. The use of tools or equipment will also create relative movement that may not exist when using hand force. Relative movement must be measured using hand force only.**

   Inspect the ball joint for relative movement by alternately pulling downward and pushing upward on the lower control arm 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 5.

5. **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.

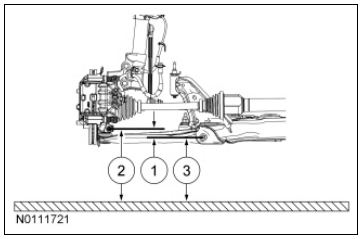
   To measure ball joint deflection, attach a suitable dial indicator with a flexible arm between the lower control arm and the wheel knuckle or ball joint stud.



6. Measure the ball joint deflection while an assistant pushes up and pulls down on the lower 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.

Ride Height Measurement

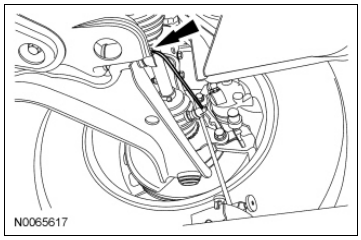
Front Ride Height Measurement



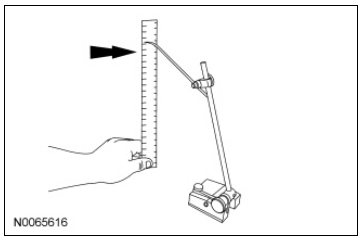
Item	Description
1	Ride height = 2 - 3
2	Measurement 2
3	Measurement 3

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.

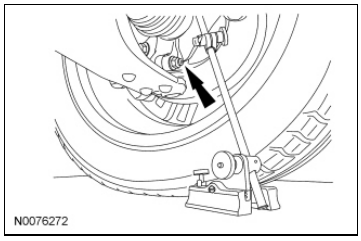
1. Position the surface gauge on the same flat, levelface, adjust the gauge arm until the scriber point is located in the center of the lower arm forward bolt.
    - Lock the surface gauge in this position.



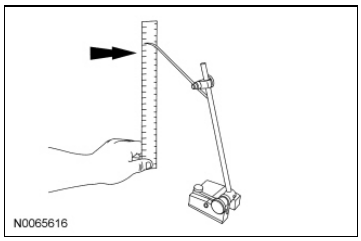
2. With the surface gauge positioned on a flat, level surface, record the measurement of the surface gauge position (measurement 2).



3. Position a suitable surface gauge (such as Starrett 57D Surface Gauge), on a flat, level surface and adjust the gauge arm until the scriber point is located in the center of the ball joint bolt.
    - Lock the surface gauge in this position.

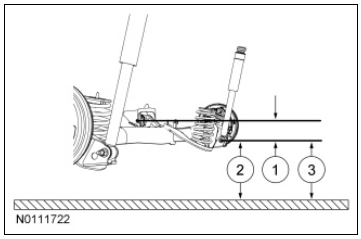


4. With the surface gauge positioned on a flat, level surface, record the measurement of the surface gauge position (measurement 3).



5. Subtract measurement 3 from measurement 2 to obtain the front ride height.
    - Refer to Specifications in this section.

Rear Ride Height Measurement



Item	Description
1	Ride height = 2 - 3
2	Measurement 2
3	Measurement 3

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.

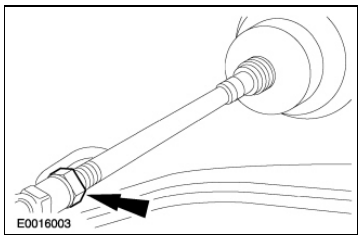
1. Measure the distance between the flat level surface and the forward lower arm inboard bolt (measurement 2).

2. Measure the distance between the flat level surface and the center of the forward lower arm outboard bolt (measurement 3).

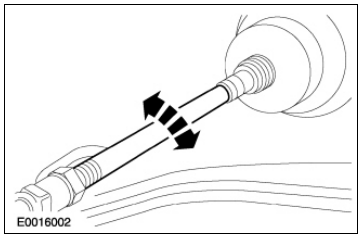
3. Subtract measurement 3 from measurement 2 to obtain the rear ride height.
    - Refer to Specifications in this section.

Toe Adjustment - Front

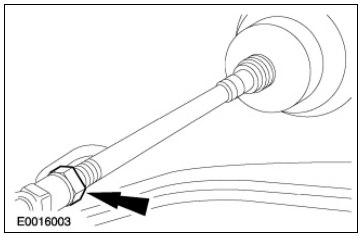
1. Using a suitable steering wheel holding device, lock the steering wheel in the straight ahead position.
2. Using alignment equipment and the manufacturer's instructions, measure the toe.
3. Loosen the tie-rod end jam nuts.



4. Rotate the tie rods as necessary to adjust the toe setting.



5. Tighten the tie-rod end jam nuts to 8 lb-ft).



6. Recheck the toe settings, adjust as necessary.

Torque Specifications

Description	Nm	lb-ft	lb-in
Ball joint nut	52	38	-
Brake caliper guide pin bolts	28	21	-
Brake flexible hose bracket bolt	26	19	-
Lower arm forward bolt [a]	-	-	-
Lower arm rearward bolt [a]	-	-	-
Stabilizer bar bracket bolts	48	35	-
Stabilizer bar link nuts	48	35	-
Strut rod nut	48	35	-
Strut upper nuts	30	22	-
Tie-rod end nut	53	39	-
Wheel hub nut	255	188	-
Wheel knuckle-to-strut nuts [a]			
Wheel speed sensor bolt	9	-	80

[a] Refer to the procedure in this section.

Front Suspension

The front suspension consists of the following components:

- Lower arms
- Stabilizer bar, bushings and links
- Strut and spring assemblies
- Wheel bearings
- Wheel hubs
- Wheel knuckles
- Wheel studs

The front suspension utilizes a MacPherson strut system. This suspension system incorporates a strut assembly that takes the place of the upper arm and ball joint. The strut performs the function of a shock absorber and is encompassed by a coil spring. The strut and spring assembly carries the sprung weight of the vehicle and is also the pivot point for the steering knuckle. This system uses a lower control arm and ball joint for the lower (unloaded) pivot point of the steering knuckle.

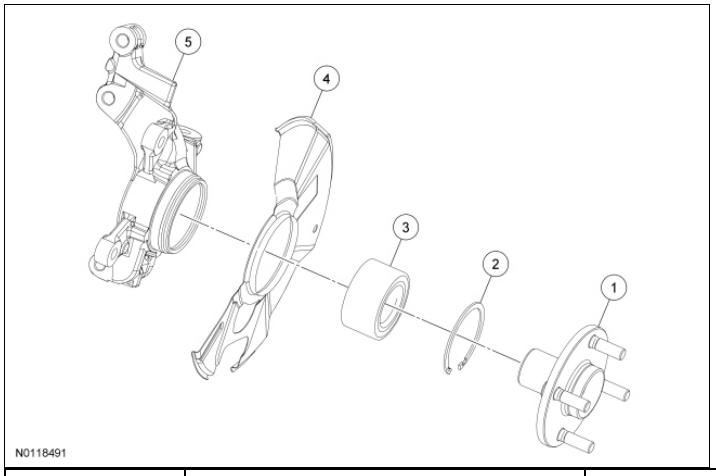
Front Suspension

Refer to Section 204-00 .

Wheel Bearing

Special Tool(s)

 ST2446-A	Installer, Wheel Hub Bearing Cup 205-147
 ST1895-A	Pinion Bearing Cone Remover 205-D0002 (D79L-4621-A) or equivalent
 ST1861-A	Remover/Installer, Wheel Hub Cup 204-020
 ST2446-A	Step Plate 205-117



Item	Part Number	Description
1	1104	Wheel hub
2	7059	Snap ring
3	1215	Wheel bearing
4	2K005LH/ 2K004RH	Brake disc shield
5	3K186 LH/ 3K185 RH	Wheel knuckle

Removal

NOTICE: **When the wheel hub is pressed from the bearing, the bearing inner race will come out with the hub. Never try to install the race back into the bearing. Always install a new bearing.**

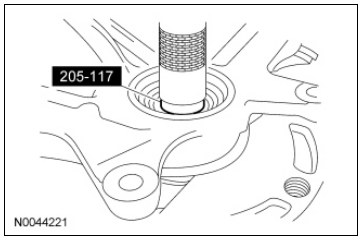
NOTICE: **Make sure to keep the knuckle level and supported during pressing operations, or damage to the knuckle can occur. Support the knuckle as close to the bearing bore as possible. Do not use knuckle extremities as supports.**

NOTE: If removing the wheel hub, the wheel bearing must be replaced.

NOTE: The Anti-Lock Brake System (ABS) tone ring is part of the wheel bearing assembly.

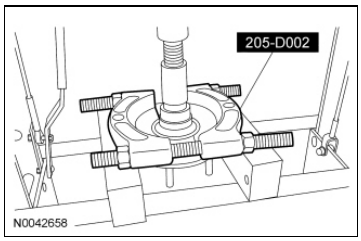
1. Remove the wheel knuckle. For additional information, refer to Wheel Knuckle in this section.

2. Using the Step Plate and a suitable press, remove the wheel hub from the wheel bearing.



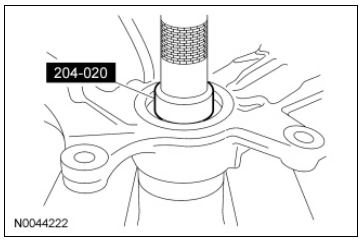
3. **NOTE:** This step may not be necessary if the inner wheel bearing race remains in the wheel knuckle after removing the wheel hub.

   Using the Pinion Bearing Cone Remover and a suitable press, remove the inner wheel bearing race from the wheel hub.



4. Remove the snap ring.

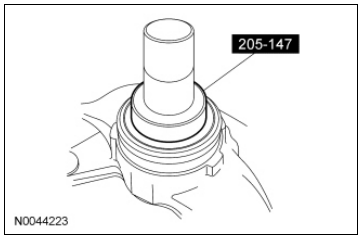
5. Using the Wheel Hub Cup Remover/Installer and a suitable press, remove the outer wheel bearing race from the wheel knuckle.



Installation

NOTE: Install the wheel bearing with the pink colored wheel speed sensor ring facing towards the transmission side.

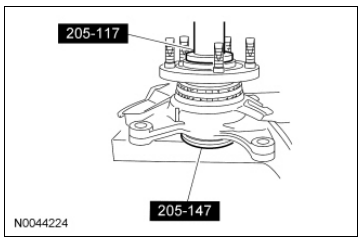
1. Using the Wheel Hub Bearing Cup Installer and a suitable press, install the wheel bearing into the wheel knuckle.



2. Install the snap ring.

3. ***NOTICE:*** **The wheel bearing inner race must be supported during hub installation. Failure to do so will damage the bearing.**

   Using the Wheel Hub Bearing Cup Installer, Step Plate and a suitable press, install the wheel hub into the wheel bearing.

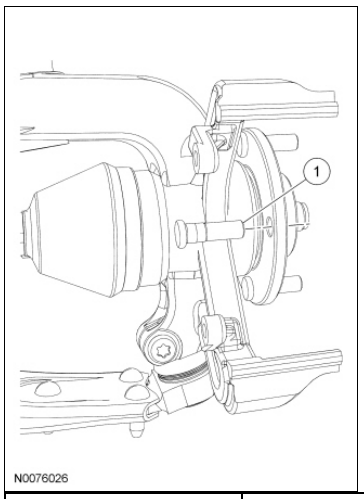


4. Install the wheel knuckle. For additional information, refer to Wheel Knuckle in this section.

Wheel Studs

Special Tool(s)

 ST1106-A	Remover, Tie-Rod End 211-001 (TOOL-3290-D)



Item	Part Number	Description
1	1107	Wheel stud

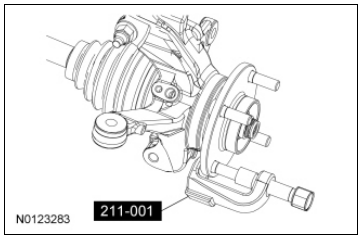
Removal

1. ***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.**

   NOTE: Make sure the steering wheel is in the UNLOCKED position.

   Remove the brake disc. For additional information, refer to Section 206-03 .

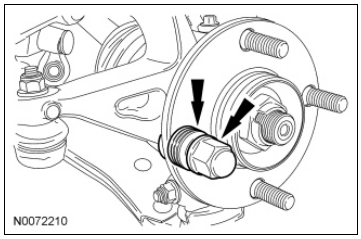
2. Using the Tie-Rod End Remover, remove the wheel stud.



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.

   Position the wheel stud in the flange, making sure the serrations on the stud line up with the serrations in the flange. Install the washers and a wheel nut.



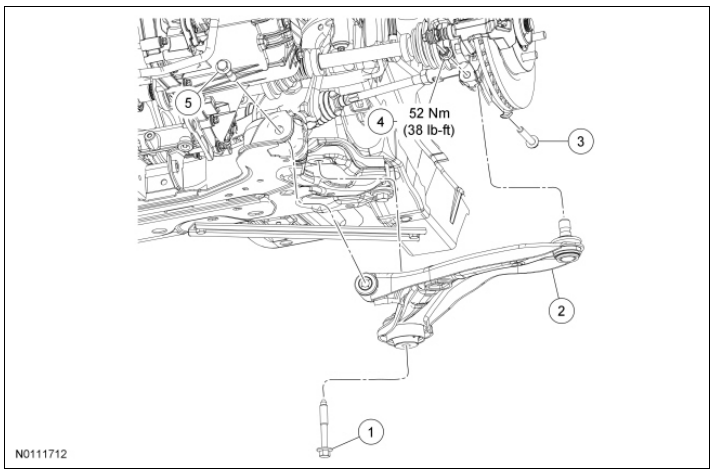
2. ***NOTICE:*** **Do not use power tools to install the wheel stud or damage to the flange may occur.**

   Tighten the wheel nut until the stud is seated against the hub flange.

3. Remove the wheel nut and the washers. Discard the wheel nut.

4. Install the brake disc. For additional information, refer to Section 206-03 .

Lower Arm



Item	Part Number	Description
1	W703432	Rear lower arm bolt
2	3079 LH / 3078 RH	Lower arm
3	W709618	Ball joint bolt
4	W520203	Ball joint nut
5	W703432	Forward lower arm bolt

Removal

NOTICE: **Suspension fasteners are critical parts that affect performance of vital components and systems. Failure of these fasteners may result in major service expense. Use the same or equivalent parts if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Tighten fasteners as specified.**

1. Remove the wheel and tire. For additional information, refer to Section 204-04 .

NOTICE: **Use care when releasing the lower arm and wheel knuckle into the resting position or damage to the ball joint seal may occur.**

NOTICE: **Tighten suspension bushing fasteners with the weight of the vehicle resting on the wheel and tires or incorrect clamp load and bushing damage may occur.**

NOTICE: **Do not use a prying device or separator fork between the ball joint and the wheel knuckle. Damage to the ball joint or ball joint seal may result. Only use the pry bar by inserting it into the lower control arm body opening.**

2. Remove and discard the ball joint nut and bolt. Using a pry bar, separate the ball joint stud from the wheel knuckle.

3. Remove and discard the forward and rear lower arm bolts and remove the lower arm.

Installation

NOTE: Do not tighten the forward and rear lower arm bolts at this time.

1. Position the lower arm and loosely install the new forward and rear bolts.

2. Insert the ball joint stud into the wheel knuckle and install the new ball joint bolt and nut.
    - Tighten to 52 Nm (38 lb-ft).

3. Install the wheel and tire. For additional information, refer to Section 204-04 .

4. Lower the hoist so the weight of the vehicle is resting on the wheels and tires.

5. Tighten the new forward and rear lower arm bolts in 2 stages
    - Stage 1: Tighten to 63 Nm (46 lb-ft).
    - Stage 2: Tighten an additional 180 degrees.

6. Check and, if necessary, align the front end. For additional information, refer to Section 204-00 .

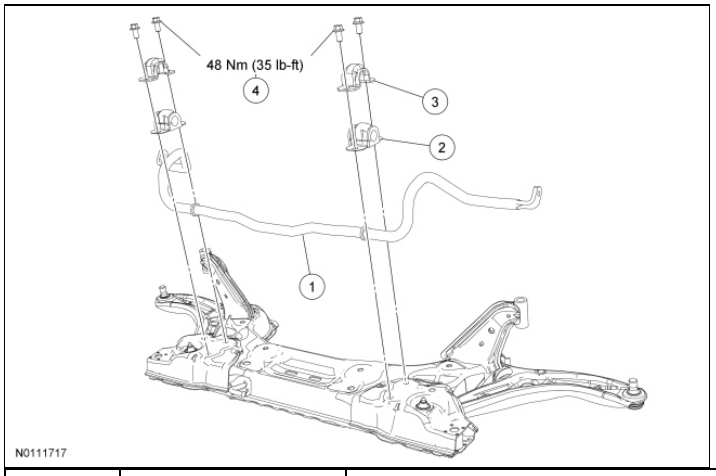
Stabilizer Bar

Special Tool(s)

 ST2783-A	Remover, Tie Rod End 211-001 (Tool-3290-D)

General Equipment

Transmission Jack

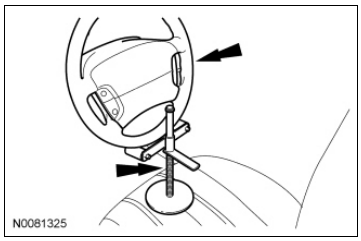


Item	Part Number	Description
1	5482	Stabilizer bar
2	5484	Stabilizer bar bushing (2 required)
3	5486	Stabilizer bar bushing bracket (2 required)
4	W500032	Stabilizer bar bracket bolt (4 required)

Removal

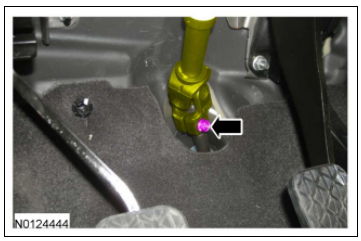
NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.**

1. Using a suitable holding device, hold the steering wheel in the straight-ahead position.



2. ***NOTICE:*** **Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence that the steering column shaft has rotated, remove and recenter the clockspring. For additional information, refer to Section 501-20B .**

   Remove and discard the steering column shaft-to-steering gear bolt and disconnect the steering column shaft from the steering gear.



3. Remove the front wheels and tires. For additional information, refer to Section 100-04 .

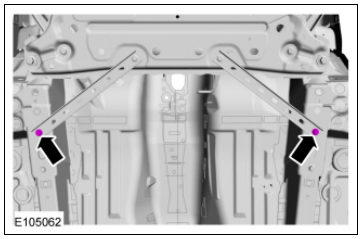
4. Remove and discard the 2 outer tie rod nuts.

5. Using the Tie Rod End Remover, separate the outer tie rods from the wheel knuckles.

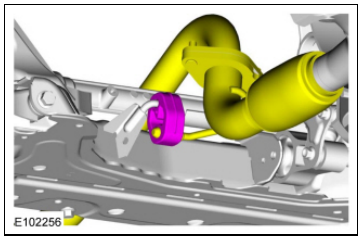


6. Remove and discard the 2 stabilizer bar link-to-stabilizer bar nuts and disconnect the stabilizer bar links from the stabilizer bar.

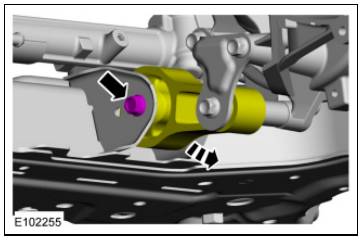
7. Remove the 2 subframe brace-to-body bolts.



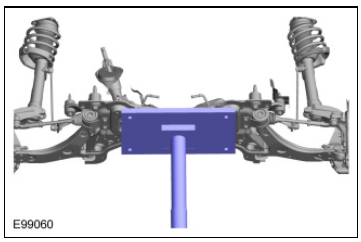
8. Disconnect the exhaust isolator.



9. Remove the engine roll restrictor bolt.

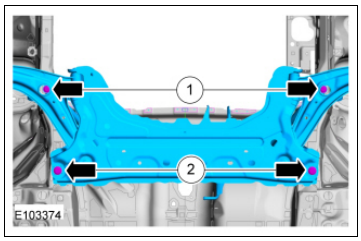


10. Support the front subframe using a suitable transmission jack.

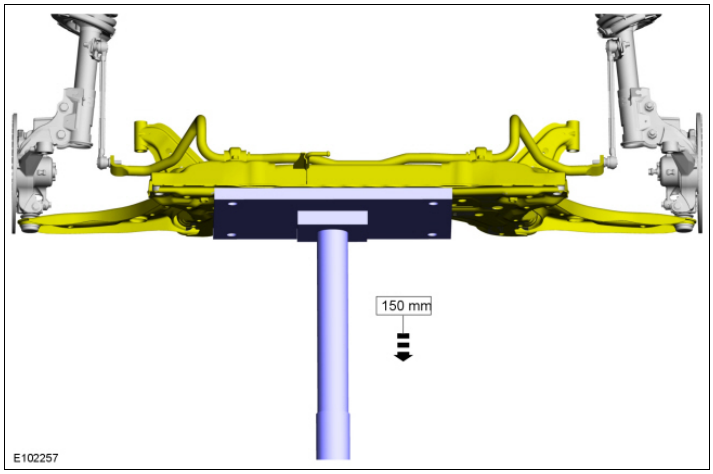


11. Mark the position of the subframe-to-frame mounting location at each mounting point on the vehicle frame rails to aide in installation.

12. Remove the 4 subframe bolts and discard the 2 rearward bolts.



13. Lower the front subframe approximately 155 mm (6.102 in).



14. Remove the stabilizer bar bracket bolts and brackets.
    - Discard the bolts.

15. Remove the stabilizer bar bushings.

16. Remove the stabilizer bar.

Installation

NOTICE: **The stabilizer bar bushings must be positioned correctly with the slit in the bushing toward the rear of the vehicle or damage to the bushings may occur.**

1. Position the stabilizer bar with the bushings installed with the slit in the bushing toward the rear of the vehicle.

2. Position the stabilizer bar brackets and install the new bolts.
   - Tighten to 48 Nm (35 lb-ft).

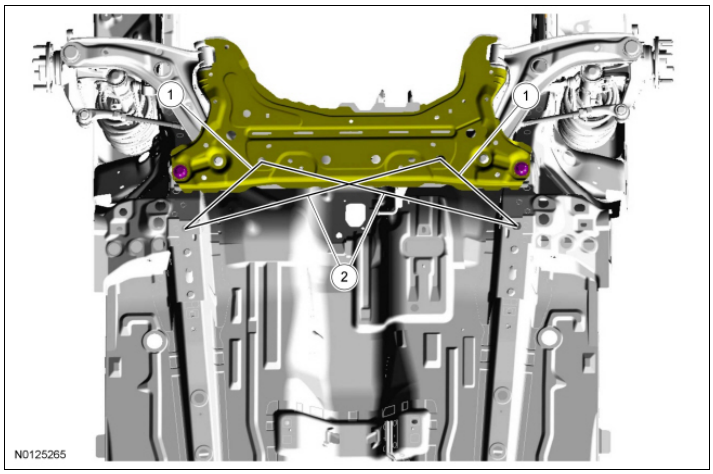
3. Raise the subframe and loosely Install the 4 subframe bolts.

4. Align the subframe to the locating marks made during removal.

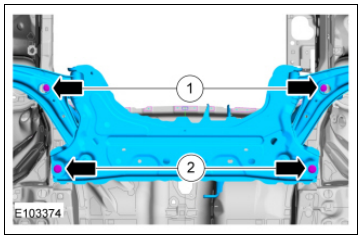
5. **NOTE:** RH and LH dimensions are identical. All measurements on center.

   Measure for correct positioning of the subframe to vehicle underbody.

   1. Location 1 - 260 mm (10.236 in)
   2. Location 2 - 666 mm (26.22 in)

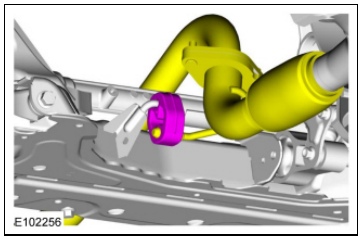


6. Tighten the subframe bolts.
   1. Tighten the forward bolts to 60 Nm (44 lb-ft).
   2. Tighten the new rearward bolts to 100 Nm (74 lb-ft).
   - Tighten the rearward bolts an additional 240°.

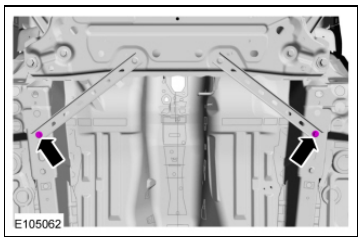


7. Position the engine roll restrictor and install the engine roll restrictor bolt.
   - Tighten to 50 Nm (37 lb-ft).

8. Connect the exhaust isolator.



9. Install the 2 subframe brace-to-body bolts.
    - Tighten to 50 Nm (37 lb-ft).



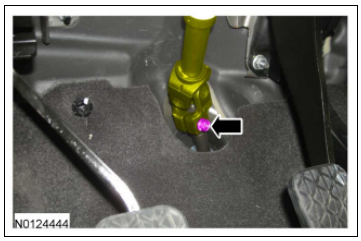
10. Position the stabilizer bar links and install the 2 new stabilizer bar link-to-stabilizer bar nuts.
    - Tighten to 48 Nm (35 lb-ft).

11. Position the outer tie rods and install the new 2 outer tie rod nuts.
    - Tighten to 53 Nm (39 lb-ft).

12. ⚠ **WARNING: Do not reuse steering column shaft bolts. This may result in fastener failure and steering column shaft detachment or loss of steering control. Failure to follow this instruction may result in serious injury to vehicle occupant(s).**

    Connect the steering column shaft and install a new steering column shaft-to-steering gear bolt.

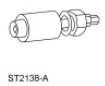
    - Tighten to 32 Nm (24 lb-ft).

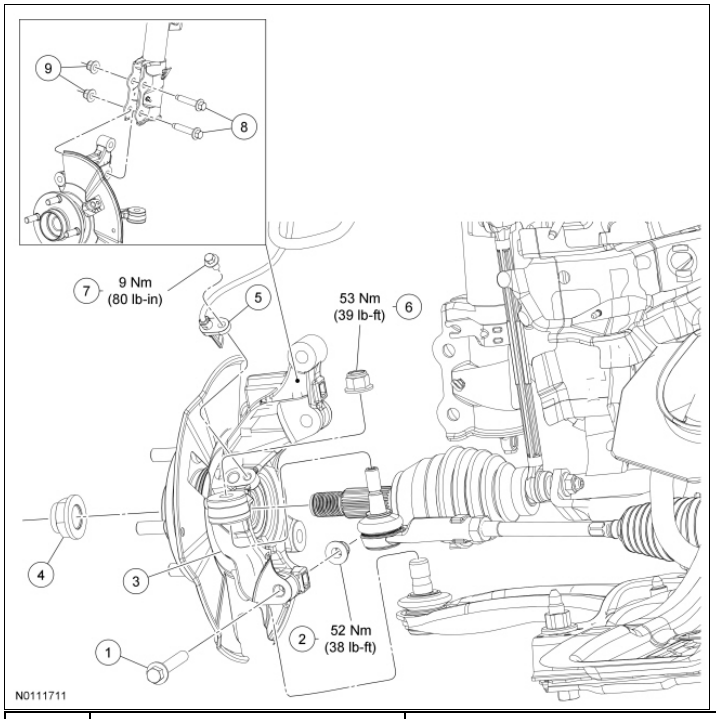


13. Check and, if necessary, adjust the front toe. For additional information, refer to Section 204-00 .

Wheel Knuckle

Special Tool(s)

 ST2136-A	Installer, Halfshaft 204-161 (T97P-1175-A)
 ST2272-A	Remover, Front Wheel Hub 205-D070 (D93P-1175-B) or equivalent
 ST1106-A	Remover, Tie-Rod End 211-001 (TOOL-3290-D)



Item	Part Number	Description
1	W709618	Ball joint bolt
2	W520203	Ball joint nut
3	3K186 LH / 3K185 RH	Wheel knuckle and hub assembly
4	W713640	Wheel hub nut
5	2C204	Wheel speed sensor
6	W520204	Tie-rod end nut
7	W500011	Wheel speed sensor bolt
8	W709618	Wheel knuckle-to-strut bolt (2 required)
9	W520203	Wheel knuckle-to-strut nut (2 required)

Removal

NOTICE: **Suspension fasteners are critical parts that affect performance of vital components and systems. Failure of these fasteners may result in major service expense. Use the same or equivalent parts if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Tighten fasteners as specified.**

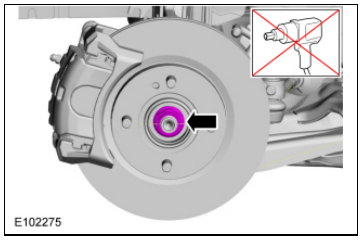
NOTICE: **Do not tighten the wheel hub nut with the vehicle on the ground. Tighten the nut to specification before the vehicle is lowered onto the wheels. Wheel bearing damage will occur if the wheel bearing is loaded with the weight of the vehicle applied.**

NOTICE: **Install and tighten the new wheel hub nut to specification in a continuous rotation. Always install a new wheel hub nut after loosening or when not tightened to specification in a continuous rotation or damage to the component may occur.**

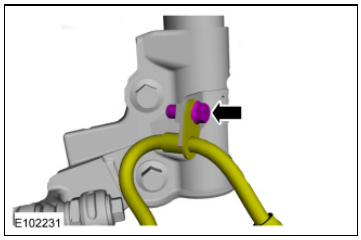
1. Remove the wheel and tire. For additional information, refer to Section 204-04 .

NOTE: Apply the brake to prevent the halfshaft from rotating while loosening the wheel hub nut.

2. Remove and discard the wheel hub nut.



3. Remove the brake flexible hose bracket bolt and disconnect the brake flexible hose from the strut and spring assembly.



NOTICE: **Do not allow the brake caliper to hang from the brake hose or damage to the brake hose can occur.**

4. Remove the 2 brake caliper anchor plate bolts and position the brake caliper assembly aside.
    - Support the brake caliper assembly using mechanic's wire.

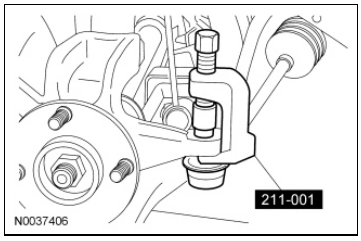
5. Remove the brake disc.

6. If equipped with Anti-Lock Brake System (ABS), remove the wheel speed sensor bolt and position the wheel speed sensor aside.

NOTICE: **Do not remove the tie-rod end nut or damage to the tie-rod end may occur.**

7. Loosen the tie-rod end nut.

8. Using the Tie-Rod End Remover, detach the tie-rod end from the wheel knuckle.
    - Remove and discard the tie-rod end nut.



NOTICE: **Do not use a prying device or separator fork between the ball joint and the wheel knuckle. Damage to the ball joint or ball joint seal may result. Only use the pry bar by inserting it into the lower arm body opening.**

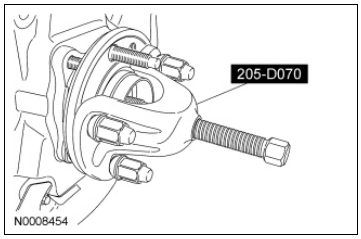
NOTICE: **Use care when releasing the lower arm and wheel knuckle into the resting position or damage to the ball joint seal may occur.**

9. Remove and discard the ball joint nut and bolt. Using a pry bar, separate the ball joint stud from the wheel knuckle.

10. ***NOTICE:*** **Do not bend the inner joint more than 18 degrees or the outer joint more than 45 degrees. Damage to the halfshaft will occur.**

    Using the Front Wheel Hub Remover, press the halfshaft from the wheel hub and detach the halfshaft from the wheel hub

    - Support the halfshaft.



11. Remove and discard the wheel knuckle-to-strut nuts and bolts.

12. Remove the wheel knuckle.
    - If necessary, remove the wheel bearing and hub. For additional information, refer to Wheel Bearing in this section.

Installation

1. Position the wheel knuckle and install new wheel knuckle-to-strut bolts and nuts.
   - Tighten to 80 Nm (59 lb-ft) and then tighten an additional 90 degrees.

2. Insert the halfshaft into the wheel hub.

3. Insert the ball joint stud into the wheel knuckle and install the new ball joint bolt and nut.
   - Tighten to 52 Nm (38 lb-ft).

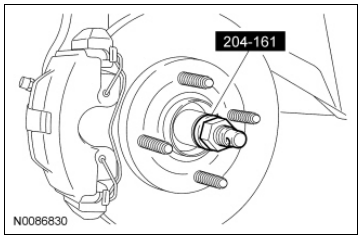
4. Attach the tie-rod end to the wheel knuckle and install a new tie-rod end nut.
   - Tighten to 53 Nm (39 lb-ft).

5. If equipped with ABS , position the wheel speed sensor and install the wheel speed sensor bolt.
   - Tighten to 9 Nm (80 lb-in).

6. Install the brake disc.

7. Position the brake caliper assembly and install the 2 brake caliper anchor plate bolts.
    - Tighten to 68 Nm (50 lb-ft).

8. Using the Halfshaft Installer, install the halfshaft into the wheel hub.



9. Connect the brake flexible hose to the strut and spring assembly and install the brake flexible hose bracket bolt.
    - Tighten to 26 Nm (19 lb-ft).

10. ***NOTICE:*** **Do not tighten the wheel hub nut with the vehicle on the ground. Tighten the nut to specification before the vehicle is lowered onto the wheels. Wheel bearing damage will occur if the wheel bearing is loaded with the weight of the vehicle applied.**

    NOTICE: **Install and tighten the new wheel hub nut to specification in a continuous rotation. Always install a new wheel hub nut after loosening or when not tightened to specification in a continuous rotation, or damage to the components may occur.**

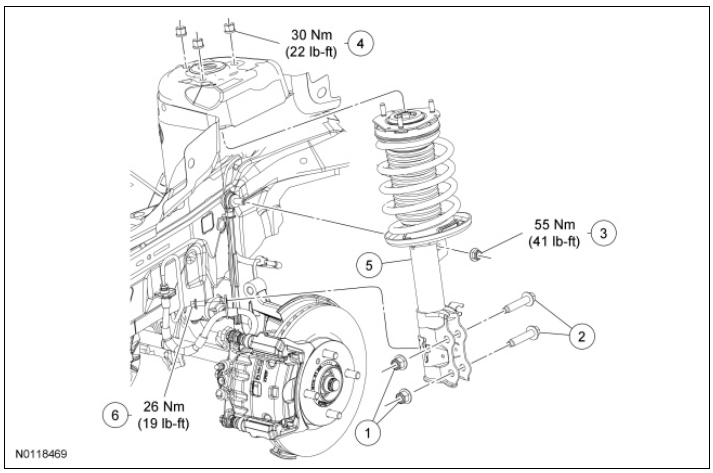
    NOTE: Apply the brake to prevent the halfshaft from rotating while tightening the wheel hub nut.

    Install a new wheel hub nut.

    - Tighten to 255 Nm (188 lb-ft).

11. Install the wheel and tire. For additional information, refer to Section 204-04 .

Strut and Spring Assembly



Item	Part Number	Description
1	W520214	Wheel knuckle-to-strut nut (2 required)
2	W500742	Wheel knuckle-to-strut bolt (2 required)
3	W713760	Stabilizer bar link upper nut
4	W715409	Strut upper nut (3 required)
5	18124	Strut and spring assembly
6	W500222	Brake hose bracket to strut bolt

Removal and Installation

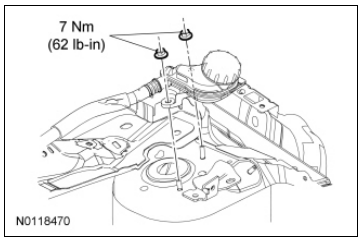
NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.**

NOTICE: **Support the strut and spring assembly to prevent damage.**

1. Remove the wheel and tire. For additional information, refer to Section 204-04 .

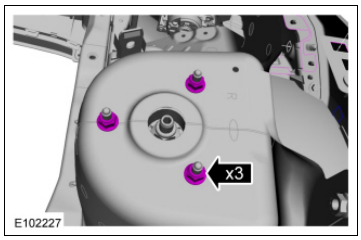
NOTE: Drivers side only

2. Position aside the brake fluid reservoir (main container).
   - To install, tighten to 7 Nm (62 lb-in).



3. Position aside the air conditioner hose support bracket.
   - To install, tighten to 7 Nm (62 lb-in).

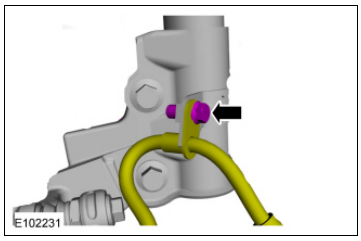
4. Remove and discard the 3 strut and spring assembly upper mount nuts.
    - To install, tighten the new nuts to 30 Nm (22 lb-ft).



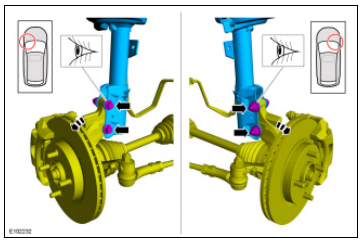
5. Disconnect the wheel speed sensor harness from the strut and spring assembly bracket.

6. Remove the stabilizer bar link upper nut and detach the link from the strut.
    - Discard the nut.
    - To install, tighten the new nut to 55 Nm (41 lb-ft).

7. Remove the brake flexible hose bracket bolt and disconnect the hose from the strut and spring assembly.
    - To install, tighten to 26 Nm (19 lb-ft).



8. Remove the wheel knuckle-to-strut nuts, bolts and the strut and spring assembly.
    - Discard the wheel knuckle-to-strut nuts and bolts.
    - To install, tighten the new wheel knuckle-to-strut nuts to 80 Nm (59 lb-ft) and then tighten an additional 90 degrees.



9. **NOTE:** Insert LH knuckle-to-strut bolts from the knuckle arm side.

   Insert RH knuckle-to-strut bolts from the brake caliper side.

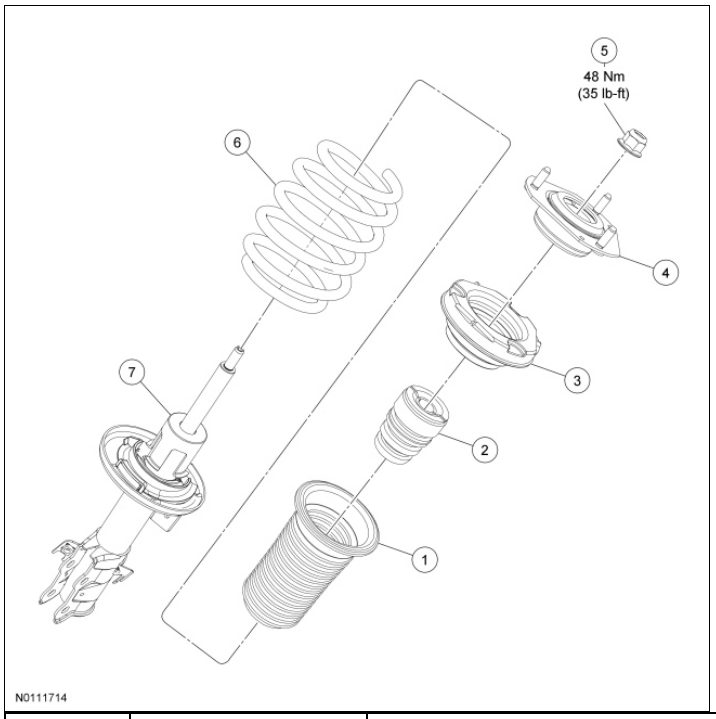
   To install, reverse the removal procedure.

10. Check and, if necessary, align the front end. For additional information, refer to Section 204-00 .

Strut and Spring Assembly

Material

Item	Specification
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A



Item	Part Number	Description
1	5349	Dust boot
2	3020	Jounce bumper
3	18198	Spring upper seat and bearing assembly
4	18183	Upper mount
5	W708922	Strut rod nut
6	5310	Spring
7	18124	Strut assembly

Disassembly and Assembly

⚠ 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.

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure can result in major service 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.**

NOTICE: **When installing a suitable spring compressor, use care not to damage the spring coating.**

1. Remove the strut and spring assembly. For additional information, refer to Strut and Spring Assembly in this section.

⚠ WARNING: Do not attempt to disassemble the shock absorber and spring assembly without using a spring compressor. Assemblies are under extreme load. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: The coil spring is under extreme load. Care must be taken at all times when removing or installing a loaded spring. Failure to follow this instruction may result in serious personal injury.

2. Using a suitable coil spring compressor, compress the spring.

3. **NOTE:** Use the hex-holding feature to prevent the strut rod from rotating while removing the nut.

   Carefully remove and discard the strut rod nut.

   - To install, tighten the new nut to 48 Nm (35 lb-ft).

4. Remove the upper mount, spring upper seat and bearing assembly and the dust boot.

5. Remove the strut and jounce bumper.

6. Carefully remove the spring from the spring compressor.

7. ***NOTICE:*** **Make sure the upper mount is correctly seated before assembly or damage to the upper mount may occur.**

   NOTICE: **Make sure the spring is installed with the flat surface facing up and with the spring end correctly positioned against the spring seat (color code at the bottom). This is to prevent spring seat damage and incorrect spring position.**

   NOTE: During assembly, apply the specified silicone brake grease to the strut rod and the top and sides of the outermost part of the dust boot.

   To assemble, reverse the disassembly procedure.

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake tube fitting	18	-	159
Shock absorber lower bolt	115	85	-
Shock absorber upper bolt	25	18	-
Trailing arm bolts [a]	-	-	-
Wheel speed sensor bolt	9	-	80
Wheel hub and bearing assembly bolts [a]	-	-	-

[a] Refer to the procedure for specification.

Rear Suspension

The rear suspension consists of the following components:

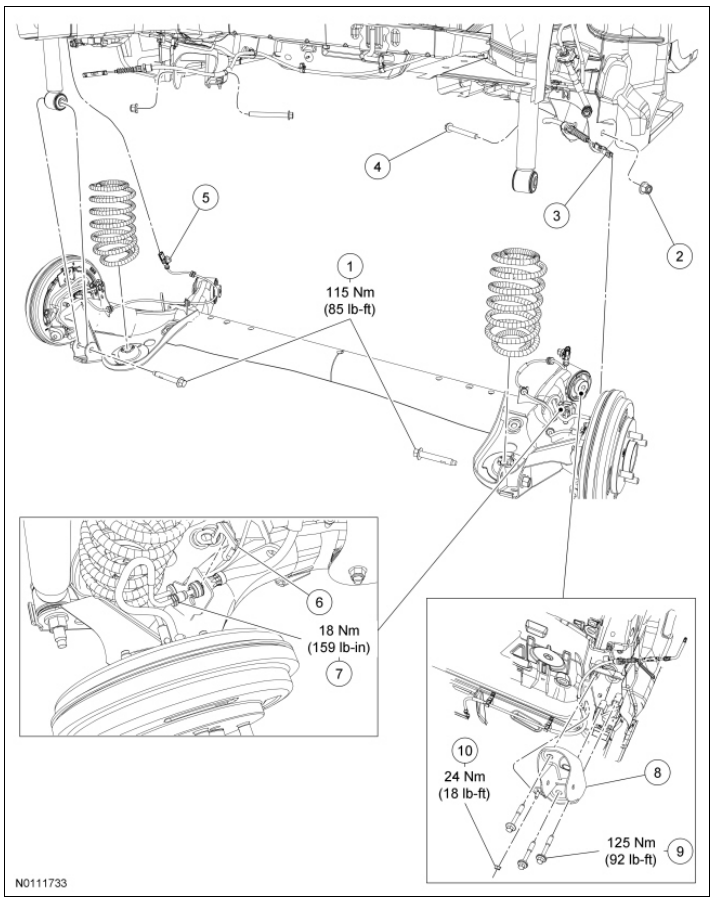
- Twist-beam axle (torsionally rigid axle)
- Coil springs
- Shock absorbers
- Wheel bearing and wheel hub assemblies
- Wheel studs

If compression takes place on both wheels evenly (for example when a load is placed on the vehicle), the whole axle unit swivels evenly in the rubber-metal bearings. If only one wheel is compressed, the cross-beam twists (undergoes torsion) and acts as a stabilizer. This minimizes track and toe changes.

Rear Suspension

Refer to Section 204-00 .

Axle



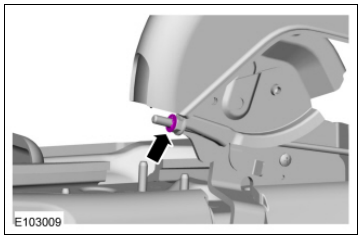
Item	Part Number	Description
1	W713343	Shock absorber lower bolt (2 required)
2	W520214	Trailing arm nut (2 required)
3	-	Front parking brake cable-to-RH rear parking brake cable union (part of 2A635) (2 required)
4	W500553	Trailing arm bolt (2 required)
5	-	Anti-Lock Brake System (ABS) connector (part of 2B372) (2 required)
6	W700936	Clip (2 required)
7	-	Brake tube fitting (part of 2267)
8	5596	Bracket assembly (2 required)
9	W708508	Bracket-to-frame bolts (6 required)
10	W520413	Parking brake cable bracket nut (2 required)

Removal

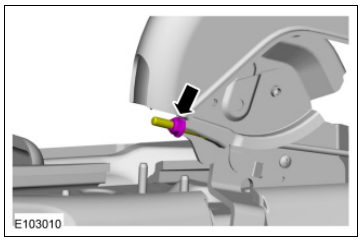
NOTICE: **Suspension fasteners are critical parts that affect performance of vital components and systems. Failure of these fasteners may result in major service expense. Use the same or equivalent parts if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Tighten fasteners as specified.**

1. Remove the floor console. For additional information, refer to Section 501-12 .

2. Remove the parking brake adjustment nut retaining clip.

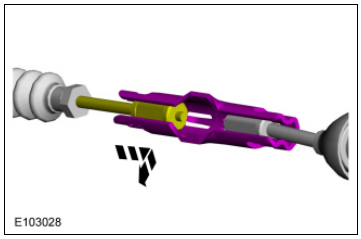


3. Loosen the parking brake adjustment nut 5 turns.



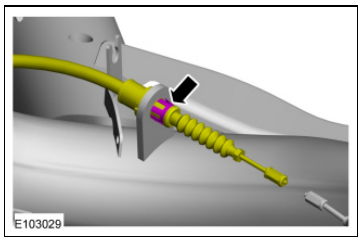
4. Remove the wheel and tire. For additional information, refer to Section 204-04 .

5. Disconnect both parking brake actuation lever cables.



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

   Compress the clips and pull both parking brake cables through the mounting brackets.



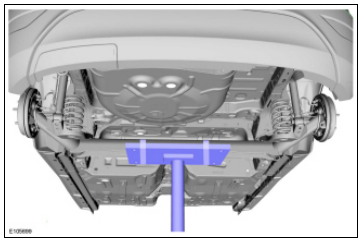
7. **NOTE:** Cap the brake tube connections to prevent fluid loss.

   Disconnect the rear brake tube fittings from the rear brake hoses and remove the clips.

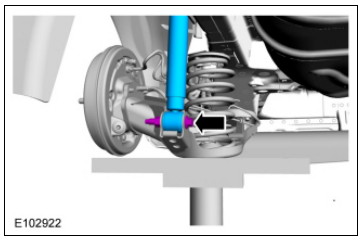
   - To install, tighten to 18 Nm (159 lb-in).

8. Remove the wheel bearing and wheel hub assemblies. For additional information, refer to Wheel Bearing and Wheel Hub .

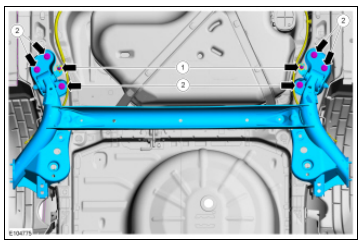
9. Using a suitable jackstand, support the rear axle assembly.



10. Remove and discard the 2 shock absorber lower bolts.
    - To install, tighten to 115 Nm (85 lb-ft).



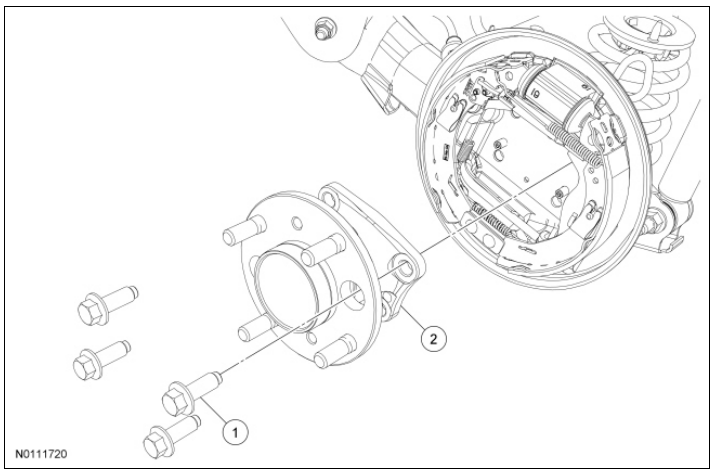
11. Remove the 2 parking brake cable bracket nuts.
    - To install, tighten to 24 Nm (18 lb-ft).



12. Remove the 6 bracket-to-frame bolts and remove the axle assembly
    - To install, tighten to 125 Nm (92 lb-ft).

13. To install, reverse the removal procedure.
    - Bleed the brake wheel cylinders. For additional information, refer to Component Bleeding in Section 206-00 .

Wheel Bearing and Wheel Hub



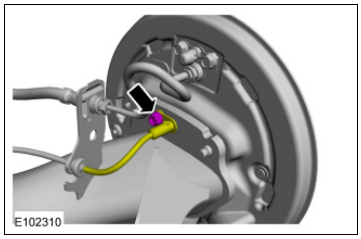
Item	Part Number	Description
1	W711918	Wheel bearing and wheel hub assembly bolt (4 required) (install new)
2	1109	Wheel bearing and wheel hub assembly

Removal

NOTICE: **Suspension fasteners are critical parts that affect performance of vital components and systems. Failure of these fasteners may result in major service expense. Use the same or equivalent parts if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Tighten fasteners as specified.**

1. Remove the brake drum. For additional information, refer to Section 206-02 .

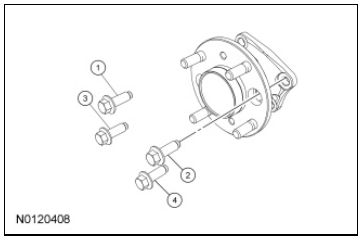
2. Remove the wheel speed sensor bolt and remove the wheel speed sensor.



3. Remove the wheel bearing and wheel hub assembly.
   - Remove and discard the 4 wheel bearing and wheel hub assembly bolts.
   - Remove the wheel bearing and wheel hub assembly.

Installation

1. Install the wheel bearing and wheel hub assembly with 4 new bolts in the sequence shown.
   1. Tighten all 4 bolts to 65 Nm (48 lb-ft).
   2. Loosen each bolt 90 degrees.
   3. Tighten each bolt to 65 Nm (48 lb-ft) using the sequence shown.



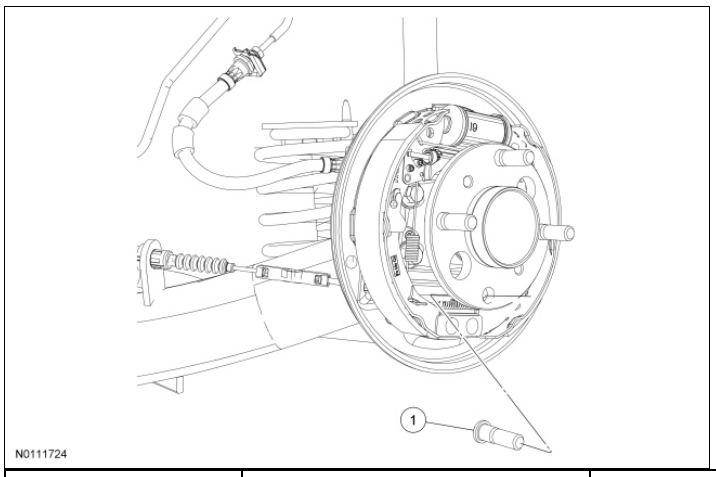
2. Install the wheel speed sensor and install the wheel speed sensor bolt.
    - Tighten to 9 Nm (80 lb-in).

3. Install the brake drum. For additional information, refer to Section 206-02 .

Wheel Studs

Special Tool(s)

 ST1106-A	Remover, Tie-Rod End 211-001 (TOOL-3290-D)



Item	Part Number	Description
1	1107	Wheel stud

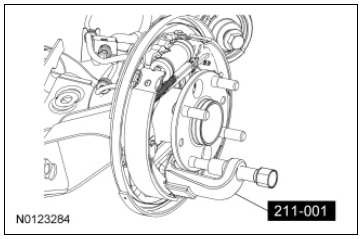
Removal and Installation

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 of correct retention of these parts.**

1. Remove the brake drum. For additional information, refer to Section 206-02 .

NOTICE: **Never use a hammer to remove a wheel stud. Damage to the wheel hub may result.**

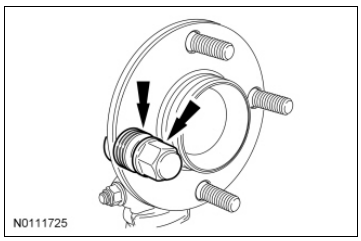
2. Using the Tie-Rod End Remover, remove the wheel stud.



3. **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.

Position the new wheel stud in the wheel hub, aligning the serrations in the wheel hub flange made by the original wheel stud.

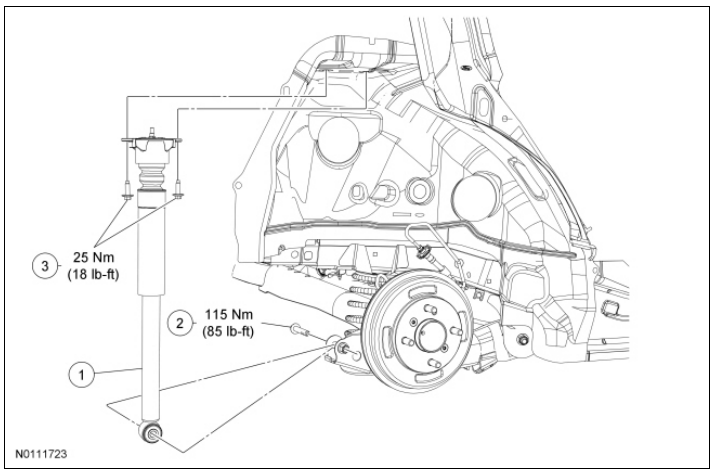
- Place approximately 4 washers over the outside end of the wheel stud and thread a standard wheel nut onto the wheel stud with the flat side against the washers.
- Tighten the wheel nut until the wheel stud head seats against the back side of the wheel hub flange.



4. Remove the wheel nut and washers.

5. Install the brake drum. For additional information, refer to Section 206-02 .

Shock Absorber



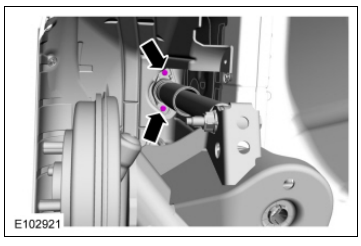
Item	Part Number	Description
1	18125	Shock absorber
2	W713343	Shock absorber lower bolt
3	W708828	Shock absorber upper bolt (2 required)

Removal

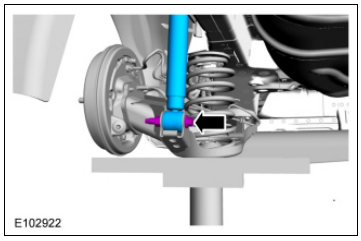
NOTICE: **Suspension fasteners are critical parts that affect performance of vital components and systems. Failure of these fasteners may result in major service expense. Use the same or equivalent parts if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Tighten fasteners as specified.**

1. Using a suitable jackstand, support the rear axle.

2. Remove and discard the two shock absorber upper bolts.
   - To install, tighten the new bolts to 25 Nm (18 lb-ft).



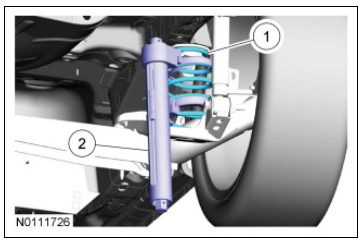
3. Remove and discard the shock absorber lower bolt and remove the shock absorber.
   - To install, tighten the new bolt to 115 Nm (85 lb-ft).



4. ***NOTICE:*** **Tighten the shock absorber lower bolt while the suspension is at curb height or bushing damage and incorrect clamp load may occur.**

To install, reverse the removal procedure.

Spring



Item	Part Number	Description
1	5560	Spring
2	-	Spring compressor

Removal and Installation

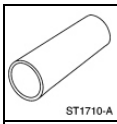
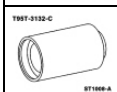
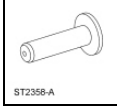
⚠ WARNING: The coil spring is under extreme load. Care must be taken at all times when removing or installing a loaded spring. Failure to follow this instruction may result in serious personal injury.

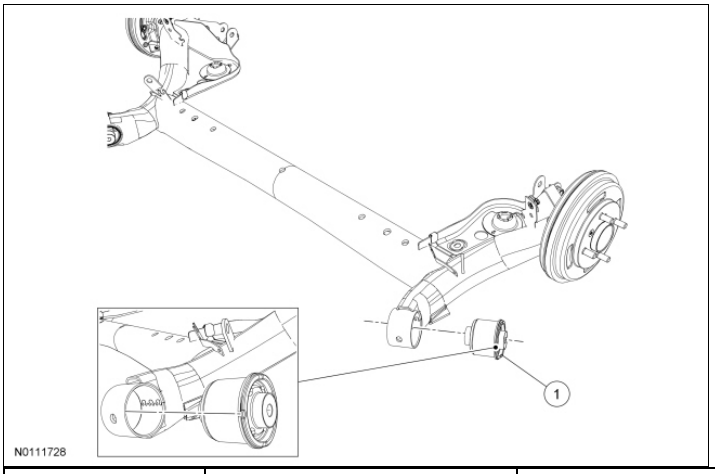
1. Using a suitable spring compressor, compress the spring.
2. Remove the spring.
3. ***NOTICE:*** **Make sure the upper spring seat is installed, and the spring ends butt correctly against the upper and lower spring seats.**

   To install, reverse the removal procedure.

Trailing Arm Bushing

Special Tool(s)

 ST1710-A	Installer, Spindle/Axle Shaft 205-199
	Installer, Front Wheel Spindle Oil Seal 205-353
 ST2358-A	Installer, Input Shaft Bearing 308-062



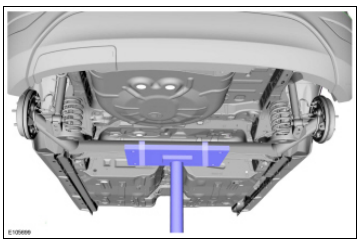
Item	Part Number	Description
1	5A638	Trailing arm bushing

Removal

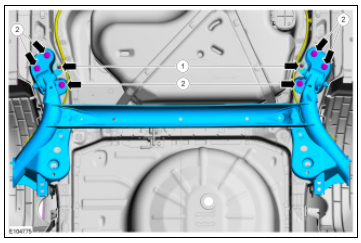
NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.**

1. Remove the wheel and tire. For additional information, refer to Section 204-04 .

2. Using a suitable jackstand, support the rear axle assembly.

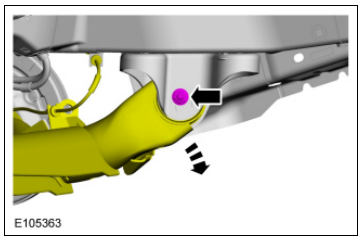


3. Remove the 2 parking brake cable bracket bolts.
    - To Install, tighten to 24 Nm (18 lb-ft).

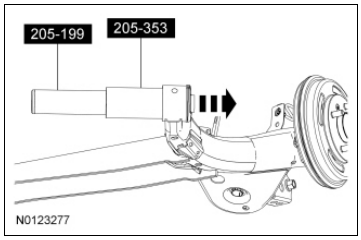


4. Remove the 6 axle bracket-to-frame bolts and remove the axle assembly.
    - To install, tighten to 125 Nm (92 lb-ft).

5. Lower the subframe and remove the 2 trailing arm bolts.
    - To install, tighten to 80 Nm (59 lb-ft) then tighten an additional 120 degrees.

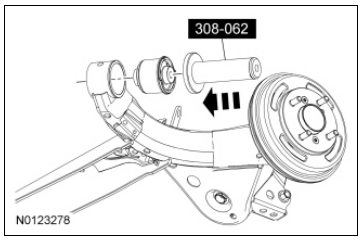


6. Using the special tools, remove the trailing arm bushing.



Installation

1. Using the special tool, install the trailing arm bushing.



2. To install, reverse the removal procedure.

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
Tire Inflation	
Tires	See Safety Certification Label on driver door jamb
Wheel Weights	
Wheel weight type	Use a wheel weight manufacturer's rim gauge to determine the correct wheel weight application

Torque Specifications

Description	Nm	lb-in
Valve stem-to-Tire Pressure Monitoring System (TPMS) sensor screw	1.5	13
Wheel nuts [a]	-	-

[a] Refer to the procedure in this section.

Wheels And Tires

Safety Precautions

⚠ 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-27-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, rotate the tires at recommended intervals.

Tire Pressure Monitoring System (TPMS)

NOTE: The Tire Pressure Monitor (TPM) module is identified by the scan tool as the Vehicle Security Module (VSM).

The TPMS includes:

- the TPM / VSM , a stand alone receiver located in the driver's side luggage compartment (4-door), or in the driver's side cargo area (5-door).
- four tire pressure sensors.

TPM / VSM

The TPM / VSM contains the TPMS functionality. Refer to Tire Pressure Monitoring System in Diagnosis and Testing for TPMS fault diagnosis and repair.

The TPM / VSM compares the information of each tire pressure sensor transmission against a pressure limit. If the TPM / VSM determines that the tire pressure has fallen below the minimum pressure the TPM / VSM communicates this to the Instrument Panel Cluster (IPC) on the vehicle communication network.

Tire Pressure Monitoring System (TPMS) Pressure Sensor

The TPM / VSM uses tire pressure sensors to monitor the tire pressure in the 4 road tires. The tire pressure sensors transmit radio frequency signals to the TPM / VSM approximately once every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph).

The tire pressure sensors are battery operated and mounted on the valve stem.

Instrument Panel Cluster (IPC)

The IPC illuminates the TPMS indicator when it receives a message from the TPM / VSM .

For additional Information, refer to Section 413-01 for diagnosis and repair of the IPC .

Wheels And Tires

Special Tool(s)

 ST2869-A	Digital Tire Gauge 204-354
 ST3058-A	Hunter Road Force® Wheel Balancer GSP9700 Series

Inspection and Verification

⚠ 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 injuy.

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 anytime 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.

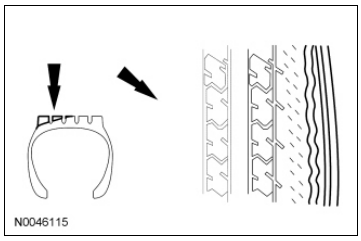
Abnormal/incorrect wear can be caused by numerous factors, some of which include driving style (aggressive, passive), climate (hot, cold), road conditions, vehicle loading and maintenance (correct tire pressure, rotation intervals and balance). It is important to determine the root cause of wear on a 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.

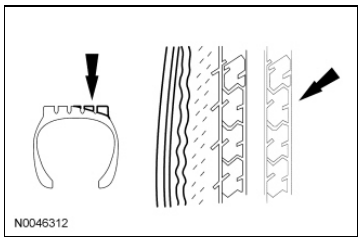
NOTE: RF tire shown, others similar.



Outer Edge/Shoulder Wear

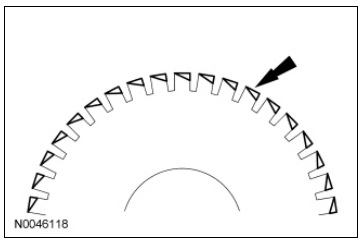
Outer edge (or shoulder) wear occurs on the outside edge of the tire and is usually caused by excessive toe in and/or excessive positive camber. If the tread depth of the inner shoulder is at least 50% greater than the tread depth of the outer shoulder, the tire is experiencing outer edge/shoulder wear. 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.



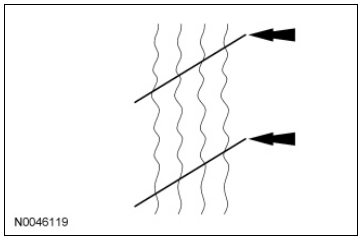
Heel/Toe Wear

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 glry 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
A1 MEASURE THE TREAD DEPTH	
• Using a tread depth gauge or similar tool, measure the inside edge/shoulder tread depth. • **Is the tread depth greater than 2/32 inch?**	**Yes** ROTATE the wheel and tire assemblies. CHECK and ADJUST the toe to nominal +0.15 degrees (toe in). CHECK and ADJUST caster and camber to nominal. REFER to Section 204-00 . **No** INSTALL a new tire(s). CHECK and ADJUST the toe to nominal. CHECK and ADJUST caster and camber to nominal. REFER to Section 204-00 .

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
B1 MEASURE THE TREAD DEPTH	
• Using a tread depth gauge or similar tool, measure the outside edge/shoulder tread depth.	**Yes** ROTATE the wheel and tire assemblies. CHECK and ADJUST the toe to nominal -0.15 degrees (toe

• **Is the tread depth greater than 2/32 inch?**	out). CHECK and ADJUST caster and camber to nominal. REFER to Section 204-00 . **No** INSTALL a new tire(s). CHECK and ADJUST the toe to nominal. CHECK and ADJUST caster and camber to nominal. REFER to Section 204-00 .

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

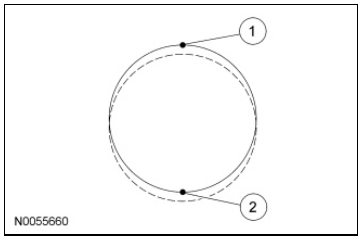
PINPOINT TEST C: DIAGONAL WEAR

Test Step	Result / Action to Take
C1 MEASURE THE TREAD DEPTH	
• Using a tread depth gauge or similar tool, measure the tread depth of the wear pattern. • **Is the tread depth greater than 2/32 inch?**	**Yes** 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 Section 204-00 . **No** 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 Section 204-00 .

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) may 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 runo 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.

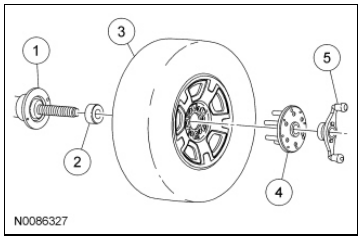
   Make sure that the tire pressures are set to the correct pressure as indicated on the Vehicle Certification (VC) label.

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 bancer 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 sng) 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.

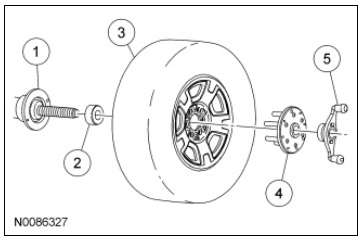
2. Using a tire crayon, record the vehicle position on the inward sidewall of all 4 tires.

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.

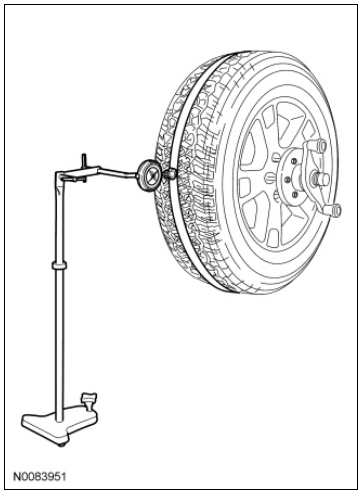


Item	Description
1	Wheel balancer
2	Cone
3	Wheel and tire assembly
4	Finger plate
5	Balancer wing nut

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.

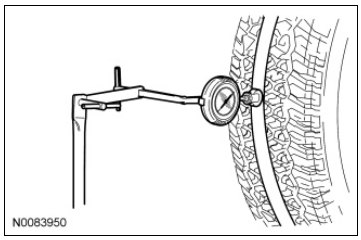
   Position a suitable dial indicator and stand with the dial indicator on the center tread rib.

   - 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.

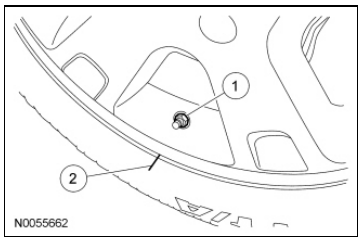


Match Mounting

NOTE: Road Force® values in illustrations are shon 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.

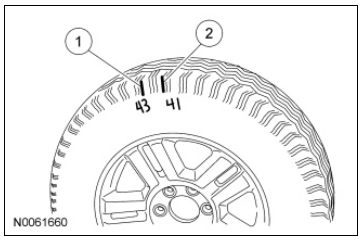
   Using a suitable tire machine, separate the tire beads from the wheel.

   - 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.

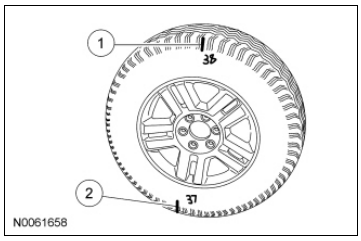
3. Re-inflate the wheel and tire assembly to the specified air pressure and measure the assembly again using a suitable dial indicator or Hunter Road Force® 9700 Series Wheel Balancer. Mark the second high spot on the tire.
    - If the runout or Road Force® is reduced to within specifications, the concern 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
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.

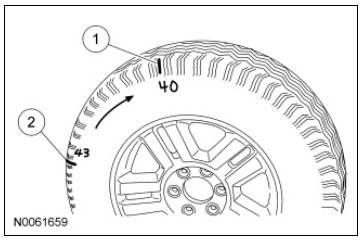


Item	Description
1	First high spot on the tire
2	Second high spot on the tire

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.

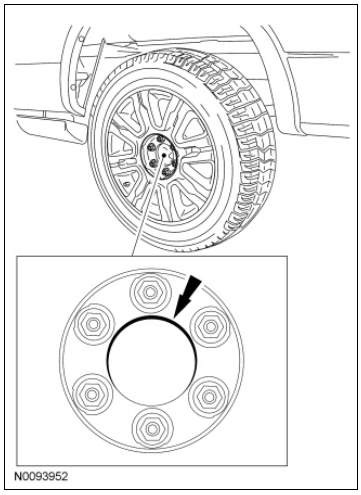


Item	Description
1	First high spot on the tire
2	Second high spot on the tire

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, sliy loading the suspension. Tighten

the wheel nuts as described in Wheel and Tire in this section.

Tire Pressure Monitoring System

Special Tool(s)

 ST2941-A	Activation Tool, Tire Pressure Monitor 204-363, or Customer Activation Tool, Tire Pressure Monitor 8C2T-1AZ03-AA
 ST2869-A	Digital Tire Pressure Gauge 204-354
 ST2574-A	Flex Probe Kit NUD105-R025D 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

⚠ 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: The Tire Pressure Monitor (TPM) module is identified by the scan tool as the Vehicle Security Module (VSM).

The Tire Pressure Monitoring System (TPMS) uses tire pressure sensors located in the wheels to monitor the tire pressure of all 4 tires (there is no sensor in the spare tire). Each sensor has a unique identifier that is transmitted to the TPMS receiver during system training. The TPM / VSM retains these identifiers in memory and associates them with a vehicle position based on the training order. The sensors transmit tire pressure information to the TPM / VSM via radio frequency signals once every 60 seconds when vehicle speed exceeds 32 km/h (20 mph), or once every 6 hours when stationary. The TPM / VSM function compares tire pressure information against a low-pressure limit. If it determines the tire pressure has fallen below this limit, the TPM / VSM sends a message requesting illumination of the TPMS indicator to the Instrument Panel Cluster (IPC) over the Medium Speed Controller Area Network (MS-CAN) bus. The IPC illuminates the TPMS indicator when commanded by the TPM / VSM .

Radio Frequency Interference (RFI) can create intermittent TPMS issues that are difficult to diagnose. RFI can be caused by the addition of aftermarket equipment that blocks the TPMS sensor transmissions from getting to the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM). Devices causing RFI can prevent the module from communicating with any of the 4 tire pressure sensors.

Tire Pressure Monitoring System (TPMS) Indicator

The TPMS indicator may display faults that cannot be resolved by the customer. Treat these messages as TPMS DTCs or symptoms that must be serviced.

Tire Pressure Monitoring System (TPMS) Indicator Is On Continuously from Key ON.

The TPMS indicator is illuminated continuously when the ignition is turned to the ON position and any of the tire pressures are low. A DTC is not present for this condition and the TPMS status PID: TP_STAT equals LOW. When this condition exists, the tire pressure must be adjusted in all tires to the recommended cold pressure as noted on the Vehicle Certification (VC) label. GO to Symptom Chart .

Ambient Temperature Change and Tire Pressure

NOTICE: **Do not inflate tires more than maximum tire pressure stamped on the tire sidewall. Premature tire wear or damage to the tire may result.**

Tire pressures fluctuate with temperature changes. For this reason, set tire pressures 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, adjust the tire inflation pressure 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 illuminate the TPMS indicator.

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 maintain tire pressure pecified on the Vehicle Certification (VC) label. 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[1]
** 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)																	
	30	32	34	35	38	40	41	42	45	50	55	60	65	70	75	80	85	90
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)[1]
** 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)																	
	205	220	235	240	260	275	285	290	310	345	380	415	450	485	515	550	585	620
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

[1]When Outside (Ambient) Temperature is greater than 21˚C (70˚F), Inflate tires to placard pressure.
[1]Use the table to adjust tire pressure for P-metric and LT tires only.
[1]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.

N0057700

Tire Pressure Monitoring System (TPMS) Indicator Flashes For 70 seconds From Key ON And Then Remains On Continuously

The TPMS indicator flashes for 70 seconds and then remains on continuously if the TPMS is malfunctioning. The TP_STAT PID can be used to determine why the TPMS indicator is flashing.

Tire Pressure Monitoring System (TPMS) PID Definitions

TPM / VSM Status PID

The TPM / VSM monitors the TPMS status. The TPMS status can be monitored using the scan tool PID TP_STAT. The PID has 4 valid states:

1. TP_STAT = SENSOR FAULT.
    - SENSOR FAULT is displayed if the TPM / VSM has not heard from 1 to 3 TPMS sensors for 20 minutes when the vehicle speed is above 32 km/h (20 mph).

2. TP_STAT = SYSTEM FAULT.
    - SYSTEM FAULT is displayed if the TPM / VSM does not receive a signal transmission from all 4 TPMS sensors for 20 minutes and the vehicle speed is above 32 km/h (20 mph).

3. TP_STAT = LOW.
    - LOW is displayed if the TPM / VSM has detected that at least 1 TPMS sensor is reporting low tire pressure.

4. TP_STAT = ACTIVE.
    - ACTIVE is displayed if the TPMS is functioning normally.

TPMS Last Warning Event PID Definitions

The TPMS uses the TPMS last warning event PIDs to store detailed information about the last 5 times the TPMS indicator was illuminated. These PIDs can be used to acquire more information about a particular TPMS event.

EVT1_IGN through EVT5_IGN

The number of key cycles since the TPMS indicator was illuminated. This PID cycles from zero to 255 and then starts over from zero again. Use this PID to determine how long ago a TPMS event occurred and the time (in key cycles) between events.

EVT1_TLOC through EVT5_TLOC

This is the last programmed location for the sensor causing each TPMS event. Due to tire rotation, the sensor may no longer be at the location indicated. It is suggested that all the PIDs be recorded, the system retrained, and the sensor identifier PIDs be used to pinpoint the actual location of each sensor.

EVT1_PSI through EVT5_PSI

This is the tire pressure associated with each TPMS indicator event. This can be used to identify the TPMS events that were due to low pressure and to determine when a sensor is transmitting inaccurate tire pressure.

EVT1_STAT through EVT5_STAT

Describes the warning status of each TPMS event by using the information received from the TPMS status (TP_STAT) PID. If there is a communication issue, the status could be NORMAL.

- UNKNOWN
- NORMAL (normal operation)

- LOW (low pressure event)
- FAULT (sensor fault or system fault)

EVT1_TxID through EVT5_TxID

This is the unique identifier of the sensor involved in each TPMS event. EVT1 is the most recent event that triggered the TPMS indicator.

Wheel Rotation and Sensor Training Techniques

Moving a Problem Sensor/Wheel to a Different Position

If a sensor in a certain location has caused several events, yet the sensor trains and seems to operate normally, moving that particular sensor/wheel to a different location on the vehicle can isolate the issue to a certain sensor/wheel location. Carry out a road test following sensor/wheel relocation to attempt to recreate the fault. This determines whether the fault followed the sensor or remained in the original sensor location.

Training Sensors in a Different Order

This is a technique to get past a left front sensor that may not be responding to determine if the remaining sensors train to the module. This can help save time determining if other sensors are having issues or if the module is experiencing training difficulties with a certain location.

NOTE: Training known good sensors from another vehicle cannot differentiate between a faulted module and RFI .

Training Known Good Sensors From Another Vehicle

Use this technique to differentiate between a sensor fault and a module fault. If neither the originally installed sensors nor the known good sensors can be trained, then a module fault or RFI concern is present. See items that cause RFI , below. Do not replace the original sensors.

Items That Cause RFI

Non-OEM Equipment

The following equipment has been found to cause RFI :

- Video equipment has been found to cause RFI especially when the video and power supply lines are near the TPMS .
- Car alarms (even those installed by dealerships) can create enough RFI to cause the TPMS to malfunction or lose considerable range. These car alarms can sometimes be difficult to locate, as they are usually hidden somewhere out of the way.
- Many different in-vehicle cell phone chargers have been found to cause considerable RFI . The vehicles with the power point closest to the TPM / VSM are the most affected. It must be noted that most cell phone chargers do not produce high levels of RFI all of the time. This depends on the state of charge of the cell phone battery. The phone must be almost completely discharged in some cases.
- Power supplies and DC/AC inverters typically create significant RFI . Most consumer grade equipment has very little filtering or shielding.

OEM Modules

In some cases, the RFI may actually be caused by a module or ground on the vehicle. A poor ground or loose ground shield can disable the system. Modules that have microcontrollers using clock circuits to create the timing pulses for the microprocessor may radiate RFI .

This can be a way to determine the cause of an issue well before the sensors and module are replaced with little or no affect on the system performance. Since this takes more up-front work, it relies on working with the customer to determine what equipment was being used at the time of the event.

Options for Eliminating Intermittent TPMS Conditions Caused by RFI

- If an OEM component or customer device is causing an RFI issue, the device can be replaced.
- If a phone charger is causing an RFI issue, the customer should consult with their cell phone provider to acquire a different phone charger.
- If a device such as an dealer-installed alarm is causing an RFI issue, the device could be moved to another location on the vehicle. In the case of a portable device, the power cord could be moved to another power point location.

In summary, if the RFI source is present and cannot be moved or replaced, the intermittent issue remains. The TPMS system must accept RFI and the unwanted system operation it can cause.

Inspection and Verification

1. Keep the following items in mind when diagnosing any TPMS related issue:
    - The tire pressure sensors are not designed to be used with aftermarket wheels. The use of run-flat tires (tires with steel body cord plies in the tire sidewall) that are not originally equipped, may block the TPMS signal and are not recommended.
    - Non-OEM modifications made to the vehicle may result in false TPMS warnings.
    - Swapping wheels on vehicles with the same TPMS sensors sets a fault if the sensors are not trained. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
    - The tire pressure calibrations in the TPM / VSM for the system cannot be changed to use lower tire pressures than those listed on the Vehicle Certification (VC) label.
    - Certain non-OEM electronic equipment may cause RFI and false TPMS warnings. To aid in diagnosis, obtain information from the owner regarding any equipment that has been added or was in use at the time the TPMS fault occurred.
    - It may be necessary to disconnect any electronic add-on equipment to verify its impact on TPMS operation. For intermittent cases, it may be necessary to ask the customer to provide portable electronic equipment to verify its impact on the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Low tire pressure • Tire Pressure Monitoring System (TPMS) sensor damaged or missing • Spare tire installed as a road wheel • Incorrect TPMS sensor installed • TPMS sensor installed incorrectly • Non-OEM wheels installed (aftermarket rims)	• Wiring, terminals or connectors • Electrical connectors • TPM / VSM missing or damaged • Aftermarket electronic accessories (in-car chargers or supplies, DC/AC inverters, video screens, car alarms)

• Non-OEM equipped run-flat tires installed • Other non-OEM modifications (roll cages, service barriers, part racks, ladder racks)	

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 is ON.
   - 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 CMDTCs and carry out the self-test diagnostics for the TPM / VSM module.

9. If the DTCs retrieved are related to the concern, go to the TPM / VSM 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

Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) DTC Chart

DTC	Description	Action
B106A	TPMS Sensor Pressure Range Bit Incorrect State	GO to Pinpoint Test D .
B106B	Tire Pressure Sensor Low Battery	DTC B106B can be set during TPM / VSM configuration. If DTC B106B was set during configuration, DISREGARD the DTC. If DTC B106B was not set during configuration. GO to Pinpoint Test D .
B106E		GO to Pinpoint Test E .

	Solid State Driver Disabled Due To Short Circuit	
B106F	Module Disabled Due To External Fault	GO to Pinpoint Test E .
B1217	Horn Relay Coil Circuit Failure	If the horn sounds continuously, REFER to Section 413-06 . If the horn does not sound continuously, GO to Pinpoint Test E .
B1218	Horn Relay Coil Circuit Short to VBatt	GO to Pinpoint Test E .
B1317	Battery Voltage High	GO to Pinpoint Test F .
B1342	ECU Is Faulted	**NOTE:** If other DTCs are present, REPAIR them before installing a new component. CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved, INSTALL a new module. REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. TEST the system for normal operation.
B1359	Ignition Run/Acc Circuit Failure	GO to Pinpoint Test G .
B1363	Ignition Start Circuit Failure	GO to Pinpoint Test G .
B2477	Module Configuration Failure	Only present in a new or reconfigured module. To configure the TPM / VSM REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. TEST the system for normal operation.
B2868	Left Front Tire Pressure Sensor Fault	Only present in a new or reconfigured module. To configure the TPM / VSM REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. TEST the system for normal operatio>
B2869	Right Front Tire Pressure Sensor Fault	Only present in a new or reconfigured module. To configure the TPM / VSM REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section.
B2870	Right Rear Tire Pressure Sensor Fault	Only present in a new or reconfigured module. To configure the TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. TEST the system for normal operation.
B2871	Left Rear Tire Pressure Sensor Fault	Only present in a new or reconfigured module. To configure the TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. TEST the system for normal operation.
B2872	Tire Pressure Sensor Fault If DTC B287A is also present, GO to Pinpoint Test K . Otherwise, GO to Pinpoint Test J .	
B287A		GO to Pinpoint Test K .

	Tire Pressure System Fault	
C2780	ECU in Manufacturer Sub-state	To configure the TPM / VSM REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. TEST the system for normal operation.
U0155	Lost Communication With Instrument Panel Cluster	GO to Pinpoint Test L .
U2023	Fault Received From External Node	RETRIEVE and REPAIR all non-network DTCs in the IPC . REFER to Section 413-01 .
U2050	No Application Present	CONFIGURE the TPM / VSM . REFER to Programmable Module Installation (PMI) in Section 418-01 . CARRY OUT the TPM / VSM self-test. If DTC U2050 returns, INSTALL a new TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Mole - 5-Door Hatchback in this section. TEST the system for normal operation.

Symptom Chart

Symptom Chart
NOTE: 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.

ConditionPossible SourcesAction

- Tire Pressure Monitoring System (TPMS) indicator ON continuously from key ON with no related DTCs present

- Tire pressure not set to specifications listed on the Vehicle Certification (VC) label

- GO to Pinpoint Test I .

- TPMS indicator flashes for 70 seconds from key ON and then remains on continuously

- TPMS sensor(s) not trained to the TPM / VSM
- TPMS sensor(s) not installed
- Spare tire in use or road wheel missing for extended duration
- Incorrect TPMS sensor installed
- Network communication concern
- TPM / VSM

- RETRIEVE the DTCs. FOLLOW diagnostics for the DTCs present. REFER to DTC Charts in this section.

- The TPMS does not enter sensor training mode when using the TPMS sensor training procedure

- Stoplamp switch open circuitry
- Vehicle communication network
- TPM / VSM

- GO to Pinpoint Test H .

- The Tire Pressure Monitoring System (TPMS) enters sensor training mode but one or more sensors do not train and DTCs are present

- TPMS sensor(s)
- Vehicle communication issue
- TPM / VSM

- RETRIEVE and RECORD DTCs. REFER to Tire Pressure Monitoring System (TPMS) DTC Chart in this section.

- The Tire Pressure Monitoring System (TPMS) enters sensor training mode but one or more sensors do not train and no DTCs are present

- TPMS sensor(s)
- Attempting to install a banded TPMS sensor that is not compatible with a valve stem mounted sensor

- TRAIN all 4 tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
- If a sensor does not respond to the Tire Pressure Monitor Activation Tool, MOVE the vehicle to rotate the wheels at least one-fourth of a turn and ATTEMPT to activate the same sensor again. If the sensor still does not respond, ATTEMPT to activate the same sensor again using the customer activation tool (if available). If the sensor still fails to train, ATTEMPT to train the sensor with the vehicle doors open.
- If the sensor(s) fails to train a second time, INSTALL a new sensor(s). REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

Pinpoint Tests

Pinpoint Test D: DTCs B106A, 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 Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM). The TPMS warning indicator flashes for 70 seconds and then remains on continuously when the ignition switch is turned to the ON position.

- DTC B106A (TPMS Sensor Range Bit Incorrect State) - sets if an attempt has been made to train a non-compatible sensor.
- DTC B106B (Tire Pressure Sensor Low Battery) - sets if an attempt has been made to train a tire pressure sensor(s) with a low battery. This DTC can also set in the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) during configuration.

This pinpoint test is intended to diagnose the following:
- Non-compatible sensor
- Tire pressure sensor battery
- Tire pressure sensor(s)

PINPOINT TEST D: DTCs B106A, B106B

Test Step	Result / Action to Take
D1 DETERMINE WHICH SENSOR HAS A LOW BATTERY OR IS NON-COMPATIBLE	
• Train all 4 tire pressure sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the TPM / VSM ?**	**Yes** CLEAR the DTCs. REPEAT the self-test. VERIystem operation. **No** **Before installing a new sensor(s)** : If a sensor does not respond to the Tire Pressure Monitor Activation Tool, MOVE the vehicle to ROTATE the wheels at least one-fourth of a turn and ATTEMPT to ACTIVATE the same sensor again. If the sensor still does not respond, ATTEMPT to ACTIVATE the same sensor again using the customer activation tool (if available). If the sensor still fails to train, ATTEMPT to TRAIN the sensor with the vehicle doors open. If the sensor(s) fails to train a second time, INSTALL a new tire pressure sensor(s). REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

Pinpoint Test E: DTCs B106E, B106F, B1217 and B1218

Refer to Wiring Diagrams Cell 118 , Tire Pressure Monitoring System (TPMS) for schematic and connector information.

Normal Operation

The Tire Pressure Monitoring System (TPMS) uses the horn as a feedback signal during TPMS sensor training and activation by sending a ground signal to the Body Control Module (BCM). When the BCM receives this ground signal it activates the horn relay and sounds the horn.

The TPMS monitors the circuit for shorts to voltage, ground and opens. If one of these conditions is detected, the appropriate DTC sets.

The TPM / VSM utilizes a Field-Effect Transistor (FET) (in place of a fuse) to protect itself during a short circuit condition, the FET is also known as a solid state driver. The FET is only designed to withstand a certain amount of use.

The TPMS keeps track of how many times DTC B106E is set and once that counter reaches a predetermined number (based off of FET durability) DTC B106F (and usually B1342) set. DTCs B1217, B1218 and/or B106E also set along with B106F. The only way to clear B106F is by installing a new Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM). Repair the circuit conditions that set DTCs B1217, B1218 and/or B106E before installing a new TPM / VSM .

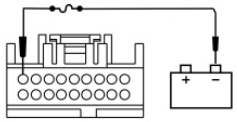
DTC Description	Fault Trigger Condition
o B1217 - Horn Relay Coil Circuit Failure	This DTC sets when the TPMS detects an open or a short to ground on horn control circuit. A short to ground on the horn control circuit causes the horn

	to sound continuously.
o B1218 - Horn Relay Coil Circuit Short to VBatt	This DTC sets when the TPMS detects a short to battery voltage.
o B106E - Solid State Driver Disabled Due to Short Circuit	This DTC sets when the TPMS has protected the horn control circuit and the horn driver has been deactivated until the vehicle is serviced.
o B106F - Module Disabled Due to External Fault	This DTC sets when DTC B106F indicates the horn control driver has reached the end of its and has been permanently disabled.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- TPM / VSM
- BCM module

PINPOINT TEST E: DTCs B106E, B106F, B1217 AND B1218

Test Step	Result / Action to Take
E1 CHECK THE HORN OPERATION	
NOTICE: **If DTC B106F is present, correct the fault condition prior to installing a new Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM). Failure to correct the fault condition first may cause damage to the new TPM / VSM , resulting in a repeat repair.** • Push the horn pad. • **Does the horn sound?**	**Yes** GO to E2 . **No** GO to Section 413-06 to diagnose the horn.
E2 CHECK THE HORN CIRCUIT FUNCTION	
NOTICE: **If the jumper wire fails, refer to the Wiring Diagrams Manual to identify the possible causes of the circuit short. After the repair: If no DTCs are present, test the system for normal operation. If DTC B106E is present, Clear the DTCs and repeat the self-test (required to enable the horn driver if DTC B106E is present). Test the system for normal operation. If DTC B106F is present, install a new TPM / VSM . Refer to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure MonitorinSystem (TPMS) Module - 5-Door Hatchback in this section. Test the system for normal operation.** • Ignition OFF. • Disconnect: TPM / VSM C4321B. • Ignition ON. • Connect a fused jumper wire between the TPM / VSM , C4321B-9 CRH03 (BN), harness side and ground.	**Yes** REMOVE the jumper wire. GO to E3 **No** REMOVE the jumper wire. REPAIR circuit CRH03 (BN) for an open circuit. CLEAR the DTCs and REPEAT the self-test.

 N0113349 • **Does the horn sound?**	
E3 CHECK FOR CORRECT TPMS OPATION	
• Disconnect all the TPM / VSM electrical connectors. • Check the connectors for: ♦ corrosion. ♦ pushed-out pins. ♦ spread terminals. • Connect all the TPM / VSM connectors and make sure that they are seated correctly. • **Is the concern still present?**	**Yes** INSTALL a new TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test F: DTC B1317

Refer to Wiring Diagrams Cell 118 , Tire Pressure Monitoring System (TPMS) for schematic and connector information.

Normal Operation

The Tire Pressure Monitoring System (TPMS) monitors the voltage from the battery to determine if it exceeds specific thresholds. DTC B1317 sets in continuous memory if the TPMS detects battery voltage above 16 volts.

- DTC B1317 (Battery Voltage High) - sets if the voltage supplied to the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) exceeds 16 volts during the TPM / VSM self-test or normal operation, with vehicle speed greater than 5 km/h (3 mph).

This pinpoint test is intended to diagnose following:

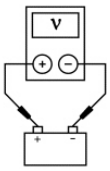
- Wiring, terminals or connectors
- Charging system concern
- TPM / VSM

PINPOINT TEST F: DTC B1317

NOTE: DTC B1317 can be set if the vehicle has been recently jump started or the battery has been recently charged. 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
F1 RETRIEVE ALL CMDTCs IN ALL MODULES	
• Connect the scan tool. • Ignition ON. • Enter the following diagnostic mode on the scan tool: VSM Self-Test. • **Is DTC B1317 present?**	**Yes** REFER to Section 414-00 to diagnose the charging system. CLEAR all Continuous Memory Diagnostic Trouble Codes (CMDTCs). TEST the system for normal operation. **No** GO to F2 .
F2 CHECK BATTERY CONDITION	
• Ignition OFF. • Refer to Section 414-01 and carry out the battery condition test. • **Does the battery pass the condition test?**	**Yes** If the battery passed the condition test but required a recharge, REFER to Section 414-00 . CLEAR all CMDTCs . TEST the system for normal operation. If the battery passed the condition test and did not require a recharge, GO to F3 . **No** INSTALL a new battery. CLEAR all CMDTCs . TEST the system for normal operation.
F3 CHECK THE CHARGING SYSTEM VOLTAGE	
NOTE: Do not allow the engine rpm 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 rpm has gone above 2,000 rpm, shut the vehicle off and restart the engine before performing this step. • Start the engine. • Measure the voltage of the battery: ♦ Turn off all accessories and run the engine at 1,500 rpm for a minimum of 2 minutes.	**Yes** GO to F4 **No** REFER to Section 414-00 to diagnose battery and charging system. TEST the system for normal operation.

 AJ0210-A • **Is the battery voltage between 13-15.2 volts?**	
F4 CHECK FOR CORRECT TPMS OPERATION	
• Disconnect all the TPM / VSM electrical connectors. • Check the connectors for: ♦ corrosion. ♦ pushed-out pins. ♦ spread terminals. • Connect all the TPM / VSM connectors and make sure that they are seated correctly. • **Is the concern still present?**	**Yes** INSTALL a new TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test G: DTCs B1359 and B1363

Refer to Wiring Diagrams Cell 118 , Tire Pressure Monitoring System (TPMS) for schematic and connector information.

Normal Operation

The Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) receives voltage from the Central Junction Box (CJB).

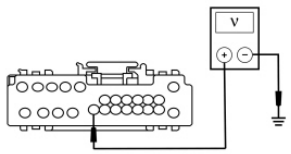
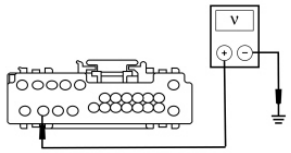
- DTC B1359 (Ignition Run/Acc Circuit Failure) - sets if the TPMS detects that the RUN/ACC input is open or shorted to ground. This DTC also sets set if the self-test is performed with the ignition in the OFF or ACC positions.
- DTC B1363 (Ignition Start Circuit Failure) - sets if the TPMS detects that the RUN/START input is open or shorted to ground. This DTC also sets set if the self-test is performed with the ignition in the OFF or ACC positions.

This pinpoint test is intended to diagnose the following:

- Fuse(s)
- Wiring, terminals or connectors
- TPM / VSM
- Ignition switch

PINPOINT TEST G: DTCs B1359 and B1363

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
G1 CHECK VOLTAGE TO THE TPM / VSM	
• Ignition In ACC. • Disconnect: TPM / VSM C4321A. • Ignition ON. • Measure the voltage between the TPM / VSM C4321A-20, circuit CBP26 (BU/WH), harness side and ground.  N0113350 • Measure the voltage between the TPM / VSM C4321A-23, circuit CBP23 (BN/YE), harness side and ground.  N0113351 • **Are the voltages greater than 10 volts?**	**Yes** GO to G2 **No** VERIFY the CJB fuses 26 (7.5A) and 23 (10A) are OK. If OK, REPAIR open in circuit CBP26 (BU/WH) or circuit CBP23 (BN/YE). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the short circuit.
G2 CHECK FOR CORRECT TPMS OPERATION	
• Disconnect all the TPM / VSM electrical connectors. • Check the connectors for: ♦ corrosion. ♦ pushed-out pins. ♦ spread terminals. • Connect all the TPM / VSM connectors and make sure that they are seated correctly.	**Yes** INSTALL a new TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. 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

• **Is the concern still present?**	connector. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test H: The Tire Pressure Monitoring System (TPMS) Does Not Enter Sensor Training Mode When Using the TPMS Sensor Training Procedure

Normal Operation

For the TPMS to enter TPMS sensor training mode, the TPM / VSM must receive valid inputs from the stoplamp switch (OFF-ON-OFF) and it must receive valid Vehicle Speed Sensor (VSS) input (0 km/h [0 mph]). The TPM / VSM also monitors the ignition switch status (both OFF and RUN). Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section for the complete sensor training procedure.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Stoplamp switch state
- TPM / VSM

PINPOINT TEST H: TPM / VSM DOES NOT ENTER SENSOR TRAINING MODE WHEN USING THE TPMS TRAINING PROCEDURE

Test Step	Result / Action to Take
H1 RETRIEVE THE RECORDED DTCs FROM THE SELF-TEST	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: VSM Self-Test. • **Are there any TPM / VSM DTCs present?**	**Yes** GO to the TPM / VSM DTC chart in this section. **No** GO to H2
H2 CHECK THE TPMS BRAKE ON/OFF (BOO_INPUT) PID	
• Enter the following diagnostic mode on the scan tool: VSM DataLogger. • Monitor the BOO_INPUT PID (TPMS receives the brake pedal information from the Instrument Panel Cluster (IPC)). • Press and release the brake pedal while monitoring the PID. • **Do the brake pedal PID values match the brake pedal positions?**	**Yes** GO to H3 . **No** REFER to Section 417-01 to continue diagnosis of the stoplamps.
H3 CHECK THE TPMS VEHICLE SPEED SENSOR (VSS) PID	
• Monitor the VSS PID (TPMS receives vehicle speed from the IPC). • **Is the vehicle speed less than 5 km/h (3 mph)?**	**Yes** GO to H4 . **No** REFER to Section 413-01 continue diagnosis of the vehicle speed.

H4 CHECK FOR CORRECT TPMS OPERATION	
• Disconnect all the TPM / VSM electrical connectors. • Check the connectors for: ♦ corrosion. ♦ pushed-out pins. ♦ spread terminals. • Connect all the TPM / VSM connectors and make sure that they are seated correctly. • Attempt to train the TPMS sensors again. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Is the concern still present?**	**Yes** The TPMS sensors may not be present. DISMOUNT the tire. REFER to Wheel and Tire in this section. VERIFY that the sensors are present and mounted to the wheels. If missing, INSTALL new TPMS sensors. If the TPMS sensors are present, INSTALL a new TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test I: TPMS Indicator On Continuously From Key ON With No Related DTCs Present

Normal Operation

The TPMS function compares each tire pressure sensor transmission against a low pressure limit. If the pressure falls below this limit, the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) communicates this on the Medium Speed Controller Area Network (MS-CAN) to the Instrument Panel Cluster (IPC). The IPC illuminates the TPMS indicator.

This pinpoint test is intended to diagnose the following:

- Low tire pressure
- Spare tire in use
- Stuck TPMS sensor

PINPOINT TEST I: TPMS INDICATOR ON CONTINUOUSLY FROM KEY ON WITH NO TPMS RELATED DTCs PRESENT IN THE TPM / VSM

Test Step	Result / Action to Take
I1 DETERMINE TPMS SYSTEM STATUS (TP_STAT) PID	
• Connect the scan tool. • Ignition ON. • Enter the following diagnostic mode on the scan tool: VSM DataLogger. • Read and record the TP_STAT PID. • **Is the TPMS system status LOW?**	**Yes** GO to I2 . **No** IF TP_STAT = SENSOR FAULT, GO to Pinpoint Test J . IF TP_STAT = SYSTEM FAULT, GO to Pinpoint Test K . IF TP_STAT = SYSTEM ACTIVE, the TPMS system is working as designed at

	this time. If an issue was reported by the customer, REFER to the symptom chart in this section.
I2 CHECK LOW PRESSURE DETECTED	
NOTE: The spare tire is not programmable even if it is equipped with a TPMS sensor. If a damaged road wheel is located in the trunk, the sensor may still be recognized by the TPM / VSM as low. Make sure the spare tire is not currently in use. To restore TPMS functionality, repair the damaged road wheel and re-mount it to the vehicle. • Check spare tire location. • **Is the spare tire in use?**	**Yes** REPAIR and REMOUNT the wheel to the vehicle. REFER to Wheel and Tire in this section. ADJUST tire pressures to the required pressure as defined on the Vehicle Certification (VC) label located in the driver door jam. **No** GO to I3 .
I3 CHECK FOR LOW TIRE PRESSURE	
• Using the Digital Tire Gauge, measure and record the tire pressure in all 4 road tires. • Adjust the pressure for those found to be below the specification listed on the VC label. • Activate each sensor at least twice with the training tool or customer activation tool to make sure the module gets the latest tire pressure data. Refer to Tire Pressure Monitoring System (TPMS) Sensor Activation or drive the vehicle for at least 2 minutes above 32 km/h (20 mph) to clear the low pressure warning. Do not train the sensors at this time. • **Has the TPMS indicator gone out?**	**Yes** The system is functioning normally. INFORM the customer that correct tire pressure maintenance is a customer responsibility and the details are provided in the Owner's Literature. **No** GO to I4 .
I4 CHECK FOR STUCK TPMS SENSOR	
• Read and record the following PIDs: ♦ LF_PRES ♦ RF_PRES ♦ LR_PRES ♦ RR_PRES • Using the Digital Tire Gauge, measure the actual tire pressures. • Compare the tire pressure PIDs with the actual tire pressures. • **Do the compared tire pressure values match within ± 5 psi and has the TPMS indicator gone out?**	**Yes** The system is functioning normally. **No** INSTALL a new TPMS sensor(s). REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

Pinpoint Test J: DTC B2872

Normal Operation

If there is a concern with 1, 2 or 3 TPMS sensors, the TPMS sets DTC B2872. The TPMS indicator flashes for 70 seconds from key ON and then remains ON continuously. This sympom occurs when the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) does not hear from a sensor or is incapable of hearing a sensor(s) for 20 minutes.

- DTC B2872 (Tire Pressure Sensor Fault) - sets if the TPMS has been unable to communicate with 1 or more sensors (up to 3) for more than 20 minutes.

This pinpoint test is intended to diagnose the following:

- TPMS sensors not trained to the TPMS
- TPMS sensors not transmitting / damaged
- TPMS sensors missing
- Incorrect TPMS sensor installed
- Spare tire in use
- Radio Frequency Interference (RFI)

PINPOINT TEST J: DTC B2872

NOTE: If the vehicle has been stationary for more than 30 minutes, the sensors go into "sleep mode" to conserve battery power. It becomes necessary to wake them up so that they transmit the latest tire pressure information to the TPM / VSM . Refer to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section.

Test Step	Result / Action to Take
J1 CHECK TPMS SENSOR IDENTIFIERS AND FOR SPARE TIRE USE	
NOTE: 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. • Connect the scan tool. • **NOTE:** A spare tire cannot be programmed to the vehicle, even if equipped with a TPMS sensor. If a damaged road wheel is located in the trunk and the TPM / VSM cannot communicate with it, or if the damaged wheel has been dropped off at a dealership or repair shop, the TPM / VSM sets a TPMS sensor fault. • Ignition ON. • Enter the following diagnostic mode on the scan tool: VSM DataLogger. • Read and record the following PIDs: ♦ Left Front Tire Transmitter Identifier (LF_ID) ♦ Right Front Tire Transmitter Identifier (RF_ID) ♦ Left Rear Tire Transmitter Identifier (LR_ID) ♦ Right Rear Tire Transmitter Identifier (RR_ID) • **Is the spare tire in use?**	**Yes** REPAIR and REMOUNT the wheel to the vehicle. REFER to Wheel and Tire in this section. ADJUST the tire pressure to the required pressure as specified on the Vehicle Certification (VC) label located in the driver door jam. **No** GO to J2 .
J2 CARRY OUT TPMS SENSOR TRAINING	
	Yes

• Training the TPMS sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all the sensors train?**	GO to J3 . **No** GO to J4 .
J3 COMPARE THE SENSOR IDENTIFIERS BEFORE AND AFTER SENSOR TRAINING	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: VSM DataLogger. • Read and record the following PIDs: ♦ Left Front Tire Transmitter Identifier (LF_ID) ♦ Right Front Tire Transmitter Identifier (RF_ID) ♦ Left Rear Tire Transmitter Identifier (LR_ID) ♦ Right Rear Tire Transmitter Identifier (RR_ID) • Compare the recorded transmitter identifier PID readings taken before sensor training with the readings taken after sensor training. • **Did all the sensors match?**	**Yes** Sensor identifiers that did not match were mounted to the vehicle without the required sensor training. Sensor training in the previous step has corrected the condition. **No** REFER to Tire Pressure Monitoring System (TPMS) PID Definitions in this section for more information on repairing intermittent conditions .
J4 SENSOR(S) NOT RESPONDING TO TRAINING	
• **NOTE:** Sensor(s) that fail to train may be broken, missing, effected by RFI or the wrong sensor(s) may be installed. • Dismount tire and inspect the suspect TPMS sensor(s). • Install a new sensor(s) as necessary. Refer to Tire Pressure Monitoring System (TPMS) Sensor in this section. • Retrain the TPMS sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all the tire pressure sensors transmit to the TPM / VSM ?**	**Yes** The system is functioning normally. **No** REFER to Tire Pressure Monitoring System (TPMS) principles of operation in this section for additional information on training sensors.

Pinpoint Test K: DTCs B2872, B287A

NOTE: If the vehicle has been stationary for more then 30 minutes, the sensors go into sleep mode to conserve battery power. It becomes necessary to wake them up to transmit the latest tire pressure information to the Tire Pressure Monitoring System (TPMS). Refer to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section.

Normal Operation

The TPMS normally receives a response from all 4 sensors, if the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) does not receive a response from one or more sensors, the TPMS system sets DTCs B2872 and B287A. When no response is received from all four sensors, the TPMS indicator flashes for 70 seconds from key ON and then remains ON continuously.

- DTC B2872 (Tire Pressure Sensor Fault) - sets if the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) has been unable to communicate with 1 or more sensors (up to 3) for more than 20 minutes.
- DTC B287A (Tire Pressure System Fault) - sets if the TPM / VSM has been unable to communicate with all 4 sensors for more than 20 minutes.
- TP_STAT = SYSTEM FAULT is displayed if the TPM / VSM does not receive a signal transmission from all 4 TPMS sensors for 20 minutes and the vehicle speed is above 32 km/h (20 mph).

This pinpoint test is intended to diagnose the following:

- TPMS sensors not trained to the TPM / VSM
- TPMS sensors missing
- Incorrect TPMS sensor installed
- TPMS
- Radio Frequency Interference (RFI)

PINPOINT TEST K: DTCs B2872, B287A

NOTE: If the vehicle has been stationary for more than 30 minutes, the sensors go into sleep mode" to conserve battery power. It is necessary to wake them up to transmit the latest tire pressure information to the TPM / VSM . Refer to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section.

Test Step	Result / Action to Take
K1 CHECK TPMS SENSOR IDENTIFIERS (IDs) AND CARRY OUT TPMS SENSOR TRAINING PROCEDURE	
NOTE: 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. • Connect the scan tool. • Ignition ON. • Enter the following diagnostic mode on the scan tool: VSM DataLogger. • Read and record the following PIDs: ♦ Left Front Tire Transmitter Identifier (LF_ID) ♦ Right Front Tire Transmitter Identifier (RF_ID) ♦ Left Rear Tire Transmitter Identifier (LR_ID) ♦ Right Rear Tire Transmitter Identifier (RR_ID) • Train the TPMS sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • Ignition ON. • Enter the following diagnostic mode on the scan tool: VSM DataLogger . • Read and record the following PIDs:	**Yes** GO to K2 . **No** GO to K3 .

♦ Left Front Tire Transmitter Identifier (LF_ID) ♦ Right Front Tire Transmitter Identifier (RF_ID) ♦ Left Rear Tire Transmitter Identifier (LR_ID) ♦ Right Rear Tire Transmitter Identifier (RR_ID) • **Did all the sensors train?**	
K2 COMPARE THE SENSOR IDENTIFIERS BEFORE AND AFTER SENSOR TRAINING	
• Read and record the following PIDs: ♦ Left Front Tire Transmitter Identifier (LF_ID) ♦ Right Front Tire Transmitter Identifier (RF_ID) ♦ Left Rear Tire Transmitter Identifier (LR_ID) ♦ Right Rear Tire Transmitter Identifier (RR_ID) • Compare the recorded PID readings taken before sensor training with the readings taken after sensor training. • **Did all the sensors match?**	**Yes** If all the sensors trained, REFER to Tire Pressure Monitoring System (TPMS) principles of operation in this section for additional Information on training sensors. **No** Any sensor identifiers that do not match were mounted to the vehicle without the required sensor training. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
K3 SENSOR(S) NOT RESPONDING TO TRAINING	
• **NOTE:** Sensor(s) that won't train may be broken, missing, or the wrong sensor(s) may be installed. • Dismount tire and inspect the suspect TPMS sensor(s). • Install a new sensor(s) as necessary. Refer to Tire Pressure Monitoring System (TPMS) Sensor in this section. • Retrain the TPMS sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all the TPMS sensors transmit to the TPM / VSM ?**	**Yes** The system is functioning normally. **No** GO to K4 .
K4 CHECK TPMS SYSTEM OPERATION	
• Disconnect all the TPM / VSM electrical connectors. • Check the connectors for: ♦ corrosion. ♦ pushed-out pins. ♦ spread terminals. • Connect all the TPM / VSM connectors and make sure that they are seated correctly. • Attempt to train the TPMS sensors again. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Is the concern still present?**	**Yes** GO to K5 . **No** 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.

K5 CHECK TPM / VSM	
NOTE: 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. A faulty TPM / VSM and a module affected by can behave in the same way. Care must be taken to make sure the root cause of the issue is clearly identified. • Attempt to train the TPMS sensors with all aftermarket electronic equipment disconnected. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all the TPMS sensors transmit to the TPM / VSM ?**	**Yes** If the concern and/or DTCs return after the road test, the customer needs to be informed that their aftermarket equipment is causing unwanted RFI with the TPM / VSM and the system is functioning as designed under Federal Communications guidelines. **No** INSTALL a new TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. TEST the system for normal operation.

Pinpoint Test L: DTC U0155

Refer to Wiring Diagrams 118 , Tire Pressure Monitoring System (TPMS) for schematic and connector information.

Normal Operation

- DTC U0155 (Lost Communication With Instrument Panel Cluster) - this DTC sets in the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) if the vehicle speed or stoplamp switch messages that should be received from the Instrument Panel Cluster (IPC) are missing for 10 seconds or longer. If a communications failure is detected by the TPM / VSM , the DTC U0155 is present in the module.

This pinpoint test is intended to diagnose the following:

- Network communication concern
- IPC
- TPM / VSM

PINPOINT TEST L: DTC U0155

Test Step	Relt / Action to Take
L1 VERIFY THE CUSTOMER CONCERN	
• Ignition ON. • Verify that there is an observable symptom present. • **Is an observable symptom present?**	**Yes** GO to L2 . **No** The system is operating normally at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
L2 CHECK THE COMMUNICATION NETWORK	

• Enter the following diagnostic mode on the scan tool: IPC Network Test. • Carry out the network test. • **Does the IPC pass the network test?**	**Yes** GO to L3 . **No** REFER to Section 418-00 .
L3 RETRIEVE THE RECORDED DTCs FROM THE TPM / VSM AND IPC SELF-TESTS	
• Check for recorded TPM / VSM and IPC DTCs from the self-test. • **Is DTC U3003:16 (or B1318) or DTC U3003:17 (or B1317) recorded?**	**Yes** For the TPM / VSM , REFER to DTC Chart in this section. For the IPC , REFER to Section 413-01 . **No** GO to L4 .
L4 CHECK FOR DTC U0155 SET IN OTHER MODULES	
• Clear the DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Enter the following diagnostic mode on the scan tool: VSM Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC U0155:00 or DTC U0155 set in more than one module?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . TEST the system for normal operation. REPEAT the ABS module self-test. **No** INSTALL a new TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan or Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback in this section. TEST the system for normal operation.

Tire Pressure Monitoring System (TPMS) Sensor Training

Special Tool(s)

 ST2941-A	Activation Tool, Tire Pressure Monitor 204-363, or Customer Activation Tool, Tire Pressure Monitor 8CZT-1A203-AA
 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 Tire Pressure Monitor (TPM)Vehicle Security Module (VSM). For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section.

NOTE: The TPMS 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 TPMS .

RFI is generated by certain electrical motors and appliance operation, cellular telephone chargers, remote transmitters, power inverters and portable entertainment equipment.

NOTE: The TPM / VSM has a 2-minute time limit between sensor responses. If the TPM / VSM does not recognize any 1 of the 4 tire pressure sensors during this time limit, the horn will sound twice and the entire procedure must be repeated.

NOTE: For vehicles with different front and rear tire pressures the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will cause the TPMS indicator to illuminate.

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.

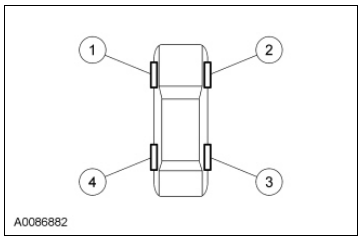
5. Turn the ignition switch from the OFF position to the RUN position 3 times, ending in the RUN position.
   - The horn will sound once and the TPMS indicator will flash if the training mode has been entered successfully.

6. **NOTE:** It may take up to 6 seconds to activate a tire pressure sensor. During this time, the Tire Pressure Monitor Activation Tool must remain in place at the valve stem.

NOTE: If a sensor does not respond to the Tire Pressure Monitor Activation Tool, move the vehicle to rotate the wheels at least one-fourth of a turn and attempt to activate the same sensor again. If the sensor still does not respond, attempt to activate the same sensor again using the customer activation tool (if available). If the sensor still fails to train, attempt to train the sensor with the vehicle doors open.

Place the Tire Pressure Monitor Activation Tool on the LF tire sidewall at the valve stem. Press and release the test button on the Tire Pressure Monitor Activation Tool. The horn will sound briefly to indicate that the tire pressure sensor has been recognized by the TPM / VSM . An animated version of this procedure is available on-line.

7. Within 2 minutes of the horn sounding, place the Tire Pressure Monitor Activation Tool on the RF tire sidewall at 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 TPM / VSM 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.
   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 TPM / VSM and document them on the applicable warranty claim.

10. **NOTE:** This step is required to clear DTC C2780, cause the TPM / VSM to exit the manufacturing mode and to make sure there are no other concerns with a newly programmed TPM / VSM .

    If the sensors are being trained due to the installation of a new TPM / VSM , clear any DTCs and carry out the TPM / VSM On-Demand Self Test.

Tire Pressure Monitoring System (TPMS) Sensor Activation

Special Tool(s)

 ST2941-A	Activation Tool, Tire Pressure Monitor 204-363, or Customer Activation Tool, Tire Pressure Monitor

NOTE: The tire pressure sensors will go into a "sleep mode" when a vehicle is stationary 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 at 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. This feedback may not always be present, do not rely on it as a confirmation that the module heard a particular sensor.

   NOTE: If a sensor does not respond to the Tire Pressure Monitor Activation Tool, move the vehicle to rotate the wheels at least one-fourth of a turn and attempt to activate the same sensor again. If the sensor still does not respond, attempt to activate the same sensor again using the customer activation tool (if available). If the sensor still fails to train, attempt to train the sensor with the vehicle doors open.

   Press the test button on the Tire Pressure Monitor Activation Tool to activate the sensor. Activate the sensor at least 2 times.

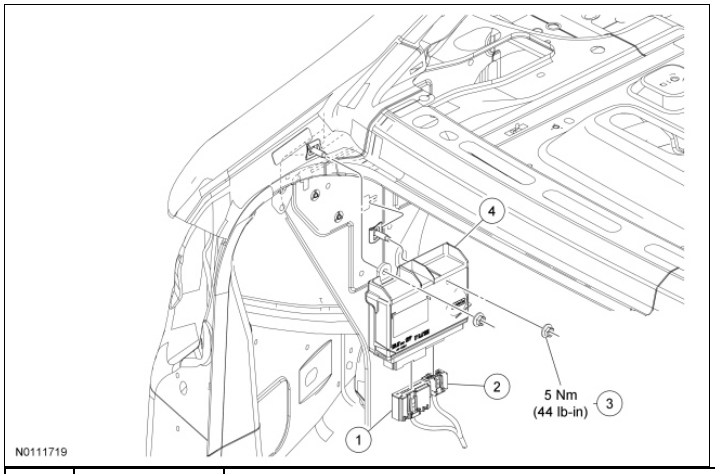
4. Repeat Steps 2 and 3 for the remaining tires.

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.

Tire Pressure Monitoring System (TPMS) Module - 4-Door Sedan

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool



Item	Part Number	Description
1	-	Tire Pressure Monitoring System (TPMS)/Vehicle Security Module (VSM) electrical connector (part of 14401)
2	-	External antenna coax connector
3	W711330	TPMS / VSM nut (2 required)
4	15K602	TPMS / VSM

Removal

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

NOTE: The Tire Pressure Monitoring System (TPMS)/Vehicle Security Module (VSM) is also identified as the VSM .

NOTE: Prior to the replacement of the TPMS / VSM , upload the module configuration information to a scan tool. This information must be downloaded into the new TPMS / VSM after installation. For additional information, refer to Section 418-01 .

NOTE: The steps included in this procedure are critical to restoring the TPMS to normal operation. A new TPMS / VSM is delivered in a manufacturing mode with 6 pre-set DTCs related to the TPMS . To clear the DTCs, successful configuration of the TPMS / VSM must occur, followed by successful TPMS sensor training, and a successful self-test. 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 necessary only if the TPMS VSM is being replaced.

   Upload the module configuration information from the TPMS / VSM . For additional information, refer to Section 418-01 .

2. Position aside the LH cargo area trim panel.

3. Disconnect the 2 TPMS / VSM electrical connectors.

4. Remove the 2 nuts and the TPMS / VSM .

Installation

1. Position the TPMS / VSM and install the 2 nuts.
   - Tighten to 5 Nm (44 lb-in).

2. Connect the 2 TPMS / VSM electrical connectors.

3. Position the LH cargo area trim panel.

4. **NOTE:** When successful, this step provides the calibration necessary for the TPMS / VSM operation and clears DTC B2477. The clearing of this DTC indicates the calibration data has been successfully downloaded to the new TPMS / VSM .

   Download the TPMS / VSM configuration information from the scan tool. For additional information, refer to Section 418-01 .

5. **NOTE:** When successful, this step clears DTCs B2868, B2869, B2870 and B2871. The clearing of these DTCs indicates the TPMS / VSM has recognized the tire pressure sensors during the training procedure.

   Train the tire pressure sensors. For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

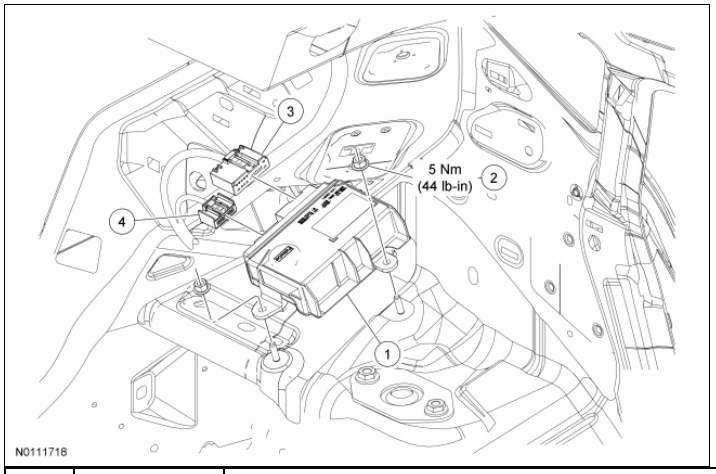
6. **NOTE:** DTC C2780 will not clear if any other DTCs are present in the TPMS / VSM . When successful, this step clears DTC C2780.

   Carry out the TPMS / VSM self-test (including an on-demand self-test). Repeat the self-test to confirm all DTCs have been cleared.

Tire Pressure Monitoring System (TPMS) Module - 5-Door Hatchback

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool



Item	Part Number	Description
1	-	Tire Pressure Monitoring System (TPMS)/Vehicle Security Module (VSM) electrical connector (part of 14401)
2	-	External antenna coax connector
3	W711330	TPMS / VSM nut (2 required)
4	15K602	TPMS / VSM

Removal

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

NOTE: The Tire Pressure Monitoring System (TPMS)/Vehicle Security Module (VSM) is also identified as the VSM .

NOTE: Prior to the replacement of the TPMS / VSM , upload the module configuration information to a scan tool. This information must be downloaded into the new TPMS / VSM after installation. For additional information, refer to Section 418-01 .

NOTE: The steps included in this procedure are critical to restoring the TPMS to normal operation. A new TPMS / VSM is delivered in a manufacturing mode with 6 pre-set DTCs related to the TPMS . To clear the DTCs, successful configuration of the TPMS / VSM must occur, followed by successful TPMS sensor training, and a successful self-test. 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 necessary only if the T/ VSM is being replaced.

   Upload the module configuration information from the TPMS / VSM . For additional information, refer to Section 418-01 .

2. Remove the LH quarter trim panel. For additional information, refer to Section 501-05

3. Disconnect the 2 TPMS / VSM electrical connectors.

4. Remove the 2 nuts and the TPMS / VSM .

Installation

1. Position the TPMS / VSM and install the 2 nuts.
   - Tighten to 5 Nm (44 lb-in).

2. Connect the 2 TPMS / VSM electrical connectors.

3. Install the LH quarter trim panel. For additional information, refer to Section 501-05

4. **NOTE:** When successful, this step provides the calibration necessary for the TPMS / VSM operation and clears DTC B2477. The clearing of this DTC indicates the calibration data has been successfully downloaded to the new TPMS / VSM .

   Download the TPMS / VSM configuration information from the scan tool. For additional information, refer to Section 418-01 .

5. **NOTE:** When successful, this step clears DTCs B2868, B2869, B2870 and B2871. The clearing of these DTCs indicates the TPMS / VSM has recognized the tire pressure sensors during the training procedure.

   Train the tire pressure sensors. For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

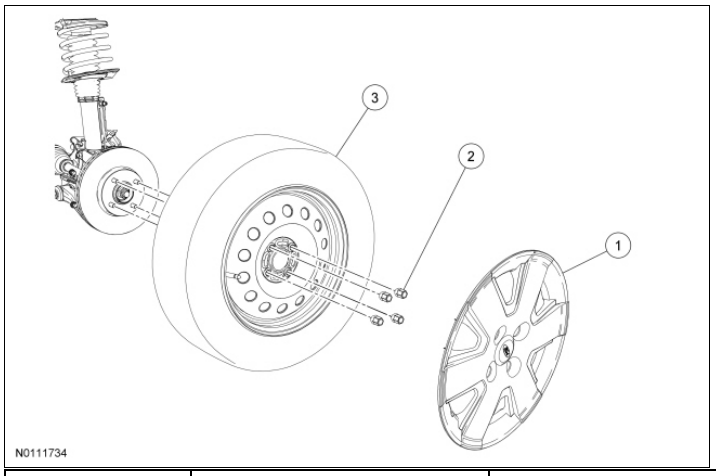
6. **NOTE:** DTC C2780 will not clear if any other DTCs are present in the TPMS / VSM . When successful, this step clears DTC C2780.

   Carry out the TPMS / VSM self-test (including an on-demand self test). Repeat the self-test to confirm all DTCs have been cleared.

Wheel and Tire

Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	-



Item	Part Number	Description
1	1130	Wheel cover
2	1012	Wheel nut (4 required)
3	-	Wheel and tire assembly

Removal

All vehicles

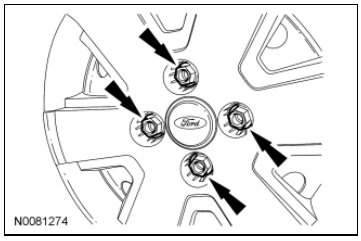
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

Vehicles equipped with wheel cover

2. ***NOTICE:*** **Do not use heat to loosen a seized wheel nut. Heat may damage the wheel and wheel bearings.**

   NOTICE: **Remove the wheel nuts prior to removing the wheel cover or damage to the wheel cover may occur.**

   Remove the 4 wheel nuts.



3. Remove the w cover and the wheel and tire.

Vehicles equipped with aluminum wheels

4. Remove the 4 wheel nuts and the wheel and tire assembly.

Installation

All vehicles

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: **Apply a thin coat of anti-seize lubricant to the interface between the wheel pilot bore and the hub pilot. Do not allow the anti-seize lubricant to contact the wheel-to-brake disc/drum mounting surface, wheel studs, wheel nuts, brake pads or brake disc friction surfaces. Damage to components may occur.**

   Clean the wheel mounting surfaces and apply a thin coat of anti-seize lubricant to the wheel hub pilot surface (wheel only).

2. Install the wheel and tire assembly.

Vehicles with wheel cover

3. Align the wheel cover valve stem opening with the valve stem.
   - Install the 4 wheel nuts and tighten by hand while ensuring alignment of the wheel and wheel cover assembly.

All vehicles

4. ⚠ **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 speeds up the development of brake roughness, shudder and vibration.**

   NOTE: The wheel nut torque specification is for clean, dry wheel studs and wheel nut threads.

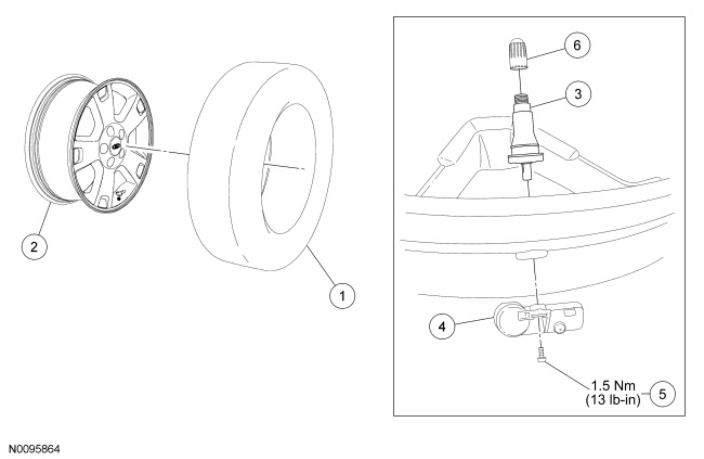
   Install the 4 wheel nuts and tighten by hand.

- Tighten the wheel nuts in a star/cross pattern to 135 Nm (100 lb-ft).

Wheel and Tire

Special Tool(s)

 ST2869-A	Digital Tire Pressure Gauge 204-354



Item	Part Number	Description
1	1508	Tire
2	1007	Wheel
3	1700	Valve stem and screw (also part of 1A189)
4	1A189	Tire Pressure Monitoring System (TPMS) sensor (a new sensor assembly includes W714266 screw and 1700 valve stem and cap)
5	-	Valve stem-to- TPMS sensor screw (part of 1700)
6	1A163	Valve stem cap (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.

NOTICE: **Failure to follow the instructions below may result in damage to the Tire Pressure Monitoring System (TPMS) sensor.**

NOTICE: **The Tire Pressure Monitoring System (TPMS) sensor is mounted to the valve stem. Removal of the valve stem requires dismounting the tire from the wheel and removal of the TPMS sensor.**

NOTE: Use only the Digital Tire Pressure Gauge any time tire pressures are measured to be sure that accurate values are obtained.

1. Remove the wheel and tire. For additional information, refer to Wheel and Tire in this section.

2. ***NOTICE:*** **The valve stem is connected to the Tire Pressure Monitoring System (TPMS) sensor. Do not pull the valve stem from the wheel, or damage to the sensor will occur.**

   Remove the valve stem core and fully deflate all air from the tire.

   - If a new Tire Pressure Monitoring System (TPMS) sensor is being installed, remove and discard the valve stem-to-sensor screw and the sensor.

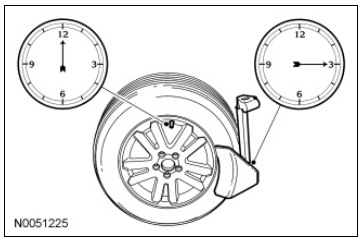
NOTICE: **Do not allow the tire beads to move beyond the wheel mid-plane (middle of the wheel) when separating the beads from the wheels, damage to the Tire Pressure Monitoring System (TPMS) sensor may occur.**

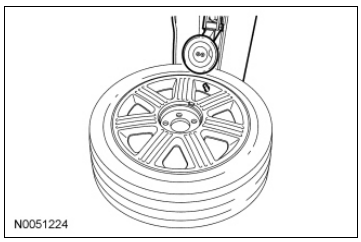
3. ***NOTICE:*** **Tire and valve stem position is critical to prevent damage to the Tire Pressure Monitoring System (TPMS) sensor when using a paddle-type bead separator.**

   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.

   Position the wheel and tire assembly on a suitable tire machine and separate both beads of the tire from the wheel.

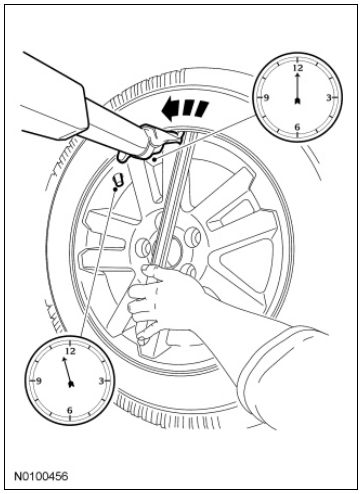
   - For a paddle-type tire machine, position the valve stem at the 12 o'clock or 6 o'clock position and the paddle at the 3 o'clock position.
   - For a roller-type tire machine, align the valve stem with the roller at any position.





4. **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 at the 11:30 position and the machine arm at the 12 o'clock position and dismount the outer bead from the wheel.

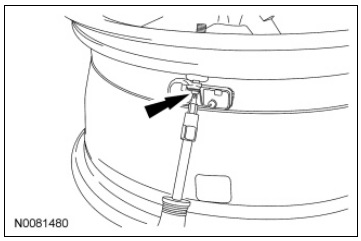


5. Reset the wheel and tire assembly on the turntable of the tire machine with the valve stem at the 11:30 position and the machine arm at the 12 o'clock position and dismount the inner bead from the wheel.

6. **NOTE:** A new valve stem must be installed whenever a new tire or wheel is installed.

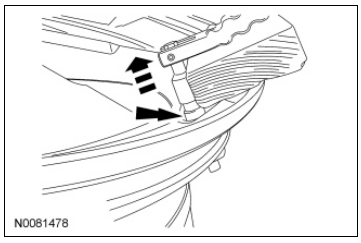
   Remove the TPMS sensor in the following sequence.

   1. Using a T10 Torx, remove the valve stem-to- TPMS sensor screw.
   2. Carefully and firmly, pull the sensor straight down and separate it from the valve stem.



7. ***NOTICE:*** **Use care not to damage the wheel surface when removing the valve stem.**

   Using a suitable valve stem puller and a wood block, remove the valve stem from the wheel.



8. **NOTE:** When installing a new wheel, always install a new valve stem and sensor screw. Reuse the TPMS sensor from the previous wheel if possible. The TPMS will not have to be trained if the sensor is reused.

   If the TPMS sensor is being reused, inspect the TPMS sensor for damage and install a new sensor as necessary.

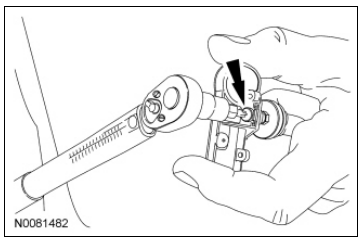
Assembly

NOTICE: **Damage to the Tire Pressure Monitoring System (TPMS) sensor may result if the tire mounting is not carried out as instructed.**

1. ***NOTICE:*** **To prevent Tire Pressure Monitoring System (TPMS) sensor and valve stem damage, the valve stem must be installed onto the TPMS sensor and then installed into the wheel as an assembly.**

   Install a new valve stem onto the TPMS sensor.

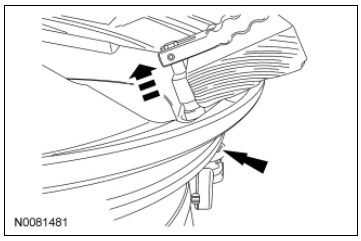
   - Tighten the new valve stem-to- TPMS sensor screw to 1.5 Nm (13 lb-in).



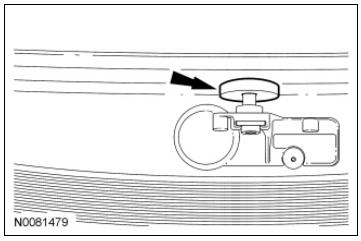
2. ***NOTICE:*** **It is important to pull the valve stem and Tire Pressure Monitoring System (TPMS) sensor assembly through the wheel rim hole in a direction parallel to the valve stem hole axis. If the assembly is pulled through at an angle, damage to the valve stem and sensor assembly may occur.**

   NOTICE: **Use care not to damage the wheel surface when installing the valve stem and Tire Pressure Monitoring System (TPMS) sensor assembly.**

   Lubricate the valve stem with soapy water and install the valve stem and TPMS sensor assembly into the wheel using a block of wood and a suitable valve stem installer.



3. Make sure the valve stem rubber is fully seated against the wheel.

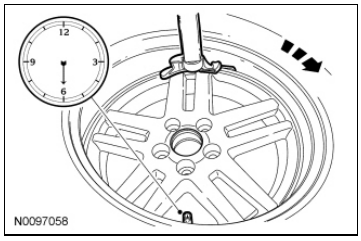


4. **NOTE:** Lubricate the tire beads using a suitable fast-drying, corrosion-inhibiting tire bead lubricant.

   NOTE: Do not mount the tire at this time.

   Position the wheel on the turntable of the tire machine, then lubricate and position the bottom bead of the tire on the wheel.

5. Position the wheel to align the valve stem with the machine arm, at the 6 o'clock position, and mount the bottom bead of the tire.



6. Reposition the wheel to align the valve stem with the machine arm at the 6 o'clock position, and mount the top bead of the tire.

7. **NOTE:** Use only the Digital Tire Pressure Gauge any time tire pressures are measured to make sure that accurate values are obtained.

   Inflate the tire to the pressure specified on the Vehicle Certification (VC) label located on the driver door or door pillar.

   - Proceed to Step 8 if the tire beads do not seat at the specified inflation pressure.

8. ⚠ **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 the tire using the remote valve and tire 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.**

9. Install the wheel and tire. For additional information, refer to Wheel and Tire in this section.

Tire Pressure Monitoring System (TPMS) Sensor

Disassembly

1. **NOTE:** The Tire Pressure Monitoring System (TPMS) sensor cannot be removed without disassembly of the wheel and tire.

   Disassemble the wheel and tire. For additional information, refer to Wheel and Tire in this section.

Driveline System

The driveline system consists of the following:

- Right halfshaft with inner and outer CV joint
- Left halfshaft with inner and outer CV joint
- Intermediate shaft connecting the transaxle to the right halfshaft
- Intermediate shaft bearing that supports the inner right halfshaft CV joint
- Circlips that retain the intermediate shaft and left halfshaft inner CV joint in the transaxle differential side gears
- Splined outer CV joints that mesh with the front drive hubs
- Outboard CV joint wheel hub nuts that secure the CV joints to the wheel hubs

The transaxle contains the differential assembly. The differential receives torque directly from the transmission. Inside the differential, side gears are splined to the right inboard CV joint and intermediate shaft. The differel allows the halfshaft and intermediate shaft to be driven at different speeds as required, such as when cornering. The rotational direction of the halfshafts determines the vehicle movement. The articulation of the front wheels, both in steering and normal jounce and rebound, is controlled by the CV joint. Both plunge and multi-ball style CV joints are used. The CV joints are permanently lubricated with a special high temperature grease and require no periodic maintenance.

Halfshaft Handling

NOTICE: **Excessive pulling force on the interconnecting shaft between the joints of the halfshaft will result in internal joint damage and separation. Axial loads used in assisting removal should be applied through the inboard joint housing only. Handle the halfshaft only by the interconnecting shaft to avoid pull-apart and potential damage to the Constant Velocity (CV) joints. Do not over-angle the CV joints. Damage will occur to an assembled inner CV joint if it is over-plunged outward from the joint housing.**

NOTE: Never use the halfshaft assembly as a lever to position other components. Always support the free-end of the halfshaft. Do not allow the boots to contact sharp edges or hot exhaust components.

Handle all halfshaft components carefully during removal and installation procedures.

Driveline System

Principals of Operation

Driveline System - General Information

The driveline system enables the power generated by the engine and transferred through the transaxle to place the vehicle in motion. Rotational torque received from the transaxle is delivered to the front wheels by halfshafts. The CV joints at the ends of the shafts allow the shafts to rotate smoothly in an allowable angle plane. The rotational torque is introduced into the differential ring gear which drives the differential. The differential 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

1. Verifyustomer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
• CV joints, housings, boots and clamps • Intermediate shaft support bearing • Intermediate shaft support bracket

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 - NVH .

Intermediate Shaft Support Bearing

With the vehicle in NEUTRAL, position it on a hoist. Refer to Section 100-02 . Rotate the intermediate shaft by hand. If the support bearing shows any signs of roughness or wear, install a new intermediate shaft bearing. Refer to Section 205-04 .

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
• Driveline clunk - loud clunk when shifting from reverse to drive	• Damaged or worn CV joints • Loose hub nut	• INSPECT the CV joints for wear or damage. INSTALL a new halfshaft as necessary. REFER to Section 205-04 . CHECK the torque on the hub nut. REPLACE the hub nut if the torque is not at specification. REFER to Section 205-04 .
• Driveline clunk (Front Wheel Drive (FWD) vehicles) - occurs during acceleration or from cruise to coast/deceleration	• Damaged or worn inner CV joint • Loose hub nut	• INSPECT the inner CV joint and boot. INSTALL a new halfshaft as necessary. REFER to Section 205-04 . CHECK the torque on the hub nut. REPLACE the hub nut if the torque is not at specification. REFER to Section 205-04 .
• Driveline clunk - occurs as the vehicle starts to move forward following a stop <	• Loose hub nut	• CHECK the torque on the hub nut. REPLACE the hub nut if the torque is not at specification. REFER to Section 205-04 .
• Clicking, popping or grinding - occurs while the vehicle is turning	• Inadequate or contaminated lubrication in the CV joints	• CHECK the CV boots and joints for wear or damage. INSTALL new boot(s) or halfshaft as necessary. REFER to Section 205-04 .
	• Another component contacting the halfshaft	• CHECK the halfshafts and the area around the halfshafts. REPAIR as necessary.
• Grunting - normally associated with a shudder experienced during acceleration from a complete stop	• Halfshaft CV joint binding	• CLEAN the CV joint and INSTALL a new halfshaft as necessary. REFER to Section 205-04 .

CV Joint Capacities

Description	Liters
Grease, inner tripod joints	Full sachet
Grease, outer joints	Full sachet

Torque Specifications

Description	Nm	lb-ft
Ball joint nut	62	46
Brake hose bracket bolt	25	18
Shield and bearing retainer strap nuts [a]	-	-
Stabilizer bar link upper nut	48	35
Wheel hub nut [a]	-	-

[a] Refer to Halfshaft-Exploded View in this section.

Front Drive Halfshafts

The front halfshafts consist of the following:

- CV joints at both ends to make sure that the rotation is smooth
- Tripod CV joints (with tripod, running rollers and tripod housing) are fitted on the transmission side
- CV joints nearest the wheel are caged ball joints (with ball star, ball cage and ball shell)
- LH tripod joint is secured in the differential with a circlip
- Intermediate shaft (RH side) is secured in the differential by the intermediate shaft bearing
- Tripod housing of the tripod CV joint for the RH front halfshaft and the intermediate shaft are attached as a unique part
- Outboard CV joints are attached to the splined wheel hubs with nuts that control wheel bearing preload

The front halfshafts transmit torque generated by the engine from the transaxle to the wheels. In order to allow vertical and horizontal movement of the wheels, the front drive halfshafts operate at varying lengths and angles. The tripod CV joints allow for changes in halfshaft length during axial movements. The caged balls of the outer CV joint permit the articulation of the front wheels and retain the stability of the intermediate and interconnecting shafts.

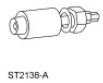
Special care should be taken when removing and installing or assembling and disassembling front halfshafts. The inner tripod joint must not be bent at more than 18 degrees. Do not allow the boots to come into contact with sharp edges or the hot exhaust system. Do not drop the front halfshaft as this can damage the inside of the boots without any signs of damage showing on the outside. Do not use front halfshafts as levering tools for the installation of other components. The front halfshafts must always be supported when disconnected from the wheel ends.

Front Drive Halfshafts

Refer to Section 205-00 .

Halfshaft - Exploded View

Special Tool(s)

 ST2136-A	Installer, Halfshaft 204-161 (T97P-1175-A)
 ST2272-A	Remover, Front Wheel Hub 205-D070 (D93P-1175-B) or equivalent
 ST1582-A	Remover, Halfshaft 205-241 (T86P-3514-A)
 ST2038-A	Remover, Halfshaft (Plate) 205-290 (T89P-3415-B)
 ST2789-A	Slide Hammer 100-001 (T50T-100-A)
 16089	Remover, Halfshaft 308-256

Wheel End Components

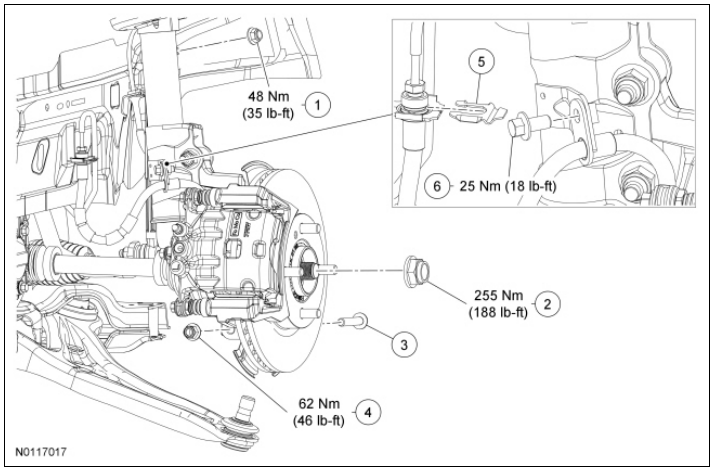
NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.**

NOTICE: **Do not tighten the wheel hub nut with the vehicle on the ground. Tighten the nut to specification before the vehicle is lowered onto the wheels. Wheel bearing damage will occur if the wheel bearing is loaded with the weight of the vehicle applied.**

NOTICE: **Install and tighten the new wheel hub nut to specification in a continuous rotation. Always install a new wheel hub nut after loosening or when not tightened to specification in a continuous rotation or damage to the components may occur.**

NOTE: Apply the brake to keep the halfshaft from rotating while tightening the wheel hub nut.

NOTE: LH shown, RH similar.



Item	Part Number	Description
1	W713760	Stabilizer bar link upper nut (install new)
2	W713640	Wheel hub nut (install new)
3	W709618	Ball joint bolt (install new)
4	W520203	Ball joint nut (install new)
5	W700936	Brake hose clip
6	W500222	Brake hose bracket bolt

Halfshafts

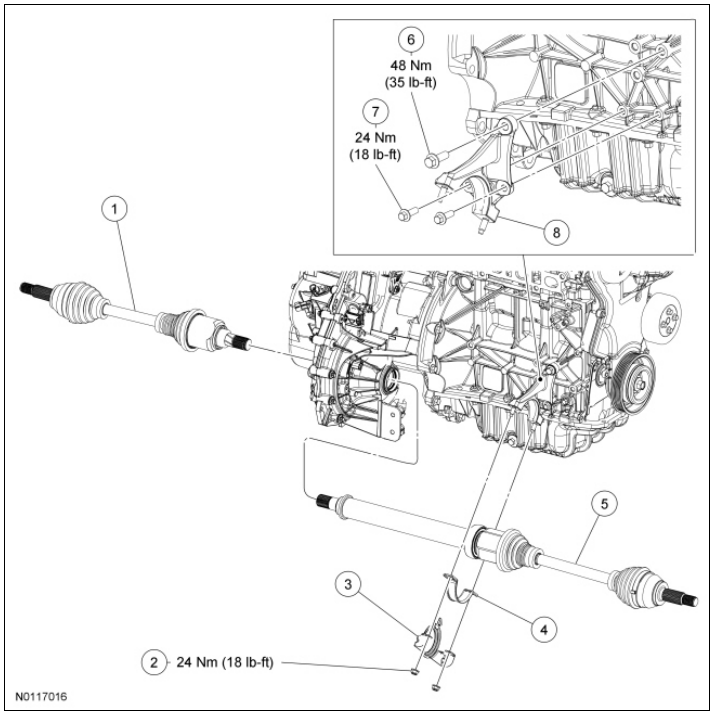
NOTICE: **Install the bearing retainer strap (item 4) on the bracket studs before the shield (item 3) and tighten the nuts evenly in stages (alternating from top to bottom) or incorrect bearing clampload may occur causing component damage.**

NOTICE: **The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees. Damage to the halfshaft will occur.**

NOTICE: **Install a new halfshaft seal any time the halfshaft is removed from the transmission/transaxle or a leak may occur. For additional Information refer to Section 307-11 .**

NOTE: Install the RH halfshaft shield so the clip is seated in the notch on the support bracket.

NOTE: For halfshaft CV boot service, refer to Halfshaft - RH or Halfshaft - LH In this section.



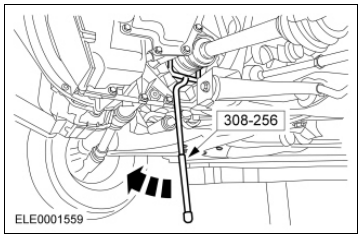
Item	Part Number	Description
1	3B437	LH halfshaft assembly
2	W520102	Shield and bearing retainer strap nuts (2 required, install new)
3	3N278	Shield
4	3N324	Bearing retainer strap (install new)
5	3B436	RH halfshaft assembly
6	W500034	Support bracket upper bolt
7	W500024	Support bracket lower bolt (2 required)
8	3K305	Support bracket

Removal and Installation <

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications and Special Tools. Items in the exploded views may not be listed in order of removal.

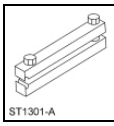
2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

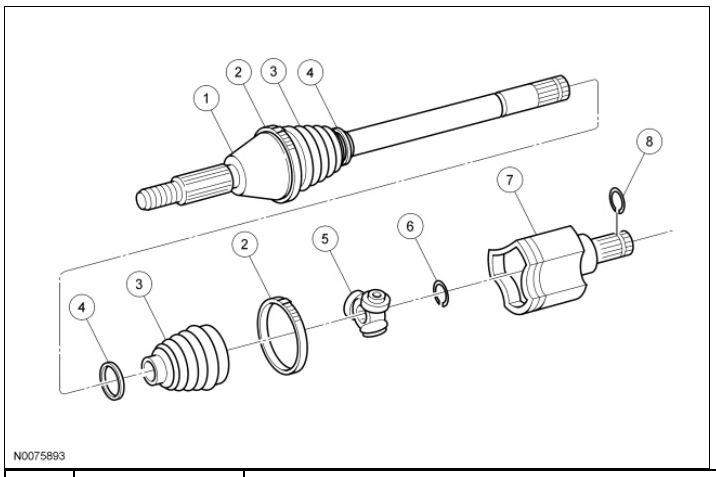
3. Vehicles equipped with a manual transmission, use special tool 308-256 to detach the LH halfshaft.



Halfshaft - LH

Special Tool(s)

 ST1301-A	Installer, Constant Velocity Joint Boot Clamp 205-343 (T95P-3514-A)

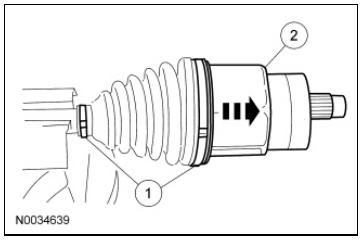


Item	Part Number	Description
1	-	Outboard fixed ball CV joint (part of 3B437 halfshaft assembly)
2	-	Large CV boot clamps (part of 4A804 boot kit)
3	-	CV boot (part of 4A804 boot kit)
4	-	Small CV boot clamps (part of 4A804 boot kit)
5	-	Tripod star with roller (part of 3B437 halfshaft assembly)
6	-	Tripod snap-ring (part of 3B437 halfshaft assembly)
7	-	Inboard tripod housing (part of 3B437 halfshaft assembly)
8	-	Halfshaft retaining circlip

Disassembly

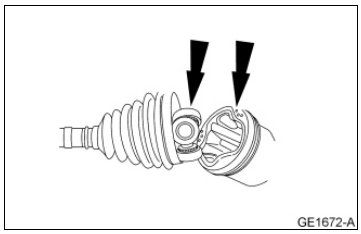
Halfshaft - Exploded View in this section.

2. Clamp the intermediate shaft in a soft-jawed vise.
    1. Remove and discard the 2 inner CV boot clamps.
    2. Remove the inner CV joint housing.

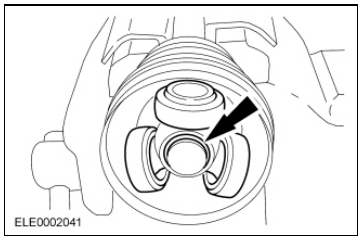


3. Push the boot back along the shaft.

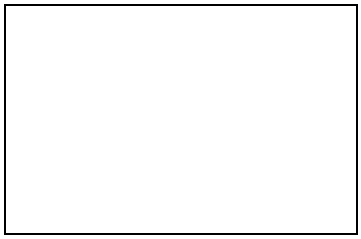
4. Separate the tripod joint from the housing and remove all of the grease.



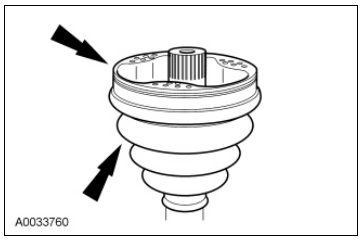
5. Remove and discard the snap ring.



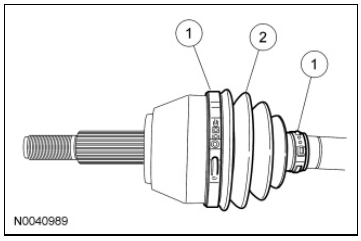
6. Using a suitable 3-jaw puller, remove the tripod joint.



7. Remove and discard the inner CV joint boot.



8. Remove and discard the outboard CV boot and boot insert.
    1. Remove and discard the 2 boot clamps.
    2. Pull the outboard boot down the length of the shaft and off the inboard end.
        - Remove the CV joint grease.



Assembly

NOTICE: **The inner joint must not be bent at more than 18 degrees; the outer joint must not be bent at more than 45 degrees or damage to the component my occur.**

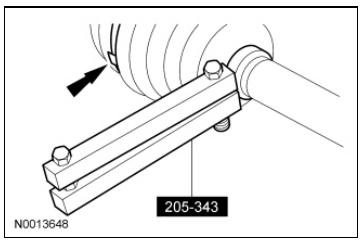
NOTICE: **Use care not to damage the boot or component damage may occur.**

1. **NOTE:** Install the outboard CV boot from the inboard end.

   Install the outboard CV boot and install half the grease in the sachet (supplied with boot kit) into the outer joint and the remainder in the CV joint boot.

   - Slide a small flat-blade screwdriver under the boot seat to allow the air to escape.
   - Position the CV boot and remove the screwdriver.

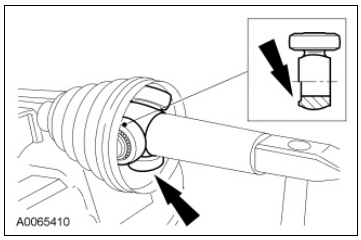
2. Using the Constant Velocity Joint Boot Clamp Installer, install the 2 new outboard boot clamps.



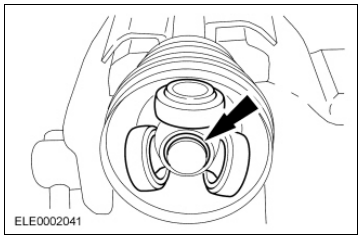
3. ***NOTICE:*** **Do not damage the tripod joint roller bearings or component damage may occur.**

   Install the tripod joint on the inboard end of the shaft.

   - Using a suitable driver, push the tripod joint onto the front drive halfshaft as far as it will go.



4. Install a new snap ring.

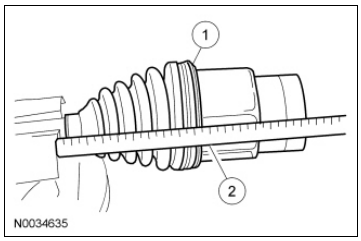


5. Install half of the sachet of grease (supplied with boot kit) into the tripod joint housing. Inject the other half of the grease into the boot.

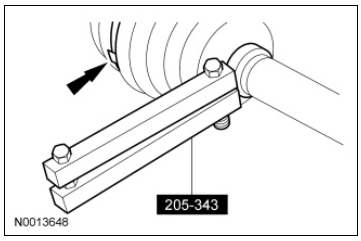
6. ***NOTICE:*** **Use care not to damage the boot or component damage may occur.**

   Install the tripod joint into the tripod joint housing.

   1. Insert a small flat-blade screwdriver under the boot seat to allow the air to escape.
   2. Slide the tripod joint in as far as it will go, then pull it out 20 mm (0.787 in).
   - Remove the screwdriver.



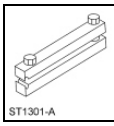
7. Using the Constant Velocity Joint Boot Clamp Installer, install the 2 new CV boot clamps.

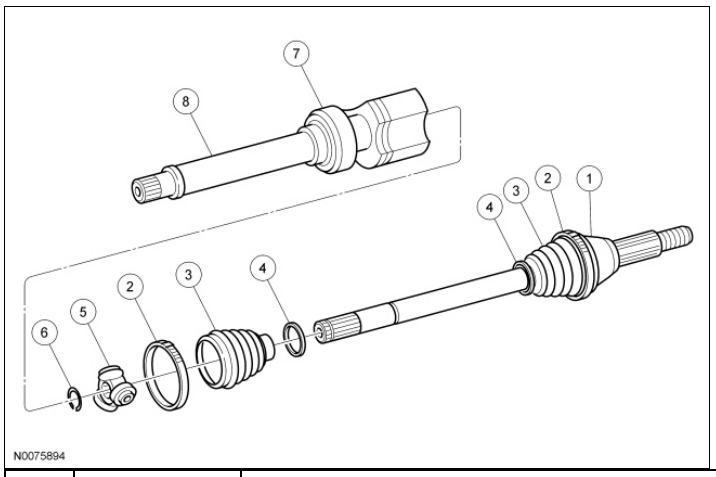


8. Install the LH halfshaft assembly. For additional information, refer to Halfshaft - Exploded View in this section.

Halfshaft - RH

Special Tool(s)

 ST1301-A	Installer, Constant Velocity Joint Boot Clamp 205-343 (T95P-3514-A)

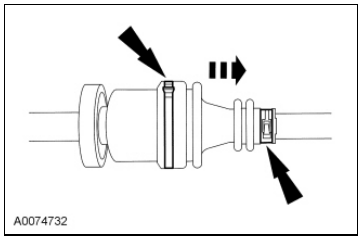


Item	Part Number	Description
1	-	Outboard fixed ball CV joint (part of 3B436 halfshaft assembly)
2	-	Large CV joint boot clamps (part of 4A804 boot kit)
3	-	Outboard CV boots (part of 4A804 boot kit)
4	-	Small CV joint boot clamps (part of 4A804 boot kit)
5	-	Tripod joint (part of 3B436 halfshaft assembly)
6	-	Snap ring (part of 3B436 halfshaft assembly)
7	-	Intermediate shaft support bearing (part of 3B436 halfshaft assembly)
8	-	Intermediate shaft (part of 3B436 halfshaft assembly)

NOTICE: **The inner joint must not be bent at more than 18 degrees; the outer joint must not be bent at more than 45 degrees or damage to the component may occur.**

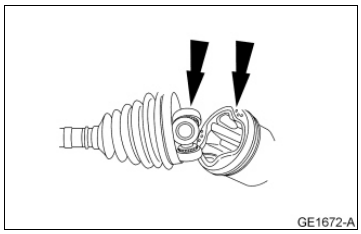
1. **Remove the RH halfshaft assembly. For additional information, refer to Halfshaft - Exploded View in this section.**

2. **Clamp the intermediate shaft in a soft-jawed vise.**
   - **Remove and discard the 2 inner boot clamps.**

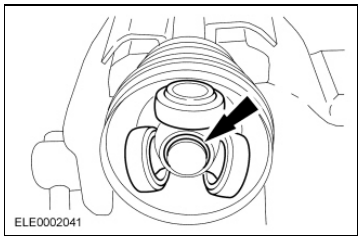


3. Push the boot back along the shaft.

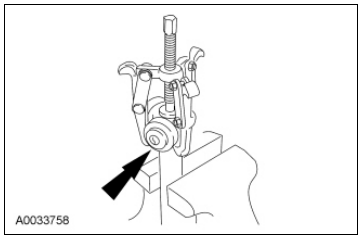
4. Separate the tripod joint from the housing and remove all the grease.



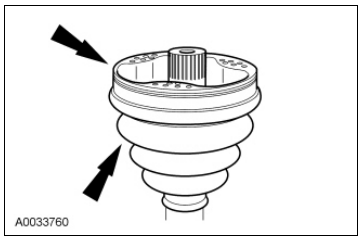
5. Remove and discard the snap ring.



6. Using a suitable 3-jaw puller, remove the tripod joint.

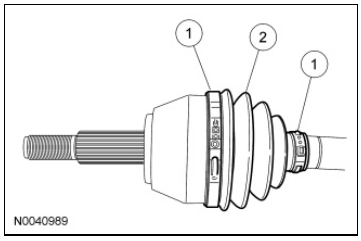


7. Remove and discard the inner CV joint boot and boot insert.



8. Remove and discard the outboard CV boot.

1. **Remove and discard the 2 CV boot clamps.**
2. **Remove and discard the boot.**
   - **Remove the CV joint grease.**



Assembly

NOTICE: **The inner joint must not be bent at more than 18 degrees; the outer joint must not be bent at more than 45 degrees or damage to the component may occur.**

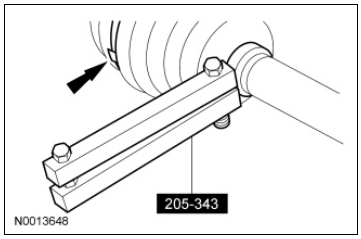
1. **Install the outboard CV boot and install half the grease in the sachet (supplied with boot kit) into the outer joint and the remainder in the CV joint boot.**

2. ***NOTICE:*** **Use care not to damage the boot or component damage may occur.**

   Position the boot on the outer CV joint.

   - **Slide a small flat-blade screwdriver under the boot seat to allow the air to escape.**
   - **Position the CV boot and remove the screwdriver.**

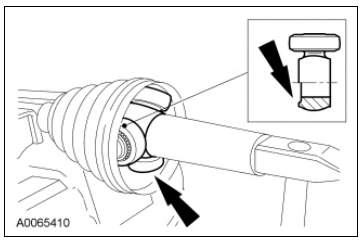
3. **Using the Constant Velocity Joint Boot Clamp Installer, install the 2 new clamps in boot ring grooves.**



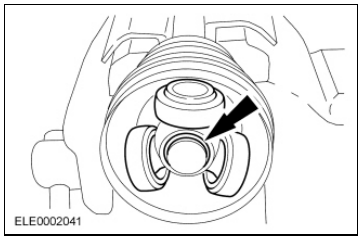
4. ***NOTICE:*** **Do not damage the tripod joint roller bearings or component damage may occur.**

   Install the tripod joint.

   - **Using a suitable driver, push the tripod joint onto the front drive halfshaft as far as it will go.**

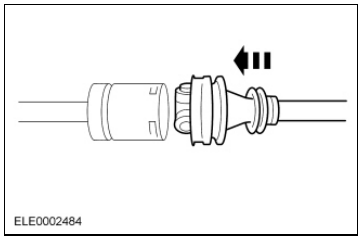


5. **Install a new snap ring.**

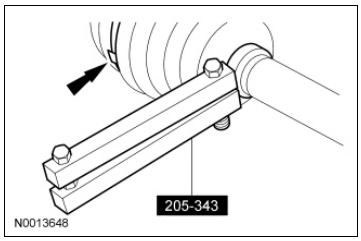


6. **Install half of the sachet of grease (supplied with boot kit) into the tripod joint housing. Inject the other half of the grease into the boot.**

7. **Install the tripod joint into the tripod joint housing.**



8. **Using the Constant Velocity Joint Boot Clamp Installer, install the 2 new inner CV boot clamps.**



9. **Install the RH halfshaft assembly. For additional information, refer to Halfshaft - Exploded View in this section.**

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	648 ml - Mannual transmission - 586 ml - Automatic transmission
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
Brake Disc	
Front brake disc minimum thickness	21 mm (0.826 in)
Brake Drum	
Maximum brake drum diameter	202 mm (7.952 in)
Brake Pads and Shoes	
Maximum brake shoe taper wear (in any direction)	3.0 mm (0.118 in)
Minimum brake pad thickness	3.0 mm (0.118 in)
Minimum brake shoe thickness	3.75 mm (0.147 in)

Torque Specifications

Description	Nm	lb-in
Brake caliper bleeder screws	10	89
Wheel cylinder bleeder screws	6	54
Master cylinder brake tube fittings	18	155

Brake System

The brake system consists of the following components:

- Fixed brake pedal
- Front disc brake system
- Brake master cylinder and fluid reservoir
- Mechanical parking brake system
- ABS
- Rear drum brake system
- Red brake light indicator
- Vacuum-assisted power brake booster

For information on:

- the hydraulic brake actuation system, refer to Section 206-06 .

  the front disc brakes, refer to Section 206-03 .
- the parking brake actuation system, refer to Section 206-05 .
- the ABS, refer to Section 206-09 .
- the rear drum brake system, refer to Section 206-02 .
- the vacuum assisted power brake booster, refer to Section 206-07 .

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 into the master cylinder. This produces hydraulic pressure in the master cylinder. On vehicles not equipped with ABS, the hydraulic pressure is transmitted by brake fluid through the brake tubes to the individual brake calipers. On vehicles equipped with ABS, the hydraulic pressure is transmitted by brake fluid through the brake tubes to the ABS Hydraulic Control Unit (HCU), which then distributes that pressure through brake tubes 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 anically 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 .

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: 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 riskserious 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

Mechanical	Electrical
• Brake fluid level and condition • Brake master cylinder • Brake master cylinder reservoir • Brake booster • Brake booster check valve • Brake booster vacuum hose • Brake hoses and tubes • Brake caliper, guide pins and anchor plate • Brake discs/drums • Brake pads/shoes • Brake pedal, bracket and booster linkage • Aftermarket modifications	• Brake fluid level switch • Parking brake switch • Wiring, terminals or connectors

3. Visually inspect the suspension system and tires for obvious signs of wear or damage.

- For suspension system concerns, refer to Section 204-00 .
- For tire concerns, refer to Section 204-04 .

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

5. If the cause is not visually evident, GO to Symptom Chart - Brake System or GO to Symptom Chart - NVH .

Symptom Chart

Symptom Chart - Brake System

Symptom Chart - Brake System

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 proportioto 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
A1 ROAD TEST THE VEHICLE - LIGHT BRAKING	
• 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. • **Is there a vibration/shudder felt in the steering wheel, seat or brake pedal?**	**Yes** GO to A4 . **No** GO to A2 .
A2 ROAD TEST THE VEHICLE - MODERATE TO HEAVY BRAKING	
• 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. • **Is there a vibration/shudder?**	**Yes** GO to A3 . **No** The concern is not present at this time.
A3 CHECK ABS OPERATION	
• **NOTE:** 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. • 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). • **Is the vibration/shudder only present on a wet, snowy or loose surface?**	**Yes** This is a normal operating condition of the ABS. **No** GO to A5 .
A4 ISOLATE BRAKE VIBRATION	

• **NOTE:** 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. • 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. • **Is there a vibration/shudder?**	**Yes** GO to A7 . **No** GO to A5 .
A5 CHECK THE FRONT SUSPENSION	
• Check the front suspension. Refer to Section 204-00 . • **Are all the suspension components in satisfactory condition?**	**Yes** GO to A6 . **No** REPAIR or INSTALL new components as necessary. TEST the system for normal operation.
A6 CHECK THE FRONT BRAKE DISCS	
• Inspect the front brake discs. Refer to Brake System Inspection in this section. • Road test the vehicle. • **Is the vibration/shudder present?**	**Yes** GO to A7 . **No** The concern has been repaired.
A7 CHECK THE REAR SUSPENSION	
• Check the rear suspension. Refer to Section 204-00 . • **Are all the suspension components in satisfactory condition?**	**Yes** INSPECT the rear brake drums. REFER to Brake System Inspection in this section. **No** REPAIR or INSTALL new components as necessary. TEST the system for normal operation.

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 4.0193 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.

bsp;
Brake Master Cylinder - Compensator Port

1. Inspect the master cylinder. Refer to Brake System Inspection in this section.

2. With the vehicle in NEUTRAL, position it on a hoist. Refer to Section 100-02 .

3. Apply and release the brakes.

4. 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 5.
   - 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.

5. Check the brake pedal switches and the brake pedal free play to verify that the brake pedal is not partially applied.

6. Loosen the brake master cylinder nuts and position the brake master cylinder away from the brake booster.

7. 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

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 ications 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.
    - 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.
    - 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 Shoes

1. Inspect and measure the thickness of the brake shoe friction material. For additional information, refer to Specifications in this section.
    - Minor surface cracks do not require shoe replacement, however, if there are missing chunks or cracks in the lining through to the backing plate, install new brake shoes.
    - If the thickness of the friction material is less than the specified thickness, install new brake shoes.
    - Verify that the mounting hardware is installed correctly and operating correctly. Install new hardware as necessary.
    - Verify that the backing plate contact points are free of corrosion that may cause binding. Clean or install new as necessary.
    - Verify correct brake shoe adjustment.
    - For additional information, refer to Section 206-02 .

Brake Discs

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 disc 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.
    - 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.
    - 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 Drums

NOTE: It is generally not required to install new brake drums to address noise issues.

1. Inspect the brake drums and measure the brake drum diameter. Record the measurements, refer to Specifications in this section.
    - If the brake drum is cracked or otherwise damaged, install a new brake drum.
    - If the diameter measurement is more than the maximum specification, install a new brake drum.
    - Heavily scored brake drums, similar to that caused by shoes worn down to the backing plate, should be machined. In order to machine, drums must be below the maximum diameter specification.
    - For additional information, refer to Section 206-02 .

Wheel Cylinders

1. Inspect the wheel cylinders for leaks, damage to seals, and piston corrosion or binding.
    - If the wheel cylinder is leaking or otherwise damaged, install a new wheel cylinder. For additional information, refer to Section 206-02 .

Brake Calipers

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.

Brake Caliper Guide Pins

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 System Inspection in this section.

Brake Flexible Hoses and Tubes

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 206-02 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.

Brake Disc Machining

NOTE: Do not use a bench lathe to machine 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. 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 .

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 .

13. Install the wheel and tire. For additional information, refer to Section 204-04 .

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

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.

⚠ WARNING: Do not allow the brake master cylinder to run dry during the bleeding operation. Master cylinder may be damaged if operated without fluid, resulting in degraded braking performance. Failure to follow this instruction 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.**

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 bleeding the brake system is preferred to manual bleeding.

1. 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.

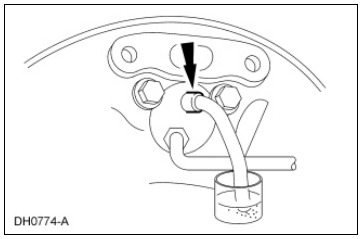
2. **NOTE:** Master cylinder pressure bleeder adapter tools are available from various manufacturers of pressure bleeding equipment. Follow the instructions of the manufacturer when installing the adapter.

   Install the bleeder adapter to the brake master cylinder reservoir, and attach the bleeder tank hose to the fitting on the adapter.

3. **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.



4. Remove the RR bleeder screw cap and place a box-end wrench on the bleeder screw. Attach a rubber drain hose to the RR bleeder screw and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.

5. Loosen the RR bleeder screw. Leave open until clear, bubble-free brake fluid flows, then tighten the RR bleeder screw to specifications. Refer to Specifications in this section. Remove the rubber hose.

6. Continue bleeding the rest of the system, going in order from the LR bleeder screw to the RF bleeder screw, ending with the LF bleeder screw.
   - Tighten the brake caliper and wheel cylinder bleeder screws to specifications. Refer to Specifications in this section.

7. Close the bleeder tank valve. Remove the tank hose from the adapter and remove the adapter. Fill the reservoir with clean, specified brake fluid and install the reservoir cap.

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.**

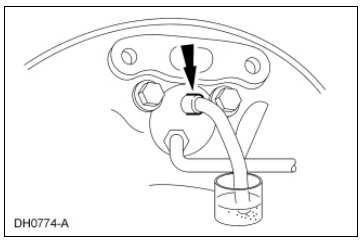
⚠ **WARNING: Do not allow the brake master cylinder to run dry during the bleeding operation. Master cylinder may be damaged if operated without fluid, resulting in degraded braking performance. Failure to follow this instruction may result in serious personal injury.**

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.**

NOTE: Pressure bleeding the brake system is preferred to manual bleeding.

1. Clean all the dirt from around the brake fluid reservoir cap and remove the filler cap.
   - Fill the brake master cylinder reservoir with clean, specified brake fluid.

2. Remove the RR bleeder screw cap and place a box-end wrench on the bleeder screw. Attach a rubber drain hose to the RR bleeder screw and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.



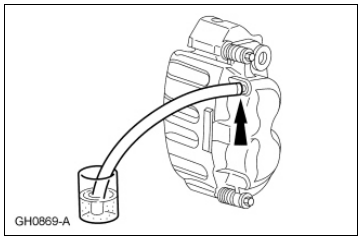
3. Have an assistant pump and then hold firm pressure on the brake pedal.

4. Loosen the RR bleeder screw until a stream of brake fluid comes out. While an assistant maintains pressure on the brake pedal, tighten the RR bleeder screw.
    - Repeat until clear, bubble-free fluid comes out.
    - Refill the brake master cylinder reservoir as necessary.

5. Tighten the RR bleeder screw to specifications. Refer to Specifications in this section. Remove the rubber hose and install the bleeder screw cap.

6. Repeat Steps 2 through 5 for the LR bleeder screw.

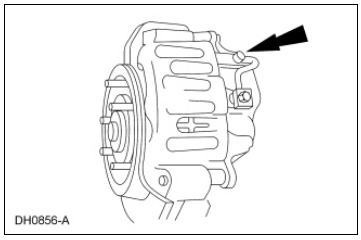
7. Remove the RF bleeder cap and place a box-end wrench on the bleeder screw. Attach a rubber drain hose to the RF bleeder screw and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.



8. Have an assistant pump and then hold firm pressure on the brake pedal.

9. Loosen the RF bleeder screw until a stream of brake fluid comes out. While the assistant maintains pressure on the brake pedal, tighten the RF bleeder screw.
    - Repeat until clear, bubble-free fluid comes out.
    - Refill the brake master cylinder reservoir as necessary.

10. Tighten the RF bleeder screw to specifications. Refer to Specifications in this section. Remove the rubber hose and install the bleeder screw cap.



11. Repeat Steps 7 through 10 for the LF bleeder screw.

Hydraulic Control Unit (HCU) 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.**

⚠ **WARNING: Do not allow the brake master cylinder to run dry during the bleeding operation. Master cylinder may be damaged if operated without fluid, resulting in degraded braking performance. Failure to follow this instruction 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.**

NOTE: Pressure bleeding the brake system is preferred to manual bleeding.

1. Follow the Pressure Bleeding or Manual Bleeding procedure steps to bleed the system.
2. Connect the scan tool and follow the ABS Service Bleed instructions.
3. Repeat the Pressure Bleeding or Manual Bleeding procedure steps to bleed the system.

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 em 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.

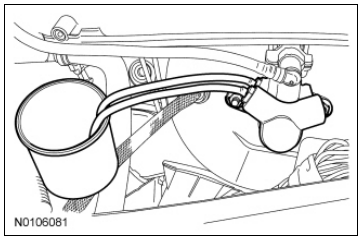
⚠ WARNING: Do not allow the brake master cylinder to run dry during the bleeding operation. Master cylinder may be damaged if operated without fluid, resulting in degraded braking performance. Failure to follow this instruction may result in serious personal injury.

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.**

NOTE: When the brake master cylinder has been installed new or the system has been emptied or partially emptied, it must be primed to prevent air from entering the system.

1. Disconnect the brake outlet tubes from the master cylinder.

2. Install short brake tubes onto the primary and secondary ports with the ends submerged in a container partially filled with clean, specified brake fluid.



3. Have an assistant pump the brake pedal until clear fluid flows from the brake tubes without air bubbles.

4. Remove the short brake tubes, and install the master cylinder brake tubes.
   - Tighten the brake tube fittings to specifications. Refer to Specifications in this section.

5. Bleed the brake system. For additional information, 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.

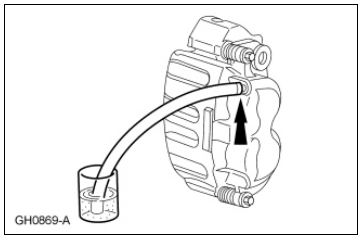
⚠ WARNING: Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Do not allow the brake master cylinder to run dry during the bleeding operation. Master cylinder may be damaged if operated without fluid, resulting in degraded braking performance. Failure to follow this instruction 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.**

NOTE: It is not necessary to do a complete brake system bleed if only the brake caliper was disconnected or installed new.

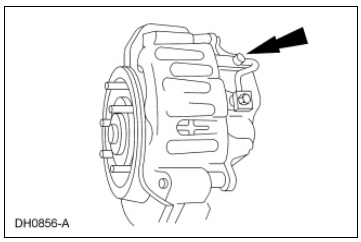
1. Remove the bleeder screw cap and place a box-end wrench on the bleeder screw. Attach a rubber drain hose to the bleeder screw and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.



2. Have an assistant pump the brake pedal at least 2 times and then hold firm pressure on the brake pedal.

3. 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.

4. Tighten the bleeder screw to specifications. Refer to Specifications in this section. Remove the rubber hose and install the bleeder screw cap.



Wheel 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.

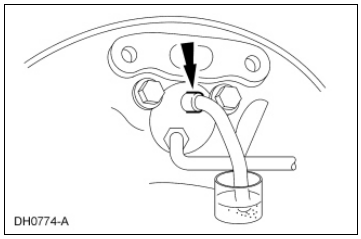
⚠ WARNING: Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Do not allow the brake master cylinder to run dry during the bleeding operation. Master cylinder may be damaged if operated without fluid, resulting in degraded braking performance. Failure to follow this instruction 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.**

NOTE: It is not necessary to do a complete brake system bleed if only the wheel cylinder was disconnected or installed new.

1. Remove the 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.



2. Have an assistant pump the brake pedal at least 2 times and then hold firm pressure on the brake pedal.

3. 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.

4. Tighten the bleeder screw to specifications. Refer to Specifications in this section. Remove the rubber hose and install the bleeder screw cap.

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	630 ml (1.33 pt)
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	-
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-	-

Drum Brake Specification

Description	mm	Inch
Brake drum discard diameter	202	8.03
Brake lining discard thickness	1	0.039

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake tube fittings	18	-	159
Wheel cylinder bolt	12	-	106
Brake drum retainers	13	-	115

Drum Brake

The drum brake system consists of the following components:

- Brake backing plate
- Brake drum
- Brake flexible hose
- Brake shoe hardware kit
- Brake shoes
- Self-adjuster
- Wheel cylinder

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 wheel cylinders moving the brake shoes against the friction surface of the brake drum. The friction of the brake shoes on the brake drum causes the slowing or stopping of wheel rotation and the vehicle.

Drum Brake

Refer to Section 206-00 .

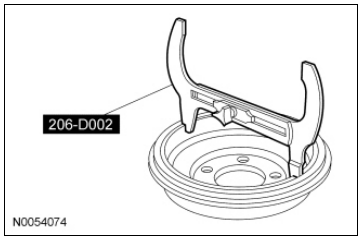
Brake Shoe Adjustment

Special Tool(s)

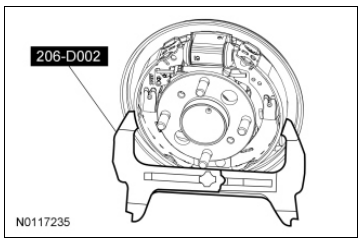
 ST1468-A	Brake Adjustment Gauge 206-D002 (D81L-1103-A) or equivalent

1. Remove the brake drum. For additional information, refer to Drum Brake System - Exploded View in this section.

2. Using the Brake Adjustment Gauge, measure the inside diameter of the brake drum.



3. Position the Brake Adjustment Gauge on the brake shoes and linings and adjust accordingly.



4. Install the brake drum. For additional information, refer to Drum Brake System - Exploded View in this section.

Drum Brake System - Exploded View

Material

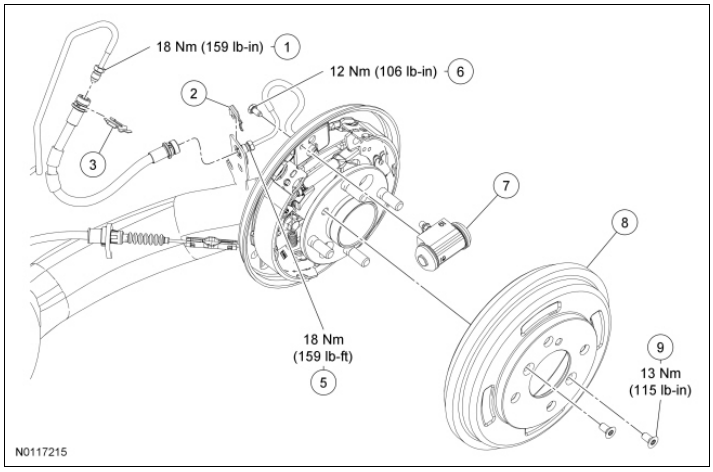
Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A

⚠ WARNING: Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Do not use aid 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.**

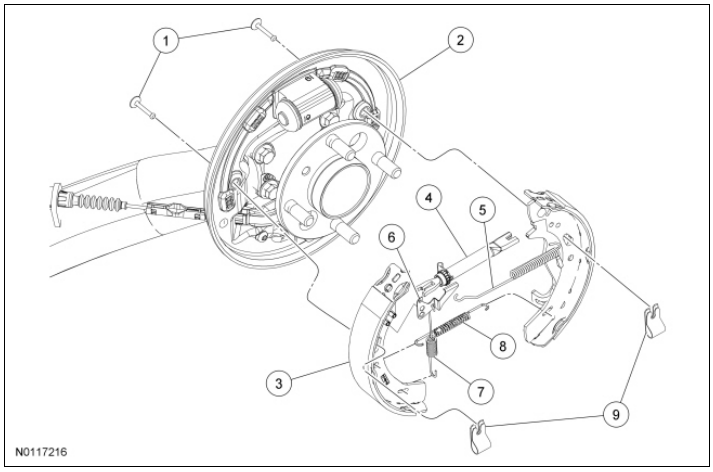


Item	Part Number	Description
1	-	Brake tube fitting (part of 2L111 RH / 2268 LH)
2	W700936	Brake hose clip
3	W700936	Brake hose clip
4	2282	Brake flexible hose td>
5	-	Brake tube fitting (2 required) (part of 2268)
6	2248	Wheel cylinder bolt
7	2261	Wheel cylinder
8	1126	Brake drum
9	W505741	Brake drum retainers (2 required)

⚠ WARNING: Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Always install new brake shoes or pads at both ends of an axle to reduce the possibility of brakes pulling vehicle to one side. Failure to follow this instruction may result in uneven braking and serious personal injury.

NOTE: Make sure that all matg surfaces are free of foreign material and apply the specified silicone grease to the brake shoe contact points on the brake backing plate.



Item	Part Number	Description
1	-	Brake shoe hold-down pin (2 required) (part of 2A225)
2	2211	Backing plate
3	-	Brake shoe (part of 2200)
4	2K286	Self-adjuster assembly
5	-	Upper return spring (part of 2A225)
6	-	Self-adjuster lever (part of 2K286)
7	-	Self-adjuster lever spring (part of 2K286)
8	-	Lower return spring (part of 2A225)
9	-	Brake shoe hold-down clip (2 required) (part of 2A225)

Removal and Installation

NOTE: For brake system and component bleeding procedures, refer to Section 206-00 .

NOTE: If removing the the drum brake backing plateb and bearing must be removed. For additional information, refer to Section 204-02

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications and Special Tools. Items in the exploded views may not be listed in order of removal.

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	630 ml (1.33 pt)
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-	-

General Specifications

Item	Specification
Brake Disc	
Brake disc minimum thickness	21 mm (0.827 in)
Brake Pads	
Brake pad maximum taper wear (in any direction)	2.0 mm (0.118 in)
Brake pad minimum thickness	2.0 mm (0.118 in)

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake caliper anchor plate bolts	68	50	-
Brake caliper flow bolt	35	26	-
Brake guide pin caliper bolts	28	21	-
Brake hose bracket bolt	27	20	-
Brake tube fitting		-	159

Front Disc Brake

The front brake disc system consists of the following components:

- Brake caliper anchor plate
- Brake caliper
- Brake disc
- 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.

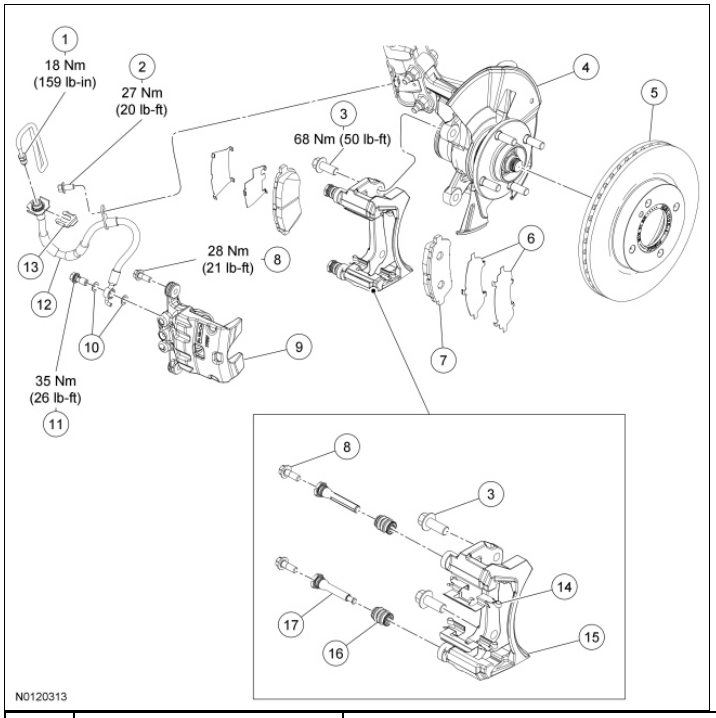
Front Disc Brake

Refer to Section 206-00 .

Disc Brake System - Exploded View

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
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-



Item	Part Number	Description
1	-	Brake tube fitting (part of 2263)
2	W500222	Brake hose bracket bolt
3	2001	Brake caliper anchor plate bolt
4	2K204	Brake disc shield
5	1125	Brake disc
6	-	Stainless steel shims (4 required) (part of 2001 kit)
7	-	Brake pad (2 required) (part of 2001 kit)
8	-	Brake caliper guide pin bolt (2 required) (part of 2L527 kit)
9	2B120RH/ 2B121LH	Brake caliper
10	W711784	Washers (2 required)

11	d>Brake caliper flow bolt	
12	2078	Brake flexible hose
13	W700936	Brake hose clip
14	-	Brake pad slides (2 required) (part of 2001 kit)
15	2B292	Brake caliper anchor plate
16	-	Dust boot (2 required) (part of 2L257 kit)
17	-	Brake caliper guide pin (2 required) (part of 2L257 kit)

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.

WARNING: Always install new brake shoes or pads at both ends of an axle to reduce the possibility of brakes pulling vehicle to one side. Failure to follow this instruction may result in uneven braking and 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.**

NOTICE: **Do not allow the brake caliper to hang from the brake flexible hose or damage to the hose can occur.**

NOTICE: **Do not pry in the caliper sight hole to retract the pistons, as this can damage the pistons and boots.**

NOTICE: **Protect the caliper pistons and boots when pushing the caliper pistons into the caliper piston bores or damage to components may occur.**

NOTE: If installing new brake pads, install all of the new hardware and lubricant supplied with the brake pad kit.

NOTE: For brake system and component bleeding procedures, refer to Section 206-00 .

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications and Special Tools. Items in the exploded views may not be listed in order of removal.

Material

Item	Specification	Fill Capacity
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	-

Torque Specifications

Description	Nm	lb-ft	lb-in
Front parking brake cable nuts	10	-	89
Parking brake control nuts	24	18	-
Parking brake control bolt	24	18	-
Floor console bracket nuts	24	18	-
Crossmember nuts	24	18	-

Parking Brake

The parking brake system consists of the following components:

- Parking brake control
- Parking brake cable equalizer
- Parking brake warning indicator switch
- Rear parking brake cables and conduits
- Rear brake shoes
- Rear brake shoe actuators

The parking brake system is cable operated and controlled by an independent hand-operated parking brake control. The parking brake control actuates the rear brake shoes directly through a cable system.

A red brake warning indicator, located in the instrument cluster, will illuminate to signal the driver that the parking brake is applied. For information and diagnosis of the brake warning indicator, refer to Section 413-01 .

Parking Brake

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

Principles of Operation

The parking brake system is cable-actuated and controlled by an independent hand-operated parking brake control that is not self adjusting, The parking brake system is actuated when the parking brake control is pulled up. The parking brake cables are connected to the parking brake control by the parking brake equalizer. When the parking brake control is pulled, the equalizer pulls on both rear parking brake cables, which are attached to the parking brake actuators and apply the brake shoes. When the parking brake release button is pressed and the brake control is released, the tension on the parking brake cables return the system to the released position.

Inspection and Verification

1. Verify the customer concern.
2. With the vehicle in NEUTRAL, position it on a hoist. Refer to Section 100-02 .
3. Visually inspect for obvious signs of mechanical or electrical damage. Refer to the following chart:

Visual Inspection Chart

Mechanical
• Brake shoe actuators • Brake shoe hardware • Brake shoe backing plate • Parking brake cable equalizer • Parking brake ctrol • Rear parking brake cables and conduits

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

5. If the concern is not visually evident, verify the symptom. GO to Symptom Chart .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: The Parking Brake Will Not Apply

Normal Operation

When the parking brake control is pulled, the parking brake equalizer pulls on both rear parking brake cables, which are attached to the parking brake actuators and apply the brake shoes.

This pinpoint test is intended to diagnose the following:

- Parking brake cables and conduits
- Parking brake control
- Parking brake equalizer
- Rear brake hardware
- Rear brake shoes

PINPOINT TEST A: THE PARKING BRAKE WILL NOT APPLY

Test Step	Result / Action to Take
A1 CHECK THE PARKING BRAKE CONTROL FOR CORRECT OPERATION	
• Pull the parking brake control handle. • **Does the parking brake control move?**	**Yes** GO to A2 . **No** GO to A4 .
A2 CHECK FOR BROKEN CABLES AND HARDWARE	
• **NOTE:** Have an assistant pull and release the parking brake handle to help isolate disconnected cables or cables that do not move. • Inspect the following items for damage and correct connections: ♦ Parking brake control ♦ Parking brake equalizer	**Yes** CONNECT the component(s) or INSTALL new parking brake component(s) as necessary. TEST the system for normal operation. **No** GO to A3 .

♦ LH rear cable ♦ RH rear cable • **Is any damage found or are any components disconnected?**	
A3 CHECK THE PARKING BRAKE SHOES AND HARDWARE	
• Remove the rear brake drum. Refer to Section 206-02 . Inspect the brake shoes and hardware for damage and/or missing components. • **Is any damage found or are any components missing?**	**Yes** INSTALL new components as necessary. REFER to Section 206-02 . TEST the system for normal operation. **No** VERIFY that the rear brake shoes and linings are within thickness specifications. REFER to Specifications in Section 206-00 . INSTALL new brake shoes as necessary. REFER to Section 206-02 . TEST the system for normal operation.
A4 ISOLATE THE PARKING BRAKE CONTROL AND FRONT PARKING BRAKE CABLE	
• Disconnect the rear cables from the cable equalizer. • Pull the parking brake control handle. • **Does the parking brake control move?**	**Yes** GO to A5 . **No** INSTALL a new parking brake control. REFER to Parking Brake - Exploded View in this section. TEST the system for normal operation.
A5 ISOLATE THE REAR PARKING BRAKE CABLES	
• Remove the rear brake drum. Refer to Section 206-02 . • Disconnect the parking brake cables from the brake shoe actuators. • While holding the rear cable conduit, attempt to slide the rear cable inside the conduit. • **Does the rear cable slide freely inside the conduit?**	**Yes** The system is operating normally at this time. The concern may have been cause by a seized or binding component. CLEAN and LUBRICATE the brake backing plate using the specified materials. CONNECT all cables and INSTALL all components. TEST the system for normal operation. **No** INSTALL new rear brake cable(s). REFER to Parking Brake - Exploded View in this section. TEST the system for normal operation.

Pinpoint Test B: The Parking Brake Will Not Release and/or Rear Brakes Drag

Normal Operation

When the parking brake release button is pressed and the brake control is released, the tension on the parking brake cables return the system to the released position.

This pinpoint test is intended to diagnose the following:
- Parking brake cables and conduits
- Parking brake control
- Parking brake equalizer

- Rear brake hardware
- Rear brake shoes

PINPOINT TEST B: THE PARKING BRAKE WILL NOT RELEASE AND/OR REAR BRAKES DRAG

Test Step	Rult / Action to Take
B1 ISOLATE THE PARKING BRAKE CONTROL	
• Disconnect the rear cables from the cable equalizer. • **Does the parking brake release?**	**Yes** INSTALL a new parking brake control. REFER to Parking Brake - Exploded View in this section. TEST the system for normal operation. **No** GO to B2 .
B2 CHECK THE REAR BRAKE SHOES AND HARDWARE	
• Remove the rear brake drum. Refer to Section 206-02 . • Inspect the brake shoes, hardware and backing plate. • **Are the shoes, hardware and backing plate in good condition?**	**Yes** GO to B3 . **No** INSTALL new components as necessary. REFER to Section 206-02 . TEST the system for normal operation.
B3 ISOLATE THE REAR PARKING BRAKE CABLES	
• Disconnect the parking brake cables from the brake shoe actuators. • While holding the rear cable conduit, attempt to slide the rear cable inside the conduit. • **Does the rear cable slide freely inside the conduit?**	**Yes** The system is operating normally at this time. The concern may have been cause by a seized or binding component. CLEAN and LUBRICATE the brake backing plate using the specified materials. CONNECT all cables and INSTALL all components. TEST the system for normal operation. **No** INSTALL new rear brake cable(s). REFER to Parking Brake - Exploded View in this section. TEST the system for normal operation.

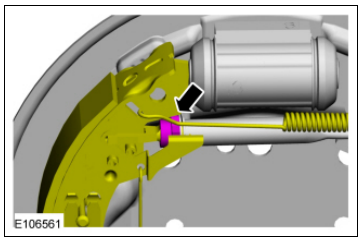
Parking Brake Cable Adjustment

1. Remove the floor console finish panel to access the parking brake cable adjuster nut. For additional information, refer to the floor console procedure exploded view in Section 501-12 .

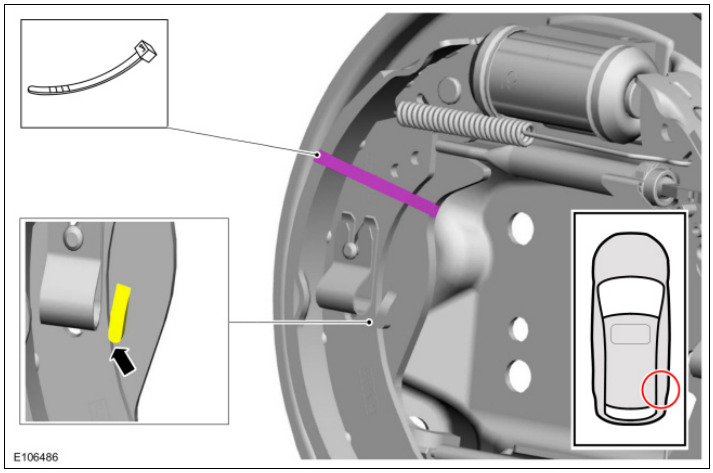
2. Make sure the parking brake control handle is in the fully released position.

3. Remove the brake drums For additional information, refer to . Section 206-02
   - Inspect drum brake assembly. Install new components as necessary.

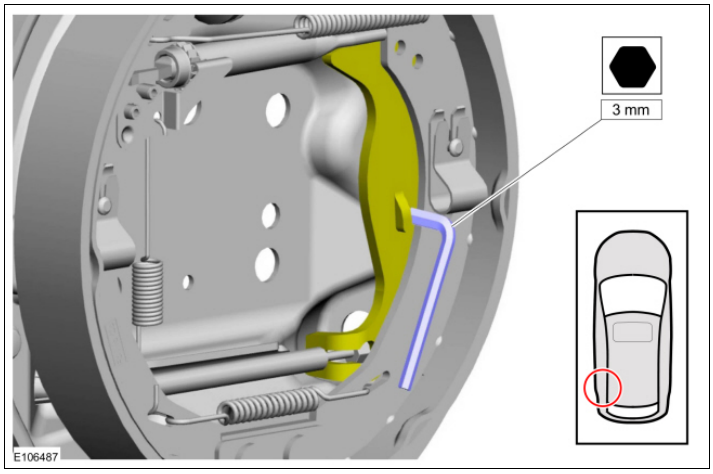
4. Loosen the self-adjuster one full turn on both axle ends.



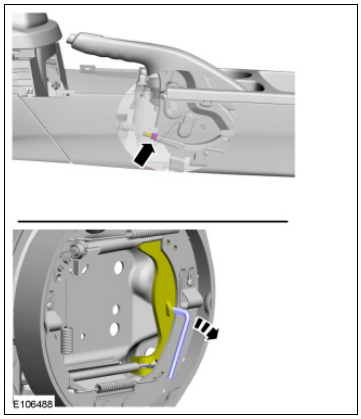
5. Using a cable tie, secure the parking brake actuation lever to the brake shoe as shown on the passenger side rear.



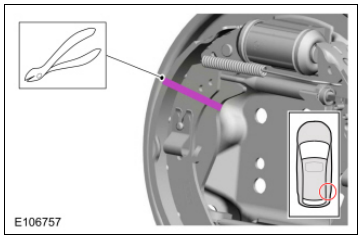
6. Install a 4mm allen wrench against the parking brake actuation lever on driver side rear only.



7. Adjust the parking brake cable adjuster nut until the allen wrench falls out.



8. Remove the cable tie.

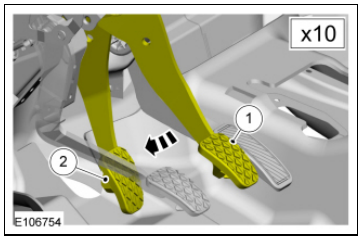


9. Adjust the brake shoes. For additional information, refer to Section 206-02

10. If new rear cables have been installed, carry out the following sub steps. If new rear cables have not been installed, proceed to step 11.
    1. Cycle parking brake control lever to the 10th notch 10 times to stretch the new cables.
    2. Remove the rear drums and verify that the gap exists between the parking brake stop lever and the brake shoe web.
    3. If the gap is zero, repeat step 2 and steps 4 thru 9.

11. After assembling the wheel, verify the wheel turns freely to ensure there is no brake drag present.

12. Fully depress the brake pedal 10 times. Apply the parking brake to verify correct operation.

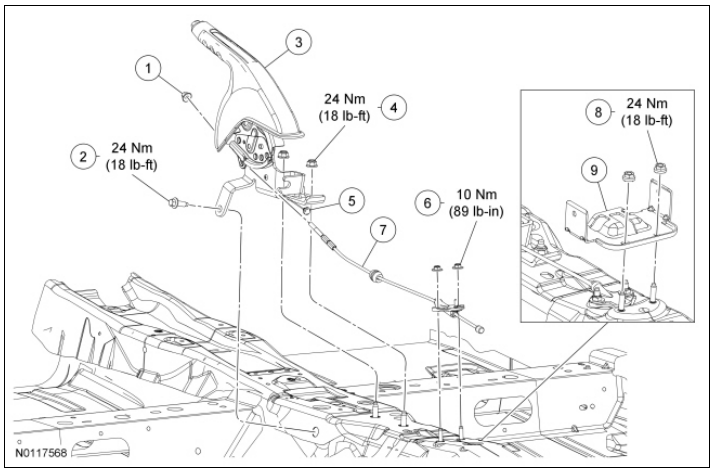


13. Install the floor console finish panel. For additional information, refer to the floor console exploded view in Section 501-12

Parking Brake - Exploded View

Parking Brake Control

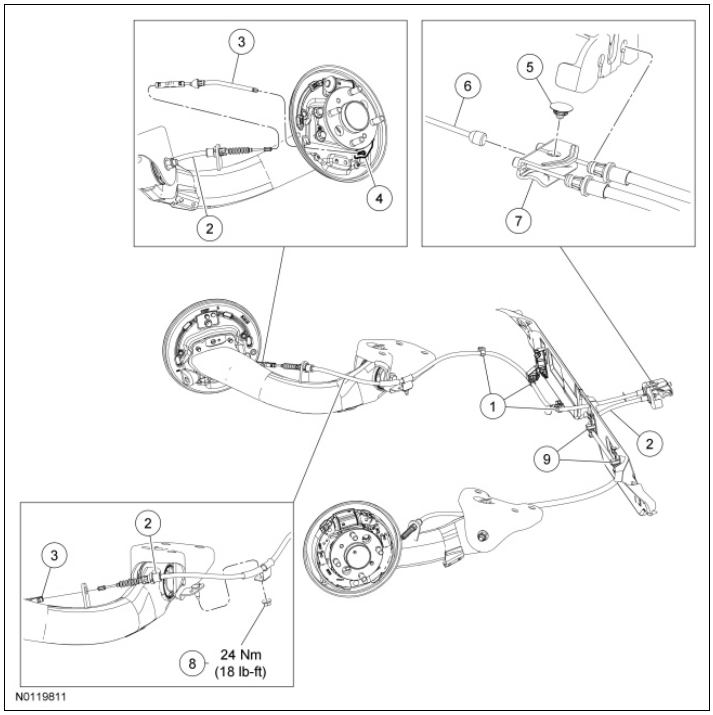
NOTE: The parking brake switch is not serviced separately . If a new parking brake switch is needed, a new parking brake control must be installed.



Item	Part Number	Description
1	-	Parking brake cable adjuster nut (part of 2853)
2	W500223	Parking brake control bolt
3	2780	Parking brake control
4	W520102	Parking brake control nut (2 required)
5	7H406	Pin type retainer
6	W702751	Front parking brake cable nut (2 required)
7	2853	Front parking brake cable
8	W702751	Floor console bracket nut
9	58045B32	Floor console bracket

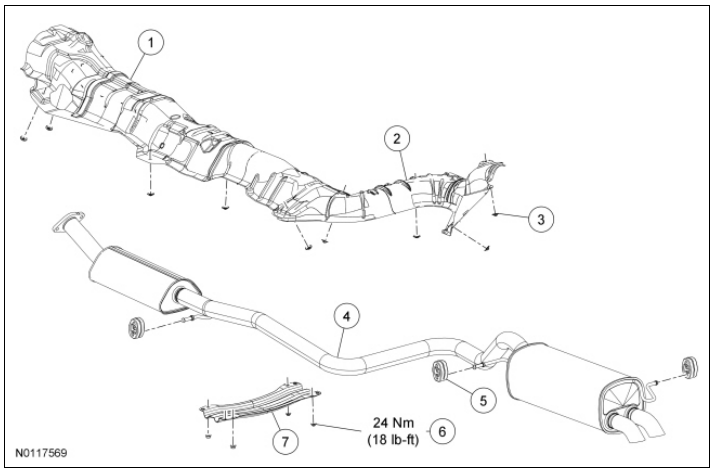
Parking Brake Cables

NOTICE: **Use care when releasing the RH rear parking brake cable from the plastic brackets or damage to the brackets may occur.**



Item	Part Number	Description
1	-	Parking brake cable retainers (3 required) (part of 2A603)
2	2A603	Rear parking brake cable
3	2A635	Parking brake actuation lever cable (2 required)
4	-	Parking brake actuation lever (2 required) (part of 2200)
5	W708952	Plug
6	2853	Front parking brake cable
7	-	Equalizer (part of 2A603)
8	W520413	Parking brake cable bracket nut
9	9A335	Parking brake cable bracket (2 required)

Heat Shields, Exhaust System and Crossmember



Item	Part Number	Description
1	5411434	Exhaust heat shield
2	54114B06	Exhaust heat shield
3	W709729	Exhaust heat shield nut (9 required)
4	5230	Muffler assembtd>
5	5A262	Exhaust insulator (3 required)
6	W520102	Crossmember nut (8 required)
7	58108K38	Crossmember

Removal and Installation

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications and Special tools. Items in the exploded views may not be listed in order of removal.

2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

3. Remove the driver seat and the floor console to access the parking brake control.
   - For the driver seat, refer to Section 501-10 .
   - For the floor console, refer to Section 501-12 .

4. Loosen the front parking brake cable adjuster nut 5 turns to release the tension for parking brake service. Remove the floor console finish panel to access the nut. For additional information, refer to the floor console procedure exploded view in Section 501-12 .

5. Remove the crossmember and lower the exhaust and the exhaust heat shields in order to access the parking brake equalizer.

6. Adjust the parking brake cables after parking brake component service. For additional information, refer to Parking Brake Cable Adjustment in this section.

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	648 ml (1.37 pt) (manual transmission) 586 ml (1.24 pt) (automatic transmission)

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake booster nuts	25	18	-
Brake fluid reservoir nuts	7	-	62
Brake master cylinder nuts	20	-	177
Brake pedal bracket nuts	25	18	-
Knee air bag bracket nuts	8	-	71
Primary brake tube fitting	17	-	150
Secondary brake tube fitting	17	-	150
Steering shaft-to-steering gear bolt	32	24	-

Hydraulic Brake Actuation

The hydraulic brake actuation system consists of the following components:

- Brake master cylinder and fluid reservoir
- Brake pedal and bracket
- Brake tubes and hoses

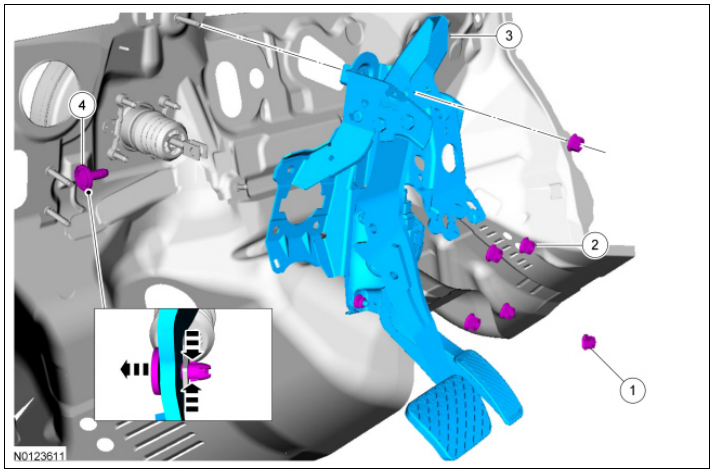
The brake pedal is connected to the power brake booster, which is connected to the brake master cylinder. When the brake pedal is pressed, brake fluid is pushed through the double-walled steel tube and flexible hoses to the front brake calipers and rear wheel cylinders. The brake fluid enters the calipers and cylinders, forcing the pistons and brake pads/shoes outward against the friction surface, slowing or stopping rotation. When the brake pedal is released, brake fluid pressure is relieved, returning the caliper pistons, wheel cylinders, brake pads and brake shoes to the unapplied position.

Hydraulic Brake Actuation

Refer to Section 206-00 .

Brake Pedal and Bracket

NOTE: Automatic transmission shown, manual transmission similar.



Item	Part Number	Description
1	W706840	Brake pedal bracket nut (2 required) - 25 Nm (18 lb-ft)
2	W706840	Brake booster nut (4 required) - 25 Nm (18 lb-ft)
3	2455	Brake pedal and bracket assembly
4	2L523	Brake booster push rod clevis locking pin

Removal and Installation

1. Remove the knee air bag module. For additional information, refer to Section 501-20B .

2. ***NOTICE:*** **Do not service the brake pedal without first removing the stoplamp switch. Remove this switch with the brake pedal in the at-rest position. Attempting to remove this switch when the plunger is extended (during pedal apply) results in damage to the switch.**

   Remove the stoplamp switch. For additional information, refer to Section 417-01 .

3. ***NOTICE:*** **Do not service the brake pedal without first removing the cruise control deactivator switch. Remove this switch with the brake pedal in the at-rest position. Attempting to remove this switch when the plunger is extended (during pedal apply) results in damage to the switch.**

   Remove the cruise control deactivator switch. For additional information, refer to Section 419-03 .

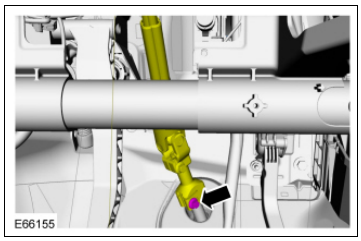
4. Using a suitable holding device, hold the steering wheel in the straight-ahead position.

5. ⚠ **WARNING: Do not reuse steering column shaft bolts. This may result in fastener failure and steering column shaft detachment or loss of steering control. Failure to follow this instruction may result in serious injury to vehicle occupant(s).**

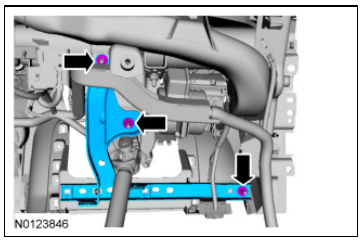
   NOTICE: **Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence the steering column has rotated, remove and recenter the clockspring. For additional information, refer to Section 501-20B .**

Remove and discard the steering shaft-to-steering gear bolt, then disconnect the steering shaft from the steering gear.

- To install, tighten the new bolt to 32 Nm (24 lb-ft).



6. Remove the 3 nuts and position the knee air bag bracket aside.
   - To install, tighten to 8 Nm (71 lb-in).



7. **NOTE:** The booster push rod clevis locking pin is a one-time use only part. Any time the booster push rod clevis locking pin is removed, install a new booster push rod clevis locking pin.

   NOTE: Use an 11 mm, 12-point socket or wrench to compress the 2 locking tabs on the clevis pin.

   Remove and discard the brake booster push rod clevis locking pin, then position the booster push rod aside.

8. Disconnect the accelerator pedal electrical connector.

9. Detach the wire harness from the brake pedal bracket.

10. Remove the 4 brake booster nuts and the 2 brake pedal bracket nuts.
    - To install, tighten to 25 Nm (18 lb-ft).

11. **NOTE:** The accelerator pedal is removed with the brake pedal bracket, but is serviced separately from the brake pedal bracket.

    Remove the brake pedal and bracket assembly.

12. ***NOTICE:*** **Do not press, pull or otherwise move the brake pedal while installing the stoplamp switch and cruise control deactivation switch. Install these switches 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 results in incorrect adjustment and damages the switches.**

    To install, reverse the removal procedure.

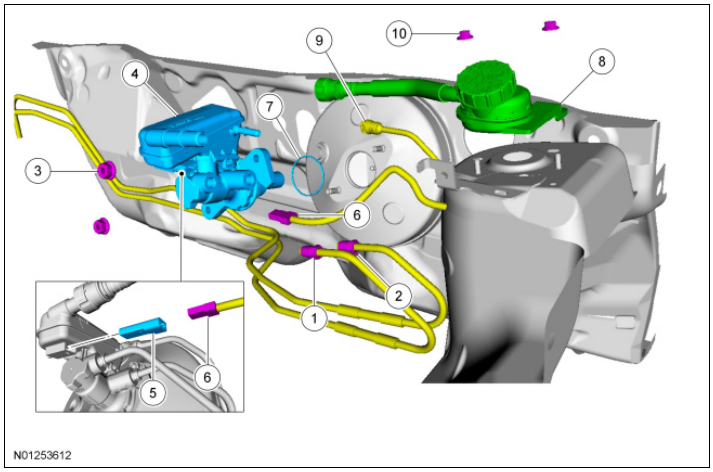
13. Verify correct stoplamp switch and cruise control deactivator switch installation. For additional information, refer to Brake Pedal Switch Adjustment in Section 206-09 .

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

NOTE: Manual transmission shown, automatic transmission similar.



Item	Part Number	Description
1	-	Primary brake tube fitting (part of 2M020) - 17 Nm (150 lb-in)
2	-	Secondary brake tube fitting (part of 2M019) - 17 Nm (150 lb-in)
3	-	Brake master cylinder nut (2 required) (part of 2140) (also part of kit 2C144) - 20 Nm (177 lb-in)
4	2140	Brake master cylinder
5	2C251	Brake fluid level switch (also part of 2140)
6	-	Brake fluid level switch electrical connector (part of 14K012)
7	-	Brake booster-to-master cylinder O-ring (part of 2140) (also part of kit 2C144)
8	2K478	Brake fluid reservoir
9	7T504	Brake master cylinder-to-clutch master cylinder tube (manual transmission only)
10	W711330	Brake fluid reservoir nut (2 required) - 7 Nm (62 lb-in)

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: **Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.**

1. Disconnect the vacuum tube from the brake booster.

2. Detach the vacuum tube from the cowl and position aside.

3. Remove the battery tray. For additional information, refer to Section 414-01 .

4. Remove the 2 brake fluid reservoir nuts.
   - To install, tighten to 7 Nm (62 lb-in).

5. Disconnect the brake fluid reservoir tube from the master cylinder.

6. If equipped with a manual transmission, disconnect the brake master cylinder-to-clutch master cylinder tube from the master cylinder.

7. Disconnect the brake fluid level switch electrical connector.

8. Disconnect the primary and secondary brake tubes from the master cylinder.
   - To install, tighten to 17 Nm (150 lb-in).

9. Remove and discard the 2 brake master cylinder nuts.
   - To install, tighten the new brake master cylinder nuts to 20 Nm (177 lb-in).

10. Remove the brake master cylinder and discard the brake booster-to-master cylinder O-ring.

11. **NOTE:** Before installing the master cylinder make sure a new brake booster-to-master cylinder O-ring is in place and the mating faces are clean.

    To install, reverse the removal procedure.

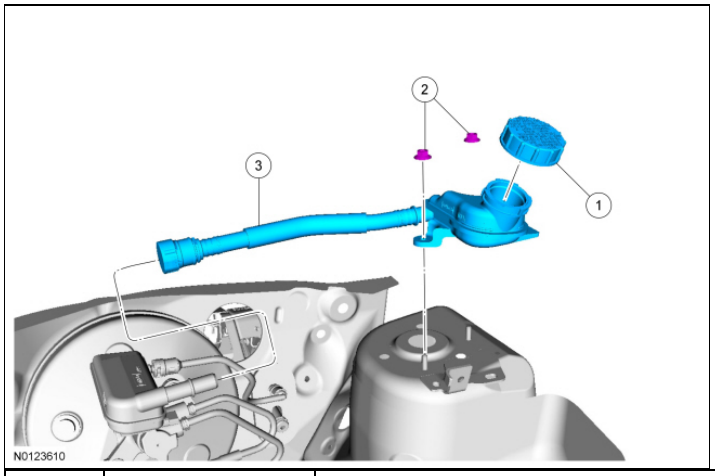
12. Bleed the master cylinder. For additional information, refer to Component Bleeding in Section 206-00 .

13. If equipped with a manual transmission, bleed the hydraulic clutch system. For additional information, refer to Section 308-00 .

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	2162	Brake fluid reservoir cap (also part of 2K478)
2	W711330	Brake fluid reservoir nuts - 7 Nm (62 lb-in)
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: **Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.**

1. Refer to exploded view and any Warnings, Notices, Materials and Specifications. Items in the exploded views may not be listed in order of removal.

Torque Specifications

Description	Nm	lb-ft
Brake booster nuts	25	18

Brake Booster

The brake booster consists of:

- brake booster assembly
- brake booster vacuum hose
- brake booster vacuum check valve

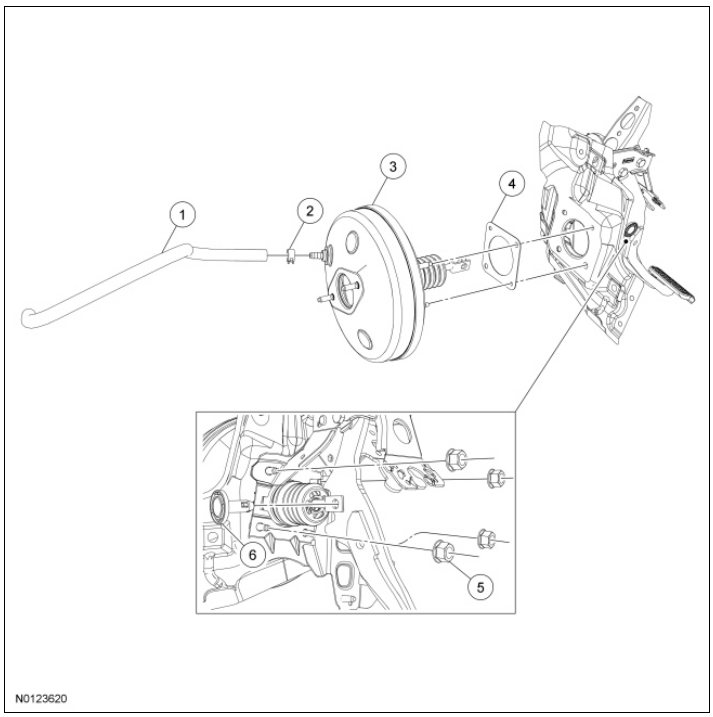
The brake booster is a single-diaphragm type which utilizes engine vacuum to reduce brake pedal effort and travel. The brake booster is divided into separate vacuum and atmospheric chambers by the diaphragms. Engine vacuum is supplied to the brake booster through the brake booster hose and a one-way check valve. The check valve retains the engine vacuum in the brake booster and allows for several power-assisted brake applications with the engine off.

When the brake pedal is applied, vacuum replaces the atmospheric pressure in the brake booster, reducing the effort required at the brake pedal to slow the vehicle. When the brake pedal is released, vacuum returns to the brake booster through the brake booster vacuum hose and check valve.

Power Brake System

Refer to Section 206-00 .

Brake Booster



Item	Part Number	Description
1	9C490	Vacuum hose
2	-	Spring clamp (part of 9C490)
3	2B195	Brake booster
4	2M078	Brake booster seal
5	W706840	Brake booster nut (4 required) - 25 Nm (18 lb-ft)
6	2L523	Brake booster push rod clevis locking pin

Removal and Installation

1. Remove the brake master cylinder. For additional information, refer to Brake Master Cylinder in Section 206-06 .

2. ***NOTICE:*** **Do not service the brake pedal without first removing the stoplamp switch. Remove this switch with the brake pedal in the at-rest position. Attempting to remove this switch when the plunger is extended (during pedal apply) results in damage to the switch.**

   Remove the stoplamp switch. For additional information, refer to Section 417-01 .

3. ***NOTICE:*** **Do not service the brake pedal without first removing the cruise control deactivator switch. Remove this switch with the brake pedal in the at-rest position. Attempting to remove this switch when the plunger is extended (during pedal apply) results in damage to the switch.**

   Remove the cruise controdeactivator switch. For additional information, refer to Section 419-03 .

4. **NOTE:** The brake booster push rod clevis locking pin is a one-time use only part. Any time the brake booster push rod clevis locking pin is removed, install a new brake booster push rod clevis locking

pin.

NOTE: Use an 11 mm, 12-point socket or wrench to compress the 2 locking tabs on the brake booster push rod clevis locking pin.

Remove and discard the brake booster push rod clevis locking pin, then position the brake booster push rod aside.

5. Remove the 4 brake booster nuts.
    - To install, tighten to 25 Nm (18 lb-ft).

6. Remove the brake booster.

7. ***NOTICE:*** **Do not press, pull or otherwise move the brake pedal while installing the stoplamp switch and cruise control deactivator switch. Install these switches 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 results in incorrect adjustment and damages the switches.**

   To install, reverse the removal procedure.

8. Verify correct stoplamp switch and cruise control deactivator switch installation. For additional information, refer to Brake Pedal Switch Adjustment in Section 206-09 .

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	630 ml (1.33 pt)

Torque Specifications

Description	Nm	lb-ft	lb-in
ABS module-to-Hydraulic Control Unit (HCU) screws	2	-	18
Brake tube fittings	17	-	150
Evaporator outlet tube bracket nut	8	-	71
HCU bracket bolts	24	18	-
HCU bracket-to-support plate bolts	9	-	80
HCU support plate bolts	9	-	80
Wheel speed sensor bolts	9	-	80

Anti-Lock Control

Anti-Lock Braking

The ABS consists of the following components:

- ABS module - attached to the Hydraulic Control Unit (HCU) and cannot be serviced separately from the HCU .
- HCU - which contains several valves (inlet, outlet, isolation and dump) and the hydraulic pump motor. The HCU is mounted on the RH side of the engine compartment and is serviced with the ABS module.
- Front wheel speed sensors - one sensor is located in each front wheel knuckle. The sensors are serviced separately from the knuckle.
- Rear wheel speed sensors - one sensor is located at each rear wheel end, is mounted to the brake backing plate and can be serviced separately.
- Wheel bearing magnetic strip - the wheel bearing magnetic strip is part of the wheel bearing and is serviced with the bearing.

ABS aids in the prevention of wheel lock-up during braking events allowing 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) and wheel cylinder(s).

When the ABS activates, the driver may notice the following operational symptoms:

- A rumble or grinding sound may be heard (HCU pump motor)
- If the driver's foot is on the brake pedal, a vay be felt in the brake pedal (HCU pump motor and valves)

Electronic Brake Distribution (EBD)

The ABS module and HCU incorporate a strategy called Electronic Brake Distribution (EBD). The EBD strategy uses the HCU as an electronic proportioning valve to create a balanced braking condition between the front and rear wheels and minimize the chance of rear wheel lockup during hard braking. A slight bump sensation may be felt in the brake pedal when EBD is active.

ABS with Advance Trac®

The ABS with Advance Trac® system consists of the same components as the conventional ABS above with the following additional components:

- Stability control sensors - located inside the Restraints Control Module (RCM) under the front floor console, and contains several sensors (yaw rate, lateral and longitudinal accelerometers).
- Steering wheel rotation sensor - is part of the Electronic Power Assist Steering (EPAS) column assembly and is not available separately for service.

The Advance Trac® system is comprised of traction control and Electronic Stability Control (ESC). ABS and the traction control portion of the Advance Trac® system will operate with the transmission in reverseut ESC will be disabled.

Traction Control System

The traction control system aids in the prevention of excessive wheel spin which allows the vehicle to maintain traction during acceleration. This is accomplished in the same manner as anti-lock braking (brake traction control) but also includes using the PCM for modulating engine torque (engine traction control). The traction control system can be disabled by the driver through the message center. The system will remain disabled until the driver enables it through the message center or until the ignition is cycled to OFF and back to RUN.

Electronic Stability Control (ESC) System

The ESC system constantly monitors vehicle direction of travel relative to the intended course and aids in keeping the vehicle traveling along that course. The ESC also aids in keeping the vehicle stable during sudden or abrupt maneuvers. This is accomplished in the same manner as anti-lock braking and traction control. ESC cannot be disabled by the driver.

When either of these 2 systems activate, the driver may notice the same operational symptoms as ABS along with the following additional symptoms:

- A small deceleration or a reduction in the acceleration of the vehicle (PCM modulating engine torque)
- The stability/traction control indicator (also known as the sliding-car icon) flashes (indicating a traction or stability event is taking place)

Stability/Traction Indicator

The stability/traction indicator (also known as the sliding-car icon) is located in the Instrument Panel Cluster (IPC). It alerts the driver to a stability/traction event taking place (flashes twice per second) and to alert the driver of potential concerns in the AdvanceTrac® system (illuminates solidly).

Stability/Traction OFF Indicator

The stability/traction OFF indicator (also known as the sliding-car OFF icon) is located in the IPC . Illumination of the indicator confirms to the driver that the brake traction control portion of the Advance Trac® system has been disabled when the TRACTION CNTRL setting in the message center is set to OFF.

Hill Start Assist (Automatic transmission only)

Hill start assist helps the driver when accelerating from a stop on an incline or side of a hill. Hill start assist supports the driver during drive-off situations on upward gradients. When the driver releases the vehicle brake, hill start assist prevents the vehicle from rolling back in the opposite direction.

Anti-Lock Control

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST3030-A	Rotunda Active Wheel Speed Sensor Tester 105-R0110 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Principles of Operations

Anti-Lock Braking

The ABS module continuously monitors and compares the rotational speed of each wheel. This is accomplished through the use of 4 active wheel speed sensors, 1 for 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 bearing magnetic strip passes through the magnetic field generated by the active wheel speed sensor. The active wheel speed sensor sends a square wave signal to the ABS module to indicate individual wheel speed.

The ABS module uses a Hydraulic Control Unit (HCU) to isolate and modulate hydraulic pressure to the caliper(s) and wheel cylinder(s). The HCU contains several solenoid-controlled valves, a pump motor, an accumulator and several sensors. The fluid flows through 4 normally open inlet valves inside the HCU , and through the outlet ports of the HCU to the brake calipers and wheel cylinders. If the ABS module senses that a wheel is nearing a lockup condition based on wheel speed sensor data and deceleration algorithms, the module closes the normally open inlet valve for that wheel. This isolates the corresponding caliper or wheel cylinder. The ABS module reads the wheel speed sensor signal from the affected wheel again. If the wheel is still decelerating (locking up), the module opens the normally closed outlet valve allowing a controlled amount of hydraulic pressure in the brake caliper to be relieved into the HCU accumulator. The ABS pump motor runs during an ABS braking event so sufficient brake fluid pressure is consistently available to the HCU valves. This procedure of closing and opening valves is repeated several times per second until the speed of the affected wheel matches the speeds of the other wheels. Once this has been accomplished, the ABS module returns the solenoid valves to their normal position.

The ABS module is self-monitoring. When the ignition is turned to the RUN position, the ABS module carries out a preliminary electrical check of the wheel speed sensor circuitry by sending voltage through the sensor

and checking for the voltage to return. At speeds above 20 km/h (12 mph), without the brake pedal being pressed, the pump motor is commanded on for approximately one-half 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. In the event the ABS module detects a concern, the module sets a DTC and sends a message to the Instrument Panel Cluster (IPC) over the High Speed Controller Area Network (HS-CAN) to illuminate the yellow ABS warning indicator and/or the stability/traction control indicator (sliding-car icon). If the concern is severe enough, ABS may be disabled. Normal power-assisted braking, however, remains.

Electronic Brake Distribution (EBD)

The ABS module incorporates a strategy called Electronic Brake Distribution (EBD). The EBD strategy uses the HCU as an electronic proportioning valve. On initial application of the brake pedal, full pressure is applied to the rear brakes. The ABS module uses wheel speed input to calculate an estimated rate of deceleration. Once vehicle deceleration exceeds a certain threshold, the ABS module closes the appropriate solenoid 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.

If there is a DTC in the ABS module specifically for the HCU or there are 2 or more wheel speed sensor DTCs set, EBD is disabled. When EBD is disabled, the ABS warning indicator, the red brake warning indicator and the stability/traction control indicator (sliding-car icon) illuminate.

AdvanceTrac® Stability Enhancement System

The AdvanceTrac® system provides the following stability enhancement features for certain driving situations:

- Traction Control System - helps to avoid excessive drive-wheel spin and loss of traction.
- Electronic Stability Control (ESC) System - helps to avoid skids and lateral slides.

Traction Control System

The traction control system uses the ABS and the PCM to limit wheel spin. When the ABS module detects a wheel spinning excessively, brake pressure to the appropriate brake caliper is modulated. This is accomplished by opening and closing the appropriate solenoid valves inside the HCU while the hydraulic pump motor is activated. At the same time, the ABS module sends a message over the HS-CAN that a traction control event is taking place. When the IPC receives this message, it flashes the stability/traction control indicator (sliding-car icon). If the event is severe enough, the ABS module sends a message to the PCM over the HS-CAN to assist with traction control. When the PCM receives this message, it adjusts engine timing and decreases fuel injector pulses. Once the affected wheel returns to normal speed, the ABS module returns the solenoid valves in the HCU to their normal position, deactivates the hydraulic pump motor and sends another message over the HS-CAN indicating the traction event has ended. The PCM returns engine timing and fuel injectors to normal operation and the IPC extinguishes the sliding-car icon.

Once vehicle speed reaches or exceeds 100 km/h (62 mph), traction control is accomplished only through PCM intervention.

Certain DTCs in the ABS module disable the traction control system. Depending on the DTCs present, the yellow ABS warning indicator and/or the sliding-car icon is illuminated.

The driver is able to enable and disable the traction control portion of the Advance Trac®. This is independent of the ABS and ESC functions, which cannot be disabled by the driver. To disable or enable the traction control system, the TRACTION CNTRL setting in the message center is changed from ON to OFF. When the driver disables the traction control system, the IPC communicates traction control system status to the ABS module over the HS-CAN bus. The ABS module will no longer intervene when a traction event is detected. The ABS module sends a message to the IPC over the to HS-CAN bus illuminate the stability/traction control OFF indicator (sliding-car OFF icon), which indicates to the driver that the traction control system is disabled. The system automatically restores to full functionality when the ignition is cycled to OFF and then back to RUN.

Electronic Stability Control (ESC) System

The ESC system is controlled by the ABS module and uses the same wheel speed sensors and wheel bearing magnetic strips used for anti-lock braking. The ESC system also uses input from the stability control sensors for the ESC system to help maintain vehicle stability. They include the yaw rate sensor, lateral accelerometer and longitudinal accelerometer and are located in the Restraints Control Module (RCM).

The ABS module uses the various sensors to continuously monitor vehicle direction of travel relative to the intended course. If the ABS module determines from all these inputs that the vehicle is unable to travel in the intended direction, it modulates brake pressure to the appropriate brake caliper(s) or wheel cylinder(s) by opening and closing the appropriate solenoid valves inside the HCU while the hydraulic pump motor is activated. At the same time, the ABS module sends a message over the HS-CAN that a stability event is taking place. When the IPC receives this message, it flashes the sliding-car icon. Under certain conditions during a stability event, the PCM may be requested to reduce engine torque as it does for traction control. Once the stability condition has been corrected, the ABS module sends another message over the HS-CAN indicating that the event has ended. The PCM returns engine timing and fuel injectors to normal operation and the IPC extinguishes the sliding-car icon.

Certain DTCs being present in the ABS module may disable the ESC system. Depending on the DTCs present, the yellow ABS warning indicator and/or the sliding-car icon is illuminated.

Hill Start Assist (Automatic transmission only)

Hill start assist helps the driver when accelerating from a stop on an incline or side of a hill. Hill start assist supports the driver during drive-off situations on upward gradients when the driver releases the vehicle brake by preventing the vehicle from rolling back in the opposite direction. The system engages automatically when the following conditions are met:

- Road inclination of approximately 4 degrees or more is detected.
- The driver applies the vehicle brake and the vehicle is at a complete stop.
- The vehicle transmission information must indicate that the driver intends to drive up the hill.
- The parking brake is not engaged.

When the driver releases the brake pedal in drive gear, hill start assist holds the car stationary for up to 3 seconds giving the driver time to accelerate the vehicle. As the vehicle accelerates hill start assist gradually reduces the brake pressure to ensure that the vehicle is neither rolling back nor driving off until there is sufficient driving torque to accelerate the vehicle forward. Hill start assist functions if the vehicle is facing downhill if the reverse gear is selected.

There is 1 message displayed by the multifunction display that informs the driver of the status of the hill start assist. HILL START ASSIST NOT AVAILABLE is displayed and the hill start assist telltale in the IPC is illuminated when it is not available.

Stability Control Sensors

The stability control sensors for the ESC system include the yaw rate sensor, lateral accelerometer and longitudinal accelerometer. The sensors are housed in the RCM which sends sensor information to the ABS module over a dedicated Controller Area Network (CAN). If any of the sensors are defective, install a new RCM .

- The yaw rate sensor measures the relative vehicle motion about the vertical axis through its center of gravity.
- The lateral accelerometer measures the acceleration that corresponds to the force involved when the vehicle moves sideways.
- The longitudinal accelerometer measures the acceleration corresponding to the force involved when the vehicle moves forward and rearward in the horizontal plane, along the centerline of the vehicle front and rear wheels.

Lateral acceleration has 2 forms. The first is the centrifugal acceleration that occurs when the vehicle travels around in a circle. The second is the acceleration due to gravity. On level ground there is no contribution from this acceleration. However, if the vehicle is parked sideways on a bank or incline, the sensor measures some lateral acceleration due to gravity, even though the vehicle is not moving.

Steering Sensor

The Power Steering Control Module (PSCM) uses the steering sensor to determine speed and rotation direction of the steering wheel. This information is transmitted to the ABS module along the HS-CAN . The sensor is attached to the Electronic Power Assist Steering (EPAS) column assembly and cannot be serviced separately.

ABS Module Configuration

ABS module configuration is a scan tool process which configures specific vehicle settings in a new ABS module. If installing a new ABS module, it must be configured. Refer to Programmable Module Installation (PMI) in Section 418-01 .

ABS Module Calibration

The calibration procedure is also required for the ABS module to learn the "zero-position" of the steering and stability control sensors.

To calibrate the ABS module, connect the scan tool and carry out the IVD Initialization sequence, following the scan tool directions. The vehicle must be on a level surface and not moving during calibration. If a DTC is retrieved after calibration, refer to the ABS Module DTC Chart in this section.

Inspection and Verification

1. Verify the customer concern.

2. Verify the stoplamps operate correctly by pressing and releasing the brake pedal. If the stoplamps do not operate correctly, refer to Section 417-01 . If the stoplamps operate correctly, proceed to the next step.

3. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Base brake system • Hydraulic Control Unit (HCU) • Incorrectly inflated tires • Mismatched wheels or tires on vehicle • Suspension components • Wheel bearing magnetic strip	• ABS module • Battery Junction Box (BJB) fuse(s): ♦ 1 (40A) ♦ 9 (20A) • Central Junction Box (CJB) fuse(s): ♦ 22 (7.5A) • Stoplamp switch • PCM • Wheel speed sensors • Wiring, terminals or connectors

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

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.
   - 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 continuous memory DTCs.

9. Clear the continuous DTCs and carry out the self-test diagnostics for the ABS module.

10. If the DTCs retrieved are related to the concern, go to the ABS Module DTC Chart or the IPC DTC Chart. For all other DTCs, refer to Section 419-10 .

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

DTC Charts

NOTE: This module utilizes a 5-character DTC followed by a 2-character failure type code. The failure type code provides information about specific fault conditions such as opens or shorts to ground. Continuous Memory Diagnostic Trouble Codes (CMDTCs) have an additional 2-character DTC status code suffix to assist in determining DTC history.

ABS Module DTC Chart

DTC	Description	Action
C0001:49	TCS Control Channel "A" Valve 1: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0001:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0002:49	TCS Control Channel "A" Valve 2: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0002:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0003:49	TCS Control Channel "B" Valve 1: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0003:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0004:49	TCS Control Channel "B" Valve 2: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0004:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0010:49	Left Front Inlet Control: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0010:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0011:49	Left Front Outlet Control: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0011:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0014:49	Right Front Inlet Control: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0014:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0015:49	Right Front Outlet Control: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0015:49 returns, INSTALL a new ABS module. REFER to

		Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0018:49	Left Rear Inlet Control: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0018:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0019:49	Left Rear Outlet Control: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C0019:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C001C:49	Right Rear Inlet Control: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C001C:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C001D:49	Right Rear Outlet Control: Internal Electronic Failure	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. REPEAT the self-test. If DTC C001D:49 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0020:11	ABS Pump Motor Control: Circuit Short To Ground	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. TEST drive the vehicle. REPEAT the self-test. DTC C0020:11 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0020:12	ABS Pump Motor Control: Circuit Short To Battery	This DTC indicates that part of the ABS module has failed internally. CLEAR the DTCs. TEST drive the vehicle. REPEAT the self-test. DTC C0020:12 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
C0020:13	ABS Pump Motor Control: Circuit Open	GO to Pinpoint Test A .
C0020:71	ABS Pump Motor Control: Actuator Stuck	GO to Pinpoint Test A .
C0030:07	Left Front Tone Wheel: Mechanical Failure	GO to Pinpoint Test B .
C0031:01	Left Front Wheel Speed Sensor: General Electrical Failure	GO to Pinpoint Test D .
C0031:19	Left Front Wheel Speed Sensor: Circuit Current Above Threshold	GO to Pinpoint Test D .
C0031:29	Left Front Wheel Speed Sensor: Signal Invalid	GO to Pinpoint Test B .
C0031:2F	Left Front Wheel Speed Sensor: Signal Erratic	GO to Pinpoint Test B .
C0031:64	Left Front Wheel Speed Sensor: Signal Plausibility Failure	GO to Pinpoint Test B .

C0033:07	Right Front Tone Wheel: Mechanical Failure	GO to Pinpoint Test B .
C0034:01	Right Front Wheel Speed Sensor: General Electrical Failure	GO to Pinpoint Test D .
C0034:19	Right Front Wheel Speed Sensor: Circuit Current Above Threshold	GO to Pinpoint Test D .
C0034:29	Right Front Wheel Speed Sensor: Signal Invalid	GO to Pinpoint Test B .
C0034:2F	Right Front Wheel Speed Sensor: Signal Erratic	GO to Pinpoint Test B .
C0034:64	Right Front Wheel Speed Sensor: Signal Plausibility Failure	GO to Pinpoint Test B .
C0036:07	Left Rear Tone Wheel: Mechanical Failure	GO to Pinpoint Test B .
C0037:01	Left Rear Wheel Speed Sensor: General Electrical Failure	GO to Pinpoint Test D .
C0037:19	Left Rear Wheel Speed Sensor: Circuit Current Above Threshold	GO to Pinpoint Test D .
C0037:29	Left Rear Wheel Speed Sensor: Signal Invalid	GO to Pinpoint Test B .
C0037:2F	Left Rear Wheel Speed Sensor: Signal Erratic	GO to Pinpoint Test B .
C0037:64	Left Rear Wheel Speed Sensor: Signal Plausibility Failure	GO to Pinpoint Test B .
C0039:07	Right Rear Tone Wheel: Mechanical Failure	GO to Pinpoint Test B .
C003A:01	Right Rear Wheel Speed Sensor: General Electrical Failure	GO to Pinpoint Test D .
C003A:19	Right Rear Wheel Speed Sensor: Circuit Current Above Threshold	GO to Pinpoint Test D .
C003A:29	Right Rear Wheel Speed Sensor: Signal Invalid	GO to Pinpoint Test B .
C003A:2F	Right Rear Wheel Speed Sensor: Signal Erratic	GO to Pinpoint Test B .
C003A:64	Right Rear Wheel Speed Sensor: Signal Plausibility Failure	GO to Pinpoint Test B .
C0044:28	Brake Pressure Sensor "A": Signal Bias Level Out of Range/Zero Adjustment Failure	GO to Pinpoint Test C .
C0044:49		GO to Pinpoint Test C .

	Brake Pressure Sensor "A": Internal Electronic Failure	
C0044:64	Brake Pressure Sensor "A": Signal Plausibility Failure	GO to Pinpoint Test C .
C0061:28	Lateral Acceleration Sensor: Signal Bias Level Out of Range/Zero Adjustment Failure	GO to Pinpoint Test I .
C0061:64	Lateral Acceleration Sensor: Signal Plausibility Failure	GO to Pinpoint Test I .
C0062:28	Longitudinal Acceleration Sensor: Signal Bias Level Out of Range/Zero Adjustment Failure	GO to Pinpoint Test I .
C0062:64	Longitudinal Acceleration Sensor: Signal Plausibility Failure	GO to Pinpoint Test I .
C0062:76	Longitudinal Acceleration Sensor: Wrong Mounting Position	GO to Pinpoint Test I .
C0063:28	Yaw Rate Sensor: Signal Bias Level Out of Range/Zero Adjustment Failure	GO to Pinpoint Test I .
C0063:64	Yaw Rate Sensor: Signal Plausibility Failure	GO to Pinpoint Test I .
C1B00:29	Steering Angle Sensor: Signal Invalid	DTC C1B00:29 sets when the ABS module receives invalid data from the Power Steering Control Module (PSCM) regarding the steering wheel angle sensor input. RETRIEVE and REPAIR all non-network DTCs in the PSCM . REFER to Section 211-00 .
C1B00:64	Steering Angle Sensor: Signal Plausibility Failure	DTC C1B00:64 sets when the ABS module receives invalid data from the PSCM regarding the steering wheel angle sensor input. RETRIEVE and REPAIR all non-network DTCs in the PSCM . REFER to Section 211-00 .
C1B00:86	Steering Angle Sensor: Signal Invalid	DTC C1B00:86 sets when the ABS module receives invalid data from the PSCM regarding the steering wheel angle sensor input. RETRIEVE and REPAIR all non-network DTCs in the PSCM . REFER to Section 211-00
U0001:88	High Speed CAN Communication: Bus Off	REFER to Section 418-00 to diagnose the network communication concern.
U0100:00	Lost Communication With ECM/PCM "A": No Sub Type Information	GO to Pinpoint Test E .
U0101:00	Lost Communication With TCM: No Sub Type Information	GO to Pinpoint Test F .
U0131:00	Lost Communication With Power Steering Control Module: No Sub Type Information	GO to Pinpoint Test G .
U0140:00		GO to Pinpoint Test H .

	Lost Communication With Body Control Module: No Sub Type Information	
U0151:00	Lost Communication With Restraints Control Module: No Sub Type Information	GO to Pinpoint Test I .
U0151:88	Lost Communication With Restraints Control Module: Bus Off	GO to Pinpoint Test J .
U0300:51	Internal Control Module Software Incompatibility: Not Programmed	CONFIGURE the ABS module. CARRY OUT Programmable Module Installation (PMI). REFER to Section 418-01 . REPEAT the self-test. If U0300:51 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
U0401:68	Invalid Data received From ECM/PCM "A": Event Information	DTC U0401:68 sets when the ABS module receives invalid network data from the PCM. RETRIEVE and REPAIR all non-network DTCs in the PCM. REFER to Section 303-14 .
U0402:68	Invalid Data received From TCM: Event Information	DTC U0402:68 sets when the ABS module receives invalid network data from the TCM . RETRIEVE and REPAIR all non-network DTCs in the TCM . REFER to Section 307-11 .
U0420:68	Invalid Data received From Power Steering Control Module: Event Information	DTC U0420:68 sets when the ABS module receives invalid network data from the PSCM . RETRIEVE and REPAIR all non-network DTCs in the PSCM . REFER to Section 211-00
U0422:68	Invalid Data received From Body Control Module: Event Information	DTC U0422:68 sets when the ABS module receives invalid network data from the BCM . This DTC refers to the IPC not the Body Control Module (BCM), this vehicle is using the IPC as a gateway module. RETRIEVE and REPAIR all non-network DTCs in the IPC . REFER to Section 413-01 .
U0452:68	Invalid Data received From Restraints Control Module: Event Information	GO to Pinpoint Test I .
U2007:46	Valve(s): Calibration/Parameter Memory Failure	This DTC indicates that part of the ABS module has failed internally. CONFIGURE the ABS module. CARRY OUT PMI . REFER to Section 418-01 . CLEAR the DTCs. REPEAT the self-test. If DTC U2007:46 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
U2100:00	Initial Configuration Not Complete: No Sub Type Information	CONFIGURE the ABS module. CARRY OUT PMI . REFER to Section 418-01 . TEST the system for normal operation.
U2100:41	Initial Configuration Not Complete: General Checksum Failure	CONFIGURE the ABS module. CARRY OUT PMI . REFER to Section 418-01 . REPEAT the self-test. If U2100:41 returns, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
U2100:54	Initial Configuration Not Complete: Missing Calibration	CONFIGURE the ABS module. CARRY OUT PMI . REFER to Section 418-01 . TEST the system for normal operation.
U2100:55	Initial Configuration Not Complete: Not Configured	CONFIGURE the ABS module. CARRY OUT the PMI . REFER to Section 418-01 . TEST the system for normal operation.
U2101:00	Control Module Configuration Incompatible: No Sub Type Information	CONFIGURE the ABS module. CARRY OUT the PMI . REFER to Section 418-01 . TEST the system for normal operation.

		CONFIGURE the ABS module. CARRY OUT the PMI . REFER to Section 418-01. TEST the system for normal operation.
U3000:41	Control Module: General Checksum Failure	This DTC sets if the vehicle battery is disconnected within 1 minute of the ignition being turned OFF. This doesn't allow enough time for the stability sensor information to be recorded to the ABS module memory. CARRY out the IVD Initialization sequence, following the scan tool directions. CLEAR the DTCs. TEST the system for normal operation.
U3000:43	Control Module: Special Memory Failure	CLEAR the DTCs. CARRY OUT the ABS module self-test. RETRIEVE and RECORD any DTCs. If DTC U3000:43 is retrieved again, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
U3000:47	Control Module: Watchdog Safety Failure	This DTC can set if the ABS module electrical connector is not fully seated and locked. DISCONNECT the ABS module C135. INSPECT the connector for bent or loose pins. If OK, RECONNECT C135. CLEAR the DTCs. REPEAT the self-test. If DTC U3000:47 is retrieved again, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
U3000:49	Control Module: Internal Electronic Failure	CLEAR the DTCs. CARRY OUT the ABS module self-test. RETRIEVE and RECORD any DTCs. If DTC U3000:49 is retrieved again, INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.
U3002:62	Vehicle Identification Number: Signal Compare Failure	**NOTE:** This DTC sets if the ABS module cannot communicate with the IPC . Correct any network communications DTCs prior to diagnosing DTC U3002:62. GO to Pinpoint Test K .
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	GO to Pinpoint Test L .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	GO to Pinpoint Test L .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: DTCs C0020:13, C0020:71

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

The ABS module uses an internal solid state switch to operate the ABS pump motor. The ABS module tests the ABS pump motor by activating it for 30 milliseconds. While the pump motor is being activated, the ABS module monitors the voltage drop across the ABS pump motor solid state switch and the amount of current the ABS pump motor draws through the solid state switch. If the voltage drop is too high or if the ABS pump motor is drawing too much current, the ABS module sets a DTC. After 30 milliseconds have passed, the ABS module stops applying voltage to the pump motor and observes the voltage that the spinning ABS pump motor is generating. The voltage generated by the motor indicates how fast the motor is spinning. Voltage that is too low indicates that the motor is not spinning freely and a DTC sets.

The ABS module uses fused battery voltage from Battery Junction Box (BJB) to power the ABS pump motor. The ABS module provides ground for the ABS pump motor. Insufficient power or ground along the circuits causes multiple DTCs to set.

- C0020:13 (ABS Pump Motor Control: Circuit Open) - this DTC sets if the voltage supplied to the ABS module is less than 10 volts, if there is an open or high resistance on the ABS pump motor circuit between the ABS module and the Hydraulic Control Unit (HCU), or if the ABS module is faulted internally.
- C0020:71 (ABS Pump Motor Control: Actuator Stuck) - this DTC sets if the ABS module detects that the ABS pump motor is not rotating when it is commanded to run.

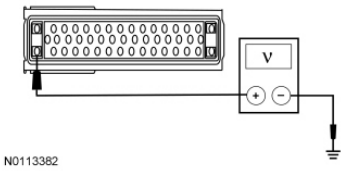
This pinpoint test is intended to diagnose the following:

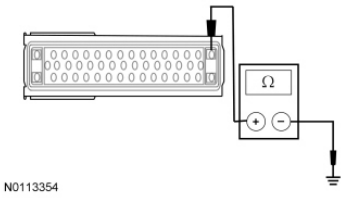
- Fuse
- Wiring, terminals or connectors
- Hydraulic pump motor
- ABS module

PINPOINT TEST A: DTCs C0020:13 AND C0020:71

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
A1 CHECK THE PUMP MOTOR (PMP_MTR) ACTIVE COMMAND	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - ABS Module. • **Listen for the ABS pump motor noise, does the ABS pump motor run for approximately 2 seconds?**	**Yes** TOGGLE the PMP_MTR active command OFF. CLEAR the DTCs. DRIVE the vehicle at speeds greater than 20 km/h (12 mph). RETRIEVE the DTCs. If DTC C0020:13 or 71 is retrieved, GO to A5 . For all other ABS module DTCs, GO to the DTC Chart in this section. If no ABS module DTCs are retrieved, the system is operating correctly at this time. **No** TOGGLE the PMP_MTR active command OFF. GO to A2 .
A2 CHECK THE ABS MODULE GROUND EYELET	
• Ignition OFF. • Remove the bolt retaining G107/G108 at the inner RF	**Yes** GO to A3 . **No**

fender. ♦ Clean the chassis mating surface and ground eyelets. ♦ Install the ground eyelet to the chassis with the retaining bolt. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is the concern still present?**	The concern was caused by a loose or corroded connector. CLEAR the DTCs. REPEAT self-test.
A3 CHECK THE PUMP MOTOR VOLTAGE SUPPLY TO THE ABS MODULE	
• Ignition OFF. • Disconnect: ABS module C135. • Measure the voltage between ABS module C135-1, circuit SBB01 (RD), harness side and ground.  • **Is the voltage greater than 10 volts?**	**Yes** GO to A4 . **No** VERIFY that BJB fuse 1 (40A) is OK. If OK, REPAIR circuit SBB01 (RD). If the fuse is not OK, REFER to the Wiring Diagrams manual to identify the cause of the circuit short. CLEAR the DTCs and REPEAT the self-test.
A4 CHECK THE ABS MODULE GROUND CIRCUIT FOR AN OPEN	
NOTE: Failure to disconnect the battery when instructed results in false resistance readings. Refer to Section 414-01 . • Ignition OFF. • Disconnect: Battery Cable - Negative. • Measure the resistance between ABS module C135-47, circuit GD123 (BK/GY), harness side and ground.	**Yes** GO to A5 . **No** REPAIR circuit GD123 (BK/GY) for an open circuit. CLEAR the DTCs. REPEAT the self-test.

 • **Is the resistance less than 5 ohms?**	
A5 CHECK FOR CORRECT ABS MODULE OPERATION	
• Connect: Battery Cable - Negative. • Check ABS module C135 for: ♦ corrosion. ♦ pushed-out pins. ♦ spread terminals. • Connect: ABS Module C135. • Make sure the connector is seated correctly, then operate the system and verify the concern is still present. • **he concern still present?**	**Yes** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. CLEAR the DTCs. DRIVE the vehicle at speeds greater than 20 km/h (12 mph). 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test B: DTCs C0030:07; C0031:29, 2F, 64; C0033:07; C0034:29, 2F, 64; C0036:07: C0037:29, 2F, 64; C0039:07; C003A:29, 2F or C003A:64

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

The wheel speed sensor and wheel bearing magnetic strip generate a square wave signal to the ABS module that is proportional to wheel speed. The ABS module compares wheel speed inputs from all wheel speed sensors to determine an impending wheel lockup.

DTC Description	Fault Trigger Conditions
• C0030:07 - Left Front Tone Wheel: Mechanical Failure • C0033:07 - Right Front Tone Wheel: Mechanical Failure • C0036:07 - Left Rear Tone Wheel: Mechanical Failure • C0039:07 - Right Rear Tone Wheel: Mechanical Failure	These DTCs set if there is damage to the wheel bearing magnetic strip or damage to the wheel bearing, or contamination or deformation of the bearing seal.

• C0031:29 - Left Front Wheel Speed Sensor: Signal Invalid • C0031:64 - Left Front Wheel Speed Sensor: Signal Plausibility Failure • C0034:29 - Right Front Wheel Speed Sensor: Signal Invalid • C0034:64 - Right Front Wheel Speed Sensor: Signal Plausibility Failure • C0037:29 - Left Rear Wheel Speed Sensor: Signal Invalid • C0037:64 - Left Rear Wheel Speed Sensor: Signal Plausibility Failure • C003A:29 - Right Rear Wheel Speed Sensor: Signal Invalid • C003A:64 - Right Rear Wheel Speed Sensor: Signal Plausibility Failure	These DTCs set if any of the wheel bearing magnetic strips are damaged or defective or not mounted properly. Also sets if the tire size is incorrect or incorrect wheel speed sensor or bearing is installed.
• C0031:2F - Left Front Wheel Speed Sensor: Signal Erratic • C0034:2F - Right Front Wheel Speed Sensor: Signal Erratic • C0037:2F - Left Rear Wheel Speed Sensor: Signal Erratic • C003A:2F - Right Rear Wheel Speed Sensor: Signal Erratic	These DTCs set if any of the wheel bearing magnetic strips are damaged or defective or not mounted properly. Also sets if the tire size is incorrect, incorrect bearing is installed, or high frequency interference is present.

This pinpointe following:

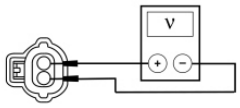
- Wiring, terminals or connectors
- Wheel speed sensor(s)
- Wheel bearing magnetic strip(s)
- ABS module

PINPOINT TEST B: DTC C0030:07; C0031:29, 2F, 64; C0033:07; C0034:29, 2F, 64; C0036:07: C0037:29, 2F, 64; C0039:07; C003A:29, 2F or 64

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

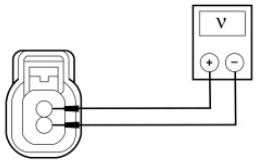
Test Step	Result / Action to Take
B1 CHECK THE DTCs FROM THE SELF-TEST	
• Review the DTCs retrieved and recorded during Inspection and Verification. • **Are DTCs C0031:01; C0034:01; C0037:01 and/or C003A:01 present?**	**Yes** GO to Pinpoint Test D . **No** GO to B2 .
B2 CHECK THE TIRES SIZE AND PRESSURE	
• Verify that all tires and wheels are the same size and the tire size and inflation pressures are correct as indicated on the Vehicle Certification (VC) label. • **Are the wheels and tires OK?**	**Yes** GO to B3 . **No** INSTALL the correct size tire or ADJUST tire pressure as necessary.
B3 MONITOR THE WHEEL SPEED SENSOR PIDs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger - ABS Module. • Drive the vehicle at a speed greater than 20 km/h (12 mph) while monitoring the following PIDs: ♦ Left front wheel speed sensor (LF_WSPD) ♦ Right front wheel speed sensor (RF_WSPD) ♦ Left rear wheel speed sensor (LR_WSPD) ♦ Right rear wheel speed sensor (RR_WSPD) • **Are the wheel speed PIDs consistent with each other, within 5 km/h (3 mph) and the vehicle speed as indicated on the speedometer?**	**Yes** GO to B11 . **No** GO to B4 .
B4 CHECK THE WHEEL SPEED SENSOR FOR DAMAGE	
• **NOTE:** Examine the wheel speed sensor wire carefully with a good light source. Failure to verify damage in the wheel speed sensor wire can lead to unnecessary installation of a new component. • Inspect the wheel speed sensor and harness for abrasion, broken connector tabs or water intrusion. • **Is the wheel speed sensor and harness OK?**	**Yes** GO to B5 . **No** INSTALL a new wheel speed sensor. REFER to Wheel Speed Sensor - Front , or Wheel Speed Sensor - Rear in this section. CLEAR the DTCs. REPEAT the self-test.
B5 INSPECT THE WHEEL SPEED SENSOR	

MOUNTING	
• Ignition OFF. • With the vehicle in NEUTRAL, position it on a hoist. Refer to Section 100-02 . • Inspect the wheel speed sensor and fastener for looseness. • **Are the wheel speed sensor and fastener tight?**	**Yes** GO to B6 . **No** TIGHTEN the wheel speed sensor to specification. REFER to Specifications in this section. CLEAR the DTCs. REPEAT the self-test.
B6 CHECK WHEEL BEARING MAGNETIC STRIP FOR DAMAGE	
• Inspect the wheel bearings for abnormal wear or roughness and for deformation or contamination of the seal and magnetic strip. • **Are the wheel bearing(s) OK?**	**Yes** For wheel speed sensor testing with the Rotunda Active Wheel Speed Sensor Tester, GO to B7 . For wheel speed sensor testing without the Rotunda Active Wheel Speed Sensor Tester, GO to B9 . **No** INSTALL a new wheel bearing as necessary. REFER to Section 204-01 for front wheel bearings or Section 204-02 for rear wheel bearings. CLEAR the DTCs. REPEAT the self-test.
B7 CHECK THE ABS MODULE OUTPUT USING THE ROTUNDA ACTIVE WHEEL SPEED SENSOR TESTER	
• Ignition OFF. • Disconnect: Suspect Wheel Speed Sensor. • Connect the Rotunda Active Wheel Speed Sensor Tester to the wheel speed sensor connectors. • Ignition ON. • Select the correct system polarity on the Rotunda Active Wheel Speed Sensor Tester and turn the power switch to the ON position. • **Is the module output LED illuminated?**	**Yes** GO to B8 . **No** GO to B12 .
B8 CHECK THE WHEEL SPEED SENSOR OUTPUT WITH THE ROTUNDA ACTIVE WHEEL SPEED SENSOR TESTER	
• Raise the suspect wheel until it can spin freely. Refer to Section 100-02 . • While monitoring the Rotunda Active Wheel Speed Sensor Tester, slowly spin the suspect wheel. • **Do the sensor output LEDs illuminate and flash and is the current overload LED not illuminated?**	**Yes** 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. **No** If the current level LED is not illuminated and the sensor output LEDs do not illuminate or if the current level LED is illuminated red,

	INSTALL a new wheel speed sensor. REFER to Wheel Speed Sensor - Front or Wheel Speed Sensor - Rear in this section. CLEAR the DTCs. REPEAT the self-test. If the current level LED is not illuminated and the sensor output LEDs illuminate green, but do not flash, INSPECT the wheel bearing magnetic strip(s) and INSTALL new if necessary. If the wheel bearing magnetic strip is OK, INSTALL a new wheel speed sensor. REFER to Wheel Speed Sensor - Front or Wheel Speed Sensor - Rear in this section. CLEAR the DTCs. REPEAT the self-test.
B9 CHECK FOR CORRECT ABS MODULE OUTPUT	
• Ignition OFF. • Disconnect: Suspect Wheel Speed Sensor. • Ignition ON. **Vehicles Built Up To 1/14/2011**  N0113356 • **For vehicles built up to 1/14/2011** , measure the voltage between the suspect wheel speed sensor connector pins, harness side as follows: **Vehicles Built Up To 1/14/2011** **Location** / **Connector-Pin/ Circuit** / **Connector-Pin/ Circuit** LH front: C150-1 VCA03 (VT/WH) / C150-2 RCA17 (YE) RH front: C160-1 VCA05 (GY/VT) / C160-2 RCA19 (VT) LH rear: C440-1 VCA04 (BU/OG) / C440-2 RCA18 (BN/GN) RH rear: C426-1 / C426-2	**Yes** For vehicles built up to 1/14/2011, GO to B10 . For vehicles built after 1/14/2011, GO to B11 . **No** GO to B12 .

	VCA06 (WH/OG)	RCA20 (BN)

Vehicles Built After 1/14/2011



N0129358

- **For vehicles built after 1/14/2011** , measure the voltage between the suspect wheel speed sensor connector pins, harness side as follows:

Vehicles Built After 1/14/2011

Location	Connector-Pin/ Circuit	Connector-Pin/ Circuit
LH front	C1315-1 VCA03 (VT/WH)	C1315-2 RCA17 (YE)
RH front	C1316-1 VCA05 (GY/VT)	C1316-2 RCA19 (VT)
LH rear	C4296-1 VCA04 (BU/OG)	C4296-2 RCA18 (BN/GN)
RH rear	C4318-1 VCA06 (WH/OG)	C4318-2 RCA20 (BN)

- **Is the voltage greater than 10 volts?**

B10 CHECK THE WHEEL SPEED SENSOR OUTPUT

NOTE: Digital Multimeter must have the leads in the current sensing ports and the correct range selected.

- **For LF wheel speed sensor DTCs** :
  - ♦ connect the meter between LF wheel speed sensor C150-1, circuit VCA03 (VT/WH), harness side and LF wheel speed sensor pin 1, component side.
  - ♦ connect a fused jumper wire between LF wheel speed sensor C150-2, circuit RCA17 (YE), harness side and LF wheel

Yes
GO to B12 .

No
INSTALL a new wheel speed sensor. REFER to Wheel Speed Sensor - Front , or Wheel Speed Sensor - Rear in this section. CLEAR the DTCs. REPEAT the self-test.

speed sensor pin 2, component side. • **For RF wheel speed sensor DTCs** : ♦ connect the meter between RF wheel speed sensor C160-1, circuit VCA05 (GY/VT), harness side and RF wheel speed sensor pin 1, component side. ♦ connect a fused jumper wire between RF wheel speed sensor C160-2, circuit RCA19 (VT), harness side and RF wheel speed sensor pin 2, component side. • **For LR wheel speed sensor DTCs** : ♦ connect the meter between LR wheel speed sensor C440-1, circuit VCA04 (BU/OG), harness side and LR wheel speed sensor pin 1, component side. ♦ connect a fused jumper wire between LR wheel speed sensor C440-2, circuit RCA18 (BN/GN), harness side and LR wheel speed sensor pin 2, component side. • **For RR wheel speed sensor DTCs** : ♦ connect the meter between RR wheel speed sensor C426-1, circuit VCA06 (WH/OG), harness side and RR wheel speed sensor pin 1, component side. ♦ connect a fused jumper wire between RR wheel speed sensor C426-2, circuit RCA20 (BN), harness side and RR wheel speed sensor pin 2, component side. • Ignition ON. • Measure the current while slightly rotating the wheel, using incremental turns. • **Does the digital multimeter indicate the current switches between the low state (5 to 8 mA) and the high state (12 to 16 mA)?**	
B11 CHECK THE OUTPUT OF THE WHEEL SPEED SENSOR	
NOTE: Digital Multimeter must have the leads in the current sensing ports and the correct range selected. • **For LF wheel speed sensor DTCs** : ♦ connect the meter between LF wheel speed sensor C1316-1, circuit VCA03 (VT/WH), harness side and LF wheel speed sensor pin 1, component side. ♦ connect a fused jumper wire between LF wheel speed sensor C1316-2, circuit RCA17 (YE), harness side and LF wheel speed sensor pin 2, component side. • **For RF wheel speed sensor DTCs** :	**Yes** GO to B12 . **No** INSTALL a new wheel speed sensor. REFER to Wheel Speed Sensor - Front , or Wheel Speed Sensor - Rear in this section. CLEAR the DTCs. REPEAT the self-test.

♦ connect the meter between RF wheel speed sensor C1315-1, circuit VCA05 (GY/VT), harness sind RF wheel speed sensor pin 1, component side. ♦ connect a fused jumper wire between RF wheel speed sensor C1315-2, circuit RCA19 (VT), harness side and RF wheel speed sensor pin 2, component side. • **For LR wheel speed sensor DTCs** : ♦ connect the meter between LR wheel speed sensor C4296-1, circuit VCA04 (BU/OG), harness side and LR wheel speed sensor pin 1, component side. ♦ connect a fused jumper wire between LR wheel speed sensor C4296-2, circuit RCA18 (BN/GN), harness side and LR wheel speed sensor pin 2, component side. • **For RR wheel speed sensor DTCs** : ♦ connect the meter between RR wheel speed sensor C4318-1, circuit VCA06 (WH/OG), harness side and RR wheel speed sensor pin 1, component side. ♦ connect a fused jumper wire between RR wheel speed sensor C4318-2, circuit RCA20 (BN), harness side and RR wheel speed sensor pin 2, component side. • Ignition ON. • Measure the current while slightly rotating the wheel, using incremental turns. • **Does the digital multimeter indicate the current switches between the low state (5 to 8 mA) and the high state (12 to 16 mA)?**	
B12 CHECK FOR CORRECT ABS MODULE OPERATION	
• Ignition OFF. • Disconnect: ABS Module C135. • Check for: ♦ corrosion ♦ pushed-out pins ♦ spread terminals • Connect: ABS Module C135. • Connect: Suspect Wheel Speed Sensor. • Make sure the connector is seated correctly, then operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test C: DTCs C0044:28, C0044:49 and C0044:64

Normal Operation

The ABS module uses internal pressure sensors to determine correct operation by monitoring internal Hydraulic Control Unit (HCU) hydraulic pressures. These DTCs set if the brake pressuensor signals do not match. This fault could set by either an internal ABS module failure or a pressure sensor failure. The pressure sensors are internal to the HCU and cannot be serviced separately.

- DTC C0044:28 (Brake Pressure Sensor "A": Signal Bias Level Out of Range / Zero Adjustment Failure) - this DTC sets if the brake pressure sensor signals do not match. This fault could set by a misadjusted stoplamp switch or improperly installed brake pedal. An internal ABS module failure or a pressure sensor failure can also cause this DTC to set. When the ABS module sets DTC C0044:28, a message is also sent to the Transmission Control Module (TCM) along the High Speed Controller Area Network (HS-CAN) bus. After received this message from the ABS module, the TCM places the automatic transmission into NEUTRAL. There is no corresponding DTC set in the Transmission Control Module (TCM).
- DTC C0044:49 (Brake Pressure Sensor "A": Internal Electronic Failure) - this DTC sets if the brake pressure sensor signals do not match. This fault could set by either an internal ABS module failure or a pressure sensor failure.
- DTC C0044:64 (Brake Pressure Sensor "A": Signal Plausibility Failure) - this DTC sets if the brake pressure sensor signals do not match. This fault could set by either an internal ABS module failure or a pressure sensor failure.

This pinpoint test is intended to diagnose the following:

- ABS module
- HCU

PINPOINT TEST C: DTCs C8, C0044:49 AND C0044:64

Test Step	Result / Action to Take
C1 CHECK THE STOPLAMP SWITCH, CRUISE CONTROL DEACTIVATOR SWITCH AND BRAKE PEDAL AND BRACKET	
• Inspect the stoplamp switch, cruise control deactivator switch and brake pedal assembly, verify there is no brake pedal pressure unintentionally applied due to incorrect stoplamp switch, cruise control deactivator switch or brake pedal installation. • **Are the stoplamp switch, cruise control deactivator switch and brake pedal OK?**	**Yes** If DTC C0044:28 is set, GO to C3 . Otherwise, GO to C2 . **No** REPAIR or INSTALL new components as necessary. REFER to Section 206-06 .
C2 CHECK FOR DTC C0044:49 AND/OR C0044:64 TO RETURN	
• Ignition ON. • Using a scan tool, clear all ABS module CMDTCs . • Test drive the vehicle at speeds greater than 32 km/h (20 mph). • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is DTC C0044:49 and/or C0044:64 present?**	**Yes** GO to C3 . **No** The system is operating correctly at this time. The concern may have been caused by air trapped in the hydraulic brake system. REFER to Section 206-00 on bleeding the base brake system. TEST the system for normal operation.

C3 CARRY OUT THE BRAKE PEDAL SWITCH ADJUSTMENT PROCEDURE	
• Refer to Brake Pedal Switch Adjustment in this section. • **Did the stoplamp itch and cruise control deactivator switch pass the brake pedal switch adjustment test?**	**Yes** GO to C4 . **No** INSTALL a new stoplamp switch or cruise control deactivator switch as required. REFER to Section 417-01 (stoplamp switch) or Section 419-03 (cruise control deactivator switch).
C4 CHECK FOR CORRECT ABS MODULE TO HCU TORQUE VALUES	
• Verify all ABS module-to- HCU fasteners are tightened to their correct torque specifications. Refer to Specifications in this section. • **Are the ABS module-to- HCU fasteners tightened correctly?**	**Yes** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation. **No** TIGHTEN all ABS module-to- HCU fasteners. CLEAR the DTCs. GO to C5 .
C5 CHECK FOR DTCs C0044:28, C0044:49 AND/OR C0044:64	
• Test drive the vehicle at speeds greater than 32 km/h (20 mph). • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • Record all ABS module DTCs. • **Is DTC C0044:28, C0044:49 and/or C0044:64 present?**	**Yes** INSTALL a new HCU . REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. The concern was likely cause by incorrectly tightened fasteners.

Pinpoint Test D: DTCs C0031:01; C0034:01; C0037:01, C003A:01, C0031:19, C0034:19, C0037:19, C003A:19

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

Active wheel speed sensors generate a square wave signal that is sent to the ABS module. The wheel speed sensor circuitry connects to the ABS module through 2 wires and a connector at each wheel speed sensor. When the ignition switch 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.

DTC Description	Fault Trigger Condition
• C0031:01 - Left Front Wheel Speed Sensor: General Electrical Failure	These DTCs set if any of the wheel speed sensor's signal current is below 4.5 mA or above 20 mA for longer than 140 milliseconds, or if either sensor circuit is shorted to ground or battery voltage.

• C0034:01 - Right Front Wheel Speed Sensor: General Electrical Failure • C0037:01 - Left Rear Wheel Speed Sensor: General Electrical Failure • C003A:01 - Right Rear Wheel Speed Sensor: Geectrical Failure • C0031:19 - LF Wheel Speed Sensor Signal: Circuit Current Above Threshold • C0034:19 - RF Wheel Speed Sensor Signal: Circuit Current Above Threshold • C0037:19 - LR Wheel Speed Sensor Signal: Circuit Current Above Threshold • C003A:19 - RR Wheel Speed Sensor Signal: Circuit Current Above Threshold	

This pinpoint test is intended to diagnose the following:

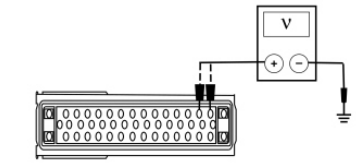
- Wiring, terminals or connectors
- Wheel speed sensors
- ABS module

PINPOINT TEST D: DTCs C0031:01; C0034:01; C0037:01, C003A:01, C0031:19, C0034:19, C0037:19, C003A:19

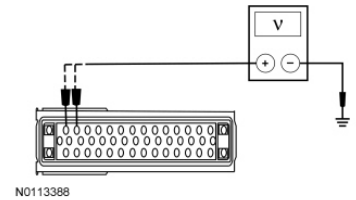
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

Test Step	Result / Action to Take
D1 CHECK FOR FAULT REPEATABILITY	
• Ignition ON. • Using the scan tool, clear the ABS module DTCs. • Drive the vehicle at least 20 km/h (12 mph). • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is the concern still present?**	**Yes** If the Rotunda Active Wheel Speed Sensor Tester is available, GO to D2 . If the Rotunda Active Wheel Speed Sensor Tester is not available, GO to D4 . **No** INSPECT the wheel speed sensors, wheel speed sensor wiring and wheel bearing magnetic strip. REPAIR or INSTALL new as necessary. If any other DTCs are retrieved, GO to the ABS Module DTC Chart in this section.
D2 CHECK THE ABS MODULE OUTPUT USING THE ROTUNDA ACTIVE WHEEL SPEED SENSOR TESTER	
• Ignition OFF.	**Yes** GO to D3 .

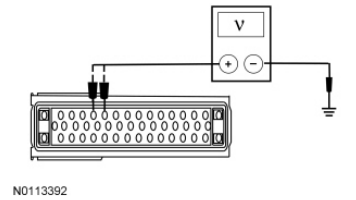
• Disconnect: Suspect Wheel Speed Sensor. • Connect the Rotunda Active Wheel Speed Sensor Tester to the wheel speed sensor connectors. • Ignition ON. • Select the correct system polarity on the Rotunda Active Wheel Speed Sensor Tester and turn the power switch to the ON position. • **Is the module output LED illuminated?**	**No** GO to D6 .
D3 CHECK THE WHEEL SPEED SENSOR OUTPUT WITH THE ROTUNDA ACTIVE WHEEL SPEED SENSOR TESTER	
• Raise the suspect wheel until it can spin freely. Refer to Section 100-02 . • While monitoring the Rotunda Active Wheel Speed Sensor Tester, slowly spin the suspect wheel. • **Do the sensor output LEDs illuminate and flash and is the current overload LED not illuminated?**	**Yes** 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. **No** If the current level LED is not illuminated and the sensor output LEDs do not illuminate or if the current level LED is illuminated red, INSTALL a new wheel speed sensor. REFER to Wheel Speed Sensor - Front or Wheel Speed Sensor - Rear in this section. CLEAR the DTCs. REPEAT the self-test. If the current level LED is not illuminated and the sensor output LEDs illuminate green, but ot flash, INSPECT the wheel bearing magnetic strip and INSTALL new if necessary. If the wheel bearing magnetic strip is OK, INSTALL a new wheel speed sensor. REFER to Wheel Speed Sensor - Front or Wheel Speed Sensor - Rear in this section. CLEAR the DTCs. REPEAT the self-test.
D4 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR A SHORT TO BATTERY VOLTAGE	
• Ignition OFF. • Disconnect: ABS Module C135. • Disconnect: Suspect Wheel Speed Sensor. • Ignition ON. • **For DTC C0031:01, 19 (LF)** , measure the voltage between: ♦ ABS module C135-45, circuit VCA03 (VT/WH), harness side and ground. ♦ ABS module C135-46, circuit RCA17 (YE), harness side and ground.	**Yes** REPAIR the affected circuit(s) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. **No** GO to D5 .



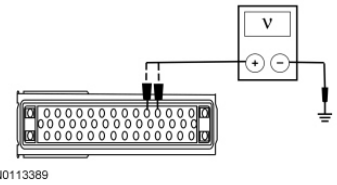
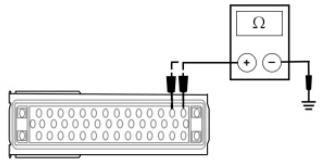
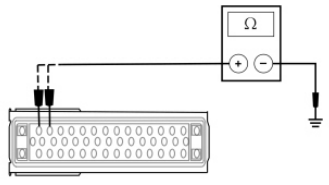
- **For DTC C0034:01, 19 (RF)** , measure the voltage between:
  - ♦ ABS module C135-33, circuit RCA19 (VT), harness side and ground.

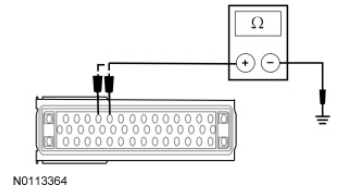
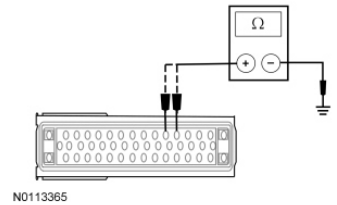
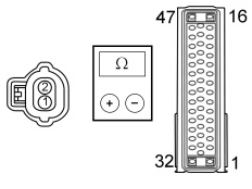


- **For DTC C0037:01, 19 (LR)** , measure the voltage between:
  - ♦ ABS module C135-36, circuit VCA04 (BU/OG), harness side and ground.
  - ♦ ABS module C135-37, circuit RCA18 (BN/GN), harness side and ground.



- **For DTC C003A:01, 19 (RR)** , measure the voltage between:
  - ♦ ABS module C135-42, circuit RCA20 (BN), harness side and ground.
  - ♦ ABS module C135-43, circuit VCA06 (WH/OG), harness side and ground.

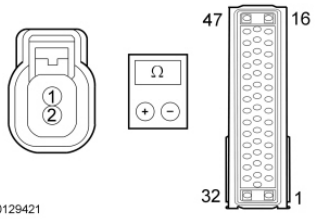
 N0113389 • **Is any voltage present?**	
D5 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • **For DTC C0031:01, 19 (LF)** , measure the resistance between: ♦ ABS module C135-45, circuit VCA03 (VT/WH), harness side and ground. ♦ ABS module C135-46, circuit RCA17 (YE), harness side and ground.  N0113362 • **For DTC C0034:01, 19 (RF)** , measure the resistance between: ♦ ABS module C135-34, circuit VCA05 (GY/VT), harness side and ground. ♦ ABS module C135-33, circuit RCA19 (VT), harness side and ground.  N0113363 • **For DTC C0037:01, 19 (LR)** , measure the resistance between: ♦ ABS module C135-36, circuit VCA04 (BU/OG), harness side and ground. ♦ ABS module C135-37, circuit RCA18 (BN/GN), harness side and ground.	**Yes** GO to D6 . **No** REPAIR the affected circuit(s) for a short to ground. CLEAR the DTCs. REPEAT the self-test.

 N0113364 • **For DTC C003A:01, 19 (RR)** , measure the resistance between: ♦ ABS module C135-43, circuit VCA06 (WH/OG), harness side and ground. ♦ ABS module C135-42, circuit RCA20 (BN), harness side and ground.  N0113365 • **Are the resistances greater than 10,000 ohms?**	
D6 CHECK THE WHEEL SPEED CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: ABS Module C135 (if not previously disconnected). • Disconnect: Suspect Wheel Speed Sensor (if not previously disconnected). **Vehicles Built Up To 1/14/2011**  N0113366 • **For vehicles built up to 1/14/2011** , measure the resistance between ABS module connector C135, harness side and the suspect wheel speed sensor connector, harness side as indicated in the following chart:	**Yes** GO to D7 . **No** REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.

Vehicles Built Up To 1/14/2011

DTC	ABS Module	Circuit	Wheel Speed Sensor
C0031:01, 19	C135-45	VCA03 (VT/WH)	C150-1
	C135-46	RCA17 (YE)	C150-2
C0034:01, 19	C135-34	VCA05 (GY/VT)	C160-1
	C135-33	RCA19 (VT)	C160-2
C0037:01, 19	C135-36	VCA04 (BU/OG)	C440-1
	C135-37	RCA18 (BN/GN)	C440-2
C003A:01, 19	C135-43	VCA06 (WH/OG)	C426-1
	C135-42	RCA20 (BN)	C426-2

Vehicles Built After 1/14/2011



- **For vehicles built after 1/14/2011**, measure the resistance between ABS module connector C135, harness side and the suspect wheel speed sensor connector, harness side as indicated in the following chart:

Vehicles Built After 1/14/2011

DTC	ABS Module	Circuit	Wheel Speed Sensor
	C135-45		C1315-1

C0031:01, 19		VCA03 (VT/WH)		
	C135-46	RCA17 (YE)	C1315-2	
C0034:01, 19	C135-34	VCA05 (GY/VT)	C1316-1	
	C135-33	RCA19 (VT)	C1316-2	
C0037:01, 19	C135-36	VCA04 (BU/OG)	C4296-1	
	C135-37	RCA18 (BN/GN)	C4296-2	
C003A:01, 19	C135-43	VCA06 (WH/OG)	C4318-1	
	C135-42	RCA20 (BN)	C4318-2	

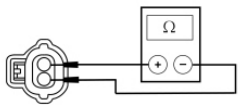
- **Are the resistances less than 5 ohms?**

D7 CHECK FOR SHORTED WHEEL SPEED SENSOR CIRCUITS

Yes
GO to D8 .

No
REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.

Vehicles Built Up To 1/14/2011



N0113367

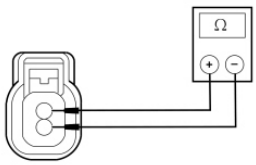
- **For vehicles built up to 1/14/2011**, measure the resistance between the suspect wheel speed sensor connector pins, harness side as follows:

Vehicles Built Up To 1/14/2011

DTC	Connector-Pin/ Circuit	Connector-Pin/ Circuit
C0031:01, 19	C150-1 VCA03 (VT/WH)	C150-2 RCA17 (YE)
C0034:01, 19	C160-1 VCA05 (GY/VT)	C160-2 RCA19 (VT)

C0037:01, 19	C440-1 VCA04 (BU/OG)	C440-2 RCA18 (BN/GN)
C003A:01, 19	C426-1 VCA06 (WH/OG)	C426-2 RCA20 (BN)

Vehicles Built After 1/14/2011



N0129359

- **For vehicles built after 1/14/2011**, measure the resistance between the suspect wheel speed sensor connector pins, harness side as follows:

Vehicles Built After 1/14/2011

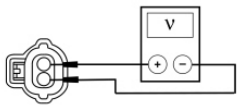
DTC	Connector-Pin/ Circuit	Connector-Pin/ Circuit
C0031:01, 19	C1316-1 VCA03 (VT/WH)	C1316-2 RCA17 (YE)
C0034:01, 19	C1315-1 VCA05 (GY/VT)	C1315-2 RCA19 (VT)
C0037:01, 19	C4296-1 VCA04 (BU/OG)	C4296-2 RCA18 (BN/GN)
C003A:01, 19	C4318-1 VCA06 (WH/OG)	C4318-2 RCA20 (BN)

- **Is the resistance greater 10,000 ohms?**

D8 CHECK FOR CORRECT ABS MODULE OUTPUT	

- Connect: ABS Module C135.
- Ignition ON.

Vehicles Built Up To 1/14/2011



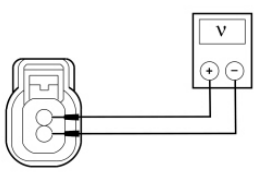
N0113356

- **For vehicles built up to 1/14/2011**, measure the voltage between the suspect wheel speed sensor connector pins, harness side as follows:

Vehicles Built Up To 1/14/2011

DTC	Connector-Pin/ Circuit	Connector-Pin/ Circuit
C0031:01, 19	C150-1 VCA03 (VT/WH)	C150-2 RCA17 (YE)
C0034:01, 19	C160-1 VCA05 (GY/VT)	C160-2 RCA19 (VT)
C0037:01, 19	C440-1 VCA04 (BU/OG)	C440-2 RCA18 (BN/GN)
C003A:01, 19	C426-1 VCA06 (WH/OG)	C426-2 RCA20 (BN)

Vehicles Built After 1/14/2011



N0129358

- **For vehicles built after 1/14/2011**, measure the voltage between the

Yes
INSTALL a new wheel speed sensor. REFER to Wheel Speed Sensor - Front , or Wheel Speed Sensor - Rear in this section. CLEAR the DTCs. REPEAT the self-test.

No
GO to D9 .

suspect wheel speed sensor connector pins, harness side as follows:

Vehicles Built After 1/14/2011

DTC	Connector-Pin/ Circuit	Connector-Pin/ Circuit
C0031:01, 19	C1316-1 VCA03 (VT/WH)	C1316-2 RCA17 (YE)
C0034:01, 19	C1315-1 VCA05 (GY/VT)	C1315-2 RCA19 (VT)
C0037:01, 19	C4296-1 VCA04 (BU/OG)	C4296-2 RCA18 (BN/GN)
C003A:01, 19	C4318-1 VCA06 (WH/OG)	C4318-2 RCA20 (BN)

- **Is the voltage greater than 10 volts?**

D9 CHECK FOR CORRECT ABS MODULE OPERATION	
• Disconnect: ABS Module C135. • Check for: ♦ corrosion ♦ pushed-out pins ♦ spread terminals • Connect: ABS Module C135. • Make sure the connector is seated correctly, then operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ABS module. REFER to href="SBR~us~en~file=SBR69005.HTM~gen~ref.HTM" >Hydraulic Control Unit (HCU) in this section. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test E: DTC U0100:00

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

- DTC U0100:00 (Lost Communication With ECM/PCM "A": No Sub Type Information) - this DTC sets if the brake pedal position switch, and traction control messages that should be received from the

ECM/PCM are missing for 5 seconds or longer.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- PCM
- ABS module

PINPOINT TEST E: DTC U0100

Test Step	Result / Action to Take
E1 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. Using a scan tool, carry out the network test. • **Does the PCM pass the network test?**	**Yes** GO to E2 . **No** REFER to Section 418-00 .
E2 CHECK THE ABS MODULE CMDTCs	
• Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • Using a scan tool, clear the ABS module DTCs. • Ignition OFF. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is DTC U0100:00 present?**	**Yes** GO to E3 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent facondition.
E3 CHECK THE ABS MODULE FOR BATTERY VOLTAGE DTCs	
• Review the ABS module DTCs retrieved in the previous step. • **Is DTC U3003:16 or DTC U3003:17 present?**	**Yes** GO to Pinpoint Test L . **No** GO to E4 .
E4 CHECK THE PCM CMDTCs	
• Using a scan tool, carry out the PCM Key ON Engine OFF (KOEO) self-test. • **Is DTC P1794:16 or P1794:17 present?**	**Yes** DIAGNOSE the PCM DTCs. REFER to Section 414-00 **No** GO to E5 .
E5 CHECK FOR DTC U0100 SET IN OTHER MODULES	
• Enter the following diagnostic mode on the scan tool: Self Test - All	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. REPEAT the ABS

CMDTCs . • **Is DTC U0100:00 or DTC U0100 set in more than one module?**	module self-test. **No** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.

Pinpoint Test F: DTC U0101:00

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

- DTC U0101:00 (Lost Communication With TCM: No Sub Type Information - this DTC sets in the ABS module if the PRNDL message that should be received from the Transmission Control Module (TCM) is missing for 5 seconds or longer.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- TCM
- ABS module

PINPOINT TEST F: DTC U0101

Test Step	Result / Action to Take
F1 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Using a scan tool, carry out the network test. • **Does the TCM pass the network test?**	**Yes** GO to F2 . **No** REFER to Section 418-00 .
F2 CHECK THE ABS MODULE CMDTCs	
• Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • Using a scan tool, clear the ABS module DTCs. • Ignition OFF. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is DTC U0101:00 present?**	**Yes** GO to F3 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
F3 CHECK THE ABS MODULE FOR BATTERY VOLTAGE DTCs	
	Yes GO to Pinpoint Test L .

• Review the ABS module DTCs retrieved in the previous step. • **Is DTC U3003:16 or DTC U3003:17 present?**	**No** GO to F4 .
F4 CHECK THE TCM CMDTCs	
• Enter the following diagnostic mode on the scan tool: Self Test - TCM . • **Is DTC P0702, P0882 or P0883 present?**	**Yes** DIAGNOSE the TCM DTCs. REFER to Section 307-11 . **No** GO to F5 .
F5 CHECK FOR DTC U0101 SET IN OTHER MODULES	
• Enter the following diagnostic mode on the scan tool: Self Test - All CMDTCs . • **Is DTC U0101:00 or DTC U0101 set in more than one module?**	**Yes** INSTALL a new TCM . REFER to Section 307-11 . TEST the system for normal operation. REPEAT the ABS module self-test. **No** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.

Pinpoint Test G: DTC U0131:00

Normal Operation

- DTC U0131:00 (Lost Communication With Power Steering Control Module: No Sub Type Information) - this DTC sets if the steering sensor message that should be received from the Power Steering ContModule (PSCM) is missing for 5 seconds or longer.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- PSCM
- ABS module

PINPOINT TEST G: DTC U0131:00

Test Step	Result / Action to Take
G1 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Using a scan tool, carry out the network test. • **Does the PSCM pass the network test?**	**Yes** GO to G2 . **No** REFER to Section 418-00 .
G2 CHECK THE ABS MODULE CMDTCs	
	Yes GO to G3 .

• Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • Using a scan tool, clear the ABS module DTCs. • Ignition OFF. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is DTC U0131:00 present?**	**No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
G3 CHECK THE ABS MODULE FOR BATTERY VOLTAGE DTCs	
• Review the ABS module DTCs retrieved in the previous step. • **Is DTC U3003:16 or DTC U3003:17 present?**	**Yes** GO to Pinpoint Test L . **No** GO to G4 .
G4 CHECK THE PSCM CMDTCs	
• Enter the following diagnostic mode on the scan tool: Self Test - PSCM . • **Is DTC P0702, P0882 or P0883 present?**	**Yes** DIAGNOSE the PSCM DTCs. REFER to Section 307-11 . **No** GO to G5 .
G5 CHECK FOR DTC U0131:00 SET IN OTHER MODULES	
• Enter the following diagnostic mode on the scan tool: Self Test - All CMDTCs pan>. • **Is DTC U0131:00 or DTC U0131 set in more than one module?**	**Yes** INSTALL a new PSCM . REFER to Section 211-00 . TEST the system for normal operation. CLEAR the DTCs. REPEAT the ABS module self-test. **No** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.

Pinpoint Test H: DTCs U0140:00

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

- DTC U0140:00 (Lost Communication With Body Control Module: No Sub Type Information) - this DTC sets in the ABS module if it cannot trsmit or receive messages to the Body Control Module (BCM) over the High Speed Controller Area Network (HS-CAN) for 5 seconds or longer. This DTC is actually referring to the IPC as this vehicle is using the IPC as a gateway module and never directly establishes communications with the BCM .

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- IPC
- ABS module

PINPOINT TEST H: DTC U0140:00

Test Step	Result / Action to Take
H1 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Using a scan tool, carry out the network test. • **Does the PSCM pass the network test?**	**Yes** GO to H2 . **No** REFER to Section 418-00 .
H2 CHECK THE ABS MODULE CMDTCs	
• Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • Using a scan tool, clear the ABS module DTCs. • Ignition OFF. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is DTC U0140:00 present?**	**Yes** GO to H3 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
H3 CHECK THE ABS MODULE FOR BATTERY VOLTAGE DTCs	
• Review the ABS module DTCs retrieved in the previous step. • **Is DTC U3003:16 or DTC U3003:17 present?**	**Yes** GO to Pinpoint Test L . **No** GO to H4 .
H4 CHECK THE IPC CMDTCs	
• Enter the following diagnostic mode on the scan tool: Self Test - IPC . • **Is DTC U3006:16 or U3006:17 present?**	**Yes** DIAGNOSE the IPC DTCs. REFER to Section 413-01 . **No** GO to H5 .
H5 CHECK FOR DTC U0140:00 SET IN OTHER MODULES	
• Enter the following diagnostic mode on the scan tool: Self Test - All CMDTCs . • **Is DTC U0140:00 or DTC U0140 set in more than one module?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . TEST the system for normal operation. CLEAR the DTCs. REPEAT the ABS module self-test. **No** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. TEST the system for normal operation.

Pinpoint Test I: DTC C0061:28, C0061:64, C0062:28, C0062:64, C0062:76, C0063:28, C0063:64, U0151:00, U0452:68

Refer to Wiring Diagrams Cell 14 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

The ABS module uses information received from several sensors (wheel speed sensors, steering wheel rotation sensor, stability/traction control system sensors, etc.) to determine if vehicle stability or traction warrants ESC interaction. If an event is going to occur, the ABS module adjusts the brake torque at specific wheels and the PCM reduces engine torque to make the vehicle more stable. Once the ABS module has determined that the stability event has been corrected, it returns the brake and engine torque to normal and continues to monitor the vehicle. DTCs set in the ignition cycle can only be cleared by cycling the ignition off and on once the fault has been corrected. The Restraints Control Module (RCM) measures the yaw rate and vehicle acceleration, then sends the signal through a secondary, dedicated Controller Area Network (CAN) to the ABS module. This dedicated CAN is used only for communication between the RCM and the ABS module. The ABS module uses this information for AdvanceTrac® system operation. The ABS module also compares this information to information it receives from other sensors (brake pedal input, steering wheel) to determine how valid the information is and to determine if an instability event is about to occur. The yaw rate sensor, lateral and longitudinal accelerometers are contained in the RCM .

DTC Description	Fault Trigger Conditions
DTC C0061:28 Lateral Acceleration Sensor: Signal Bias Level Out of Range/Zero Adjustment Failure	This DTC indicates that the lateral acceleration sensor signal is out of range.
DTC C0061:64 Lateral Acceleration Sensor: Signal Plausibility Failure	This DTC sets if one of the sensor signals does not match the other sensor signals.
DTC C0062:28 Longitudinal Acceleration Sensor: Signal Bias Level Out of Range/Zero Adjustment Failure	This DTC indicates that the longitudinal acceleration sensor signal is out of range.
DTC C0062:64 Longitudinal Acceleration Sensor: Signal Plausibility Failure	This DTC sets if one of the sensor signals does not match the other sensor signals.
DTC C0062:76 Longitudinal Acceleration Sensor: Wrong Mounting Position	This DTC sets if the RCM is loose or mounted incorrectly. /TD>
DTC C0063:28 Yaw Rate Sensor: Signal Bias Level Out of Range/Zero Adjustment Failure	This DTC indicates that the yaw rate sensor signal is out of range.
DTC C0063:64 Yaw Rate Sensor: Signal Plausibility Failure	This DTC sets if one of the sensor signals does not match the other sensor signals.
DTC U0151:00 Lost Communication With Restraints Control Module: No Sub Type Information	This DTC sets in the ABS module if it does not receive Yaw, or other sensor messages from the Restraints Control Module (RCM) for 5 seconds or longer.
DTC U0452:68 Invalid Data received From Restraints Control Module: Event Information	This DTC sets when the ABS module receives invalid network data from the RCM .

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors

- RCM
- ABS module

PINPOINT TEST I: DTC C0061:28, C0061:64, C0062:28, C0062:64, C0062:76, C0063:28, C0063:64, U0151:00, U0452:68

⚠ 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.

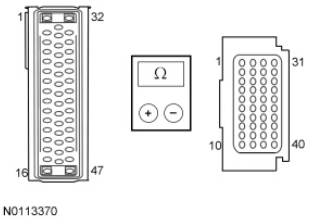
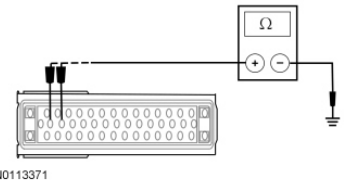
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

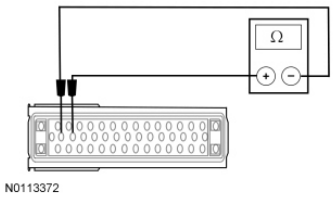
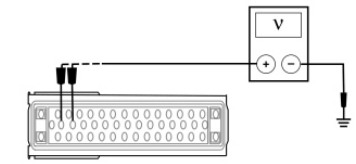
NOTE: Supplemental Restraint System (SRS) components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

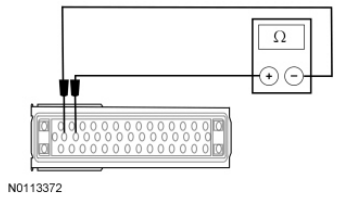
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / ction to Take
I1 CHECK FOR AN HS-CAN COMMUNICATION CONCERN WITH THE RCM	
• Connect the scan tool. • Ignition ON. • **NOTE:** The network test does not test the dedicated CAN communications between the ABS module and RCM . • Using the scan tool, carry out the network test. • **Does the RCM pass the network test?**	**Yes** GO to I2 . **No** REFER to Section 418-00 , The Restraints Control Module (RCM) Does Not Respond To The Scan Tool.
I2 VERIFY THE RCM PART NUMBER	
• Enter the following diagnostic mode on the scan tool: Log Viewer. • Retrieve and record the RCM part number from the log viewer. • Check the part number recorded against the number listed in the parts catalog. • **Does the part number on the RCM match the part number listed in the parts catalog?**	**Yes** GO to I3 . **No** INSTALL the correct RCM . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the self-test.
I3 CHECK FOR RCM AND ABS DTCs	
• Enter the following diagnostic mode on the scan tool: Self-Test - RCM . • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module.	**Yes** REFER to Section 501-20B to diagnose the RCM DTCs. TEST the system for normal operation.

• **Are any RCM DTCs retrieved on-demand self-test?**	**No** If only one of the following ABS module DTCs C0061:28, C0061:64, C0062:28, C0062:64, C0063:28, C0063:64, U0452:68 was retrieved, GO to I4 . If more than one ABS me DTC C0061:28, C0061:64, C0062:28, C0062:64, C0063:28, C0063:64,U0452:68 was retrieved, GO to I7 . For DTC C0062:76 GO to I12 . For DTC U0151:00 GO to I7 . For all other DTCs, REFER to the ABS Module DTC Chart.
I4 CHECK THE ABS MODULE YAW RATE (YAW_RATE) PID	
• Enter the following diagnostic mode on the scan tool: ABS Module DataLogger. • **NOTE:** The vehicle must be on level ground and at a complete standstill. Any vehicle movement results in false values for this test. • Monitor the YAW_RATE PID. • **Is the YAW_RATE PID value between -0.05 and 0.05?**	**Yes** GO to I5 . **No** GO to I13 .
I5 CHECK THE ABS MODULE LATERAL ACCELERATION (LAT_ACCL) PID	
• **NOTE:** The vehicle must be on level ground and at a complete standstill. Any vehicle movement results in false values for this test. • Monitor the LAT_ACCL PID. • **Is the LAT_ACCL PID value between -0.4 and 0.4?**	**Yes** GO to I6 . **No** GO to I13 .
I6 CHECK THE ABS MODULE LONGITUDINAL ACCELERATION (LONG_ACCL) PID	
• **NOTE:** The vehicle must be on level ground and at a complete standstill. Any vehicle movement results in false values for this test. • Monitor the LONG_ACCL PID. • **Is the LONG_ACCL PID value between -0.4 and 0.4?**	**Yes** GO to I7 . **No** GO to I13 .
I7 CHECK THE DEDICATED CAN CIRCUITS FOR AN OPEN	

• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Disconnect: ABS Module C135. • Disconnect: RCM C310A and C310B. • Measure the resistance between the ABS module C135, harness side and the RCM C310B, harness side as indicated in the following chart: **ABS Module / Circuit / RCM** C135-18 / VCA23 (BU/WH) / C310B-20 C135-19 / VCA24 (GN/OG) / C310B-19  N0113370 • **Are the resistances less than 5 ohms?**	**Yes** GO to I8 . **No** REPAIR the affected circuit(s). CLEAR the DTCs. CYCLE the ignition key. REPEAT the self-test.
I8 CHECK THE DEDICATED CAN CIRCUITS FOR A SHORT TO GROUND	
• Measure the resistance between ground and: ♦ ABS module C135-19, circuit VCA24 (GN/OG), harness side. ♦ ABS module C135-18, circuit VCA23 (BU/WH), harness side.  N0113371 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to I9 . **No** REPAIR the affected circuit(s). TEST the system for normal operation.
I9 CHECK THE DEDICATED CAN CIRCUITS FOR A SHORT TOGETHER	
• Measure the resistance between ABS module C135-19, circuit VCA24 (GN/OG), harness side and ABS module C135-18, circuit VCA23 (BU/WH), harness side.	**Yes** GO to I10 . **No** REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.

 N0113372 • **Is the resistance greater than 10,000 ohms?**	
I10 CHECK THE DEDICATED CAN CIRCUITS FOR A SHORT TO VOLTAGE	
• Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Ignition ON. • Measure the voltage between ground and: ♦ ABS module C135-19, circuit VCA24 (GN/OG), harness side. ♦ ABS module C135-18, circuit VCA23 (BU/WH), harness side.  N0113369 • **Is any voltage present?**	**Yes** REPAIR the affected circuit(s) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. **No** GO to I11 .
I11 CHECK RCM TERMINATING RESISTOR	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to RCM in Section 501-20B . ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: RCM C310A and C310B.	**Yes** GO to I12 . **No** INSTALL a new RCM . REFER to Section 501-20B . CLEAR all CMDTCs . PERFORM a road test. REPEAT the self test. If the concern is still present, GO to I14 . If other DTCs are present, REFER to the appropriate DTC chart.

• Measure the resistance between ABS module C135-18, circuit VCA23 (BU/WH), harness side and C135-19, circuit VCA24 (GN/OG), harness side.  N0113372 • **Is the resistance between 108 and 132 ohms?**	
I12 CHECK THE RCM INSTALLATION AND MOUNTING SURFACE	
• Ignition OFF. • If not previously directed to do so, depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Inspect the Restraints Control Module (RCM) installation and make sure that the fasteners are fully seated and tightened correctly. Refer to RCM in Section 501-20B . • Inspect the mounting surface for damage, corrosion or foreign material. • **Is the RCM installed correctly and is the mounting surface clean and free from damage?**	**Yes** GO to I13 . **No** REPAIR or INSTALL new as necessary. REPOWER the SRS . REFER to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . CLEAR all CMDTCs . PERFORM a road test. REPEAT the self test.
I13 CHECK FOR AN INTERMITTENT FAULT	
• Disconnect: RCM C310A and C310B. • Disconnect: ABS module C135. ♦ inspect connector(s) (including any in-line connectors) for corrosion, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Perform a road test. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module.	**Yes** INSTALL a new RCM . REFER to Section 501-20B . CLEAR all CMDTCs . PERFORM a road test. REPEAT the self test. If the ccern is still present, GO to I14 . If other DTCs are present, REFER to the appropriate DTC chart. **No** The fault is not present and cannot be recreated at this time. **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.**

• **Is the concern still present?**	
I14 CHECK THE ABS MODULE FOR CORRECT OPERATION	
• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to RCM in Section 501-20B . ♦ inspect ABS module C135 for dirt, corrosion, water intrusion, pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s). • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Perform a road test. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is the concern still present?**	**Yes** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test J: DTC U0151:88

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

The Restraints Control Module (RCM) measures vehicle yaw rate, lateral acceleration and longitudinal acceleration and then sends the information to the ABS module along a dedicated pair of Controller Area Network (CAN) circuits. This dedicated CAN is used only for communication between the RCM and the ABS module. The yaw rate sensor, lateral accelerometer and longitudinal accelerometer are contained in the RCM .

- DTC U0151:88 (Lost Communication With Restraints Control Module: Bus Off) - This DTC can set if either of the dedicated CAN circuits are open, shorted to ground or shorted to each other. Other DTCs indicating missing messages or invalid signals from the RCM sensors can set as a result of a dedicated CAN fault.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- RCM
- ABS module

PINPOINT TEST J: DTC U0151:88

⚠ 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.

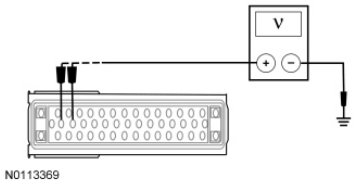
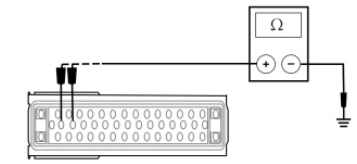
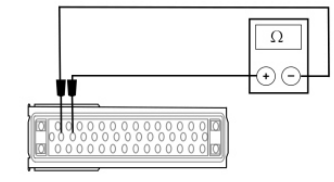
⚠ WARNING: Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

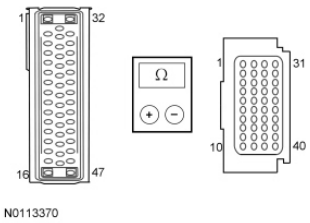
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

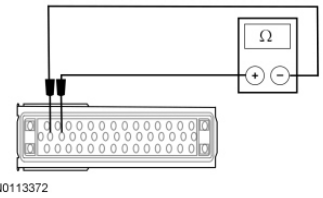
NOTE: Supplemental Restraint System (SRS) components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
J1 CHECK FOR AN HS-CAN CONCERN WITH THE RCM	
• Ignition ON. • **NOTE:** The Network Test does not test the dedicated CAN communications between the ABS module and RCM . • Using a scan tool, carry out the Network Test. • **Does the RCM pass the Network Test?**	**Yes** GO to J2 . **No** REFER to Section 418-00 to diagnose the RCM does not respond to scan tool.
J2 CHECK THE DEDICATED CAN CIRCUITS FOR A SHORT TO VOLTAGE	
• **⚠ 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.** • Depower the SRS . Refer to Refer to Supplemental Restraint System (SRS) Depowering and Repowering Section 501-20B . • Disconnect: ABS Module C135 . • Disconnect: RCM C310A .	**Yes** REPAIR the affected circuit(s) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. GO to J10 . **No** GO to J3 .

• Disconnect: RCM C310B . • Ignition ON. • Measure the voltage between ground and: ♦ ABS module C135-19, circuit VCA24 (GN/OG), harness side. ♦ ABS module C135-18, circuit VCA23 (BU/WH), harness side.  N0113369 • **Is any voltage present?**	
J3 CHECK THE DEDICATED CAN CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between ground and: ♦ ABS module C135-19, circuit VCA24 (GN/OG), harness side. ♦ ABS module C135-18, circuit VCA23 (BU/WH), harness side.  N0113371 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to J4 . **No** REPAIR the affected circuit(s). TEST the system for normal operation. GO to J10 .
J4 CHECK THE DEDICATED CAN CIRCUITS FOR A SHORT TOGETHER	
• Measure the resistance between ABS module C135-19, circuit VCA24 (GN/OG), harness side and ABS module C135-18, circuit VCA23 (BU/WH), harness side.  N0113372	**Yes** GO to J5 . **No** REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test. GO to J10 .

• **Are the resistances greater than 10,000 ohms?**	
J5 CHECK THE DEDICATED CAN CIRCUITS FOR AN OPEN	
• Measure the resistance between the ABS module C135, harness side and the RCM C310B, harness side as indicated in the following chart: **ABS Module / Circuit / RCM** C135-18 / VCA23 (BU/WH) / C310B-20 C135-19 / VCA24 (GN/OG) / C310B-19  N0113370 • **Are the resistances less than 5 ohms?**	**Yes** GO to J6 . **No** REPAIR the affected circuit(s). CLEAR the DTCs. CYCLE the ignition key. REPEAT the self-test. GO to J10 .
J6 CHECK RCM TERMINATING RESISTOR	
• Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B Connector Position Assurance (CPA) lever/lock for correct operation. Refer to RCM in Section 501-20B . ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: RCM C310A . • Connect: RCM C310B .	**Yes** GO to J7 . **No** GO to J8 .

• Measure the resistance between ABS module C135-19, circuit VCA24 (GN/OG), harness side and ABS module C135-18, circuit VCA23 (BU/WH), harness side.  N0113372 • **Is the resistance between 108 and 132 ohms?**	
J7 CHECK THE ABS MODULE FOR CORRECT OPERATION	
• Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to RCM in Section 501-20B . ♦ inspect ABS module C135 for dirt, corrosion, water intrusion, pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s) . • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module . • **Was DTC U0151 retrieved on-demand during the self-test?**	**Yes** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. GO to J10 . **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. GO to J10 .
J8 CONFIRM THE RCM FAULT	

NOTE: Make sure all restraint system components, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self-test. If not, DTCs will be recorded. • If previously directed to repower the SRS , depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Prior to reconnecting any previously disconnected SRS component: ♦ inspect connector(s) (including any in-line connectors) for pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ inspect RCM C310A and C310B CPA lever/lock for correct operation. Refer to RCM Removal and Installation in Section 501-20B . ♦ inspect ABS module C135 for dirt, corrosion, water intrusion, pushed-out, loose or spread terminals and loose or frayed wire connections at terminals. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s) . • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Enter the following diagnostic mode on the scan tool: Self Test - RCM . • **Were DTCs U0028:08 and/or U0028:88 retrieved on-demand during self-test?**	**Yes** INSTALL a new RCM . REFER to Section 501-20B . GO to J10 . **No** In the process of diagnosing the fault, the fault condition has become intermittent. CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harss and cycling the ignition 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.** GO to J9 .
J9 CHECK FOR AN INTERMITTENT FAULT	
• Ignition OFF. • Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Disconnect RCM C310B and ABS module C135: ♦ inspect connector(s) (including any in-line connectors) for corrosion,	**Yes** REFER to the Restraints Control Module (RCM) DTC Chart in Section 501-20B . **No** The fault is not present and cannot be recreated at this time. **Do not install any new SRS components at this time. SRS components should only be installed when directed to do so**

loose or spread terminals and loose or frayed wire connections at terminals. ♦ inspect wire harness for any damage, pinched, cut or pierced wires. ♦ repair any concerns found. Refer to Wiring Diagrams Cell 5 , Connector Repair Procedures for schematic and connector information. • Connect: All Previously Disconnected Component(s)/Connector(s) . • Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - RCM . • **Are any RCM DTCs retrieved on-demand during the self-test?**	**in the pinpoint test.** GO to J10 .
J10 CHECK FOR ADDITIONAL SRS DTCs	
• Ignition OFF. • ⚠ **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.** • Reconnect all SRS components (if previously disconnected). ♦ If previously directed to depower the SRS , repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . • Ignition ON. • Using a scan tool, clear all RCM CMDTCs . • Enter the following diagnostic mode on the scan tool: Self Test - RCM span> . • **Were any DTCs retrieved on-demand from the RCM during self-test?**	**Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the appropriate DTC Chart in this section and/or Section 501-20B for pinpoint test direction. **No** CLEAR all CMDTCs . PROVE OUT the SRS . REFER to Supplemental Restraint System (SRS) Depowering and Repowering in Section 501-20B . Repair is complete. RETURN the vehicle to the customer.

Pinpoint Test K: DTC U3002:62

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

When the ignition is turned to the RUN position, the ABS module and the IPC share Vehicle Identification Number (VIN) information over the High Speed Controller Area Network (HS-CAN) bus. Correct any network communications DTCs prior to diagnosing DTC U3002:62

- DTC U3002:62 (Vehicle Identification Number: Signal Compare Failure) - this DTC sets when the VIN message sent by the IPC over the HS-CAN does not match the VIN stored in the ABS module.

This pinpoint test is intended to diagnose the following:
- Module configuration (ABS and IPC)
- ABS module

PINPOINT TEST K: DTC U3002:62

Test Step	Result / Action to Te
K1 VERIFY IPC VIN	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Log Viewer. • Compare the VIN in Log Viewer to the vehicle VIN plate. • **Does VIN in Log Viewer match the vehicle VIN plate?**	**Yes** GO to K2 . **No** CARRY OUT Programmable Module Installation (PMI) for the IPC . REFER to Section 418-01 . TEST the system for normal operation.
K2 VERIFY ABS MODULE PART NUMBER	
• Retrieve and record the ABS module part number from Log Viewer and verify that the vehicle has the correct ABS module installed. • **Is the correct ABS module installed in the vehicle?**	**Yes** CARRY OUT PMI for the ABS module. Refer to Section 418-01 . TEST the system for normal operation. **No** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. CLEAR the DTC. CYCLE the ignition key. REPEAT the self-test.

Pinpoint Test L: DTCs U3003:16, U3003:17

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Normal Operation

The operating voltage required to supply the ABS module, hydraulic pump and isolation valves is in a range between 10 and 16 volts.

- DTC U3003:16 (Battery Voltage: Circuit Voltage Below Threshold) - this DTC sets if the voltage supplied to the ABS module falls below 10 volts during the ABS module self-test or normal operation, with vehicle speed greater than 5 km/h (3 mph.
- DTC U3003:17 (Battery Voltage: Circuit Voltage Above Threshold) - this DTC sets if the voltage supplied to the ABS module is greater than 17 volts during the ABS module self-test or normal

operation, with vehicle speed greater than 5 km/h (3 mph.

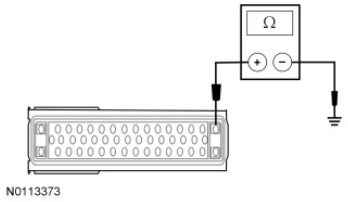
This pinpoint test is intended to diagnose the following:
- Module configuration (ABS and PCM)
- ABS module

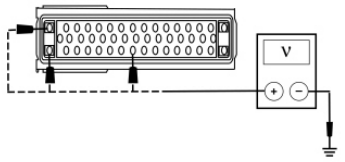
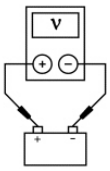
PINPOINT TEST L: DTCs U3003:16 AND U3003:17

NOTE: DTCs U3003:16 and U3003:17 can set if the vehicle has been recently jump started, the 12-volt battery has been recently charged or the 12-volt battery has been discharged. The 12-volt 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
L1 RETRIALL CMDTCs IN ALL MODULES	
• Connect: ABS Module C135. • Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - CMDTCs . • **Are there battery, voltage or charging system DTCs present in more than one module?**	**Yes** REFER to Section 414-00 for diagnosis of the battery and charging system. **No** For ABS DTC U3003:16 GO to L2 . For ABS DTC U3003:17 GO to L6
L2 CHECK BATTERY CONDITION	
• Ignition OFF. • fer to Section 414-01 and carry out the Battery - Condition Test. • **Does the battery pass the condition test?**	**Yes** If the battery passed the condition test but required a recharge, REFER to Section 414-00 to diagnose the charging system. CLEAR all Continuous Memory Diagnostic Trouble Codes (CMDTCs). TEST the system for normal operation. If the battery passed the condition test and did not require a recharge, GO to L3 . **No** INSTALL a new battery. CLEAR all CMDTCs . TEST the system for normal operation.
L3 CHECK THE ABS MODULE GROUND EYELET	
• Ignition OFF. • Remove the bolt retaining G107/G108 at the inner RF fender. ♦ Clean thchassis mating surface and ground eyelets. ♦ Install the ground eyelet to the chassis with the retaining bolt.	**Yes** GO to L4 . **No** The concern was caused by a loose or corroded connector. CLEAR the DTCs. REPEAT self-test.

• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - ABS Module. • **Is the concern still present?**	
L4 CHECK THE ABS MODULE GROUND CIRCUIT FOR AN OPEN	
NOTE: Failure to disconnect the battery when instructed results in false resistance readings. Refer to Section 414-01 • Ignition OFF. • Disconnect: Battery Cable - Negative. • Disconnect: ABS Module C135. • Measure the resistance between ground and: ♦ ABS module C135-47, circuit GD123 (BK/GY), harness side. ♦ Repeat this measurement while wiggling the harness.  N0113373 • **Is the resistance less than 5 ohms?**	**Yes** GO to L5 . **No** The concern was caused by a loose or corroded connector. CLEAR the DTCs. REPEAT self-test.
L5 CHECK FOR VOLTAGE AT THE ABS MODULE	
• Connect: Battery Cable - Negative. • Ignition ON. • Measure the voltage between ground and: ♦ ABS module C135-1, SBB01 (RD), harness side. ♦ ABS module C135-8, CBP22 (GN/OG), harness side. ♦ ABS module C135-32, SBB28 (GN/RD), harness side.	**Yes** GO to L6 . **No** VERIFY that BJB fuses 1 (40A), and 9 (20A) and CJB 22 (7.5A) are OK. If OK, REPAIR the affected circuit(s). If the fuses are not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs and REPEAT the self-test.

 N0113375 • **Are the voltages greater than 10 volts?**	
L6 CHECK CHARGING SYSTEM VOLTAGE	
• Start the engine. • Measure the voltage of the battery with and without a load on the charging system as follows: ♦ Turn off all accessories and measure battery voltage. ♦ Turn on headlights and HVAC fan on high and measure battery voltage.  AJ0210-A • **Are the voltages between 13 and 15.2 volts?**	**Yes** GO to L7 . **No** REFER to Section 414-00 to diagnose the charging system. CLEAR all CMDTCs . TEST the system for normal operation.
L7 CHECK FOR CORRECT ABS MODULE OPERATION	
• Ignition OFF. • Disconnect: ABS Module C135. • Check for: ♦ corrosion ♦ pushed-out pins ♦ spread terminals • Connect: ABS Module C135. • Make sure the connector seats correctly, then operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ABS module. REFER to Hydraulic Control Unit (HCU) in this section. 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. CLEAR the DTCs. REPEAT the self-test.

Brake Pedal Switch Adjustment

NOTICE: **Do not press the brake pedal when installing or removing the brake pedal position switch or damage to the brake pedal-mounted switches can occur.**

1. Inspect both brake pedal position switches and brake pedal assembly to verify there is no brake pedal pressure unintentionally applied due to incorrect brake pedal position switch or brake pedal installation.
    - Correct any concerns before proceeding to the next step.

2. Confirm that all fasteners retaining the brake pedal assembly are correctly tightened. For additional information, refer to Section 206-06 .

3. Using the Integrated Diagnostic System (IDS) scan tool, select DataLogger->Chassis->Braking->Brake Switch Parameters.

4. **NOTE:** Using the scan tool record function makes it easier to observe the brake pressure sensor readings.

   Turn the ignition to the ON position.

5. Slowly apply the brake pedal to generate the pressure graph for the BPS PID.
    - The rate of brake pedal apply must not exceed 5 psi per second as indicated by the scan tool.

6. Record the initial value of the BPS PID when BRAKE_LAMP and CRUISE_CANCL change from OFF to ON.
    - If BRAKE_LAMP and CRUISE_CANCL transition to ON before the BPS PID reads 44 psi or less, the brake pedal position switch is correctly installed.
    - If BRAKE_LAMP and CRUISE_CANCL transition to ON after the BPS PID reads greater than 44 psi, replace the stoplamp switch and cruise control deactivation switch (if equipped). Clear all DTCs and repeat Steps 3-6 to verify that the BRAKE_LAMP and CRUISE_CANCL transition to ON before the BPS PID reads 44 psi or less.

Hydraulic Control Unit (HCU)

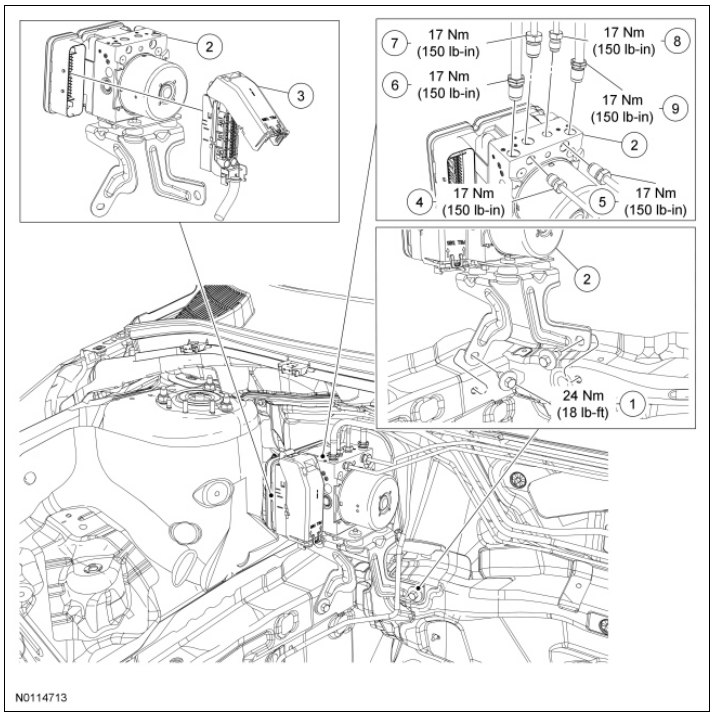
Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

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

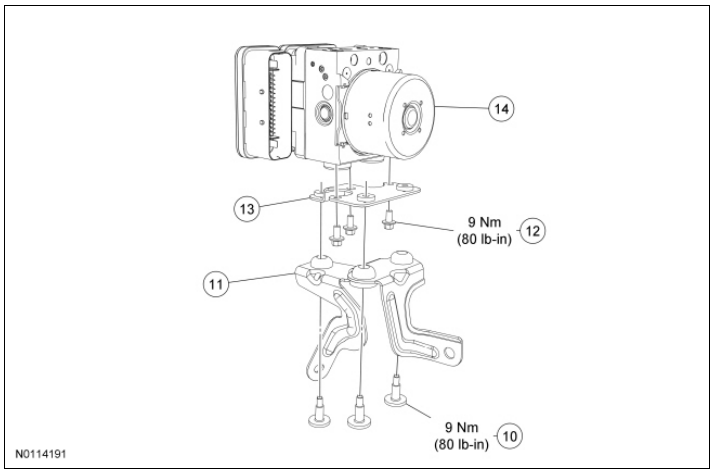
Hydraulic Control Unit (HCU), Brake Tubes, Electrical Connector and Bracket



Item	Part Number	Description
1	W706859	Hydraulic Control Unit (HCU) bracket-to-frame bolt (2 required)
2	2C405	HCU /ABS module assembly

3	-	HCU /ABS module electrical connector (part of 14A464)
4	-	RH rear brake tube fitting (part of 2C294)
5	-	LH rear brake tube fitting (part of 2C295)
6	-	Master cylinder primary brake tube fitting (part of 2M020)
7	-	LH front brake tube fitting (part of 2264)
8	-	RH front brake tube fitting (part of 2263)
9	-	Master cylinder secondary brake tube fitting (part of 2M019)

Hydraulic Control Unit (HCU) and Brackets



Item	Part Number	Description
10	W703244	Hydraulic Control Unit (HCU) support plate-to-bracket bolt (3 required)
11	2C304	HCU bracket
12	W500011	HCU -to-support plate bolt (3 required) r valign="top">
13	2C325	HCU support plate
14	2C405	HCU /ABS module assembly

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.**

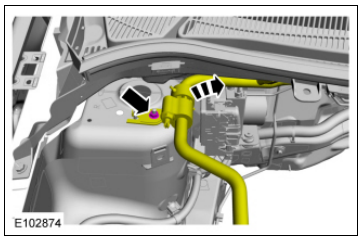
NOTE: The Hydraulic Control Unit (HCU) and ABS module are serviced as an assembly.

1. If installing a new HCU /ABS module, connect the scan tool and upload the module configuration information from the ABS module. For additional information, refer to Section 418-01 .

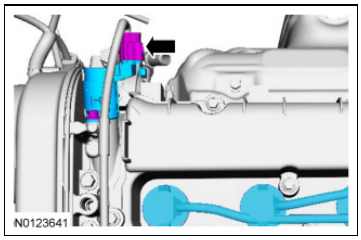
2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

3. Remove the 2 HCU bracket-to-frame bolts.
   - To install, tighten to 24 Nm (18 lb-ft).

4. Remove the nut and evaporator outlet tube bracket.
   - To install, tighten to 8 Nm (71 lb-in).



5. Disconnect the exhaust camshaft Variable Camshaft Timing (VCT) oil control solenoid electrical connector.



6. **NOTE:** Cap the brake tube connections to prevent fluid loss or dirt contamination.

   Disconnect the 6 brake tubes from the HCU .

   - To install, tighten the brake tube fittings to 17 Nm (150 lb-in).

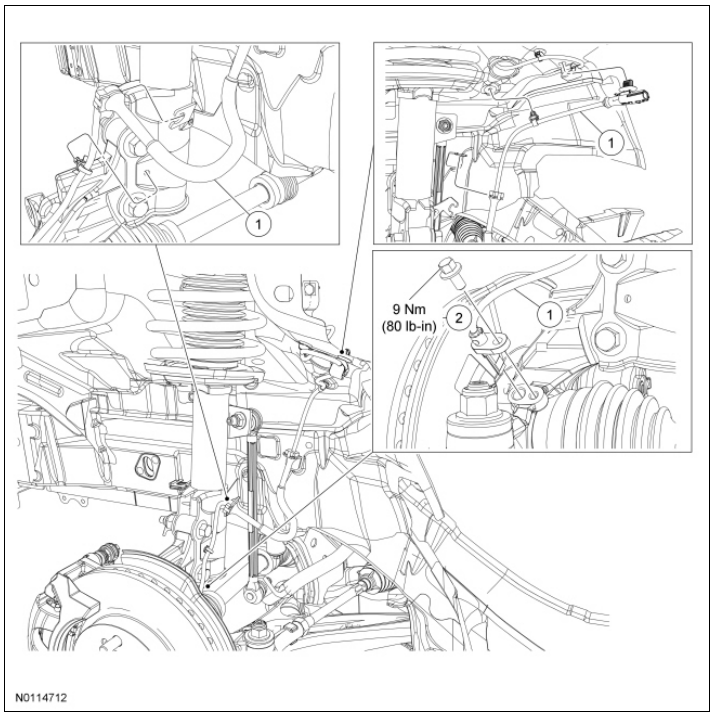
7. Disconnect the HCU /ABS module electrical connector.

8. Position the HCU to the center line of the vehicle and remove the HCU .

9. To install, reverse the removal procedure.
   1. If a new HCU /ABS module was installed, download the module configuration information from the scan tool. For additional information, refer to Section 418-01 .
   2. Bleed the brake system. For additional information, refer to Section 206-00 .

Wheel Speed Sensor - Front

NOTE: LH shown, RH similar.

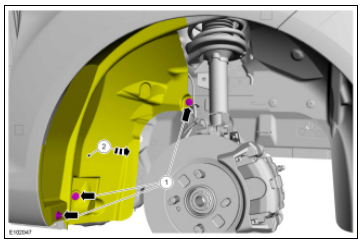


Item	Part Number	Description
1	2C204	Wheel speed sensor
2	W500011	Wheel speed sensor bolt

Removal and Installation

1. Remove the wheel and tire. For additional information, refer to Section 204-04 .

2. Position the rear portion of the splash shield aside.
    1. Remove the 3 pushpin retainers.
    2. Position the splash shield aside.



3. Disconnect the wheel speed sensor electrical connector.

4. Detach the wheel speed sensor from the body and wheel knuckle/li>

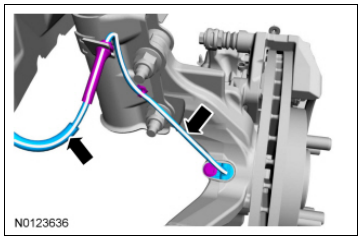
5. Remove the wheel speed sensor bolt.

- To install, tighten to 9 Nm (80 lb-in).

6. Remove the wheel speed sensor.

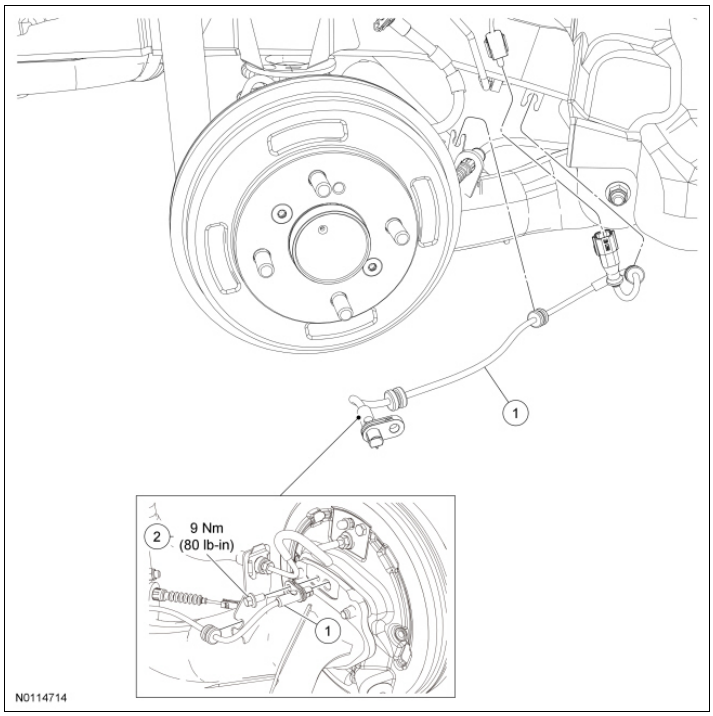
7. ***NOTICE:*** **The white stripe on the wheel speed sensor harness is used for orientation purposes. Correct routing of the wheel speed sensor and harness is essential to prevent contact damage to the harness.**

   To install, reverse the removal procedure.



Wheel Speed Sensor - Rear

NOTE: RH shown, LH similar. Wheel and tire removed for clarity.



Item	Part Number	Description
1	2C204	Wheel speed sensor
2	W500011	Wheel speed sensor bolt (also part of 2C204)

Removal and Installation

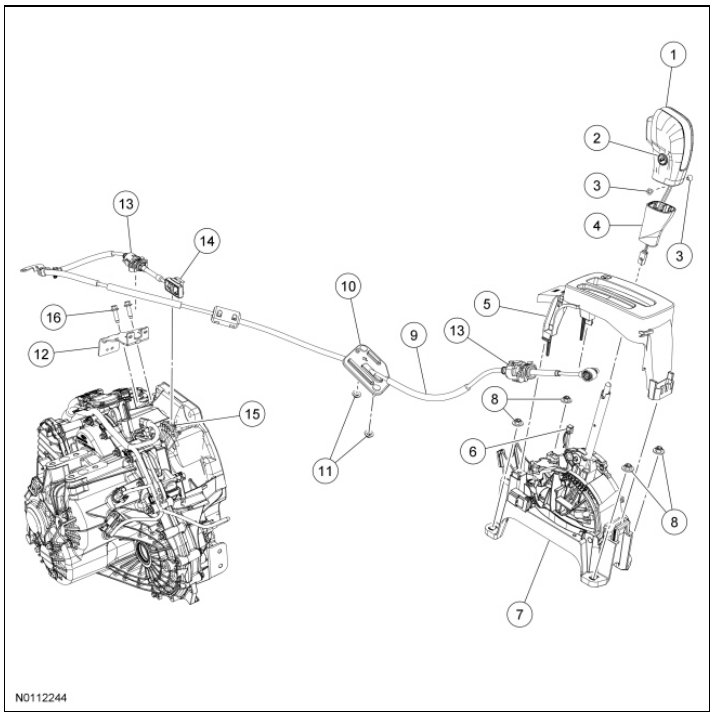
1. Refer to exploded view(s) and any Warnings, Notices, Notes, Materials, Specifications and Special Tools. Items in the exploded views may not be listed in order of removal.

Torque Specifications

Description	Nm	lb-ft	lb-in
Battery tray bolts	10	-	89
Cross brace bolts	40	30	-
Exhaust flange nuts	47	35	-
Selector lever nuts	9	-	80
Selector lever cable bracket-to-battery tray bolt	10	-	89
Selector lever cable bracket-to-transaxle bolt	25	18	-
Selector lever cable grommet nuts	9	-	80
Selector lever knob screws	2	-	18

External Controls

Exploded View



Item	Part Number	Description
1	7L010	Selector lever knob
2	-	Transmission Control Switch (TCS) (part of 7L010)
3	-	Selector lever knob screws (part of 7L010) (2 required)
4	-	Selector lever knob bezel (part of 7L010)
5	7E034	Selector lever lower bezel
6	-	Brake Shift Interlock Actuator (BSIA) (part of 7210)
7	7210	Selector lever
8	W711470-S441	Selector lever nuts (4 required)
9	7E395	Selector lever cable
10	57809	Selector lever cable grommet
11	W702751-S437	Selector lever cable grommet nuts (2 required)
12	7B229	Selector lever cable bracket
13	7H181	Selector lever cable clip
14	-	Selector lever cable adjuster (part of 7E395)
15	7A256	Manual control lever
16	W714072-S437	Selector lever cable bracket bolts (2 required)

External Controls

The transaxle external controls system consists of the following components:

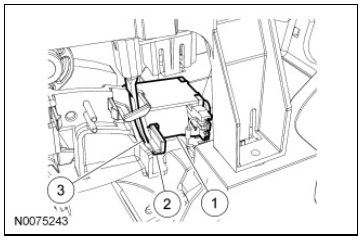
- Selector lever assembly
- Selector lever cable and bracket
- Brake Shift Interlock Actuator (BSIA)
- Transmission Control Switch (TCS)

The selector lever controls the transaxle gear selection through the selector lever cable. When the selector lever is moved to the desired mode of operation it moves the selector lever cable which moves the manual conton the transaxle. This results in the desired gear selection. The selector lever knob controls the cable detent and selector lever locking position.

Range Selection

Range Positions		
P	Park	In the PARK position, • there is no power flow through the transaxle. • the parking pawl locks the final drive. • the engine may be started. • the ignition key may be removed.
R	Reverse	In the REVERSE position, • the vehicle may be operated in a rearward direction, at a reduced rear ratio. • engine braking occurs.
N	Neutral	In the NEUTRAL position, • the vehicle is able to roll. • there is no power flow through the transaxle. • the output shaft is not held and is free to turn. • the engine may be started.
D	Drive position with Grade Assist	DRIVE is the normal position for most forward driving. The DRIVE position provides • automatic shifts -1st through 6th gears. • maximum fuel economy during normal operation.
L	Manual Low	Manual L position allows for 1st gear when the vehicle reaches slower speeds. This position provides • maximum engine braking. i>downshifts to the lowest available gear for the current vehicle speed.

Brake Shift Interlock Actuator (BSIA)



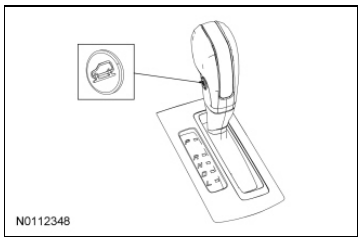
Item	Part Number	Description
1	-	Actuator (part of 7210)
2	-	Blocker (part of 7210)
3	-	Manual release mechanism (part of 7210)

Location

The BSIA is part of the selector lever assembly.

The brake shift interlock system prevents the selector lever from being moved out of PARK unless the requirements to do so are met. The ignition switch must be in the ON position and the brake pedal must be pressed. The brake pedal position is detected by the Brake Pedal Position (BPP) switch. In the event the vehicle will not come out of PARK, the manual release mechanism mechanically bypasses the electric portion of the brake shift interlock system allowing the selector lever to be moved out of PARK. The manual release mechanism is part of the selector lever assembly. If PARK is selected again, the selector lever will be locked again.

Drive with Grade Assist



Drive with Overdrive (O/D) cancel and grade assist is activated when the Transmission Control Switch (TCS) is pressed. The TCS is located on the selector lever knob. When the TCS is pressed, the 6th gear or O/D upshift is prevented or the transaxle shifts down to 5th gear. The TCS is meant to be used when driving conditions cause excessive shifting from 6th to other gears such as hilly terrain, mountainous areas or when engine braking is required.

Grade Assist

- O/D is cancelled.
- The transaxle operates in gears 1 through 5.
- The Grade Assist lamp illuminates on the Instrument Panel Cluster (IPC).
- Improves vehicle handling in hilly terrain or mountainous areas by providing engine braking and extending lower gear operation on uphill climbs.
- Provides additional engine braking through the automatic transaxle shift strategy which reacts to vehicle inputs (vehicle acceleration, accelerator pedal, brake pedal and vehicle speed).
- The transaxle selects gears that provide the desired engine braking which is based on the vehicle inputs. Engine braking increases engine rpm.

Returning to DRIVE mode on flat terrain provides the best fuel economy and transaxle performance. The transaxle returns to O/D when the TCS is pressed again or the key is turned OFF.

Gear Availability

MANUAL LEVER POSITION	TRANSAXLE GEAR OPERATION	DESCRIPTION
P	Park	Forward or reverse gears not available. Final drive is held to the transaxle case.
R	Reverse	Transaxle allows reverse only.
N	Neutral	Forward or reverse gears not available. Final drive moves freely.
D	1 ⇆ 2 ⇆ 3 ⇆ 4 ⇆ 5 ⇆ 6	6 forward gears are available. Gears are dependent on vehicle speed and throttle position with coast braking.
D Grade Assist	1 ⇆ 2 ⇆ 3 ⇆ 4 ⇆ 5 ← 6	1st through 5th gears are available. Transaxle shifts to 5th gear if button is pressed when the transaxle is in 6th gear. Transaxle provides engine braking.
L	1 ← 2 ← 3 ← 4 ← 5 ← 6	1st gear hold with engine braking, the transaxle downshifts to 1st gear when L is selected above a calibrated speed under minimum to moderate accelerator pedal position.

N0118514

External Controls

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

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom. GO to Symptom Chart - External Controls or GO to Symptom Chart - NVH .

Visual Inspection Chart

Mechanical	Electrical
• Selector lever cable • Manual control lever • Selector lever or selector lever knob	• Central Junction Box (CJB) fuse 18 (10A) • CJB fuse 22 (7.5A) • Connections • Wiring harness • Brake Pedal Position (BPP) switch • Brake Shift Interlock Actuator (BSIA) • Transmission Control Switch (TCS)

DTC Chart

DTC	Component	Description	Condition	Symptom	Action
B2572	Brake Shift Interlock	Brake Shift Interlock Output Circuit Failure	The associated circuitry connected to the Central Junction Box (CJB) or fuse, or the CJB itself may have an issue causing a brake shift interlock concern.	Brake shift interlock is inoperative or does not operate correctly.	GO to Pinpoint Test A .

PID Chart

PIDs	PID Description
BOO TCM	Brake Switch Input Status
TCS_DEPRES	Transmission Control Switch Depressed
TCS_STATE	Transmission Control Switch State
TR_A_DC	Transmission Range Sensor Input A Duty Cycle
TR_A_POS_MEAS	Transmission Range Sensor A Position - Measured
TR_A_UR	Transmission Range Sensor Input A Unreliable
TR_B_DC	Transmission Range Sensor Input B Duty Cycle
TR_POS_MEAS	Transmission Range Sensor B Position - Measured
TR_B_UR	Transmission Range Sensor Input B Unreliable
TR_CORRECTED	Transmission Range Sensor Position - Corrected
TR_CRANK	Transmission Range Input Allowing Engine Start
TR_CRANK_F	Park Neutral Starter Enable Output Fault Detected
TR_SUPPLY_f	Transmission Range Supply Voltage Output Fault
TRAN_RAT	Transmission Gear Ratio

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.

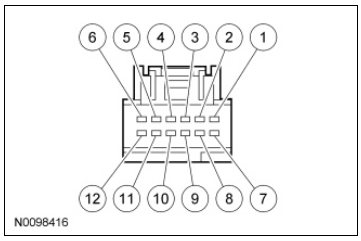
ConditionPossible SourcesAction

- Vibration - a high frequency (20-80 Hz) that is felt through the seat or selector lever. Changes with engine speed

- Selector lever cable incorrectly routed, grounded out or loose
- CHECK the selector lever cable. REPAIR as necessary.

Electrical Connectors

Selector Lever Harness C3245 (Vehicle Harness Side)



Pin Number	Circuit	Circuit Function
1	CCA26 (BU/GY)	Brake Shift Interlock Actuator (BSIA) solenoid power circuit
2	CDC41 (WH/BN)	Park position signal to ignition switch
3	-	Park position signal to Instrument Panel Cluster (IPC)
4	CLN04 (BU/BN)	Power to PRNDL LED Illumination
5	GD115 (BK/GY)	Ground
6	CBP22 (GN/OG)	Transmission Control Switch (TCS)/Grade Assist button power supply from Central Junction Box (CJB)
7	CE417 (GY/BN)	TCS /Grade Assist button signal return
8		Empty
9		Empty
10		Empty
11		Empty
12	CTE53 (BU/OG)	BSIA solenoid ground

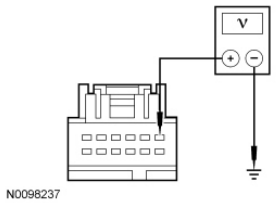
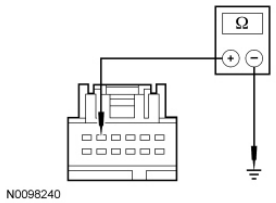
Pinpoint Tests

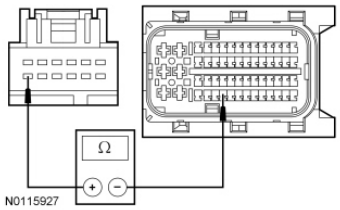
Pinpoint Test A: The Brake Shift Interlock System Does Not Release/Lock Correctly

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.

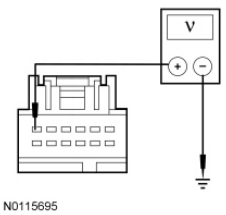
PINPOINT TEST A: THE BRAKE SHIFT INTERLOCK SYSTEM DOES NOT RELEASE/LOCK CORRECTLY

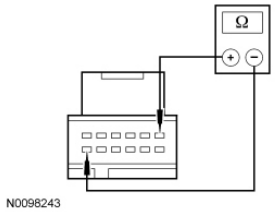
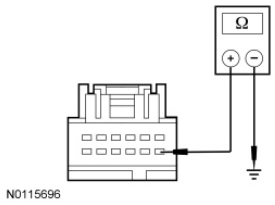
Test Step	Result / Action to Take
A1 TEST THE BRAKE LIGHTS	
• Apply the brake pedal and view the brake lights. • **Do the brake lights illuminate?**	**Yes** GO to A2 . **No** REFER to Section 417-01 .
A2 TEST THE BSIA POWER CIRCUIT	
• Disconnect: Selector Lever Harness C3245. • Ignition ON. • Measure the voltage between selector lever harness C3245-1, circuit CCA26 (BU/GY), vehicle harness side and ground, while applying the brake pedal.  N0098237 • **Is the voltage greater than 10 volts?**	**Yes** GO to A3 . **No** REPAIR circuit CCA26 (BU/GY) for an open.
A3 TEST THE TCM	
• Ignition OFF. • Measure the resistance between selector lever harness C3245-5 circuit GD115 (BK/GY) and ground.  N0098240 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new selector lever. REFER to Selector Lever in this section. **No** GO to A4 .
A4 TEST THE BSIA GROUND CIRCUIT	
• Disconnect: Transmission Control Module (TCM) C1ET02. • Measure the resistance between selector lever harness C3245-12 and C1ET02-49.	**Yes** INSTALL a new TCM . **No** REPAIR circuit CET53 (BU/OG) for an open.

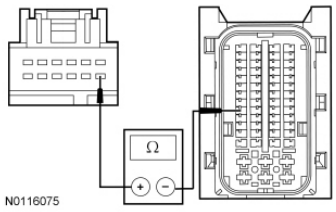
 • **Is the resistance less than 5 ohms?**	

Pinpoint Test B: Transmission Control Switch (TCS) Does Not Operate Correctly

PINPOINT TEST B: TCS DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
B1 TEST THE IPC	
• Connect the scan tool. • Using the scan tool, monitor the TCS_DEPRES PID while cycling the Transmission Control Switch (TCS). • **Does the TCS_DEPRES PID cycle from DEPRESSED to NOT DEPRESSED?**	**Yes** REFER to Section 413-01 . **No** GO to B2 .
B2 CHECK CJB FUSE 22 (7.5A)	
• Ignition OFF. • Check fuse: Central Junction Box (CJB) 22 (7.5A). • **Is the resistance less than 5 ohms?**	**Yes** GO to B3 . **No** GO to B4 .
B3 CHECK FOR VOLTAGE AT THE SELECTOR LEVER CONNECTOR	
• Disconnect: Selector Lever Harness C3245. • Ignition ON. • Measure the voltage between selector lever harness C3245-6, circuit CBP22 (GN/OG), vehicle harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** GO to B4 . **No** REPAIR circuit CBP22 (GN/OG). RECONNECT all components. TEST the system for normal operation.

B4 TEST THE TCS	
• Measure the resistance between selector lever harness C3245 pins 6 and 7, component side, while cycling the TCS .  • **Is the resistance less than 5 ohms when pressed and greater than 10,000 ohms when released?**	**Yes** GO to B5 . **No** INSPECT the selector lever wiring harness for damage. REPAIR the wiring harness as required. If the selector lever wiring harness is not damaged, INSTALL a new selector lever knob. REFER to Selector Lever Knob in this section. TEST the system for normal operation.
B5 TEST THE TCS SIGNAL CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: Transmission Control Module (TCM) C1ET02. • Measure the resistance between selector lever harness C3245-7, circuit CE417 (GY/BN) and ground.  • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to B6 . **No** REPAIR circuit CE417 (GY/BN) for a short to ground. TEST the system for normal operation.
B6 TEST THE TCS SIGNAL CIRCUIT FOR AN OPEN CIRCUIT	
• Measure the resistance between selector lever harness C3245-7, circuit CE417 (GY/BN) and TCM C1ET02-11.	**Yes** INSTALL a new TCM . REFER to Section 307-11 . **No** REPAIR circuit CE417 (GY/BN) for an open. RECONNECT all components. TEST the system for normal operation.

 • **Is the resistance greater than 10,000 ohms?**	

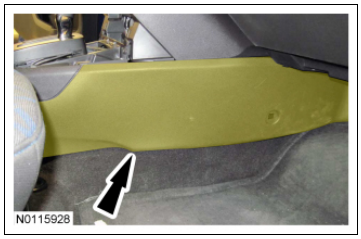
Brake Shift Interlock Override

NOTE: If it is necessary to use the brake shift interlock override procedure to move the selector lever out of the PARK position, it is possible that a fuse has blown and the brake lights are not operational. Before driving the vehicle, verify that the brake lights are working.

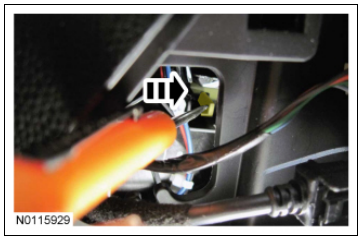
This vehicle is equipped with a brake shift interlock feature that prevents the selector lever from being moved out of PARK when the ignition is in the ON or RUN position unless the brake pedal is depressed.

Perform the following if the selector lever cannot be moved out of the PARK position when the ignition is in the ON position and the brake pedal is depressed:

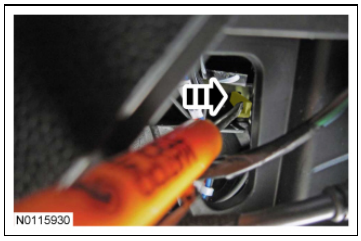
1. Apply the parking brake.
2. Turn the ignition key to the ON position.
3. Remove the center console side panel.



4. Locate the brake shift interlock override mechanism on the Brake Shift Interlock Actuator (BSIA).



5. Using an suitable tool, depress the brake shift interlock override mechanism on the BSIA , apply the brake, depress the button on the selector lever and move the selector lever into NEUTRAL.



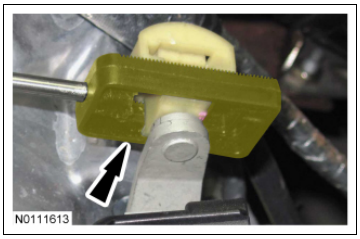
6. Start the vehicle.
7. To install, reverse the procedure.

Selector Lever Cable Adjustment

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

1. Disconnect the selector lever cable end from the manual control lever.


N0111613

2. Place the manual control lever in the D position as indicated on the transaxle case.

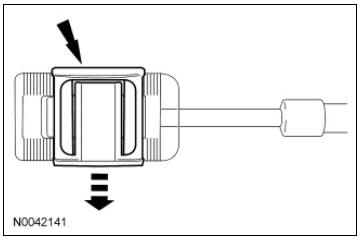
3. Place the manual control lever in the P position as indicated on the transaxle case.

4. Place the manual control lever in the D position as indicated on the transaxle case.

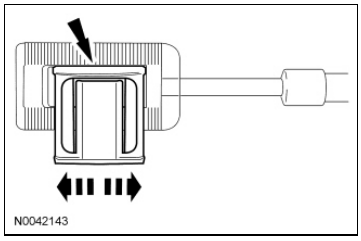
5. Place the selector lever in the D position.


N0111772

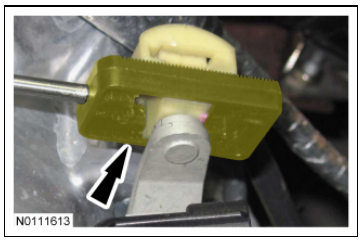
6. Unlock the selector lever cable adjuster by sliding the locking tab over.


N0042141

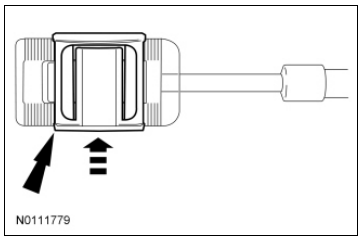
7. Slide the selector lever cable end forward or backward to align it with the manual control lever.



8. With the selector lever cable adjuster locking tab released, connect the selector lever cable end to the manual control lever.



9. Slide the locking tab back to lock the selector lever cable adjuster.

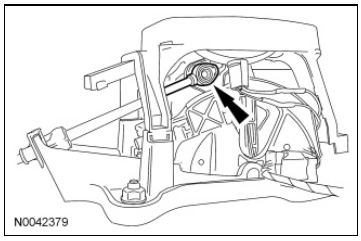


10. Verify that the vehicle only starts in PARK and NEUTRAL and the reverse lamps illuminate in REVERSE.

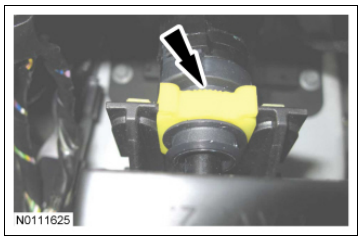
Selector Lever Cable

Removal

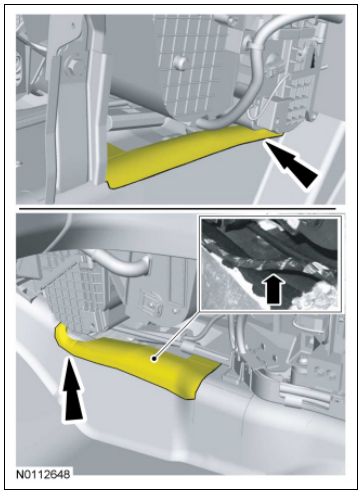
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .
2. Remove the floor console. For additional information, refer to Section 501-12 .
3. Disconnect the selector lever cable end from the selector lever ball stud.



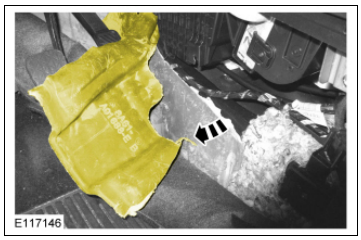
4. Release the locking tab on the selector lever cable clip and remove the selector lever cable from the selector lever housing.



5. Using a suitable tool, cut the carpet in the center under the heater core and evaporator core housing to gain access to the selector lever cable grommet in the following sequence.
    1. Begin cutting the carpet where the selector lever cable is exposed and cut the carpet back until the tool no longer fits between the floor and the heater core and evaporator core housing.
    2. To cut the carpet further forward, access the carpet with the tool through the LH side of the heater core and evaporator core housing.

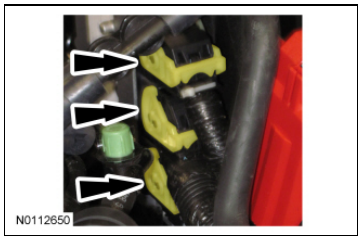


6. Position the carpet aside to access the selector lever cable grommet.

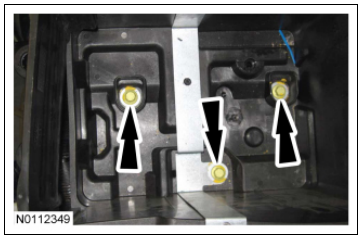


7. Remove the battery. For additional information, refer to Section 414-01 .

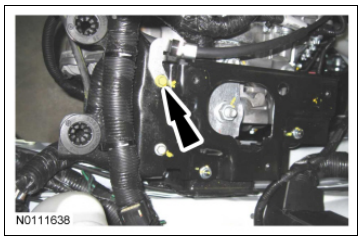
8. Disconnect the 3 PCM electrical connectors.



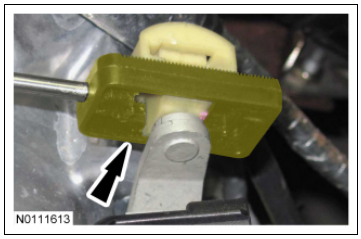
9. Remove the 3 battery tray bolts and the battery tray.



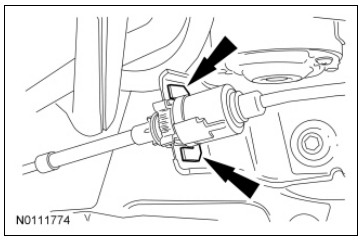
10. Remove the selector lever cable bracket bolt.



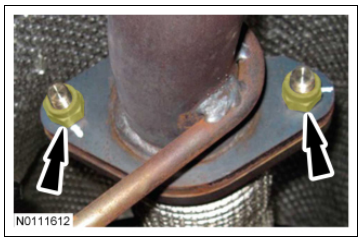
11. Disconnect the selector lever cable end from the manual control lever.



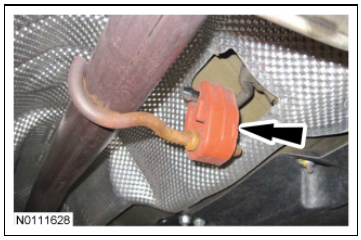
12. Disconnect the selector lever cable from the selector lever cable bracket.

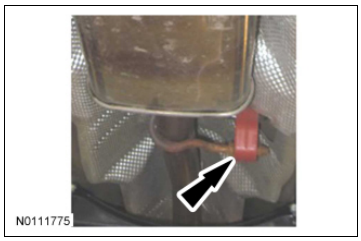


13. Remove and discard the 2 exhaust flange nuts and disconnect the exhaust flange.
    - Discard the exhaust flange gasket.

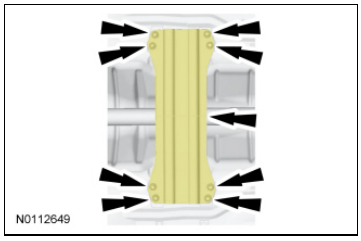


14. Disconnect the exhaust hangers and support the exhaust with wire.

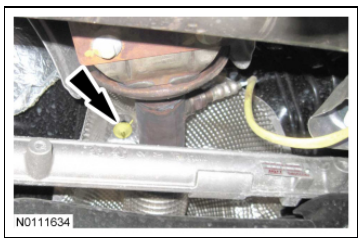


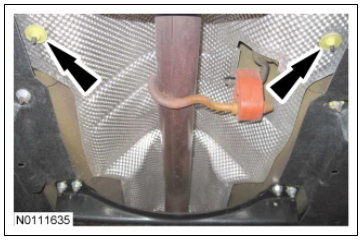


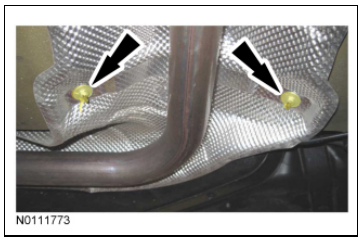
15. Remove the 8 bolts and remove the cross brace.



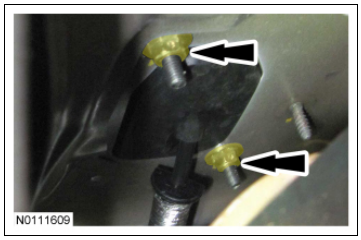
16. Remove the 6 exhaust heat shield fasteners (5 shown) and the exhaust heat shield.







17. Remove the 2 selector lever cable grommet nuts.



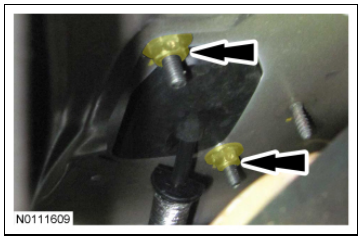
18. **NOTE:** Remove the selector lever cable from outside of the vehicle.

    Remove the selector lever cable.

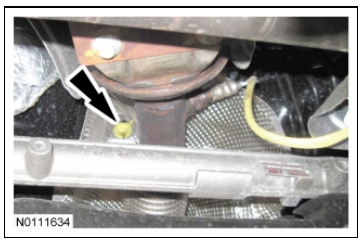
Installation

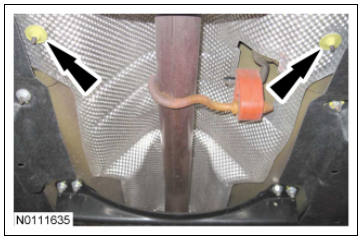
1. Position the selector lever cable grommet in place.

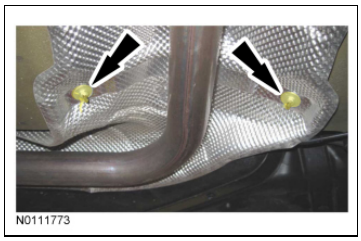
2. Install the 2 selector lever cable grommet nuts.
   - Tighten to 9 Nm (80 lb-in).



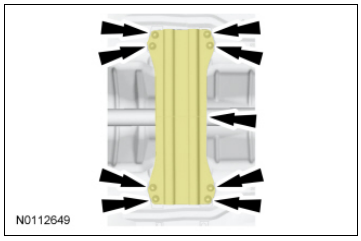
3. Install the exhaust heat shield and the 6 exhaust heat shield fasteners (5 shown).



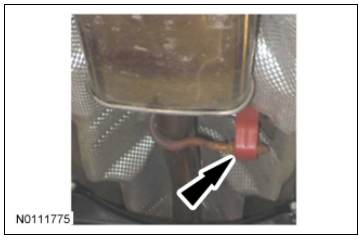


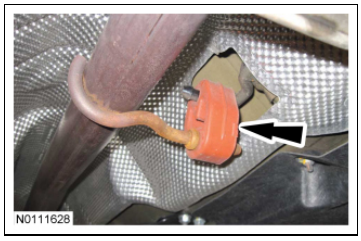


4. Install the cross brace and the 8 cross brace bolts.
   - Tighten to 40 Nm (30 lb-ft).

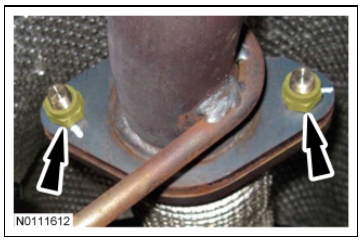


5. Connect the exhaust hangers.

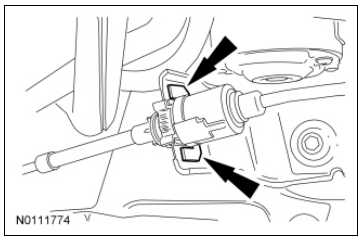




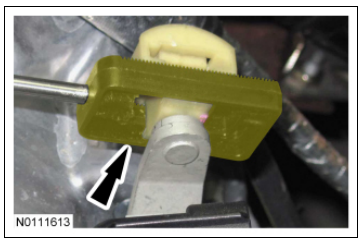
6. Using a new exhaust flange gasket and 2 new exhaust flange nuts, connect the exhaust flange.
    - Tighten to 47 Nm (35 lb-ft).



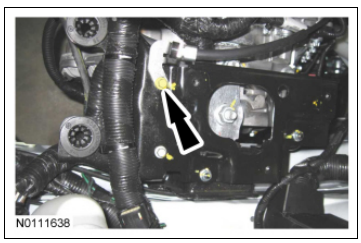
7. Connect the selector lever cable to the selector lever cable bracket.



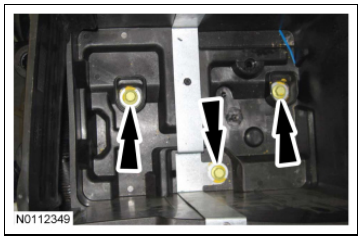
8. Connect the selector lever cable end to the manual control lever.



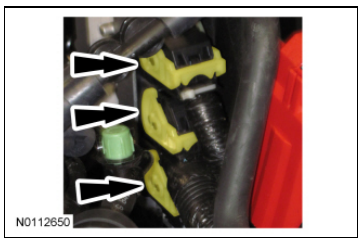
9. Install the selector lever cable bracket bolt.
    - Tighten to 10 Nm (89 lb-in).



10. Install the battery tray and the 3 bolts.
    - Tighten to 10 Nm (89 lb-in).

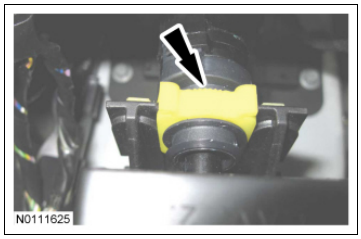


11. Connect the 3 PCM electrical connectors.

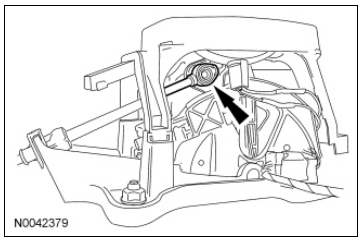


12. Install the battery. For additional information, refer to Section 414-01 .

13. Install the selector lever cable on the selector lever housing.



14. Connect the selector lever cable end to the selector lever ball stud.



15. Position the carpet back in place under the heater core and evaporator core housing.

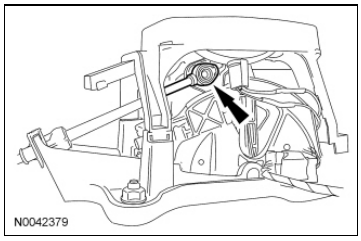
16. Install the floor console. For additional information, refer to Section 501-12 .

17. Adjust the selector lever cable. For additional information, refer to Selector Lever Cable Adjustment in this section.

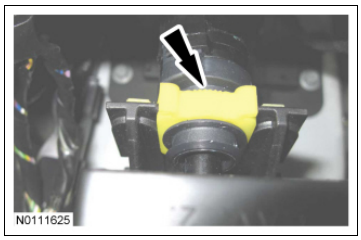
Selector Lever

Removal

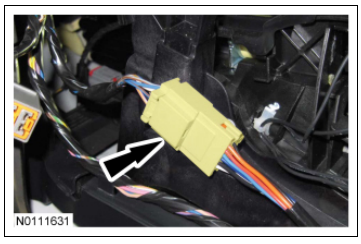
1. Remove the floor console. For additional information, refer to Section 501-12 .
2. Depower the Supplemental Restraint System (SRS). For additional information, refer to Section 501-20B .
3. Disconnect the selector lever cable end from the selector lever ball stud.



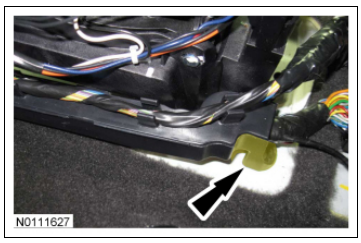
4. Release the locking tab on the selector lever cable clip and remove the selector lever cable from the selector lever housing.



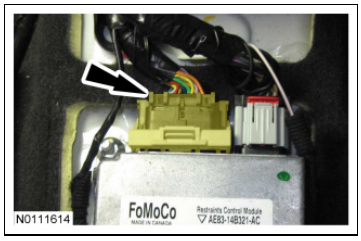
5. Disconnect the selector lever electrical connector.



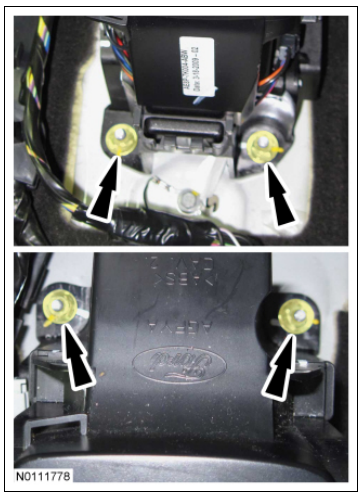
6. Using a suitable tool, remove the wiring harness from the selector lever base.



7. Disconnect the Restraints Control Module (RCM) electrical connector.

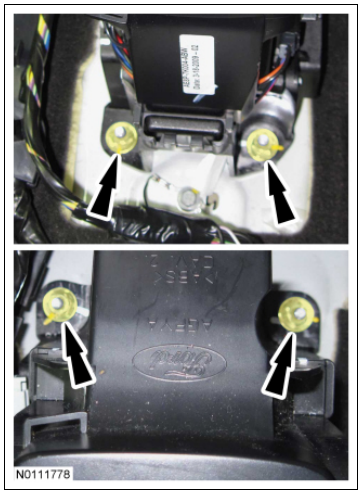


8. Remove the 4 selector lever nuts and remove the selector lever.



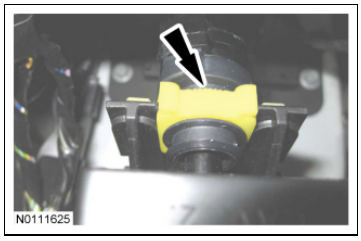
Installation

1. Install the selector lever and the 4 selector lever nuts.
   - Tighten to 9 Nm (80 lb-in).



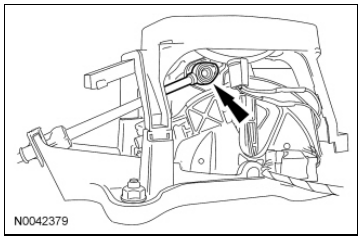
2. **NOTE:** When installing the selector lever cable, make sure the selector lever cable locking tabs are locked in place. Press the selector lever cable into the bracket and listen for the selector lever cable to click in place. Pull back on the selector lever cable to make sure it is locked into the selector lever cable bracket.

   Install the selector lever cable in the selector lever housing.

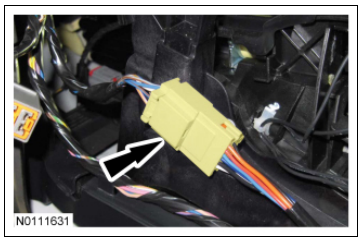


3. **NOTE:** Make sure the selector lever cable end is correctly installed onto the ball stud. Pull back on the selector lever cable end to make sure the selector lever cable end is correctly installed.

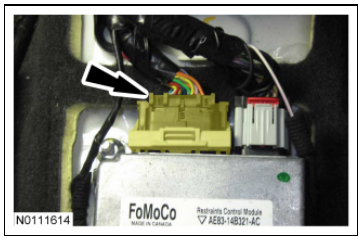
   Connect the selector lever cable end to the selector lever ball stud.



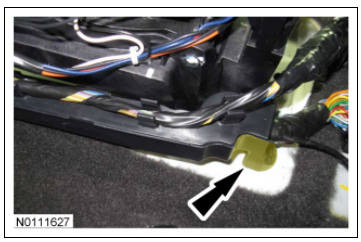
4. Connect the selector lever electrical connector.



5. Connect the RCM electrical connector.



6. Connect the wiring harness to the selector lever base.



7. Install the floor console. For additional information, refer to Section 501-12 .

8. Repower the Supplemental Restraint System (SRS). For additional information, refer to Section 501-20B .

9. Adjust the selector lever cable. For additional information, refer to Selector Lever Cable Adjustment in this section.

Selector Lever Knob

Removal

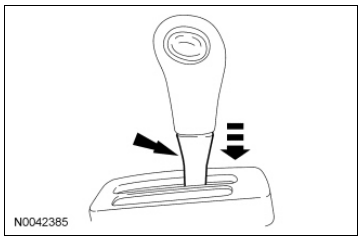
1. Remove the selector lever trim ring.



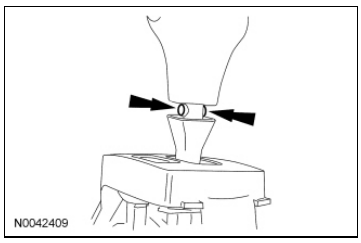
2. Remove the upper console panel.



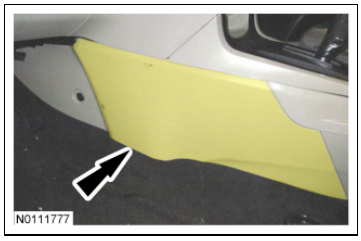
3. Slide the selector lever knob bezel downward.



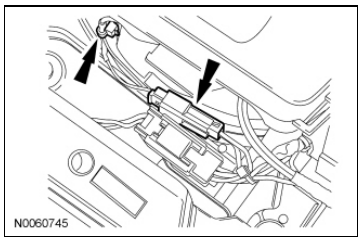
4. Remove and discard the 2 selector lever knob screws.



5. Remove the center console LH panel.



6. Disconnect the Transmission Control Switch (TCS) electrical connector and remove the wiring harness fastener from the selector lever housing.



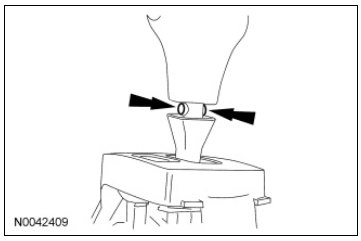
7. Remove the selector lever knob.

Installation

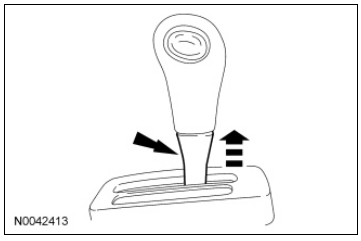
1. ***NOTICE:*** **Do not overtighten the selector lever knob screws or damage to the selector lever or selector lever knob may occur.**

   Install the selector lever knob and the 2 new selector lever knob screws.

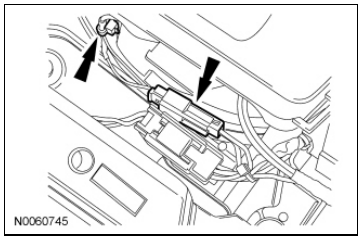
   - Tighten to 2 Nm (18 lb-in).



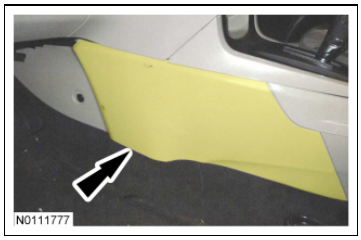
2. Slide the selector lever knob bezel up and into place.



3. Connect the TCS electrical connector and install the wiring harness fastener to the selector lever housing.



4. Install the center console LH panel.



5. Install the upper console panel.



6. Install the selector lever trim ring.



7. Verify the selector lever knob functions correctly.

Material

Item	Specification	Fill Capacity
Gasket Maker TA-16	WSK-M2G348-A5	-
High Temperature Nickel Anti-Seize Lubricant XL-2	-	-
Motorcraft® Dual Clutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2	1.7L (1.8 qt)
DPS6 Grease 9U7Z-19A506-BA	WSS-M1C270-A	-

General Specifications

Item	Specification
Transaxle Weight	76 kg (168 lb)
Clutch	
Clutch 1	26 mm (1.023 in) [a]
Clutch 2	15 mm (0.59 in) [a]

[a] Maximum after clutch reset

Synchronizer Ring Clearance	
Clearance Between Synchronizer Ring and Flank Surface of Gear	
Minimum	1.3 mm (0.051 in) minimum (1.6 mm (0.062 in) +/- 0.3 mm (0.011 in))

Shift Fork and Hub Sleeve Clearance	
Reverse/4th Gear Shift Fork and Hub Sleeve	
Maximum	1.85 mm (0.072 in)
0.75-1.25 mm (0.029-0.049 in)	
Clearance Between 1st/5th Shift Fork and Hub Sleeve	

Maximum	1.85 mm (0.072 in)
Standard	0.75-1.25 mm (0.029-0.049 in)
Clearance Between 3rd Gear Shift Fork and Hub Sleeve	
Maximum	1.725 mm (0.067 in)
Standard	0.625-1.125 mm (0.024-0.044 in)
Clearance Between 2nd/6th Shift Fork and Hub Sleeve	
Maximum	1.725 mm (0.067 in)
Standard	0.625-1.125 mm (0.024-0.044 in)

Gear Clearance	
1st Gear	
Radial Clearance Maximum	0.055 mm (0.002 in)
Axial Clearance Maximum	0.645 mm (0.025 in)
2nd Gear	
Radial Clearance Maximum	0.055 mm (0.002 in)
Axial Clearance Maximum	0.495 mm (0.019 in)
3rd Gear	
Radial Clearance Maximum	0.055 mm (0.002 in)
Axial Clearance Maximum	0.595 mm (0.023 in)
4th Gear	
Radial Clearance Maximum	0.055 mm (0.002 in)
Axial Clearance Maximum	0.625 mm (0.024 in)
5th Gear	
Radial Clearance Maximum	0.055 mm (0.002 in)
Axial Clearance Maximum	0.52 mm (0.02 in)
6th Gear	
Radial Clearance Maximum	0.055 mm (0.002 in)
Axial Clearance Maximum	0.51 mm (0.02 in)
Reverse Gear	
Radial Clearance Maximum	0.073 mm (0.002 in)
Axial Clearance Maximum	0.59 mm (0.023 in)

Differential Shim Selection Chart

Tool Reading mm (in)	Part Number	Shim Thickness mm (in)
0.500-0.550 (0.0196-0.0216)	AE8P-7F119-AA	0.500 (0.0197)
0.551-0.600 (0.0216-0.0236)	AE8P-7F119-BA	0.550 (0.0217)
0.601-0.650 (0.0236-0.0255)	AE8P-7F119-CA	0.600 (0.0236)
0.651-0.700 (0.0256-0.0275)	AE8P-7F119-DA	0.650 (0.0256)
0.701-0.750 (0.0275-0.0295)	AE8P-7F119-EA	0.700 (0.0276)
0.751-0.800 (0.0295-0.0314)	AE8P-7F119-FA	0.750 (0.0295)
0.801-0.850 (0.0315-0.0334)	AE8P-7F119-GA	0.800 (0.0315)
0.851-0.900 (0.0335-0.0354)	AE8P-7F119-HA	0.850 (0.0335)
0.901-0.950 (0.0354-0.0374)	AE8P-7F119-JA	0.900 (0.0354)
0.951-1.000 (0.0374-0.0393)	AE8P-7F119-KA	0.950 (0.0374)
1.001-1.050 (0.0394-0.0413)	AE8P-7F119-LA	1.000 (0.0394)
1.051-1.100 (0.0413-0.0433)	AE8P-7F119-MA	1.050 (0.0413)
1.101-1.150 (0.0433-0.0452)	AE8P-7F119-NA	1.100 (0.0433)
1.151-1.200 (0.0453-0.0472)	AE8P-7F119-PA	1.150 (0.0452)
1.251-1.300 (0.0492-0.0511)	AE8P-7F119-RA	1.200 (0.0472)

Gear Ratio

Gear	Ratio	Final Drive	Overall Ratio
Reverse	3.508	4.35	15.270
1st	3.917	3.89	15.254
2nd	2.429	3.89	9.459
3rd	1.436	4.35	6.250
4th	1.021	4.35	4.446
5th	0.867	3.89	3.375
6th	0.702	3.89	2.735

Shift Speeds Chart

Throttle Position	Shift	km/h	mph
Light	1-2	13-21 km/h	8-13 mph
	2-3	23-31 km/h	14-19 mph
	3-4	32-39 km/h	20-24 mph
	4-5	40-63 km/h	25-39 mph
	5-6	64-82 km/h	40-51 mph
Medium	1-2	29-42 km/h	18-26 mph
	2-3	43-58 km/h	27-36 mph
	3-4	59-76 km/h	37-47 mph
	4-5	77-87 km/h	48-54 mph

	5-6	88-121 km/h	55-75 mph
Wide Open	1-2	42-61 km/h	26-38 mph
	2-3	63-90 km/h	39-56 mph
	3-4	92-121 km/h	57-75 mph
	4-5	122-208 km/h	76-129 mph
	5-6	209-251 km/h	130-156 mph

Torque Specifications

Description	Nm	lb-ft	lb-in
Ball joint nuts	48	35	-
Battery tray bolts	10	-	89
Battery tray brt nuts	10	-	89
Brake hose retainer bolts	25	18	-
Clutch actuator lever bolts	19	-	168
Clutch actuator lever spring retainer bolts [a]	-	-	-
Clutch housing-to-case bolts	27	20	-
Clutch housing-to-engine bolts	48	35	-
Clutch motor bolts	5	-	44
Differential ring gear bolts [a]	-	-	-
Drain plug	43	32	-
Exhaust flange nuts	48	35	-
Fill plug	43	-	
Flexplate-to-clutch nuts [a]	-	-	-
Ground wire bolt	25	18	-
Guide tube bolts	8	-	71
Input shaft bearing retainer bolts	11	-	97
Input shaft speed sensor bolt	10	-	89
Manual control lever bolt	26	19	-
Output shaft bearing retainer bolts [a]	-	-	-
Output Shaft Speed (OSS) sensor bolt	10	-	89
Park plunger plug	43	32	-
PCM cover bolt	-	5.4	47.8
48	35	-	
Roll restrictor bolt	70	52	-
Selector lever battery tray bracket bolt	25	18	-
Selector lever cable bracket bolts	10	-	89
Shield and bearing retainer strap nuts [a]	-	-	-
Shim selection tool bolts	18	-	159
Transaxle support insulator bracket bolts	90	66	-
Transaxle support insulator bracket nuts	125	92	-
Transmission Control Module (TCM)	27	20	-

Transmission Range (TR) sensor bolts	10	-	89
Upper sD valign="top" align="center">48	35	-	

[a] Refer to the procedure in this section.

Transaxle Description

This DPS6 is a fully automatic, dry dual clutch, automatic shifting manual, electronically controlled 6-speed transaxle.

Its abbreviated designation DPS6 means:

- D - Dry Dual Clutch
- P - Powershift
- S - Synchronized
- 6 - 6-speed transaxle

This transaxle features the following:

- Computer Control with electro-mechanical actuation
- Two piece aluminum housing design
- Six (6) discrete stepped forward gears and one (1) reverse gear
- Dual Output shafts with two separate final drive ratios
- Full ball and roller bearing design for all gears and shafts
- All gears are bevel cut for improved NVH characteristics and power transfer
- All gears are in constant mesh for no loss of torque during the shifting process
- All cast construction of shift fork/linkage mechanisms

This transaxle features two nested input shafts driven by a compact dry dual clutch system. These two shafts are used in conjunction with each other to provide seamless shifting through the six (6) available ratios with overdrive in the two top gears. As each gear is selected, the appropriate clutch is activated to drive the vehicle. Each consecutive gear is then preselected for the next "shift" operation as power is shifted from one clutch to the other and back again as moving up and down through the individual gears

This transaxle is designed to be operated in the same manner as a conventional torque converter equipped automatic transaxle. It provides the smooth application of power, but with the bonus of efficiencies found only in a manual transaxle. By delivering the power with a dual clutch system, fluid volume is limited to less than 2 liters as compared against a conventional automatic transaxle, and that is only within the gearbox case itself. The actuation of the clutch system is controlled by a dedicated computer through two individual electrically driven clutch motors and actuator systems.

This transaxle provides six (6) discrete forward ratios with overdrive in the top two gears and a reverse gear, giving a continuous flow of power for acceleratieration

The selector lever gives the driver a choice of P, R, N, D and L.

With the selector lever in the D position, you can operate the Transmission Control Switch (TCS)/Grade Assist switch on the selector lever to prevent the transaxle from shifting into 6th gear.

If a fault occurs continued motoring is guaranteed in the following limited conditions based on the failure: 1st, 3rd and 5th gear if a fault with clutch 2 and/or relational components occurs. 2nd, 4th, 6th and reverse if a fault with clutch 1 and/or relational components occurs.

This transaxle can be tested using a scan tool through the Data Link Connector (DLC) in the passenger compartment.

Internal components are based on manual transaxle technologies that include:

- Dry friction clutches to transmit power between the engine and transaxle
- Lay shaft gearing for high efficiency and uncoupled ratio selection
- Rotating sequential shift drums for fast response
- Synchronizers with dog clutches to pre-select and direct the power flow
- Splash fluid lubrication without filter and external oil coolers

This transaxle is two transaxles within one housing that share a common:

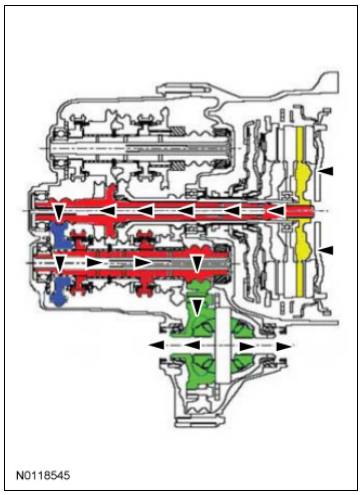
- Final drive which includes two output shaft pinions
- Differential assembly
- Output Shaft Speed (OSS) sensor
- Transmission Range (TR) sensor
- Park system
- Transmission Control Module (TCM)

The first consists of three odd gear ratios (1st, 3rd & 5th):

- Odd input clutch and actuator system including a clutch motor
- Odd or inner input shaft with input shaft speed sensor 1 and related speed gears
- Odd synchronizer system including a shift motor (part of TCM), shift drum, shift forks and transfer assemblies.

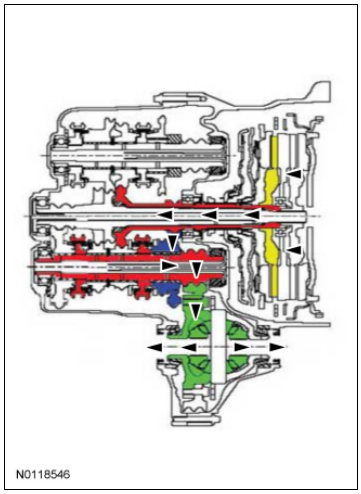
The second consists of three even gear ratios and reverse (2nd, 4th, 6th & Reverse):

- Even input clutch and actuator system including a clutch motor
- Outer or hollow input shaft with input shaft speed sensor 2 and related speed gears.
- Even synchronizer system including a shift motor (part of TCM), shift drum, shift forks and transfer assemblies



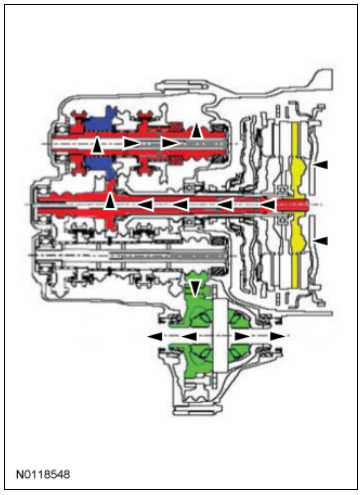
1st Gear

The torque is introduced into the dual clutch via the flywheel. From there, the power is transmitted via clutch 1 to the inner input shaft. The inner input shaft transmits the torque to the first gear of the output shaft. The torque is transmitted to the differential via the output pinion.



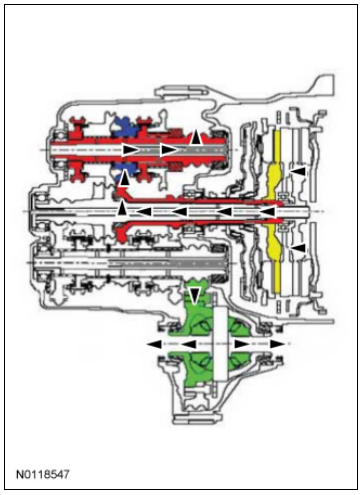
2nd Gear

The torque is introduced into the dual clutch via the flywheel. From there, the power is transmitted via clutch 2 to the hollow input shaft. The inner input shaft transmits the torque to the second gear of the output shaft. The torque is transmitted to the differential via the output pinion.



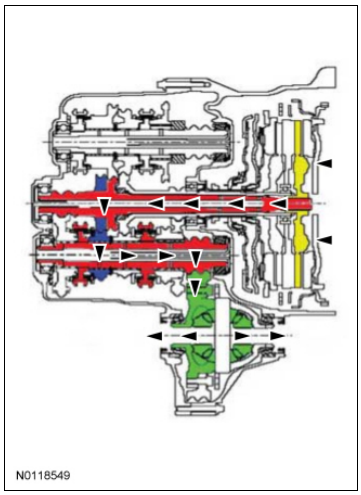
3rd Gear

The torque is introduced into the dual clutch via the flywheel. From there, the power is transmitted via clutch 1 to the inner input shaft. The inner input shaft transmits the torque to the third gear of the output shaft. The torque is transmitted to the differential via the output pinion.



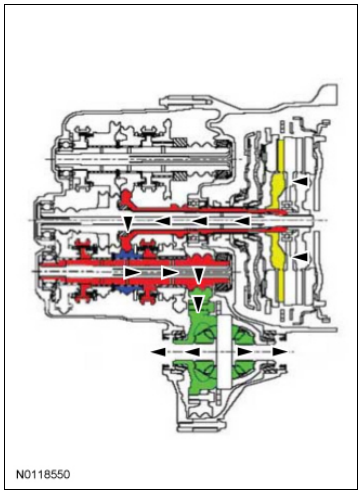
4th Gear

The torque is introduced into the dual clutch via the flywheel. From there, the power is transmitted via clutch 2 to the hollow input shaft. The hollow input shaft transmits the torque to the fourth gear of the output shaft. The torque is transmitted to the differential via the output pinion.



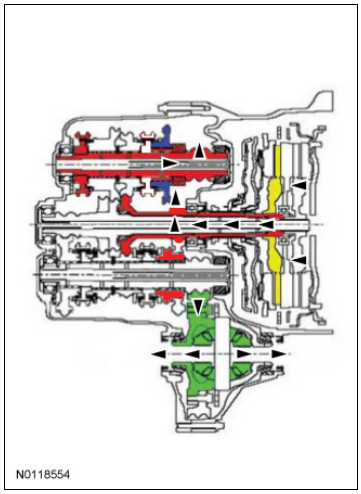
5th Gear

The torque is introduced into the dual clutch via the flywheel. From there, the power is transmitted via clutch 1 to the inner input shaft. The inner input shaft transmits the torque to the fifth gear of the output shaft. The torque is transmitted to the differential via the output pinion.



6th Gear

The torque is introduced into the dual clutch via the flywheel. From there, the power is transmitted via clutch 2 to the hollow input shaft. The hollow input shaft transmits the torque to the sixth gear of the output shaft. The torque is transmitted to the differential via the output pinion.

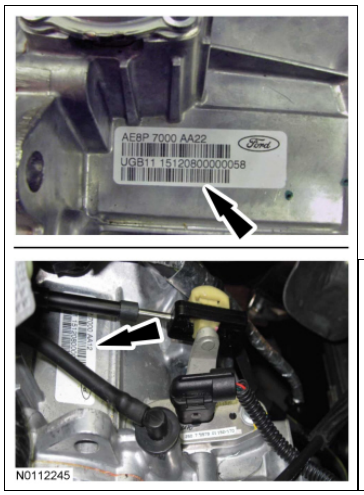


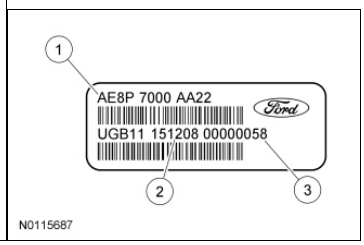
Reverse

The torque is introduced into the dual clutch via the flywheel. From there, the power is transmitted via clutch 2 to the hollow input shaft. The hollow input shaft now transmits the torque to the reverse/2nd double gear which acts as an idler gear to reverse the direction of rotation. This idler transmits torque to the reverse gear of the output shaft. The torque is transmitted to the differential via the output pinion.

Identification Tags

When servicing the transaxle, refer to the identification tag located on the case.

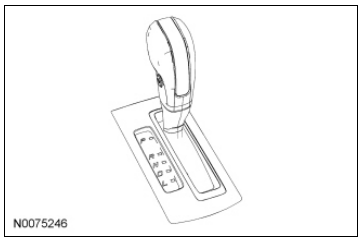




Item	Description
1	Part number
2	Build date
3	Serial number

Range Selection

The transaxle range selector has 5 positions: P, R, N, D, L.



Range Positions		
P	Park	In the PARK position: • there is no power flow through the transaxle. • the parking pawl locks the final drive. • the engine may be started. • the ignition key may be removed.
R	Reverse	In the REVERSE position: • the vehicle may be operated in a rearward direction, at a reduced rear ratio. • engine braking occurs.
N	Neutral	In the NEUTRAL position: • the vehicle is able to roll. • there is no power flow through the transaxle. • the output shaft is not held and is free to turn. • the engine may be started.
D	Drive position with Grade Assist	DRIVE is the normal position for most forward driving. The DRIVE position provides: • automatic shifts -1st through 6th gears. • maximum fuel economy during normal operation. • with Transmission Control Switch (TCS)/Grade assist switch pressed, only gears 1-5 are available.
L	Manual Low	Manual L position allows for 1st gear when the vehicle reaches slower speeds. This position provides:

		• maximum engine braking. • downshifts to the lowest available gear for the current vehicle speed.

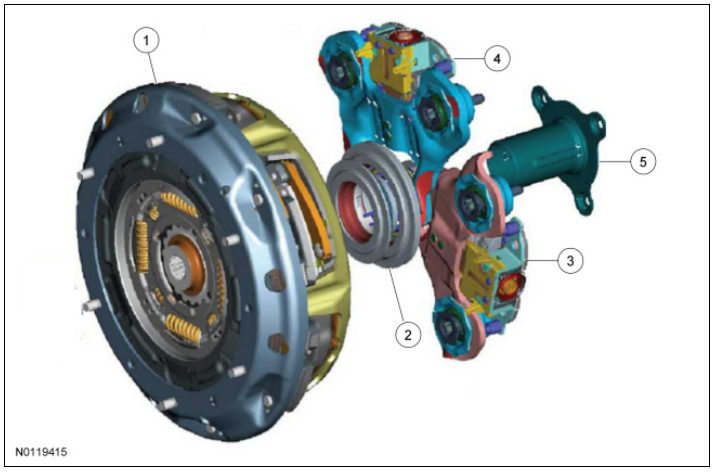
Main Components and Functions

This transmission system has been divided into 6 sub-systems that relate to specific functional areas. These sub-systems are:

- a clutch/actuator system which transfers engine crankshaft speed and torque.
- an active input system which includes applied clutch disc, bearings, speed gears and output shaft.
- a passive input system which includes disengaged clutch disc, bearings, speed gears and an output shaft system.
- a synchronizer/engagement system which includes a torque carrying interface between speed gear and output shaft.
- a differential system that is the final drive output system which includes drive pinions, ring gear, support bearings and side gears.
- an electrical control system which includes control system logic, Transmission Control Module (TCM), speed sensors, electric motors and a wire harness.

Sub-System Overview

Clutch/Actuator System

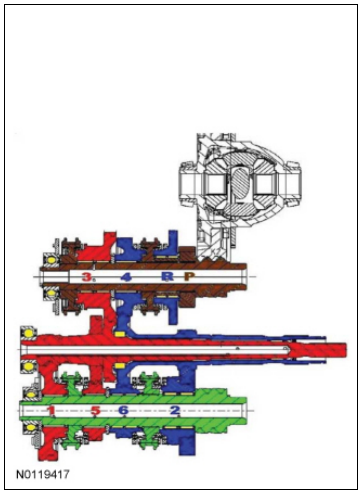


Item	Part Number	Description
1	7B546	Clutch assembly
2	7A508	Clutch engagement system bearing assembly
3	7515	Clutch engagement system actuator lever 1
4	7515	Clutch engagement system actuator lever 2
5	7A564	Clutch engagement system guide tube

The clutch and actuator sub - system consists of engine crankshaft mounted rotating components. These include, a center flywheel, odd and even clutch pressure plates, clutch actuating mechanisms and engagement components. The clutch actuators are independent systems within the clutch housing that apply an axial force to the clutch diaphragm springs causing their respective clutch to apply. This apply force is reacted back into the transaxle through the input shaft unlike a manual transaxle dry clutch system, no thrust is applied to the engine crankshaft. Normally the clutch capacity commands are mutually exclusive (to prevent tie-up) with minor overlaps to allow synchronous shifting. A clutch "touch point" position must be established by a

learning algorithm within the system software. Establishing the touch point is the system´s method for ensuring that the displacement-based clutch actuation system is properly calibrated. This is necessary so that the clutch capacity can be controlled correctly by the TCM and be engaged and released to the required torque capacity and within the required time.

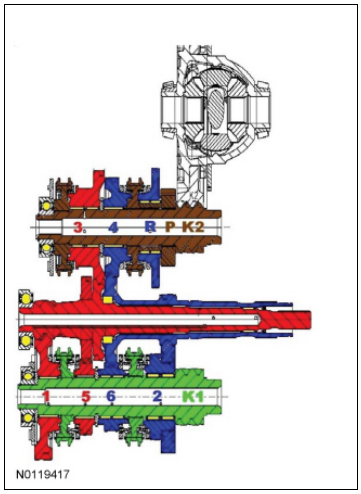
Active Input System



ACTIVE INPUT GEAR	PASSIVE INPUT GEAR	OUTPUT
1	2	K1
3	4 D valign="top" align="center">K2	
5	6	K1
	R	
2	1	K1
4	3	K2
6	5	K1
R		K2

The active input system of the transaxle can be viewed as two transaxles within a common housing (one for 1st, 3rd & 5th and another for Reverse, 2nd, 4th & 6th). For any driving gear there is one transaxle actively engaged in the power flow between the engine and the wheels and one that is disconnected or passive. This section will discuss considerations for the driving input shaft system whether it be the ODD or EVEN transaxle. The driving or active input shaft system consists of the input shaft and clutch disc, support bearings and the meshed speed gears with their needle roller bearings.

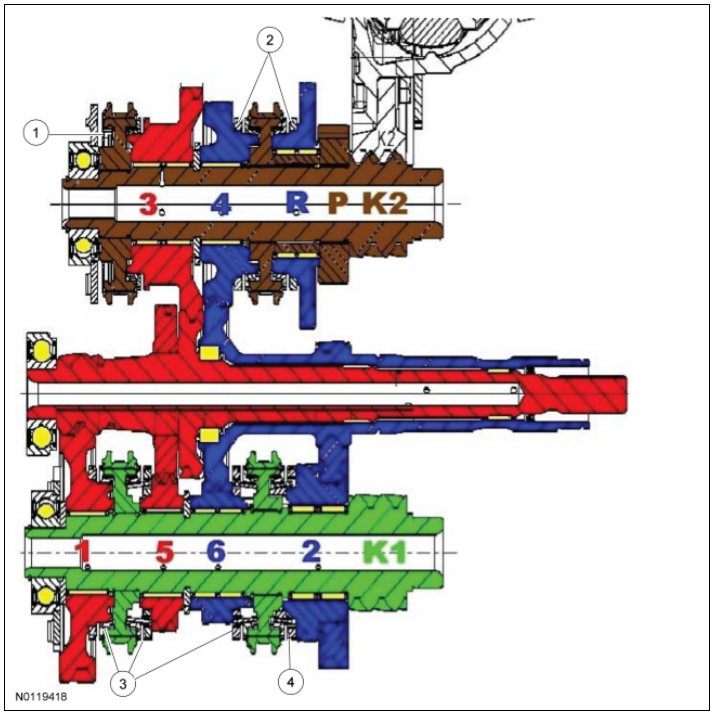
Passive Input System



ACTIVE INPUT GEAR	PASSIVE INPUT GEAR	OUTPUT
1	2	K1
3	4	K2
5	6	K1
	R	
2	1	K1
4	3	K2
6	5	K1
R		K2

The passive input system can be viewed as two transaxles within a common housing (one for 1st, 3rd & 5th and another for Reverse, 2nd, 4th & 6th). For any driving gear there is one transaxle actively engaged in the power flow between the engine and the wheels and one that is disconnected or passive. The non-driving, or passive input shaft system consists of the input shaft and clutch disc, support bearings and the meshed speed gears with their needle roller bearings.

Synchronizer Systems



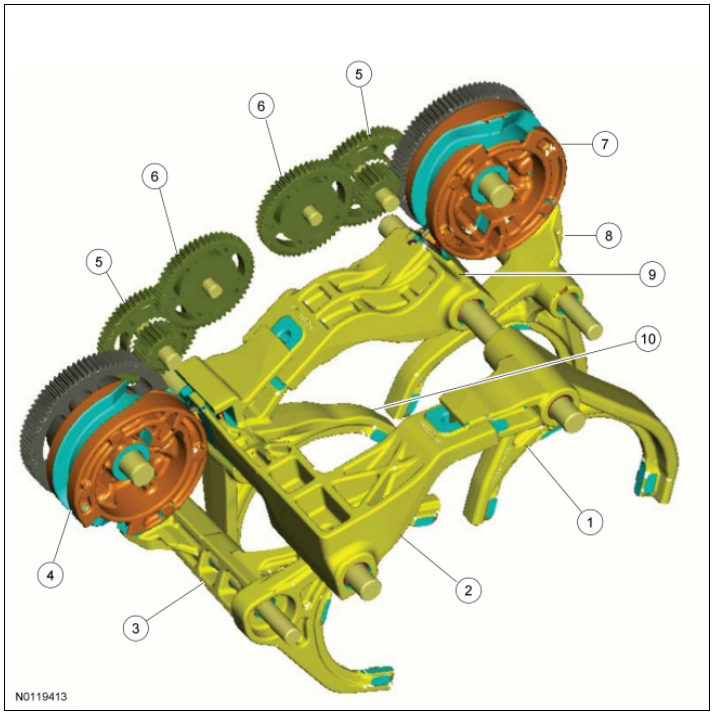
Item	Part Number	Description
1	-	3rd gear single cone synchronizer system (part of 7060)
2	-	4th gear and reverse gear single cone synchronizer systems (part of 7060)
3	-	1st, 5th and 6th gears single cone synchronizer systems (part of 7060)
4	-	2nd gear dual cone synchronizer system (part of 7060)

The synchronizer systems are comprised of single and dual cone synchronizer systems. The synchronizers are designed to act as the torque carrying interfaces between each speed gear and corresponding output shaft. The synchronizer design and function are similar to manual transaxle operations.

Basic Synchronizer Hardware Operation

As in manual transaxle operation, gear pre-selection is made by sliding the synchronizer sleeve towards a speed gear. This causes the internal splines of the synchronizer sleeve to bridge a gap between the output hub and the external spline feature of the speed gear, thus transmitting speed and torque between the gear and output shaft. Synchronizers are small cone wet friction clutches mounted to the transaxle output shaft. They are used to bring the rotation speed of the engaging speed gear in sync with the output shaft speed. After synchronous speed has been attained the final power flow connection is made possible and the synchronizer sleeve is permitted to pass by and engage the external spline teeth on the speed gear.

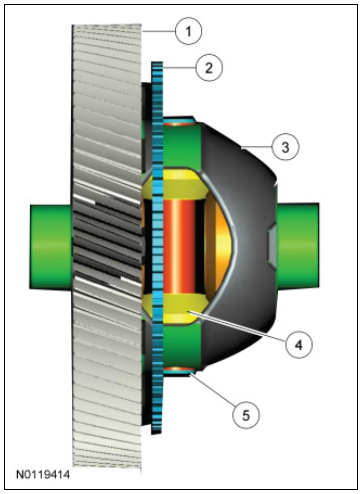
Shift Fork Mechanical System Overview



Item	Part Number	Description
1	7230	3rd gear shift fork
2	7P081	3rd gear linkage
3	7230	1st/5th gear shift fork
4	7J047	Shift drum 1
5	7J048	Small clock gear
6	7J049	Large clock gear
7	7J047	Shift drum 2
8	7230	Reverse/4th gear shift fork
9	7P081	2nd/6th linkage
10	7230	2nd/6th gear shift fork

The shift system consists of two independent sub-systems for controlling the transaxle synchronizer pre - selections and engagements. Using this arrangement provides an independent control of the two transaxles and a mechanical interlock that prevents two gears within the same transaxle from being engaged simultaneously. The TCM houses two electric motors that mesh with and drive the first double gear wheel, which drives the second double gear which finally drives the shift drum. Gearing between the shift motors and the drums reduce speed and multiply torque. Position sensors in the TCM detect feedback of the motor angular position. Shift drum position is learned by the TCM during a teach-in process that involves rotating each drum against hard stops located on the shift drum and the transaxle housing.

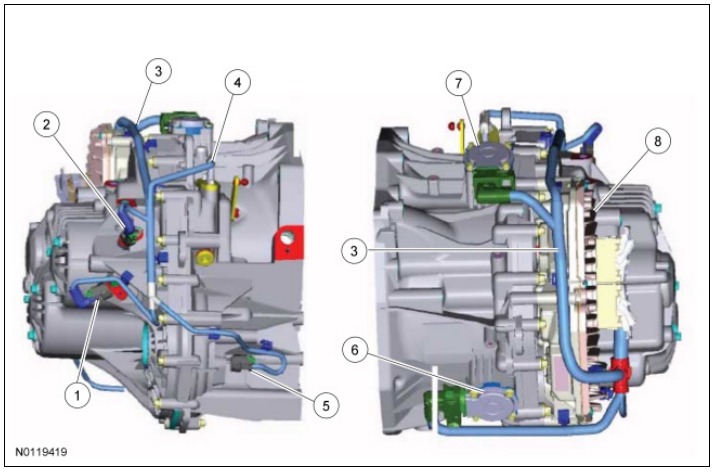
Differential System



Item	Part Number	Description
1	7D392	Differential ring gear
2	7H150	Differential impulse ring
3	-	Differential carrier (part of 4026)
4	-	Differential pinion gear (part of 4026)
5	-	Differential pinion shaft (part of 4026)

The output shaft system consists of the output shaft gears, differential ring (final drive) gear and the differential assembly. Typically when a vehicle is traveling down the road both wheels are rotating at the same speed; however, when a vehicle is turning, the outside wheel must travel a greater distance than the inside wheel. To do this, in the same time, the outside wheel must rotate faster than the inside wheel. The differential is designed to provide speed compensation for the wheels to allow the vehicle to negotiate turns smoothly.

Electrical Control System



Item	Part Number	Description
1	7M101	Input shaft speed sensor 1
2	7M101	Input shaft speed sensor 2
3	7G276	Wiring harness
4	7F293	Transmission Range (TR) sensor
5	7H103	Output Shaft Speed (OSS) sensor
6	7C604	Clutch motor 2

7	7C604	Clutch motor 1
8	7Z369	TCM

Electrical components function:

- Input shaft speed sensor 1 measures the speed and the rotating direction of the input shaft 1. The input shaft can be stationary.
- Input shaft speed sensor 2 measures the speed of the input shaft 2. The rotation direction is not measured.
- OSS sensor measures the speed of the output shaft. The rotation direction is not measured.
- Two electrical clutch motors are used to actuate the dual clutch in the transmission - one motor for each clutch. The motors work independently of each other. When the clutch is fully closed, the clutch motor provides the holding torque in addition with spring force. The clutch motors work against a clutch spring and self disengage with no electrical power.
- TR sensor detects the angular position of the shift lever shaft.
- TCM is an assembly of an electronic module, sensors, and electrical motors.
- The TCM 's electrical motors (2) control the mechanical shift fork system. The shift drums are the link from electrical to mechanical operation. The TCM collects incoming vehicle, transmission and driver demand signals and uses these signals to select the next required gear ratio. The TCM receives transmission sensor signals and transmits clutch motor current through externally mounted wire harness. The TCM uses these signals to control shift feel.

Transaxle Electronic Control System

Overview Electronic Transaxle Control

The electronic transaxle control system includes:

- a Transmission Control Module (TCM)
- a Transmission Range (TR) sensor
- an Output Shaft Speed (OSS) sensor
- 2 input shaft speed sensors each with pre-measured shims.
- 2 shift motors
- 2 clutch motors
- a Brake Pedal Position (BPP) switch
- a Brake Shift Interlock Actuator (BSIA)
- a starter inhibitor relay
- an Transmission Control Switch (TCS)/Grade Assist button
- an TCS /Grade Assist Indicator

Electrical System Components

Transmission Control Module (TCM)

The TCM is an assembly of an electronic module, sensors, and electrical actuators. It combines a control module and two electric motors for gear shifting. The primary function of TCM is to collect incoming data signals to control the transaxle, perform the interpretation of incoming data signals, communicate with the periphery and connect the electrical and mechanical contact to the signal transmitter and actuating elements. Vehicle and transaxle interface is achieved via two connectors; vehicle and transaxle connector. The transaxle connector plug is located at the TCM and is the electrical connection between the TCM and the clutch actuators and the sensors. The vehicle connector is located at the TCM and is the electrical connection between TCM and the vehicle. The TCM is a programmable module.

Transmission Range (TR) Sensor

The TR sensor detects the position of the manual control lever shaft. The TR sensor is mounted on the transaxle. The TR sensor allows the vehicle to start in PARK and NEUTRAL positions. The TR sensor output signal is linear over the measurement range and the TCM receives the selector lever position.

The signals of the TR sensor are used for the following functions:

- to recognize the selector lever position.
- to actuate the starter inhibitor relay.
- to actuate the reversing lamps.

No substitute signal is available for the TR sensor.

If the connection is cut, the vehicle cannot be started.

The TR sensor requires to be calibrated through the adaptive learning procedures.

Output Shaft Speed (OSS) Sensor

The OSS sensor measures the speed of the output shaft. The rotation direction is not measured.

The OSS sensor is located in the clutch housing above the differential.

The OSS sensor is an inductive sensor which detects the vehicle speed by means of an impulse ring on the differential.

The signal is used for the following functions among other things:

- to determine the shift timing.
- to supply the vehicle speed input signal for the TCM .

Input Shaft Speed Sensors

Input shaft speed sensor 1 measures the input speed and the rotating direction of the input shaft 1. The input shaft can be stationary. Therefore it is necessary, that the sensor system can detect the stationary state of the input shaft accurate. By being stationary the sensor must not indicate speed unequal to 0 (also not, if the motor runs by high speeds). The slow rolling of the car has to be detected safely.

Input shaft speed sensor 2 measures the input speed of the input shaft 2. The rotation direction is not measured.

Shift Motors

Two electric motors are used to shift the gears in the transaxle, one motor for gears 1-3-5 and one motor for gears R-2-4-6. The gear shifting is made by two shift drums connected to shift motor pinion via two ideal gears. The max shifting force is 1500 N (337 lb). The motors are integrated in the TCM and work independently of each other.

Clutch Motors

Two electrically commuted motors are used to actuate the double clutch in the transaxle - one motor per clutch. The motors work independently of each other. When the clutch is fully closed, the motor provides the holding torque in addition with spring force. The clutch motors work against a clutch spring and are disengaged when they reach the zero position (rest position) with the spring force.

Brake Pedal Position (BPP) Switch

The BPP switch is mounted on the brake pedal bracket.

The signal of the BPP switch is used by the PCM for the following functions:

- to activate the Brake Shift Interlock Actuator (BSIA) when the brake pedal is pressed in PARK.

No substitute signal is available for the BPP switch.

If the connection to the BPP switch is cut, the selector lever cannot be moved out of PARK.

Brake Shift Interlock Actuator (BSIA)

When the ignition is switched to the ON or RUN position, the BSIA is actuated by pressing the brake (signal from the BPP switch). This retracts the blocker so that the selector lever can be moved out of PA.

Brake Shift Interlock Override

NOTE: If PARK is selected again, the selector lever is locked again.

If the brake signal should fail due to a malfunction, manual unlocking of the selector lever is possible.

For this, the release of the mechanism must be done by removing the side console panel and using a suitable tool press the BSIA lever until the selector lever can be moved out of PARK.

Starter Inhibitor Relay

The relay prevents the engine starting in selector lever positions R, D and L.

The relay obtains the information about the position of the selector lever directly from the TR sensor.

Transmission Control Switch (TCS) Button

The TCS button is located on the selector lever.

Grade Assist improves vehicle handling in hilly terrain or mountainous areas by providing additional engine braking and extends lower gear operation on uphill climbs. Additional engine braking is provided through the automatic transaxle shift strategy which reacts to vehicle inputs including vehicle acceleration, accelerator pedal, brake pedal and vehicle speed. The transaxle will select gears that will provide the desired engine braking, based on the vehicle inputs, the engine rpm during engine braking will increase. It is recommended to return to DRIVE mode on flat terrain to provide the best fuel economy and transaxle function. The transaxle returns to Overdrive (O/D) and grade assist is cancelled when the TCS is pressed again.

TCS /Grade Assist Indicator

The TCS /Grade Assist indicator is located in the Instrument Cluster (IC).

It tells the driver that shifting into 6th gear is prevented by the transaxle control.

The O/D /Grade Assist light flashes to tell the driver that the transaxle control has switched to the emergency operating mode.

Emergency Operating Program

If correct gear shifting can no longer be guaranteed due to failure of certain signals, the TCM changes to an emergency operating program.

The driver is informed of the operation of the emergency operating program by the illumination of the powertrain warning indicator in the IC .

Continued motoring is guaranteed in the following limited conditions based on the failure:

- 1st, 3rd and 5th gear if a fault with clutch 2 and/or relational components occurs.
- 2nd, 4th, 6th and reverse if a fault with clutch 1 and/or relational components occurs.

Diagnostic Strategy

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Troubleshooting an electronically-controlled automatic transaxle 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.

Preliminary Inspection

- Verify the concern by operating the vehicle.
- Check the transmission fluid levels and condition.
- Check selector lever linkages for correct adjustment.

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-transaxle DTCs first.
- Repair all transaxle DTCs second.
- Erase all continuous DTCs and attempt to repeat them.
- Repair all continuous DTCs.
- If only pass DTCs are obtained, proceed to the Diagnosis by Symptom Index. Refer to Diagnosis By Symptom in this section for further information and diagnosis.

Follow the diagnostic sequence to diagnose and repair the concern the first time.

Preliminary Inspection

Determine Customer Concern

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.

Transmission Fluid Level and Condition Check

NOTICE: **If transaxle noise is reported, first check the transmission fluid level. The vehicle should not be driven if the transmission fluid level is low or damage can occur.**

NOTE: The vehicle should not be driven if the transmission fluid level is low.

An incorrect transmission fluid level may affect the transaxle operation and can result in transaxle damage. To correctly check and add transmission fluid to the transaxle, refer to Transmission Draining and Filling in this section.

A low transmission fluid level can result in poor transaxle shifting, engagement or damage. It can also indicate a leak in the transaxle seals.

1. Check the transmission fluid condition.
    - Observe the color of the transmission fluid. Allow the transmission fluid to drip onto a white cloth and examine the stain. Check the transmission fluid for contamination or metal particles.
        - ♦ Transmission fluid should appear nearly clear.

Visual Inspection

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Visually inspect the vehicle for obvious causes of the customer concern. Check for:

- Electronic add-on items
- Vehicle modification

- Leaks; refer to Leakage Inspection in this section.

Inspect the Selector Lever and Components

Check selector lever linkage adjustment by matching the detents in the selector lever with those in the transaxle. If they do not match, adjust the selector lever cable. Refer to Section 307-05 .

Inspect the selector lever and components for:

- binding
- signs of damage.
- broken clips
- binding
- cable not fully seated or in brackets
- hold-down bracket bolts are loose
- correct routing
- correct adjustment

Evaluation of the Transaxle

1. During the road test, use the following driving methods to diagnose the problem.
    - Start the engine.
    - Evaluate the noise in NEUTRAL while the vehicle is parked.
        - Check whether the noise is present.
        - With the parking brake engaged, move the selector lever to DRIVE. Apply very slight pressure to the throttle and note if the noise level is reduced.
        - With the vehicle in PARK, check whether the noise is present as the engine speed is increased. If the noise reduces, note the engine speed at which this occurs.
    - Listen for any change in noise while changing engine rpm.
    - Drive the vehicle and allow it to shift through all of the gear ranges, including reverse. Listen for any change in noise in a particular gear.

- Drive the vehicle in the gear in which the noise is most noticeable. Listen for any change in noise.
- Drive the vehicle in the gear in which the noise is most noticeable and shift the transaxle into NEUTRAL. Allow the vehicle to coast. Note any change in noise.

2. Compare the road test results with the symptom charts. It is a list of conditions that are typical faults into which the transaxle will fall:

GO to Diagnosis By Symptom .

Diagnostic Parameters Identification (PID) Chart

Accessing PIDs

The following general PID list may be of use to the technician when exercising output state control:

PIDs	PID Description
1stBLCK_GR_JMP	1st Gear Is Blocked Due To Gear Jump Occurred
1stBLOCK_TMP	1st Gear Is Blocked Temporarily Protect Mode
2ndBLCK_GR_JMP	2nd Gear Is Blocked Due To Gear Jump Occurred
2ndBLOCK_TMP	2nd Gear Is Blocked Temporarily Protect Mode
3rdBLCK_GR_JMP	3rd Gear Is Blocked Due To Gear Jump Occurred
3rdBLOCK_TMP	3rd Gear Is Blocked Temporarily Protect Mode
4thBLCK_GR_JMP	4th Gear Is Blocked Due To Gear Jump Occurred
4thBLOCK_TMP	4th Gear Is Blocked Temporarily Protect Mode
5thBLCK_GR_JMP	5th Gear Is Blocked Due To Gear Jump Occurred
5thBLOCK_TMP	5th Gear Is Blocked Temporarily Protect Mode
6thBLCK_GR_JMP	6th Gear Is Blocked Due To Gear Jump Occurred
6thBLOCK_TMP	6th Gear Is Blocked Temporarily Protect Mode
CLTC_A_BLCK	Clutch A Actuator Blocked [a]
CLTC_A_CLOS_F	Clutch A Reference Position Closed Failed [a]
CLTC_A_CUR_MES	Clutch A Actuator Current - Measured [a]
CLTC_A_F_MANAG	Clutch A Failure Management Status [a]
CLTC_A_LOWCONF	Clutch A Low Confidence In Sensed Position [a]
CLTC_A_MTR_DSD	Clutch A Actuator Motor - Desired [a]
CLTC_A_OPEN_F	Clutch A Reference Position Open Direction Failed [a]
CLTC_A_POS_F	Clutch Motor A - Position Sensor Fault
CLTC_A_SEQ_F	Clutch Motor A - Phase Sequence Fault
CLTC_A_SLFDIAG	Clutch A Self Diagnostic Procedure Status [a]
CLTC_A_SLIPMES	Clutch A Measured Slip [a]
CLTC_A_SPRNG	Clutch A Spring Cannot Fully Open Clutch [a]
CLTC_B_BLCK	Clutch B Actuator Blocked [b]
CLTC_B_CLOSE_F	Clutch B Reference Position Closed Failed [b]
CLTC_B_CUR_MES	Clutch B Actuator Current - Measured [b]
CLTC_B_F_MANAG	Clutch B Failure Management Status [b]
CLTC_B_LOWCONF	Clutch B Low Confidence In Sensed Position
CLTC_B_MTR_DSD	Clutch B Actuator Motor - Desired [b]

CLTC_B_OPEN_F	Clutch B Reference Position Open Direction Failed [b]
CLTC_B_POS_F	Clutch Motor B - Position Sensor Fault
CLTC_B_SEQ_F	Clutch Motor B - Phase Sequence Fault
CLTC_B_SLFDIAG	Clutch B Self Diagnostic Procedure Status [b]
CLTC_B_SLIPMES	Clutch B Measured Slip [b]
CLTC_B_SPRNG	Clutch B Spring Cannot Fully Open Clutch [b]
CLTC_MTR_A_F	Clutch Motor A - Phase Circuit Fault
CLTC_MTR_B_F	Clutch Motor B - Phase Circuit Fault
CLUTCH_A_OPEN	Clutch A Is Completely Open - Measured
CLUTCH_B_OPEN	Clutch B Is Completely Open - Measured
FOOT_BRAKE	Foot Brake - Foot brake state used by strategy
GEAR_CMD	Gear Commanded
GEAR_ENGAGED	Transmission Gear Engaged
GEAR_OSC	Gear Command by Output State Control
GEARBX_SF_A_F	Gearbox Error Status for Shift Fork A
GEARBX_SF_B_F	Gearbox Error Status for Shift Fork B
ISS_A_PC_F	Input Shaft Speed Sensor A - Power/Circuit Fault
ISS_A_RAW	Input Shaft Speed A - Raw
ISS_B_PC_F	Input Shaft Speed Sensor B - Power/Circuit Fault
ISS_B_RAW	Input Shaft Speed B - Raw
ISS_EFFECT_RPM	Effective Input Shaft Speed
OSS_PC_F	Output Shaft Speed Sensor - Power or Circuit Fault
OSS_SRC	Unfiltered Output Shaft Speed A
REVBLCK_GR_JMP	Reverse Gear Is Blocked Due To Gear Jump Occurred
REVBLOCK_TMP	Reverse Is Blocked Temporarily Protect Mode
RLC	Reverse Lamp Control
RLC_F	Reverse Control Lamp Status
SF_A_CURR_MES	Shift Fork A Actuator Current - Measured
SF_A_ENGAG_STA	Shift Fork A Engagement Control Status
SF_A_GRRAT_MES	Shift Fork A Gear Ratio - Measured
SF_A_POS_MES	Shift Fork A Actuator Position - Measured
SF_A_POS_STAT	Position Signal Status for Shift Fork A Actuator
SF_A_POS_TARG	Shift Fork A Actuator Position - Target
SF_A_ROTAT_MES	Shift Fork A Rotational Position - Measured
SF_B_CURR_MES	Shift Fork B Actuator Current - Measured
SF_B_ENGAG_STA	Shift Fork B Engagement Control Status
SF_B_GRRAT_MES	Shift Fork B Gear Ratio - Measured
SF_B_POS_MES	Shift Fork B Actuator Position - Measured
SF_B_POS_STAT	Position Signal Status for Shift Fork B Actuator
SF_B_POS_TARG	Shift Fork B Actuator Position - Target
SF_B_ROTAT_MES	Shift Fork B Rotational Position - Measured
SHFRK_A_CAL_E1	Self Calibration Error - Shift Fork A Movement
SHFRK_A_CAL_E2	Self Calibration Error - Shift Fork A Reference
SHFRK_B_CAL_E1	Self Calibration Error - Shift Fork B Movement

SHFRK_B_CAL_E2	Self Calibration Error - Shift Fork B Reference
SHFRK_NO_CAL_0	Self Calibration Prevented - Brake Input Status
SHFRK_NO_CAL_1	Self Calibration Prevented - Clutch A is Not Open
SHFRK_NO_CAL_2	Self Calibration Prevented - Clutch B is Not Open
SHFRK_NO_CAL_3	Self Calibration Prevented - Output Shaft Speed
SHFRK_NO_CAL_4	Self Calibration Prevented - Actuator Supply Voltage
SHFTLCK_ALLW	Transmission Range Shift Lock Output Allow
SHFTLCK_ALLW_F	Transmission Range Shift Lock Output Allow Status
SHIFT_A	Shifting In Progress on Shift Fork A
SHIFT_B	Shifting In Progress on Shift Fork B
TCIL	Transmission Control Indicator Light
TCS_DEPRES	Transmission Control Switch Pressed
TCS_STATE	Transmission Control Switch Requested State
TR_A_DC	Transmission Range Sensor Input A Duty Cycle
TR_A_POS_MEAS	Transmission Range Sensor A Position - Measured
TR_A_UR	Transmission Range Sensor Input A Unreliable
TR_B_DC	Transmission Range Sensor Input B Duty Cycle
TR_B_POS_MEAS	Transmission Range Sensor B Position - Measured
TR_B_UR	Transmission Range Sensor Input B Unreliable
TR_CORRECTED	Transmission Range Sensor Position - Corrected
TR_CRANK	Transmission Range Input Allowing Engine Start
TR_CRANK_F	Park Neutral Starter Enable Output Fault Detected
TR_SUPPLY_F	Transmission Range Supply Voltage Output Fault
TRAN_RAT	Transmission Gear Ratio

[a] Clutch A = Clutch 1
[b] Clutch B = Clutch 2

Diagnostic Trouble Code (DTC) Charts

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

DTC Chart

Five Digit DTC	Description	Condition	Symptom	Action
C0044:28	Brake pressure sensor A: signal bias level out of range / zero adjustment failure	Brake pressure sensor signals do not match	Transaxle defaults to NEUTRAL	For additional information, refer to Section 206-09 .
P06A6	Sensor reference voltage A circuit range/performance	Input shaft speed sensor 1 power supply circuit failure	Disabled 3rd and 5th gears. Only engage in 1st gear at a stop. Neutral shift drum 1 after launch.	GO to Pinpoint Test C .
P06A7	Sensor reference voltage B circuit range/performance	Input shaft speed sensor power supply circuit failure	Disabled 2nd, 4th and 6th gears. Neutral shift drum 2 in forward range.	GO to Pinpoint Test C .
P06A8	Sensor reference voltage C circuit range/performance	Output Shaft Speed (OSS) power supply circuit failure.	Substitute Anti-Lock Brake System (ABS) wheel speed, input shaft speed sensor 1 or input shaft speed sensor 2 for OSS .	GO to Pinpoint Test C .
P0700	Transmission control system DTC present	TCM has sent a DTC error code to PCM indicating that additional TCM DTCs may be	Malfunction Indicator Lamp (MIL) may be illuminated.	Code set in PCM to indicate that there is a transmission code(s) present and technician

		present.	Other transmission concerns present.	should check the TCM for codes. RERUN OBD test and retrieve transmission DTCs from TCM .
P0701	Wrong engine control fault - monitors the torque up and engine speed requests from the Transmission Control Module (TCM), if it finds a fault it turns off these requests	Transmission control system range/performance	Will turn on Malfunction Indicator Lamp (MIL).	See more specific DTC. If no other DTCs are set, clear code and re-test.
P0702	Transmission control system electrical	Sets with P0882 (voltage out of range low) or P0883 (voltage out of range high)	See more specific DTC.	• Verify TR sensor adaptive learning. For additional information, refer to Transmission Adaptive Learning in this section. • Adjust selector lever cable. Refer to Section 307-05 . If concern still present, replace TR sensor.
P0706	TR sensor A circuit range/performance	TR sensor A frequency out of range (200-300 Hz). Code does not set for open, short to ground or short to power (duty cycle less than 2.0 or greater than 98.0 disables this code)	• Default to NEUTRAL at low speed. • Crank disabled if fault present at start-up • Will turn on Malfunction Indicator Lamp (MIL).	GO to Pinpoint Test D .
P0707	TR sensor A circuit low	TR sensor A duty cycle out of range low (below Park Min duty cycle)	• Default to NEUTRAL at low speed. • Crank disabled	• Verify TR sensor adaptive learning. For additional information, refer to Transmission Adaptive Learning in this

			if fault present at start-up • Will turn on MIL .	section. • Adjust selector lever cable. Refer to Section 307-05 . If concern still present, replace TR sensor.
P0708	TR sensor A circuit high	TR sensor A duty cycle out of range high (below Low Max duty cycle).	• Default to NEUTRAL at low speed. • Crank disabled if fault present at start-up • Will turn on MIL .	GO to Pinpoint Test D .
P0709	TR sensor A circuit intermittent	TR intermittent PARK or NEUTRAL signal during pre-crank test	• Sets with P0706, P0707 or P0708. • Will turn on MIL .	GO to Pinpoint Test D .
P0715	Insufficient input from input shaft speed sensor	Input shaft speed sensor 1 circuit failure detected	Disabled 3rd and 5th gears. Only engages in 1st at a stop, Neutral Shift Drum 1 after launch.	GO to Pinpoint Test C .
P0716	Input shaft speed sensor A circuit	Erratic input shaft speed sensor 1 signal - noisy signal, out of range high, or not plausible. Detection of this fault is disabled if a power supply (P06A6) or circuit fault (P0715) is present.	Disabled 3rd and 5th gears. Only engages in 1st at a stop, neutral shift drum 1 after launch.	GO to Pinpoint Test C .
P0717	Input shaft speed sensor A circuit no signal	Input shaft speed sensor 1 failed to 0 speed. Detection of this fault is disabled if a power supply (P06A6) or circuit fault (P0715) is present	Disabled 3rd and 5th gears. Only engages in 1st at a stop, neutral shift drum 1 after launch.	GO to Pinpoint Test C .
P0718	Input shaft speed sensor A signal intermittent	PCM has detected an erratic input shaft speed sensor signal.	• Disabled 3rd and 5th gears. Only engages	GO to Pinpoint Test C .

			in 1st at a stop, neutral shift drum 1 after launch. • Sets with P06A6, P0715, P0716 or P0717 • Will turn on Malfunction Indicator Lamp (MIL).	
P0720	Insufficient input from OSS sensor circuit	OSS circuit failure detected.	Substitute ABS wheel speed, input shaft speed sensor 1 or input shaft speed sensor 2 for OSS	GO to Pinpoint Test C .
P0721	OSS sensor signal error	Erratic OSS signal - noisy signal, out of range high, or not plausible. Detection of this fault is disabled if a power supply (P06A8) or circuit fault (P0720) is present.	Substitute ABS wheel speed, input shaft speed sensor 1 or input shaft speed sensor 2 for OSS	GO to Pinpoint Test C .
P0722	OSS sensor no signal	OSS failed to 0 speed when vehicle conditions indicate OSS should be non-zero. Detection of this fault is disabled if a power supply (P06A8) or circuit fault (P0720) is present.	Substitute ABS wheel speed, input shaft speed sensor 1 or input shaft speed sensor 2 for OSS	GO to Pinpoint Test C .
P0723	OSS sensor circuit intermittent	Sets with P0720, P0721 or P0722	• Substitute ABS wheel speed, input shaft speed sensor 1 or input shaft speed sensor 2 for OSS	GO to Pinpoint Test C .

			• Will turn on Malfunction Indicator Lamp (MIL).	
P072B	Stuck in reverse	Shift drum 2 is unable to disengage REVERSE gear	• Shift drum 2 mechanical fault. • Shift drum 2 motor fault. • Electrical faults that prevent shift drum 2 from rotating (open circuits cannot be detected during operation). • Clutch 2 stuck on (if undetected may prevent shift drum 2 movement). • 2nd, 4th and 6th gears disabled.	• REPAIR all speed sensor, clutch motor 2, and clutch 2 performance DTCs first. • GO to Pinpoint Test B . • INSPECT shift drum, shift fork, synchronizer and TCM Shift Motors for wear or damage. REPLACE as needed. REFER to Transaxle in this section.
P072C	Stuck in gear 1	Shift drum 1 is unable to disengage 1st gear	• Shift drum 1 mechanical fault. • Shift drum 1 motor fault. • Electrical faults that	• REPAIR all speed sensor, clutch motor 1, and clutch 1 performance DTCs first. • GO to Pinpoint Test B . • INSPECT shift drum, shift fork, synchronizer and

			prevent shift drum 1 from rotating (open circuits cannot be detected during operation). • Clutch 1 stuck on (if undetected may prevent shift drum 1 movement). • 3rd and 5th gears disabled.	TCM shift motors for wear or damage. REPLACE as needed. REFER to Transaxle in this section.
P072D	Stuck in gear 2	Shift drum 2 is unable to disengage 2nd gear	• Shift drum 2 mechanical fault. • Shift drum 2 motor fault. • Electrical faults that prevent shift drum 2 from rotating (open circuits cannot be detected during operation). • Clutch 2 stuck on (if undetected may prevent shift drum 2	• REPAIR all speed sensor, clutch motor 2, and clutch 2 performance DTCs first. • GO to Pinpoint Test B . • INSPECT shift drum, shift fork, synchronizer and TCM shift motors for wear or damage. REPLACE as needed. REFER to Transaxle in this section.

			movement). • REVERSE, 4th and 6th gears disabled.	
P072E	Stuck in gear 3	Shift drum 1 is unable to disengage 3rd gear	• Shift drum 1 mechanical fault. • Shift drum 1 motor fault. • Electrical faults that prevent shift drum 1 from rotating (open circuits cannot be detected during operation). • Clutch 1 stuck on (if undetected may prevent shift drum 1 movement). • 1st and 5th gears disabled.	• REPAIR all speed sensor, clutch motor 1, and clutch 1 performance DTCs first. • GO to Pinpoint Test B . • INSPECT shift drum, shift fork, synchronizer and TCM shift motors for wear or damage. REPLACE as needed. REFER to Transaxle in this section.
P072F	Stuck in gear 4	Shift drum 2 unable to disengage 4th gear	• Shift drum 2 mechanical fault. • Shift drum 2 motor fault. • Electrical faults that prevent shift	• REPAIR all speed sensor, clutch motor 2, and clutch 2 performance DTCs first. • GO to Pinpoint Test B . • INSPECT shift drum, shift fork, synchronizer and TCM shift motors for wear or

			drum 2 from rotating (open circuits cannot be detected during operation). • Clutch 2 stuck on (if undetected may prevent shift drum 2 movement). • REVERSE, 2nd and 6th gears disabled.	damage. REPLACE as needed. REFER to Transaxle in this section.
P073A	Stuck in gear 5	Shift drum 1 unable to disengage 5th gear	• Shift drum 1 mechanical fault. • Shift drum 1 motor fault. • Electrical faults that prevent shift drum 1 from rotating (open circuits cannot be detected during operation). • Clutch 1 stuck on (if undetected may prevent shift drum 1 movement).	• REPAIR all speed sensor, clutch motor 1, and clutch 1 performance DTCs first. • GO to Pinpoint Test B . • INSPECT shift drum, shift fork, synchronizer and TCM shift motors for wear or damage. REPLACE as needed. REFER to Transaxle in this section.

			• 1st and 3rd gears disabled.	
P073B	Stuck in gear 6	Shift drum 2 unable to disengage 6th gear	• Shift drum 2 mechanical fault. • Shift drum 2 motor fault. • Electrical faults that prevent shift drum 2 from rotating (open circuits cannot be detected during operation). • Clutch 2 stuck on (if undetected may prevent shift drum 2 movement). • REVERSE, 2nd and 4th gears disabled.	• REPAIR all speed sensor, clutch motor 2, and clutch 2 performance DTCs first. • GO to Pinpoint Test B . • INSPECT shift drum, shift fork, synchronizer and TCM shift motors for wear or damage. REPLACE as needed. REFER to Transaxle in this section.
P073E	Unable to engage reverse	Shift drum 2 is unable to engage REVERSE	• Motor turns, but cannot synchronize and engage REVERSE gear. • Reverse gear is disabled.	INSPECT shift fork and synchronizer for wear or damage. REPLACE as needed. REFER to Transaxle in this section.
P073F	Unable to engage gear 1	Shift drum 1 is unable to engage 1st gear	• Motor turns, but	INSPECT shift fork and synchronizer for wear or damage. REPLACE as

			cannot synchronize and engage 1st gear. • 1st gear disabled.	needed. REFER to Transaxle in this section.
P074A	Unable to engage gear 2	Shift drum 2 is unable to engage 2nd gear	• Motor turns, but cannot synchronize and engage 2nd gear. • 2nd gear disabled. • For certain faults shift drum controls will not pass through a failed gear; reverse, 4th and 6th gears may also be disabled.	INSPECT shift fork and synchronizer for wear or damage. REPLACE as needed. REFER to Transaxle in this section.
P074B	Unable to engage gear 3	Shift drum 1 is unable to engage 3rd gear	• Motor turns, but cannot synchronize and engage 3rd gear. • 3rd gear disabled. • For certain faults shift drum controls will not pass through a failed	INSPECT shift fork and synchronizer for wear or damage. REPLACE as needed. REFER to Transaxle in this section.

			gear; 1st and 5th gears may also be disabled.	
P074C	Unable to engage gear 4	Shift drum 2 is unable to engage 4th gear	• Motor turns, but cannot synchronize and engage 4th gear. • 4th gear disabled. • For certain faults shift drum controls will not pass through a failed gear; reverse, 2nd and 6th gears may also be disabled.	INSPECT shift fork and synchronizer for wear or damage. REPLACE as needed. REFER to Transaxle in this section.
P074D	Unable to engage gear 5	Shift drum 1 is unable to engage 5th gear	• Motor turns, but cannot synchronize and engage 5th gear. • 5th gear disabled.	INSPECT shift fork and synchronizer for wear or damage. REPLACE as needed. REFER to Transaxle in this section.
P074E	Unable to engage gear 6	Shift drum 2 is unable to engage 6th gear	• Motor turns, but cannot synchronize and engage 6th gear. • 6th gear disabled.	INSPECT shift fork and synchronizer for wear or damage. REPLACE as needed. REFER to Transaxle in this section.

P07A2	Transmission friction element A performance/stuck off	Clutch A (1st, 3rd and 5th gears) stuck off [a]	1st, 3rd and 5th gears disabled.	Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P07A3	Transmission friction element A stuck on	Clutch A (1st, 3rd and 5th gears) spring fault or clutch motor 1 is blocked, preventing it traveling its full range. [a]	• Spring. • Blockage. • 3rd and 5th gears disabled.	Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P07A4	Transmission friction element B performance/stuck off	Clutch B (R, 2nd, 4th and 6th) stuck off. [b]	Reverse, 2nd, 4th and 6th gears disabled	Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P07A5	Transmission friction element B stuck on	Clutch B (reverse, 2nd, 4th and 6th gears) spring fault or clutch motor 2 is blocked, preventing it traveling its full range. [b]	• Spring. • Blockage. • Reverse, 2nd, 4th and 6th gears disabled.	Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P0805	Clutch position sensor A circuit	Clutch motor 1 (ATIC) fault	1st, 3rd and 5th gears disabled.	GO to Pinpoint Test A .
P0806	Clutch position sensor A circuit range/performance	Clutch motor 1 hall sensor fault detected	1st, 3rd and 5th gears disabled	GO to Pinpoint Test A .
P0809	Clutch position sensor A circuit intermittent	Clutch motor 1 sequence fault detected	1st, 3rd and 5th gears disabled.	GO to Pinpoint Test A .
P087A	Clutch position sensor B circuit	Clutch motor 2 (ATIC) fault detected	Reverse, 2nd, 4th and 6th gears disabled.	GO to Pinpoint Test A .
P087B	Clutch position sensor B circuit range/performance	Clutch motor 2 hall sensor fault detected	Reverse, 2nd, 4th and 6th gears disabled.	GO to Pinpoint Test A .
P087E	Clutch position sensor B circuit intermittent	Clutch motor 2 sequence fault detected	Reverse, 2nd, 4th and 6th gears disabled.	GO to Pinpoint Test A .
P0882	TCM power input signal low	TCM voltage out of range - low	Shift drums will not engage new gears.	GO to Pinpoint Test A .
P0883	TCM power input signal high	TCM voltage out of range - high	No noticeable problems.	Section 414-00 .
P0900	Clutch A actuator control circuit / open	Clutch motor 1 open circuit fault detected	1st. 3rd and 5th gears disabled.	GO to Pinpoint Test A .
P0901	Clutch A actuator control circuit range/performance	Sets with P0900, P0902 or P0903	Will turn on MIL .	GO to Pinpoint Test A .
P0902	Clutch A actuator control circuit low	Clutch motor 1 short to ground fault detected	1st, 3rd and 5th gears disabled.	GO to Pinpoint Test A .
P0903				GO to Pinpoint Test A .

	Clutch A actuator control circuit high	Clutch motor 1 short to power fault detected	1st, 3rd and 5th gears disabled.	
P090A	Clutch B actuator control circuit / open	Clutch motor 2 open circuit fault detected	Reverse, 2nd, 4th and 6th gears disabled.	GO to Pinpoint Test A .
P090B	Clutch B actuator control circuit performance	Sets with P090A, P090C or P090D	Will turn on MIL .	GO to Pinpoint Test A .
P090C	Clutch B actuator control circuit low	Clutch motor 2 short to ground fault detected	Reverse, 2nd, 4th and 6th gears disabled.	GO to Pinpoint Test A .
P090D	Clutch B Actuator Control Circuit High	Clutch motor 2 short to power fault detected	Reverse, 2nd, 4th and 6th gears disabled.	GO to Pinpoint Test A .
P163E	TCM programming error	Gear ratio calibration error	• Gear ratios used within Ford software and shift drum controls do not match. • The calibration does not match the hardware.	Verify TCM calibration. For additional information, refer to Transmission Adaptive Learning in this section.
P2700	Transmission friction element A apply time range/performance	-	-	Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P2701	Transmission friction element B apply time range/performance	-	-	Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P2765	Input speed sensor 2 circuit	Input shaft speed 2 circuit failure detected	2nd, 4th and 6th gears disabled.	GO to Pinpoint Test C .
P2766	Input speed sensor 2 circuit range / performance	Erratic input shaft speed sensor 1 signal - noisy signal, out of range high, or not plausiD>	2nd, 4th and 6th gears disabled.	GO to Pinpoint Test C .
P2767	Input speed sensor 2 circuit no signal	Input shaft speed sensor failed to 0 speed when vehicle conditions indicate that input shaft speed sensor should be non-zero	2nd, 4th and 6th gears disabled.	GO to Pinpoint Test C .
P2768				GO to Pinpoint Test C .

	Input speed sensor 2 circuit intermittent	Sets with P06A7, P2765, P2766 or P2767	• 2nd, 4th and 6th gears disabled. • Will turn on MIL .	
P2801	TR sensor B circuit range/performance	TR B frequency out of range (200-300 Hz). Code does not set for open, short to ground or short to power (duty cycle less than 2.0 or greater than 98.0 disables this code.	• Default to neutral at low speed. • Crank disabled if fault present at start-up	GO to Pinpoint Test D .
P2802	TR sensor B circuit low	TR sensor B duty cycle out of range low	• Default to neutral at low speed. • Crank disabled if fault present at start-up	GO to Pinpoint Test D .
P2803	TR sensor B circuit high	TR sensor B duty cycle out of range high	• Default to neutral at low speed. • Crank disabled if fault present at start-up	GO to Pinpoint Test D .
P2804	TR sensor B circuit intermittent	Sets with P2801, P2802 or P2803	See P0706, P0707 and P0708.	GO to Pinpoint Test D .
P2805	TR sensor A / B correlation	TR sensor A and B sum must be 100 +/- 2x sensor tolerance. If both are "in-range" (no other DTC's set) but the sum fails to add up to 100% this DTC will set	• Defaults to neutral at low speed. • Crank disabled if fault present at start up.	GO to Pinpoint Test D .
P2831	Shift fork A position circuit intermittent	Shift drum motor 1 fault detected	Shift drum 1 will no longer move, so only the current gear is	GO to Pinpoint Test B .

			available on shift drum 1	
P2832	Shift fork A position circuit range/performance	Shift drum - shift drum controls found an error with shift drum 1 that indicated it has lost position confidence.	• 1st, 3rd, and 5th gears disabled. • If shift drum 1 indicates state of shift drum 1 unknown the transaxle will default to neutral.	GO to Pinpoint Test B .
P2835	Shift fork A position circuit intermittent	Shift drum motor 1 sequence fault detected	Disables all the gears but the current engaged gear.	GO to Pinpoint Test B .
P2836	Shift fork B position circuit	Shift drum motor 2 fault detected	Shift drum will no longer move. Current gear is the only gear available.	GO to Pinpoint Test B .
P2837	Shift fork B position circuit range/performance	Shift drum 2 - shift drum controls found an error with shift drum 2 that indicated it has lost position confidence	• Reverse, 2nd, 4th and 6th gears disabled. • If shift drum control indicates state of shift drum 2 as unknown the transaxle will default to neutral.	GO to Pinpoint Test B .
P283A	Shift fork B position circuit intermittent	Shift drum motor 2 sequence fault detected	Disables all gears but the current gear.	GO to Pinpoint Test B .
P285B	Shift fork A actuator circuit / open	Shift drum motor 2 open circuit fault detected	Disables all gears but the current	GO to Pinpoint Test B .

			gear.	
P285C	Shift fork A actuator circuit performance	Sets with P285F, P2861 or P2862	• Disables all gears but the current gear. • Will turn on MIL .	GO to Pinpoint Test B .
P285D	Shift fork A actuator circuit low	Shift drum motor 1 short to ground fault detected	Disables all gears but the current gear.	GO to Pinpoint Test B .
P285E	Shift fork A actuator circuit high	Shift drum motor 1 short to power fault detected	Disables all gears but the current gear.	GO to Pinpoint Test B .
P285F	Shift fork B actuator circuit / open	Shift drum motor 1 open circuit fault detected	Disables all gears but the current gear.	GO to Pinpoint Test B .
P2860	Shift fork B actuator circuit performance	Sets with P285F, P2861 or P2862	• Disables all gears but the current gear. • Will turn on MIL .	GO to Pinpoint Test B .
P2861	Shift fork B actuator circuit low	Shift drum motor 2 short to ground fault detected	Disables all gears but the current gear.	GO to Pinpoint Test B .
P2862	Shift fork B actuator circuit high	Shift drum motor 2 short to power fault detected	Disables all gears but the current gear.	GO to Pinpoint Test B .
P286F	Clutch A disengagement time performance/too slow	TIP unintended launch protection or wrong driving direction tripped.	Disables clutch 1.	Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P2872	Clutch A stuck engaged	Clutch confidence error	Neutral shift drum 1 and disables all gears with clutch 1 on.	• GO to Pinpoint Test B . • Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P2877	Clutch B disengagement time performance/too slow	TIP unintended launch protection or wrong driving direction tripped.	Disables clutch 2.	Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P287A	Clutch B stuck engaged	Clutch confidence error	Neutral shift drum 2 and	

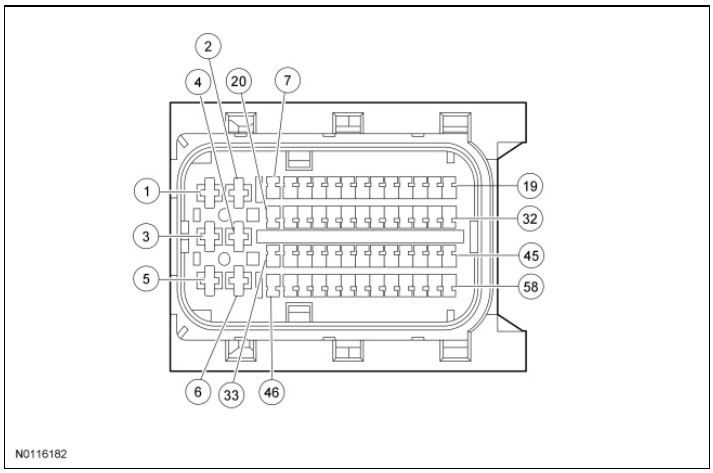
			disables all gears with clutch 2 on.	• GO to Pinpoint Test B . • Check the clutch for wear or damage. For additional information, refer to Clutch in this section.
P287B	Shift fork calibration not learned	Transmission control module adaptive learning failure	Defaults to neutral until a transmission control module adaptive learning completes successfully	Verify TCM calibration. For additional information, refer to Transmission Adaptive Learning in this section.
U0028	Vehicle communication bus A	non- MIL sister code to U0073	• Holds current gear until the vehicle speed is too low, then defaults to neutral.	Refer to Section 418-00 .
U0073	Control module communication bus A off	Complete Controller Area Network (CAN) failure	• Holds current gear until the vehicle speed is too low, then defaults to NEUTRAL. • Will turn on MIL .	Refer to Section 418-00 .
U0100	Lost communication with Engine Control Module (ECM)/ PCM A	Lost communication with the PCM .	• Holds current gear until the vehicle speed is too low, then defaults to	Refer to Section 418-00 .

			neutral. • Will turn on MIL .	
U0115	Lost Communication With ECM / PCM B	Lost communication with the PCM .	FMEM mode.	Refer to Section 418-00 .
U0121	Lost communication with ABS control module	Lost communication with ABS	Provide failure mode substitutions for missing brake pressure and wheel speeds	Refer to Section 418-00 .
U0129	Lost communication with ABS control module	Lost communication with ABS control module	Provide failure mode substitutions for missing brake pressure and wheel speeds	Refer to Section 418-00 .
U0140	Lost communication with Body Control Module (BCM)	-	-	Refer to Section 418-00 .
U0141	Lost communication with BCM A	-	-	Refer to Section 418-00 .
U0155	Lost communication with Instrument Panel Cluster (IPC) control module	Lost communication with the IPC control module	-	Refer to Section 418-00 .
U0294	Lost communication with PCM	Lost communication with PCM	Holds current gear until speed is too low then defaults to neutral.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U0401	Invalid data received from ECM / PCM A	Receiving CAN messages from PCM , but PCM is indicating failures of certain key signals	Holds current gear until speed is too low then defaults to neutral.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U0415	Invalid data received from ABS control module	Receiving CAN messages from ABS , but ABS is indicating failures of certain key signals	-	Refer to Section 206-09 .

[a] Clutch A = Clutch 1
[b] Clutch B = Clutch 2

Transaxle Connector Layouts

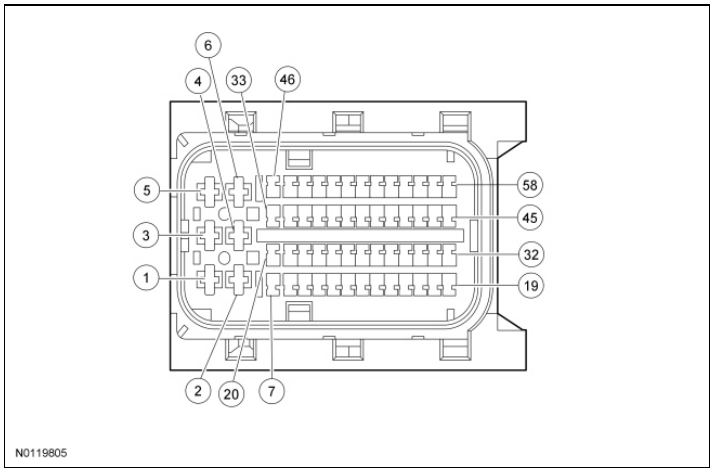
Transmission Control Module (TCM) Connector C1750B



Item	Description
1	Clutch 2 Phase W
2	Clutch 2 Phase U
3	Clutch 2 Phase V
4	Clutch 1 Phase W
5	Clutch 1 Phase V
6	Clutch 1 Phase U
8	Input Shaft Speed Sensor 2
9	Output Shaft Speed (OSS)
10	Input Shaft Speed Sensor 1
12	Input Shaft Speed Sensor 2 Supply
19	Clutch Motor 1
21	Input Shaft Speed Sensor 1 Supply
24	Transmission Range (TR) Sensor 1 Input
25	TR Sensor 2 Input
32	Clutch Motor 1
34	TR Sensor Supply 5 Volt
35	TR Sensor Ground
37	OSS Supply
42	Clutch Motor 2
43	Clutch Motor 2
44	Clutch Motor 2
45	Clutch Motor 1
55	Clutch Motor 2

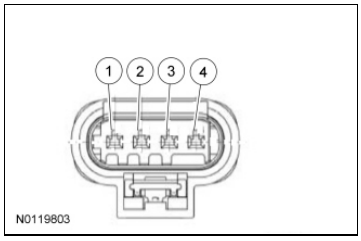
56	Clutch Motor 2
57	Clutch Motor 1
58	Clutch Motor 1

Transmission Control Module (TCM) Connector C1750A



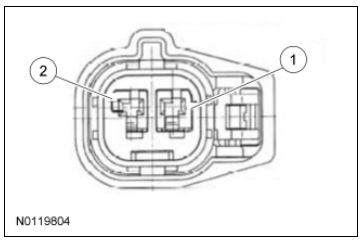
Item	Description
1	Power
2	Power
3	Ground
4	Ground
5	Ground
6	Ground
11	Overdrive (O/D) Cancel
18	Power
31	Ignition Run Start
34	Can Bus High Speed High
35	Can Bus High Speed Low
39	P/N Switch/Clutch 2
40	REVERSE Lamp
49	Brake Shift Interlock Actuator (BSIA)

Transmission Range (TR) Sensor Vehicle Harness C167



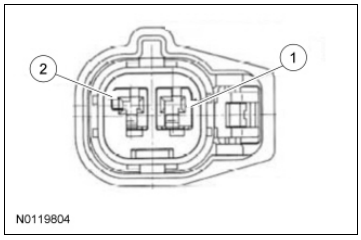
Pin Number	Circuit Function
1	Transmission Range (TR) sensor 2 input
2	Ground
3	Power
4	TR sensor 1 input

Output Shaft Speed (OSS) Vehicle Harness C193



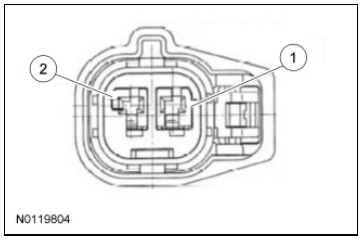
Pin Number	Circuit Function
1	Power
2	Output Shaft Speed (OSS)

Input Shaft Speed Sensor 1 Vehicle Harness C143



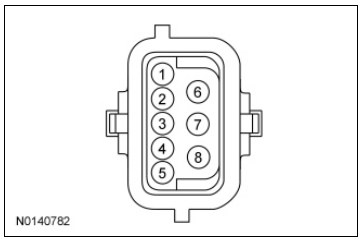
Pin Number	Circuit Function
1	Input Shaft Speed Sensor
2	Power

Input Shaft Speed Sensor 2 Vehicle Harness C164



Pin Number	Circuit Function
1	Power
2	Input Shaft Speed Sensor

Clutch Motor 1 C1633 and Clutch Motor 2 C1634



Pin Number	Circuit Function
1	Power
2	Hall Effect 2
3	Hall Effect 3
4	Hall Effect 1
5	Ground
6	Phase U
7	Phase W
8	Phase V

Pinpoint Tests

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

Any time an electrical connector is disconnected, inspect the connector for terminal condition, corrosion and contamination. Also inspect the connector seal for damage. Clean, repair or install new as necessary.

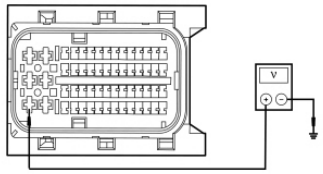
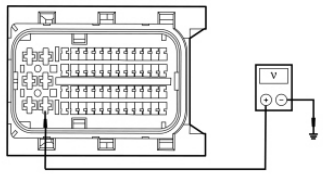
Pinpoint Tests

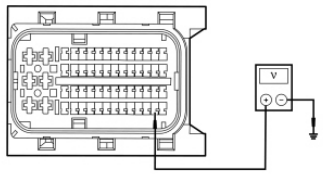
Refer to Wiring Diagrams Cell 29 for schematic and connector information.

PINPOINT TEST A: CLUTCH MOTORS

NOTE: Refer to the transaxle connector illustrations Transaxle Connector Layouts in this section.

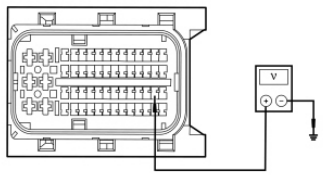
Test Step	Result / Action to Take
A1 TEST BJB FUSE 2 (50A)	
• Check fuse: Battery Junction Box (BJB) fuse 2 (50A). • **Is the resistance less than 5 ohms?**	**Yes** GO to A2 . **No** REPAIR circuit SBB02 (YE/RD) for a short to ground. INSTALL a new fuse. TEST the system for normal operation. Refer to clutch test in Transmission Adaptive Learning .
A2 TEST BJB FUSE 27 (7.5A)	
• Check fuse: BJB fuse 27 (7.5A). • **Is the resistance less than 5 ohms?**	**Yes** GO to A3 . **No** REPAIR circuit SBB27 (BU/RD) for a short to ground. INSTALL a new fuse. TEST the system for normal operation.
A3 TEST CJB FUSE 23 (10A)	

• Check fuse: Central Junction Box (CJB) fuse 23 (10A). • **Is the resistance less than 5 ohms?**	**Yes** GO to A4 . **No** REPAIR circuit CBP23 (BN/YE) for a short to ground. INSTALL a new fuse. TEST the system for normal operation.
A4 CHECK FOR VOLTAGE AT THE TCM CONNECTOR	
• Ignition OFF. • Disconnect: Transmission Control Module (TCM) C1750A. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the voltage between TCM C1750A-1, circuit SBB02 (YE/RD) harness side and ground.  N0125641 • Measure the voltage between TCM C1750A-2, circuit SBB02 (YE/RD) harness side and ground.  N0125642 • **Is the voltage greater than 10 volts?**	**Yes** GO to A5 . **No** REPAIR circuit SBB02 (YE/RD) for an open. RECONNECT all components. TEST the system for normal operation.
A5 CHECK FOR KAM VOLTAGE AT THE TCM CONNECTOR	
• Measure the voltage between TCM C1750A-18, circuit SBB27 (BU/RD) harness side and ground.	**Yes** GO to A6 . **No** REPAIR circuit SBB27 (BU/RD) for an open. RECONNECT all components. TEST the system for normal operation.



N0125643

- **Is the voltage greater than 10 volts?**

A6 CHECK FOR IGNITION POWER AT THE TCM CONNECTOR	
• Ignition ON. • Measure the voltage between TCM C1750A-31, circuit CBP23 (BN/YE) harness side and ground.  N0125644 • **Is the voltage greater than 10 volts?**	**Yes** GO to A7 . **No** REPAIR circuit CBP23 (BN/YE) for an open. RECONNECT all components. TEST the system for normal operation.
A7 CHECK THE TRANSAXLE WIRING HARNESS FOR AN OPEN CIRCUIT	
• Ignition OFF. • Disconnect: TCM C1750B. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Disconnect: Clutch Motor 1 C1633. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Disconnect: Clutch Motor 2 C1634. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • If diagnosing a clutch motor 1 concern, measure the resistance between TCM C1750B, harness side and clutch motor 1 C1633, using the following chart. **TCM** / **Clutch Motor 1** C1750B-58 — C1633-1 C1750B-19 — C1633-2 C1750B-45 — C1633-3	**Yes** GO to A8 . **No** REPAIR the circuit(s) for an open. RECONNECT all components. TEST the system for normal operation.

C1750B-32	C1633-4
C1750B-57	C1633-5
C1750B-6	C1633-6
C1750B-4	C1633-7
C1750B-5	C1633-8

- If diagnosing a clutch motor 2 concern, measure the resistance between TCM C1750B, harness side and clutch motor 2 C1634, using the following chart.

TCM	Clutch Motor 2
C1750B-55	C1634-1
C1750B-42	C1634-2
C1750B-44	C1634-3
C1750B-43	C1634-4
C1750B-56	C1634-5
C1750B-2	C1634-6
C1750B-1	C1634-7
C1750B-3	C1634-8

- **Is the resistance less than 5 ohms?**

A8 CHECK THE TRANSAXLE WIRING HARNESS FOR A SHORT TO GROUND

- If diagnosing a clutch motor 1 concern, measure the resistance between TCM C1750B, harness side and ground using the following chart.

TCM	Ground
C1750B-58	Ground
C1750B-19	Ground
C1750B-45	Ground
C1750B-32	Ground
C1750B-57	Ground
C1750B-6	Ground
C1750B-4	Ground
C1750B-5	Ground

- If diagnosing a clutch motor 2 concern, measure the resistance between TCM C1750B, harness side and ground using the following chart.

Yes
Inspect the transaxle wiring harness for signs of physical damage and repair or install a new transaxle wiring harness as necessary. TEST the system for normal operation. If the transaxle wiring harness is not damaged, GO to A9 .

No
REPAIR the circuit(s) for a short to ground. RECONNECT all components. TEST the system for normal operation.

TCM	Ground
C1750B-55	Ground
C1750B-42	Ground
C1750B-44	Ground
C1750B-43	Ground
C1750B-56	Ground
C1750B-2	Ground
C1750B-1	Ground
C1750B-3	Ground

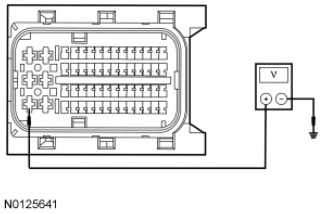
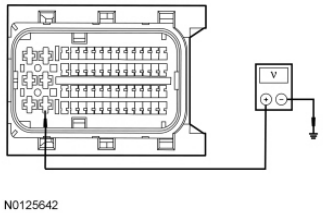
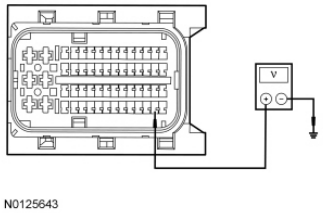
- **Is the resistance greater than 10,000 ohms?**

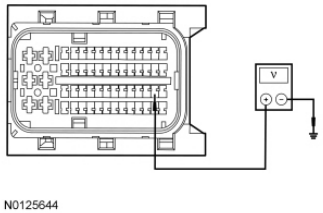
A9 CHECK THE CLUTCH MOTOR	
• Remove both clutch motors. Install clutch motor 1 in the original clutch motor 2 location and install clutch motor 2 in the original clutch motor 1 location. RECONNECT all components. Clear the DTC's and TEST the system for normal operation. • **Does the TCM set the same DTC?**	**Yes** INSTALL a new TCM . **No** INSTALL a new clutch motor. TEST the system for normal operation.

PINPOINT TEST B: SHIFT MOTORS

NOTE: Refer to the transaxle connector illustrations Transaxle Connector Layouts in this section.

Test Step	Result / Action to Take
B1 TEST BJB FUSE 2 (50A)	
• Check fuse: Battery Junction Box (BJB) fuse 2 (50A). • **Is the resistance less than 5 ohms?**	**Yes** GO to B2 . **No** REPAIR circuit SBB02 (YE/RD) for a short to ground. INSTALL a new fuse. TEST the system for normal operation.
B2 TEST BJB FUSE 27 (7.5A)	
• Check fuse: BJB fuse 27 (7.5A). • **Is the resistance less than 5 ohms?**	**Yes** GO to B3 . **No** REPAIR circuit SBB27 (BU/RD) for a short to ground. INSTALL a new fuse. TEST the system for normal operation. Refer to Shift Drum Test in Transmission Adaptive Learning .
B3 TEST CJB FUSE 23 (7.5A)	
• Check fuse: CJB fuse 23 (7.5A).	**Yes** GO to B4 .

• **Is the resistance less than 5 ohms?**	**No** REPAIR circuit CBP23 (BN/YE) for a short to ground. INSTALL a new fuse. TEST the system for normal operation.
B4 CHECK FOR VOLTAGE AT THE TCM CONNECTOR	
• Ignition OFF. • Disconnect: Transmission Control Module (TCM) C1750A. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the voltage between TCM C1750A-1, circuit SBB02 (YE/RD) harness side and ground.  N0125641 • Measure the voltage between TCM C1750A-2, circuit SBB02 (YE/RD) harness side and ground.  N0125642 • **Is the voltage greater than 10 volts?**	**Yes** GO to B5 . **No** REPAIR circuit SBB02 (YE/RD) for an open. RECONNECT all components. TEST the system for normal operation.
B5 CHECK FOR KAM VOLTAGE AT THE TCM CONNECTOR	
• Measure the voltage between TCM C1750A-18, circuit SBB27 (BU/RD) harness side and ground.  N0125643 • **Is the voltage greater than 10 volts?**	**Yes** GO to B6 . **No** REPAIR circuit SBB27 (BU/RD) for an open. RECONNECT all components. TEST the system for normal operation.

B6 CHECK FOR IGNITION POWER AT THE TCM CONNECTOR	
• Ignition ON. • Measure the voltage between TCM C1750A-31, circuit CBP23 (BN/YE) harness side and ground.  N0125644 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new TCM . **No** REPAIR circuit CBP23 (BN/YE) for an open. RECONNECT all components. TEST the system for normal operation.

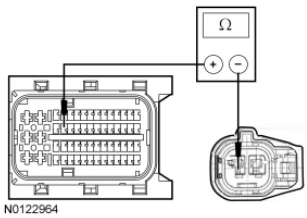
PINPOINT TEST C: SPEED SENSORS

NOTE: Perform speed sensor test prior to beginning speed sensor pinpoint tests. For additional information, refer to Transmission Adaptive Learning in this section.

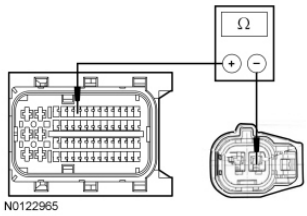
NOTE: Refer to the transaxle connector illustrations Transaxle Connector Layouts in this section.

Test Step	Result / Action to Take
C1 CHECK THE TRANSAXLE WIRING HARNESS FOR AN OPEN CIRCUIT	
• Ignition OFF. • Disconnect: Transmission Control Module (TCM) C1750B. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Disconnect: Input Shaft Speed Sensor 1 C143. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Disconnect: Input Shaft Speed Sensor 2 C164. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Disconnect: Output Shaft Speed (OSS) sensor C193. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • If diagnosing an input shaft speed sensor 1 concern, measure the resistance between TCM C1750B-21, harness side and input	**Yes** GO to C2 . **No** REPAIR the circuit(s) for an open. RECONNECT all components. TEST the system for normal operation.

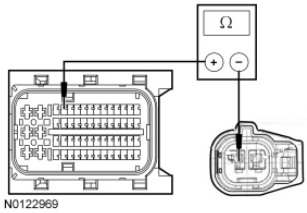
shaft speed sensor 1 C143-2.



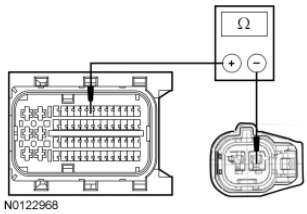
- If diagnosing an input shaft speed sensor 1 concern, measure the resistance between TCM C1750B-10, harness side and input shaft speed sensor 1 C143-1.



- If diagnosing an input shaft speed sensor 2 concern, measure the resistance between TCM C1750B-8, harness side and input shaft speed sensor 2 C164-2.

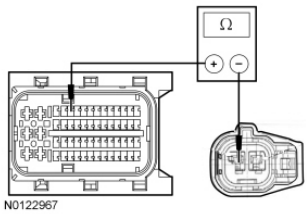


- If diagnosing an input shaft speed sensor 2 concern, measure the resistance between TCM C1750B-12, harness side and input shaft speed sensor 2 C164-1.

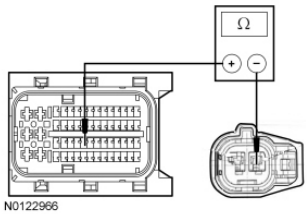


- If diagnosing an OSS sensor concern, measure the resistance between TCM C1750B-9, harness side and OSS sensor

C193-2.

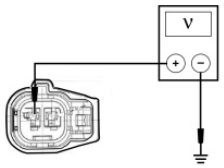
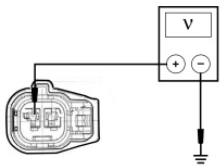


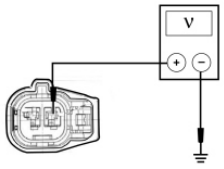
- If diagnosing an OSS sensor concern, measure the resistance between TCM C1750B-37, harness side and OSS sensor C193-1.



- **Is the resistance less than 5 ohms?**

C2 CHECK THE TRANSAXLE WIRING HARNESS FOR A SHORT TO GROUND	
• If diagnosing an input shaft speed sensor 1 concern, measure the resistance between TCM C1750B, harness side and ground using the following chart. **TCM** / **Ground** C1750B-21 / Ground C1750B-10 / Ground • If diagnosing an input shaft speed sensor 2 concern, measure the resistance between TCM C1750B, harness side and ground using the following chart. **TCM** / **Ground** C1750B-12 / Ground C1750B-8 / Ground	**Yes** Inspect the transaxle wiring harness for signs of physical damage and repair or install a new transaxle wiring harness as necessary. TEST the system for normal operation. If the transaxle wiring harness is not damaged, GO to C3 . **No** REPAIR the circuit(s) for a short to ground. RECONNECT all components. TEST the system for normal operation.

• If diagnosing an OSS sensor concern, measure the resistance between TCM C1750B, harness side and ground using the following chart. **TCM** / **Ground** C1750B-37 / Ground C1750B-9 / Ground • **Is the resistance greater than 10,000 ohms?**	
C3 CHECK THE TCM	
• Connect: TCM C1750B. • Ignition ON. • If diagnosing an input shaft speed sensor 1 concern, measure the voltage between input shaft speed sensor 1 C143-2, harness side and ground.  N0122981 • If diagnosing an input shaft speed sensor 2 concern, measure the voltage between input shaft speed sensor 2 C164-2, harness side and ground.  N0122981 • If diagnosing an OSS sensor concern, measure the voltage between OSS sensor C193-1, harness side and ground.	**Yes** INSTALL a new speed sensor. RECONNECT all components. TEST the system for normal operation. Refer to ISS or OSS Test in Transmission Adaptive Learning . **No** INSTALL a new TCM . RECONNECT all components. TEST the system for normal operation.

 N0122982 • **Is the voltage greater than 10 volts?**	

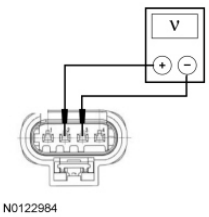
PINPOINT TEST D: TR SENSOR

NOTE: Prior to beginning TR sensor pinpoint test, verify TR sensor adaptive learning. For additional information, refer to Transmission Adaptive Learning in this section.

NOTE: Refer to the transaxle connector illustrations Transaxle Connector Layouts in this section.

Test Step	Result / Action to Take
D1 VERIFY SELECTOR LEVER CABLE/LINKAGE ADJUSTMENT	
• Verify that the selector lever cable/linkage is correctly adjusted. Refer to Section 307-05 . • **Is the selector lever cable/linkage correctly adjusted?**	**Yes** GO to D2 . **No** ADJUST the selector lever cable/linkage. REFER to Section 307-05 .
D2 CHECK THE TRANSAXLE WIRING HARNESS FOR AN OPEN CIRCUIT	
• Ignition OFF. • Disconnect: Transmission Control Module (TCM) C1750B. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Disconnect: Transmission Range (TR) sensor C167. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the resistance between TCM C1750B, harness side and TR sensor C167, using the following chart.	**Yes** GO to D3 . **No** REPAIR the circuit(s) for an open. RECONNECT all components. TEST the system for normal operation. Refer to TR Sensor Adaptive Learning in Transmission Adaptive Learning .

TCM	Transmission Range Sensor
C1750B-24	C167-4
C1750B-25	C167-1
C1750B-34	C167-3
C1750B-35	C167-2

• **Is the resistance less than 5 ohms?**	
D3 CHECK THE TRANSAXLE WIRING HARNESS FOR A SHORT TO GROUND	
• Measure the resistance between TCM C1750B, harness side and ground using the following chart. **TCM** / **Ground** C1750B-24 / Ground C1750B-25 / Ground C1750B-34 / Ground C1750B-35 / Ground • **Is the resistance greater than 10,000 ohms?**	**Yes** Inspect the transaxle wiring harness for signs of physical damage and repair or install a new transaxle wiring harness as necessary. TEST the system for normal operation. If the transaxle wiring harness is not damaged, GO to D4 . **No** REPAIR the circuit(s) for a short to ground. RECONNECT all components. TEST the system for normal operation.
D4 CHECK THE TCM	
• Connect: Transmission Control Module (TCM) C1750B. • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Ignition ON. • Measure the voltage between TR sensor C167-3, harness side and TR sensor C167-2, harness side.  N0122984 • **Is the voltage between 4.5 and 5.5 volts?**	**Yes** INSTALL a new TR sensor. RECONNECT all components. TEST the system for normal operation. **No** INSTALL a new TCM . RECONNECT all components. TEST the system for normal operation. Refer to TR Sensor Adaptive Learning in Transmission Adaptive Learning .

Leakage Inspection

Material

Item	Specification
Motorcraft® Dual Clutch Transmission Fluid X-11-QDC	WSS-M2C200-D2

NOTICE: **Do not try to stop the transmission fluid leak by increasing the torque beyond specification. This may cause damage to the case threads.**

If leakage is found at the Transmission Range (TR) manual control lever, install a new seal. Refer to Manual Control Lever Shaft Seal in this section.

If leakage is found at the TCM , install a new O-rings. Refer to Transmission Control Module (TCM) in this section.

Check the fill plug and drain plug. If leakage is present refer to Transmission Draining and Filling in this section.

Check all the speed sensors for leakage. Refer to Input Shaft Speed Sensor - No. 1 , Input Shaft Speed Sensor - No. 2 or Output Shaft Speed (OSS) Sensor in this section.

Check the RH and LH halfshaft seals. Refer to Halfshaft Seal - RH and Halfshaft Seal - LH in this section.

Check the Inner Input shaft seal and outer Input shaft case seal If fluid leakage is detected in the clutch housing area:

1. Remove the clutch engagement system, Refer to Clutch Engagement System .
    - Remove the Inner Input shaft seal and replace as ne Refer to Inner Input Shaft Seal .
    - Remove the Outer Input Shaft case seal and replace as necessary. Refer to Outer Input Shaft Case Seal .

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

Symptom Chart - Transaxle Operation

Symptom Chart - Transaxle Operation

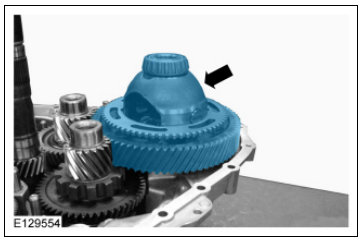
Differential Shim Selection

Special Tool(s)

 ST3257-A	Differential Bearing Preload Tool DPS6 307-681 (includes 307-681/1 and 307-681/2)
 ST2486-A	Shim Selection Set 308-164

NOTE: If the differential, differential bearings, clutch housing or transaxle case have been replaced this procedure must be performed.

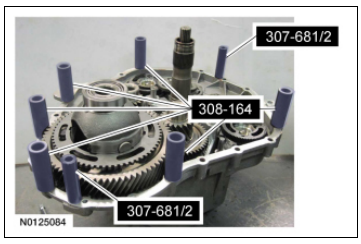
1. Install the differential.



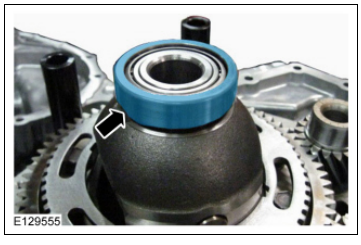
2. **NOTE:** Install the alignment standoffs at the transaxle dowel locations.

   NOTE: Place the special tools around the differential area as shown.

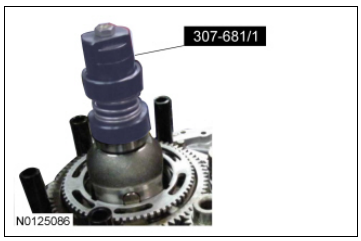
   Install the special tools.



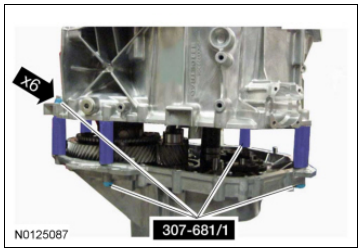
3. Position the differential bearing race on the differential. For removal of the differential bearing race from the clutch housing refer to Differential Shim in this section.



4. Install the special tool on the differential.

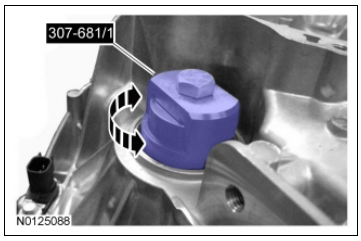


5. Position the clutch housing on the special tools and install the 6 special tool bolts, 4 shown.
   - Tighten to 18 Nm (13 lb-ft).

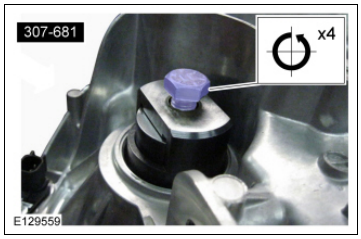


6. Turn the differential several times clockwise and counter-clockwise to make sure the differential turns freely and that the bearing is seated.

7. Turn the differential pre-load tool as shown.

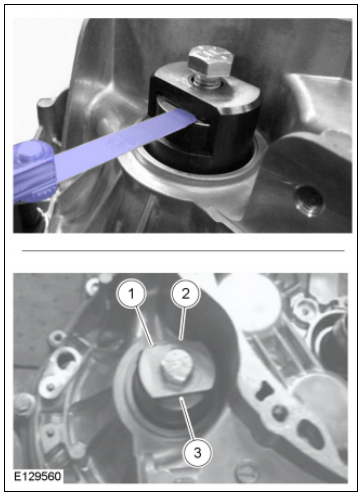


8. Loosen the differential pre-load tool bolt.



9. **NOTE:** The shim size should be the average of the 3 measurements.

   Using a feeler gauge measure the clearance at points 1, 2 and 3 and record. Using the average of the recorded measurements, select the appropriate shim from the shim selection chart in the specifications section.



10. Remove the special tools.

11. Install the selected shim into the clutch housing and install the differential bearing race. For additional information, refer to Differential Shim in this section.

Transmission Adaptive Learning

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

1. The adaptive learning procedures and self-tests should be done with the Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS).

2. **NOTE:** The VCM LED prove-out confirms power and ground from the Data Link Connector (DLC) 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 to diagnose no power to the scan tool.

3. If the scan tool does not communicate with the vehicle:
   - verify the ignition is in the RUN position.
   - verify scan tool operation with a known good vehicle.
   - refer to, Section 418-00 to diagnose no response from the scan tool.

4. 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, continue with the transmission adaptive learning procedures.

5. Verify that the calibration file is present on the scan tool. If the file is present, go to Step 10. If the file is not present, continue with this procedure.

6. Update the PCM/Transmission Control Module (TCM) calibration. Calibration files maybe obtained at Professional Technician Society (PTS) website. Independent Technicians refer to www.motorcraft.com.
   The scan tool checks to see if the file is present on the scan tool. If the calibration file is present, the technician may proceed with downloading the file to the PCM/ TCM . If the file is not present, the scan tool will need to be connected to the server to download the file onto the scan tool.

7. Connect the scan tool to the PTS server.

8. Follow the instructions on the network to download the strategy file to the scan tool.

9. If the scan tool cannot connect to the PTS server, download the file from www.motorcraft.com.
   If the scan tool cannot download a strategy from the web site, a partial strategy will automatically be

downloaded.

10. Reconnect the scan tool to the vehicle.

TCM Reprogramming

1. Using the scan tool, navigate to the Module Reprogramming sub menu.
    1. Module Programming
    2. Module Reprogramming
    3. TCM

2. Follow the instructions displayed on the scan tool.

TCM Programming

1. Using the scan tool, navigate to the Module Reprogramming sub menu.
    1. Module Programming
    2. Programmable Module Installation
    3. TCM

2. Follow the instructions displayed on the scan tool.

Transmission Range (TR) Sensor Adaptive Learning

1. Using the scan tool, navigate to the TCM Adaptive Learning sub menu.
    1. PCM
    2. TCM
    3. TCM Adaptive Learning

2. Select TR sensor.

3. Select Perform Adaptive Learning.

4. Follow the instructions displayed on the scan tool.

Shift Drum Adaptive Learning

1. Using the scan tool, navigate to the TCM Adaptive Learning sub menu.
    1. PCM
    2. Transmission
    3. TCM Adaptive Learning

2. Select Shift Drum.

3. Follow the instructions displayed on the scan tool.

Clutch Adaptive Learning

1. Using the scan tool, navigate to the TCM Adaptive Learning sub menu.

1. PCM
2. Transmission
3. TCM Adaptive Learning

2. Follow the instructions displayed on the scan tool.

Clutch System Test

1. Using the scan tool, navigate to the TCM Adaptive Learning sub menu.
    1. PCM
    2. Transmission
    3. Clutch System Test

2. Follow the instructions displayed on the scan tool.

Speed Sensor Test

1. Using the scan tool, navigate to the TCM Adaptive Learning sub menu.
    1. PCM
    2. Transmission
    3. Speed Sensor Test

2. Select the desired speed sensor.

3. Follow the instructions displayed on the scan tool.

Drive Cycle

NOTICE: **If a drive cycle is not completed, the customer may feel erratic shifts and driveability concerns.**

NOTE: To perform drive cycle, drive the vehicle on a level road surface.

1. Depress vehicle brake pedal (do not use parking brake).

2. Shift to Drive.

3. Wait 15 seconds.

4. Shift to Reverse.

5. Wait 2 seconds.

6. Repeat (1-5) ten (10) times.

7. Accelerate from a stop with light throttle to 15 mph (24 km/h).

8. Brake gently to a complete stop (allow at least 6 seconds).

9. Repeat steps (7-8) five (5) times in dealership parking lot or similar setting.

10. Accelerate from a stop with light throttle performing 1-2, 2-3, 3-4 shifts maintaining 1700-2000 rpm.
11. Accelerate to a speed between 50 mph (80 km/h) and 65 mph (104 km/h), achieve 6th gear, keep throttle steady with engine below 3000 rpm for a minimum of two (2) minutes.
12. Repeat step 11 two (2) times.
13. Test drive the vehicle.

Transmission Draining and Filling

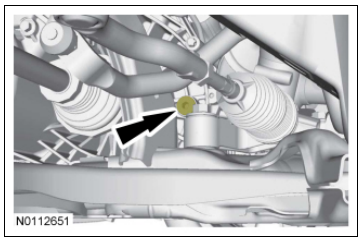
Material

Item	Specification
Motorcraft® Dual Clutch ransmission Fluid XT-11-QDC	WSS-M2C200-D2

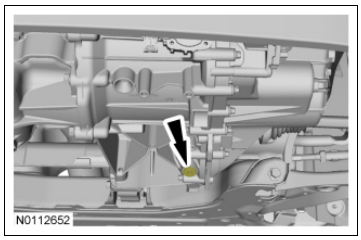
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. **NOTE:** Prior to removal, clean the area surrounding the fill plug.

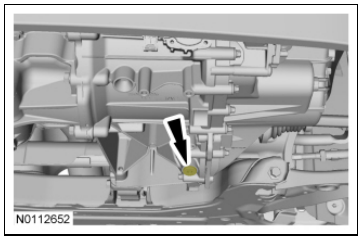
   Remove the fill plug.



3. Remove the drain plug and drain the fluid.

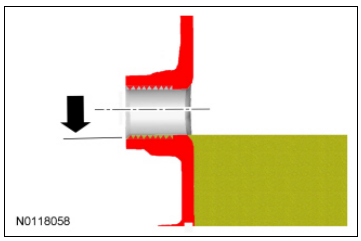


4. Install the drain plug.
   - Tighten to 43 Nm (32 lb-ft).



5. **NOTE:** Do not overfill the transaxle. This will cause transaxle fluid to be forced out of the case.

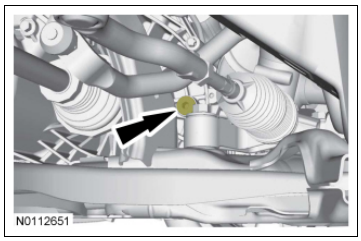
Using a suitable oil suction gun, fill the transaxle to the correct level with the specified fluid. Add transmission fluid until the oil runs out of the fill port in a continuous stream. The transaxle is full when the oil flow from the fill port has slowed to a broken stream or dripping.



6. **NOTE:** Use a ball head hex socket to torque to specifications.

   Install the fill plug.

   - Tighten to 43 Nm (32 lb-ft).



Transmission Fluid Level Check

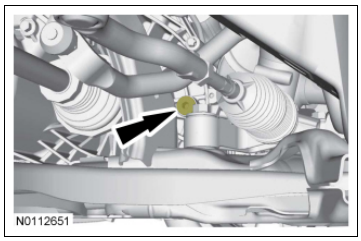
Material

Item	Specification
Motorcraft® Dual Clutch Transission Fluid XT-11-QDC	WSS-M2C200-D2

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

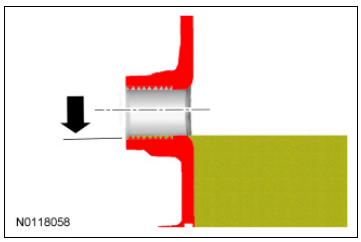
2. **NOTE:** Prior to removal, clean the area around the fill plug.

   Remove the fill plug.



3. **NOTE:** Do not overfill the transaxle. This causes transmission fluid to be forced out of the case.

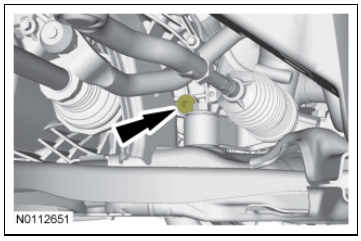
   Using a suitable oil suction gun, fill the transaxle to the correct level with the specified fluid. Add transmission fluid until the oil runs out of the fill port in a continuous stream. The transaxle is full when the oil flow from the fill port has slowed to a broken stream or dripping.



4. **NOTE:** Use a ball head hex socket to tighten the transaxle fill plug.

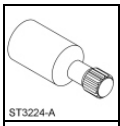
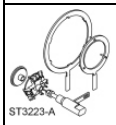
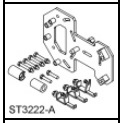
   Install the fill plug.

   - Tighten to 43 Nm (32 lb-ft).


N0112651

Clutch

Special Tool(s)

 ST3224-A	Actuator Reset, Spline Socket 307-677
 ST3223-A	Clutch Reset 307-676 (includes 307-676/1, 307-676/2, 307-676/3, 307-676/4, 307-676/5 and 307-676/6)
 ST3222-A	Fixture, Clutch Remover/Installer 307-675 (includes 307-675/1, 307-675/2, 307-675/3 and 307-675/4)
 ST2986-A	Holding Fixture 307-580

Material

Item	Specification
DPS6 Grease 9U7Z-19A506-BA	WSS-M1C270-A
High Temperature Nickel Anti-Seize Lubricant XL-2	-
Motorcraft® Dual Clutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2

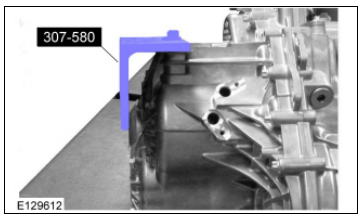
Removal

⚠ WARNING: Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.

NOTICE: **After installation of the transaxle be sure to perform the Clutch Adaptive Learning procedure or transaxle damage can occur. For additional information, refer to Transmission Adaptive Learning in this section.**

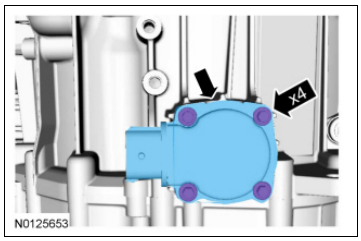
1. Remove the transaxle from the vehicle. For additional information, refer to Transaxle in this section.

2. Install the special tools.

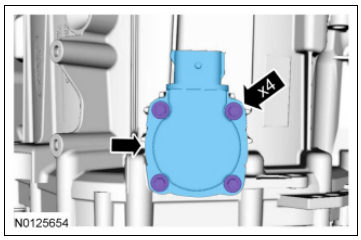


3. Stand the transaxle on its back.

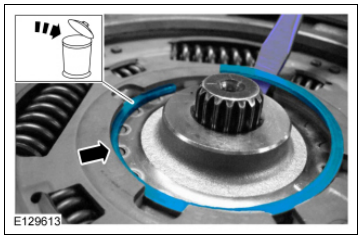
4. Remove the 4 clutch motor 1 bolts and remove clutch motor 1.



5. Remove the 4 clutch motor 2 bolts and remove clutch motor 2.

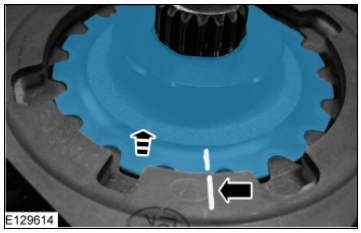


6. Remove and discard the clutch hub snap ring.

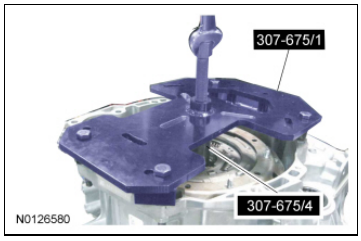


7. **NOTE:** Index mark the clutch hub and clutch for installation.

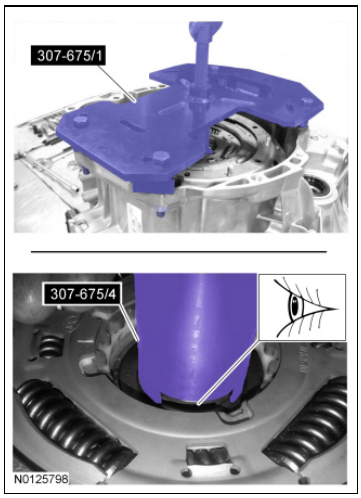
   Remove the clutch hub.



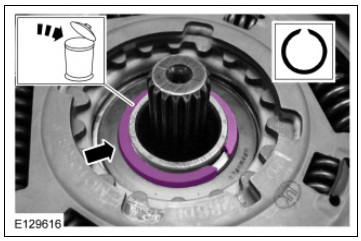
8. Install the special tools.



9. Using the special tools, turn the center bolt of the special tool with a maximum of 5 Nm (44 lb-in) of torque to push the clutch down to release the pressure from the hollow input shaft snap ring.



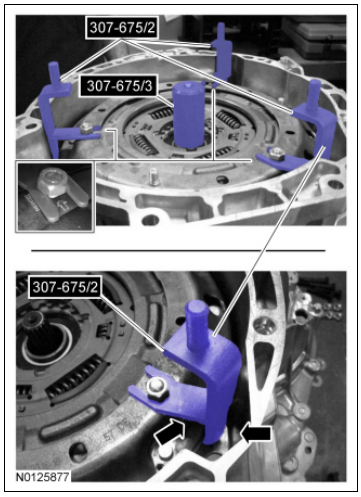
10. Remove and discard the hollow input shaft snap ring.



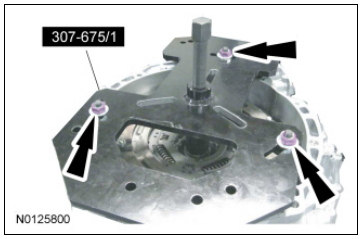
11. **NOTE:** Make sure the lifting legs are installed on the 3 clutch studs marked with the manufacturing mark as shown.

    NOTE: Make sure the lifting leg with the angle is in the location shown.

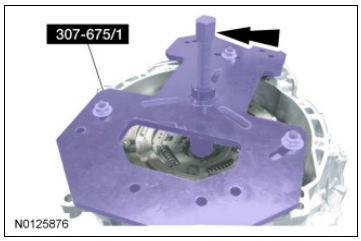
    Install the special tools.



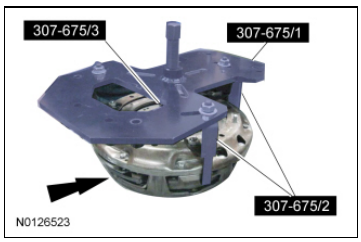
12. Install the special tools.



13. Turn the center bolt of the special tool with approximately 5 Nm (44 lb-in) of torque until the clutch is free of the input shaft.



14. Using the special tools, remove the clutch as an assembly from the transaxle.

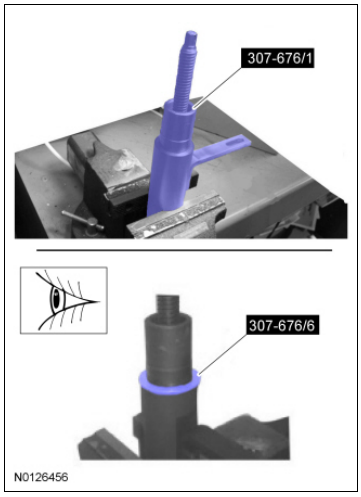


Installation

1. If installing a new clutch go to step 19.

2. **NOTE:** Make sure the special tool washer is also installed.

   Install the special tool in a vise.



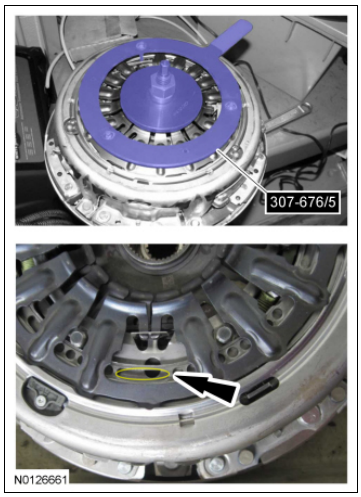
3. Place the clutch on the special tool and align one clutch stud with the slotted hole on the special tool.



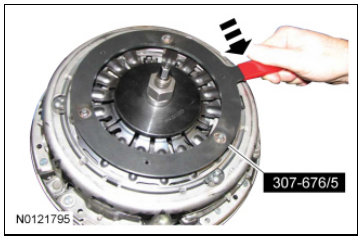
4. Install the special tool loosely on the clutch.



5. Install the special tool on the clutch making sure the legs are inserted in the slots.

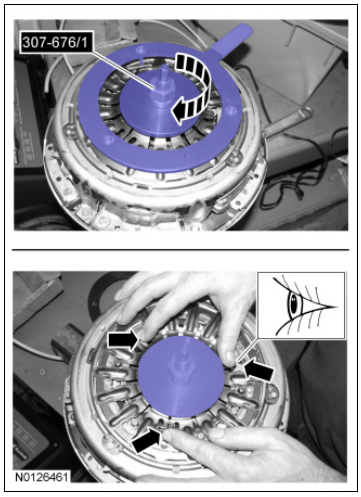


6. Turn the special tool clockwise to the stops and hold.

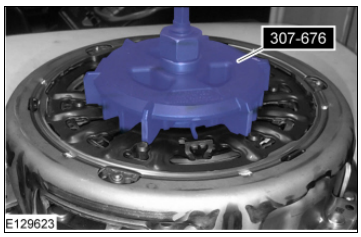


7. ***NOTICE:*** **Failure to rotate the self-adjuster to the stops before compressing the clutch, causes damage to the clutch.**

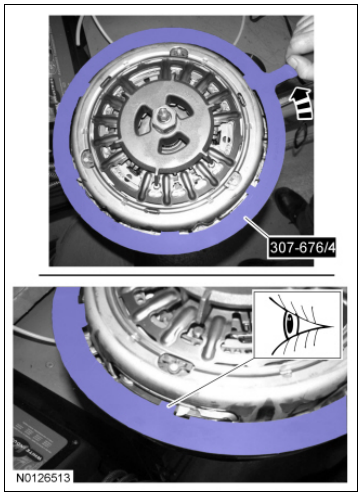
   Tighten the special tool until the 3 clutch 1 locks can be locked in place by hand.



8. Install the special tool loosely on the clutch.



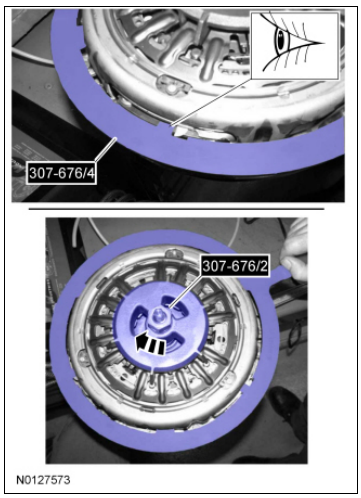
9. Using the special tool, move the clutch self-adjuster counterclockwise to the stop and hold.



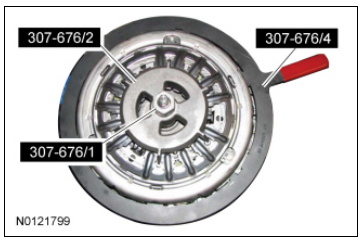
10. *NOTICE:* **Make sure the clutch self-adjuster is held to the stops before compressing the clutch or damage will occur to the clutch.**

    NOTE: An audible click can be heard when the clutch locks lock.

    While holding the clutch self-adjuster to the stops, use the special tool and compress the clutch to the stops on the clutch. The locks on clutch 2 lock at this time.

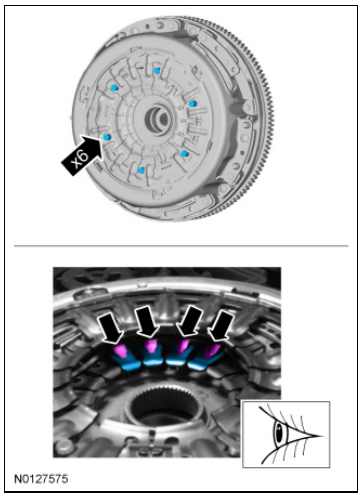


11. Remove the special tools.



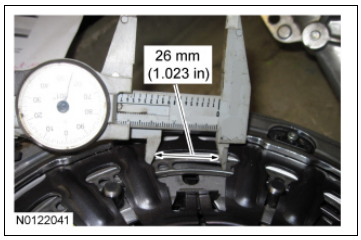
12. **NOTE:** The minimum number of engaged clutch locks is 6. Make sure the 6 locked clutch fingers align with the clutch studs as shown. If not, reset the clutch 2 locks as necessary.

    Visually check the locks to make sure they have locked. 4 locks shown, 12 total.

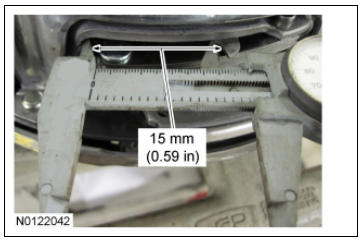


13. If installing a used clutch, verify the clutch is not worn or damaged. Perform the next 2 steps to check for clutch wear.

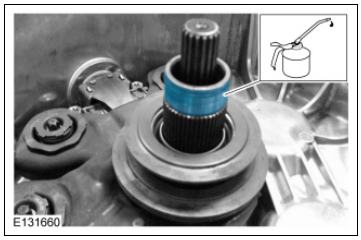
14. Check clutch 1 for wear by measuring the distance between the adjuster ring 1 long hole and lever 1 spring. Replace the clutch assembly if the measurement is 26 mm (1.023 in) or less.



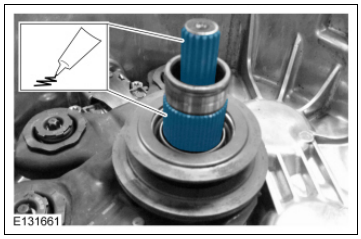
15. Check clutch 2 for wear by measuring the distance between adjuster ring 2 and the cover. Replace the clutch assembly if the measurement is 15 mm (0.59 in) or less.



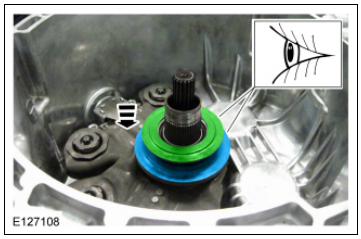
16. Apply a small amount of transmission fluid on the input shaft bearing surface.



17. Apply a small amount of DPS6 Grease on both input shaft splines.



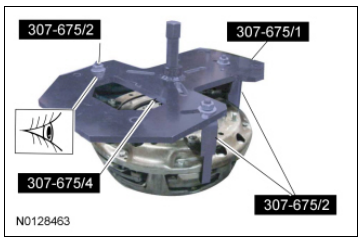
18. Verify the Z-washers are installed correctly.



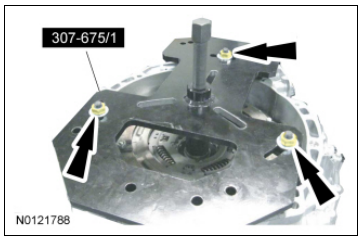
19. ***NOTICE:*** **Verify the clutch locks are locked prior to installation or the transaxle may not operate correctly and damage can occur. If the clutch locks are not locked go to step 2 within this procedure.**

    NOTE: Make sure the angled lifting leg is installed in the location shown.

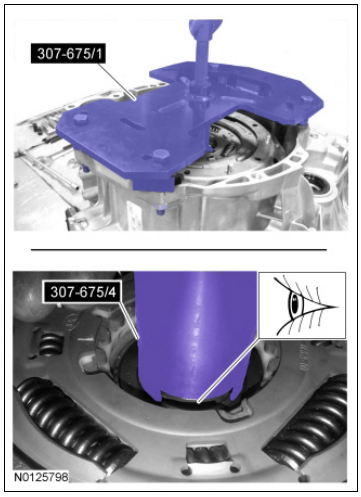
Using the special tools, install the clutch in the transaxle.



20. Remove all the special tools.

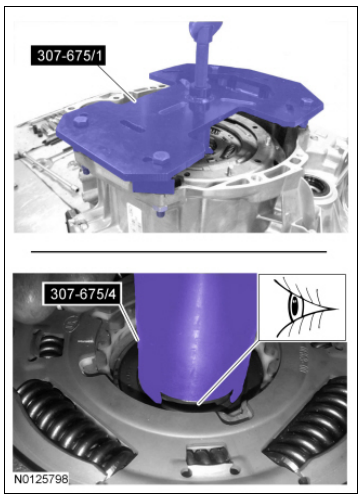


21. Install the special tools onto the transaxle case.



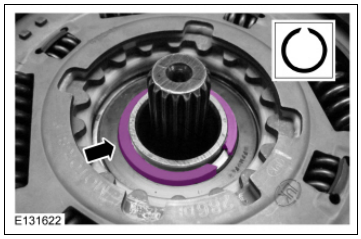
22. ***NOTICE:*** **Do not overtighten the special tool or damage can occur.**

Using the special tools, push the clutch down with approximately 5 Nm (44 lb-in) of torque until seated on the input shaft bearing and the snap ring groove is visible.



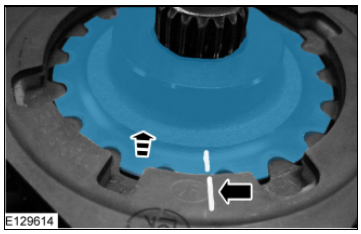
23. **NOTE:** Make sure the hollow input shaft snap ring is fully seated.

    Install the new hollow input shaft snap ring.

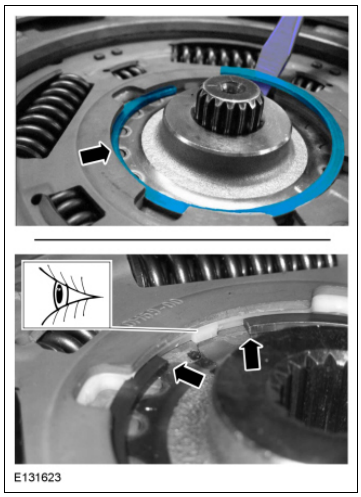


24. **NOTE:** Align the index marks on the clutch hub and clutch.

    Install the clutch hub.

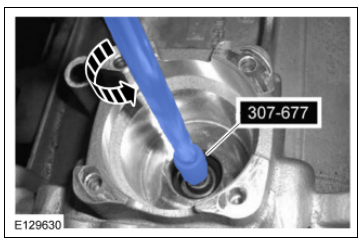


25. Install the new clutch hub snap ring in the position shown.

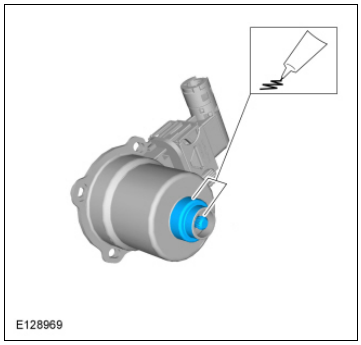


26. ***NOTICE:*** **Do not turn the special tool more than 12 turns or damage to the clutch actuator engagement lever can occur.**

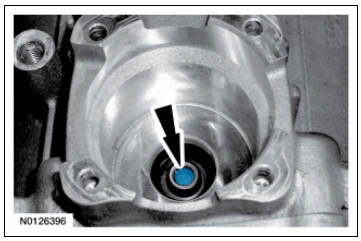
    Using the special tool, release the clutch 1 locks and then the clutch 2 locks by slowly turning the special tool counterclockwise. An audible click will be heard when the clutch locks are released.



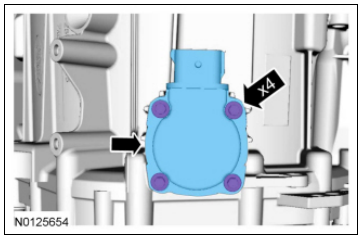
27. Apply High Temperature Nickel Anti-Seize Lubricant to both clutch motor surfaces where indicated.



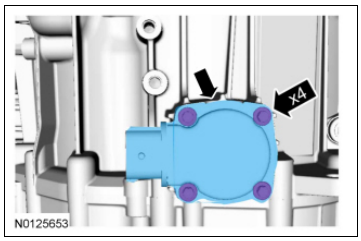
28. Apply High Temperature Nickel Anti-Seize Lubricant to the clutch actuator lever splines as shown.



29. Install the clutch motor 2 and the 4 clutch motor 2 bolts.
    - Tighten to 5 Nm (44 lb-in).



30. Install the clutch motor 1 and the 4 clutch motor 1 bolts.
    - Tighten to 5 Nm (44 lb-in).



31. ***NOTICE:*** **After installation of the transaxle be sure to perform the Clutch Adaptive Learning procedure or transaxle damage can occur. For additional information, refer to Transmission Adaptive Learning in this section.**

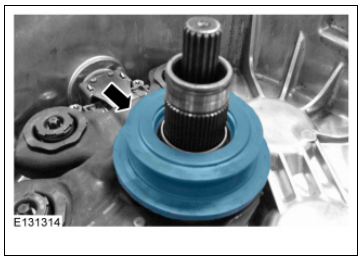
    Install the transaxle in the vehicle. For additional information, refer to Transaxle in this section.

Clutch Engagement System

Removal

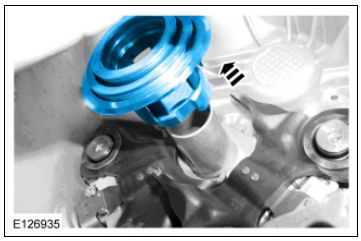
1. Remove the clutch. For additional information, refer to Clutch in this section.

2. Remove the Z-washers from the engagement system bearing unit.



3. **NOTE:** The engagement system bearing unit should be removed easily.

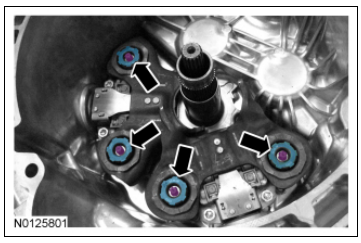
   Remove the engagement system bearing unit. Inspect for wear or damage. Replace as neccessary. Refer to Transaxle in this section.



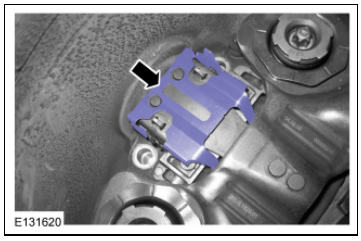
4. ***NOTICE:*** **Remove the spring retainer bolts by loosening them slightly in an alternating pattern or damage can occur to the clutch actuator levers.**

   NOTE: The spring retainers and actuator levers are matched sets with corresponding serial numbers. If the spring retainers and actuator levers are being reused, mark on each spring retainer and actuator lever for assembly.

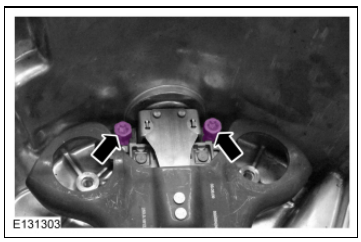
   Remove the 4 spring retainer bolts from the spring retainers and remove the spring retainers.



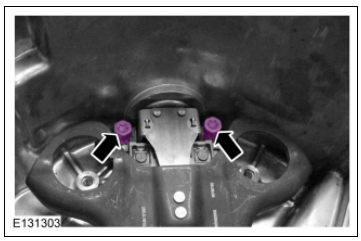
5. Install clutch actuator lever locks as shown if available.



6. Remove the 2 bolts from the clutch actuator lever 1.

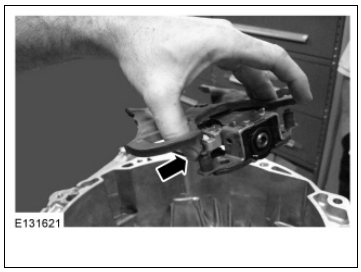


7. Remove the 2 bolts from the clutch actuator lever 2.



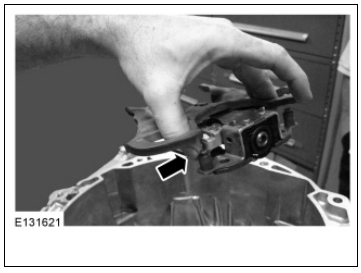
8. ***NOTICE:*** **Be sure to properly handle the actuator lever as shown or damage may occur.**

   Remove the clutch actuator lever 1.



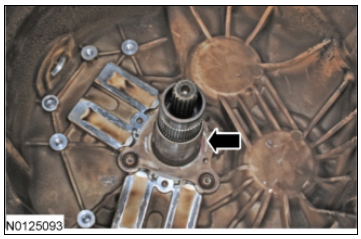
9. ***NOTICE:*** **Be sure to properly handle the actuator lever as shown or damage may occur.**

   Remove the clutch actuator lever 2.



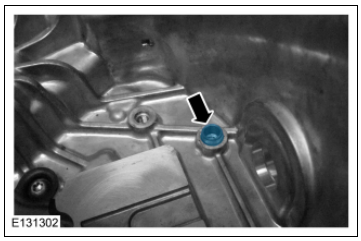
Installation

1. Inspect the guide tube for wear or damage. For additional information, refer to Transaxle in this section.



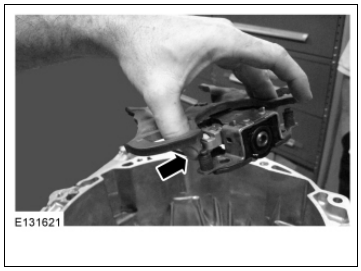
2. **NOTE:** One clutch actuator lever bushing shown, one per clutch actuator lever.

   Install the clutch actuator lever bushings.



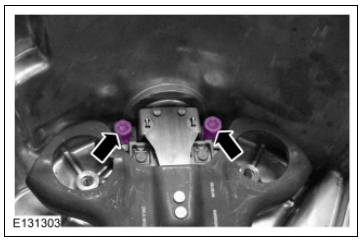
3. ***NOTICE:*** **Be sure to properly handle the actuator lever as shown or damage may occur.**

   Install the clutch actuator lever 2.



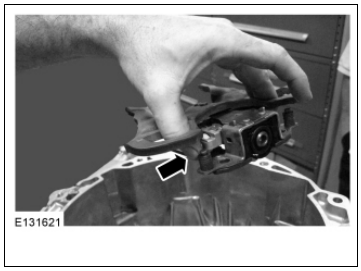
4. Install clutch motor 2 without the bolts to aide in the alignment of the clutch actuator lever.

5. Install the 2 clutch actuator lever 2 bolts.
   - Tighten to 19 Nm (168 lb-in).



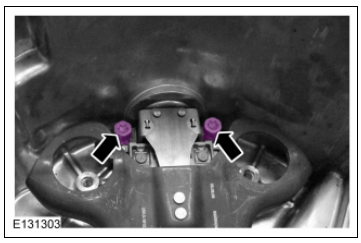
6. ***NOTICE:*** **Be sure to properly handle the actuator lever as shown or damage may occur.**

   Install the clutch actuator lever 1.



7. Install clutch motor 1 without the bolts to aide in the alignment of the clutch actuator lever.

8. Install the 2 clutch actuator lever 1 bolts.
   - Tighten to 19 Nm (168 lb-in).



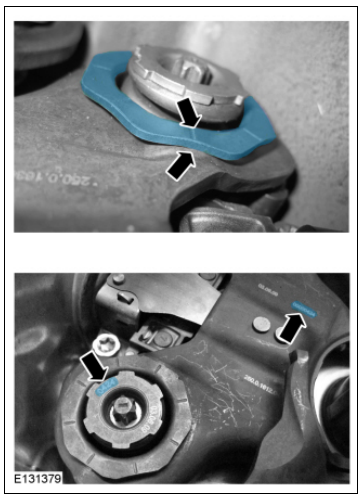
9. ***NOTICE:*** **Tighten the spring retainer bolts by tightening them slightly in an alternating pattern or damage can occur to the clutch actuator levers.**

   NOTE: Make sure the spring retainer contour aligns with the actuator lever contour as shown.

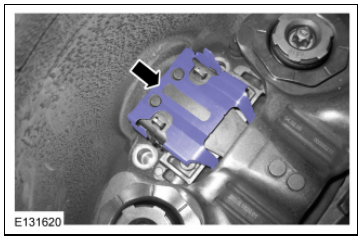
   NOTE: Make sure the serial number on the spring retainer matches the serial number on the actuator lever. If reusing the spring retainers and actuator levers use the marks made during removal for assembly.

   Install the spring retainers and spring retainer bolts.

   - Tighten to 26 Nm (19 lb-ft).

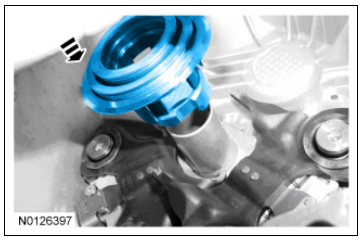


10. Remove the clutch actuator lever locks if installed.



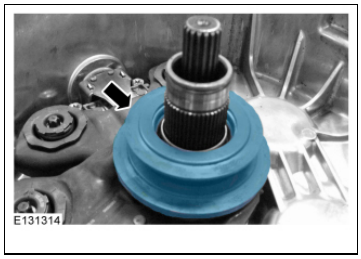
11. **NOTE:** The engagement system bearing unit should be installed easily.

    Install the engagement system bearing unit.



12. ***NOTICE:*** **Do not tilt transaxle after the Z-washers are installed, they may come off center and damage can occur.**

    Install the Z-washers onto the engagement system bearing unit and center them correctly.



13. Install the clutch. For additional information, refer to Clutch in this section.

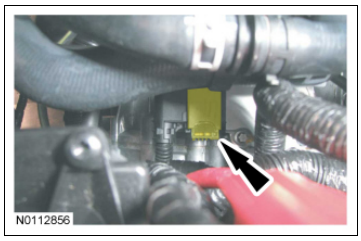
Clutch Motor - No. 1

Material

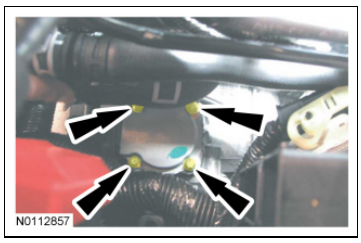
Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	-

Removal

1. Clean the area around the clutch motor to ensure no debris gets into the clutch motor pocket.
2. Disconnect the clutch motor electrical connector.

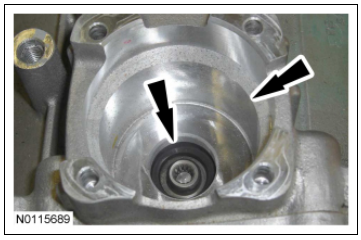


3. Remove the 4 clutch motor bolts and the clutch motor.

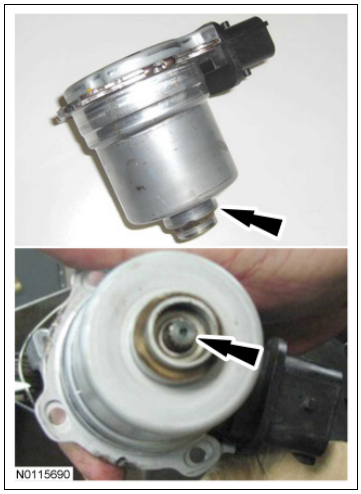


Installation

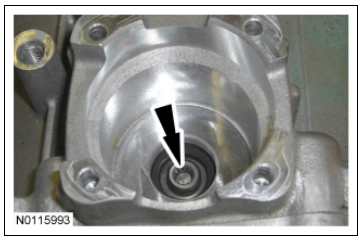
1. Inspect the clutch motor pocket for damage or debris. Clean or repair as needed.



2. Apply anti-seize to the clutch motor surfaces where indicated.



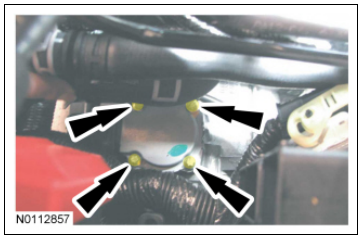
3. Apply anti-seize to the clutch actuator lever splines as shown.



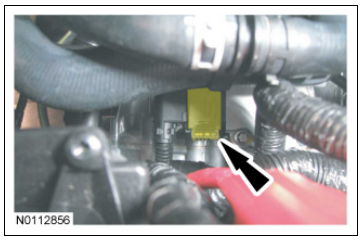
4. **NOTE:** Clutch motor splines may need to be turned to ease installation.

   Install the clutch motor and the 4 clutch motor bolts.

   - Tighten to 5 Nm (44 lb-in).



5. Connect the clutch motor electrical connector.



Clutch Motor - No. 2

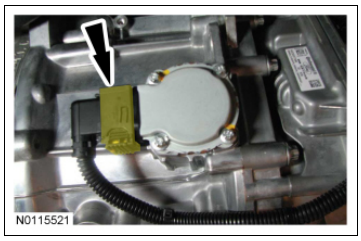
Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	-

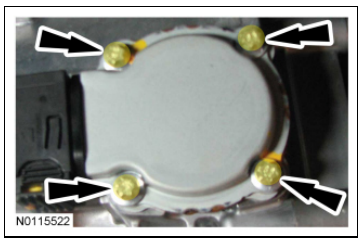
Removal

1. Clean the area around the clutch motor to ensure no debris gets into the clutch motor pocket.

2. Disconnect the clutch motor electrical connector.

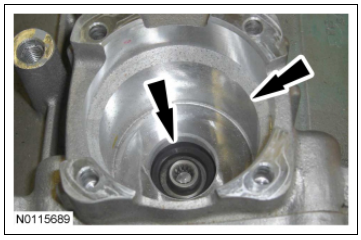


3. Remove the 4 clutch motor bolts and the clutch motor.

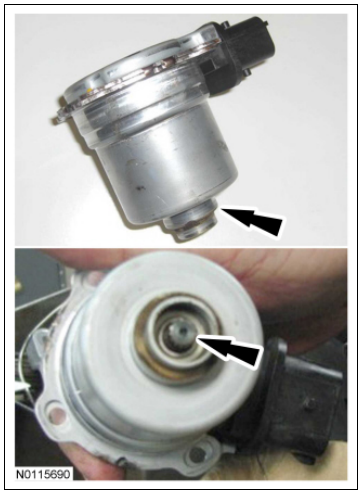


Installation

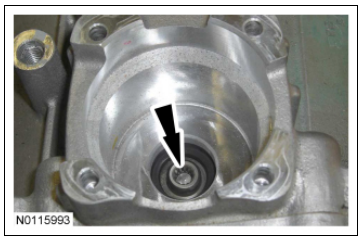
1. Inspect the clutch motor pocket for damage or debris. Clean or repair as needed.



2. Apply anti-seize to the clutch motor surfaces as shown.



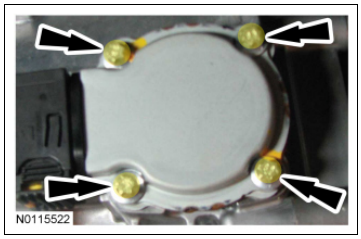
3. Apply anti-seize to the clutch actuator lever splines as shown.



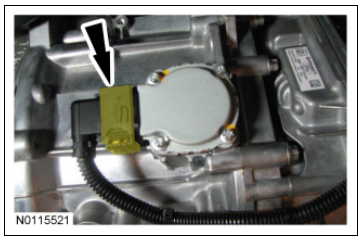
4. **NOTE:** Clutch motor splines may need to be turned to ease installation.

   Install the clutch motor and the 4 clutch motor bolts.

   - Tighten to 5 Nm (44 lb-in).

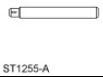


5. Connect the clutch motor electrical connector.



Transaxle

Special Tool(s)

 ST2378-A	Adapter for 303-290A 303-290-01
 ST2379-A	Adapter for 303-290A (Support Leg) 303-290-03A
 ST1255-A	Handle 205-153
 ST3218-A	Installer, Axle Seal 307-671
 ST1582-A	Remover, Halfshaft 205-241 (T86P-3514-A)
 ST2038-A	Remover, Halfshaft (Plate) 205-290 (T89P-3415-B)
 ST2789-A	Slide Hammer 100-001 (T50T-100-A)
 ST2363-A	Support Bar, Engine 303-290A
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Removal

All Vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. **NOTE:** Transmission Control Module (TCM) Programming does not need to be performed if the transmission is being removed for flexplate or rear main seal service.

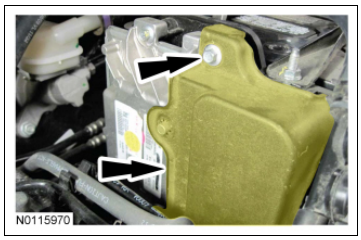
   Using the scan tool, recover all module information before removing the transaxle. For additional information, refer to Transmission Adaptive Learning in this section.

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

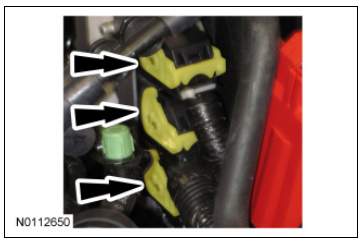
4. Remove the cowl assembly. For additional information, refer to Section 501-02 .

5. Remove the Air Cleaner (ACL) assembly and outlet pipe. For additional information, refer to Section 303-12 .

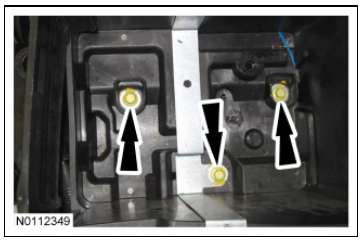
6. Remove the bolt and the PCM cover.



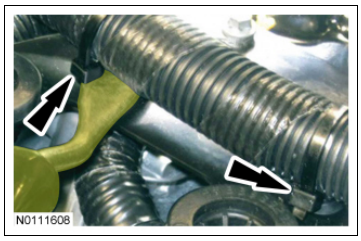
7. Disconnect the 3 PCM electrical connectors.



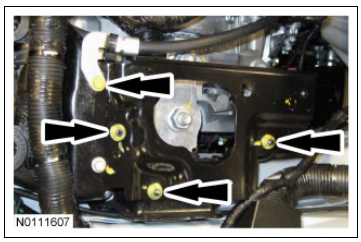
8. Remove the 3 battery tray bolts and the battery tray.



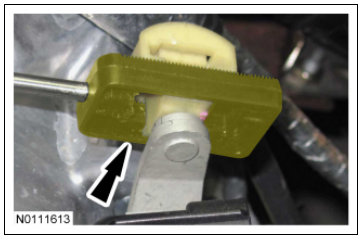
9. Using a suitable tool, detach the wiring harness from the battery tray bracket.



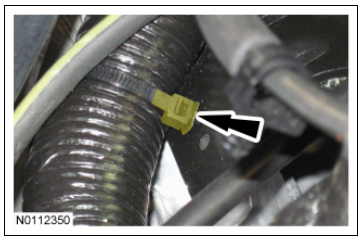
10. Remove the selector lever cable bracket bolt, the battery tray bracket nuts and remove the battery tray bracket.



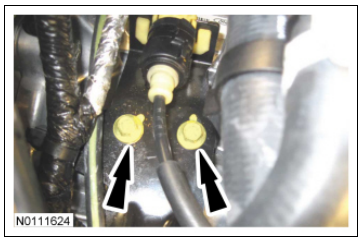
11. Disconnect the selector lever cable from the manual control lever.



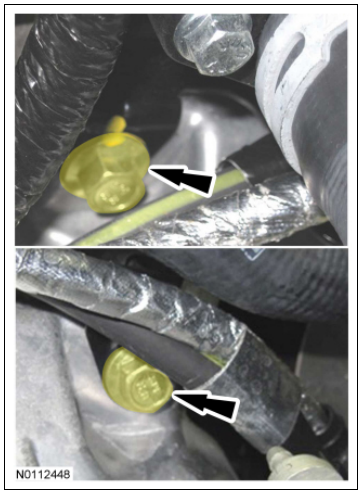
12. Remove the wiring harness from the selector lever cable bracket.



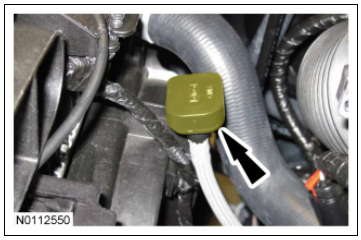
13. Remove the 2 selector lever cable bracket bolts from the transaxle and position the selector lever cable and bracket aside.



14. Remove the 2 upper clutch housing-to-engine bolts.



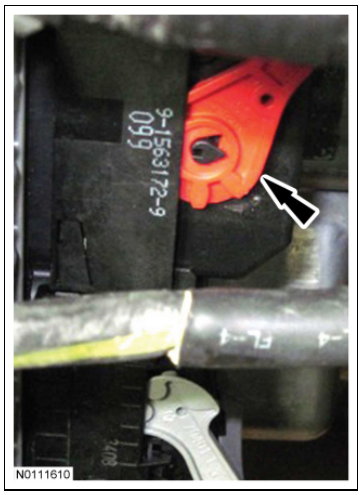
15. Remove the transaxle vent hose from the cooling fan housing and position aside.



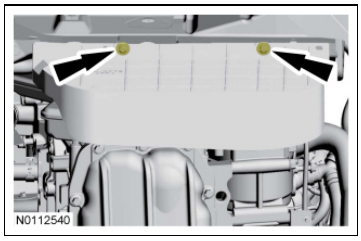
16. Remove the ground wire bolt and the ground wire from the transaxle.



17. Disconnect the engine harness electrical connector from the Transmission Control Module (TCM).

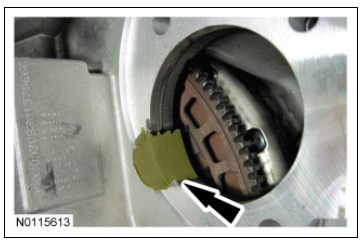


18. If equipped, remove the engine splash shield.



19. Remove the starter motor. For additional information, refer to Section 303-06 .

20. Remove the flexplate-to-clutch nut access cover.

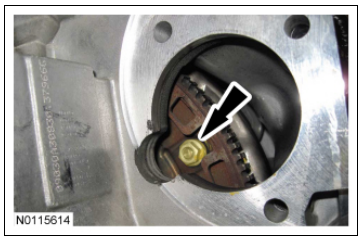


21. ***NOTICE:*** **Rotate the engine in a clockwise direction only or engine damage will occur.**

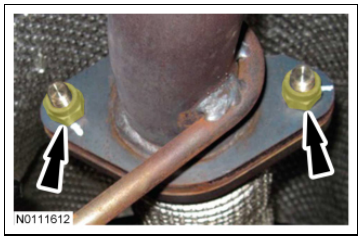
    NOTICE: **To prevent the flexplate-to-clutch nuts from falling into the clutch housing and causing damage, use a magnetic socket to remove the 6 flexplate-to-clutch nuts.**

    NOTE: Index mark one clutch stud and the flexplate for installation reference.

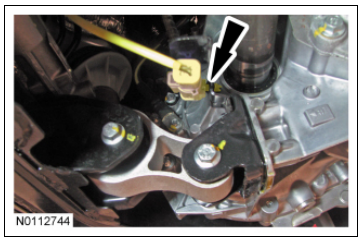
Rotate the crankshaft in a clockwise direction to gain access to the flexplate-to-clutch nuts. Remove and discard the 6 flexplate-to-clutch nuts.



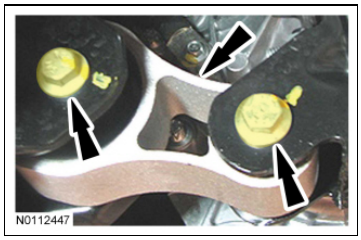
22. Remove and discard the exhaust flange nuts and exhaust flange gasket. Disconnect the exhaust flange.



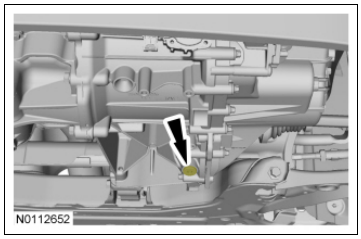
23. Detach the Heated Oxygen Sensor (HO2S) electrical connector from the HO2S bracket.



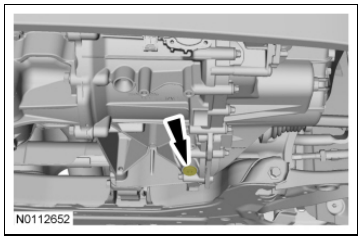
24. Remove the transaxle roll restrictor bolts and the transaxle roll restrictor.



25. Remove the drain plug and drain the transmission fluid.

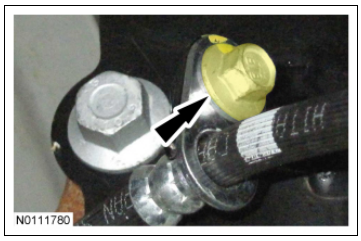


26. Install the drain plug.
    - Tighten to 43 Nm (32 lb-ft).

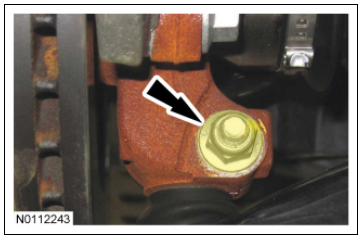


27. Remove the front wheels. For additional information, refer to Section 204-04 .

28. Remove the brake hose retainer bolt and the brake hose retainer from the RH strut.

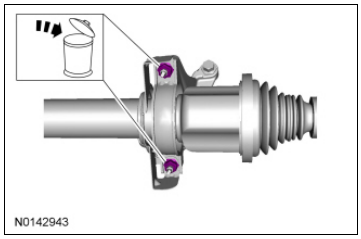


29. Remove and discard the RH ball joint nut and bolt.



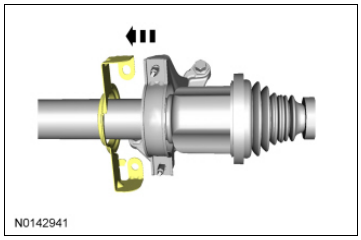
30. Separate the RH ball joint from the knuckle.

31. Remove and discard the bearing retainer strap nuts.



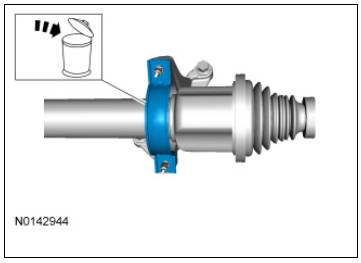
Vehicles built before 04/2011

32. Position aside the bearing shield.



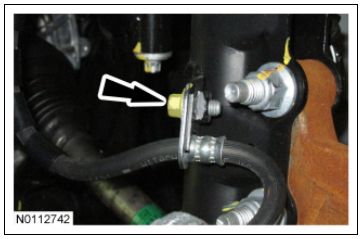
All Vehicles

33. Remove and discard the bearing retainer strap.

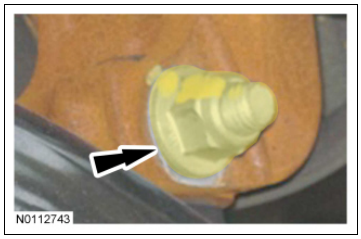


34. Remove the RH intermediate shaft assembly from the transaxle and position aside. Support the intermediate shaft assembly.

35. Remove the brake hose retainer bolt and the brake hose retainer from the LH strut.

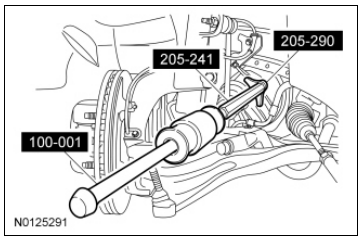


36. Remove and discard the LH ball joint nut and bolt.

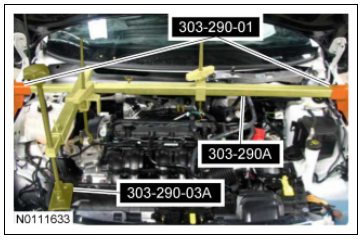


37. Separate the LH ball joint from the knuckle.

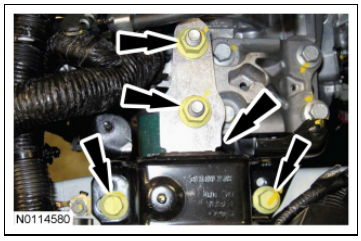
38. Using the special tools, remove the LH halfshaft assembly from the transaxle and position aside. Support the LH halfshaft assembly.



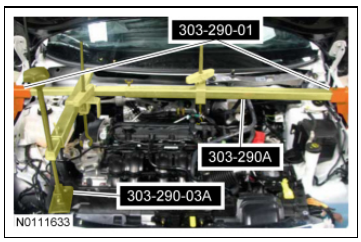
39. Install the special tools and support the engine.



40. Remove the 2 transaxle support insulator bolts and nuts and remove the transaxle support insulator.

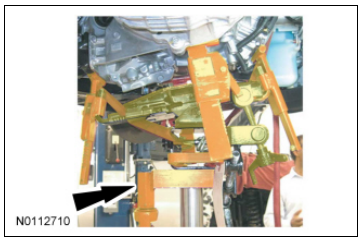


41. Using the special tools, lower the transaxle.

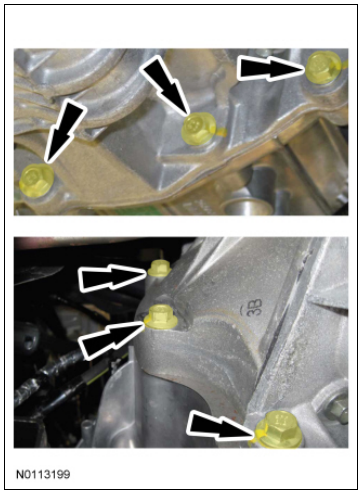


42. ***NOTICE:*** **Use caution not to damage the transaxle wiring harness or sensors.**

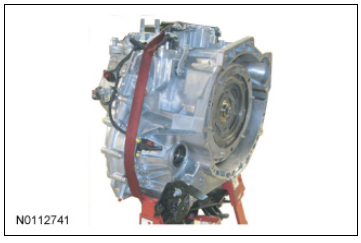
    Position a suitable high-lift transmission jack under the transaxle and secure the transaxle to the high-lift transmission jack.



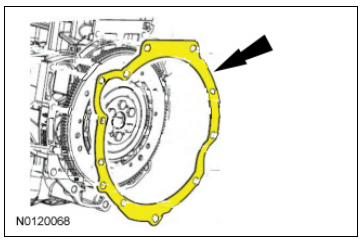
43. Remove the 6 lower clutch housing-to-engine bolts.



44. Remove the transaxle.



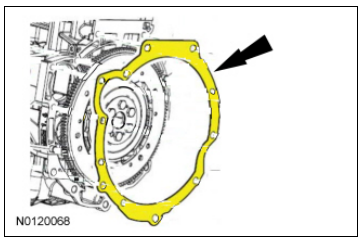
45. Remove and discard the engine-to-transaxle separator plate.



Installation

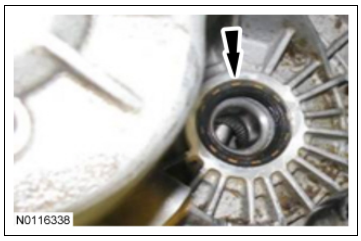
1. ***NOTICE:*** **Use caution not to damage the engine-to-transaxle separator plate or damage can occur.**

   Install the new engine-to-transaxle separator plate.

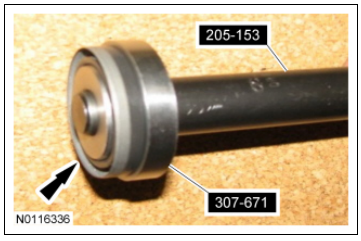


2. ***NOTICE:*** **If installing the existing transaxle, the halfshaft seals must be replaced or damage to the transaxle can occur.**

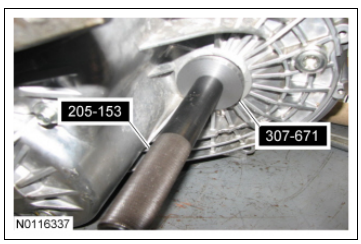
   Using a suitable tool, remove and discard the LH halfshaft seal.



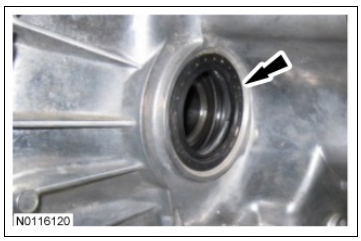
3. Install the new LH halfshaft seal onto the special tool.



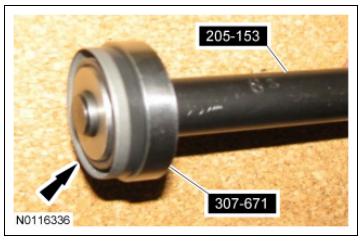
4. Using the special tools, install the new LH halfshaft seal.



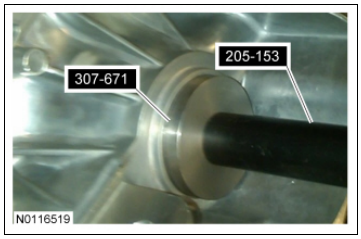
5. Using a suitable tool, remove and discard the RH halfshaft seal.



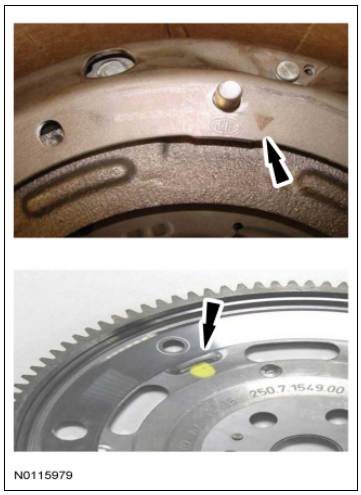
6. Install the new RH halfshaft seal onto the special tool.



7. Using the special tools, install the new RH halfshaft seal.

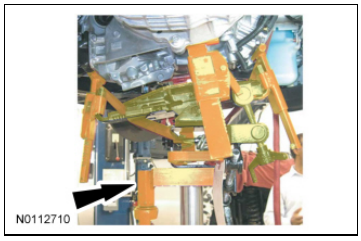


8. If using a new clutch assembly, make sure the clutch-to-flexplate alignment marks are aligned.

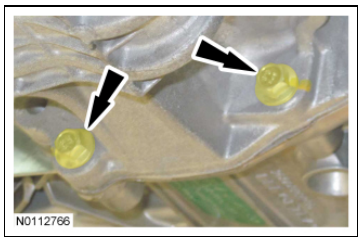


9. **NOTE:** If using the existing clutch assembly, align the index marks on the flexplate and the clutch stud made during removal.

   Install the transaxle.



10. Install 2 lower clutch housing-to-engine bolts.
    - Tighten to 48 Nm (35 lb-ft).



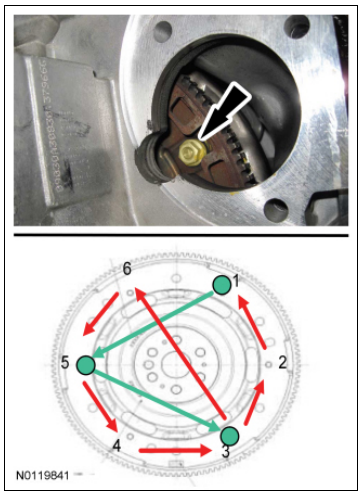
11. ***NOTICE:*** **Rotate the engine in a clockwise direction only or engine damage will occur.**

    NOTICE: **Tighten the flexplate-to-clutch nuts in a star pattern or transaxle damage can occur.**

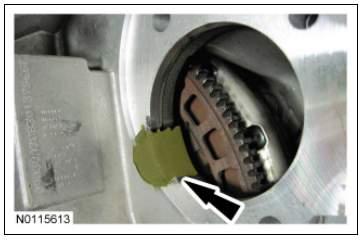
    NOTE: Using a magnetic socket will help ease the installation of new flexplate-to-clutch nuts. If the flexplate-to-clutch nuts fall into the clutch housing, the transaxle will have to be removed to retrieve them.

    Install the 6 new flexplate-to-clutch nuts. Tighten the nuts in a star pattern in 2 stages.

    - Stage 1: Tighten nuts 1, 5 and 3 to 12 Nm (106 lb-in).
    - Stage 2: Tighten all nuts to 25 Nm (18 lb-ft).

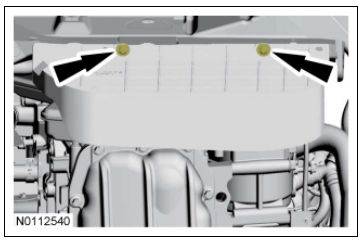


12. Install the flexplate-to-clutch nut access cover.

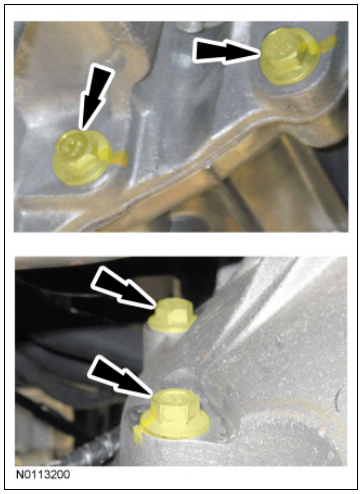


13. Install the starter motor. For additional information, refer to Section 303-06 .

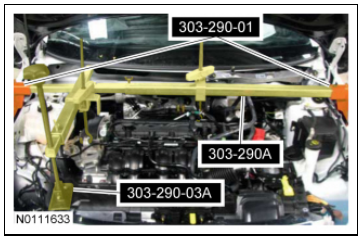
14. If equipped, install the engine splash shield.



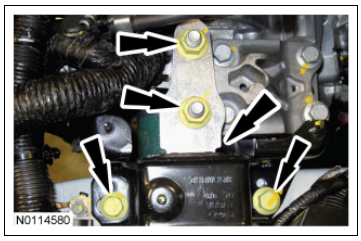
15. Install the 4 lower clutch housing-to-engine bolts.
    - Tighten to 48 Nm (35 lb-ft).



16. Using the special tools, raise the transaxle.



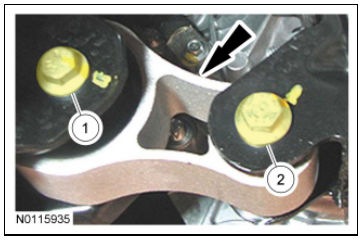
17. Install the transaxle support insulator and install the 2 transaxle support insulator bolts and the 2 nuts.
    - Tighten the 2 bolts to 90 Nm (66 lb-ft).
    - Tighten the 2 nuts to 125 Nm (92 lb-ft).



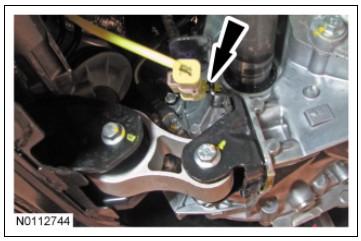
18. Install the ground wire and bolt onto the transaxle.
    - Tighten to 25 Nm (18 lb-ft).



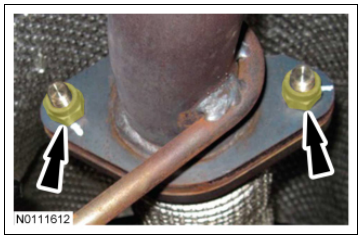
19. Install the transaxle roll restrictor and the 2 roll restrictor bolts. Tighten the bolts in the sequence shown.
    1. Tighten to 70 Nm (52 lb-ft).
    2. Tighten to 70 Nm (52 lb-ft).



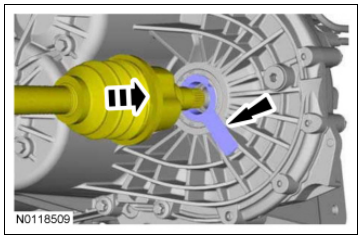
20. Attach the HO2S electrical connector to the HO2S bracket.



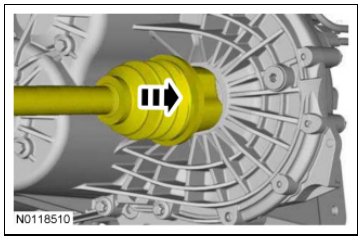
21. Using a new exhaust flange gasket and nuts, connect the exhaust flange to the exhaust.
    - Tighten to 48 Nm (35 lb-ft).



22. Using the LH halfshaft seal protector provided with the new LH halfshaft seal, install the LH halfshaft partially into the transaxle.

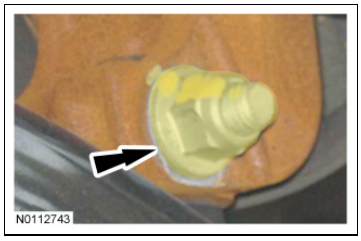


23. Remove the LH halfshaft seal protector and install the LH halfshaft into the transaxle.

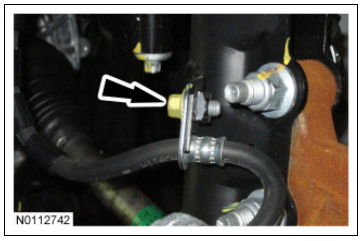


24. Install the LH ball joint into the knuckle.

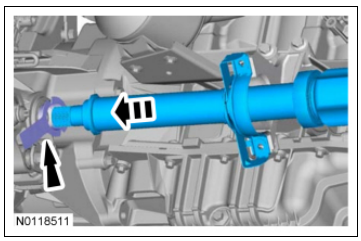
25. Install the new LH ball joint bolt and nut.
    - Tighten to 48 Nm (35 lb-ft).



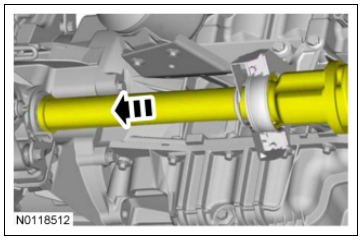
26. Install the brake hose retainer and bolt on the LH strut.
    - Tighten to 25 Nm (18 lb-ft).



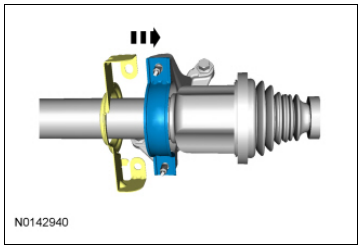
27. Using the RH halfshaft seal protector provided with the new RH halfshaft seal, install the RH intermediate shaft assembly partially into the transaxle.



28. Remove the RH halfshaft seal protector and install the RH intermediate shaft assembly into the transaxle.

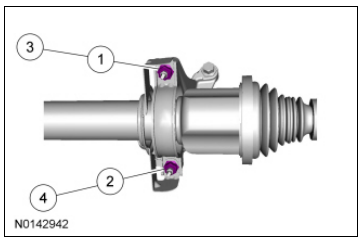


29. Install the new bearing retainer strap and shield (if equipped).
    - Install the strap on the studs.
    - Position the shield (if equipped) on the studs.



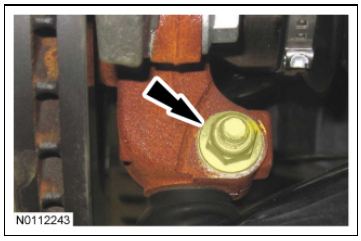
NOTICE: **Install the bearing retainer strap on the bracket studs before the shield, and tighten the nuts evenly in stages (alternating from top to bottom) or incorrect bearing clampload may occur causing component damage.**

30. Install the new bearing retainer strap nuts.
    - Tighten to 6 Nm (53 lb-in).
    - Tighten to 6 Nm (53 lb-in).
    - Tighten to 25 Nm (18 lb-ft).
    - Tighten to 25 Nm (18 lb-ft).

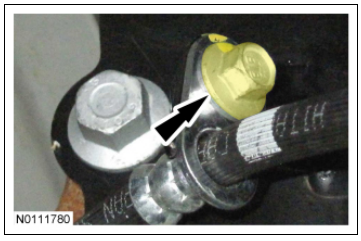


31. Install the RH ball joint into the knuckle.

32. Install the new RH ball joint bolt and nut.
    - Tighten to 48 Nm (35 lb-ft).

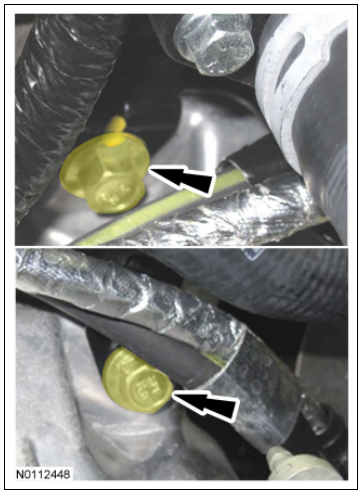


33. Install the brake hose retainer and bolt on the RH strut.
    - Tighten to 25 Nm (18 lb-ft).

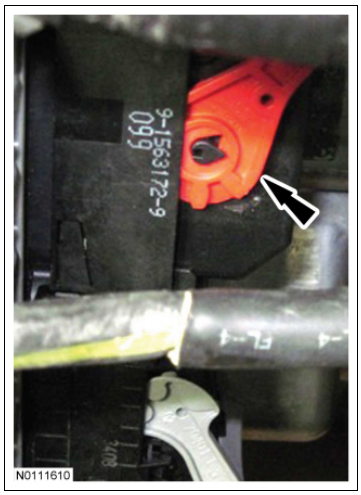


34. Install the front wheels. For additional information, refer to Section 204-04 .

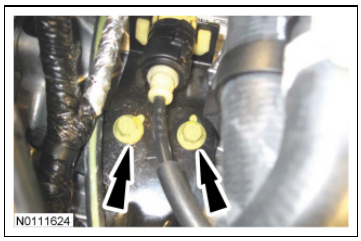
35. Install the 2 upper clutch housing-to-engine bolts.
    - Tighten to 48 Nm (35 lb-ft).



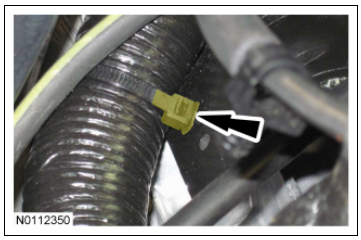
36. Connect the engine harness electrical connector to the TCM .



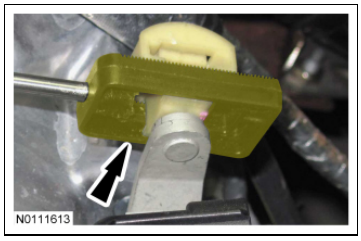
37. Install the selector lever cable bracket and the 2 selector lever cable bracket bolts on the transaxle.
    - Tighten to 25 Nm (18 lb-ft).



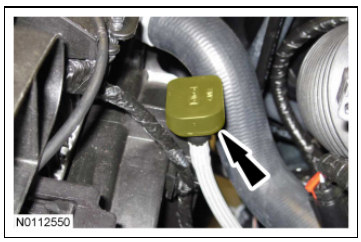
38. Attach the wiring harness to the selector lever cable bracket.



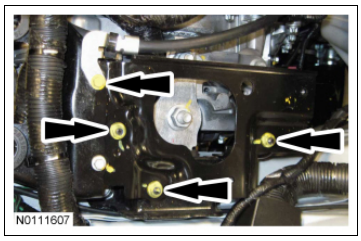
39. Connect the selector lever cable to the manual control lever.



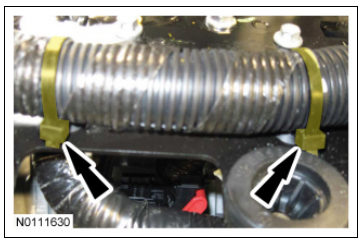
40. Attach the transaxle vent hose to the cooling fan housing.



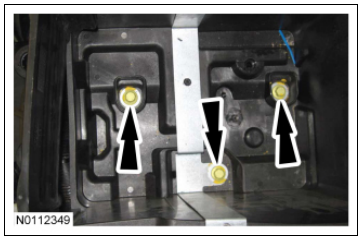
41. Install the battery tray bracket, battery tray bracket nuts and the selector lever cable bracket bolt.
    - Tighten to 10 Nm (89 lb-in).



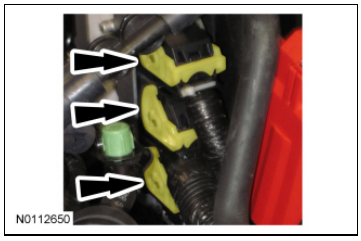
42. Attach the wiring harness to the battery tray bracket.



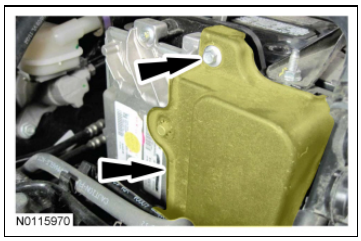
43. Install the battery tray and the 3 battery tray bolts.
    - Tighten to 10 Nm (89 lb-in).



44. Connect the 3 PCM electrical connectors.



45. Install the PCM cover and bolt.
    - Tighten to 5.4 Nm (47.8 lb-in).



46. Install the ACL assembly and outlet pipe. For additional information, refer to Section 303-12 .

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

48. Install the cowl assembly. For additional information, refer to Section 501-02 .

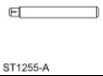
49. Fill the transaxle with transmission fluid. For additional information, refer to Transmission Draining and Filling .

50. Adjust the selector lever cable. For additional information, refer to Section 307-05 .

51. Using the scan tool, install all recovered module information after installing the transaxle. For additional information, refer to Transmission Adaptive Learning in this section.

Halfshaft Seal - LH

Special Tool(s)

 ST1255-A	Handle 205-153 (T80T-4000-W)
 ST3218-A	Installer, Output Shaft Seal 307-671
 ST1582-A	Remover, Halfshaft 205-241 (T86P-3514-A)
 ST2038-A	Remover, Halfshaft (Plate) 205-290 (T89P-3415-B)
 ST2789-A	Slide Hammer 100-001 (T50T-100-A)

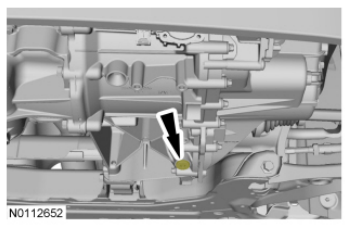
Material

Item	Specification
Motorcraft® Dual Clutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2

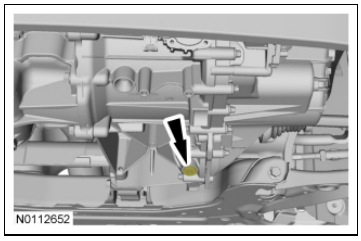
Removal

1. Remove the front wheel and tire. For additional information, refer to Section 204-04 .

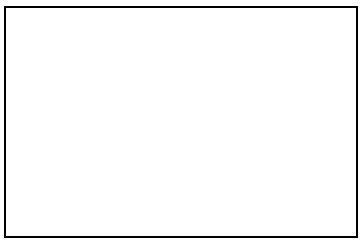
2. Remove the drain plug and drain the transmission fluid.


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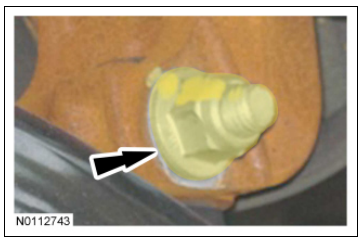
3. Install the drain plug.
   - Tighten to 43 Nm (32 lb-ft).



4. Remove the brake hose retainer bolt and the brake hose retainer from the LH strut.

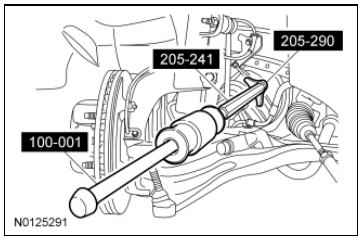


5. Remove and discard the LH ball joint bolt and nut.

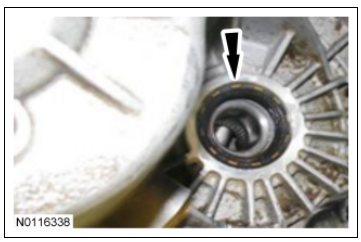


6. Separate the LH ball joint from the knuckle.

7. Using the special tools, remove the LH halfshaft assembly from the transaxle and position aside. Support the LH halfshaft assembly.

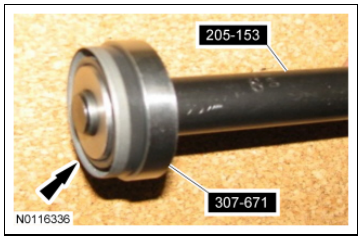


8. Using a suitable tool, remove and discard the LH halfshaft seal.

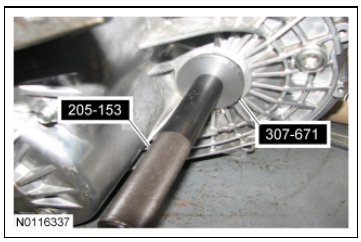


Installation

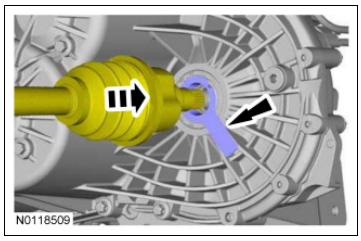
1. Install the LH halfshaft seal onto the special tool.



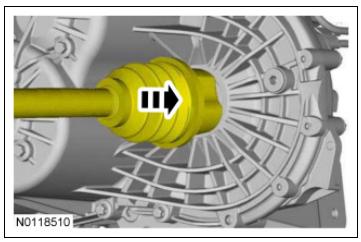
2. Using the special tools, install the LH halfshaft seal.



3. Using the LH halfshaft seal protector provided with the new LH halfshaft seal, install the LH halfshaft partially into the transaxle.

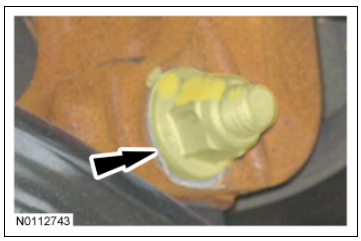


4. Remove the LH halfshaft seal protector and install the LH halfshaft into the transaxle.

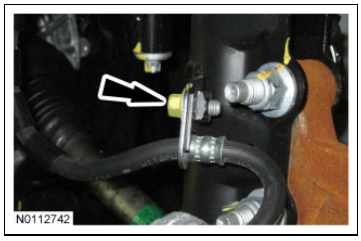


5. Install the LH ball joint into the knuckle.

6. Install the new LH ball joint bolt and nut.
   - Tighten to 48 Nm (35 lb-ft).



7. Install the brake hose retainer and bolt on the LH strut.
   - Tighten to 25 Nm (18 lb-ft).

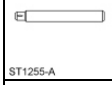


8. Install the front wheel and tire. For additional information, refer to Section 204-04 .

9. Fill the transaxle with transmission fluid. For additional information, refer to Transmission Draining and Filling in this section.

Halfshaft Seal - RH

Special Tool(s)

 ST1255-A	Handle 205-153
 ST3218-A	Installer, Output Shaft Seal 307-671

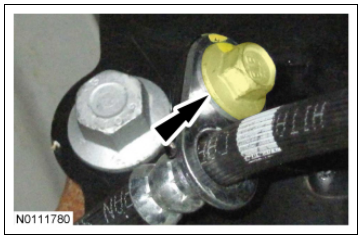
Material

Item	Specification
Motorcraft® Dual Clutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2

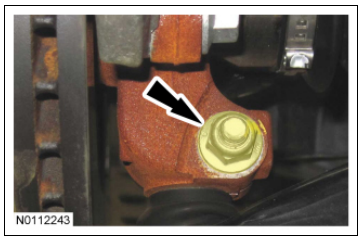
Removal

All Vehicles

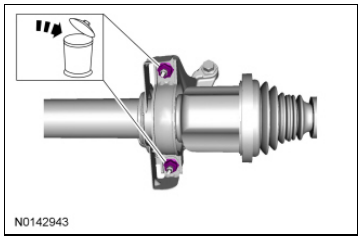
1. Remove the RH front wheel and tire. For additional information, refer to Section 204-04 .
2. Remove the brake hose retainer bolt and the brake hose retainer from the RH strut.


N0111780

3. Remove and discard the RH ball joint bolt and nut.

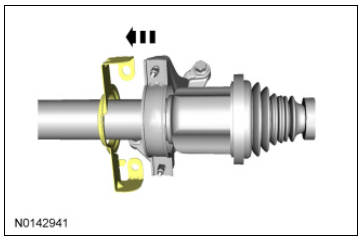

N0112243

4. Separate the RH ball joint from the knuckle.
5. Remove and discard the bearing retainer strap nuts.



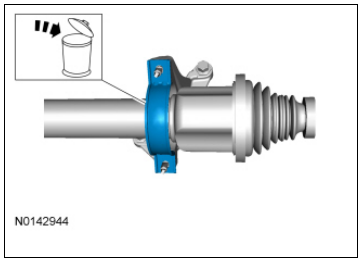
Vehicles built before 04/2011

6. Position aside the bearing shield.



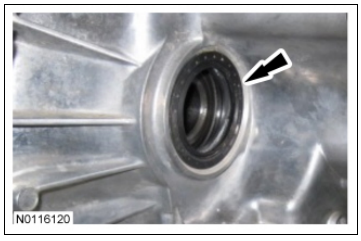
All Vehicles

7. Remove and discard the bearing retainer strap.



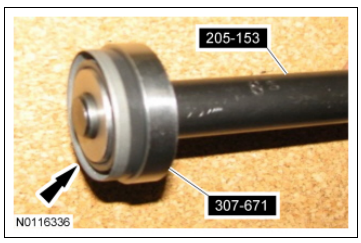
8. Detach the RH intermediate shaft assembly from the transaxle and position aside. Support the RH intermediate shaft assembly.

9. Using a suitable tool. remove and discard the RH halfshaft seal.

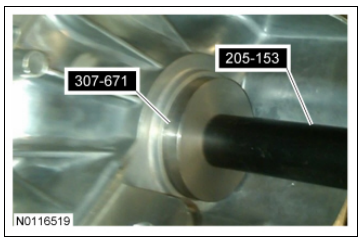


Installation

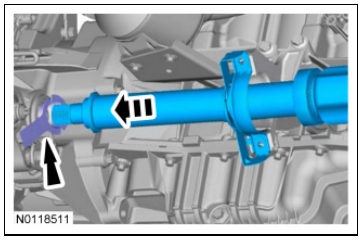
1. Install the RH halfshaft seal onto the special tool.



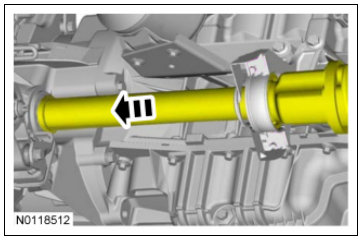
2. Using the special tools, install the RH halfshaft seal.



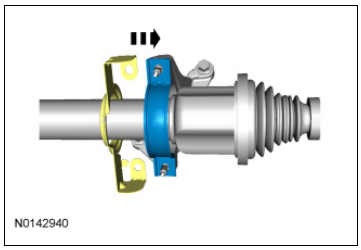
3. Using the RH halfshaft seal protector provided with the new RH halfshaft seal, install the RH intermediate shaft assembly partially into the transaxle.



4. Remove the RH halfshaft seal protector and install the RH intermediate shaft assembly into the transaxle.

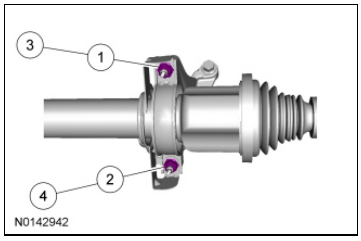


5. Install the new bearing retainer strap and shield (if equipped).
    - Install the strap on the studs.
    - Position the shield (if equipped) on the studs.



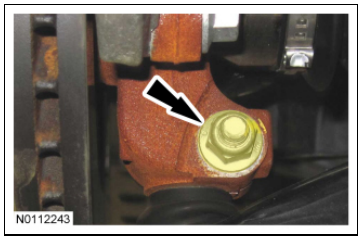
NOTICE: **Install the bearing retainer strap on the bracket studs before the shield, and tighten the nuts evenly in stages (alternating from top to bottom) or incorrect bearing clampload may occur causing component damage.**

6. Install the new bearing retainer strap nuts.
    - Tighten to 6 Nm (53 lb-in).
    - Tighten to 6 Nm (53 lb-in).
    - Tighten to 25 Nm (18 lb-ft).
    - Tighten to 25 Nm (18 lb-ft).

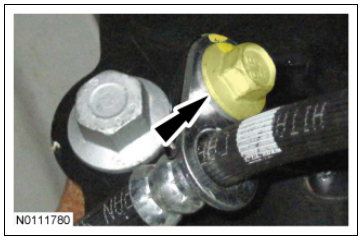


7. Install the RH ball joint into the knuckle.

8. Install the new RH ball join bolt and nut.
   - Tighten to 48 Nm (35 lb-ft).



9. Install the brake hose retainer and bolt on the RH strut.
   - Tighten to 25 Nm (18 lb-ft).

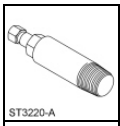
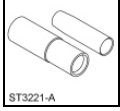


10. Install the RH front wheel and tire. For additional information, refer to Section 204-04 .

11. Fill the transmission fluid. For additional information, refer to Transmission Draining and Filling in this section.

Inner Input Shaft Seal

Special Tool(s)

 ST3220-A	Remover, Outer Input Shaft Seal 307-673
 ST3221-A	Installer, Outer Input Seal 307-674 (includes 307-674/1 and 307-674/2)

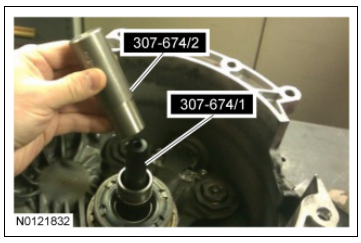
Removal

1. Remove the transaxle. For additional information, refer to Transaxle .
2. Remove the clutch. For additional information, refer to Clutch .
3. Using the special tools, remove and discard the inner input shaft seal.



Installation

1. Using the special tools, install the new inner input shaft seal.

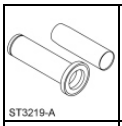
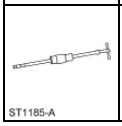


2. Install the clutch. For additional information, refer to Clutch .

3. Install the transaxle into the vehicle. For additional information, refer to Transaxle .

Outer Input Shaft Case Seal

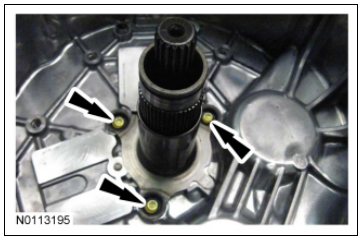
Special Tool(s)

 ST3219-A	Installer, Input Guide and Seal 307-672 (includes 307-672/1 and 307-672/2)
 ST2417-A	Remover, Input Shaft Oil Seal 308-375
 ST1185-A	Slide Hammer 100-001

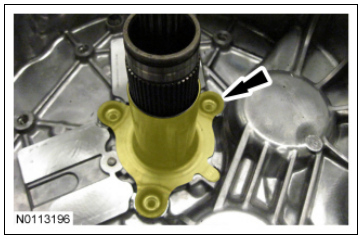
Removal

1. Remove the clutch engagement system. For additional information, refer to Clutch Engagement System in this section.

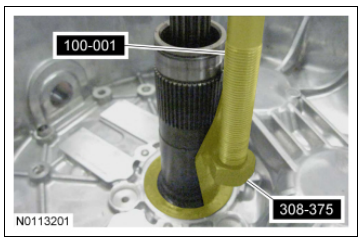
2. Remove the guide tube bolts.



3. Remove the guide tube.

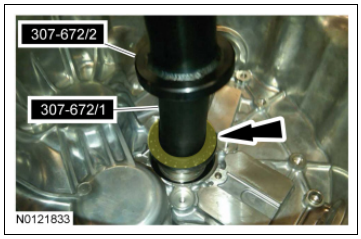


4. Using the special tools, remove and discard the outer input shaft case seal.

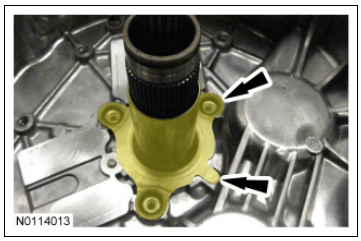


Installation

1. Using the special tools, install the new outer input shaft case seal.



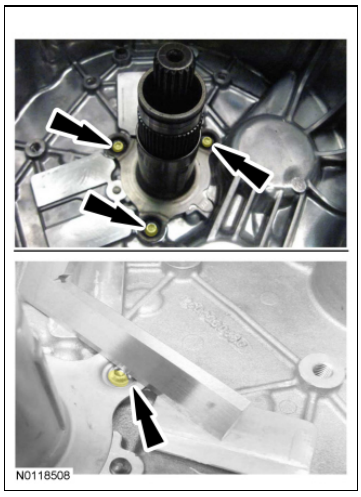
2. Using the locating tab on the guide tube, install the guide tube.



3. **NOTE:** The guide tube bolts must not project beyond the mounting surface of the clutch engagement levers.

   Install the guide tube bolts.

   - Tighten to 8 Nm (71 lb-in).



4. Install the clutch engagement system. For additional information, refer to Clutch Engagement System in this section.

5. Install the clutch. For additional information, refer to Clutch in this section.

6. Install the transaxle into the vehicle. For additional information, refer to Transaxle in this section.

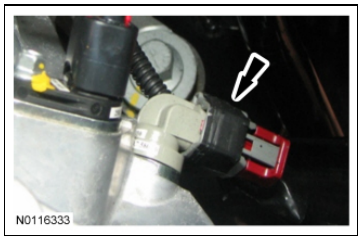
Input Shaft Speed Sensor - No. 1

Material

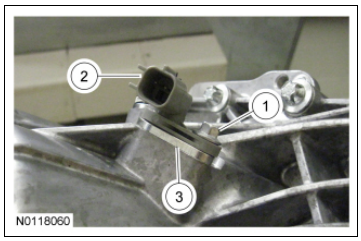
Item	Specification
Motorcraft® Dual Clutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2

Removal

1. Disconnect the input shaft speed sensor 1 electrical connector.

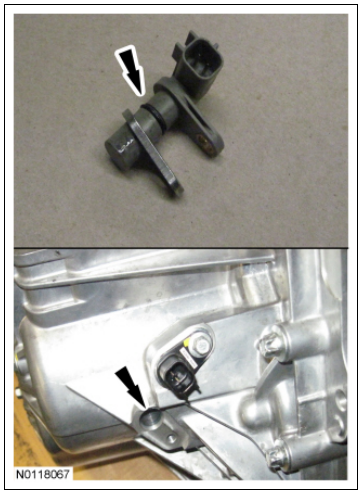


2. Remove the input shaft speed sensor 1.
    1. Remove the input shaft speed sensor 1 bolt.
    2. Remove the input shaft speed sensor 1.
    3. Remove the input shaft speed sensor 1 shim.



Installation

1. Inspect the input shaft speed sensor 1 and transaxle bore for debris or damage. Clean, repair and/or replace as needed.



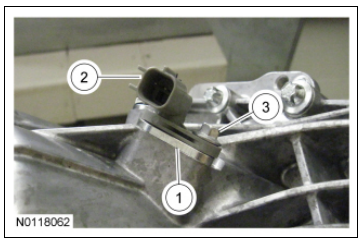
NOTICE: **Be sure to use the 3.5 mm (0.137 in) input shaft speed sensor 1 shim on input shaft speed sensor 1 or damage can occur to the transaxle.**

NOTE: Install a new O-ring if installing the existing input shaft speed sensor 1.

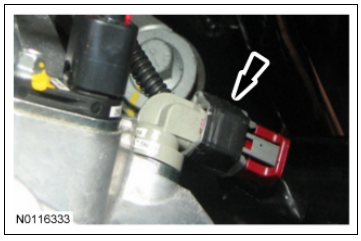
NOTE: Use a small amount of transmission fluid on the input shaft speed sensor 1 O-ring for installation.

Install the input shaft speed sensor 1.

1. Install the input shaft speed sensor 1 shim.
2. Install the input shaft speed sensor 1.
3. Install the input shaft speed sensor 1 bolt.
    - ♦ Tighten to 10 Nm (89 lb-in).



3. Connect the input shaft speed sensor 1 electrical connector.



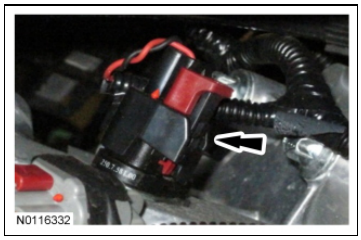
Input Shaft Speed Sensor - No. 2

Material

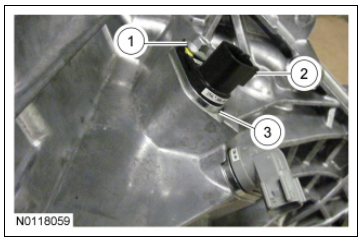
Item	Specification
Motorcraft® Dual Clutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2

Removal

1. Disconnect the input shaft speed sensor 2 electrical connector.

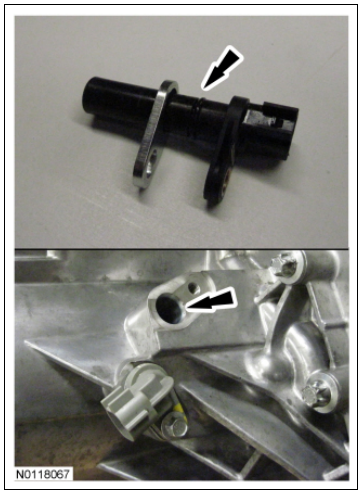


2. Remove the input shaft speed sensor 2.
    1. Remove the input shaft speed sensor 2 bolt.
    2. Remove the input shaft speed sensor 2.
    3. Remove the input shaft speed sensor 2 shim.



Installation

1. Inspect the input shaft speed sensor 2 and transaxle bore for debris or damage. Clean, repair and/or replace as needed.



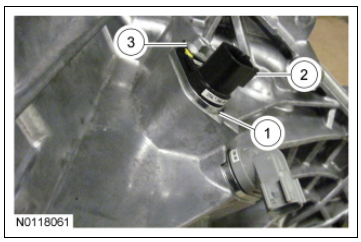
NOTICE: **Be sure to use the 3.2 mm (0.125 in) input shaft speed sensor 2 shim or damage can occur to the transaxle.**

NOTE: Install a new O-ring if installing the existing input shaft speed sensor 2.

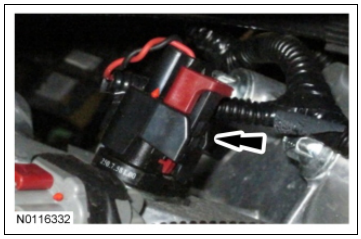
NOTE: Use a small amount of transmission fluid on the input shaft speed sensor 2 O-ring for installation.

Install the input shaft speed sensor 2.

1. Install the input shaft speed sensor 2 shim.
2. Install the input shaft speed sensor 2.
3. Install the input shaft speed sensor 2 bolt.
    - ♦ Tighten to 10 Nm (89 lb-in).

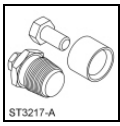


3. Connect the input shaft speed sensor 2 electrical connector.



Manual Control Lever Shaft Seal

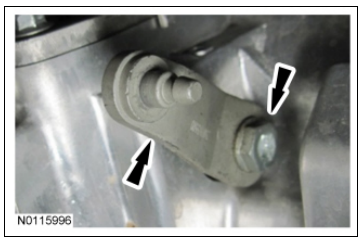
Special Tool(s)

 ST3217-A	Remover/Installer, Manual Lever Seal 307-670 (includes 307-670/1 and 307-670/2)

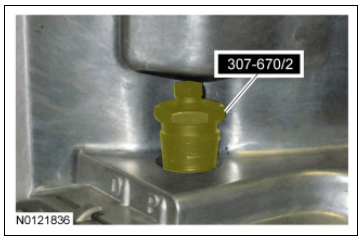
Removal

1. Remove the transaxle. For additional information, refer to Transaxle in this section.

2. Remove and discard the manual control lever bolt and remove the manual control lever.

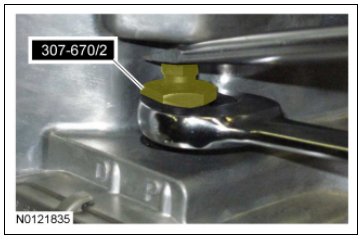


3. Install the special tool.



4. **NOTE:** Use care to prevent clutch housing cup plug from being dislodged.

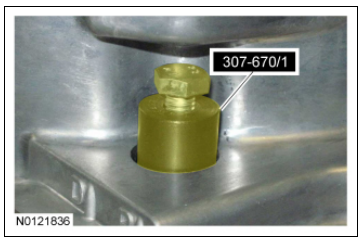
   Using the special tool and a suitable tool, apply slight pressure to the special tool, remove and discard the manual control lever seal.



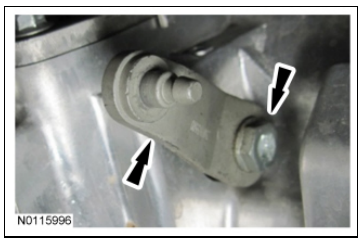
5. Inspect the transaxle case bore for debris or damage. Clean and/or repair as needed.

Installation

1. Using the special tools, install the new manual control lever shaft seal.



2. Install the manual control lever and the new manual control lever bolt.
   - Tighten to 26 Nm (19 lb-ft).



3. Install the transaxle. For additional information, refer to Transaxle in this section.

Output Shaft Speed (OSS) Sensor

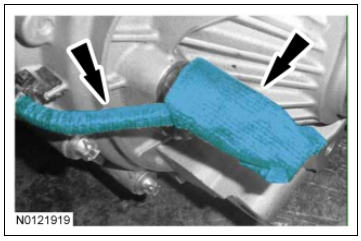
Material

Item	Specification
Motorcraft® DualClutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2

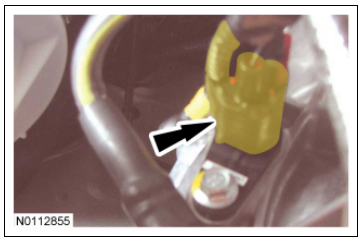
Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

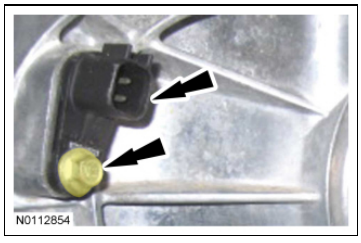
2. Remove and discard the heat tape from the Output Shaft Speed (OSS) sensor and electrical connector.



3. Disconnect the OSS sensor electrical connector.



4. Remove the OSS sensor bolt and OSS sensor.



Installation

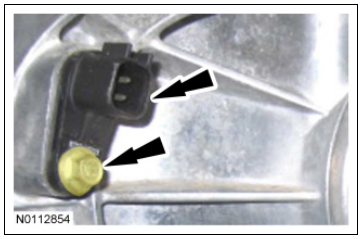
1. Inspect the transaxle case bore. Clean and/or repair as needed.

2. Inspect the OSS sensor for debris or damage. Clean or replace the OSS as needed.

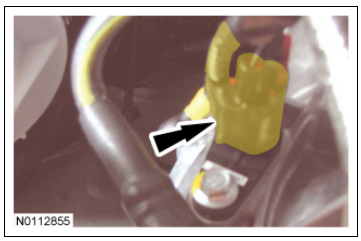
3. **NOTE:** If installing the old OSS sensor, install a new O-ring.

   Apply a small amount of transmission fluid to the O-ring and install the OSS sensor and the OSS sensor bolt.

   - Tighten to 10 Nm (89 lb-in).



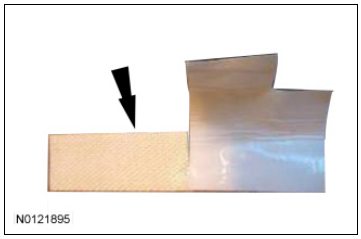
4. Connect the OSS sensor electrical connector.



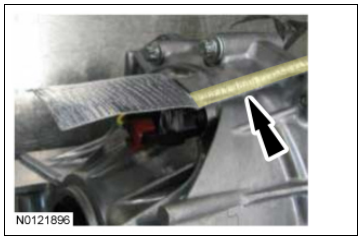
5. Thoroughly clean the OSS sensor, electrical connector and wire.

6. Install new heat tape on the OSS sensor as shown in the preceding steps.

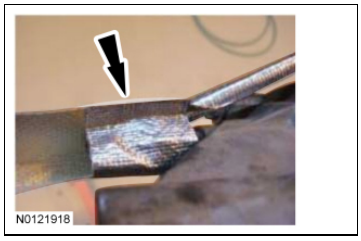
7. Remove the heat tape backing only from this location first.



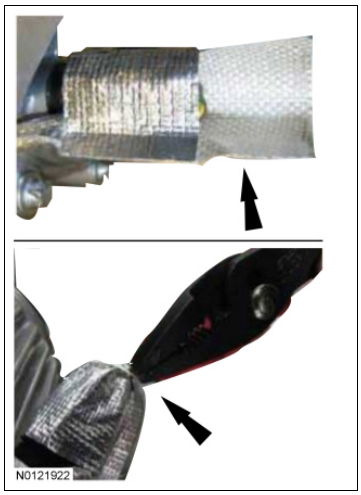
8. Wrap the heat tape around the OSS sensor wiring harness.



9. Remove the heat tape backing from the rest of the heat tape and wrap it around the OSS sensor and sticking the ends together.



10. Fold the remaining portion of the heat tape and crimp around the edge starting from the sensor portion moving around.

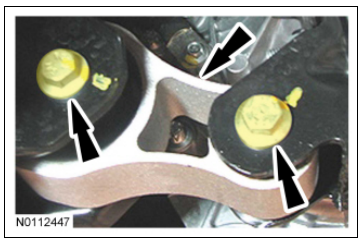


Roll Restrictor

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the roll restrictor bolts and the roll restrictor.

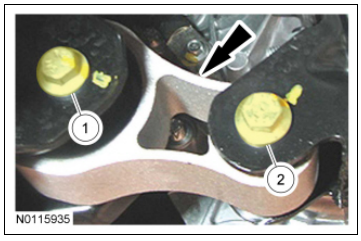


Installation

1. **NOTE:** The bolts are different lengths, make sure the bolts are in the correct location using the marks made during removal.

   Install the roll restrictor and the roll restrictor bolts.

   1. Tighten to 70 Nm (52 lb-ft).
   2. Tighten to 48 Nm (35 lb-ft).



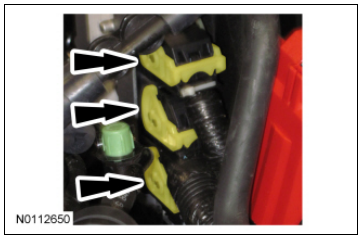
Transaxle Support Insulator

Special Tool(s)

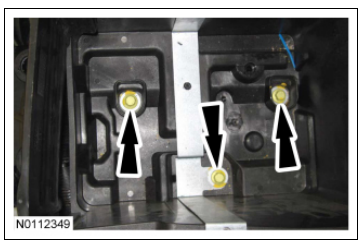
 ST2378-A	Adapter for 303-290 303-290-01
 ST2379-A	Adapter for 303-290A (Support Leg) 303-290A-03A
 ST2363-A	Support Bar, Engine 303-290A

Removal

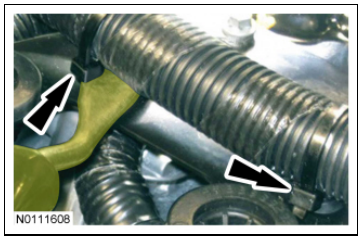
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .
2. Remove the battery. For additional information, refer to Section 414-01 .
3. Remove the cowl assembly. For additional information, refer to Section 501-02 .
4. Remove the Air Cleaner (ACL) assembly and outlet pipe. For additional information, refer to Section 303-12 .
5. Disconnect the 3 PCM electrical connectors.



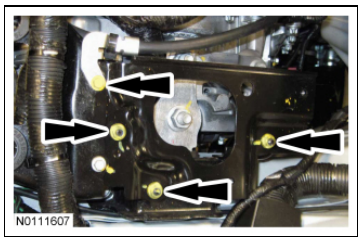
6. Remove the 3 battery tray bolts and the battery tray.



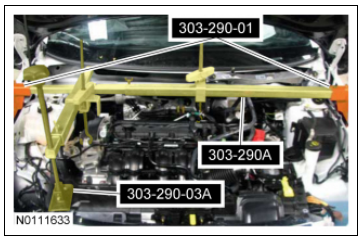
7. Using a suitable tool, detach the wiring harness from the battery tray bracket.



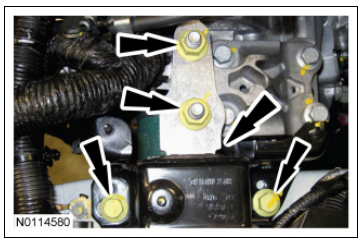
8. Remove the selector lever cable bracket bolt, the battery tray bracket nuts and remove the battery tray bracket.



9. Install the special tools and support the engine.

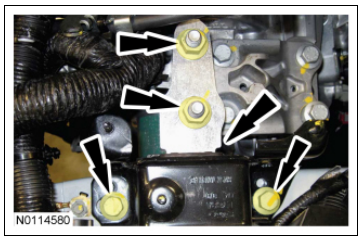


10. Remove the 2 transaxle support insulator bolts and nuts and remove the transaxle support insulator.

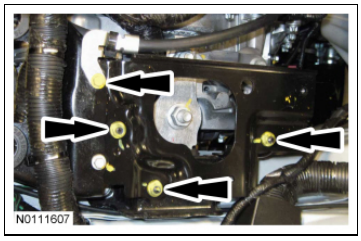


Installation

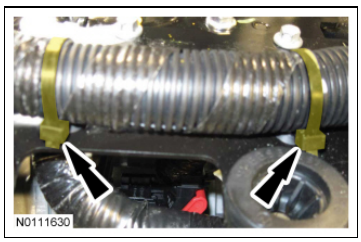
1. Install the transaxle support insulator and install the 2 transaxle support insulator bolts and the 2 nuts.
   - Tighten the 2 bolts to 90 Nm (66 lb-ft).
   - Tighten the 2 nuts to 125 Nm (92 lb-ft).



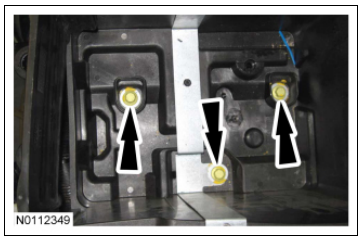
2. Install the battery tray bracket, battery tray bracket nuts and the selector lever cable bracket bolt.
   - Tighten to 10 Nm (89 lb-in).



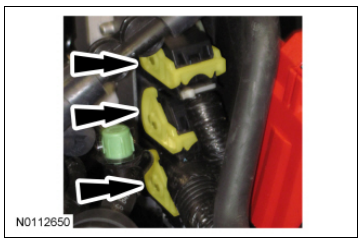
3. Attach the wiring harness to the battery tray bracket.



4. Install the battery tray and 3 battery tray bolts.
   - Tighten to 10 Nm (89 lb-in).



5. Connect the 3 PCM electrical connectors.

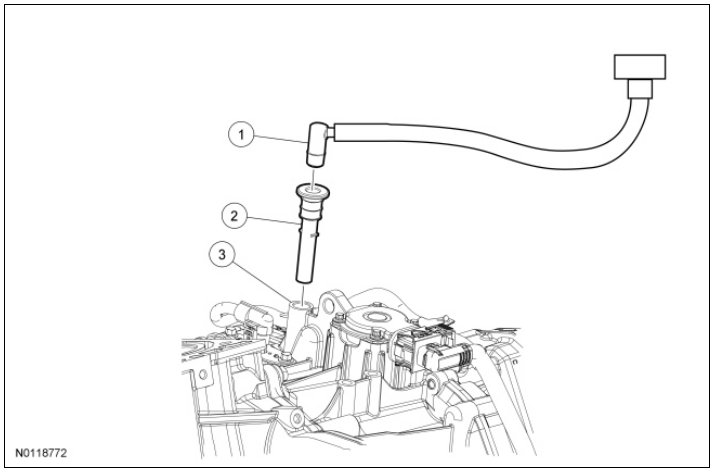


6. Install the ACL and the outlet pipe. For additional information, refer to Section 303-12 .

7. Install the cowl assembly. For additional information, refer to Section 501-02 .

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

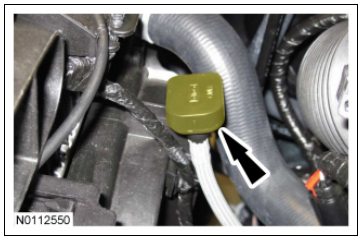
Transaxle Vent



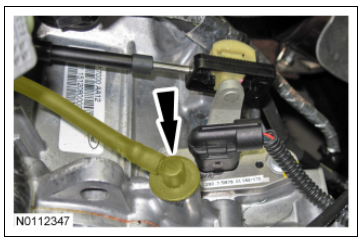
Item	Part Number	Description
1	-	Vent cap housing
2	-	Vent base
3	-	Transaxle

Removal

1. Remove the battery and battery tray. For additional Information, refer to Section 414-01 .
2. Remove the Air Cleaner (ACL) assembly and the outlet pipe. For additional Information, refer to Section 303-12 .
3. Remove the vent assembly end from the cooling fan housing and position it aside.



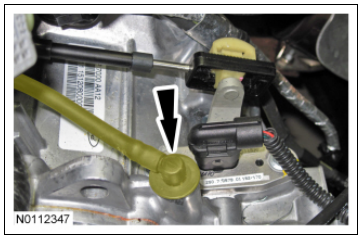
4. Remove the vent assembly from the transaxle.



Installation

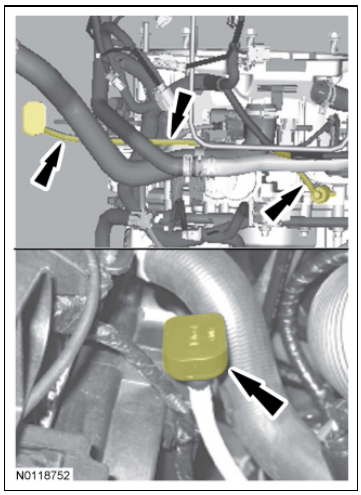
1. Inspect the vent transaxle bore for damage or debris. Clean or repair as needed.

2. Install the vent assembly in the transaxle bore.



3. ***NOTICE:*** **Make sure the transaxle vent hose is properly routed or damage can occur.**

   Install the vent assembly end onto the cooling fan housing.



4. Install the ACL assembly and outlet pipe. For additional Information, refer to Section 303-12 .

5. Install the battery tray and battery. For additional Information, refer to Section 414-01 .

Transmission Control Module (TCM)

Special Tool(s)

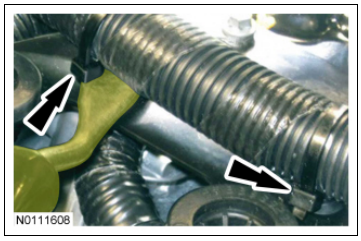
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Material

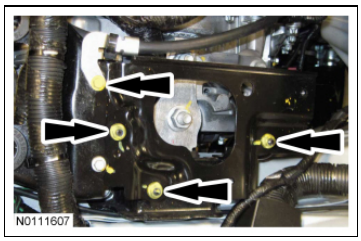
Item	Specification
Motorcraft® Dual Clutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2

Removal

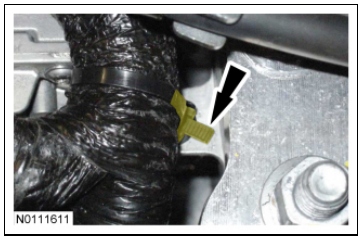
1. Using the scan tool, recover all module information before removing the Transmission Control Module (TCM). For additional information, refer to Transmission Adaptive Learning in this section.
2. Remove the battery and battery tray. For additional information, refer to Section 414-01 .
3. Remove the Air Cleaner (ACL) assembly and the outlet pipe. For additional information, refer to Section 303-12 .
4. Using a suitable tool, detach the wiring harness from the battery tray bracket.



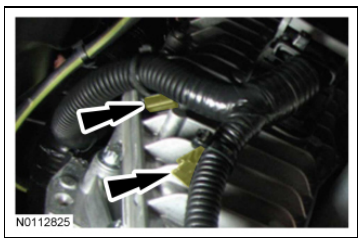
5. Remove the selector lever cable bracket bolt, the battery tray bracket nuts and the battery tray bracket.



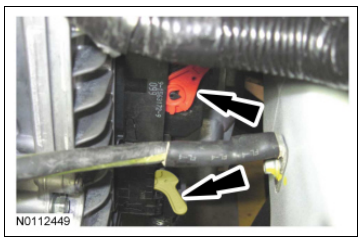
6. Remove the wiring harness from the transaxle housing.



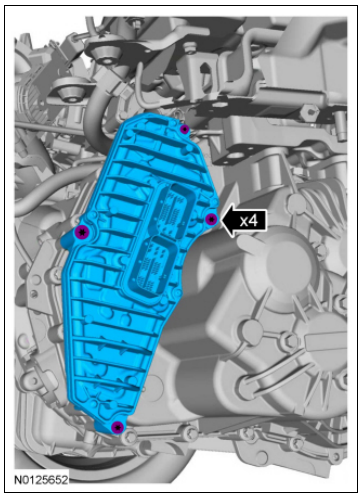
7. Detach the wiring harness clips from the Transmission Control Module (TCM) housing.



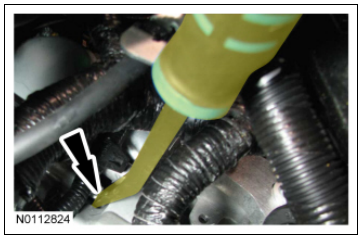
8. Disconnect the 2 TCM electrical connectors.



9. Remove the 4 TCM bolts.



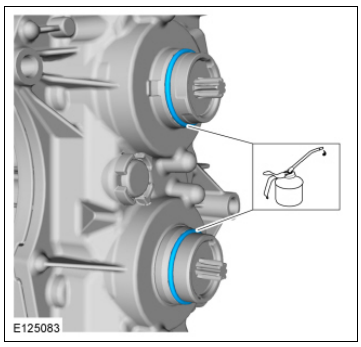
10. Using a suitable flat blade screwdriver, carefully pry the TCM from the transaxle, at the location shown, and remove the TCM , discard the O-rings.



Installation

1. Carefully inspect the TCM and the transaxle bore for debris or damage. Clean and/or repair as needed.
2. **NOTE:** Use a small amount of transmission fluid on the new O-rings prior to installation.

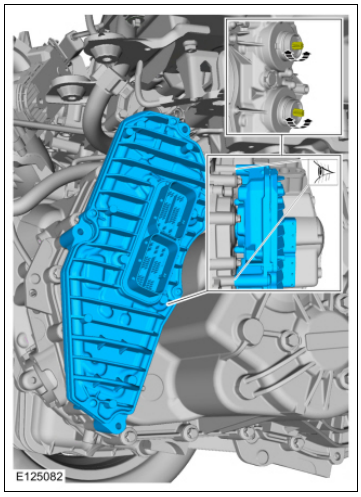
   Install new O-rings if the TCM is being reused.



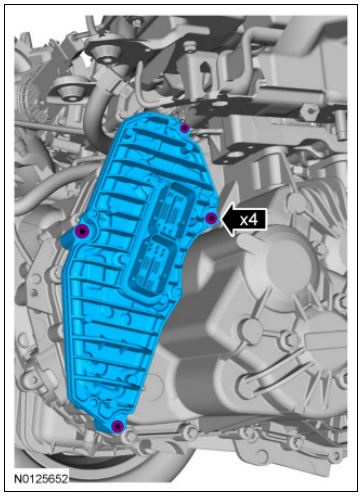
3. ***NOTICE:*** **Do not force the TCM onto the transaxle or damage may occur.**

   NOTICE: **Make sure the TCM sits flush on the transaxle or damage can occur.**

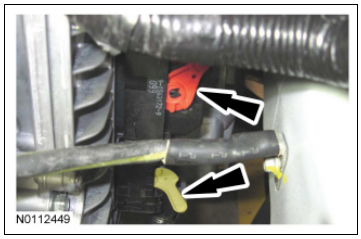
   Install the TCM on the transaxle. Apply light pressure to seat the O-rings. If the TCM does not push in place with light pressure, remove the TCM and slightly turn the TCM gears and retry installing the TCM on the transaxle.



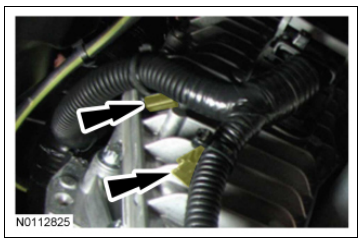
4. Install the 4 TCM bolts.
   - Tighten to 27 Nm (20 lb-ft).



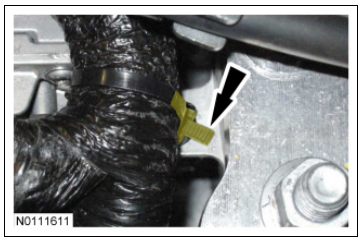
5. Connect the 2 TCM electrical connectors.



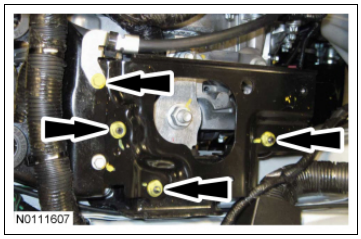
6. Install the wiring harness clips on the TCM housing.



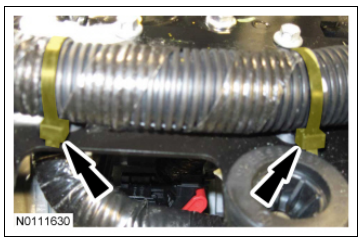
7. Install the wiring harness on the transaxle housing.



8. Install the battery tray bracket, battery tray bracket nuts and selector lever cable bracket bolt.
   - Tighten to 10 Nm (89 lb-in).



9. Install the wiring harness onto the battery tray bracket.



10. Install the ACL assembly and outlet pipe. For additional information, refer to Section 303-12 .

11. Install the battery tray and battery. For additional information, refer to Section 414-01 .

12. If a new TCM was installed, it will need to be reprogrammed to the latest calibration level available. For additional Information, refer to Transmission Adaptive Learning in this section.

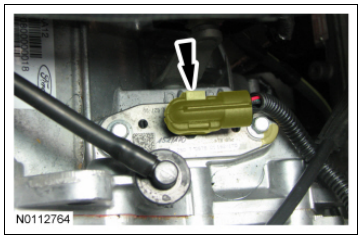
Transmission Range (TR) Sensor

Special Tool(s)

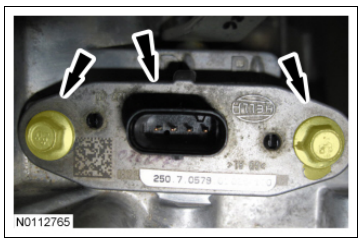
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Removal

1. Disconnect the Transmission Range (TR) sensor electrical connector.

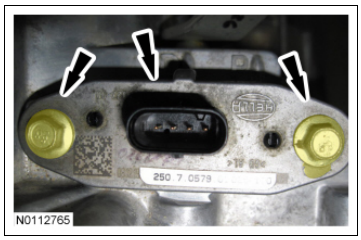


2. Remove the 2 TR sensor bolts and the TR sensor.

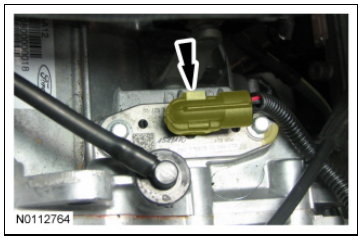


Installation

1. Install the TR sensor and the 2 TR sensor bolts.
   - Tighten to 10 Nm (89 lb-in).



2. Connect the TR sensor electrical connector.



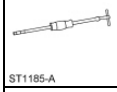
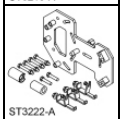
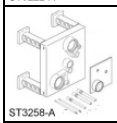
3. Adjust the selector lever cable. For additional information, refer to Section 307-05 .

4. Re-calibrate the TR sensor. For additional information, refer to Transmission Adaptive Learning in this section.

5. Verify the vehicle starts in PARK and NEUTRAL only.

Transaxle

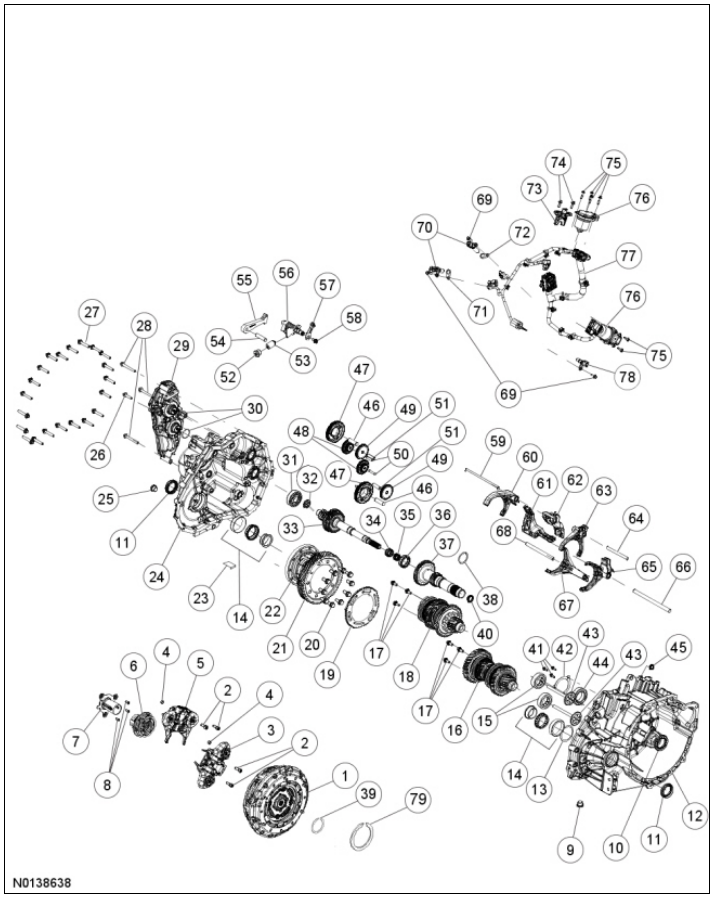
Special Tool(s)

 ST1185-A	Slide Hammer 100-001
 ST2986-A	Holding Fixture 307-580
 ST3219-A	Installer, Input Guide and Seal 307-672 (includes 307-672/1 and 307-672/2)
 ST3222-A	Fixture, Clutch Remover/Installer 307-675 (includes 307-675/1, 307-675/2, 307-675/3 and 307-675/4)
 ST3258-A	Table, Assembly (DPS6) 307-680 (includes 307-680/1, 307-680/2, 307-680/3, 307-680/4 and 307-680/5)
 ST2417-A	Remover, Input Shaft Oil Seal 308-375

Material

Item	Specification
DPS6 Grease 9U7Z-19A506-BA	WSS-M1C270-A
Gasket Maker TA-16	WSK-M2G348-A5
High Temperature Nickel Anti-Seize Lubricant XL-2	-
Motorcraft® Dual Clutch Transmission Fluid XT-11-QDC	WSS-M2C200-D2

Transmission Exploded View



Item	Part Number	Description
1	7B546	Clutch assembly (part of 7C601 kit)
2	W790187	Actuator lever bolts (4 required)
3	7515	Actuator lever 1 (part of 7C601 kit)
4	7N080	Actuator lever dowels (2 required)
5	7515	Actuator lever 2 (part of 7C601 kit)
6	7A508	Engagement bearing (part of 7C603 kit)
7	7A564	Guide tube
8	W790185	Guide tube bolts (3 required)
9	7L013	Drain plug
10	7048	Input shaft case seal
11	1177	Halfshaft seals (2 required)
12	7505	Clutch housing
13	4067	Differential shim (part of kit)
14	4220	Differential bearings (2 required)
15 /td>	7M037	Output shaft bearings (2 required)
16	7060	Output shaft assembly
17	W790208	Output shaft bearing retainer bolts (6 required)
18	7060	Output shaft assembly
19	7H150	Differential impulse ring
20	W790237	Differential ring gear bolts (10 required)
21	7D392	Differential ring gear
22	4026	Differential case

23	7L027	Magnet
24	7005	Transmission case
25	7C013	Fill plug
26	W790189	Transmission Control Module (TCM) bolt
27	W790209	Clutch housing-to-case bolts (21 required)
28	W790188	TCM bolt
29	7Z369	TCM
30	7B498	TCM O-ring seal
31	7118	Input shaft bearing
32	7D000	Oil spout
33	7017	Inner input shaft
34	7M037	Needle bearing
35	7M037	Needle bearing
36	7118	Bearing
37	7017	Hollow input shaft
38	7917	Input shaft snap ring
39	7064	Hollow input shaft snap ring
40	7052	Hollow input shaft seal
41	W790236	Bolts (3 required)
42	7049	Bearing retainer
43	7D000	Lube feed tubes (2 required)
44	7118	Input shaft bearing
45	7052	Manual control lever shaft seal
46	-	Shift drum pin (2 required) (part of 7J047)
47	7J047	Shift drum (2 required)
48	7J048	Small clock gear (2 required)
49	7J048	Large clock gear (2 required)
50	6397	Clock gear pin (2 required)
51	6397	Clock gear pin (2 required)
52	7L013	Park plunger plug
53	7233	Park plunger
54	6397	Park pawl rod
55	7A248	Park pawl
56	7H296	Park pawl actuation shaft assembly
57	7A256	Manual control lever

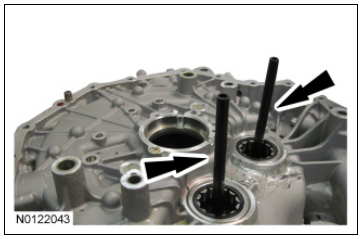
Clutch Housing

Special Tool(s)

 ST1608-A	Collet, 1 1/4" to 1 1/2" 303-D022
 ST3214-A	Forcing Screw 204-594
ST1255-A	Handle 205-153
 ST3226-A	Installer, Countershaft Needle Bearing 307-679
 ST2350-A	Installer, Differential Bearing Cup 205-118
 ST3218-A	Installer, Output Shaft Seal 307-671
 ST3225-A	Remover, Differential Bearing Cup 307-678
 ST1185-A	Slide Hammer 100-001

Disassembly

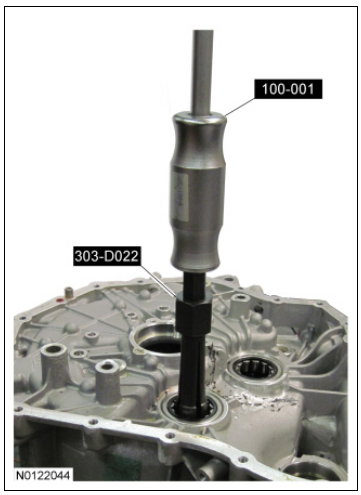
1. Break the lube feed tubes off the clutch housing output shaft bearings and discard.



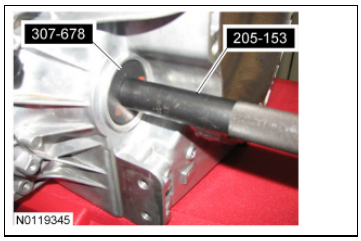
2. **NOTE:** If the clutch housing output shaft bearing is broken, use the next size larger special tool.

   NOTE: The clutch housing output shaft bearing 1 is shown, the clutch housing output shaft bearing 2 is similar.

Using the special tool, remove the 2 clutch housing output shaft bearings.



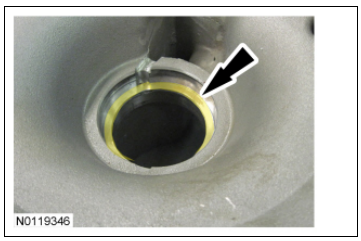
3. Using the special tools, remove the clutch housing differential bearing race and shim.



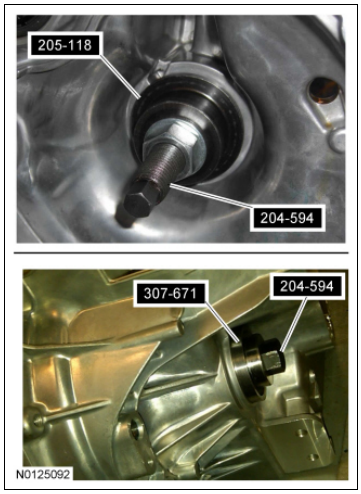
Assembly

1. **NOTE:** If new differential bearings, differential, clutch housing or transaxle case are installed refer to the Differential Shim Selection in this section.

   Install the clutch housing differential bearing shim.

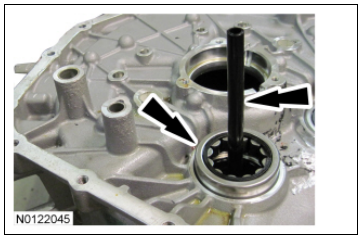


2. Using the special tools, install the clutch housing differential bearing race.



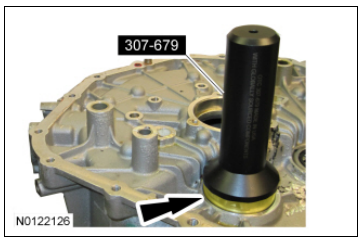
3. **NOTE:** The clutch housing output shaft bearing 1 is shown, the clutch housing output shaft bearing 2 is similar.

   Install the new lube feed tubes and position the clutch housing output shaft bearings into the clutch housing.



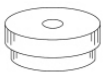
4. **NOTE:** The clutch housing output shaft bearing 1 is shown, the clutch housing output shaft bearing 2 is similar.

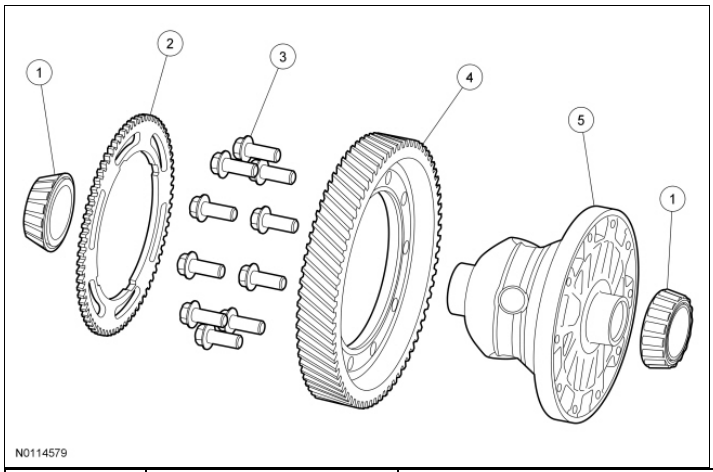
   Using the special tool, install the 2 clutch housing output shaft bearings.



Differential

Special Tool(s)

 ST1653-A	Handle 205-153
 ST3242-A	Installer, Differential Bearing 205-206
 ST2785-A	Puller, Bearing 205-D064
 ST2770-A	Remover/Installer, Front Wheel Hub 204-069
 ST1935-A	Step Plate 205-D014

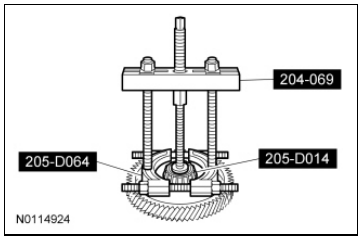


Item	Part Number	Description
1	4220	Differential bearings
2	7H150	Differential impulse ring
3	W790237	Differential ring gear bolts
4	-	Differential ring gear (part of 4026)
5	-	Differential case (part of 4026)

Disassembly

1. ***NOTICE:*** **Take care not to damage the differential impulse ring.**

   Using the special tools, remove and discard the differential bearings.



2. Using a 1500W heat gun, slightly heat the impulse ring. Remove the impulse ring.

3. Remove and discard the differential ring gear bolts. Lightly tap the ring gear to separate it from the differential case.

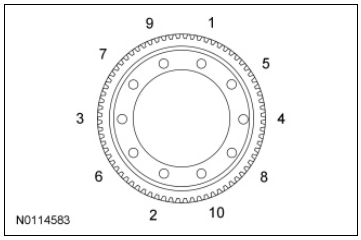
4. Clean all parts in clean solvent and dry with compressed air.

Assembly

1. Inspect differential parts for damage or wear. Repair or replace as needed.

2. Install the differential ring gear onto the differential case.

3. Install the new differential ring gear bolts.
   - Using the illustration, tighten to 85 Nm (63 lb-ft) in a star pattern.

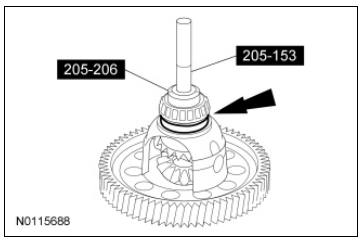


4. **NOTE:** Make sure the differential impulse ring is fully seated and flush on the differential.

   Using a 1500W heat gun, slightly heat the differal impulse ring. Install it onto the differential assembly.

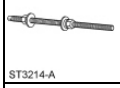
5. ***NOTICE:*** **Take care not to damage the differential impulse ring.**

   Using the special tools, install the new differential bearings.



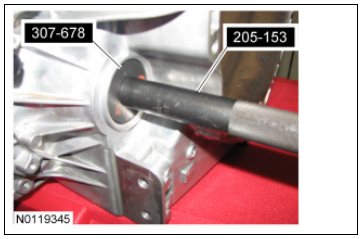
Differential Shim

Special Tool(s)

 ST3214-A	Forcing Screw 204-594
 ST2350-A	Installer, Differential Bearing Cup 205-118
ST1255-A	Handle 205-153
 ST3218-A	Installer, Axle Seal 307-671
 ST3225-A	Remover, Differential Bearing Cup 307-678

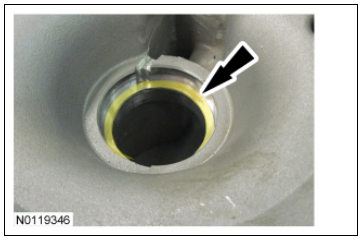
Disassembly

1. Using the special tools, remove the clutch housing differential bearing race and shim.



Assembly

1. Install the selected differential bearing shim. If the differential bearings, differential, clutch housing or transaxle case were replaced, refer to Differential Shim Selection in this section.

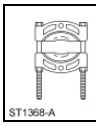


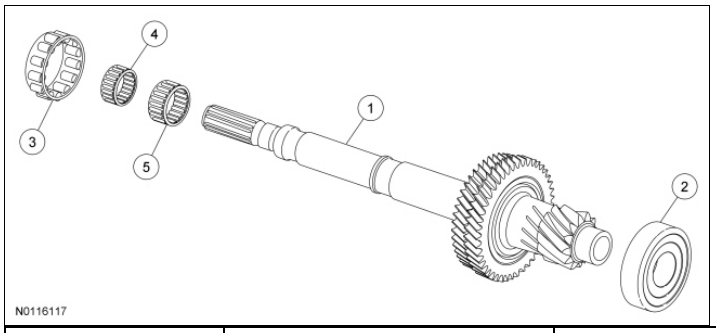
2. Using the special tools, install the differential bearing race.


205-118
204-594
307-671
204-594
N0125092

Input Shaft - Inner

Special Tool(s)

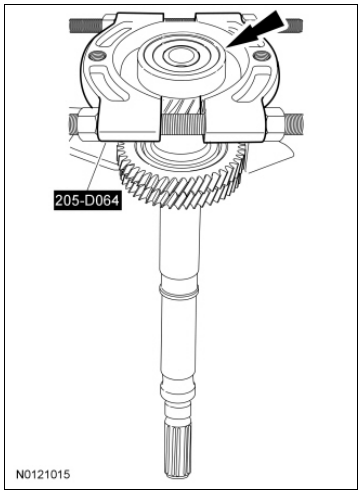
 ST1368-A	Puller, Bearing 205-D064



Item	Part Number	Description
1	7717	Inner input shaft
2	7B412	Radial bearing
3	7B412	Roller bearing
4	7M150	Needle bearing
5	7M150	Needle bearing

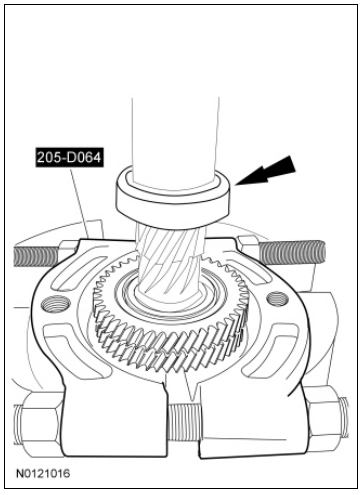
Disassembly

1. Remove the inner input shaft needle bearing.
2. Remove the inner input shaft needle bearing.
3. Remove the inner input shaft roller bearing.
4. Using the special tools and a press, remove the inner input shaft radial bearing.



Assembly

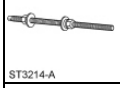
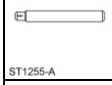
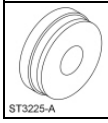
1. Inspect the inner input shaft for wear or damage, replace as needed.
2. Using the special tools and a press, install the inner input shaft radial bearing.



3. Install the inner input shaft roller bearing.
4. Install the inner input shaft needle bearing.
5. Install the inner input shaft needle bearing.

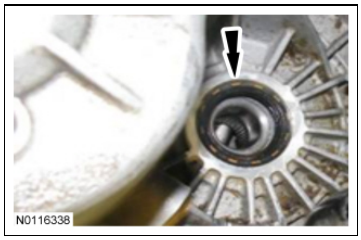
Transaxle Case

Special Tool(s)

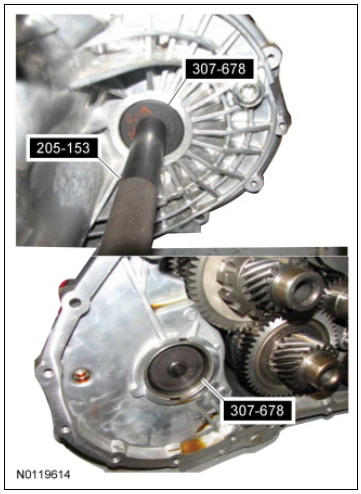
 ST3214-A	Forcing Screw 204-594
 ST1255-A	Handle 205-153
 ST3218-A	Installer, Output Shaft Seal 307-671
 ST3225-A	Remover, Differential Bearing Cup 307-678

Disassembly

1. Remove and discard the halfshaft seal.



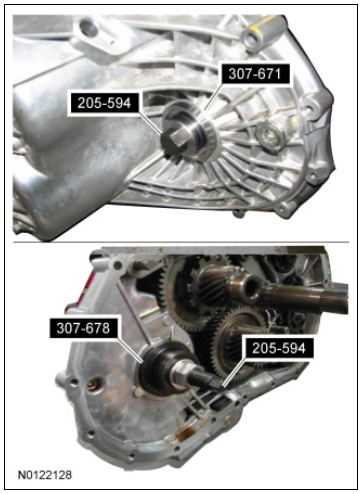
2. Using the special tools, remove the differential case bearing cup.



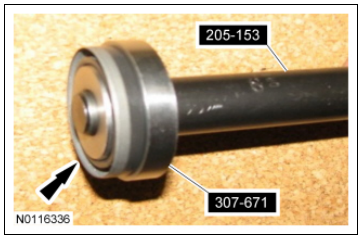
Assembly

1. **NOTE:** If a new differential gear bearing, transmission case, differential or clutch housing are installed, measure the differential shim for the correct size. For additional information, refer to Differential Shim Selection .

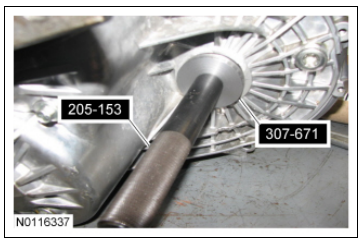
   Using the special tools, install the differential gear bearing cup.



2. Install the new halfshaft seal on the special tools.



3. Using the special tools, install the new halfshaft seal.



Material

Item	Specification	Fill Capacity
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C	2.1L (2.2 qt)
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1	-

Gear Ratios

Gear	Ratio
1st	3.85
2nd	2.04
3rd	1.28
4th	0.95
5th	0.76
Reverse	3.62
Final Drive	4.07

Manual Transaxle and Clutch

The IB5 manual transaxle and clutch system consists of the following:

- Five-speed manual transaxle
- Clutch disc
- Clutch pressure plate
- Clutch release hub and bearing
- Clutch hydraulic system
- Clutch pedal
- Flywheel

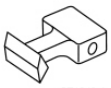
The function of the transaxle is to move the vehicle from a rest position to motion. The transaxle uses gears to adapt the torque to the demands of load and road conditions. It matches engine power to vehicle needs. This power is delivered from the engine flywheel to the transaxle. The power is transmitted through a driver-operated clutch, which allows for engagement and disengagement of the engine to the transaxle.

The transaxle input shaft receives the power when the clutch is engaged. The transaxle then uses a system of gears to change the speed and torque relationship between the engine crankshaft and the transaxle differential.

The purpose of the clutch is to connect and disconnect a manually operated transaxle and the halfshafts from the engine. This allows starting and stopping the vehicle, shifting and changing speeds that copond to the engine speed through gear changes.

Manual Transaxle and Clutch

Special Tool(s)

 ST1840-A	Holding Tool, Flywheel 303-103 (T74P-6375-A)
 ST1897-A	Dial Indicator Gauge With Holding Fixture 100-002 (TOOL-4201-C)

Material

Item	Specification
Motorcraft® Full Synthetic Manual Tranion Fluid XT-M5-QS	WSD-M2C200-C
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1

Inspection and Verification

NOTICE: **If transaxle noise is reported, check the fluid level first. Do not drive the vehicle if the fluid level is low or damage can occur.**

NOTE: If any evaluation or inspection reveals an obvious concern, repair the vehicle.

NOTE: Before attempting to repair any concerns, road test the vehicle to determine in which system the concern falls.

The technician should have a thorough knowledge of transaxle/clutch operation and accepted general transaxle/clutch guidelines to detect any problems.

A gear driven unit produces a certain amount of noise. Some noise is acceptable and audible at certain speeds or under various driving conditions. Certain conditions, such as road and weather, amplify normal vehicle noise.

Use the following to diagnose and repair a transaxle/clutch concern:

Verify the Customer Concern

NOTICE: **If transaxle noise is reported, first check the fluid level. The vehicle should not be driven if the fluid level is low or damage can occur.**

1. Verify and document the customer concern.
    1. When was it first noticed?
    2. Did it appear suddenly or gradually?
    3. Did anything unusual occur that would coincide with it or precede it?
    4. Identify when the condition occurs.
        - ♦ Hot or cold vehicle operating conditions
        - ♦ Type of terrain
        - ♦ City or highway driving
        - ♦ Driving at a particular speed
            - ♦ coasting
            - ♦ hard acceleration
        - ♦ Shifting
            - ♦ upshifts
            - ♦ downshifts
            - ♦ in a particular gear
            - ♦ in all gears
        - ♦ Hot or cold ambient temperatures
    5. Check TSBs and On-Line Automotive Service Information System (OASIS) messages.

2. Visually inspect for obvious signs of mechanical damage.

Check Fluid Level and Condition

NOTICE: **Do not drive the vehicle if the fluid level is low or damage can occur.**

An incorrect fluid level may affect transaxle operation and can result in transaxle damage. To correctly check and add fluid to the transaxle, refer to transaxle draining and filling in Section 308-03 .

Low fluid level can result in poor transaxle shifting, engagement or damage. It can also indicate a leak in one of the transaxle seals or gaskets.

1. Check the fluid condition.
    - Observe the color and the odor of the fluid. Allow the fluid to drip onto a white cloth and examine the stain. Check the fluid for contamination or metal particles.
        - ♦ Fluid should appear nearly clear, similar to clean engine oil.

Evaluation of Clutch Hydraulic System

1. Verify the clutch hydraulic fluid reservoir is filled to the correct level.
    - If the fluid level is low, add fluid as necessary. Check the clutch hydraulic system for leaks and repair as necessary. Refer to Section 308-02 .

Evaluation Of The Clutch

1. Slowly press and release the clutch pedal to see if the pedal is binding. Make sure the clutch pedal can be fully pressed and is not restricted by the floor mat. Verify the pedal return spring is present and is functioning correctly.

2. Measure the clutch reserve. GO to Pinpoint Test A .

3. With the engine idling, the parking brake on and the clutch pedal up, gently move the gearshift lever

into a forward or reverse gear, until gear clash can be heard. Slowly press the clutch pedal.
- If the gears cease to clash (full disengage at 25-38 mm [1-1.5 in] from the floor), hold the pedal at the point of disengagement and increase engine to 4,000 rpm. If the clutch remains disengaged, it is functioning correctly.
- Any concerns indicate a worn or damaged clutch. Repair as necessary. Refer to Section 308-01 .

4. With the engine idling, move the gearshift lever into 4th gear. Increase the engine to 2,000 rpm and slowly release the clutch pedal.
   - If the engine stalls, the clutch is OK.
   - If the engine does not stall, the clutch is slipping. Repair as necessary.

5. Compare the road test results with the symptom chart. The chart is a list of conditions that are typical faults. GO to Symptom Chart - Clutch .

Inspect The Gearshift Components

1. Inspect the gearshift cables for:
   - signs of damage
   - broken locks
   - binding
   - cables not fully seated or in hold-down brackets
   - correct routing
   - correct adjustment
     - ♦ If the concern is a gear(s) cannot be selected, jumps out of gear or gear clashes, adjust the gearshift cables. Refer to Section 303-06 .

2. Inspect the gearshift lever for free play.
   - If the gearshift lever free play is more than 15 mm (0.59 in), check the gearshift cables and repair as necessary.
   - If the gearshift lever free play is 15 mm (0.59 in), adjust the gearshift cables. Refer to Section 308-06 .

Road Test the Vehicle

1. During the road test, use the following driving methods to diagnose the problem.
   - Start the engine.
   - Evaluate the noise in NEUTRAL while the vehicle is parked.
     - ♦ Check whether the noise is present with the clutch fully disengaged (pedal fully pressed). Check to see if the pedal pulsates abnormally (for clutch diaphragm finger run out).
     - ♦ Check whether the noise is present with the gearshift in the NEUTRAL position and the clutch fully engaged (foot off pedal). With the parking brake engaged, move the gearshift towards the 1st gear position. Apply very slight pressure and note if the gear noise level is reduced (for gear rollover noise).
     - ♦ With the clutch fully engaged (foot off pedal) check whether the noise is present as the engine rpm increases. If the noise reduces, note the engine rpm at which this occurs.
   - Listen for any change in noise while pressing and releasing the clutch pedal.
   - Listen for any change in noise while changing the engine rpm.
   - Drive the vehicle and shift through all of the gear ranges, including reverse. Listen for any change in noise in a particular gear.

- Drive the vehicle in the gear in which the noise is most noticeable. Press the clutch pedal and leave the gear engaged. Listen for any change in noise.
- Drive the vehicle in the gear in which the noise is most noticeable. Press the clutch pedal and shift the transaxle into NEUTRAL. Release the clutch pedal and allow the vehicle to coast.

2. Compare the road test results with the symptom charts. The charts are a list of conditions that are typical faults.GO to Symptom Chart - Clutch , GO to Symptom Chart - Transaxle or GO to Symptom Chart - NVH in this section.

Symptom Chart - Clutch

Symptom Chart - Transaxle

Symptom Chart - Transaxle

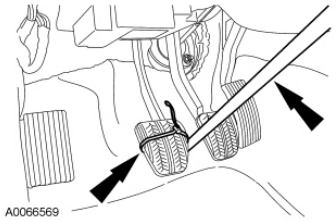
Symptom Chart - NVH

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.

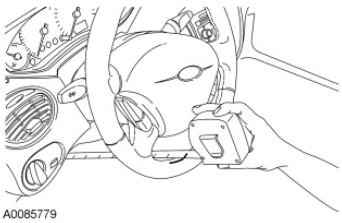
Pinpoint Tests

PINPOINT TEST A: CLUTCH SLIPPAGE

Test Step	Result / Action to Take
A1 TEST CLUTCH SLIPPAGE	
• Apply the parking brake. • Start engine and engage 4th gear. • Run the engine at approximately 2,000 rpm. • Slowly release clutch pedal. • **Does the engine stall when the clutch pedal is fully released?**	**Yes** Clutch is OK. **No** GO to **A2 MEASURE THE CLUTCH RESERVE**
NOTE: Remove the floor mat, if equipped, to allow the clutch pedal to travel to the downstop. • Install a cable tie to the lower clutch pedal, than attach a tape measure to the cable tie.	**Yes** Clutch pedal reserve is OK. VERIFY customer concern. GO to Symptom Chart - Clutch .

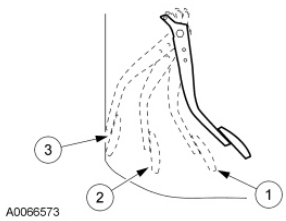


- Pull the tape measure up to the steering wheel. Position it through the steering wheel opening. Put a piece of masking tape on the wheel, index mark the tape.



- Press the clutch fully and start the vehicle.
- Shift the transaxle into reverse gear, then move the gearshift lever forward to the position in between reverse gear and neutral. Slowly release the clutch pedal (if the vehicle creeps rearward, move the gearshift lever forward a little more). The transaxle will work as if in neutral, but the reverse gear synchronizer will be bypassed.
- With the clutch pedal released, gently pull the gearshift lever toward the reverse gear position. Gear clash can now be heard.
- Slowly press the clutch pedal. Using the mark on the tape as a reference, note the measurement when the gear clash stops or the gearshift lever slides into reverse gear. Press the clutch pedal to the downstop. The difference between the measurement taken when the gear clash stopped and the measurement taken at the downstop is the clutch reserve.

Item	Pedal Position
1	Gear clash begins
2	Gear clash ends
3	Clutch pedal downstop



- **Is the clutch reserve between 25-38 mm (1 to 1.5 in)?**

No
INSTALL a new pressure plate and clutch disc. REFER to Section 308-01 .

PINPOINT TEST B: CLUTCH CHATTER, RATTLE OR SHUDDER

Test Step	Result / Action to Take
B1 CHECK THE ENGINE OR TRANSAXLE MOUNTS	
• Inspect all the engine and transaxle mounts for looseness or damage. • **Are any of the engine or transaxle mounts loose or damaged?**	**Yes** TIGHTEN or INSTALL new engine or transaxle mounts. TEST the system for normal operation. **No** GO to B2 .
B2 INSPECT THE PRESSURE PLATE BOLTS	
• Inspect the pressure plate-to-flywheel bolts. • **Are any of the pressure plate-to-flywheel bolts loose?**	**Yes** TIGHTEN or INSTALL new bolts. REFER to Section 308-01 . **No** GO to B3 .
B3 INSPECT THE PRESSURE PLATE	
• Remove the clutch pressure plate. • Inspect the clutch pressure plate for wear or damage. • **Are any signs of damage present on the clutch pressure plate?**	**Yes** INSTALL a new clutch pressure plate. REFER to Section 308-01 . TEST the system for normal operation. **No** GO to B4 .
B4 CHECK THE CLUTCH DISC	
NOTE: If the internal damper of the clutch disc is damaged or contaminated with grease or oil, it will sound similar to a "transaxle rattle". • Check the clutch disc for wear or damage. • **Is the clutch disc OK?**	**Yes** GO to B5 . **No** INSTALL a new clutch disc. REFER to Section 308-01 . TEST the system for normal operation.
B5 INSPECT THE FLYWHEEL	
• Inspect the flywheel for wear or damage. • **Is the flywheel OK?**	**Yes** GO to B6 . **No** REPAIR or INSTALL a new flywheel as necessary. REFER to Section 308-01 . TEST the system for normal operation.
B6 INSPECT THE INPUT SHAFT	
• Inspect the input shaft for signs of wear, damage or corrosion. • **Are any signs of wear damage, or corrosion present on the input shaft?**	**Yes** If wear or damage is found, INSTALL a new input shaft. REFER to Section 308-03 . If corrosion is found on the splines of the input shaft, apply a small amount of grease to the splines of the input shaft.

	No VERIFY the customer concern. GO to Symptom Chart - Clutch , GO to Symptom Chart - Transaxle , GO to Symptom Chart - NVH if necessary.

PINPOINT TEST C: CLUTCH DRAG

Test Step	Result / Action to Take
C1 CHECK CLUTCH FLUID LEVEL	
• Check clutch fluid level. • **Is the clutch fluid level between the MAX and MIN marks on the brake fluid reservoir?**	**Yes** GO to C2 . **No** FILL reservoir to specification, CHECK the brake and clutch systems for leaks. TEST clutch system for normal operation.
C2 TEST CLUTCH PEDAL FREE TRAVEL	
• Manually operate the clutch pedal to the point of resistance and release. • Measure pedal travel. • **Is the measured dimension within 10 mm (0.393 in)?**	**Yes** GO to C3 . **No** GO to Pinpoint Test B .
C3 CHECK THE BELLEVILLE SPRING WASHER OF THE CLUTCH PRESSURE PLATE	
• Remove transaxle. • **Does the clutch pressure plate or the Belleville spring washer of the clutch pressure plate show signs of wear or damage?**	**Yes** INSTALL a new clutch pressure plate. TEST the system for normal operation. **No** VERIFY the customer concern. GO to Symptom Chart - Clutch .

PINPOINT TEST D: CLUTCH PEDAL PULSATION

Test Step	Result / Action to Take
D1 CHECK THE CLUTCH PEDAL PULSATION	
• Start engine. • With the transaxle in neutral, slowly press the clutch pedal. • **Does the clutch pedal pulsate while being pressed?**	**Yes** GO to D2 . **No** VERIFY the customer concern. GO to Symptom Chart - Clutch if necessary.
D2 INSPECT THE PRESSURE PLATE BOLTS	
• Inspect the pressure plate-to-flywheel bolts.	**Yes** TIGHTEN or INSTALL new bolts. REFER to Section 308-01 . TEST the system for normal operation.

• **Are any of the pressure plate-to-flywheel bolts loose?**	**No** GO to D3 .
D3 INSPECT THE CLUTCH PRESSURE PLATE	
• Remove the clutch pressure plate. REFER to Section 308-01 . • Inspect the clutch pressure plate for wear or damage. • **Are there any signs of damage present on the clutch pressure plate?**	**Yes** INSTALL a new clutch pressure plate. REFER to Section 308-01 . TEST the system for normal operation. **No** GO to D4 .
D4 INSPECT THE CLUTCH DISC	
• Check the clutch disc for wear or damage. • **Is the clutch disc OK?**	**Yes** GO to D5 . **No** INSTALL a new clutch disc. REFER to Section 308-01 . TEST the system for normal operation.
D5 INSPECT THE FLYWHEEL	
• Inspect the flywheel for wear or damage. • **Is flywheel OK?**	**Yes** VERIFY the customer concern. GO to Symptom Chart - Clutch , GO to Symptom Chart - Transaxle , GO to Symptom Chart - NVH if necessary. **No** TIGHTEN, RESURFACE or INSTALL a new flywheel as necessary. REFER to Section 308-01 . TEST the system for normal operation.

PINPOINT TEST E: CLUTCH RELATED VIBRATIONS

Test Step	Result / Action to Take
E1 CHECK FOR ENGINE COMPONENT GROUNDING	
• Raise and support the vehicle. • Check the engine mount interlocks for grounding on the body or frame. • Check the exhaust manifold or other engine component grounding on the body or frame. • **Is there evidence of grounding on body or frame?**	**Yes** REPAIR any components as necessary. TEST the system for normal operation. **No** GO to E2 .
E2 CHECK FOR ACCESSORY DRIVE VIBRATIONS	
	Yes REPAIR or INSTALL new accessory drive belt

• Feel accessory vibration at clutch engage/disengage when engine torque changes. • Disconnect the accessory drive belt and check for vibration. • **Does the vibration stop when the drive belt is removed from the engine?**	components. REFER to Section 303-05 . **No** GO to E3 .
E3 CHECK FOR RELEASE BEARING NOISE	
• Start engine. • Press and hold clutch pedal. • **Is a whirring, grating or grinding noise present?**	**Yes** INSTALL a new clutch slave cylinder. REFER to Section 308-02 . TEST the system for normal operation. **No** GO to E4 .
E4 INSPECT THE FLYWHEEL	
• Remove the transaxle. REFER to Section 308-03 . • Inspect for loose flywheel bolts. • Carry out flywheel runout check. REFER to Section 303-00 . • **Is the flywheel OK?**	**Yes** DIAGNOSE engine vibration concern. REFER to Section 308-00 . **No** TIGHTEN the flywheel bolts or INSTALL a new flywheel. REFER to Section 303-01 . TEST the system for normal operation.

PINPOINT TEST F: HARD SHIFTING

Test Step	Result / Action to Take
F1 CHECK THE FLUID LEVEL	
NOTE: The hydraulic clutch fluid is supplied from the brake master cylinder. • Ignition OFF. • Inspect the fluid level in the brake master cylinder reservoir. • **Is the fluid within the MAX and MIN level marks?**	**Yes** GO to F2 . **No** ADD brake fluid and CHECK for leaks in the clutch and brake system. TEST the system for normal operation.
F2 CHECK THE CLUTCH PEDAL FREE PLAY	
• Press the clutch pedal lightly by hand. • Measure the distance the clutch pedal travels. • **Is the clutch pedal free play within 1-3 mm (0.04-0.12 in)?**	**Yes** DIAGNOSE hard shifting concern. REFER to Section 308-03 . **No** INSPECT the clutch pressure plate for wear or damage. REPAIR as necessary. REFER to Section 308-01 . TEST the system for normal operation.

PINPOINT TEST G: EXCESSIVE NOISE

Test Step	Result / Action to Take
G1 CHECK THE TRANSAXLE NEUTRAL POSITION	
• Start engine and run it in neutral. • Press clutch pedal fully. • **Are there noises when the clutch is operated?**	**Yes** GO to G2 . **No** There is a problem with the transaxle. GO to Symptom Chart - Transaxle if necessary.
G2 TEST THE CLUTCH PEDAL FREE TRAVEL	
• Manually press the clutch pedal down until resistance is felt, then release. • Measure pedal travel. • **Is the travel within 10 mm (0.393 in)?**	**Yes** GO to G3 . **No** REFER to Section 308-02 .
G3 TEST THE CLUTCH SLAVE CYLINDER WITH RELEASE BEARING	
• Remove the transaxle. • Check the clutch slave cylinder bolts. • Check the release bearing for wear and rust. • **Are the bolts loose or are there signs of wear or rust?**	**Yes** TIGHTEN the bolts or INSTALL a new clutch slave cylinder with the release bearing. REFER to Section 308-02 . TEST the system for normal operation. **No** GO to G4 .
G4 TEST THE CLUTCH FRICTION DISC TORSION SPRINGS	
• Check torsion springs for wear or damage. • **Do the torsion springs have signs of wear or damage?**	**Yes** INSTALL a new clutch disc. REFER to Section 308-01 . TEST the system for normal operation. **No** CHECK the crankshaft end play. REFER to Section 303-00 .

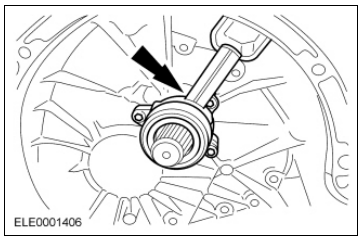
PINPOINT TEST H: CLUTCH SYSTEM LEAKAGE

Test Step	Result / Action to Take
H1 INSPECT THE CLUTCH MASTER CYLINDER	
• Inspect clutch master cylinder for leakage.	**Yes** GO to H2 .

• **Is the clutch master cylinder OK?**	**No** REPAIR or INSTALL a new clutch master cylinder as necessary. REFER to Section 308-02 .
H2 INSPECT THE CLUTCH SLAVE CYLINDER	
• Inspect clutch slave cylinder for leaks. • **Is the clutch slave cylinder OK?**	**Yes** GO to H3 . **No** REPAIR or INSTALL a new clutch slave cylinder as necessary. REFER to Section 308-02 .
H3 INSPECT THE SYSTEM HYDRAULIC TUBES	
• Inspect clutch hydraulic tubes for loose or damaged fittings causing leakage. • **Are the clutch hydraulic tubes OK?**	**Yes** CARRY OUT a road test to VERIFY customer complaint. **No** REPAIR or INSTALL new components as necessary. REFER to Section 308-02 . TEST the clutch system for normal operation.

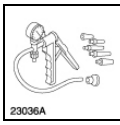
Clutch Slave Cylinder Check

1. Check the clutch slave cylinder with release bearing for:
    - leaks.
    - transmission fluid.
    - brake fluid.
    - damage or rust.



Clutch System Bleeding

Special Tool(s)

 23036A	Vacuum Pump Kit 416-D002 (D95L-7559-A)

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

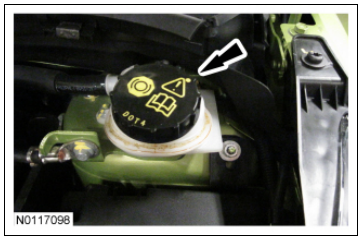
⚠ **WARNING: Carefully cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.**

NOTICE: **If brake fluid is spilled on the paint, immediately wash the affected area with cold water or damage can occur.**

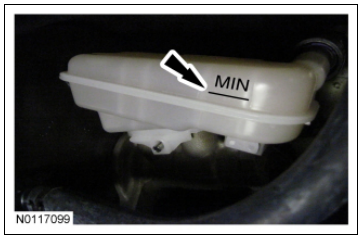
NOTE: Do not reuse brake fluid.

1. Remove the Air Cleaner (ACL) assembly and outlet pipe. For additional information, refer to Section 303-12 .

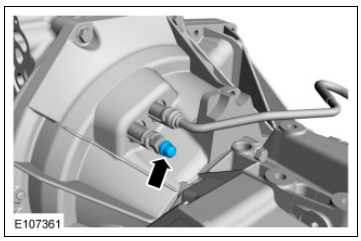
2. Remove the brake fluid reservoir cap.



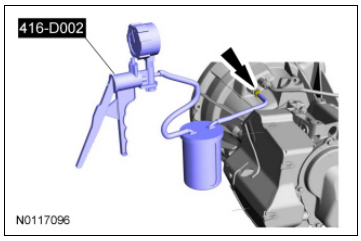
3. Drain the brake fluid reservoir to the MIN mark.



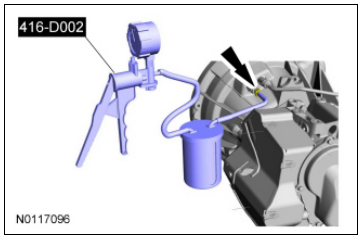
4. Remove the clutch slave cylinder bleed fitting dust cap.



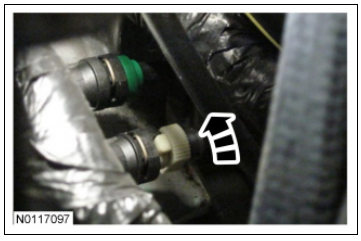
5. Install the special tool and loosen the clutch slave cylinder bleed fitting.



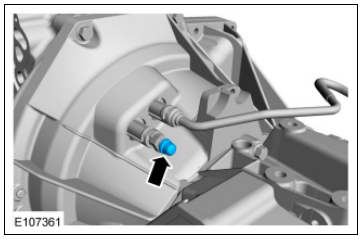
6. Using the special tool, bleed the clutch system.
    1. Fill the reservoir of the special tool with approximately 120 ml (4.06 oz) of brake fluid.
    2. Loosen the clutch slave cylinder bleed fitting.
    3. Pump approximately 100 ml (3.38 oz) of brake fluid into the clutch system.



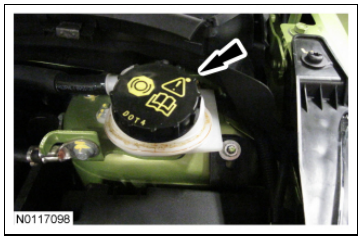
7. Tighten the clutch slave cylinder bleed fitting.



8. Install the clutch slave cylinder bleed fitting dust cap.



9. Install the brake fluid reservoir cap.



10. Check the fluid level in the brake fluid reservoir and add as necessary.

11. **NOTE:** Carefully move the gearshift lever into REVERSE.

    Test the operation of the clutch control system.

    - Start the engine, after 2 seconds press the clutch pedal and carefully move the gearshift lever into REVERSE. If there are abnormal noises, automatically bleed the clutch control system by pressing the clutch pedal 4 or 5 times. During bleeding, full travel of the clutch pedal must be reached.
    - Test the operation of the clutch control system again after 30 seconds. If there are still abnormal noises perform steps 2 to 10 again.

12. Install the ACL assembly and outlet pipe assembly. For additional information, refer to Section 303-12 .

Flywheel Runout Check

NOTICE: **Do not clean the dual mass flywheel with any kind of fluid. Use a dry cloth only or damage to the dual mass flywheel may occur.**

NOTICE: **Do not clean the gap between the primary and secondary mass. Only clean the bolt connection surface and the clutch surface or damage to the flywheel may occur.**

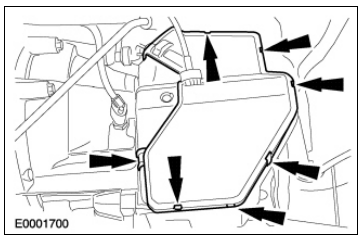
1. Check the transmission fluid level and fill to the correct level as necessary.

2. With the engine operating at idle and the transaxle in NEUTRAL, listen and check for unacceptable noise. Determine if any unacceptable noise is reduced when the clutch pedal is pressed. For additional information, refer to the Flywheel Inspection procedure in Section 303-00 .

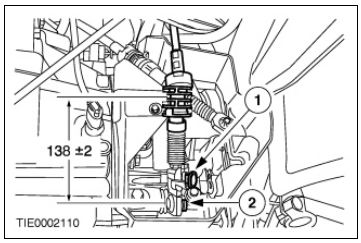
Gearshift Cable Adjustment

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

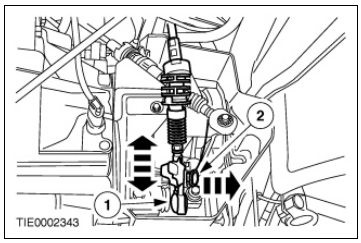
2. Remove the gearshift cables cover.



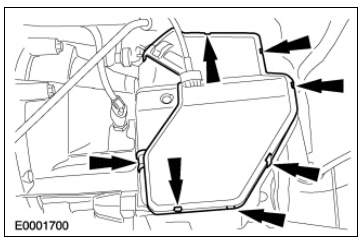
3. Adjust the selector cable.
    1. Unlock the selector cable (press colored insert).
    2. Move the selector lever to its center position.



4. Adjust the selector cable.
    1. Select 3rd or 4th gear (move the gearshift lever to its RH or LH stop position).
    2. Lock the selector cable.



5. Install the gearshift cables cover.



6. Check system for normal operation.

General Specifications

Item	Specification
Clutch	
Type	Single-plate dry clutch
Operation	Hydraulic
External diameter of clutch disc	220 mm (8.661 in)
Pedal travel (not adjustable)	132-138 mm (5.197-5.433 in)

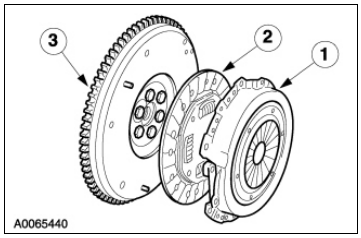
Torque Specifications

Description	Nm	lb-ft
Clutch pressure plate-to-flywheel [a]	-	-

[a] Refer to the procedure in this section.

Clutch

Clutch Components



Item	Part Number	Description
1	7563	Clutch pressure plate (part of 7B546)
2	7550	Clutch friction disc (part of 7B546)
3	6375	Flywheel

The clutch transmits the engine torque to the transaxle.

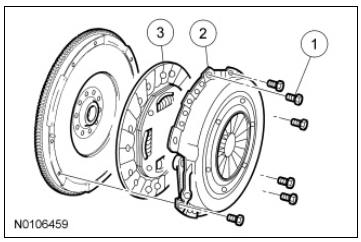
The clutch is a single-plate, dry-friction disc with a diaphragm-style spring clutch pressure plate. The clutch disc has a hub which is splined to the transmission input shaft. The clutch disc has friction material where it contacts the flywheel and the clutch pressure plate. The clutch pressure plate applies pressure to the clutch disc, holding it tightly against the surface of the flywheel. In the engaged position, the diaphragm spring holds the clutch pressure plate against the clutch disc, so that engine torque is transmitted to the input shaft.

When the clutch pedal is applied, the release bearing pushes the diaphragm spring center of the clutch pressure plate toward the flywheel. The diaphragm spring pivots at the fulcrum, relieving the load on the clutch pressure plate. The clutch slave cylinder assists in the effort it takes to relieve the load on the clutch pressure plate. Steel spring straps riveted to the clutch pressure plate cover pull the clutch pressure plate from the clutch disc, disengaging the engine torque from the transaxle.

Clutch

For additional information, refer to Section 308-00 .

Clutch Disc and Pressure Plate



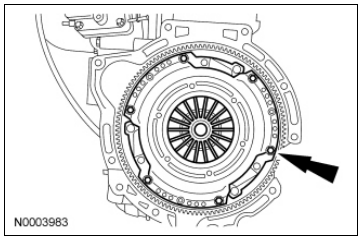
Item	Part Number	Description
1	W702426	Clutch pressure plate-to-flywheel bolt (6 required)
2	7563	Clutch pressure plate (part of 7B546)
3	7550	Clutch disc (part of 7B546)

Removal

1. Remove the transaxle. For additional information, refer to Section 308-03 .

2. ***NOTICE:*** **Loosen the clutch pressure plate retaining bolts evenly, by two turns at a time.**

   Remove and discard the 6 clutch pressure plate retaining bolts, remove the clutch disc and pressure plate.

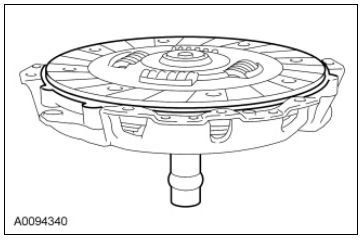


Installation

1. ***NOTICE:*** **Be sure the clutch is installed correctly in the pressure plate. The side of the clutch marked gearbox side faces the pressure plate fingers. Failure to install the clutch plate will damage the clutch assembly during installation on the flywheel.**

   NOTICE: **Do not use cleaners with a petroleum base and do not immerse the clutch pressure plate in solvent or damage may occur.**

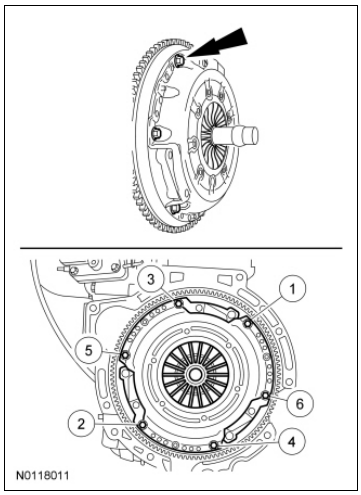
   Position the clutch disc on the clutch pressure plate with the side of the clutch marked gearbox side facing the pressure plate fingers. Using a suitable clutch aligner, centralize the clutch disc to the clutch pressure plate.



2. **NOTE:** Tighten the clutch pressure plate-to-flywheel bolts finger tight and then evenly by two turns at a time to the specified torque.

   Using a suitable clutch aligner, position the clutch disc and clutch pressure plate on the flywheel. Install the 6 new clutch pressure plate-to-flywheel bolts.

   - Tighten the bolts evenly two turns at a time in the pattern shown.
   - Tighten to 29 Nm (21 lb-ft).



3. Install the transaxle. For additional information, refer to Section 308-03 .

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	-

General Specifications

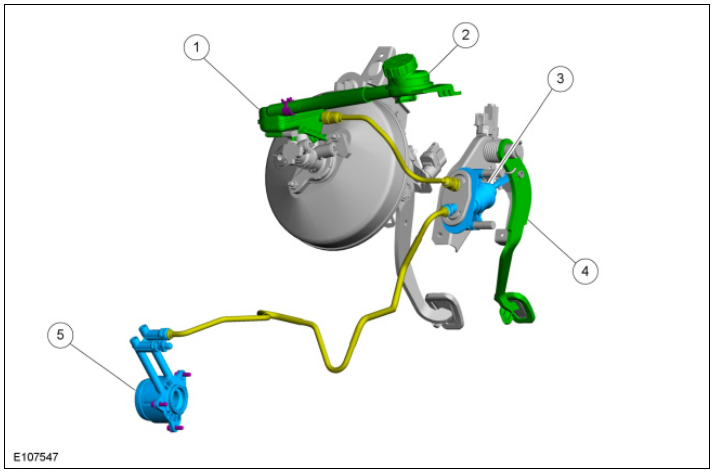
Item	Specification
Clutch adjustment	Automatic
Clutch operation	Hydraulic
Total pedal travel (not adjustable)	132-138 mm (5.197-5.433 in)

Torque Specifications

Description	Nm	lb-ft	lb-in
Clutch pedal assembly nuts	25	18	-
Clutch slave cylinder bolts	10	-	89

Clutch Controls

Components - Clutch Control



Item	Part Number	Description
1	-	Brake fluid reservoir
2	-	Brake fluid filling reservoir
3	-	Clutch master cylinder
4	-	Clutch pedal
5	-	Clutch slave cylinder

The clutch control system is a hydraulic/mechanical clutch system. The clutch control system disengages the clutch when the clutch pedal is pressed and engages the clutch when the clutch pedal is released. When the clutch pedal is pressed, pressure builds up in the clutch master cylinder and the release bearing in the clutch slave cylinder is actuated.

The advantages of a hydraulic clutch system are:

- Automatic adjustment
- Low operating effort
- Minimal wear

A self-adjusting clutch system eliminates the need for maintenance adjustments. It provides for consistent pedal height throughout the service life of the clutch.

Brake Fluid Reservoir

The brake fluid reservoir supplies brake fluid to the hydraulic clutch system and the brake system. The hydraulic clutch system and brake system are arranged separately inside the brake fluid reservoir. If a leak occurs in the hydraulic clutch system, the brake system continues to operate unrestricted.

Brake Fluid Filling Reservoir

Clutch Master Cylinder

The clutch master cylinder generates the system pressure required to actuate the clutch. When the clutch pedal is depressed, the piston rod moves the clutch master cylinder piston. The hydraulic fluid in the clutch master

cylinder is forced through the high-pressure tube to the clutch slave cylinder.

Clutch Pedal

When the clutch pedal is pressed, the clutch master cylinder transmits hydraulic fluid pressure to the clutch slave cylinder. The clutch slave cylinder and the clutch release fork transfer the clutch pedal motion to the clutch release bearing. The release bearing presses against the pressure plate diaphragm spring, releasing the clutch disc. Once the clutch pedal is released, the diaphragm spring pushes the piston in the clutch slave cylinder back to its initial position. The non-positive connection between the clutch disc and the flywheel is re-established.

Clutch Slave Cylinder

The central clutch slave cylinder is equipped with a release bearing and is attached to the clutch bell housing with three bolts. The release bearing is an interference installed in the clutch slave cylinder and is not serviced separately.

The hydraulic fluid forced from the piston in the clutch master cylinder moves the piston in the clutch slave cylinder which, moves the release bearing in an axial direction. The release bearing inner ring presses onto the diaphragm spring. The non-positive connection between the clutch disc and the flywheel is interrupted.

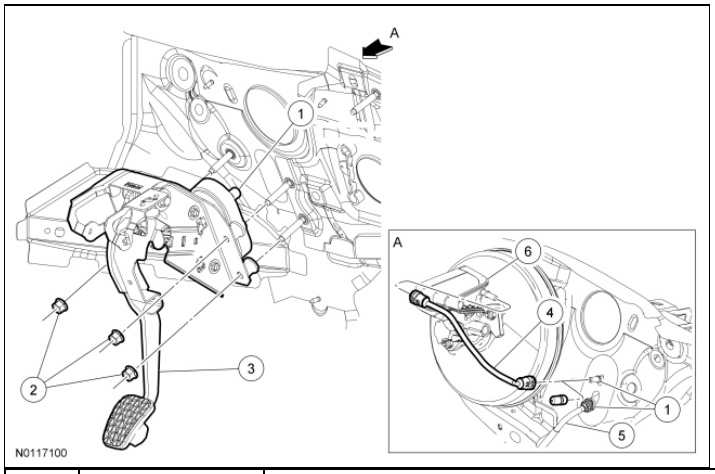
Clutch Controls

Refer to Section 308-00 .

Clutch 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	-	Clutch master cylinder (part of 7519)
2	W706840	Clutch pedal nut (3 required)
3	7519	Clutch pedal assembly
4	7K502	Brake master cylinder to clutch master cylinder tube
5	7K592	Clutch master cylinder to slave cylinder tube
6	2140	Brake master cylinder assembly

Removal

⚠ 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.

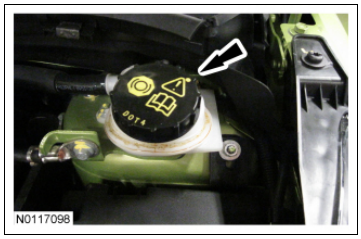
⚠ WARNING: Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

⚠ WARNING: Do not allow the brake master cylinder to run dry during the bleeding operation. Master cylinder may be damaged if operated without fluid, resulting in degraded braking performance. Failure to follow this instruction may result in serious personal injury.

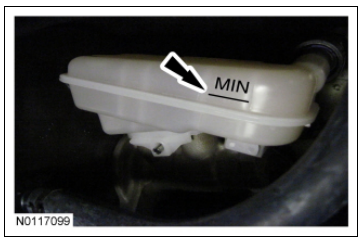
NOTICE: **Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.**

NOTE: When any part of the hydraulic system has been disconnected for repair or new installation, air may get into 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.

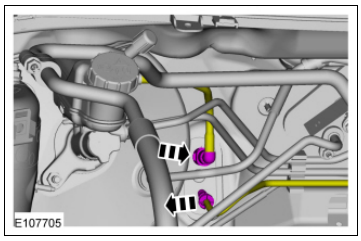
1. Remove the brake fluid reservoir cap.



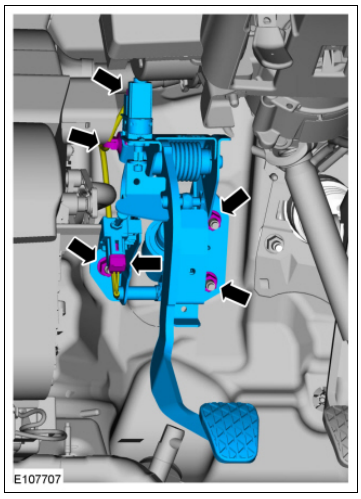
2. Drain the brake fluid into a suitable container until the brake fluid level reaches the MIN mark.



3. Disconnect the clutch master cylinder tubes.



4. Disconnect the clutch pedal position switch, starter inhibitor switch electrical connectors and remove the 3 clutch pedal assembly nuts.

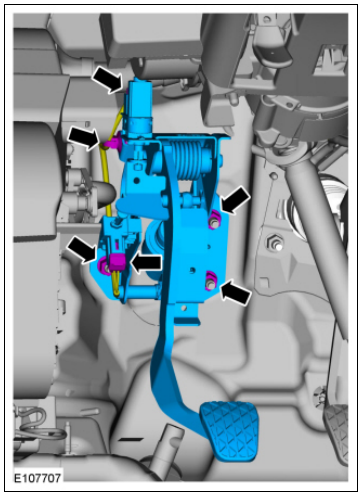


5. Remove the clutch pedal/master cylinder assembly.

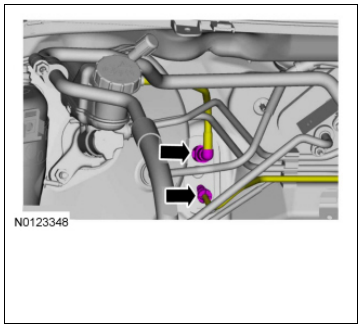
Installation

1. Install the clutch pedal/ master cylinder assembly

2. Install the 3 clutch pedal assembly nuts, connect the starter inhibitor switch and clutch pedal position switch electrical connectors.
    - Tighten to 25 Nm (18 lb-ft).



3. Connect the clutch master cylinder tubes.



4. Bleed the clutch hydraulic system. For additional information, refer to Section 308-00 .

Clutch Slave Cylinder

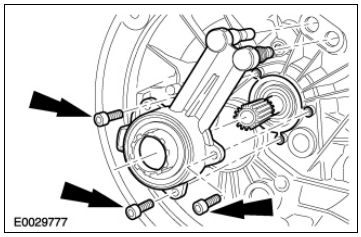
Removal

1. Remove the transaxle. For additional information, refer to Section 308-03 .

2. *NOTICE:* **If brake fluid is spilled on the paint work, the affected area must be immediately washed down with cold water.**

   NOTE: Any oily or greasy deposits witnessed on the slave cylinder release bearing surface should be wiped off with a suitable de-greasing agent or cleaner. Do not use detergent or other corrosive agents.

   Remove the 3 clutch slave cylinder bolts and remove the clutch slave cylinder.

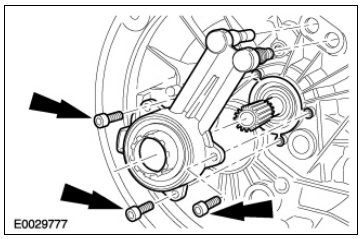


Installation

1. *NOTICE:* **If brake fluid is spilled on the paint work, the affected area must be immediately washed down with cold water.**

   Install the clutch slave cylinder and the 3 clutch slave cylinder bolts.

   - Tighten to 11 Nm (97 lb-in.).



2. Install the transaxle. For additional information, refer to Section 308-03 .

3. Fill and bleed the clutch system. For additional information, refer to Section 308-00 .

Material

Item	Specification	Fill Capacity
Gasket Maker TA-16	WSK-M2G348-A5	-
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1	-
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C	2.3L (2.4 qt)
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	-
Threadlock and Sealer TA-25	WSK-M2G351-A5	-

General Specifications

Item	Specification
Transaxle Weight	36.8 kg (81 lbs)

Transaxle Ratios

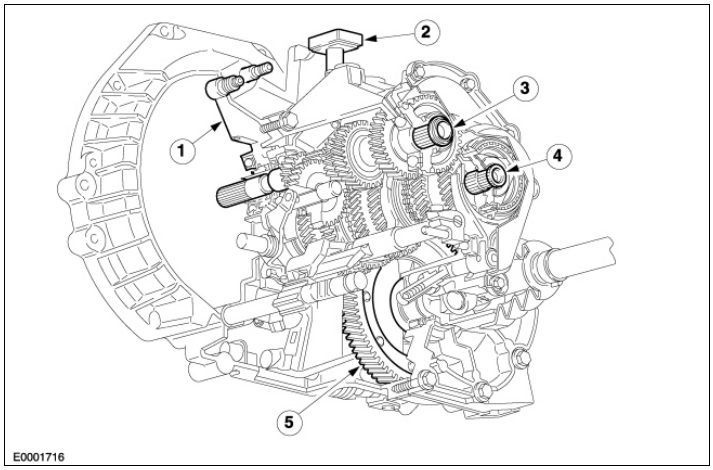
Description	1.6L
1st gear	3.85
2nd gear	2.04
3rd gear	1.41
4th gear	1.11
5th gear	0.88
Reverse gear	3.62
Final drive	3.82

Torque SpecificationsDescriptionNmlb-ftlb-in Ball joint nuts4835-Battery tray bolts10-89Battery tray bracket nuts2518-Brake hose retainer bolts2518-Clutch housing-to-engine bolts4835-Clutch slave cylinder11-97Differential ring gear bolts9066-Exhaust flange nuts4835-Fifth gear cover12-106Fifth gear housing-to-transaxle**lign="center">17**-150Fill plug3526-Gearshift cables shroud5-44Gearshift cables bracket nuts20-177Ground wire bolt2518-Heated Oxygen Sensor (HO2S) bracket nut2518-PCM cover bolt6-53Reversing lamp switch14-124Roll restrictor bolt7052-Roll restrictor bracket bolts4835-Roll restrictor-to-transaxle bracket bolt4835-**op" align="left">Selector shaft interlock mechanism**2518-Shield and bearing retainer strap nuts [a]---Transaxle housing3324-Transaxle housing special tool bolts2821-Transaxle support insulator bolts9066-Transaxle support insulator nuts12592-Upper strut mount nuts4835-Wiring harness bracket bolt2518-

[a] Refer to the procedure in this section.

Manual Transaxle

General View



Item	Part Number	Description
1	7A564	Clutch slave cylinder
2	7D494	Transaxle vent
3	7L226	Input shaft
4	7061	Output shaft
5	4026	Differential

The IB5 transaxle has an aluminum transaxle housing which comprises of two sections. Its rigidity has been improved with the inclusion of reinforcement ribbing in the design. The transaxle housing sections come in pairs and cannot be obtained separately. The clutch is hydraulically actuated.

All the gears are constant mesh gears (except reverse gear). In each gear, the required transaxle ratio is achieved by means of a pair of gears.

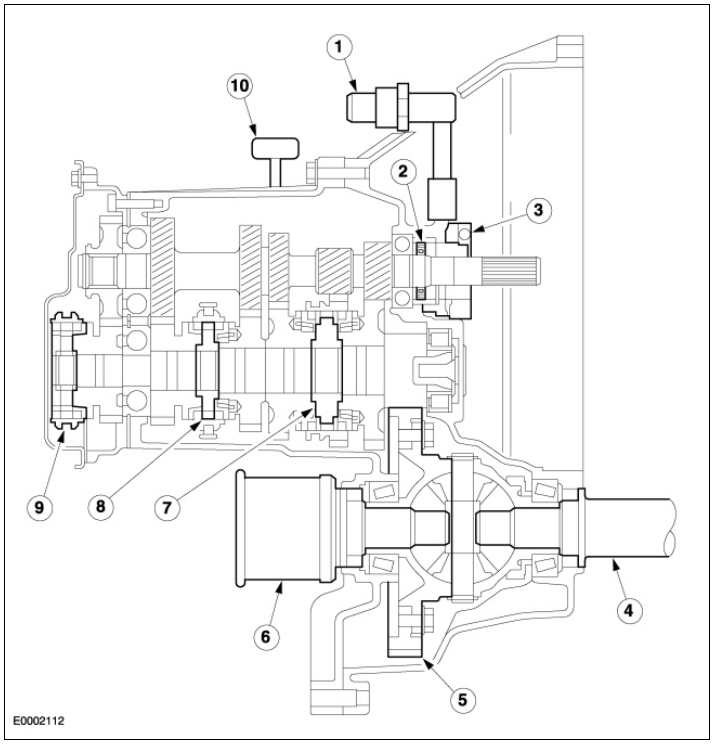
When reverse gear is selected, the direction of rotation of the output shaft is changed by an idler gear.

The gears are all helical gears (except reverse gear). They all have synchronizers (except reverse gear) and run on plain bearings.

First and second gears have dual synchronizers.

IB5 Manual Transaxle Components

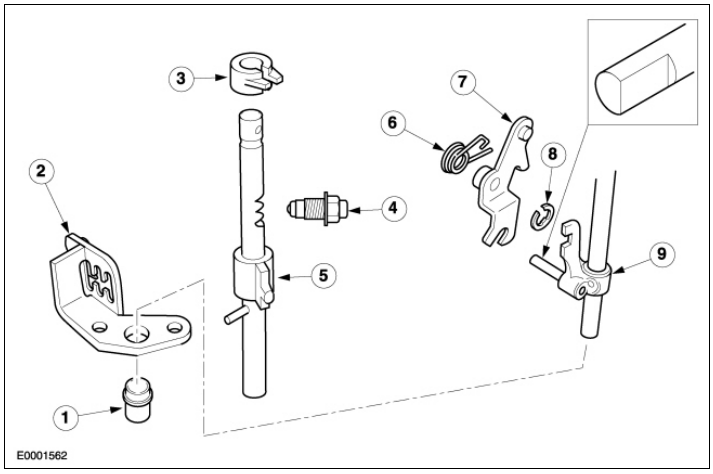
General View



Item	Part Number	Description
1	-	Quick-release coupling
2	7052	Oil seal (accessible from outside)
3	7A564	Clutch slave cylinder with release bearing (cannot be serviced separately)
4	3B436	RH intermediate shaft
5	7F343	Differential ring gear
6	3B437	LH halfshaft
7	7124	Gear synchronizer - 1st/2nd gear
8	7124	Gear synchronizer - 3rd/4th gear
9	7107	Gear synchronizer - 5th gear
10	7D494	Transaxle vent

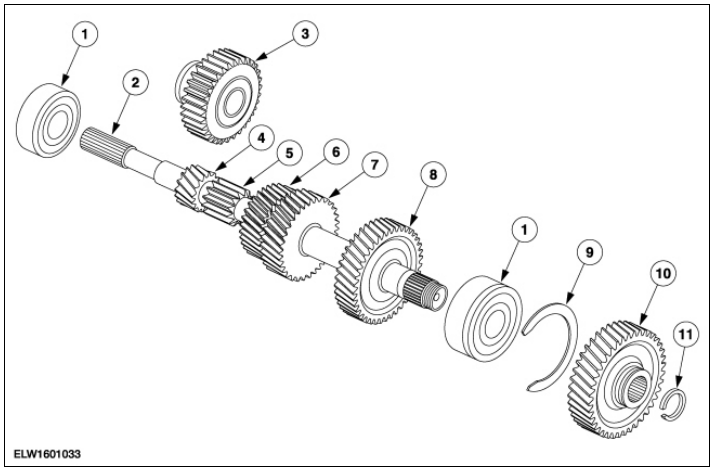
In neutral, no gear is connected to the output shaft via the gear synchronizers. No input torque is transmitted to the differential.

Selector Mechanism



Item	Part Number	Description
1	7K024	Selector rod guide sleeve, 5th/reverse gear
2	7M038	Selector gate
3	7K201	Select interlock plate
4	7M131	Selector shaft interlock mechanism
5	7C031	Selector shift shaft
6 td>7K205	Return spring for selector lever, reverse gear	
7	7K001	Selector lever, reverse gear
8	W527007	Snap-ring
9	7302	Selector fork, 5th/reverse gear

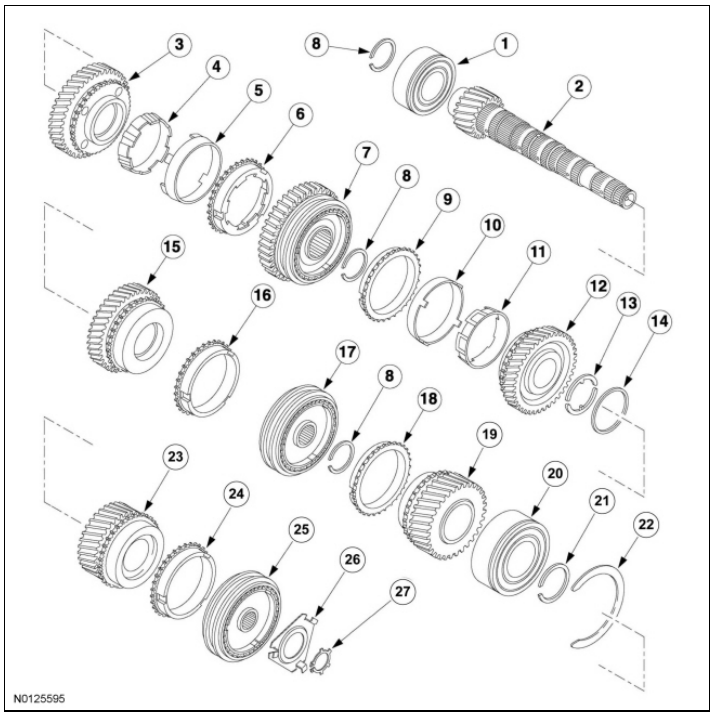
Input Shaft



Item	Part Number	Description
1	7025	Bearing
2	7L226	Input shaft
3	7141	Reverse idler gear
4	-	1st gear (part of 7L226)

5	-	Reverse gear (part of 7L226)
6	-	2nd gear (part of 7L226)
7	-	3rd gear (part of 7L226)
8	-	4th gear (part of 7L226)
9	7026	Retaining ring
10	-	5th gear (part of 7L226)
11	E860332	Snap-ring

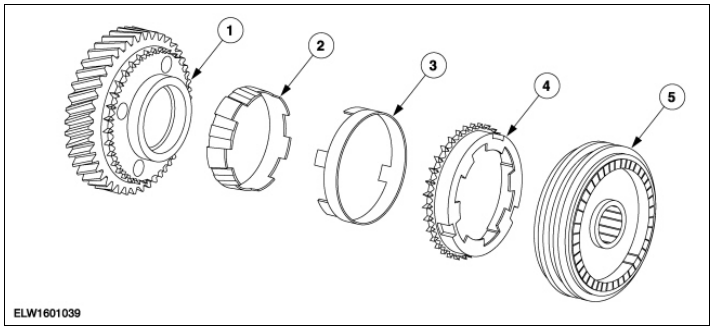
Output Shaft



Item	Part Number	Description
1	7A043	Bearing
2	7061	Output shaft
3	7100	1st gear
4	7107	Inner synchronizer ring
5	7M000	Synchronizer cone
6	7107	Outer synchronizer ring
7	7124	1st/2nd gear synchronizer with reverse gear
8	E860141	Snap-ring
9	-	Outer synchronizer ring (part of 7124)
10	7M000	Synchronizer cone
11	7107	Inner synchronizer ring
12	7102	2nd gear
13	7A385	Half moon washer (2 required)
14	7A046	Snap-ring
15	7B340	3rd gear

16	7107	Synchronizer ring, 3rd gear
17	7124	Gear synchronizer, 3rd/4th gear
18	7107	Synchronizer ring, 4th gear
19	7110	4th gear
20	7065	Bearing
21	E860303	Circlip
22	7026	Retaining ring
23	7K136	5th gear
24	7107	Synchronizer ring, 5th gear
25	7L053	Gear synchronizer, 5th gear
26	7L049	Retaining plate
27	W702295	Circlip

Dual Synchronizer



Item	Part Number	Description
1	7100	Gear
2	7107	Inner synchronizer ring
3	7M000	Synchronizer cone
4	7107	Outer synchronizer ring
5	7124	Synchronizer assembly

Dual Synchronizer

First and second gear have dual synchronizers. The use of a second synchronizer ring means that the effective synchronization area is increased approximate. 100% in relation to single synchronizers. Dual synchronization gives considerable improvement in gearshift quality.

The dual synchronizers consist of inner synchronizer ring, cone ring, outer synchronizer ring and synchronizer assembly.

The conical surface on the gear wheel is discontinued. Synchronization occurs through both synchronizer rings and the cone ring which is positively fitted to the gear wheel.

Differential

Major components of the differential include:

- ♦ Differential ring gear

- Differential housing with two taper roller bearings
- Differential pinion gears
- Input shaft pinion gears

The transaxle and differential are housed in a two-section aluminum housing and flange-mounted to the engine.

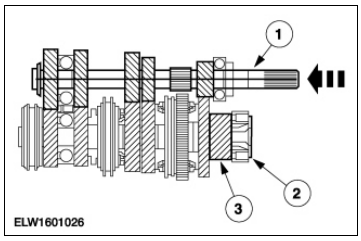
The input torque is transmitted to the differential via a ring gear which is bolted to the differential case.

The differential case contains the differential pinions mounted on one pin as well as the front halfshaft pinions connected to the front drive shafts through the splines.

If the front wheels are travelling at different speeds (when cornering), the front halfshaft pinions can move on the differential pinions.

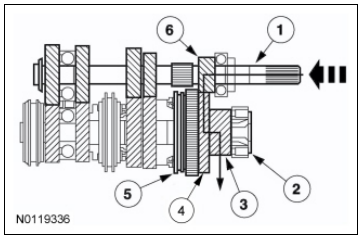
Power Flow

Neutral



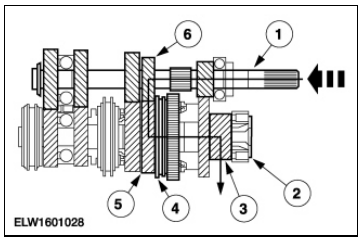
1	Input shaft
2	Output shaft
3	Output pinion

First Gear



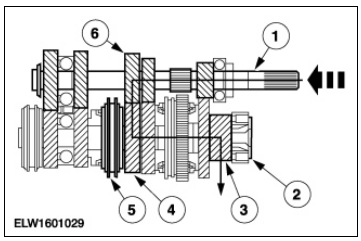
1	Input shaft
2	Output shaft
3	Output pinion
4	1st gear
5	Gear synchronizer, 1st/2nd gear
6	Gearing, 1st gear

Second Gear



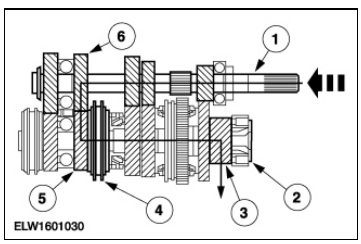
1	Input shaft
2	Output shaft
3	Output pinion
4	Gear synchronizer, 1st/2nd gear
5	2nd gear
6	Gearing, 2nd gear

Third Gear



1	Input shaft
2	Output shaft
3	Output pinion
4	Gearing, 3rd gear
5	Gear synchronizer, 3rd/4th gear
6	3rd gear

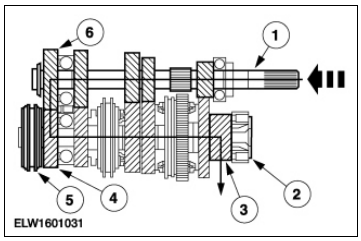
Fourth Gear



1	Input shaft
2	Output shaft
3	Output pinion

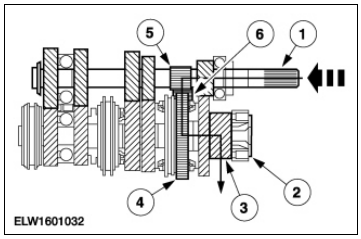
4	Gear synchronizer, 3rd/4th gear
5	Gearing, 4th gear
6	4th gear

Fifth Gear



1	Input shaft
2	Output shaft
3	Output pinion
4	Gearing, 5th gear
5	Gear synchronizer, 5th gear
6	5th gear

Reverse Gear



1	Input shaft
2	Output shaft
3	Output pinion
4	Reverse gear wheel
5	Gearing, reverse gear
6	Reverse idler gear

The reverse idler gear is driven off the input shaft. Its purpose is to change the direction of rotation of the output shaft when reverse gear is selected.

The reverse idler gear runs in a plain bearing on the idler gear shaft and a bearing block.

The selector interlock mechanism and the selector finger are mounted on a sleeve in the transaxle housing. They hold the selected gear by means of a spring-loaded ball until a different gear is selected.

The selector interlock mechanism has three different positions.

Manual Transaxle

Refer to Section 308-00 .

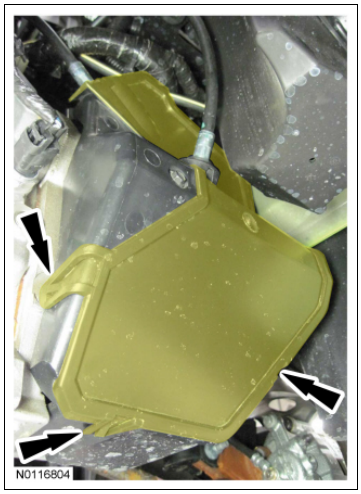
Transaxle Draining and Filling

Material

Item	Specification
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS /td>	WSD-M2C200-C

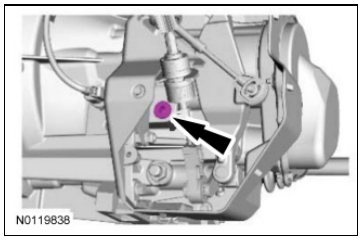
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Release the 7 retainers (2 shown) and remove the shift cable cover.

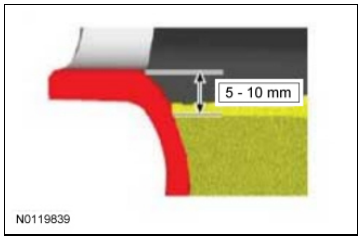


3. **NOTE:** Before removing, clean the area around the filler plug.

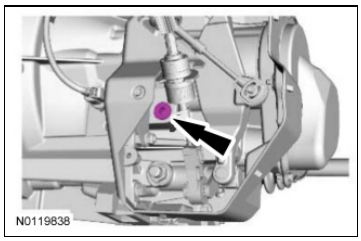
   Remove the fill plug.



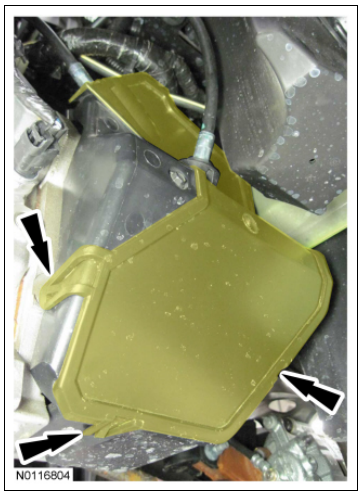
4. Using a suitable oil suction gun, fill the transaxle to the correct level with the specified fluid.
   - Transaxle fluid level: 5-10 mm (0.196-0.393 in.) below the lower edge of the filler plug bore.



5. Install the fill plug.
    - Tighten to 35 Nm (26 lb-ft).



6. Install the shift cables cover.



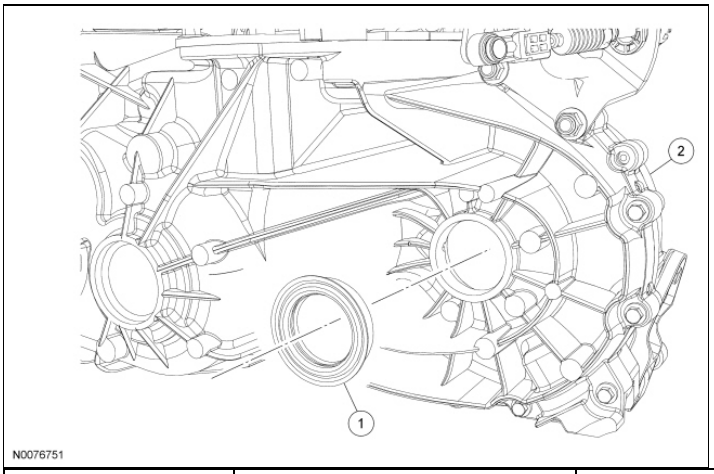
Halfshaft Seal - LH

Special Tool(s)

 16018	Installer, Halfshaft Oil Seal 308-039
 ST1556-A	Remover, Halfshaft Oil Seal 307-163 (T86P-70043-A)
 ST2791-A	Remover, Pilot Bearing 308-001 (T58L-101-B)

Material

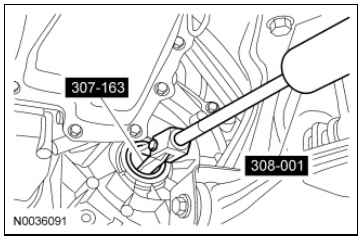
Item	Specification
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C



Item	Part Number	Description
1	3K169	Halfshaft seal
2	7003	Transaxle

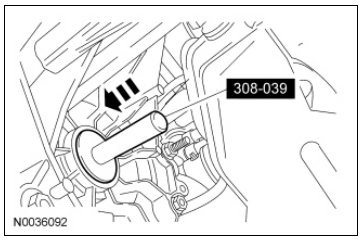
Removal

1. Remove the LH halfshaft. For additional information, refer to Section 205-04 .
2. Using the Pilot Bearing Remover with the Halfshaft Oil Seal Remover, remove and discard the halfshaft oil seal.



Installation

1. Using the Halfshaft Oil Seal Installer, install the new halfshaft oil seal.

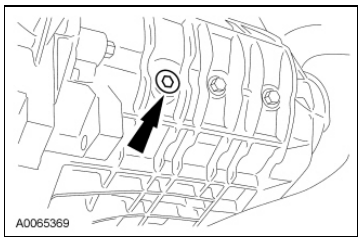


2. Install the halfshaft. For additional information, refer to Section 205-04 .

3. **NOTE:** The fill height is 0.0-0.5 mm (0.0-0.2 in) below the lower edge of the filler hole.

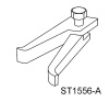
   Remove the transaxle fluid filler plug. Check the transaxle fluid level and fill with manual transmission fluid as necessary.

   - Tighten to 35 Nm (26 lb-ft).



Halfshaft Seal - RH

Special Tool(s)

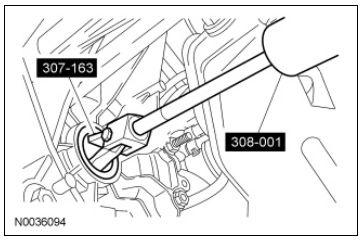
 16018	Installer, Halfshaft Oil Seal 308-039
 ST1556-A	Remover, Halfshaft Oil Seal 307-163 (T86P-70043-A)
 ST2791-A	Remover, Pilot Bearing 308-001 (T58L-101-B)

Material

Item	Specification
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C

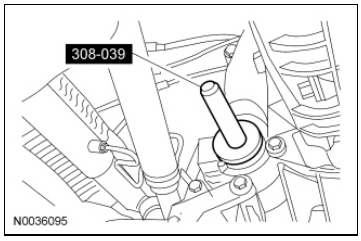
Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .
2. Remove the RH halfshaft and intermediate shaft assembly. For additional information, refer to Section 205-04 .
3. Using the Pilot Bearing Remover with the Halfshaft Oil Seal Remover, remove and discard the halfshaft oil seal.



Installation

1. Using the Halfshaft Oil Seal Installer, install the new halfshaft oil seal.

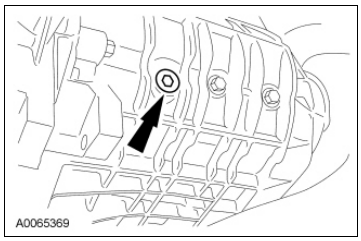


2. Install the RH halfshaft and intermediate shaft assembly. For additional information, refer to Section 205-04 .

3. **NOTE:** The fill height is 0.0-5.0 mm (0.0-0.2 in) below the lower edge of the filler hole.

   Remove the transaxle fluid filler plug. Check the transaxle fluid level and fill with manual transmission fluid as necessary.

   - Tighten to 35 Nm (26 lb-ft).



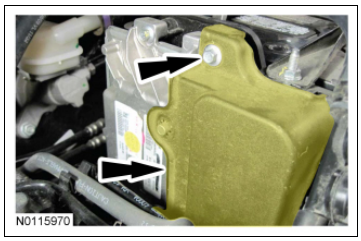
Transaxle Support Insulator

Special Tool(s)

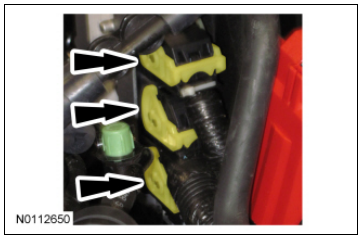
 ST2759A	Adapter for 303-290A 303-290-01
 ST2379-A	Adapter for 303-290A (Support Leg) 303-290-03A
 ST2761A	Support Bar, Engine 303-290A

Removal

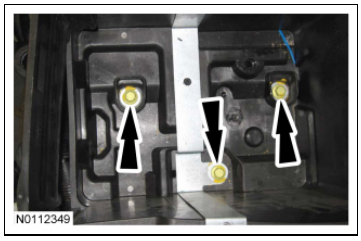
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .
2. Remove the battery. For additional information, refer to Section 414-01 .
3. Remove the cowl assembly. For additional information, refer to Section 501-02 .
4. Remove the Air Cleaner (ACL) assembly and outlet pipe. For additional information, refer to Section 303-12 .
5. Remove the PCM cover bolt and the PCM cover.


N0115970

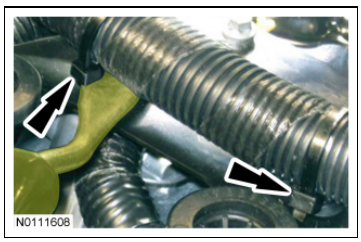
6. Disconnect the 3 PCM electrical connectors.


N0112650

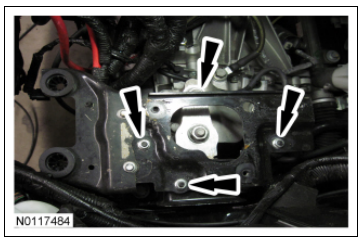
7. Remove the 3 battery tray bolts and the battery tray.



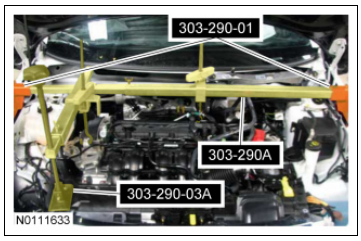
8. Using a suitable tool, detach the wiring harness from the battery tray bracket.



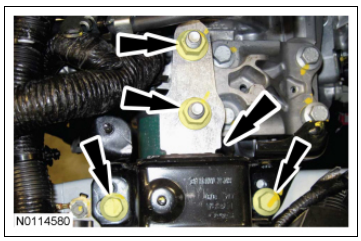
9. Remove the 3 battery tray bracket nuts and remove the battery tray bracket.



10. Install the special tools and support the engine.

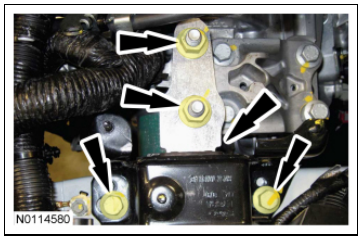


11. Remove the 2 transaxle support insulator bolts and nuts and remove the transaxle support insulator.

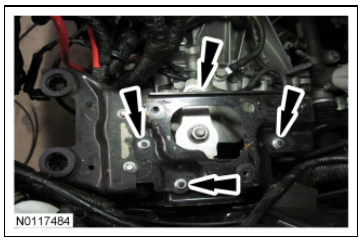


Installation

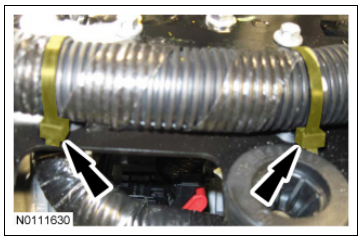
1. Install the transaxle support insulator and install the 2 transaxle support insulator bolts and the 2 nuts.
   - Tighten the 2 bolts to 90 Nm (66 lb-ft).
   - Tighten the 2 nuts to 125 Nm (92 lb-ft).



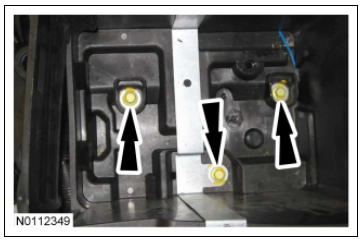
2. Install the battery tray bracket and the 3 battery tray bracket nuts.
    - Tighten to 25 Nm (18 lb-ft).



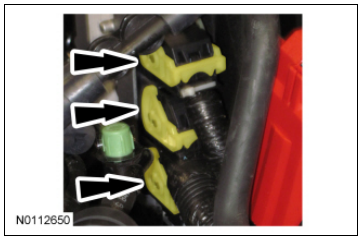
3. Attach the wiring harness to the battery tray bracket.



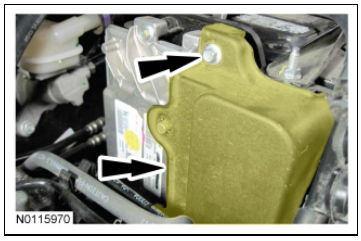
4. Install the battery tray and 3 battery tray bolts.
    - Tighten to 10 Nm (89 lb-in).



5. Connect the 3 PCM electrical connectors.



6. Install the PCM cover and the PCM cover bolt.
    - Tighten to 6 Nm (53 lb-in).



7. Install the ACL and the outlet pipe. For additional information, refer to Section 303-12 .

8. Install the cowl assembly. For additional information, refer to Section 501-02 .

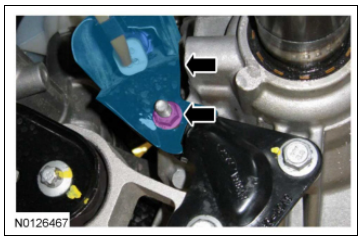
9. Install the battery. For additional information, refer to Section 414-01 .

Roll Restrictor

Removal

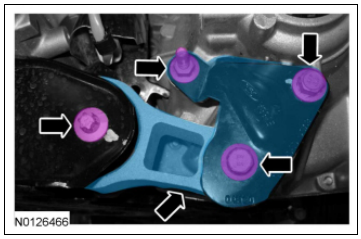
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the Heated Oxygen Sensor (HO2S) electrical connector bracket nut and the HO2S electrical connector bracket from the roll restrictor bracket.



3. **NOTE:** The roll restrictor bolts are different types, make note of their location prior to removal.

   Remove the roll restrictor bolts, roll restrictor bracket bolts and the roll restrictor with roll restrictor bracket.

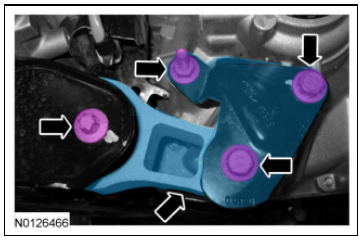


Installation

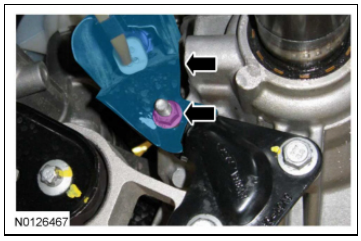
1. **NOTE:** The bolts are different types, make sure the bolts are in the correct location.

   Install the roll restrictor with roll restrictor bracket, roll restrictor bolts and the roll restrictor bracket bolts.

   1. Tighten to 70 Nm (52 lb-ft).



2. Install the HO2S electrical connector bracket to the roll restrictor bracket and install the HO2S electrical connector bracket nut.
   - Tighten to 25 Nm (18 lb-ft).


N0126467

Transaxle

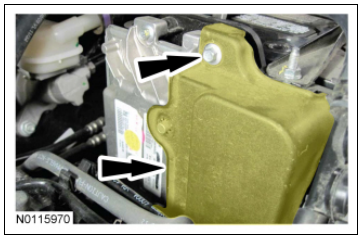
Special Tool(s)

 ST2378-A	Adapter for 303-290A 303-290-01
 ST2379-A	Adapter for 303-290A (Support Leg) 303-290-03A
 ST2363-A	Support Bar, Engine 303-290A
 16089	Remover, Halfshaft 308-256

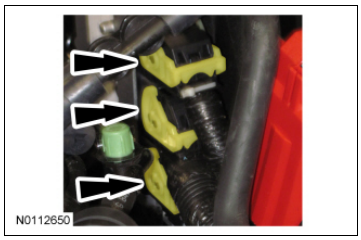
Removal

All Vehicles

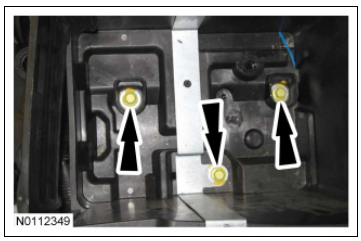
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .
2. Remove the battery. For additional information, refer to Section 414-01 .
3. Remove the cowl assembly. For additional information, refer to Section 501-02 .
4. Remove the Air Cleaner (ACL) assembly and outlet pipe. For additional information, refer to Section 303-12 .
5. Remove the PCM cover bolt and the PCM cover.



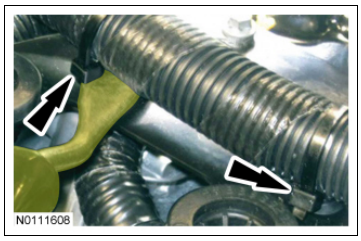
6. Disconnect the 3 PCM electrical connectors.



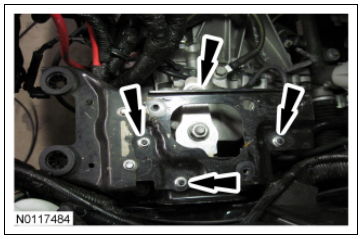
7. Remove the 3 battery tray bolts and the battery tray.



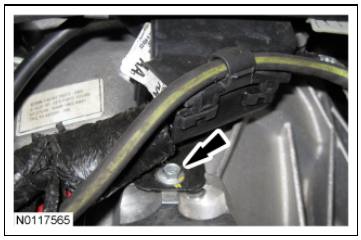
8. Using a suitable tool, detach the wiring harness from the battery tray bracket.



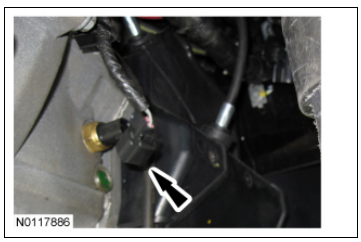
9. Remove the 3 battery tray bracket nuts and remove the battery tray bracket.



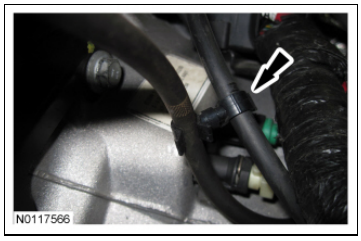
10. Remove the wiring harness bracket bolt from the transaxle and position the wiring harness bracket aside.



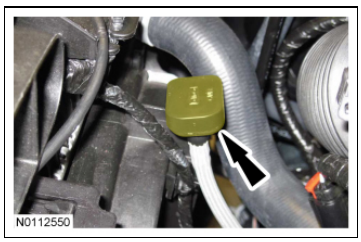
11. Disconnect the reverse light switch electrical connector.



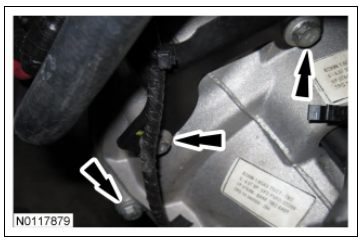
12. Remove the transaxle vent hose from the hose retainer.



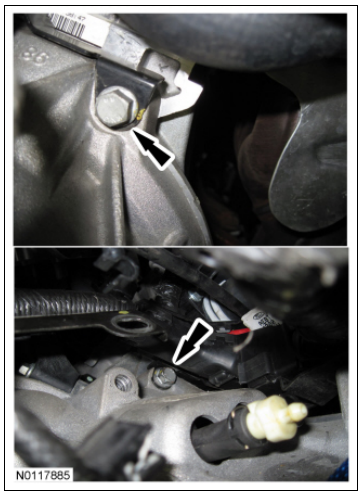
13. Remove the transaxle vent hose from the cooling fan housing and position aside.



14. Remove the 4 clutch housing-to-engine bolts (3 shown).

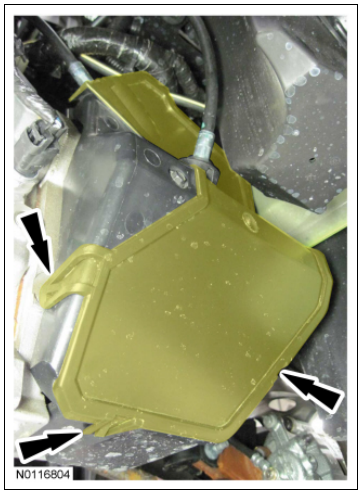


15. Remove the 2 top clutch housing-to-engine bolts.

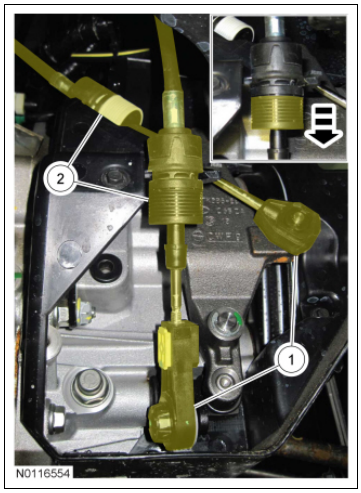


16. Remove the front wheels. For additional information, refer to Section 204-04 .

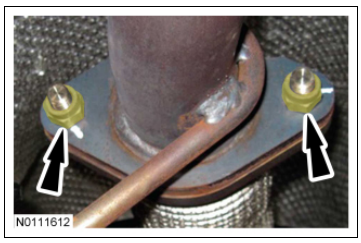
17. Release the 7 shift cables cover retainers (2 shown) and remove the shift cables cover.



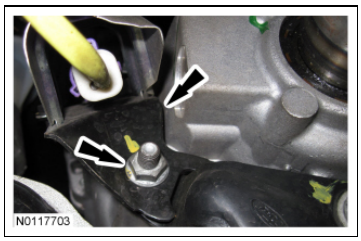
18. Remove the gearshift cables from the transaxle.
    1. Using a suitable tool, gently pry the shift and selector cables off the transaxle shift control levers.
    2. Remove the shift and selector cables by pulling the lower part of abutment down and removing from the brackets.



19. Remove and discard the exhaust flange nuts and exhaust flange gasket. Disconnect the exhaust flange.

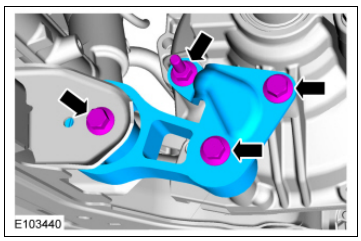


20. Remove the Heated Oxygen Sensor (HO2S) bracket nut and position the HO2S bracket aside.

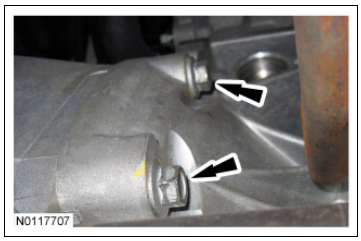


21. **NOTE:** The roll restrictor bolts are different lengths, mark the roll restrictor bolts for installation.

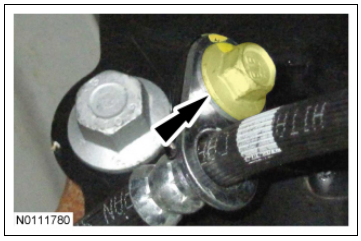
    Remove the roll restrictor bolts, bracket and the roll restrictor.



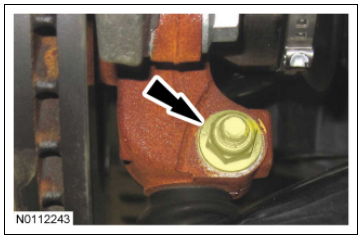
22. Remove the 2 LH clutch housing-to-engine bolts.



23. Remove the brake hose retainer bolt and the brake hose retainer from the RH strut.

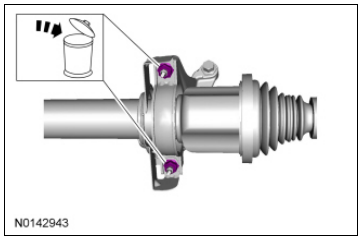


24. Remove and discard the RH ball joint nut and bolt.



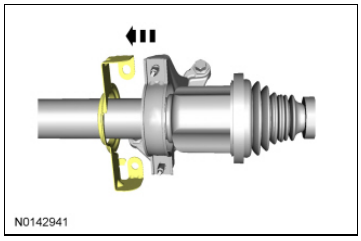
25. Separate the RH ball joint from the knuckle.

26. Remove and discard the bearing retainer strap nuts.



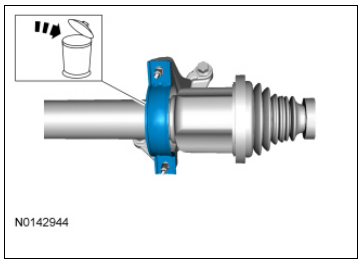
Vehicles built before 04/2011

27. Position aside the bearing shield.



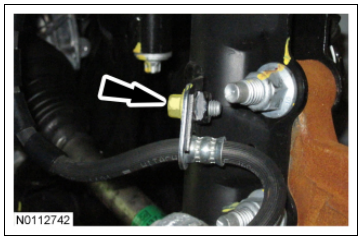
All Vehicles

28. Remove and discard the bearing retainer strap.

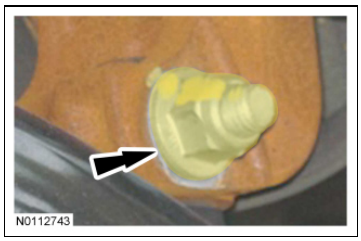


29. Remove the RH intermediate shaft assembly from the transaxle and position aside. Support the intermediate shaft assembly.

30. Remove the brake hose retainer bolt and the brake hose retainer from the LH strut.

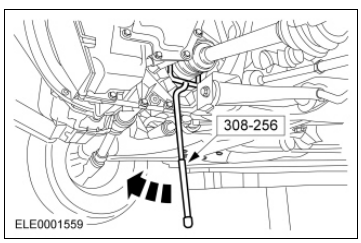


31. Remove and discard the LH ball joint nut and bolt.

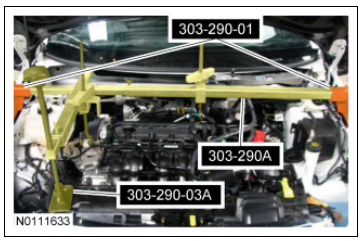


32. Separate the LH ball joint from the knuckle.

33. Using the special tools, remove the LH halfshaft assembly from the transaxle and position aside. Support the LH halfshaft assembly.



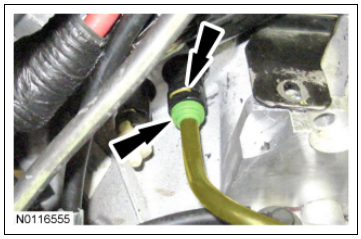
34. Install the special tools and support the engine.



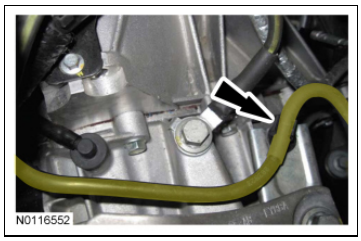
35. ⚠ **WARNING: Carefully read cautionary information on product label. For emergency medical information seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure 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.**

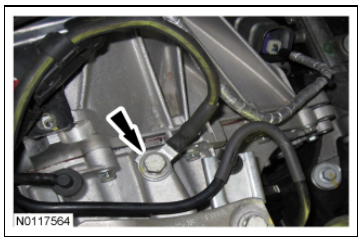
    Remove the clip and disconnect the clutch hydraulic hose.



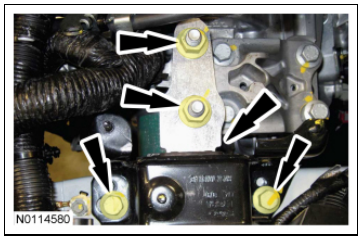
36. Remove the clutch hydraulic hose from the transaxle retainer.



37. Remove the ground wire bolt and position the ground wire aside.

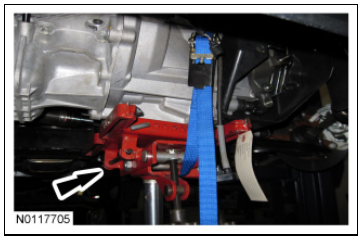


38. Remove the 2 bolts, 2 nuts and the transaxle support insulator.

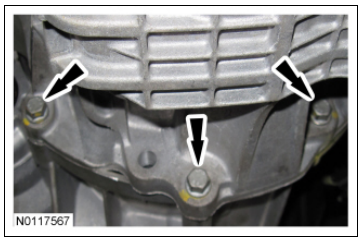


39. Lower the engine/transmission with the 3 bar approximately 2 inches.

40. Position a suitable high-lift transmission jack under the transaxle and secure the transaxle to the high-lift transmission jack.



41. Remove the 4 lower clutch housing-to-engine bolts (3 shown).

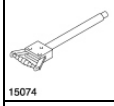
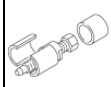


NOTE: Transmission will have to be tilted on the transmission jack to clear the subframe.

42. Remove the transaxle.

Transaxle

Special Tool(s)

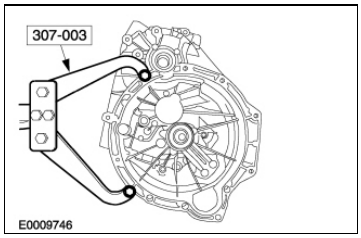
 15048	Remover, Drive Pinion Oil Seal 205-078
 15074	Remover, Bearing Cup, Differential 205-176
 ST1556-A	Remover, Stator Case Bearing 307-163 (T86P-70043-A)
 ST1186-A	Holding Fixture, Transmission 307-003 (T57L-500-B)
 16035	Remover, Input Shaft Fifth Gear 308-082

Material

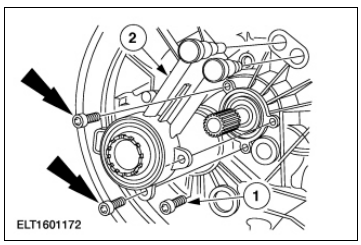
Item	Specification
Motorcraft® Metal urface Prep ZC-31-A	-

All Transmissions

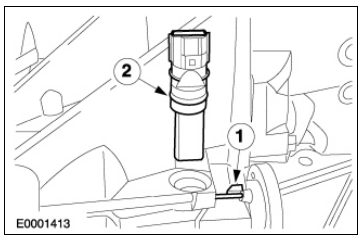
1. Using the special tool, install the transaxle.



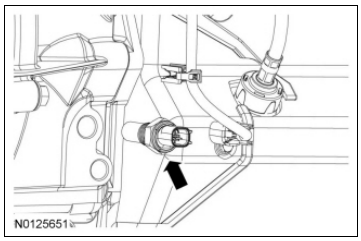
2. Remove the clutch slave cylinder.
    1. Remove the 3 clutch slave cylinder bolts.
    2. Remove the clutch slave cylinder.



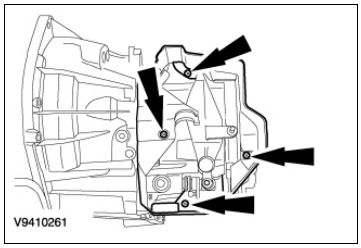
3. Remove the Vehicle Speed Sensor (VSS).
    1. Remove the retaining pin.
    2. Remove the VSS .



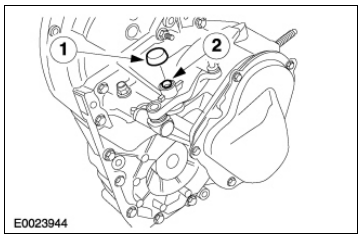
4. Remove the reversing lamp switch.



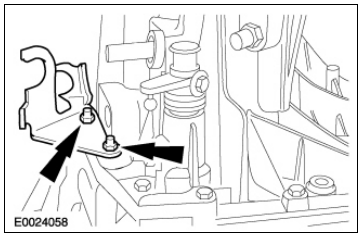
5. Remove the gearshift cables shroud retainers and the gearshift cables shroud.



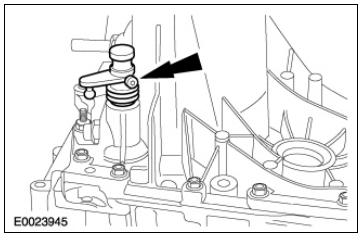
6. Remove the selector lever.
    1. Remove the protective cap.
    2. Remove and discard the snap-ring and remove the selector lever.



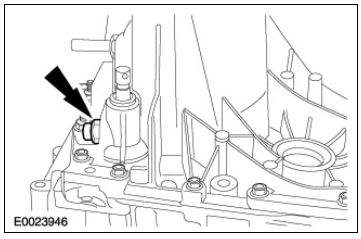
7. Remove the 2 gearshift cables bracket nuts and remove the gearshift cables bracket.



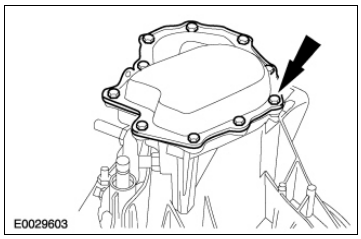
8. Remove the shift lever snap ring and remove the shift lever.



9. Remove the selector shaft interlock mechanism.

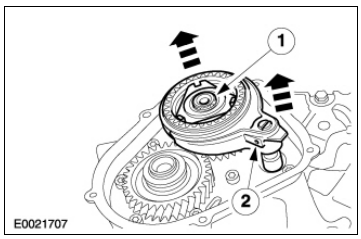


10. Remove the 5th gear cover bolts and remove the 5th gear cover.



Transmissions with Old Style Synchronizer

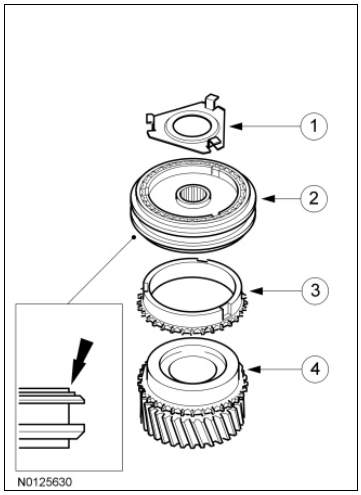
11. Remove the 5th gear synchronizer unit, selector fork and 5th gear.
    1. Remove and discard the circlip.
    2. Remove and discard the roll pin.



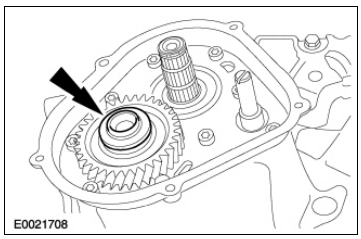
12. **NOTE:** Mark the installation position of the gear synchronizer before disassembling.

    Disassemble the 5th gear synchronizer unit.

    1. Remove the retention plate
    2. Remove the synchronizer assembly
    3. Remove the synchronizer ring
    4. Remove the 5th gear



13. Remove and discard the 5th gear snap ring.

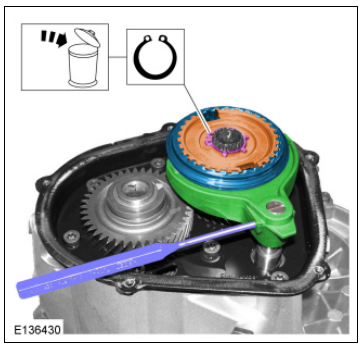


Transmissions with New Style Synchronizer and All Replacement Synchronizers

14. **NOTE:** Note the position of the components before removal.

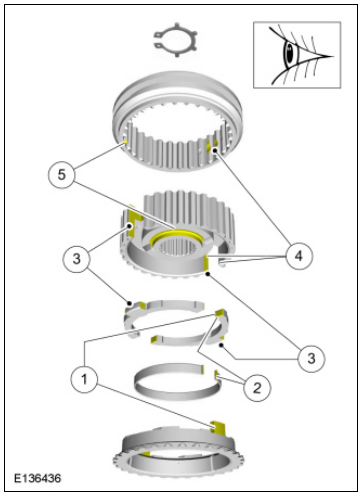
    Remove the 5th gear synchronizer unit and selector fork.

    1. Remove and discard the circlip.
    2. Remove and discard the roll pin.

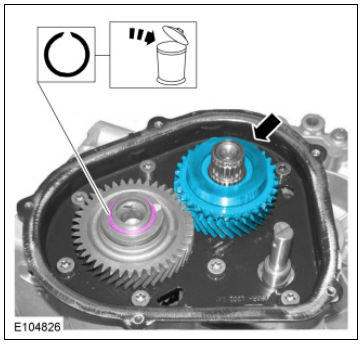


15. **NOTE:** Note the position of the components before removal.

    Disassemble the synchronizer assembly.

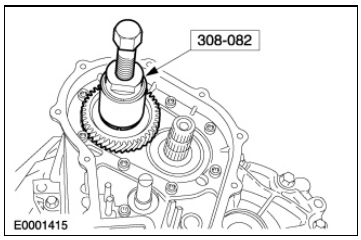


16. Remove and discard the 5th gear snap ring and remove the mainshaft 5th gear.



All Transmissions

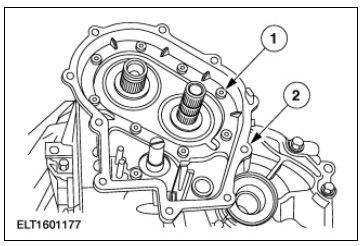
17. Using the special tool, remove the 5th gear.



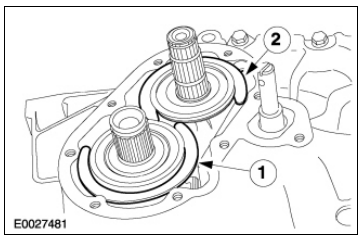
18. ***NOTICE:*** **Do not strike directly on the gear housing mating surfaces or damage can occur.**

    Remove the 5th gear housing.

    1. Remove and discard the 9 bolts and carefully separate the 5th gear housing sections by tapping lightly.
    2. Using Motorcraft® Metal Surface Prep, clean the 5th gear housing mating surfaces.



19. Remove the input shaft and output shaft retaining rings.
    1. Remove and discard the input shaft retaining ring.
    2. Remove and discard the output shaft retaining ring.



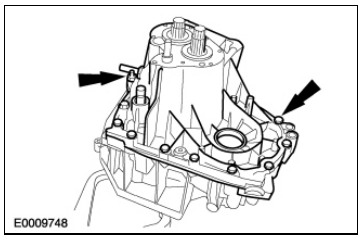
20. Remove the LH and RH halfshaft seals.

21. ***NOTICE:*** **Do not use metal scrapers to clean the transaxle gear housing surfaces or damage can occur.**

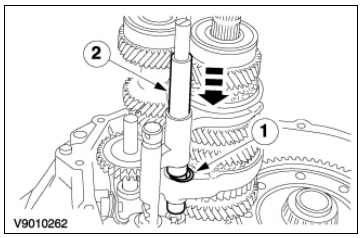
    NOTE: Slightly turn the transaxle housing to raise it.

    Separate the transaxle housing from the clutch housing.

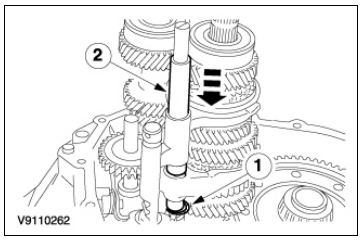
    - Using Motorcraft® Metal Surface Prep, clean the transaxle housing and clutch housing mating surfaces.



22. Remove the upper snap-ring from the selector rod guide sleeve.
    1. Remove and discard the upper snap-ring.
    2. Push the selector rod guide sleeve downwards.

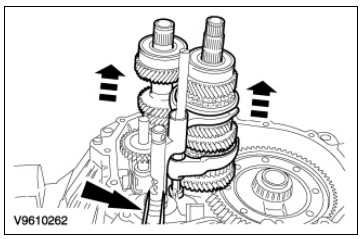


23. Remove the selector rod guide sleeve.
    1. Remove and discard the lower snap-ring from the guide sleeve.
    2. Pull off the selector rod guide sleeve.

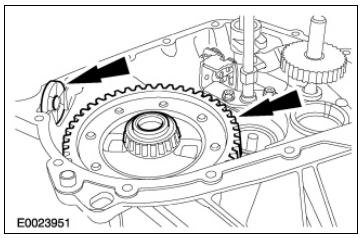


24. **NOTE:** Install a rubber belt to the auxiliary selector shaft to aid disassembly.

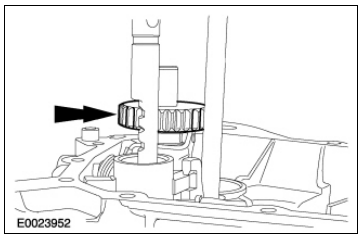
    Remove the input and output shaft with the shift forks.



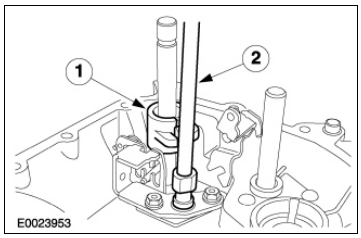
25. Remove the differential and the magnet.



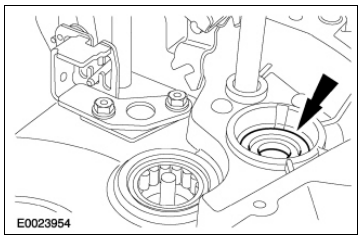
26. Remove the reverse idle gear.



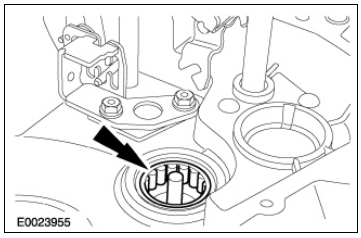
27. Remove the selector rod and locking plate.
    1. Remove the selector interlock plate.
    2. Remove the 5th/reverse gear selector rod.



28. Remove and discard the input shaft oil seal.



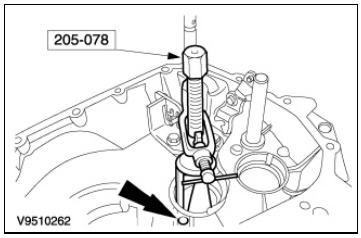
29. Remove output shaft roller bearing.
    - Press out the track rollers from the bearing cage.
    - Remove the bearing cage.



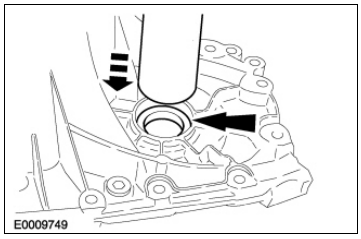
30. *NOTICE:* **Only use the special tool in the position indicated, otherwise the blanking plug will be forced out of the housing.**

    Using the special tool, remove the output shaft bearing cone.

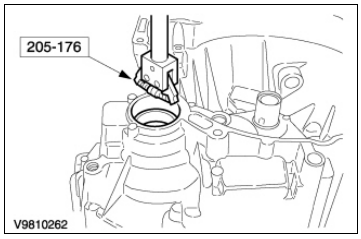
    - Remove the oil thrower.



31. Remove the bearing cone.

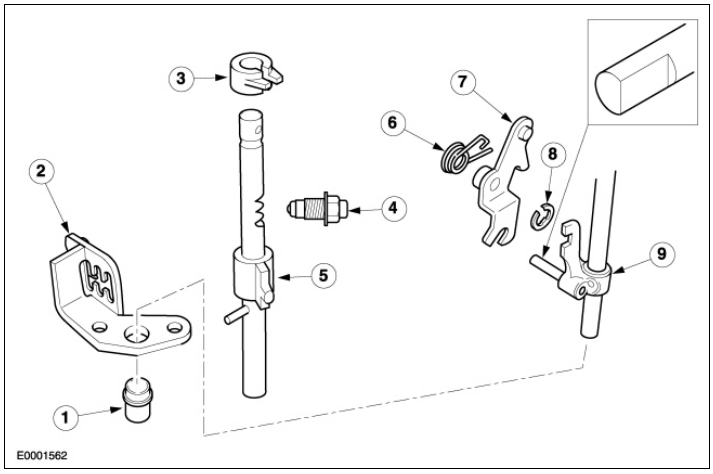


32. Using the special tool, remove the differential bearing cone.



Selector Plate

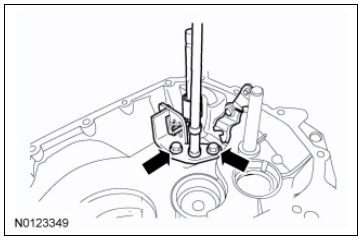
Selector Mechanism



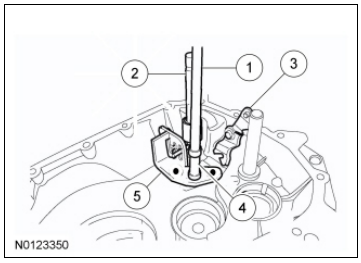
Item	Part Number	Description
1	-	Selector rod guide sleeve, 5th/reverse gear
2	7M038	Selector plate
3	7K201	Selector gate
4	7M131	Selector shaft interlock mechanism
5	7C031	Selector shift shaft
6	7K205	Return spring for selector lever, reverse gear
7	7K001	Selector lever, reverse gear
8	W527007	Snap-ring
9	-	Fifth and reverse gear selector rod

Disassembly

1. Remove the 2 selector plate bolts.

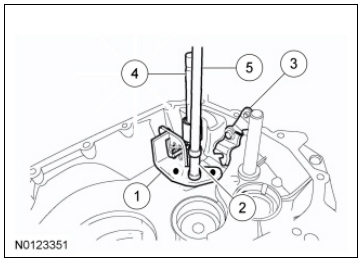


2. Remove the selector mechanism.
    1. Fifth and reverse gear selector rod.
    2. Selector shift shaft.
    3. Reverse gear selector lever.
    4. Fifth and reverse gear selector rod guide sleeve.
    5. Selector plate.

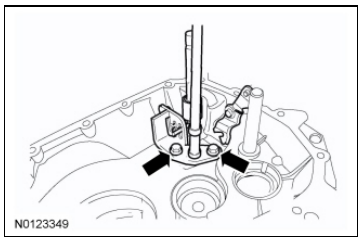


Assembly

1. Install the selector mechanism.
   -64. Fifth and reverse gear selector rod guide sleeve.
   3. Reverse gear selector lever.
   4. Selector shift shaft.
   5. Fifth and reverse gear selector rod.



2. Install the 2 selector plate bolts.
   - Tighten to 22 Nm (16 lb-ft).

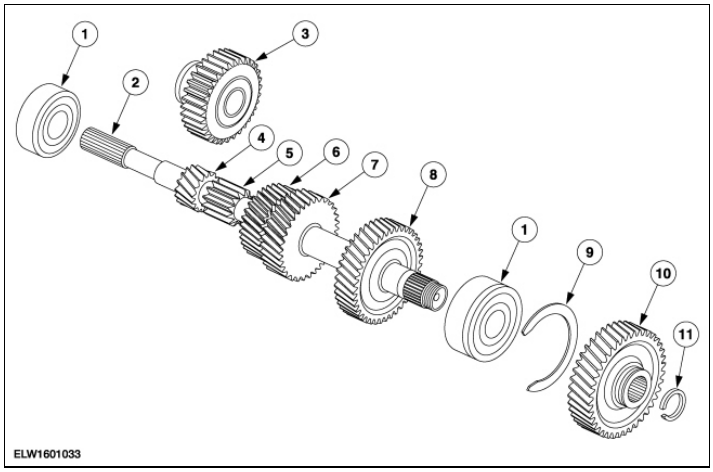


Input Shaft

Special Tool(s)

 ST1310-A	Remover, Bearing 205-055

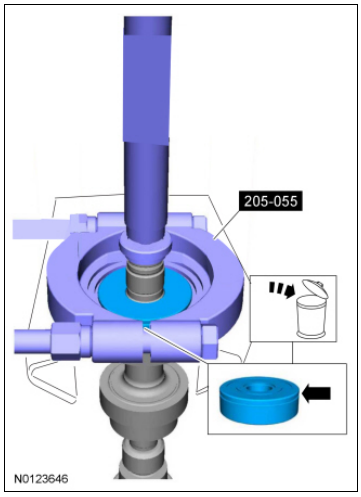
Input Shaft



Item	Part Number	Description
1	7025	Bearing
2	7L226	Input shaft
3	7141	Reverse idler gear
4	-	1st gear (part of 7L226)
5	-	Reverse gear (part of 7L226)
6	-	2nd gear (part of 7L226)
7	-	3rd gear (part of 7L226)
8	-	4th gear (part of 7L226)
9	7026	Retaining ring
10	-	5th gear (part of 7L226)
11	E860332	Snap-ring

Disassembly

1. Using the special tools, remove and discard the bearing.



2. Using a suitable tool, remove and discard the bearing.

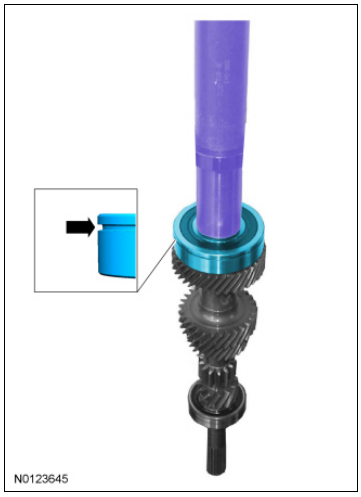


Assembly

1. Using a suitable tube, install the new bearing.



2. Using a suitable tube, instaearing.


N0123645

Output Shaft

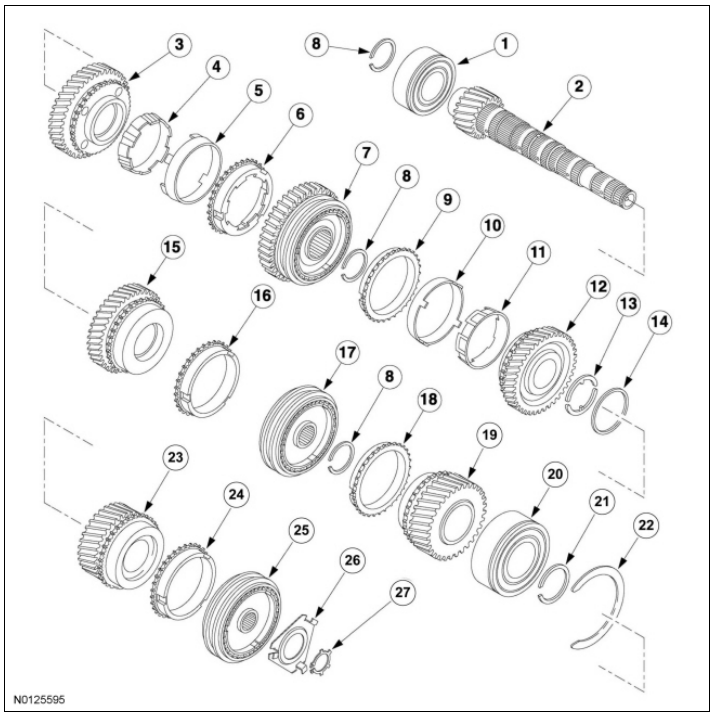
Special Tool(s)

 ST1310-A	Remover, Bearing 205-055

Material

Item	Specification
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C

Output Shaft

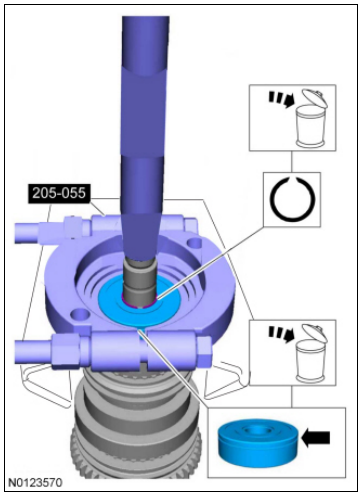


Item	Part Number	Description
1	7065	Bearing
2	7061	Output shaft
3	7100	1st gear
4	7107	Inner synchronizer ring
5	7M000	Synchronizer cone
6	7107	Outer synchronizer ring

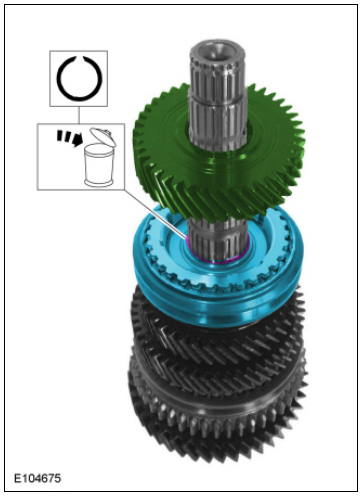
7	7124	1st/2nd gear synchronizer with reverse gear
8	E860141	Snap-ring
9	-	Outer synchronizer ring (part of 7124)
10	7M000	Synchronizer cone
11	7107	Inner synchronizer ring
12	7102	2nd gear
13	7A385	Half moon washer (2 required)
14	7A046	Snap-ring
15	7B340	3rd gear
16	7107	Synchronizer ring, 3rd gear
17	7124	Gear synchronizer, 3rd/4th gear
18	7107	Synchronizer ring, 4th gear
19	7110	4th gear
20	7065	Bearing
21	E860303	Circlip
22	7026	Retaining ring
23	7K136	5th gear
24	7107	Synchronizer ring, 5th gear
25	7L053	Gear synchronizer, 5th gear
26	7L049	Retaining plate
27	W702295	Circlip

Disassembly

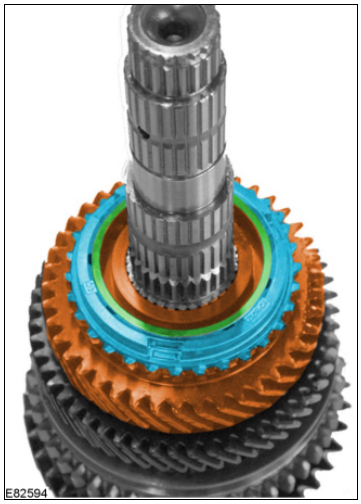
1. Remove the bearing.
    - Remove and discard the circlip.
    - Using the special tools, remove and discard the bearing.



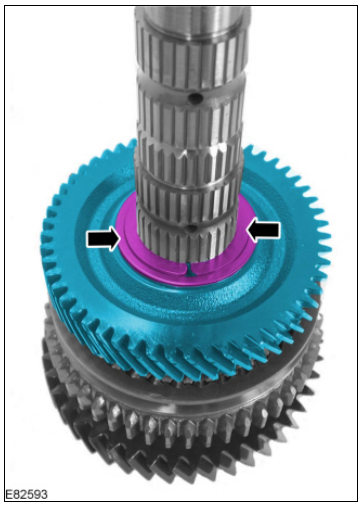
2. Remove 4th gear, remove and discard the snap-ring and remove the 3rd/4th gear synchronizer.



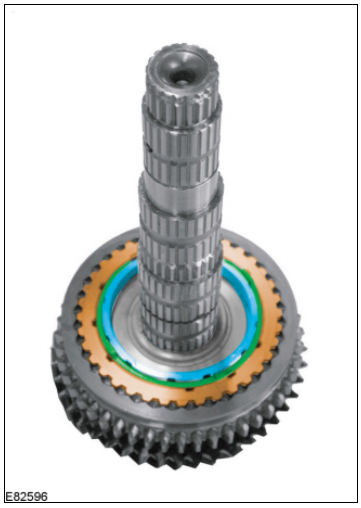
3. Remove the 3rd gear synchronizer ring and 3rd gear.



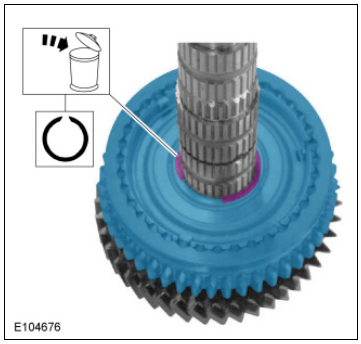
4. Remove the 2 half moon washers and 2nd gear.



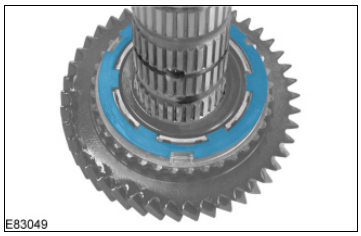
5. Remove the inner and outer synchronizer rings and the synchronizer cone.



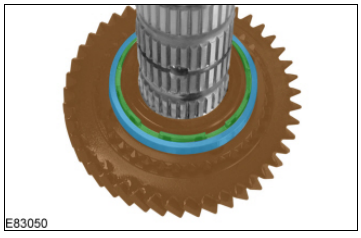
6. Remove and discard the snap-ring and remove the 1st/2nd gear synchronizer with reverse gear.



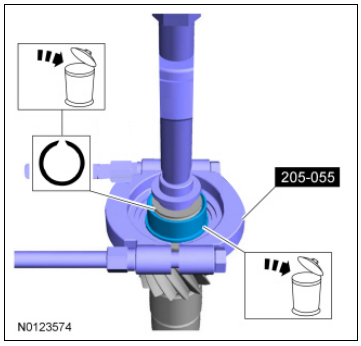
7. Remove the outer synchronizer ring.



8. Remove the synchronizer cone, inner synchronizer ring and the 1st gear.

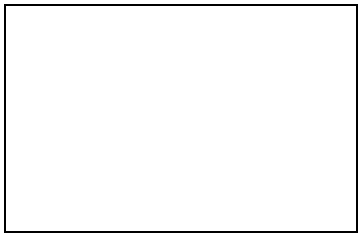


9. Remove the bearing cone.
    - Remove and discard the snap-ring.
    - Using the special tools, remove and discard the bearing cone.

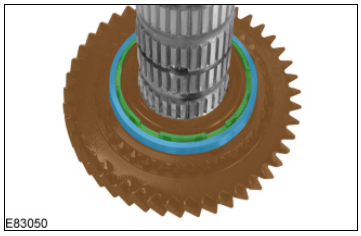


Assembly

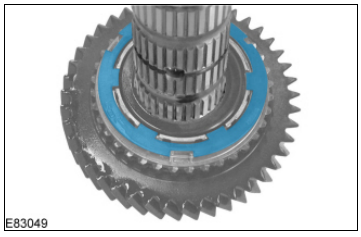
1. Install the new bearing cone and new snap-ring.
    1. Evenly heat the new bearing cone to approximately 176°F (80°C) and slide it onto the output shaft.
    2. Install the new snap-ring.



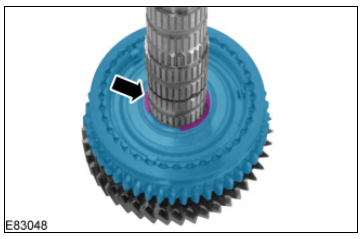
2. Install the 1st gear, inner synchronizer ring and the synchronizer cone.



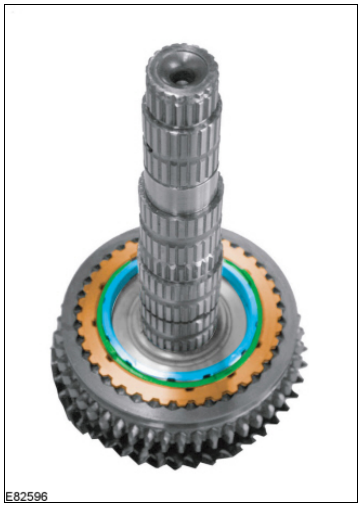
3. Install the outer synchronizer ring.



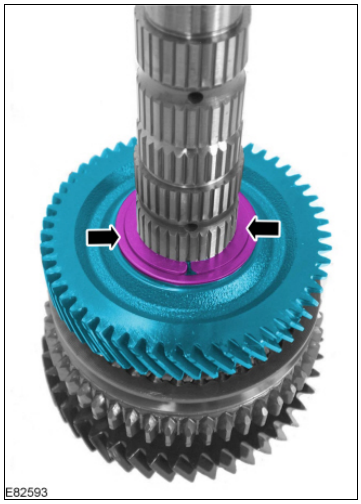
4. Install the new snap-ring.



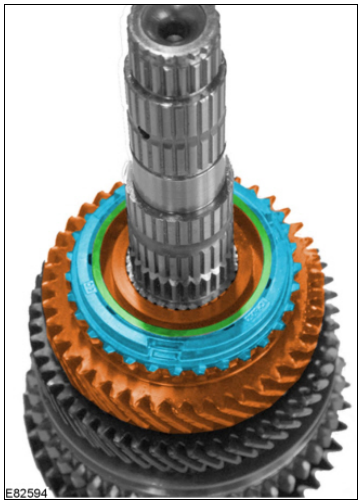
5. Install the synchronizer cone and the outer and inner synchronizer rings.



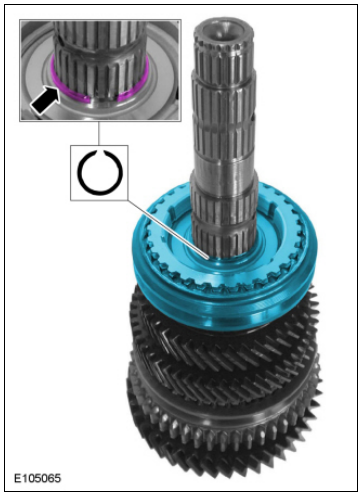
6. Install the 2nd gear and the 2 half moon washers.



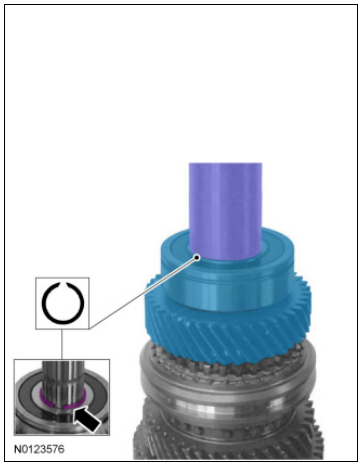
7. Install the 3rd gear and 3rd gear synchronizer ring.



8. Install the 3rd/4th gear synchronizer and new snap-ring.

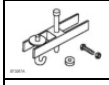


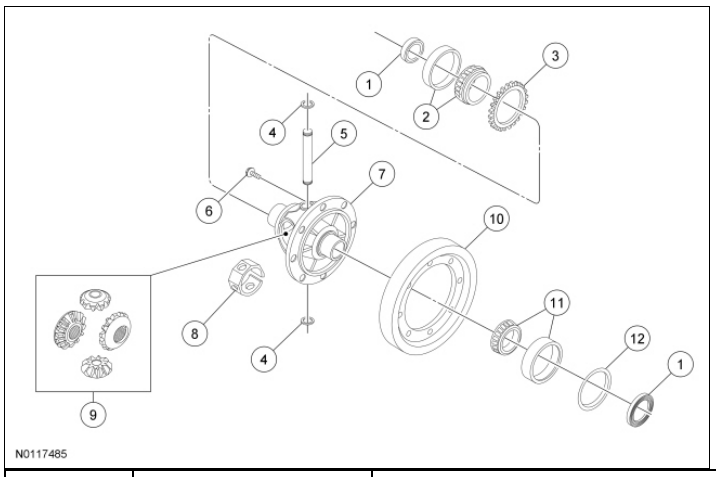
9. Install 4th gear and using a suitable tube, install the new bearing and new circlip.



Differential

Special Tool(s)

	Remover, Wheel Knuckle 205-253 (T87C-1104-A)
	Puller, Drive Pinion/Differential Carrier 205-D036 (D81L-4220-A)
	Handle 205-153 (T80T-4000-W)
	Installer, Differential Bearing Cup 308-162 (T88C-77000-C)

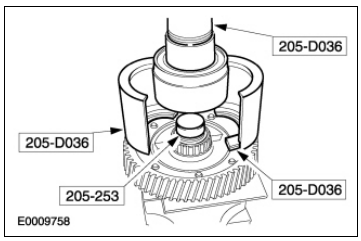


Item	Part Number	Description
1	1177	Differential seal
2	4221	Differential bearing
3	17285	Speed sensor trigger wheel
4	E860187	Retainer
5	4211	Differential pinion shaft
6	W700427	Differential bolt
7	4205	Differential case
8	4K322	Differential case lining
9	-	Differential pinion gears (part of 4026)
10	7F343	Differential ring gear
11	4220	Differential bearing
12	4228	Differential cup

Disassembly

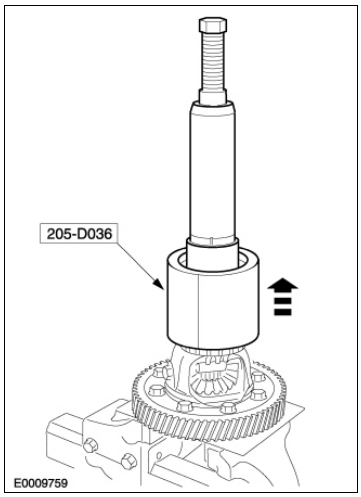
1. **NOTE:** Clutch side shown, transaxle side similar.

Install the special tools.

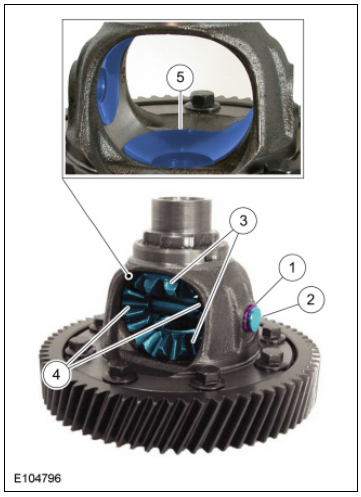


2. **NOTE:** Transaxle side shown, clutch side similar.

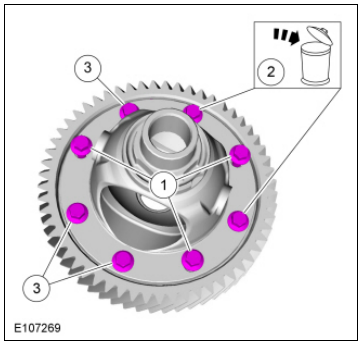
Using the special tools, remove the differential bearings from the differential assembly.



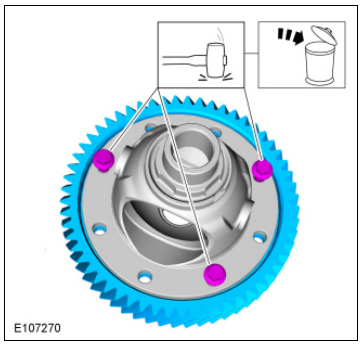
3. Remove the differential pinions.
    1. Remove the differential pinion shaft snap ring.
    2. Remove the differential pinion shaft.
    3. Rotate and remove the differential pinion gears.
    4. Rotate and remove the differential pinion gears.
    5. Remove the differential pinion gear case lining.



4. Remove the differential ring gear bolts as follows:
    1. Loosen the 3 differential bolts four turns.
    2. Remove and discard the 2 differential bolts.
    3. Remove and save the 3 differential bolts.

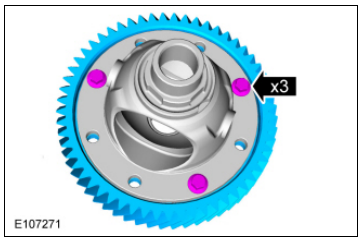


5. Using a hammer, hit the 3 remaining differential bolts, remove and discard the differential bolts and remove the differential ring gear.

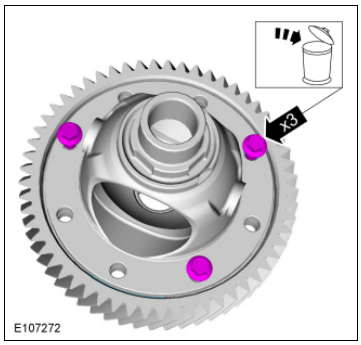


Assembly

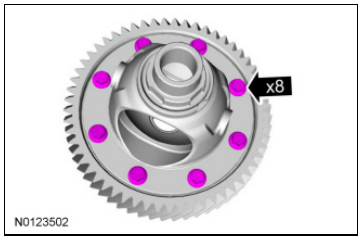
1. Install the differential ring gear and the 3 bolts saved during disassembly.
   - Tighten to 105 Nm (77 lb-ft).



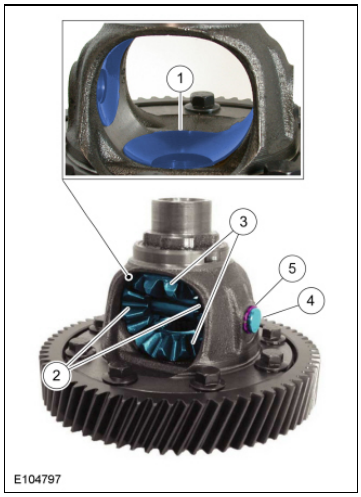
2. Remove and discard the 3 bolts.



3. Install 8 new differential ring gear bolts.
   - Tighten to 105 Nm (77 lb-ft).

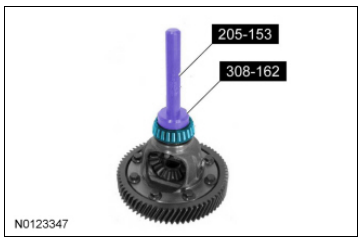


4. Install the differential pinion gears.
    1. Install the differential pinion gear case lining.
    2. Install the differential pinion gears.
    3. Install the differential pinion gears.
    4. Install the differential pinion shaft.
    5. Install the differential pinion shaft snap ring.



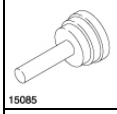
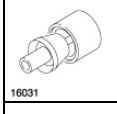
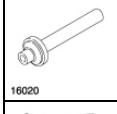
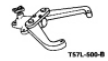
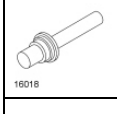
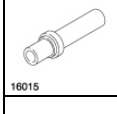
5. **NOTE:** Transaxle side shown, clutch side similar.

    Using the special tools, install the differential bearings.



Transaxle

Special Tool(s)

 15085	Installer, Rear Hub Bearing/Oil Seal 205-296 (15-085)
 16031	Installer, Input Shaft Snap Ring 308-076
 16020	Installer, Bearing Cones 308-041
	Holding Fixture, Transmission 307-003 (T57L-500-B)
 16018	Installer, Halfshaft Oil Seal 308-039 (16-018)
 16015	Installer, Extension Housing Bushing/Oil Seal 308-045 (16-0159)
 308-152	Blanking Plugs, Transaxle Housing 308-152 (T88C-7025-AH)

Material

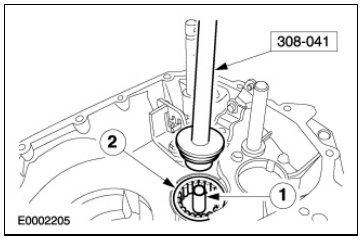
Item	Specification
Gasket Maker TA-16	WSK-M2G348-A5
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Threadlock and Sealer TA-25	WSK-M2G351-A5

All Transmissions

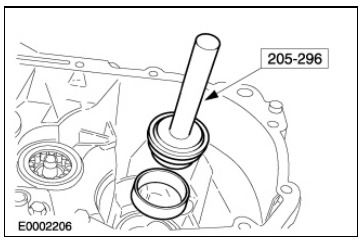
1. **NOTE:** Apply transmission fluid to all rotating surfaces.

   Clean and check all parts carefully before reassembly.

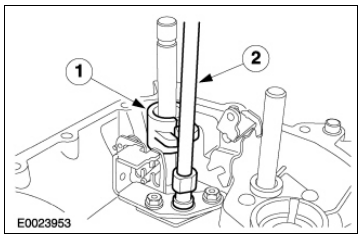
2. Using the special tool, install the output shaft roller bearing and bearing cone.
   1. Install the oil thrower.
   2. Install the bearing as far as stop.



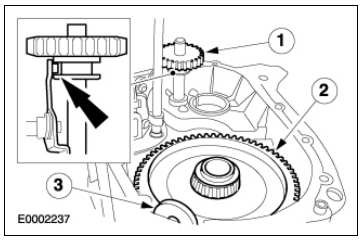
3. Using the special tool, install the differential bearing cone.



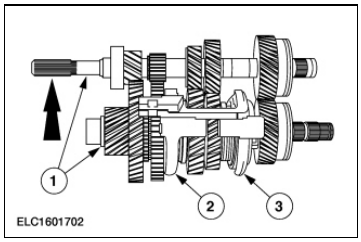
4. Install the shift selector interlock plate and the selector rod.
    1. Install the shift selector interlock plate.
    2. Install the 5th/reverse gear selector rod.



5. Install the reverse gear idler (as shown), the differential and the magnet.
    1. Reverse gear idler.
    2. Differential.
    3. Magnet.

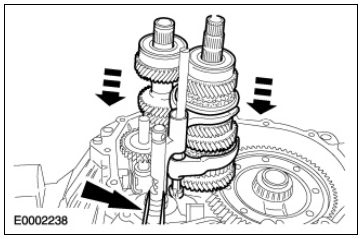


6. Prepare the input and the output shaft for installation.
    1. Position the input shaft and the output shaft together.
    2. Position the 1st and 2nd gear selector fork on the shaft assemblies.
    3. Position the 3rd and 4th gear selector fork on the shaft assemblies.

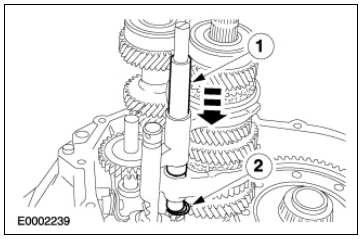


7. Install the input shaft, output shaft and selector fork assemblies into the transaxle case.

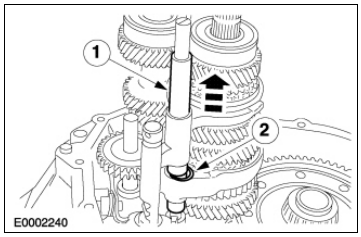
- Install a rubber band to the selector shaft to aid assembly.
- Insert the input shaft to a depth of approximately 50 mm (1.968 in) and swivel it slightly to the side.
- Insert the output shaft to the level of the input shaft and engage the gears.
- Install the input shaft and the output shaft.



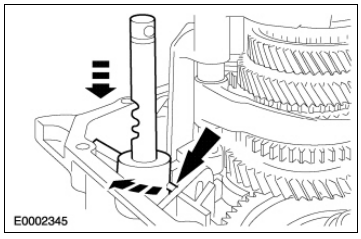
8. Install the selector shaft guide sleeve and new lower snap ring.
    1. Push in the selector shaft guide sleeve.
    2. Install the new lower snap ring.



9. Install the selector shaft guide sleeve new upper snap ring.
    1. Pull up the selector shaft guide sleeve.
    2. Install the new upper snap ring.



10. Move the inner gearshift linkage to 5th gear.
    - Turn the selector shaft clockwise until the reverse and 5th gear passage is reached, then press downwards.

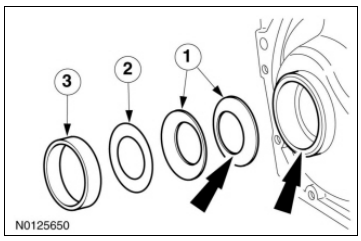


11. **NOTE:** The inner diameters of the Belleville washers are touching.

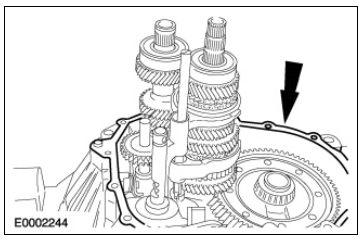
    Install the shim and secure it by staking the edge of the housing.

    1. Belleville washers.
    2. Shim.

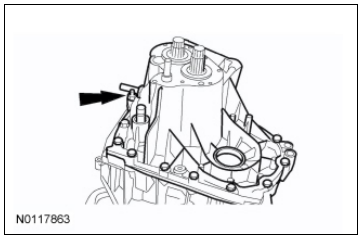
3. Install the bearing cone and secure it by staking the edge of the housing.



12. Apply Gasket Maker to the transaxle housing.

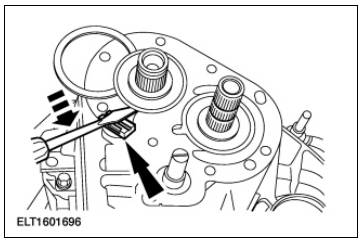


13. Install the transaxle housing bolts and evenly tighten.
    - Tighten to 33 Nm (24 lb-ft).



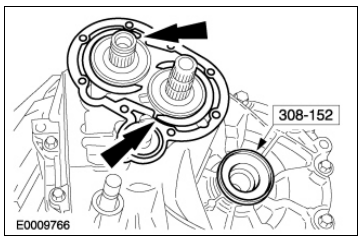
14. **NOTE:** Use a wooden block.

    Install the new input shaft and output shaft retaining rings.

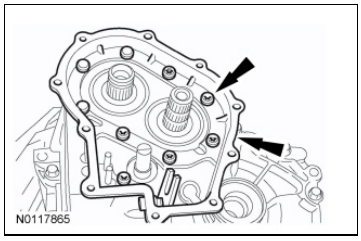


15. **NOTE:** Turn the retaining rings so that they are located in the cut-outs in the gasket.

    Install the special tools.



16. Install the new 5th gear housing gasket, 5th gear housing and the 9 new 5th gear housing bolts.
    - Tighten to 17 Nm (150 lb-in).

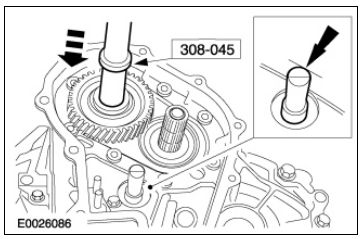


17. **NOTE:** Remove the transaxle from the special tool and carry out the following step on a press.

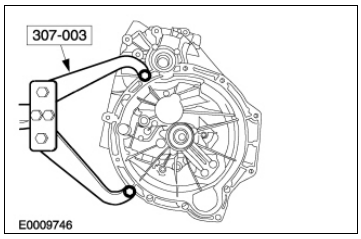
    NOTE: Install an anti twist stop for the selector rod.

    NOTE: The transaxle housing must not rest on the press table. Support the input shaft clutch splines on the press.

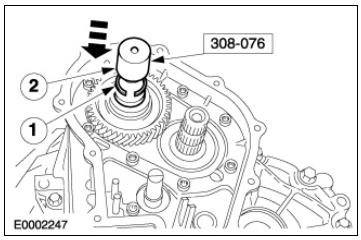
    Using the special tool and a press, install the 5th gear wheel onto the input shaft.



18. Install the special tool onto the transaxle.



19. Using the special tool, install the new 5th gear snap ring.
    1. Install the new snap ring onto the special tool.
    2. Install the special tool and push on the new snap ring.



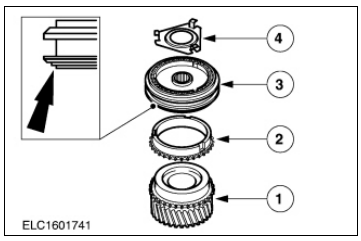
Transmissions with Old Style Synchronizer

20. **NOTE:** Align the synchronizer with the marks made during disassembly.

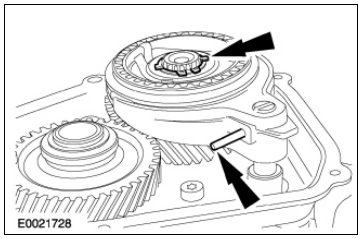
    Assemble the 5th gear synchronizer assembly:

    1. install 5th gear.
    2. install the synchronizer ring.
    3. install the synchronizer (as shown).

4. install the retention plate.

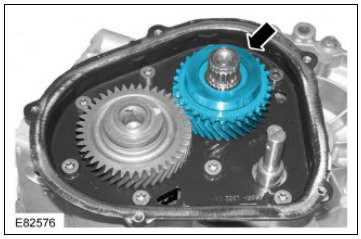


21. Install the 5th gear synchronizer assembly with selector fork.
    - Install the new roll pin.
    - Install the new circlip.



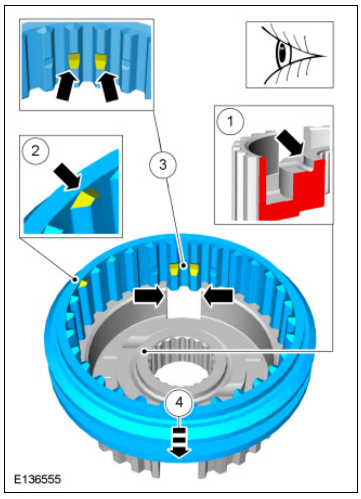
Transmissions with New Style Synchronizer and All Replacement Synchronizers

22. Install the mainshaft 5th gear.



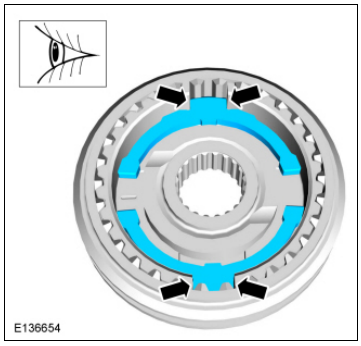
23. **NOTE:** Make sure that the components are installed to the position noted before removal.

    Assemble the synchronizer hub and sleeve.



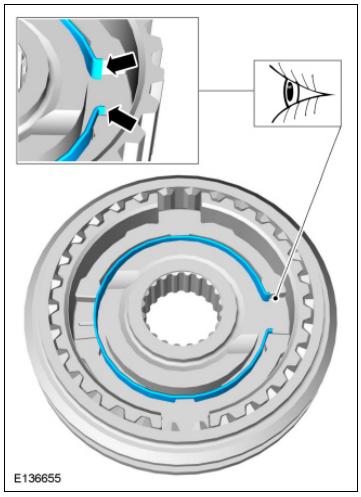
24. **NOTE:** Make sure that the components are installed to the position noted before removal.

    Install the synchronizer actuators.



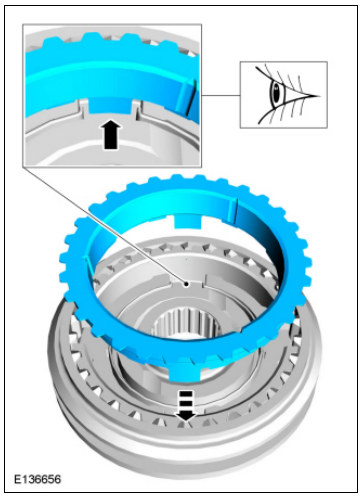
25. **NOTE:** Make sure that the components are installed to the position noted before removal.

    Install the synchronizer radial spring.

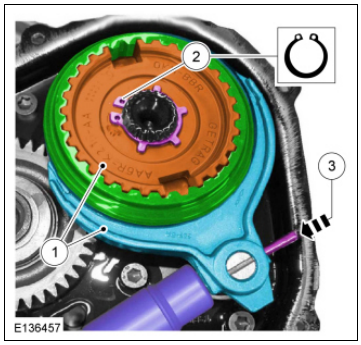


26. **NOTE:** Make sure that the components are installed to the position noted before removal.

    Install the synchronizer ring.

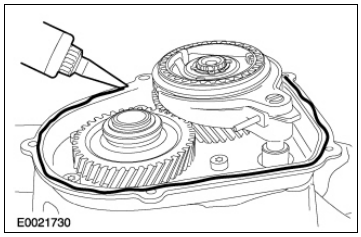


27. Install the synchronizer and selector fork.
    1. Align the marks made during removal.
    2. Install the new circlip.
    3. Install the new roll pin.

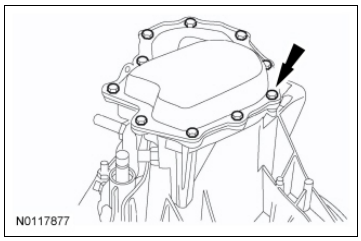


All Transmissions

28. Apply Silicone Gasket and Sealant evenly to the end cap.

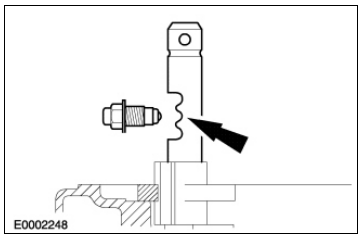


29. Install the 5th gear cover and the 5th gear cover bolts.
    - Tighten to 12 Nm (106 lb-in).



30. **NOTE:** Install the selector shaft interlock in the neutral position.

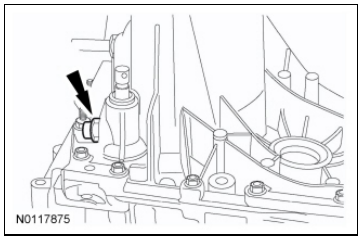
    Install the selector shaft interlock as shown.



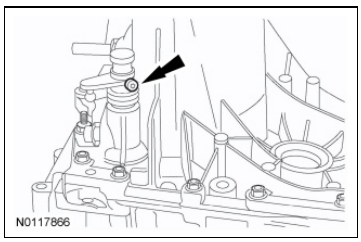
31. **NOTE:** Make sure the selector shaft interlock in the neutral position.

    Apply Threadlock and Sealer to the selector interlock mechanism and install.

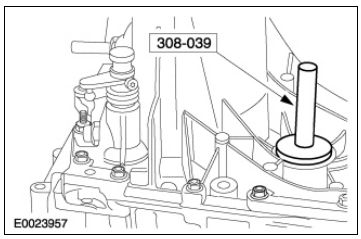
    - Tighten to 25 Nm (18 lb-ft).



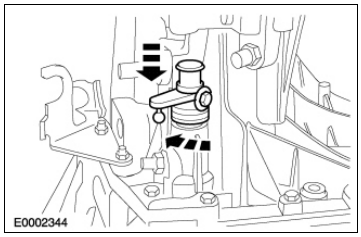
32. Install the shift lever.



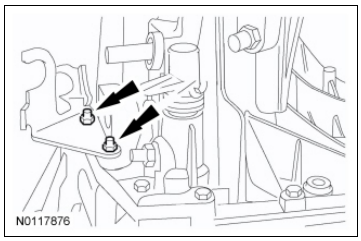
33. Using the special tool, install the halfshaft seal until it engages audibly.



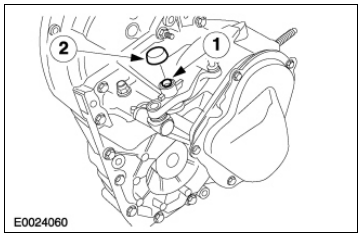
34. Engage 5th gear.
    - Turn the selector shaft clockwise as far as possible and press it in.



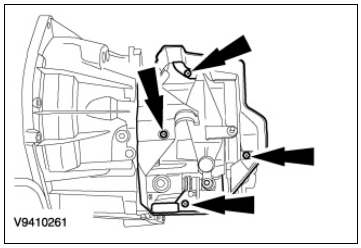
35. Install the gearshift cables bracket and the gearshift cables bracket nuts.
    - Tighten to 20 Nm (177 lb-in).



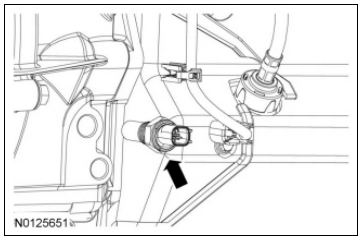
36. Install the selector lever.
    1. Install the new snap ring.
    2. Install the protective cap.



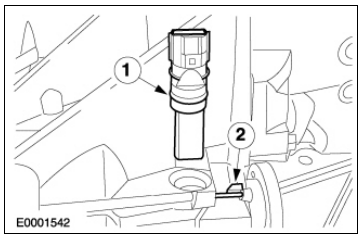
37. Install the gearshift cables shroud and gearshift cables shroud fasteners.



38. Install the reversing lamp switch.
    - Tighten to 14 Nm (124 lb-in).



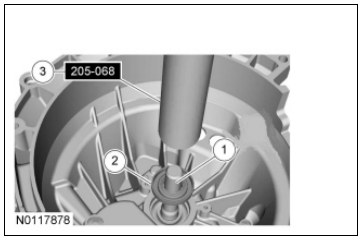
39. Install the Vehicle Speed Sensor (VSS).
    1. Connect the VSS .
    2. Install the retaining pin.



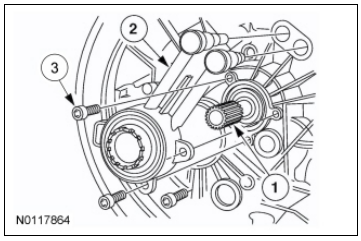
40. ***NOTICE:*** **Apply adhesive tape to cover the input shaft splines to prevent damage to the input shaft seal.**

    Using the special tools, install the new input shaft seal.

    1. Apply a small amount of adhesive tape to the input shaft.
    2. Put the input shaft seal on the input shaft.
    3. Using the special tool, install the new input shaft seal.



41. Install the clutch slave cylinder and the clutch slave cylinder bolts.
    1. Apply a small amount of grease to the input shaft.
    2. Install the clutch slave cylinder.
    3. Install the 3 clutch slave cylinder bolts.
        - ♦ Tighten evenly to 11 Nm (97 lb-in).



Transaxle

Special Tool(s)

 ST2378-A	Adapter for 303-290A 303-290-01
 ST2379-A	Adapter for 303-290A (Support Leg) 303-290-03A
 ST2363-A	Support Bar, Engine 303-290A

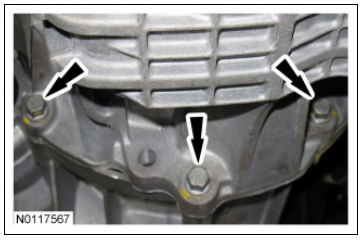
Material

Item	Specification
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200-C

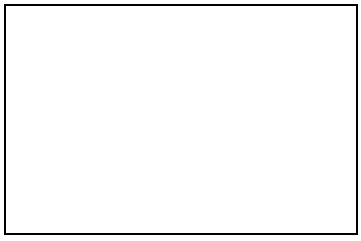
Installation

1. Install the transaxle.

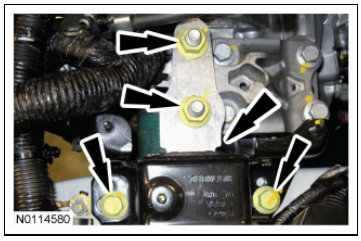
2. Install the 4 lower clutch housing-to-engine bolts (3 shown).
   - Tighten to 48 Nm (35 lb-ft).



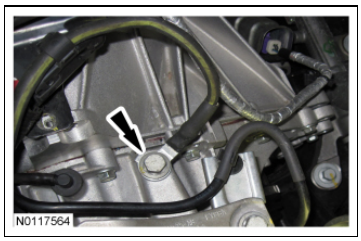
3. Using the special tools, lower the transaxle.



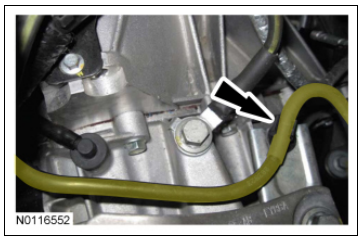
4. Install the transaxle support insulator, the 2 transaxle support insulator bolts and the 2 nuts.
   - Tighten the 2 bolts to 90 Nm (66 lb-ft).
   - Tighten the 2 nuts to 125 Nm (92 lb-ft).



5. Install the ground wire and bolt onto the transaxle.
    - Tighten to 25 Nm (18 lb-ft).



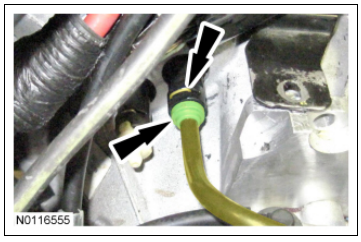
6. Attach the clutch hydraulic hose to the transaxle retainer.



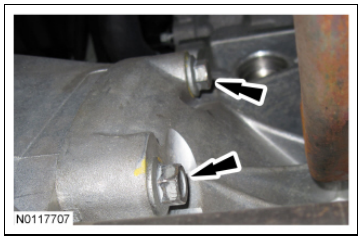
7. ⚠ **WARNING: Carefully read cautionary information on product label. For emergency medical information seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure 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.**

   Install the clutch hydraulic hose onto the transaxle and install the clip.



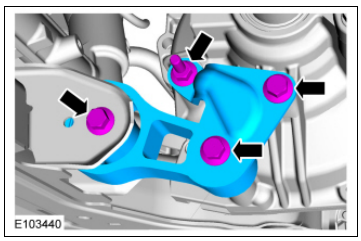
8. Install the 2 LH clutch housing-to-engine bolts.
    - Tighten to 48 Nm (35 lb-ft).



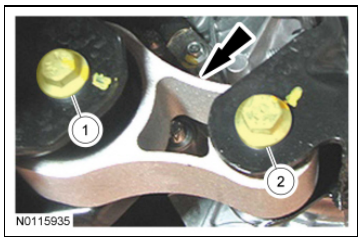
9. **NOTE:** The roll restrictor bolts are different lengths, make sure the roll restrictor bolts are in the correct location using the marks made during removal.

   Install the roll restrictor bracket, roll restrictor and the roll restrictor bolts.
   Loosely install the 2 roll restrictor bolts and the 2 roll restrictor bracket bolts at this time.

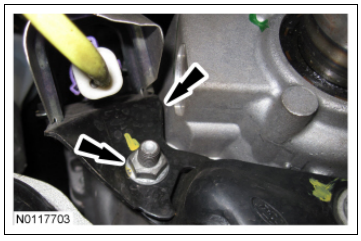
   - Only tighten the top 2 roll restrictor bracket bolts.
     - ♦ Tighten the to 48 Nm (35 lb-ft).



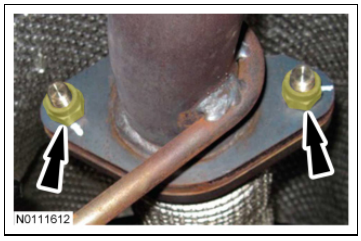
10. Tighten the roll restrictor bolts.
    1. Tighten the roll restrictor bolt to 70 Nm (52 lb-ft).
    2. Tighten the roll restrictor-to-transaxle bracket bolt to 70 Nm (52 lb-ft).



11. Attach the Heated Oxygen Sensor (HO2S) bracket to the transaxle and install the HO2S bracket nut.
    - Tighten to 25 Nm (18 lb-ft).



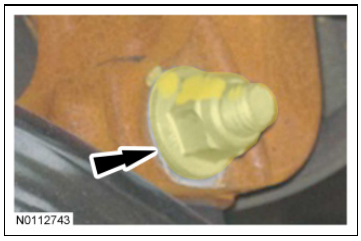
12. Using a new exhaust flange gasket and nuts, connect the exhaust flange to the exhaust.
    - Tighten to 48 Nm (35 lb-ft).



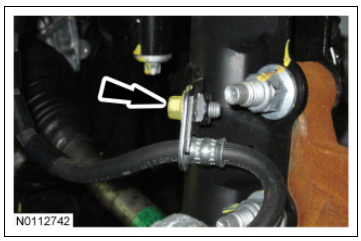
13. Install the LH halfshaft into the transaxle.

14. Install the LH ball joint into the knuckle.

15. Install the new LH ball joint bolt and nut.
    - Tighten to 48 Nm (35 lb-ft).

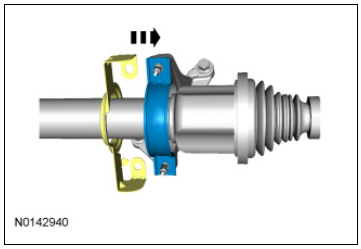


16. Install the brake hose retainer and bolt on the LH strut.
    - Tighten to 25 Nm (18 lb-ft).



17. Install the RH intermediate shaft assembly into the transaxle.

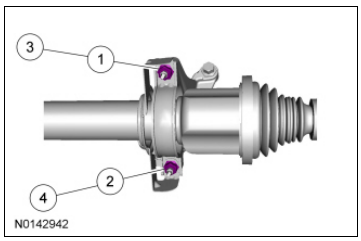
18. Install the new bearing retainer strap and shield (if equipped).
    - Install the strap on the studs.
    - Position the shield (if equipped) on the studs.



NOTICE: **Install the bearing retainer strap on the bracket studs before the shield, and tighten the nuts evenly in stages (alternating from top to bottom) or incorrect bearing clampload may occur causing component damage.**

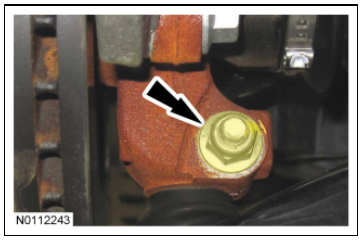
19. Install the new bearing retainer strap nuts.
    - Tighten to 6 Nm (53 lb-in).
    - Tighten to 6 Nm (53 lb-in).
    - Tighten to 25 Nm (18 lb-ft).

- Tighten to 25 Nm (18 lb-ft).

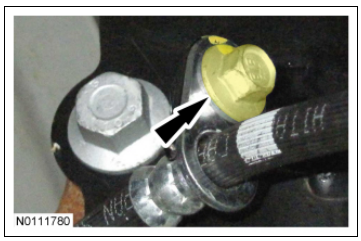


20. Install the RH ball joint into the knuckle.

21. Install the new RH ball joint bolt and nut.
    - Tighten to 48 Nm (35 lb-ft).

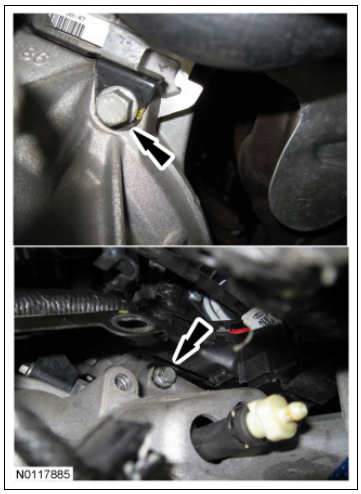


22. Install the brake hose retainer and bolt on the RH strut.
    - Tighten to 25 Nm (18 lb-ft).

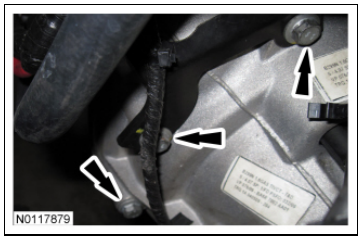


23. Install the front wheels. For additional information, refer to Section 204-04 .

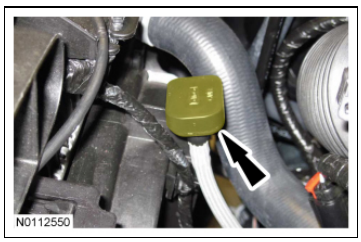
24. Install the 2 top clutch housing-to-engine bolts.
    - Tighten to 48 Nm (35 lb-ft).



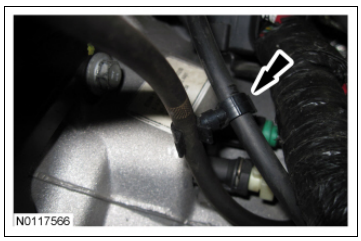
25. Install the 4 clutch housing-to-engine bolts (3 shown).
    - Tighten to 48 Nm (35 lb-ft).



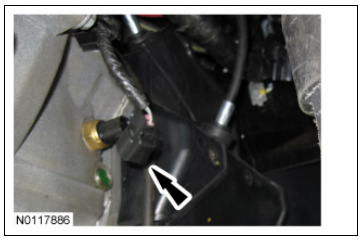
26. Install the transaxle vent hose on the cooling fan housing.



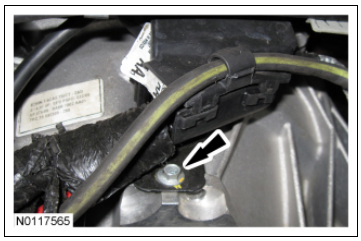
27. Attach the transaxle vent hose to the hose retainer.



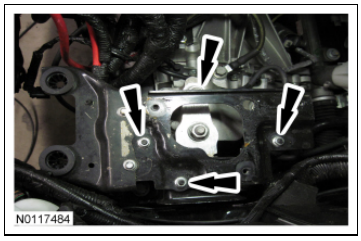
28. Connect the reverse light switch electrical connector.



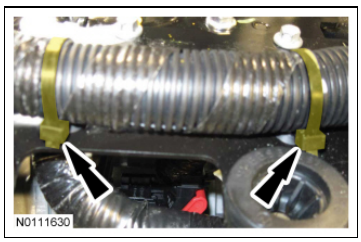
29. Install the wiring harness bracket and wiring harness bracket bolt to the transaxle.
    - Tighten to 25 Nm (18 lb-ft).



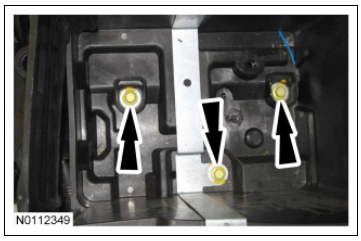
30. Install the battery tray bracket and the 3 battery tray bracket nuts.
    - Tighten to 25 Nm (18 lb-ft).



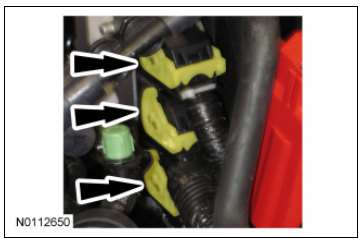
31. Attach the wiring harness to the battery tray bracket.



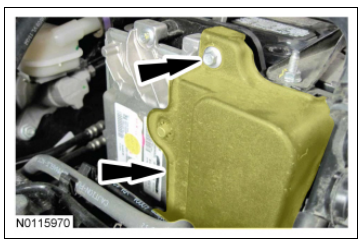
32. Install the battery tray and 3 battery tray bolts.
    - Tighten to 10 Nm (89 lb-in).



33. Connect the 3 PCM electrical connectors.



34. Install the PCM cover and the PCM cover bolt.
    - Tighten to 6 Nm (53 lb-in).



35. Install the cowl assembly. For additional information, refer to Section 501-02 .

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

37. Fill the transaxle with transmission fluid. For additional information, refer to Transaxle Draining and Filling in this section.

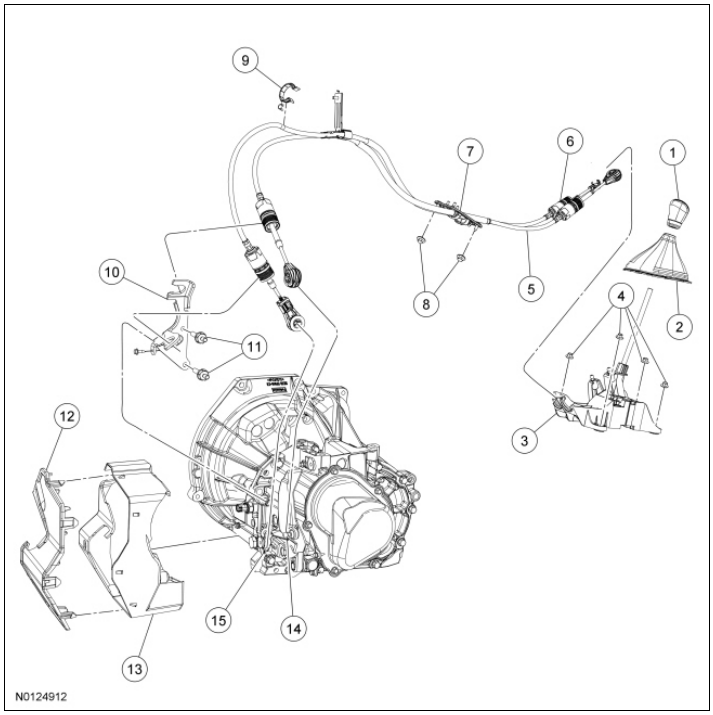
38. Bleed the clutch hydraulic system. For additional information, refer to Section 308-00 .

39. Adjust the gearshift cables. For additional information, refer to Section 308-00 .

Torque Specifications

Description	Nm	lb-ft	lb-in
Exhaust flange bolts	47	35	-
Gearshift lever nuts	9	-	80
Shift and selector cable grommet nuts.	9	-	80

External Controls



Item	Part Number	Description
1	-	Gearshift knob (part of 7213)
2	-	Gearshift boot (part of 7213)
3	-	Gearshift lever base (part of 7210)
4	W706131	Gearshift nuts
5	-	Shift cable (part of 7E395)
6	-	Selector cable (part of 7E395)
7	-	Gearshift cables grommet (part of 7E395)
8	W706131	Gearshift cables grommet nuts (2 required)
9	W709047	Gearshift cable clip
10	7474	Gearshift cables bracket
11	W703125	Gearshift cables bracket studs
12	7222	Gearshift cables cover
13	7220	Gearshift cables shroud
14	7210	Transaxle selector lever
15	7F116	Transaxle shift lever

The IB5 manual transaxle external controls consists of the following:

- Gearshift cables
  - ♦ shift cable
  - ♦ selector cable
- Gearshift lever

- Gearshift lever knob and boot
- Transaxle shift lever
- Transaxle selector lever

The manual transaxle is controlled by a floor-mounted gearshift lever located in the floor console. Connection between the floor-mounted gearshift lever and the transaxle shift lever and selector lever is made through 2 gearshift cables. When the operator moves the floor mounted gearshift lever, that movement is transmitted through 2 gearshift cables routed through the floor txle. The 2 gearshift cables are attached to the transaxle at the shift lever and selector lever. The shift and selector levers transfer the movement of the gearshift cables to the shift rods and shift forks located inside the transaxle. Removal and installation of the gearshift cables require specific adjustments for correct shifting of the transaxle. For information regarding gearshift cable adjustments, refer to Section 308-00 .

The shift cable has white ends and the selector cable has black ends. The selector cable (black) does not have an adjustment.

External Controls

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.
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 evident, verify the symptom. GO to Symptom Chart .

Symptom Chart

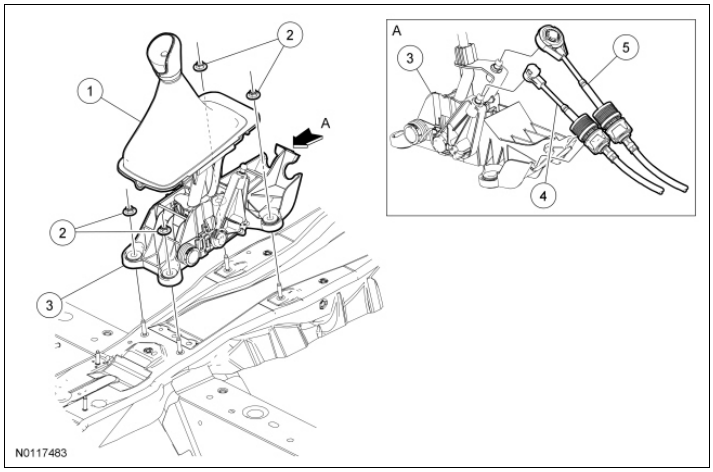
Symptom Chart

Pinpoint Test

PINPOINT TEST A: GEARSHIFT CABLES DO NOT OPERATE FREELY

Test Step	Result / Action to Take
A1 CHECK GEARSHIFT LEVER	
• Disconnect the gearshift cables from the gearshift lever. • **Is the gearshift lever difficult to operate?**	**Yes** INSTALL a new gearshift lever. REFER to Gearshift Lever in this section. **No** GO to A2 .
A2 CHECK THE GEARSHIFT CABLES.	
• Attach the gearshift cables to the gearshift lever. • Disconnect the gearshift cables from the transaxle. • **Is the gearshift lever difficult to operate?**	**Yes** INSTALL a new gearshift cable assembly. REFER to Gearshift Cables in this section. **No** There is a problem with the transaxle. REFER to Section 308-03 .

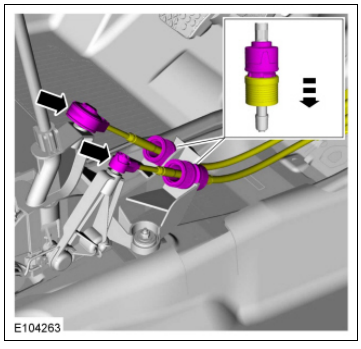
Gearshift Lever



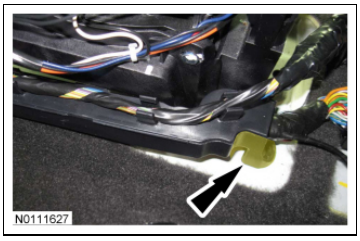
Item	Part Number	Description
1	7213	Gearshift lever
3	W706131	Gearshift lever nuts (4 required)
3	-	Gearshift lever base (part of 7210)
4	-	Shift cable (part of 7E395)
5	-	Selector cable (part of 7E395)

Removal

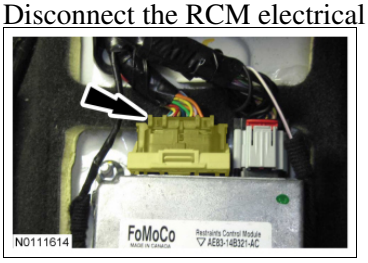
1. Remove the floor console. For additional information, refer to Section 501-12 .
2. Depower the Supplemental Restraint System (SRS). For additional information, refer to Section 501-20B .
3. Remove the gearshift cables.



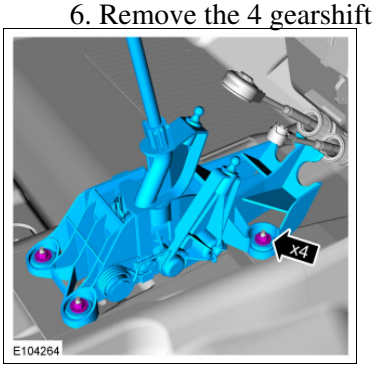
4. Using a suitable tool, remove the wiring harness from the gearshift lever base.



- Disconnect the RCM electrical connector.

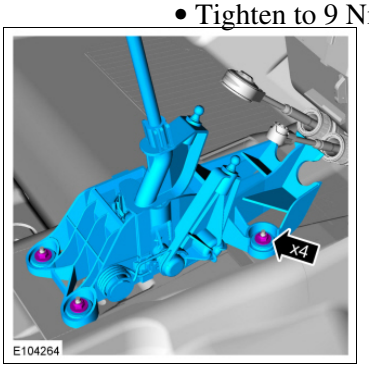


6. Remove the 4 gearshift lever nuts and remove the gearshift lever.

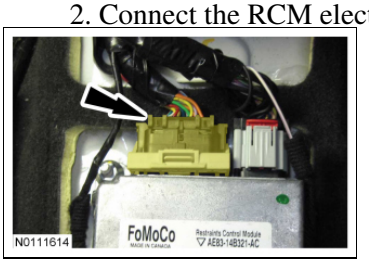


Installation

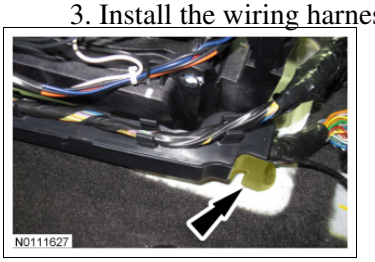
1. Install the gearshift lever and the 4 gearshift lever nuts.
   - Tighten to 9 Nm (80 lb-in).



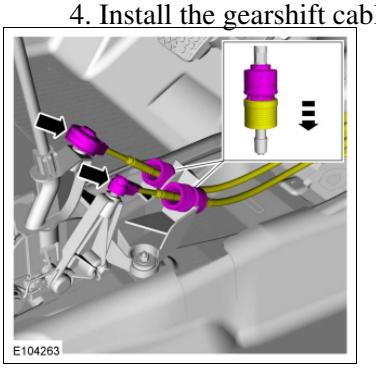
2. Connect the RCM electrical connector.



3. Install the wiring harness to the gearshift lever base.

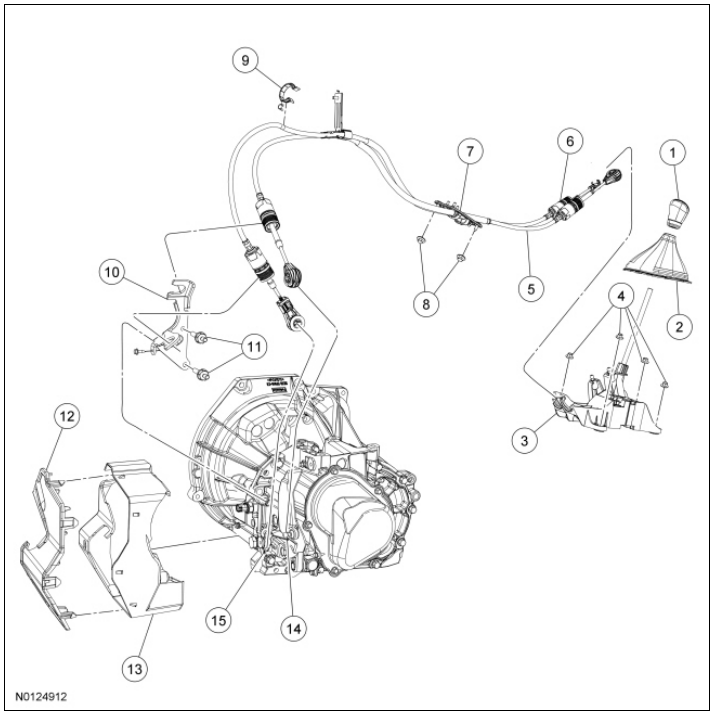


4. Install the gearshift cables.



5. Install the floor console. For additional information, refer to Section 501-12 .
6. Repower the Supplemental Restraint System (SRS). For additional information, refer to Section 501-20B .
7. Adjust the gearshift mechanism. For additional information, refer to Section 308-00 .

Gearshift Cables



Item	Part Number	Description
1	-	Gearshift knob (part of 7213)
2	-	Gearshift boot (part of 7213)
3	-	Gearshift lever base (part of 7210)
4	W706131	Gearshift nuts
5	-	Shift cable (part of 7E395)
6	-	Selector cable (part of 7E395)
7	-	Gearshift cables grommet (part of 7E395)
8	W706131	Gearshift cables grommet nuts (2 required)
9	W709047	Gearshift cable clip
10	7474	Gearshift cables bracket
11	W703125	Gearshift cables bracket studs
12	7222	Gearshift cables cover
13	7220	Gearshift cables shroud
14	7210	Transaxle selector lever
15	7F116	Transaxle shift lever

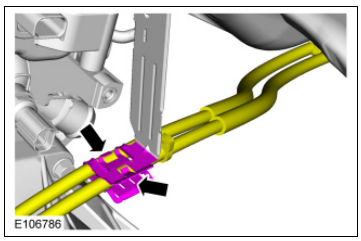
Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

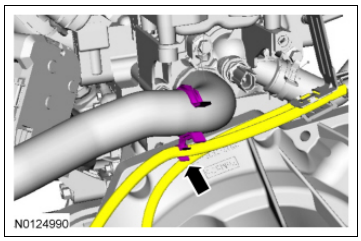
2. Remove the battery tray. For additional information, refer to Section 414-01 .

3. Remove the Air Cleaner (ACL) assembly. For additional information, refer to Section 303-12 .

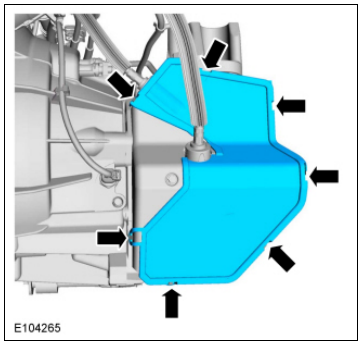
4. Remove the gearshift cables from the gearshift cables bracket.



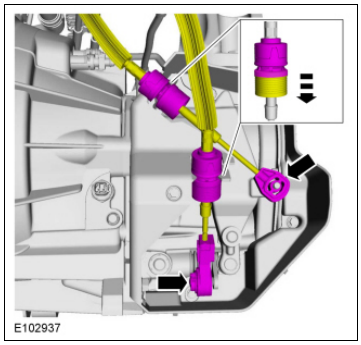
5. Remove the gearshift cable from the gearshift cable clip.



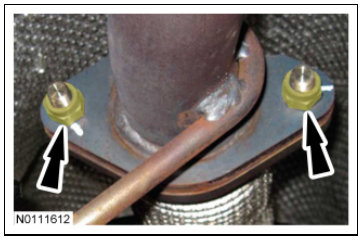
6. Release the 7 retainers and remove the gearshift cables cover.



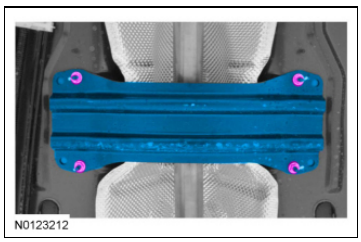
7. Remove the gearshift cables.
   - Using a suitable tool, gently pry the gearshift cables off the transaxle shift control levers.
   - Remove the gearshift cables by pulling the lower part of the abutment down and removing from the gearshift cables bracket.



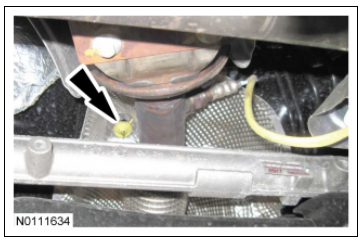
8. Remove and discard the 2 exhaust flange nuts and the exhaust flange gasket. Disconnect the exhaust flange.

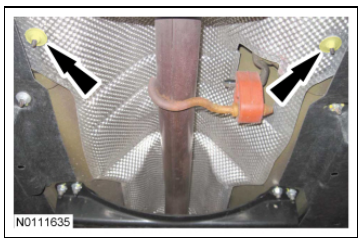


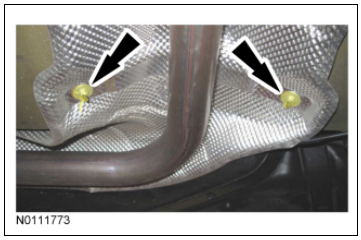
9. Remove the 4 cross brace nuts and remove the cross brace.



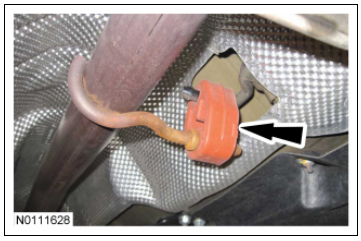
10. Remove the 6 exhaust heat shield fasteners (5 shown).

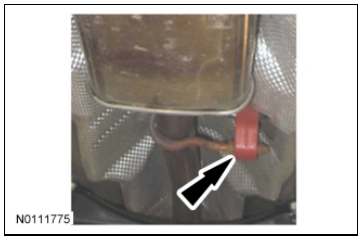






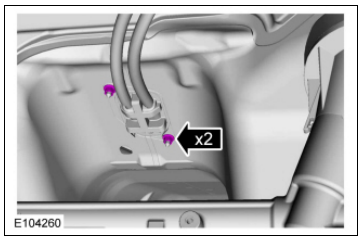
11. Disconnect the exhaust hangers and support the exhaust with wire.





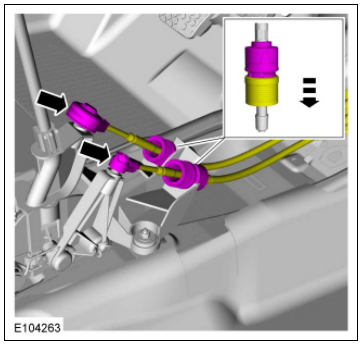
12. Remove the exhaust heat shield.

13. Remove the 2 gearshift cables grommet nuts.



14. Remove the floor console. For additional information, refer to Section 501-12 .

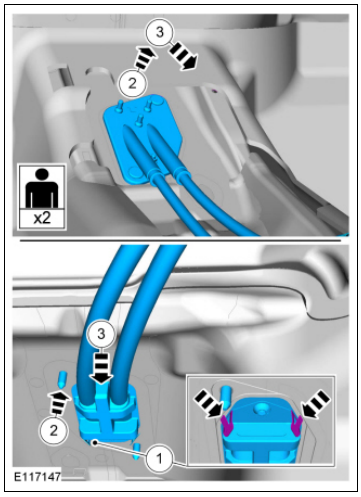
15. Detach the gearshift cables from the gearshift lever.



16. **NOTE:** Heater core and evaporator core housing not shown.

    Remove the gearshift cables.

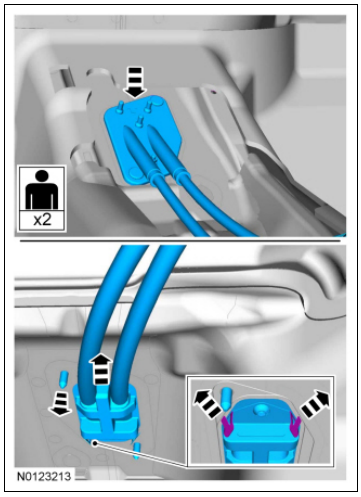
    1. Release the clips.
    2. Push the studs through the floor pan.
    3. Push the gearshift cables grommet through the floor pan and remove the gearshift cables through to the vehicle interior.



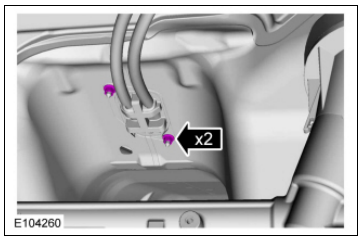
Installation

1. **NOTE:** Heater core and evaporator core housing not shown.

   Position the gearshift cables and gearshift cables grommet in place.

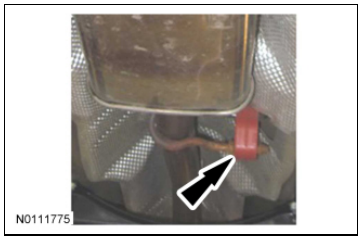


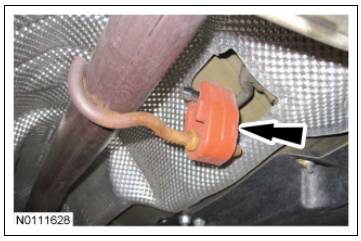
2. Install the 2 gearshift cables grommet nuts.
   - Tighten to 9 Nm (80 lb-in).



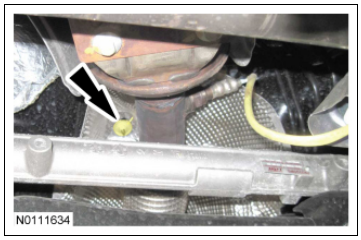
3. Install the exhaust heat shield.

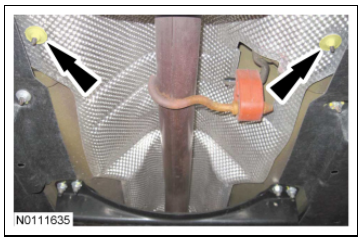
4. Connect the exhaust hangers.

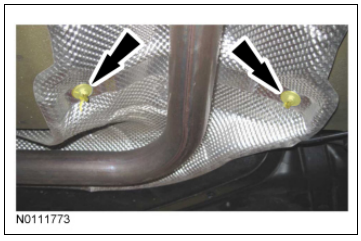




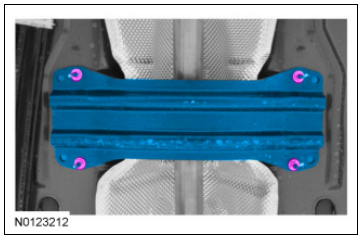
5. Install the 6 exhaust heat shield fasteners (5 shown).



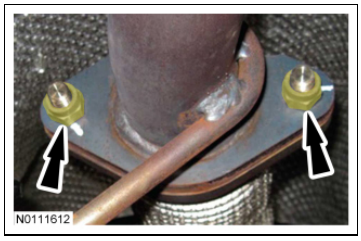




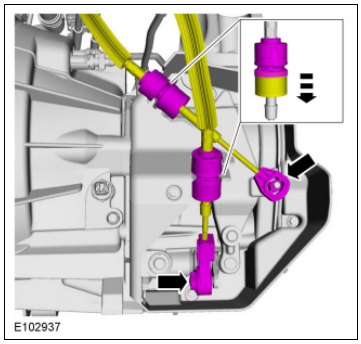
6. Install the cross brace and the 4 cross brace nuts.
   - Tighten to 40 Nm (30 lb-ft).



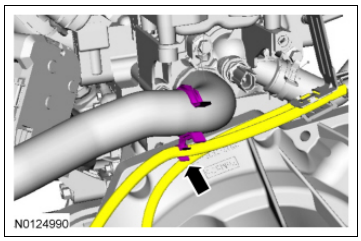
7. Using a new exhaust flange gasket and 2 new exhaust flange nuts, connect the exhaust flange.
   - Tighten to 47 Nm (35 lb-ft).



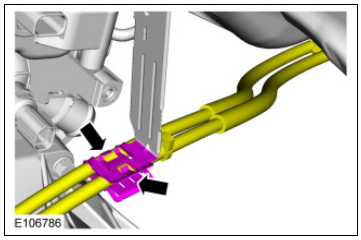
8. Install the gearshift cables.
    - Install the gearshift cables by pulling the lower part of the abutment down and installing the gearshift cables onto the gearshift cables bracket.
    - Push the gearshift cables onto the transaxle shift control levers.



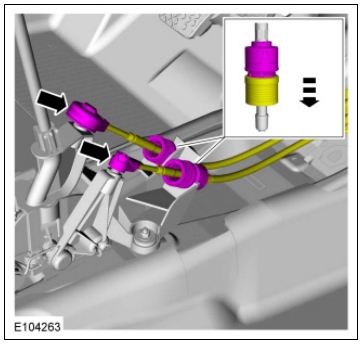
9. Install the gearshift cable on the gearshift cable clip.



10. Install the gearshift cables on the gearshift cables bracket.



11. Attach the gearshift cables to the gearshift lever.



12. Install the floor console. For additional information, refer to Section 501-12 .
13. Install the Air Cleaner (ACL) assembly. For additional information, refer to Section 303-12
14. Install the battery tray. For additional information, refer to Section 414-01
15. Adjust the shift and selector cables. For additional information, refer to Section 308-00 .

Torque Specifications

Description	Nm	lb-ft	lb-in
Catalytic converter bracket-to-engine bolts	50	37	-
Catalytic converter manifold studs	17	-	150
Catalytic converter manifold-to-cylinder head bolt and nuts [a]	-	-	-
Catalytic converter-to-catalytic converter bracket bolts	25	18	-
Catalytic converter-to-muffler and tailpipe assembly nuts	48	35	-
Heat shield bolts	10	-	89
RH halfshaft support bracket upper bolt	48	35	-
RH halfshaft support bracket lower bolts	24	18	-
Worm gear clamp	7	-	62

[a] See the procedure for specification.

Exhaust System

The exhaust system consists of:

- a one-piece catalytic converter manifold with exhaust flexible pipe.
- a resonator.
- a muffler and tailpipe assembly with isolators.

The exhaust system provides an exit for exhaust gases and reduces engine noise by passing exhaust gases through the catalytic converter, a muffler and tailpipe assembly and resonator. Rubber exhaust hanger isolators attach the exhaust system to the mounting hooks on the body.

Catalytic Converter

The catalytic converter plays a major role in the emission control system by functioning as a gas reactor. The catalytic converter speeds up the heat producing chemical reaction between the components of the exhaust gases to reduce air pollutants. Due to the high temperatures at which the catalytic converter operates, the vehicle body areas around the catalytic converter are protected by heat shields. The catalytic converter controls Hydrocarbon (HC), Carbon Monoxide (CO) and Nitrogen Oxides (NOx) emissions.

Exhaust System

Inspection and Verification

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
• Exhaust pipe pinched or crushed • Damaged muffler • Broken or damaged exhaust hanger brackets • Damaged catalytic converter • Cracked exhaust manifold • Loose or damaged heat shields

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 damaged 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 catatic 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

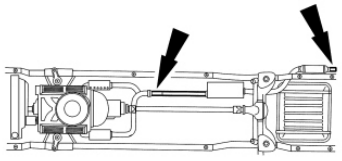
tighten the nuts to specification. INSPECT for missing or damaged damper. INSTALL new components as necey. TEST the system for normal operation after the repair.

- 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 thet 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
A1 CHECK THE EXHAUST SYSTEM	

• Key in RUN position. • Increase the engine rpmil the noise is the loudest. Note the engine rpm. • Ignition OFF. • Add approximately 9 kg (20 lb) of weight to the exhaust system. First place the weight at the tailpipe and test, then at the front pipe.  DF1768-A • Key in RUN position. • Increase the engine rpm and listen for the drumming noise. Note the engine rpm if the noise occurs. • Ignition OFF. • Remove the weight from the exhaust system. • **Is the noise/vibration reduced or eliminated, or does the noise/vibration occur at a different rpm?**	**Yes** REFER to Exhaust System Alignment in this section. TEST the system for normal operation. **No** CONDUCT a diagnosis on other suspect systems. REFER to Section 100-04 .

Exhaust System Alignment

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

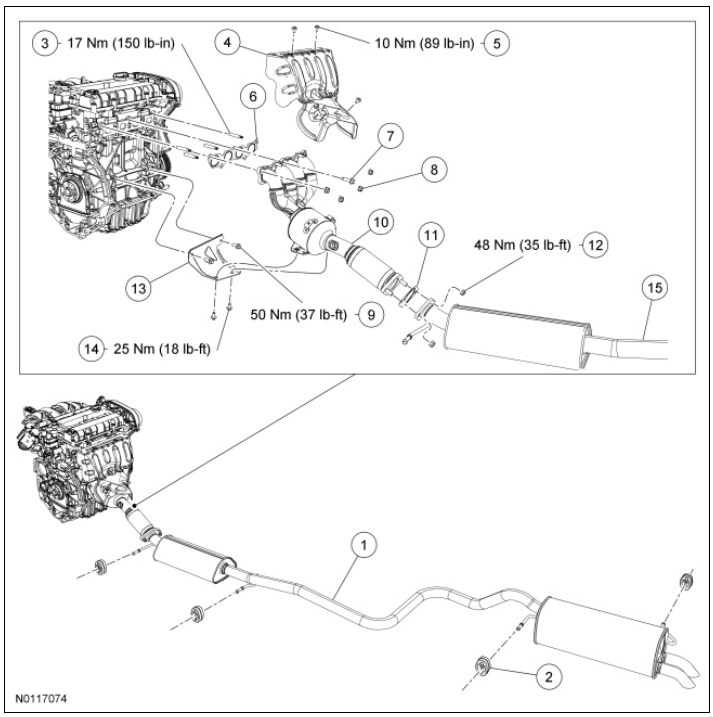
2. Loosen all fasteners joining the exhaust system components.

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.

Exhaust System - Exploded View



Item	Part Number	Description
1	5230	Muffler and tailpipe assembly
2	-	Muffler and tailpipe assembly isolator (4 required)
3	W703540	Catalytic converter manifold stud (4 required)
4	9N454	Heat shield
5	W703715	Heat shield bolt (4 required)
6	9448	Catalytic converter manifold gasket
7	W500634	Catalytic converter manifold-to-cylinder head bolt
8	W703662	Catalytic converter manifold-to-cylinder head nut (4 required)
9	W500433	Catalytic converter bracket-to-engine bolts (2 required)
10	5G232	Catalytic converter assembly
11	9450	Gasket
12	W703662	Catalytic converter-to-muffler and tailpipe assembly nut (2 required)
13	5K291	Catalytic converter bracket
14	W703404	Catalytic converter-to-catalytic converter bracket bolts (2 requi
15	5230	Muffler and tailpipe assembly

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Catalytic Converter

General Equipment

Cable Ties

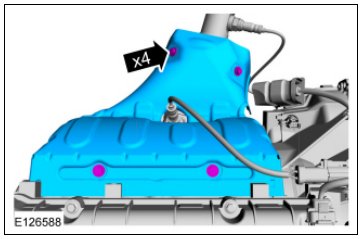
Removal and Installation

NOTE: Exhaust fasteners are of a torque prevailing design. Use only new fasteners with the same part number as the original. Torque values must be used as specified during reassembly to make sure of correct retention of exhaust components.

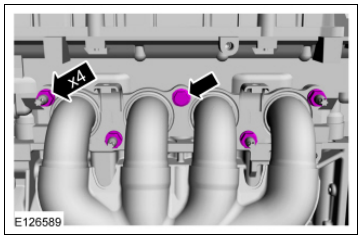
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the Heated Oxygen Sensor (HO2S). For additional information, refer to Section 303-14 .

3. Remove the 4 bolts and position aside the heat shield.



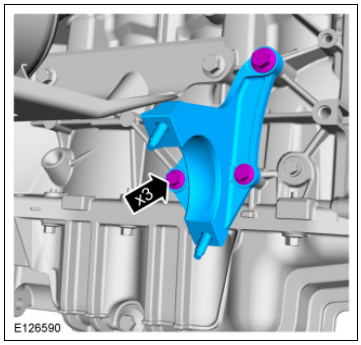
4. Remove and discard the 4 nuts and 1 bolt.



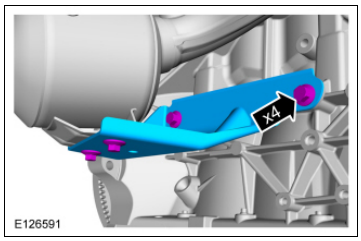
5. Remove the RH halfshaft. For additional information, refer to Front Drive Halfshafts, Halfshaft - Exploded View in Section 205-04 .

6. Remove the Catalyst Monitor Sensor (CMS). For additional information, refer to Section 303-14 .

7. Remove the 3 bolts and the halfshaft support bracket.

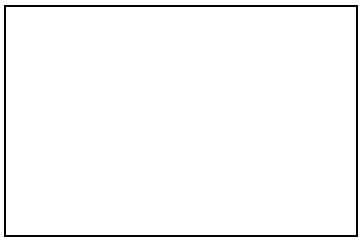


8. Remove the 4 bolts and the catalytic converter bracket.



9. ***NOTICE:*** **Do not forcibly bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

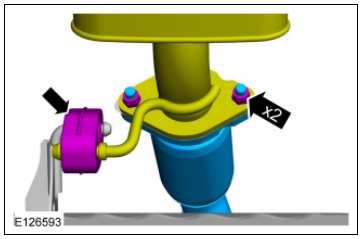
   Using cable ties, support the exhaust flexible pipe with a support wrap or suitable splint.



10. ***NOTICE:*** **Do not forcibly bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

    Detach the muffler and tailpipe assembly isolator and remove the 2 catalytic converter-to-muffler and tailpipe assembly nuts.

    - Remove the catalytic converter assembly.
    - Discard the 2 nuts and gaskets.

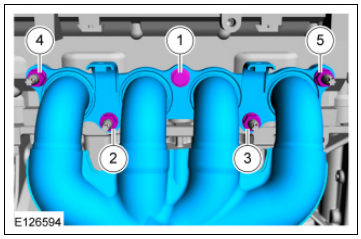


Installation

1. ***NOTICE:*** **Failure to tighten the catalytic converter manifold fasteners in 20 Nm increments until reaching final torque of 55 Nm will cause the converter to develop an exhaust leak.**

Install a new gasket, catalytic converter assembly and new fasteners. Tighten the bolt and 4 nuts in the sequence shown, in 3 stages.

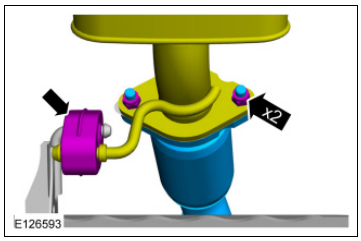
- Stage 1: Tighten to 20 Nm (177 lb-in).
- Stage 2: Tighten to 40 Nm (30 lb-ft).
- Stage 3: Tighten to 55 Nm (41 lb-ft).



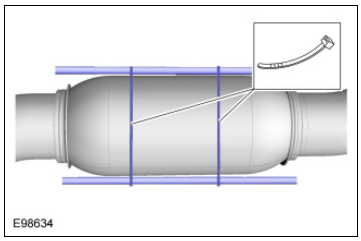
2. ***NOTICE:*** **Do not forcibly bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

   Install a new gasket and 2 new catalytic converter-to-muffler and tailpipe assembly nuts.

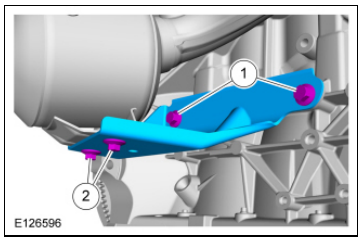
   - Attach the muffler and tailpipe assembly isolator.
   - Tighten to 48 Nm (35 lb-ft).



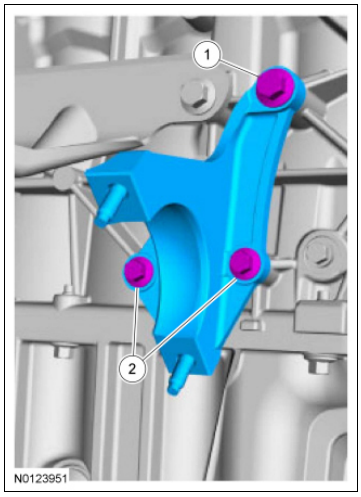
3. Remove the cable ties, support wrap or suitable splint from the exhaust flexible pipe.



4. Install the catalytic converter bracket and the 4 bolts.
   1. Tighten the 2 catalytic converter bracket-to-engine block bolts to 50 Nm (37 lb-ft).
   2. Tighten the 2 catalytic converter bracket-to-catalytic converter bolts to 25 Nm (18 lb-ft).



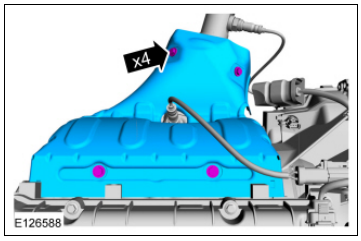
5. Install the halfshaft support bracket and the 3 bolts.
   1. Tighten the upper bolt to 48 Nm (35 lb-ft).
   2. Tighten the 2 lower bolts to 24 Nm (18 lb-ft).



6. Install the RH halfshaft. For additional information, refer to Front Drive Halfshafts, Halfshaft - Exploded View in Section 205-04 .

7. Install the Catalyst Monitor Sensor (CMS). For additional information, refer to Section 303-14 .

8. Install the 4 bolts and the heat shield.
   - Tighten to 10 Nm (89 lb-in).



9. Install the Heated Oxygen Sensor (HO2S). For additional information,efer to Section 303-14 .

10. Fill the transmission/transaxle to the correct fluid level. For Automatic Transmission/Transaxle, refer to Transmission Fluid Level Check in Section 307-11 . For Manual Transmission/Transaxle, refer to Transaxle Draining and Refilling in Section 308-03 .

Muffler and Tailpipe

General Equipment

Air Body Saw
Cable Ties

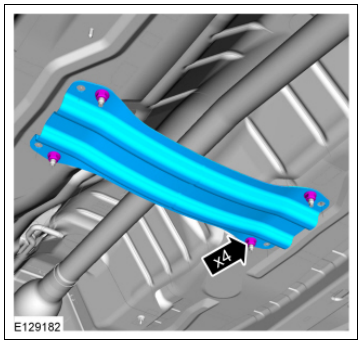
Removal and Installation

NOTE: Exhaust fasteners are of a torque prevailing design. Use only new fasteners with the same part number as the original. Torque values must be used as specified during reassembly to make sure of correct retention of exhaust components.

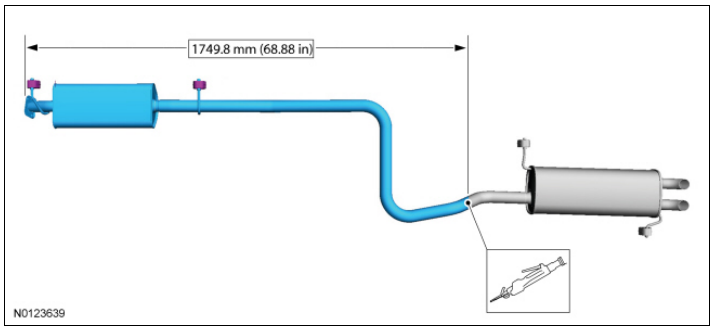
NOTE: Check the exhaust hanger isolators for damage and fatigue. Install new exhaust hanger isolators as required.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Remove the 4 nuts and the brace.



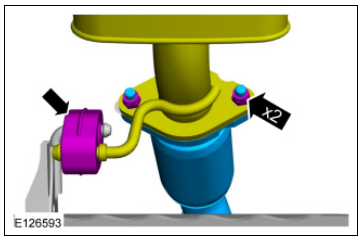
3. Cut the pipe where shown.



4. ***NOTICE:*** **Do not forcibly bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.**

   Detach the front muffler and tailpipe assembly isolators and remove the 2 catalytic converter-to-muffler and tailpipe assembly nuts.

- Remove the front muffler and tailpipe section.
- Discard the 2 nuts and gasket.



5. Detach the 2 isolators and remove the rear muffler and tailpipe section.

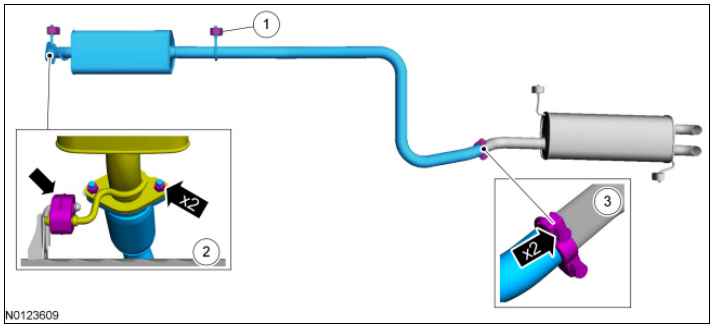
Installation

1. Install the rear muffler and tailpipe section and attach the 2 isolators.

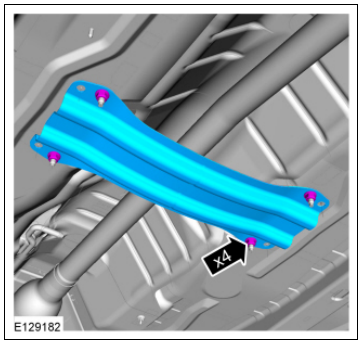
2. **NOTE:** If the rear muffler and tailpipe section is being serviced, the rear muffler service part is sized to overlap the front muffler and tailpipe section (shown). If the front muffler and tailpipe section is being serviced, install the service sleeve and clamp.

   Install the front muffler and tailpipe section.

   1. Attach the front muffler and tailpipe assembly isolator.
   2. Install a new gasket and 2 new catalytic converter-to-muffler and tailpipe assembly nuts.
      - ♦ Attach the front muffler and tailpipe assembly isolator.
      - ♦ Tighten to 48 Nm (35 lb-ft).
   3. Install the service clamp.
      - ♦ Tighten to 45 Nm (33 lb-ft).



3. Install the 4 nuts and the brace.
   - Tighten to 40 Nm (30 lb-ft).



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); or equivalent	WSS-M2C930-A	-

General Specifications

Item	Specification
Fuel Pressure	
Key ON Engine Running (KOER)	379 kPa (55 psi)
Fuel Tank Capacity	
Fuel tank capacity	47 L (12.5 gal)

Fuel System

The fuel system consists of:

- a Multi-Port Fuel Injection (MFI) system.
- a 2-speed Mechanical Returnless Fuel System (MRFS).
- Easy Fuel ™ (capless) fuel tank filler pipe assembly.
- a fuel tank filler pipe containing:
  - a recirculation tube.
  - a fresh air hose.
  - a restrictor plate to permit only unleaded fuel to be pumped into the tank.
- a fuel tank.
- a Fuel Pump (FP) module containing:
  - an electric FP , which provides pressurized fuel to the fuel rail.
  - a lifetime fuel filter serviced as part of the FP module.
  - a serviceable fuel level sender.
  - a check valve, which maintains system pressure after the FP is shut off.
  - a pressure relief valve for overpressure protection in the event of restri fuel flow.
- fuel, vapor and brake tubes in an integrated bundle assembly attached to the underside of the vehicle by retaining clips.
- a fuel rail.
- fuel injectors.
- fuel pump control module.

The fuel tank filler pipe cannot be modified in any way.

The vehicle is equipped with electronic Multi-Port Fuel Injection (MFI) that is supplied by a 2-speed Mechanical Returnless Fuel System (MRFS) . The PCM is able to maintain constant fuel pressure by varying the FP output. This is accomplished by increasing or decreasing voltage supplied by the fuel pump control module to the FP based on the duty cycle request from the PCM. The returnless fuel system offers improved economy, lower fuel temperatures and decreased fuel vapor in the fuel tank.

Fuel Pump (FP) Shut-off Feature

In the event of a moderate to severe collision, the vehicle is equipped with a Fuel Pump (FP) shut-off feature that is initiated by the event notification signal.

The event notification signal is a signal provided by the Restraints Control Module (RCM) to the FP control module. Signal communication between the RCM and the FP control module allows the PCM to shut-off the FP .

Should the vehicle shut off after a collision due to this feature, the vehicle may be restarted by first turning the ignition switch to the OFF position and then turn the ignition switch to the ON position. In some instances the vehicle may not start the first time and may take one additional key cycle.

Fuel System

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

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 inlet 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 levelder 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 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's 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
• Bent, kinked or damaged fuel tank filler pipe • Bent, kinked or damaged fuel tank filler pipe fresh air hose or recirculation tube (if equipped) • Incorrect routing of the fuel tank filler pipe • Incorrect routing of the fuel tank filler pipe fresh air hose or recirculation tube (if equipped) • Incorrect position of fuel tank filler pipe clamps • Incorrect position of fuel tank filler pipe fresh air hose or recirculation tube clamps (if equipped) • Fuel tank mounted vapor tubes bent or damaged • Evaporative Emission (EVAP) system tubes or hoses bent or damaged • Accident damage to the fuel tank • Accident damage to the vehicle effecting the fuel tank filler pipe-to-body connection • Unauthorized modifications and/or alterations to the vehicle • EVAP fresh air hose or recirculation tube plugged (dirt, spider webbing)

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 memory DTCs and carry out the self-test diagnostics for the 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	GO to Pinpoint Test A .
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	GO to Pinpoint Test A .
P0452	Evaporative Emission System Pressure Sensor/Switch Low	GO to Pinpoint Test A .
P0453	Evaporative Emission System Pressure Sensor/Switch High	GO to Pinpoint Test A .
P0454	Evaporative Emission System Pressure Sensor/Switch Intermittent	GO to Pinpoint Test A .
P1450	Unable to Bleed up Fuel Tank Vacuum	GO to Pinpoint Test A .
P1451	Evaporative Emission System Vent Control Circuit	GO to Pinpoint Test A .
P260F	Emission System Monitoring Processor Performance	GO to Pinpoint Test A .

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 inlet check valve (part of the fuel tank)
- Fuel level vent valve (part of the fuel tank)

PINPOINT TEST A: SLOW TO FILL

Test Step	Result / Action to Take
A1 CARRY OUT INSPECTION AND VERIFICATION	
• Carry out inspection and verification. • **Was the cause of the concern found?**	**Yes** REPAIR or INSTALL new components to correct the concern. **No** GO to A2 .
A2 CHECK THE SYSTEM FOR ANY EVAP DTCs	
• Connect the scan tool. • Check the system for any of the following EVAP DTCs: P0446, P0451, P0452, P0453, P0454, P1450, P1451 and P260F. • **Are any of these DTCs present?**	**Yes** REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual to diagnosis the EVAP system. **No** GO to A3 .
A3 CHECK THE FUEL TANK FILLER PIPE ASSEMBLY FOR BLOCKAGE OR RESTRICTION	
• Remove the fuel tank filler pipe assembly. Refer to Section 310-01 . • Inspect the fuel tank filler pipe and fuel tank filler pipe fresh air hose or recirculation tube (if equipped) for a blockage or restriction. • **Is the fuel tank filler pipe or fuel tank filler pipe fresh air hose or recirculation tube (if equipped) blocked or restricted?**	**Yes** If possible, REPAIR the blockage or restriction. If the blockage or restriction cannot be repaired, INSTALL a new fuel tank filler pipe. REFER to Section 310-01 . **No** GO to A4 .
A4 CHECK THE FUEL TANK INLET CHECK VALVE	
• Inspect the fuel tank inlet check valve for restriction or sticking. • **Is the fuel tank inlet check valve restricted or sticking?**	**Yes** If possible, REPAIR the restriction. If the restriction cannot be repaired, INSTALL a new fuel tank. REFER to Section 310-01 . **No** INSTALL a new fuel tank. REFER to Section 310-01 .

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.

⚠ 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. **NOTE:** The Fuel Pump (FP) module fuse is located in the Battery Junction Box (BJB), location F8.

   Remove the FP module fuse.

2. **NOTE:** The engine will crank and not start.

   Crank the engine for approximately 20 seconds.

3. Crank the engine an additional 20 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.

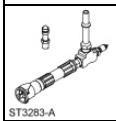
6. **NOTE:** It may take more than one key cycle to pressurize the fuel system. Cycle the ignition key and wait 3 seconds to pressurize the fuel system.

   Check for leaks prior to starting the engine.

7. Start the vehicle and check the fuel system for leaks.

Fuel System Pressure Test

Special Tool(s)

 ST3038-A	Fuel Pressure Test Kit 310-D009 or equivalent
 ST3283-A	Fuel Pressure T-Adapter 5/16" 310-D251 or equivalent

⚠ ING: 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.

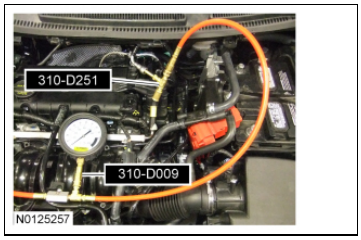
⚠ WARNING: When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

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 supply tube-to-fuel rail spring lock coupling. For additional information, refer to Spring Lock Couplings in this section.

4. Install the Fuel Pressure T-Adapter 5/16" and Fuel Pressure Test Kit in line between the fuel supply line and 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 completing 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 the Fuel Pressure Test Kit.

   Test the fuel system pressure to make sure it is within the specified range. For additional information, refer to Specifications in this section.

Fuel Tank Draining

Special Tool(s)

 ST1134A	Fuel Storage Tanker 164-R3202 or equivalent

⚠ 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.

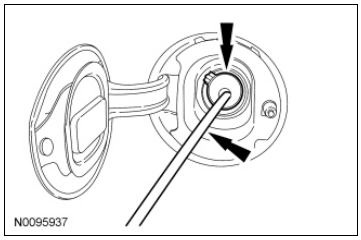
⚠ WARNING: When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Remove the fuel filler cap slowly. The fuel system may be under pressure. If the fuel filler cap is venting vapor or if you hear a hissing sound, wait until it stops before completely removing the fuel filler cap. Otherwise, fuel may spray out. 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. **NOTE:** The supplemental refueling adapter is located in the luggage compartment.

   Install the supplemental refueling adapter and a length of semi-rigid fuel drain tube into the Easy Fuel ™ (capless) fuel tank filler pipe.

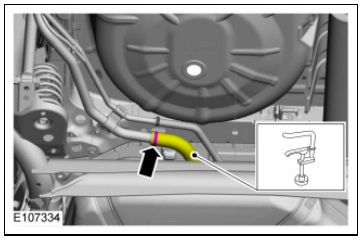


3. Attach the Fuel Storage Tanker to the fuel drain tube and drain as much fuel as possible from the Easy Fuel ™ (capless) fuel tank filler pipe, lowering the fuel level below the fuel tank inlet spout.

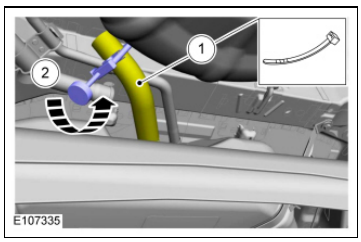
4. **NOTE:** Some residual fuel may remain in the fuel tank filler pipe. Carefully drain into a suitable container.

   Release the clamp and position the fuel tank filler pipe hose aside.

   - To install, tighten to 4 Nm (35 lb-in).



5. Secure the fuel tank filler pipe hose above the fuel level.



6. Insert the fuel drain tube into the fuel tank filler pipe hose, attach the Fuel Storage Tanker and drain as much fuel as possible from the fuel tank.

Spring Lock Couplings

Special Tool(s)

 ST2590-A	Disconnect Tool, Spring Lock Coupling 310-040 or equivalent

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: 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.

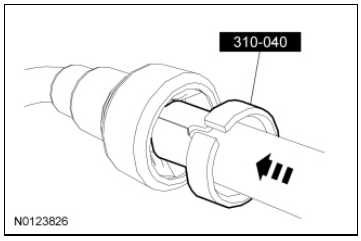
NOTICE: **When reusing liquid or vapor tube connectors, make sure to use compressed air to remove any foreign material from the connector retaining clip area before separating from the tube or damage to the tube or connector retaining clip can occur.**

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 plugs to any open orifices or tubes.**

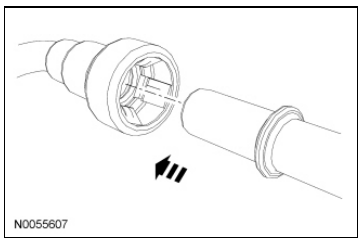
1. Release the fuel system pressure. For additional information, refer to Fuel System Pressure Release in this section.

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

3. Install the Spring Lock Coupling Disconnect Tool on the tube and push into the spring lock coupling to release.

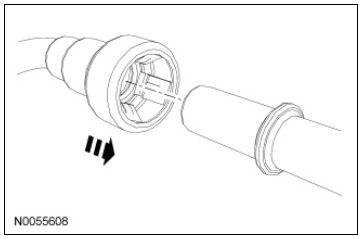


4. Separate the spring lock coupling from the tube.



Connect

1. Align and push the spring lock coupling onto the tube until a click is heard.



2. Pull on the coupling to make sure it is fully engaged.

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

Quick Connect Coupling

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: 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.**

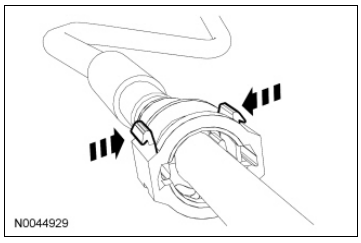
NOTICE: **Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components or component damage can occur. Always install plugs to any open orifices or tubes.**

NOTICE: **Do not use any tools. The use of tools may cause a deformity in the clip components which may cause fuel leaks.**

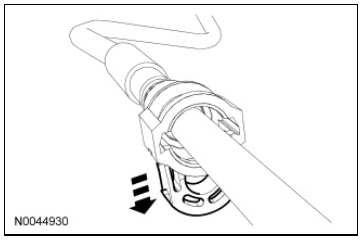
1. If servicing a liquid fuel tube quick connect coupling, release the fuel system pressure. For additional information, refer to Fuel System Pressure Release in this section.

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

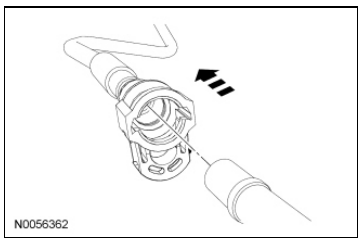
3. Squeeze the quick connect coupling retainer clip tabs to release the locking mechanism.



4. Push the locking mechanism outward to release the tube.

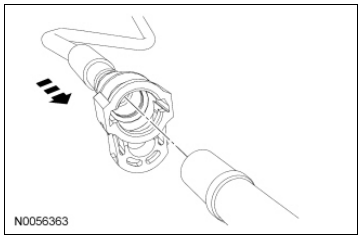


5. Remove the quick connect coupling from the tube.

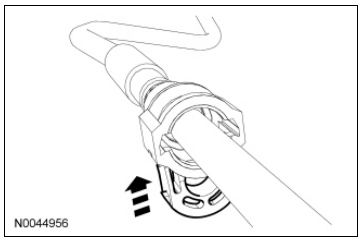


Connect - Type I

1. Install the quick connect coupling onto the tube.

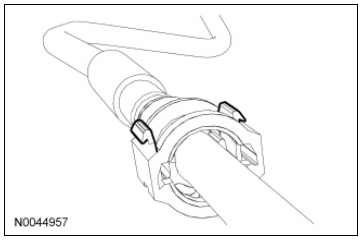


2. Depress the quick connect coupling locking mechanism into the locked position.



3. **NOTE:** Make sure the coupling is completely seated and locked onto the tube by pulling on the quick connect coupling.

   Visually inspect and verify that the locking mechanism is flush with the quick connect coupling housing and that the tabs are locked in place.



4. 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: 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 mayesult 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.**

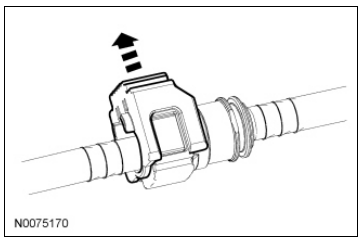
NOTICE: **Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components or component damage can occur. Always install plugs to any open orifices or tubes.**

NOTICE: **Do not use any tools. The use of tools may cause a deformity in the clip components which may cause fuel leaks.**

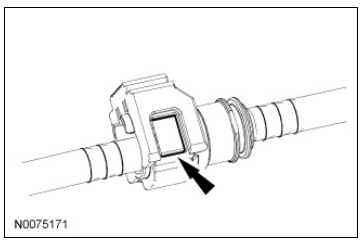
1. If servicing a liquid fuel tube quick connect coupling, release the fuel system pressure. For additional information, refer to Fuel System Pressure Release in this section.

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

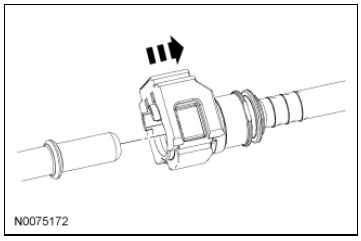
3. Position the secondary latch outward.



4. Squeeze both of the release tabs.

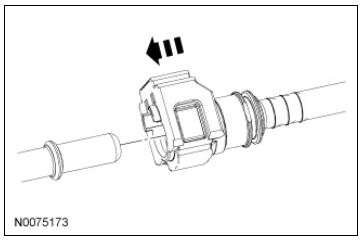


5. Remove the quick connect coupling from the tube.



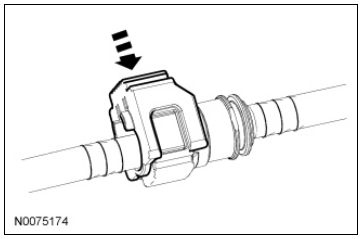
Connect - Type II

1. Install the quick connect coupling onto the tube until completely seated.



2. **NOTE:** Make sure the coupling is completely seated and locked onto the tube by pulling on the quick connect coupling.

   Apply the secondary latch into the locked 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-5W2QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A	-

General Specifications

Item	Specification
Fuel tank capacity	47 L (12.5 gal)

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake tube fittings	17	-	150
Fuel tank filler pipe bracket bolt	11	-	97
Fuel tank filler pipe hose clamp	4	-	35
Fuel tank strap bolt	25	18	-

Fuel Tank and Lines

The fuel system consists of:

- a Multi-Port Fuel Injection (MFI) system.
- a 2-speed Mechanical Returnless Fuel System (MRFS).
- Easy Fuel ™ (capless) fuel tank filler pipe assembly.
- a fuel tank filler pipe containing:
  - a recirculation tube.
  - a fresh air hose.
  - a restrictor plate to permit only unleaded fuel to be pumped into the tank.
- a fuel tank.
- a Fuel Pump (FP) module containing:
  - an electric FP , which provides pressurized fuel to the fuel rail.
  - a lifetime fuel filter serviced as part of the FP module.
  - a serviceable fuel level sender.
  - a check valve, which maintains system pressure after the FP is shut off.
  - a pressure relief valve for overpressure protection in the event of restricted fuel flow.
- fuel, vapor and brake tubes in an integrated bundle assembly attached to the underside of the vehicle by retaining clips.
- a fuel rail.
- fuel injectors.
- fuel pump control module.

The fuel tank filler pipe cannot be modified in any way.

The vehicle is equipped with electronic Multi-Port Fuel Injection (MFI) that is supplied by a 2-speed Mechanical Returnless Fuel System (MRFS) . The PCM is able to maintain constant fuel pressure by varying the FP output. This is accomplished by increasing or decreasing voltage supplied by the fuel pump control module to the FP based on the duty cycle request from the PCM. The returnless fuel system offers improved economy, lower fuel temperatures and decreased fuel vapor in the fuel tank.

Fuel Pump (FP) Shut-off Feature

In the event of a moderate to severe collision, the vehicle is equipped with a Fuel Pump (FP) shut-off feature that is initiated by the event notification signal.

The event notification signal is a signal provided by the Restraints Control Module (RCM) to the FP control module. Signal communication between the RCM and the FP control module allows the PCM to shut-off the FP .

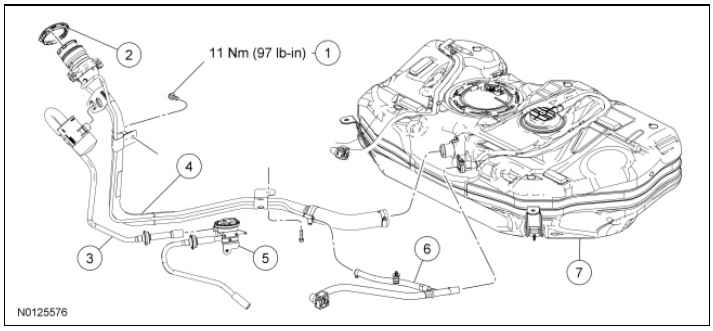
Should the vehicle shut off after a collision due to this feature, the vehicle may be restarted by first turning the ignition switch to the OFF position and then turn the ignition switch to the ON position. In some instances the vehicle may not start the first time and may take one additional key cycle.

Fuel Tank and Lines

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

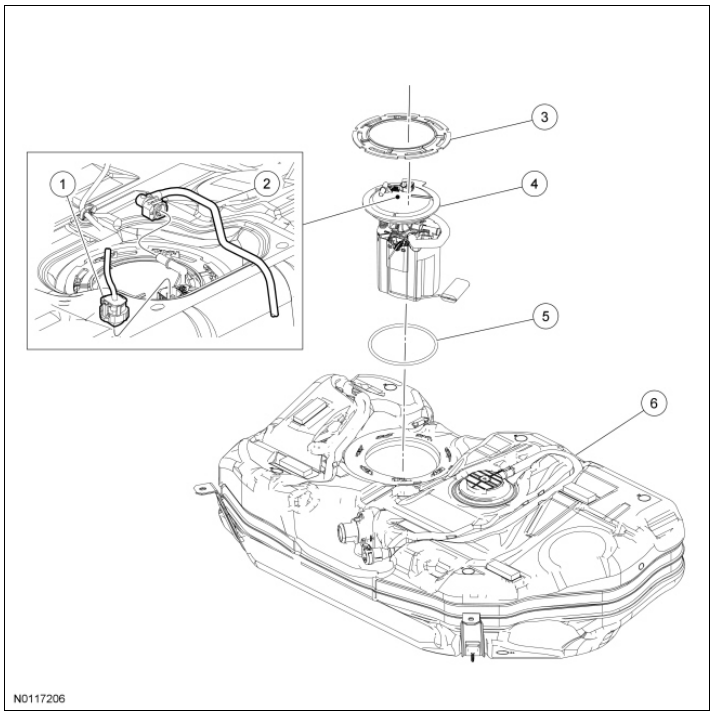
Fuel Tank and Filler Pipe - Exploded View

Fuel Tank Filler Pipe Assembly



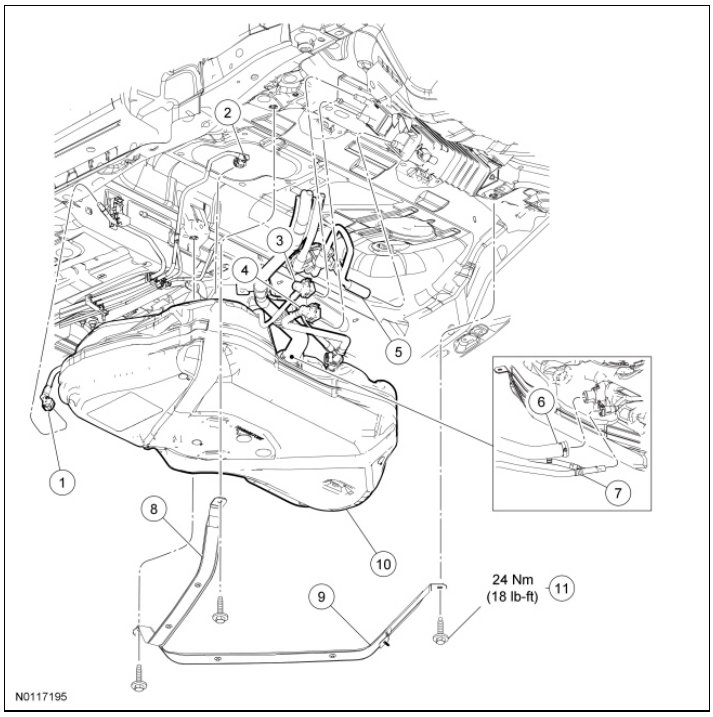
Item	Part Number	Description
1	W700228	Fuel tank filler pipe bracket bolt (2 required)
2	9K072	Fuel tank filler pipe information bezel
3	-	Fresh air hose (part of 9J279)
4	9034	Fuel tank filler pipe
5	9J279	Natural vacuum leak detection valve
6	9B033	Fuel vapor tube assembly
7	9002	Fuel tank

Fuel Fuel Pump (FP) Module and Lock Ring



Item	Part Number	Description
1	-	Fuel Pump (FP) module el connector (part of 14A005)
2	9L291	Fuel supply tube
3	9C385	FP module lock ring
4	9H307	FP module
5	9276	FP module O-ring seal
6	9002	Fuel tank

Fuel Tank and Fuel Tank Supports



Item	Part Number	Description
1	9B337	Evaporative Emission (EVAP) vapor tube quick connect coupling-to-fuel vapor tube assembly
2	9L291	Fuel supply tube quick connect coupling
3	9B337	EVAP vapor tube quick connect coupling-to- EVAP canister
4	9B033	Fuel vapor tube quick connect coupling-to- EVAP canister
5	-	Natural vacuum leak detection valve hose (part of 9J279)
6	9034	Fuel tank filler pipe
7	9B033	Fuel vapor tube assembly
8	9054	Fuel tank strap
9	9054	Fuel tank strap
10	9002	Fuel tank
11	W700222	Fuel tank strap bolt (3 required)

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

Fuel Tank

Special Tool(s)

 ST1293-A	Powertrain Lift 300-OTC1585AE or equivalent

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.

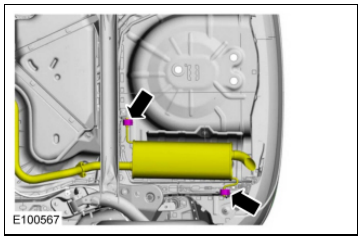
⚠ WARNING: Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result 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.

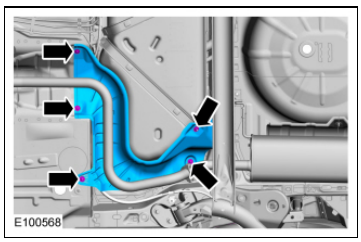
⚠ WARNING: Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

NOTE: Front grounding clip needs to be present and replaced if damaged using only a black grounded clip. Do not substitute for another clip.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .
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. Drain the fuel tank. For additional information, refer to Section 310-00 .
5. Disconnect the muffler and tailpipe assembly from the insulators.



6. Remove the 5 nuts and fuel tank heat shield.



7. Disconnect the fuel vapor tube assembly-to-fuel tank quick connect coupling. For additional information, refer to Section 310-00 .

8. Loosen the hose clamp and disconnect the fuel tank filler pipe from the fuel tank.

9. Position the Powertrain Lift under the fuel tank.

10. **NOTE:** Some residual fuel may remain in the fuel tank filler pipe after draining the fuel tank. Carefully drain any residual fuel into a suitable container.

    Release the clamp and disconnect the fuel tank filler pipe from the fuel tank.

    - To install, tighten clamp to 4Nm (35 lb-in).

11. Position the Powertrain Lift under the fuel tank.

12. Remove the 3 fuel tank strap bolts.
    - To install, tighten to 25 Nm (18 lb-ft).

13. Partially lower the fuel tank for access.

14. Disconnect the fuel supply tube-to-Fuel Pump (FP) module quick connect coupling. For additional information, refer to Section 310-00 .

15. Disconnect the FP module electrical connector.

16. Lower the fuel tank.

17. To install, reverse the removal procedure.

Fuel Tank Filler Pipe

Special Tool(s)

 ST1134A	Fuel Storage Tanker 164-R3202 or equivalent

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: Remove the fuel filler cap slowly. The fuel system may be under pressure. If the fuel filler cap is venting vapor or if you hear a hissing sound, wait until it stops before completely removing the fuel filler cap. Otherwise, fuel may spray out. 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.

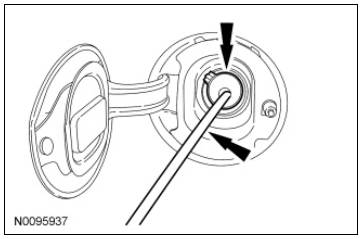
⚠ WARNING: Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

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

3. **NOTE:** The supplemental refueling adapter is located in the luggage compartment.

   Install the supplemental refueling adapter and a length of semi-rigid fuel drain tube into the Easy Fuel ™ (capless) fuel tank filler pipe.


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4. **NOTE:** If the fuel tank is completely full, this step will lower the fuel level to the fuel tank Inlet.

   Attach the Fuel Storage Tanker to the fuel drain tube and drain the fuel from the fuel tank filler pipe.

5. Remove the information bezel.

6. Remove the LR wheel and tire. For additional information, refer to Section 204-04 .

7. Remove the 3 retainers, 2 pin-type retainers and position LR splash shield aside.

8. Release the fresh air hose from the fuel tank filler pipe bracket and disconnect the fresh air hose retainer from the fuel tank filler pipe.

9. Disconnect the fuel vapor tube-to-Evaporative Emission (EVAP) canister quick connect coupling. For additional information, refer to Section 310-00 .

10. Release the clamp and disconnect the fuel tank filler pipe recirculation tube.

11. **NOTE:** The fuel tank filler pipe may have some residual fuel remaining in it after draining. Upon disconnecting the fuel tank filler pipe, carefully drain the residual fuel into a suitable container.

    Release the clamp and disconnect the fuel tank filler pipe from the fuel tank.

    - To install, tighten to 4 Nm (35 lb-in).

12. Remove the 2 fuel tank filler pipe bracket bolts.
    - To install, tighten to 11 Nm (97 lb-in).

13. Remove the fuel tank filler pipe from the vehicle.

14. To install, reverse the removal procedure.

Fuel Pump Module

Special Tool(s)

 ST2603-A	Lock Ring Wrench 310-123

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: 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.

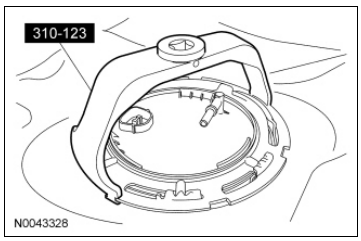
NOTE: The Fuel Pump (FP) module has a serviceable fuel level sender. For additional information, refer to Fuel Level Sender in this section.

1. **NOTE:** To avoid introducing contamination into the fuel tank use water to clean the FP module connections, couplings, flange surface and the immediate surrounding area of any dirt or foreign material. Blow dry thoroughly with shop air after cleaning.

Remove the fuel tank. For additional information, refer to Section 310-01 .

2. ***NOTICE:*** **Carefully install the lock ring wrench to avoid damaging the Fuel Pump (FP) module when removing the lock ring**

   Using the lock ring wrench, rotate the lock ring counterclockwise and remove the FP module lock ring.



3. ***NOTICE:*** **The Fuel Pump (FP) module must be handled carefully to avoid damage to the float arm.**

   NOTE: The FP module will have residual fuel remaining internally, drain into a suitable container.

   Remove the FP module from the fuel tank.

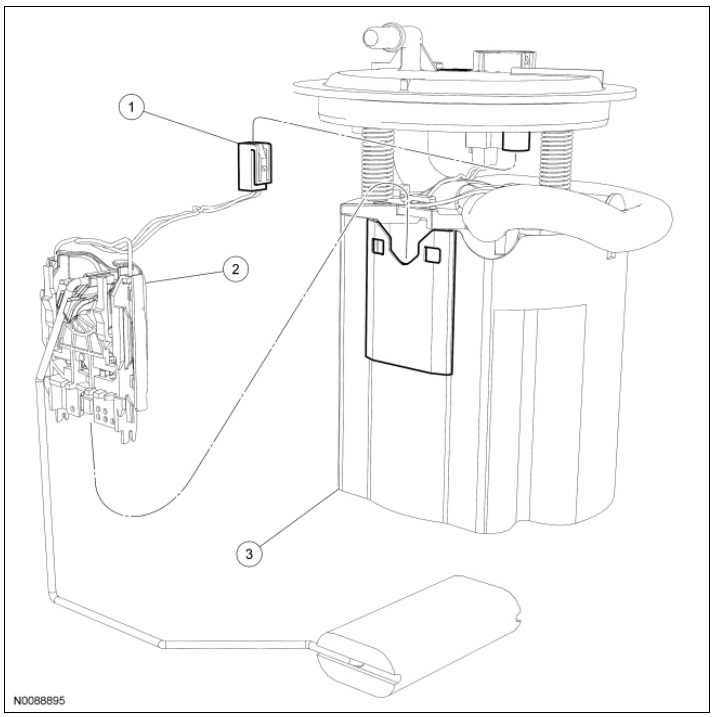
4. **NOTE:** Inspect the mating surfaces of the FP module flange and the fuel tank O-ring seal contact surfaces. Do not polish or adjust the O-ring seal contact area of the fuel tank flange or the fuel tank. Install a new FP module or fuel tank if the O-ring seal contact area is bent, scratched or corroded.

   NOTE: To install, apply clean engine oil to the new O-ring seal.

   Remove and discard the FP module O-ring seal.

5. To install, reverse the removal procedure.
   - Install a new FP module O-ring seal.

Fuel Level Sender



Item	Part Number	Description
1	-	Fuel level sender electrical connector (part of 9A299)
2	9A299	Fuel level sender
3	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.

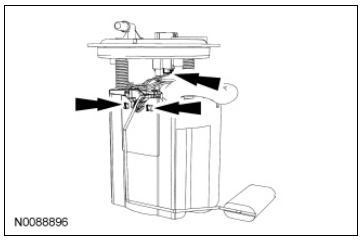
⚠ WARNING: When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition soues. Failure to follow these instructions may result in serious personal injury.

⚠ 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 Pump (FP) module. For additional information, refer to Fuel Pump Module in this section.

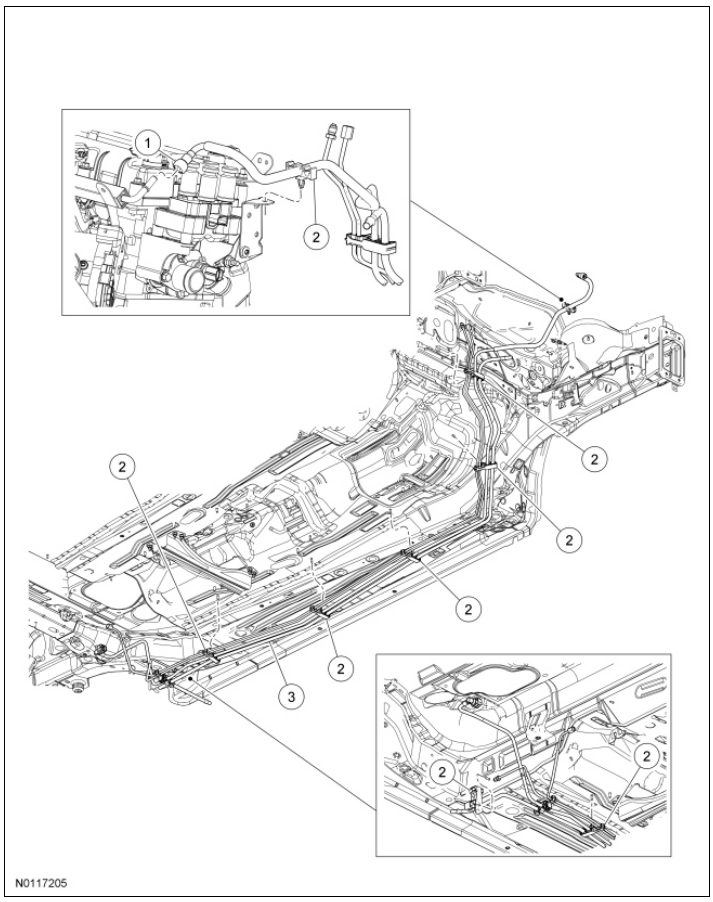
2. Disconnect the fuel level sender electrical connector.

3. Depress the lock tabs and slide the fuel level sender upwards.
    - Remove the sender from the FP module.



4. To install, reverse the removal procedure.

Fuel Lines - Exploded View



Item	Part Number	Description
1	-	Fuel tube spring lock coupling (part of 9L291)
2	-	Fuel tube bundle retainer (part of 9L291)
3	9L291	Fuel tube bundle

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

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. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

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. Remove the fuel tank. For additional information, refer to Fuel Tank in this section.

5. Disconnect the fuel tube-to-fuel rail spring lock coupling.

6. Disconnect the Evaporative Emission (EVAP) canister purge valve-to-fuel vapor tube assembly quick connect coupling.

7. **NOTE:** Cap the brake tube connections to prevent fluid loss or dirt contamination.

   Disconnect the 2 Hydraulic Control Unit (HCU) brake tube inline fittings-to-fuel bundle assembly and postion aside.

   - To install, tighten to 17 Nm (150 b-in).

8. Disconnect the 2 rear brake tube fittings-to-fuel bundle assembly.
   - To install, tighten to 17 Nm (150 b-in).

9. Disconnect the 5 fuel tube bundle retainers and remove fuel tube bundle assembly.

10. To install, reverse the removal procedure.
    - Bleed the brake system. For additional information, refer to Section 206-00 .

Torque Specifications

Description	Nm	lb-ft
Accelerator pedal and sensor assembly nuts	22	16

Acceleration Control

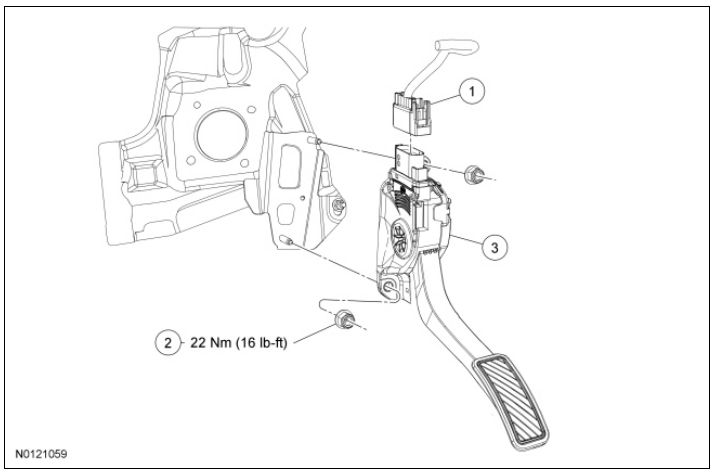
The acceleration controls consist of the accelerator pedal and sensor assembly.

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.

Acceleration Control

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Accelerator Pedal



Item	Part Number	Description
1	-	Accelerator pedal sensor electrical connector (part of 14K733)
2	W706840	Accelerator pedal and sensor assembly nut (2 required)
3	9F836	Accelerator pedal and sensor assembly

Removal and Installation

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. Remove the 2 nuts and the accelerator pedal and sensor assembly.
   - To install, tighten to 22 Nm (16 lb-ft).

3. To install, reverse the removal procedure.

Acronyms

4WD - Four-Wheel Drive

AAT - Ambient Air Temperature

ABS - Acrylonitrile Butadiene Styrene

ABS - Anti-Lock Brake System

ACL - Air Cleaner

ACM - Audio Control Module

ACM - Audio Front Control Module

ALR - Automatic Locking Retractor

APIM - Accessory Protocol Interface Module

APP - Accelerator Pedal Position

BCM - Body Control Module

BCM-HVTB - Battery Control Module - High Voltage Traction Battery

BH - Bake Hardened Steel

BJB - Battery Junction Box

BPP - Brake Pedal Position

BSIA - Brake Shift Interlock Actuator

BTS - Belt Tension Sensor

CAN - Controller Area Network

CCA - Cold Cranking Amps

CFC - Chlorofluorocarbons

CHT - Cylinder Head Temperature

CIP - Consumer Interface Processor

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

CO - Carbon Monoxide

CPA - Connector Position Assurance

CPP - Clutch Pedal Position

D/A - Dual Action

DERU - Drive Engine Run-Up

DLC - Data Link Connector

DMM - Digital Multimeter

DP - Dual Phase Steel

DRL - Daytime Running Lamps

DRM - Digital Rights Management

DTC - Diagnostic Trouble Code

DTE - Distance To Empty

EBD - Electronic Brake Distribution

ECM - Engine Control Module

ECT - Engine Coolant Temperature

ECU - Electronic Control Unit

EEPROM - Electrically Erasable Programmable Read-Only Memory

EI - Electronic Ignition

ELR - Emergency Locking Retractor

EMTC - Electronic Manual Temperature Control

EOP - Engine Oil Pressure

EPAS - Electronic Power Assist Steering

ESC - Electronic Stability Control

ESN - Electronic Serial Number

ETB - Electronic Throttle Body

ETC - Electronic Throttle Control

EVA - Electronic Vibration Analyzer

EVAP - Evaporative Emission

FCDIM - Front Control/Display Interface Module

FCIM - Front Controls Interface Module

FDIM - Front Display Interface Module

FEAD - Front End Accessory Drive

FET - Field-Effect Transistor

FP - Fuel Pump

FWD - Front Wheel Drive

GPSM - Global Positioning System Module

GVWR - Gross Vehicle Weight Rating

HC - Hydrocarbon

HCU - Hydraulic Control Unit

HO2S - Heated Oxygen Sensor

HS-CAN - High Speed Controller Area Network

HSLA - High-Strength Low Alloy

HVAC - Heating Ventilation Air Conditioning

I-CAN - Infotainment Controller Area Network

IA - Intelligent Access

IAT - Intake Air Temperature

IC - Instrument Cluster

IDS - Integrated Diagnostic System

IKT - Integrated Keyhead Transmitter

IKTs - Integrated Keyhead Transmitters

IPC - Instrument Panel Cluster

IPM-A - Image Processing Module - A

ISO - International Organization for Standardization

KAM - Keep Alive Memory

KOEO - Key ON Engine OFF

KOER - Key ON Engine Running

KS - Knock Sensor

LCD - Liquid Crystal Display

LED - Light Emitting Diode

LIN - Local Interconnect Network

MACS - Mobile Air Conditioning Society

MAF - Mass Air Flow

MFI - Multi-Port Fuel Injection

MIG - Metal Inert Gas

MIL - Malfunction Indicator Lamp

MRFS - Mechanical Returnless Fuel System

MS-CAN - Medium Speed Controller Area Network

NERU - Neutral Engine Run-Up

NOx - Nitrogen Oxides

NVH - Noise, Vibration and Harshness

NVM - Non-Volatile Memory

O/D - Overdrive

OASIS - On-Line Automotive Service Information System

OBD - On-Board Diagnostic

OCS - Occupant Classification System

OCSM - Occupant Classification System Module

OE - Original Equipment

OEM - Original Equipment Manufacturer

ORVR - On-Board Refueling Vapor Recovery

OSS - Output Shaft Speed

PAD - Passenger Air Bag Deactivation

PATS - Passive Anti-Theft System

PC/ED - Powertrain Control/Emissions Diagnosis

PCM - Powertrain Control Module

PIN - Personal Identification Number

PMI - Programmable Module Installation

PSCM - Power Steering Control Module

PTS - Professional Technician Society

PVC - Polyvinyl Chloride

PVC - Polyvinyl Chloride

PWM - Pulse Width Modulated

RCM - Restraints Control Module

READ - Rear End Accessory Drive

RFA - Remote Function Actuator

RFI - Radio Frequency Interference

RFR - Remote Functions Receiver

RKE - Remote Keyless Entry

ROM - Read-Only Memory

ROW - Rest Of World

SDARS - Satellite Digital Audio Receiver System

SFI - Sequential Multi-Port Fuel Injection

SJB - Smart Junction Box

SMC - Sheet-Molded Composite

SRS - Supplemental Restraint System

STRW - Squeeze-Type Resistance Spot Welding

TB - Throttle Body

TCIL - Transmission Control Indicator Lamp

TCM - Transmission Control Module

TCS - Transmission Control Switch

TDC - Top Dead Center

TIC - Transmitter Identification Code

TICs - Transmitter Identification Codes

TPM - Tire Pressure Monitor

TPM - Tire Pressure Monitor Module

TPMS - Tire Pressure Monitoring System

TPO - Thermoplastic Olefin

TR - Transmission Range

TSB - Technical Service Bulletin

TTS - Text-To-Speech

TXV - Thermostatic Expansion Valve

UHSS - Ultra High Strength Steel

USB - Universal Serial Bus

VC - Vehicle Certification

VCM - Vehicle Communication Module

VCT - Variable Camshaft Timing

VID - Vehicle Identification

VIN - Vehicle Identification Number

VIP - Vehicle Interface Processor

VSM - Vehicle Security Module

VSS - Vehicle Speed Sensor

WMI - World Manufacturer Identifier

WOT - Wide Open Throttle

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Steering System

Electronic Power Assist Steering (EPAS) System

NOTICE: **The steering sensor contains a clockspring that will be damaged if the steering column is not handled correctly. To prevent damage to the steering sensor, use the service bolt (HB1) to lock the steering column in the straight ahead position before disconnecting the steering column from the steering gear. Damage caused to the steering sensor by failing to lock the steering when disconnecting the column from the steering gear leads to a complete failure of the Electronic Power Assist Steering (EPAS) system and requires a new EPAS column to be installed.**

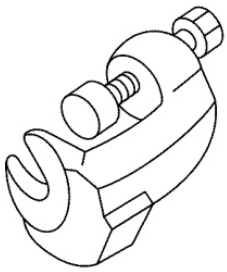
The Electronic Power Assist Steering (EPAS) system consists of the following components:

- Power Steering Control Module (PSCM) - the PSCM controls the functions of the EPAS system and communicates with other modules on the High Speed Controller Area Network (HS-CAN). The PSCM is attached to the EPAS column assembly and cannot be serviced separately.
- Motor - the EPAS column uses a 12-volt brushless, reversible motor, a worm gear and a reduction gear to control the steering effort. The motor is attached to the EPAS column assembly and cannot be serviced separately.
- Steering sensor - the PSCM uses the steering sensor to determine force applied to, speed and direction of the steering wheel. This information is transmitted to other modules along the HS-CAN . The sensor is attached to the EPAS column assembly and cannot be serviced separately.
- Steering column shaft - the steering column shaft connects the EPAS column assembly to the steering gear and can be serviced separately. For additional information, refer to Section 211-04 .
- Steering gear - the steering gear is a rack and pinion type gear, which is serviced as an assembly and contained within a one-piece aluminum housing. The steering gear uses tie-rod ends to connect the gear to the wheel knuckles. The steering gear can be serviced separately from the EPAS column assembly. For additional information, refer to Section 211-02 .
- Tie-rod ends - one inner and outer tie rod is located at each end of the steering gear and can be serviced separately. For additional information, refer to Section 211-02 .

The EPAS system provides power steering assist to the driver by replacing the conventional hydraulic valve system with an electric motor coupled to the steering shaft. The motor is controlled by the PSCM which senses the steering effort using sensors mounted between the steering column shaft and the steering gear. Steering assist is provided in proportion to the steering input effort and vehicle speed.

Steering System

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD150-R025D or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST1408-A	Tie-Rod End Remover 211-001 (TOOL-3290-D)
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Principles of Operation

Electronic Power Assist Steering (EPAS)

The Electronic Power Assist Steering (EPAS) system provides power steering assist to the driver by replacing the conventional hydraulic valve system with an electric motor coupled to the steering shaft. The motor is controlled by the Power Steering Control Module (PSCM) that senses the steering effort using a torque sensor mounted internally to the steering column assembly. Steering assist is provided in proportion to the steering input effort and vehicle speed.

The EPAS system requires a 12-volt, hot at all times feed for system operation. The PSCM is activated when power is applied to the hardwired ignition/run input. After activation, the PSCM monitors the High Speed Controller Area Network (HS-CAN) to determine if the vehicle is operating in a manner capable of supporting the EPAS system.

The PSCM recieves vehicle speed from the PCM over the HS-CAN and steering shaft speed, direction and position from the steering shaft sensor to determine the amount or level of power steering assist provided by the EPAS system.

The level of steering assist is primarily based on vehicle speed. As vehicle speed increases, the amount of assist decreases to improve and enhance road feel at the steering wheel. As vehicle speed decreases the amount of assist increases to ease vehicle maneuvering. If the vehicle speed is missing or out of range, the PSCM defaults to a safe level of assist for all driving conditions. If the vehicle speed returns to the correct in-range values, the PSCM adjusts the level of assist accordingly. Steering wheel/shaft speed, torque and direction information allows the PSCM to determine how much assist is needed to turn the wheels right and left.

The PSCM continually monitors and adjusts steering efforts based on the sensor inputs to enhance the feel of the steering. Compensation is made to reduce the effect of pull or drift that may be experienced when driving on roads with a high degree of camber. Active nibble control is also employed by the PSCM to reduce the vibrating movement felt at the steering wheel that can be caused by driving on rough surfaces or out of balance wheels.

The PSCM is self-monitoring and is capable of setting and storing DTCs. Depending on the DTC set, the control module enters into a safe mode of manual steering. In addition, the PSCM may send a request to the Instrument Panel Cluster (IPC) module over the HS-CAN to display a message in the message center, part of the Front Controls Interface Module (FCIM) alerting the driver of a potential EPAS concern.

Low battery and/or charging system voltage or a charging system DTC being present may cause the PSCM to enter into a limited operation mode resulting in uneven steering assist or a lack of steering assist. This limited operation mode feature is built into the PSCM to allow the safe, continued operation of the vehicle in the event of an EPAS concern. A DTC may or may not be present when the PSCM is operating in limited operation mode. Additionally, overheating the steering system may cause the PSCM to go into the limited operation mode, to protect the electronic components from overheating.

The PSCM is an integral part of the EPAS column assembly and cannot be serviced separately.

Power Steering Control Module (PSCM) Power Down

The internal circuitry of the PSCM enables the PSCM to remain powered for 90 seconds after the igniton state has been switched to OFF. When carrying out diagnostic procedures that require DTCs to be cleared and a new ignition cycle to be started, make sure the ignition state remains OFF for a minimum of 90 seconds before switching to ON. This allows the PSCM to shut down completely and a new ignition cycle to be entered.

Power Steering Motor

The EPAS system uses a 12-volt brushless reversible motor to control the steering effort. The motor is connected to the steering shaft through a worm gear and a reduction gear on the steering column. The motor is part of the steering column assembly and is not serviced separately.

Steering Sensor

NOTICE: **The steering sensor contains a clockspring that will be damaged if the steering column is not handled correctly. To prevent damage to the steering sensor, use the service bolt (HB1) to lock the steering column in the straight ahead position before disconnecting the steering column from the steering gear. Damage caused to the steering sensor by failing to lock the steering when disconnecting the column from the steering gear leads to a complete failure of the EPAS system and requires a new EPAS column to be installed.**

The steering sensor provides the PSCM with information on the direction, speed and amount of force being applied to the steering wheel. The steering sensor is a split sensor that monitors the steering inputs from the driver and the output side of the EPAS assembly. The PSCM uses the inputs from the sensor to determine the amount of steering assist required and adjusts steering efforts based on the sensor inputs. The sensor is a 5-volt dual analog sensor with an output voltage range of 0.25 volt to 4.75 volts. When the steering wheel is turned to the left, the left signal increases while the right signal decreases, likewise when the steering wheel is turned to the right, the right signal increases while the left signal decreases.

Interactive Diagnostics

For diagnosing and testing please refer to the on-line Workshop Manual. If you do not have an on-line subscription, go to www.motorcraftservice.com.

Torque Specifications

Description	Nm	lb-ft
Engine roll restrictor bolt	50	37
Forward subframe bolts	60	44
Outer tie-rod end nuts	53	39
Rearward subframe bolts [a]	-	-
Stabilizer bar link-to-strut nuts	48	35
Steering column shaft-to-steering gear bolt	32	24
Steering gear bolts	90	66
Subfame brace-to-body bolts	50	37
Tie-rod end jam nuts	63	46

[a] Refer to the procedure in this section.

Power Steering

The rack and pinion steering gear that is used with the Electronic Power Assist Steering (EPAS) system is a manual (non-hydraulic) steering gear that is contained within a 1-piece die cast aluminum housing. The power assist is provided by a 12-volt, 65 amp brush-less motor, mounted to the steering column. The steering column and motor/module are serviced as an assembly. For information on steering column service, refer to Section 211-04 . A new steering gear includes inner tie rods, however, the inner and outer tie rods can also be serviced separately. For information on tie-rod service, refer to Section 211-03 .

Power Steering

Refer to Section 211-00 .

Steering Gear

Special Tool(s)

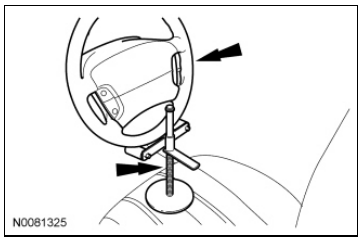
 ST2783-A	Remover, Tie Rod End 211-001 (Tool-3290-D)

General Equipment

Transmission Jack

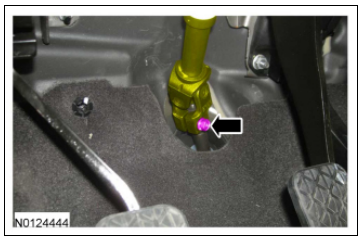
Removal

1. Using a suitable holding device, hold the steering wheel in the straight-ahead position.


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2. ***NOTICE:*** **Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence that the steering column shaft has rotated, remove and recenter the clockspring. For additional information, refer to Section 501-20B .**

   Remove and discard the steering column shaft-to-steering gear bolt and disconnect the steering column shaft from the steering gear.


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3. Remove the front wheels and tires. For additional information, refer to Section 100-04 .

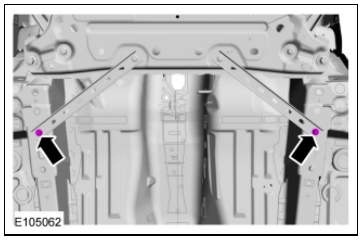
4. Remove and discard the 2 outer tie rod nuts.

5. Using the Tie Rod End Remover, separate the outer tie rods from the wheel knuckles.

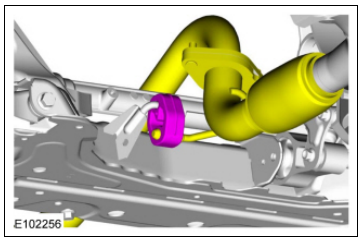


6. Remove and discard the 2 stabilizer bar link-to-strut nuts and disconnect the stabilizer bar links from the struts.

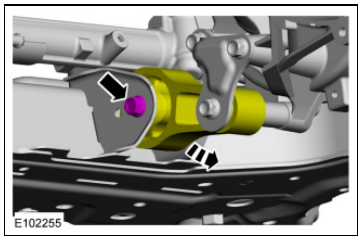
7. Remove the 2 subframe brace-to-body bolts.



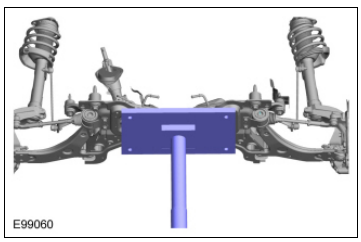
8. Disconnect the exhaust isolator.



9. Remove the engine roll restrictor bolt.

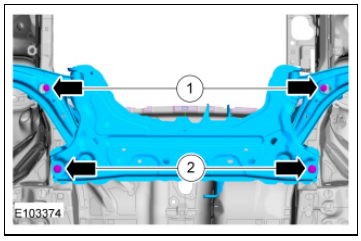


10. Support the front subframe using a suitable transmission jack.

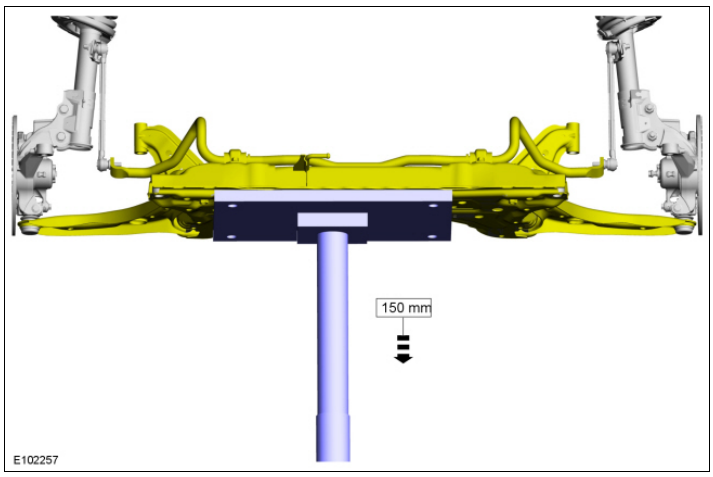


11. Mark the position of the subframe-to-frame mounting location at each mounting point on the vehicle frame rails to aide in installation.

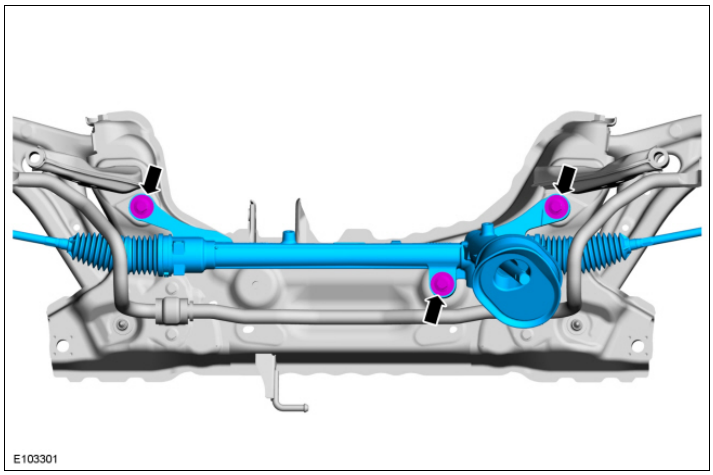
12. Remove the 4 subframe bolts and discard the 2 rearward bolts.



13. Lower the front subframe approximately 155 mm (6.102 in).



14. Remove the 3 steering gear bolts and the steering gear.



Installation

1. Position the steering gear and install the 3 bolts.
   - Tighten to 90 Nm (66 lb-ft).

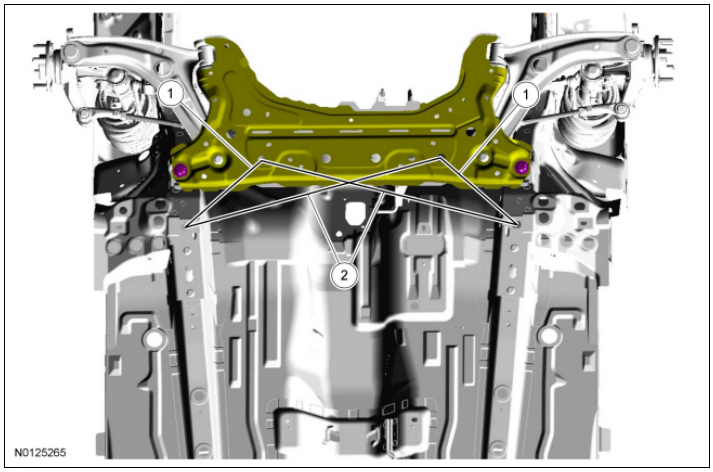
2. Raise the subframe and loosely install the 4 subframe bolts.

3. Align the subframe to the locating marks made during removal.

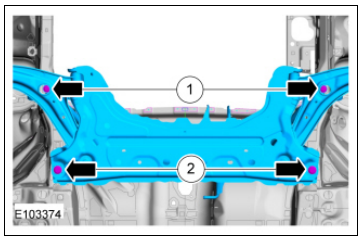
4. **NOTE:** RH and LH dimensions are identical. All measurements on center.

   Measure for correct positioning of the subframe to vehicle underbody.

   1. Location 1 - 260 mm (10.236 in)
   2. Location 2 - 666 mm (26.22 in)

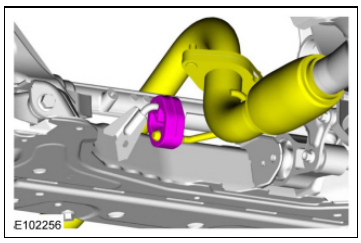


5. Tighten the subframe bolts.
    1. Tighten the forward bolts to 60 Nm (44 lb-ft).
    2. Tighten the new rearward bolts to 100 Nm (74 lb-ft).
    - Tighten the rearward bolts an additional 240°.

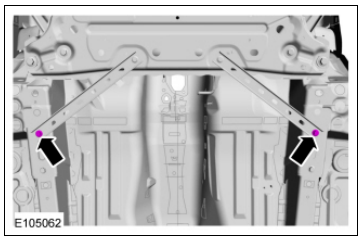


6. Position the engine roll restrictor and install the engine roll restrictor bolt.
    - Tighten to 50 Nm (37 lb-ft).

7. Connect the exhaust isolator.



8. Install the 2 subframe brace-to-body bolts.
    - Tighten to 50 Nm (37 lb-ft).



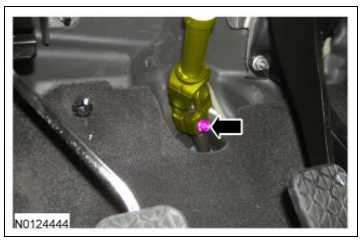
9. Position the stabilizer bar links and install the 2 new stabilizer bar link-to-strut nuts.
    - Tighten to 48 Nm (35 lb-ft).

10. Position the outer tie rods and install the new 2 outer tie rod nuts.
    - Tighten to 53 Nm (39 lb-ft).

11. ⚠ **WARNING: Do not reuse steering column shaft bolts. This may result in fastener failure and steering column shaft detachment or loss of steering control. Failure to follow this instruction may result in serious injury to vehicle occupant(s).**

    Connect the steering column shaft and install a new steering column shaft-to-steering gear bolt.

    - Tighten to 32 Nm (24 lb-ft).



12. Check and, if necessary, adjust the front toe. For additional information, refer to Section 204-00 .

Material

Item	Specification	Fill Capacity
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B	-

Torque Specifications

Description	Nm	lb-ft
Inner tie-rod end	83	61
Outer tie-rod end nut	53	39
Tie-rod end jam nut	63	46

Steering Linkage

The steering linkage consists of the following components:

- Inner tie-rod end
- Steering gear
- Outer tie-rod end
- Steering gear boot

The inner and outer tie rods connect the steering gear to the wheel knuckles. The tie rods are lubricated for life and do not contain grease fittings. The steering linkage is adjustable at the 2 tie-rod ends.

Steering Linkage

Refer to Section 211-00 .

Tie Rod - Inner

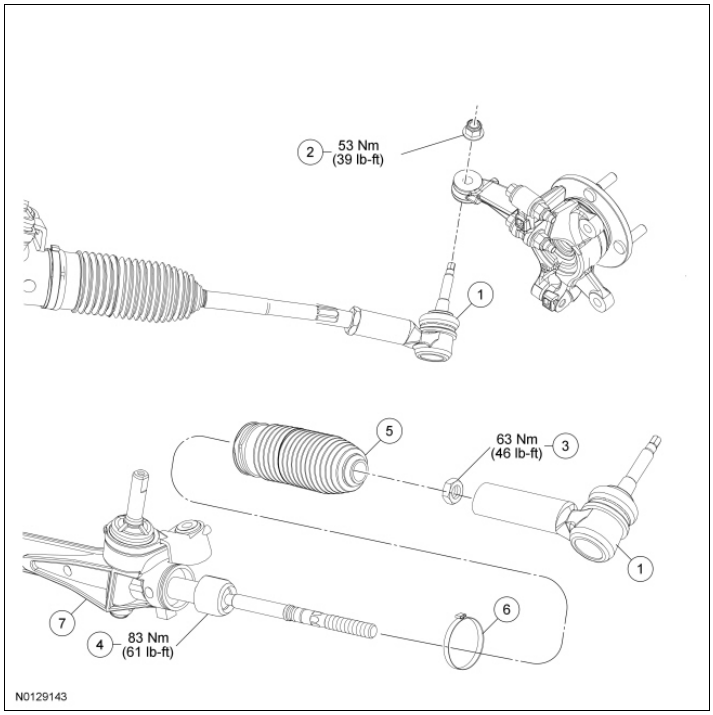
Special Tool(s)

 ST2783-A	Remover, Tie Rod End 211-001

Material

Item	Specification
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B

Removal



Item	Part Number	Description
1	3A130	Outer tie-rod end
2	W520204	Outer tie-rod nut
3	W303694	Tie-rod end jam nut
4	3280	Inner tie-rod end
5	-	Steering gear bellows boot kit (part of 3332A boot kit)
6	-	Steering gear bellows boot clamp, inner (part of 3332A boot kit)

7	3504	Steering gtd>

NOTICE: **The steering gear bellows boots and clamps are designed to produce 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 contamination into the gear, causing damage. Zip ties do not provide an airtight seal and must not be used.**

NOTICE: **The inner tie-rod ball joint grease is not compatible with water. Water trapped in the grease will damage the joint.**

NOTE: If the RH inner tie rod is being serviced, remove the LH outer tie-rod end and bellows boot to access and hold the steering gear rack when loosening and tightening the inner tie rod. An assistant will be needed to hold the steering gear rack on the LH side when servicing the RH inner tie rod.

1. Remove the wheel and tire. For additional information, refer to Section 204-04 .

2. Loosen the tie-rod jam nut.

3. Remove and discard the outer tie rod nut.

4. ***NOTICE:*** **Do not use a hammer to separate the outer tie-rod end from the wheel knuckle or damage to the wheel knuckle can result.**

   Use the Tie-Rod End Remover to separate the outer tie-rod end from the wheel knuckle.



5. **NOTE:** Count and record the number of turns required to remove the outer tie-rod end for reference during installation.

   Remove the outer tie-rod end.

6. Remove the tie-rod jam nut.

7. Remove and discard the inner bellows boot clamp.

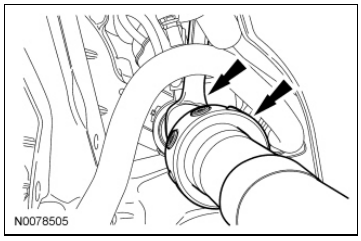
8. Remove and discard the steering gear bellows boot.

9. ***NOTICE:*** **Use an appropriate-sized wrench on the flat of the rack gear to resist rotation and to prevent damage during the removal of the inner tie rod.**

   NOTE: An assistant will be needed to hold the steering gear rack on the LH side when servicing the RH inner tie rod.

   NOTE: Set screw style inner tie rod tool shown.

   While holding the steering gear rack, use a set screw style inner tie rod tool (such as Matco® stock # TRT48) to remove the inner tie rod.



Installation

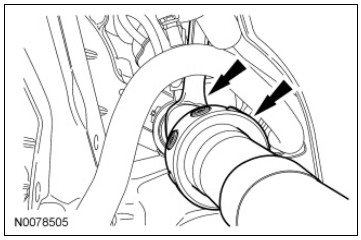
1. *NOTICE:* **Thoroughly remove any abrasive material. This material is extremely harmful to the steering gear.**

   Thoroughly clean the bellows boot-to-steering gear housing mating surface and install the O-ring supplied with the new bellows boot.

2. *NOTICE:* **Use an appropriate-sized wrench on the flat of the rack gear to resist rotation and to prevent damage during the installation of the inner tie rod.**

   While holding the steering gear rack, use a set screw style inner tie rod tool (such as Matco® stock # TRT48) to install the inner tie rod.

   - Tighten to Nm (61 lb-ft).



3. Apply the specified grease to the bellows boot-to-steering gear mating surfaces and bellows boot grooves in the inner tie-rod casting.

4. **NOTE:** Make sure the bellows boot is positioned correctly over the steering gear housing bead and the groove in the inner tie rod.

   Install the steering gear bellows boot.

5. Using bellows boot clamp pliers, install a new inner bellows boot clamp.

6. Install the tie-rod jam nut onto the inner tie rod.

7. **NOTE:** Install the outer tie rod end(s) the same number of turns recorded during removal.

   Install the outer tie-rod end.

8. Connect the outer tie-rod end to the wheel knuckle and install the outer tie-rod end nut.
   - Tighten to 53 Nm (39 lb-ft).

9. Tighten the tie-rod jam nut to 63 Nm (46 lb-ft).

10. Install the wheel and tire. For additional information, refer to Section 204-04 .

11. Check and if necessary, adjust the front toe. For additional information, refer to Section 204-00 .

Material

Item	Specification	Fill Capacity
Instant Gel Adhesive TA-19	WSK-M2G402-A4	-

Torque Specifications

Description	Nm	lb-ft	lb-in
Ignition switch/lock cylinder housing shear bolt	15	-	133
Knee air bag brace nuts	8	-	71
Steering column nuts	24	18	-
Steering column shaft-to-steering column bolt	33	24	-
Steering column shaft-to-steering gear bolt	32	24	-
Steering column shroud screws	1	-	9
Steering column switch carrier bolt	7	-	62
Steering wheel bolt	40	30	-

 nbsp;

Steering Column

The steering column is the mechanical linkage between the steering wheel and the steering gear. However, the steering column housing also contains the Power Steering Control Module (PSCM), motor and steering sensor, which are used to provide the power assist. The programmable module uses inputs from the sensor to determine when and how much assist is needed. The 12-volt brushless, reversible motor uses a worm gear and a reduction gear to apply the power assist to the steering column shaft. The steering column, module, motor and sensor are serviced as an assembly. For information on Electronic Power Assist Steering (EPAS) diagnosis, refer to Section 211-00 .

The steering wheel is mounted to a shaft which passes through the center of the steering column. The shaft is centered by roller ball 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 lever is unlocked, the steering column can then be adjusted to various positions through a pin-type pivot. 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. For information on steering column switches, refer to Section 211-05 .

Steering Column

Refer to Section 211-00 or Section 211-05 .

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 specificed adhesive evenly over the wheel spoke.

4. Position the loose leather back into the original position.

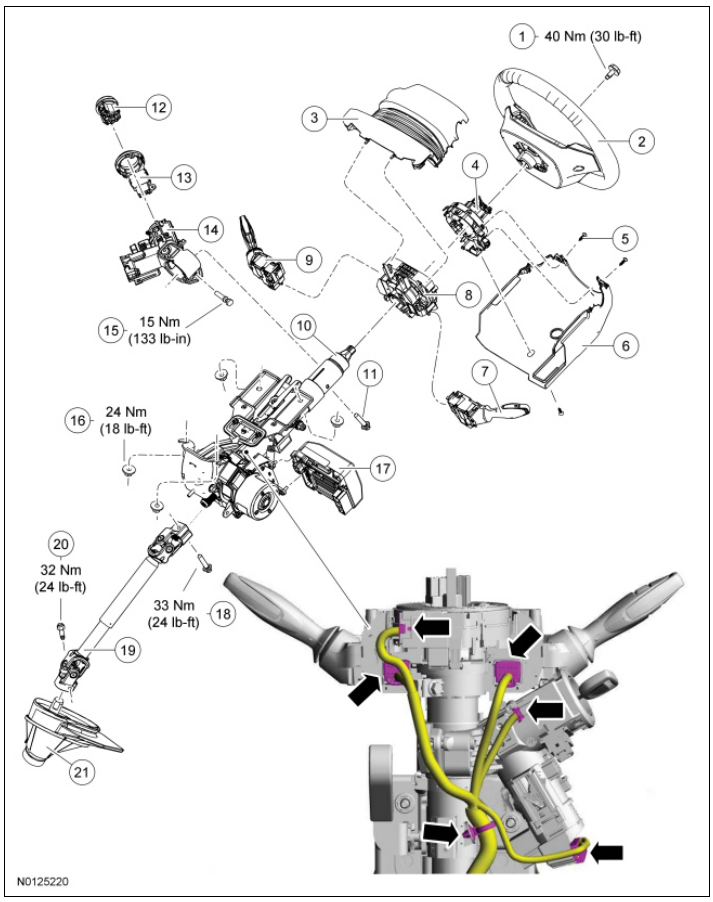
5. **NOTE:** The adhesive should be completely set after 5 minutes. Do not pull on the repair area.

   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 Column - Exploded View



Item	Part Number	Description
1	W750985	Steering wheel bolt
2	3600	Steering wheel
3	3530A	Upper steering column shroud
4	14A664	Clockspring
5	W714630	Lower steering column shroud screw (3 required)
6	3530B	Lower steering column shroud
7	13341	Steering column multifunction switch
8	3F791	Steering column switch carrier
9	17A553	Wiper/washer switch
10	3C529	Steering column
11	-	Steering column anti-rotation bolt (M6 x 1 x 30)
12	11582	Ignition lock cylinder
13	15607	Passive Anti-Theft System (PATS) transceiver electrical connector (part of 14401)
14	3F527	Ignition switch/lock cylinder housing (push button start and key start)
15	W709942	

		Ignition switch/lock cylinder housear bolt (or part of 3F790)
16	W520102	Steering column nut (4 required)
17	-	Steering column module (part of 3C529)
18	3R827A	Steering column shaft-to-steering column bolt
19	3A525	Steering column shaft (or part of 3C529)
20	3R827B	Steering column shaft-to-steering gear bolt
21	3D677	Dash seal

1. Refer to the procedures in this section.

Steering Column

Special Tool(s)

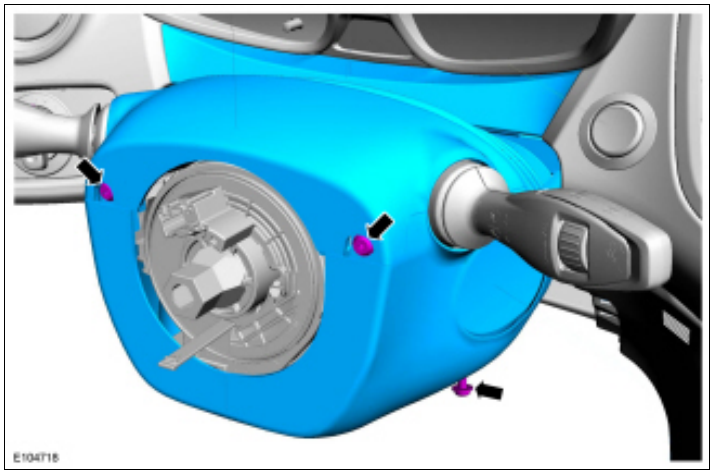
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Removal and Installation

1. Remove the steering wheel. For additional information, refer to Steering Wheel in this section.

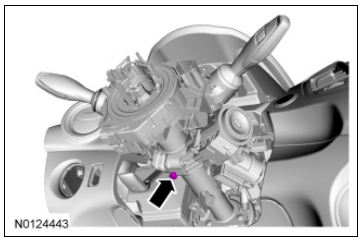
2. Remove the knee airbag module. For additional information, refer to Section 501-20B .

3. Remove the 3 screws and the upper and lower steering column shroud.
   - To install, tighten to 1 Nm (9 lb-in).

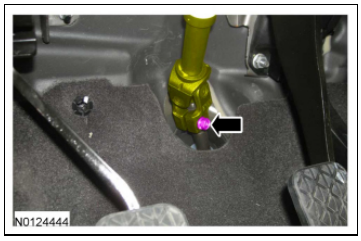


4. *NOTICE:* **Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the steering column internal sensor may result.**

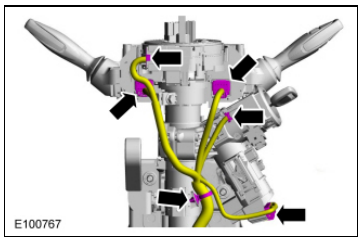
   To prevent steering column rotation, install a M6 x 1 x 30 bolt into the steering column and tighten hand tight.



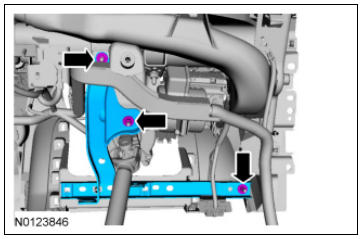
5. Remove and discard the steering column shaft-to-steering gear bolt and disconnect the steering column shaft from the steering gear.
   - To install, tighten the new bolt to 32 Nm (24 lb-ft).



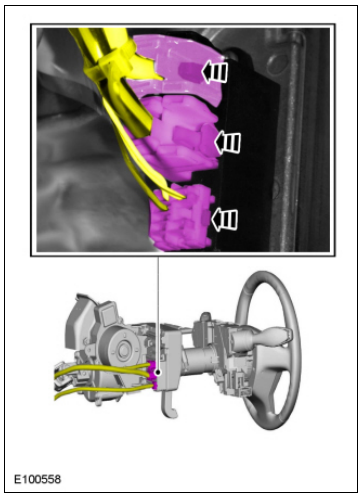
6. Disconnect the electrical connectors, detach the wiring harness retainers and position the wiring harness aside.



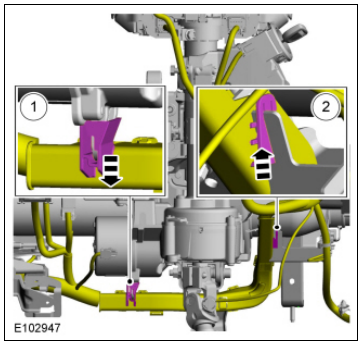
7. Remove the 3 nuts and the knee airbag brace.
   - To install, tighten to 8 Nm (71 lb-in).



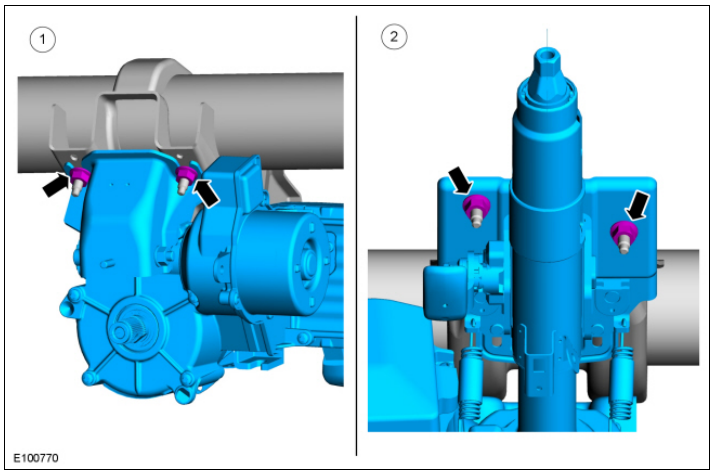
8. Disconnect the 3 steering column electrical connectors.



9. Unclip the wiring harness shield from the steering column in the order shown.



10. Remove and discard the 4 steering column nuts in the order shown.
    - To install, tighten the new nuts to 24 Nm (18 lb-ft).



11. Remove the steering column and steering column shaft as an assembly.

12. ***NOTICE:*** **Leave the anti-rotation cap on the new column until the steering column shaft has been connected and the steering column shaft-to-steering gear bolt has been installed or damage to the steering column may occur. Once the anti-rotation cap has been removed from the new column it must be installed on the old steering column and the anti-rotation bolt can be removed.**

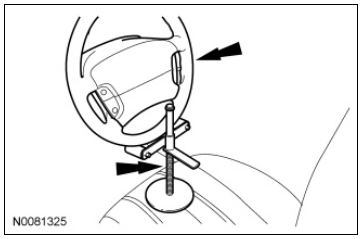
    NOTE: If a new column is being installed, a new ignition switch/lock cylinder housing shear bolt (W709942) will be required to transfer the ignition switch/lock cylinder housing to the new column. For additional information, refer to Ignition Lock Cylinder Housing in Section 501-14 .

    To install, reverse the removal procedure.

13. Calibrate the steering wheel position sensor if a new steering column has been installed.
    - Using the scan tool, select programable parameters/steering wheel position sensor calibration and follow the scan tool instructions.

Steering Column Shaft

1. Turn the steering wheel 45 degrees to the right and using a suitable holding device, secure the steering wheel.

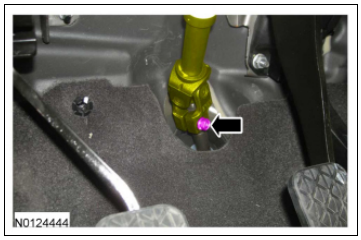


2. ***NOTICE:*** **Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence that the steering column has rotated, remove and recenter the clockspring. For additional information, refer to Section 501-20B .**

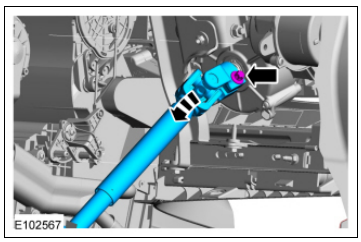
   NOTICE: **Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the steering column internal sensor may result.**

   Remove and discard the steering column shaft-to-steering gear bolt and disconnect the steering column shaft from the steering gear.

   - To install, tighten a new bolt to 32 Nm (24 lb-ft).



3. Remove and discard the steering column shaft-to-steering column bolt and remove the steering column shaft.
   - To install, tighten a new bolt to 33 Nm (24 lb-ft).

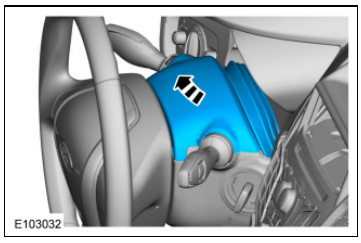


4. To install, reverse the removal procedure.

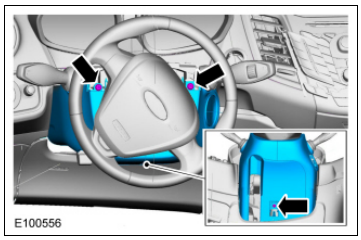
Steering Column Shroud

Removal and Installation

1. Pulling upward, detach the upper steering column shroud from the lower steering column shroud.
   - Slide the upper steering column shroud out of the Instrument Cluster (IC) trim panel and remove the shroud.



2. Remove the 3 screws and the lower steering column shroud.
   - To install, tighten to 1 Nm (9 lb-in).



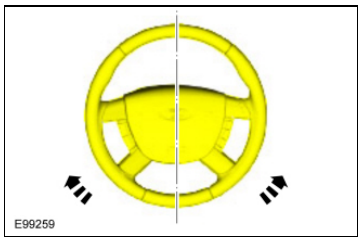
3. To install, reverse the removal procedure.

Steering Wheel

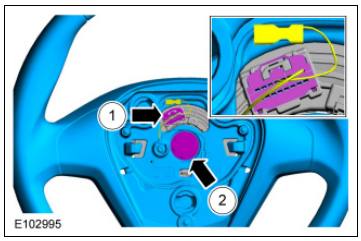
Removal and Installation

1. Remove the driver air bag module. For additional information, refer to Section 501-20B .

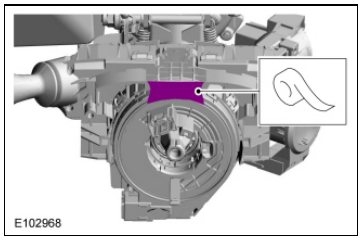
2. Turn the steering wheel to the straight-ahead position.



3. Remove the steering wheel as shown.
    1. Disconnect the electrical connector.
    2. Remove the bolt and the steering wheel.
        - To install, tighten the steering wheel bolt to 40 Nm (30 lb-ft).



4. Tape the clockspring center rotor to the outer housing to keep it from rotating.



5. To install, reverse the removal procedure.

Steering Column Switches

The steering column switches consist of the following components:

- LH multifunction switch - controls the turn signals, headlamp low/high beam, headlamp flash-to-pass and the trip computer display (if equipped). The LH multifunction switch can be serviced separately. For additional information on exterior lighting, refer to Section 417-01 . For additional information on the trip computer, refer to Section 413-01 .
- RH multifunction switch - controls the front windshield wipers and the rear window wiper (if equipped). The RH multifunction switch can be serviced separately. For additional information on the wiper/washer system, refer to Section 501-16 .
- Ignition switch - used in conjunction with the ignition lock cylinder and ignition key to achieve the various ignition modes.
- Start/stop switch - available only on vehicles equipped with a push button start system. Located in the instrument panel just to the right of the steering column, the start/stop switch is used instead of a conventional ignition switch to achieve the various ignition modes.

Push Button Start System Ignition Modes

The push button start system has 3 ignition modes:

- OFF
- ON (engine off)
- START

The start/stop button is used in conjunction Intelligent Access (IA) key and the brake pedal (automatic transaxle) or clutch pedal (manual transaxle) to achieve the different ignition modes as indicated in the table below. For additional information on the IA key, refer to Section 419-01B .

Push Button Start Ignition Modes

Ignition Entry Condition	Desired Ignition Modes	Action
Ignition off	ON (engine off)	Press the start/stop switch without pressing the brake or clutch pedal.
Any ignition mode	START	Press and hold the brake or clutch pedal and then push the start/stop switch.
On (engine off)	OFF	Push the start/stop switch.
On (engine running)	OFF	Press and hold the start/stop switch.

OFF Mode

If the vehicle is in motion, a momentary press of the start/stop switch will not shut the engine off. If the vehicle is moving, the start/stop switch must be pressed and held for longer than one second to achieve OFF

mode.

ON Mode

When the vehicle enters ON mode, multiple indicators in the IPC will prove out (just like a vehicle equipped with an ignition key cylinder), the indicator in the start/stop switch will illuminate and the IPC will display the vehicle mileage and current transmission gear selection.

Steering Column Switches

Special Tool(s)

 ST2574-A	Flex Probe Kit NUD105-R025D 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

Ignition Switch

The ignition switch is controlled by the ignition lock cylinder with a key. When the ignition lock cylinder is turned, a mechanical connection positions the ignition switch to the selected position. The available ignition switch positions are:

- OFF
- ACC
- ON
- START

The ignition switch supplies battery voltage to the Central Junction Box (CJB) which then distributes this voltage to multiple circuits and modules throughout the vehicle, based on ignition switch position.

Push Button Start System

The Remote Function Actuator (RFA) module applies battery voltage to the same circuits that a conventional ignition switch uses to achieve 3 of the 4 standard ignition states (OFF, ON and START). Unlike a conventional ignition switch system, this push button start system does not have a driver accessible ACC mode. The RFA module automatically cycles through the ACC mode when the driver cycles the vehicle to the ON mode. The RFA module receives input from the following:

- Clutch Pedal Position (CPP) switch (manual transaxle)
- Cruise control deactivator switch (automatic transaxle)
- Intelligent Access (IA) key (wireless input)
- Park detect switch (automatic transaxle)
- Start/stop switch

The RFA module uses input from the IA key to authorize use of the vehicle. The RFA module uses input from the start/stop switch, the park detect switch (automatic transaxle), the cruise control deactivator switch (automatic transaxle) and/or the CPP switch (manual transaxle) to transition between ignition modes.

Intelligent Access (IA) Key

To achieve any ignition state other than OFF, the IA key must be present inside the vehicle. The driver need not perform any actions with the IA key to operate the push button start system. It is sufficient that the IA key is located inside the vehicle when the start/stop switch is pressed. Pressing the start/stop switch triggers radio frequency communication between the IA key and the RFA module.

Backup Antenna

If the battery inside the IA key is weak, if the IA key is damaged or if excessive ambient Radio Frequency Interference (RFI) prevents communication between the RFA module and the IA key, the backup antenna located on the RH side of the steering column (where a conventional ignition lock cylinder would be located) provides a secondary means for the RFA module to validate the IA key and authorize use of the vehicle. The backup antenna uses passive radio frequency identification to exchange signals with the IA key, similar to the way a typical encoded Passive Anti-Theft System (PATS) key and transceiver operate. For additional information on the IA key and backup antenna, refer to Section 419-01B .

Push Button Start System Front Control/Display Interface Module (FCDIM) Messages

The FCDIM provides instruction for operating the push button start system. The FCDIM can also display warnings that could indicate a potential issue with the push button start system. The following FCDIM messages pertain to the push button start system:

- **TO START PRESS BRAKE** - Momentarily displays when the start/stop switch is pressed without the brake pedal being applied (vehicles equipped with an automatic transaxle).
- **TO START PRESS CLUTCH** - Momentarily displays when the start/stop switch is pressed without the clutch pedal being applied (vehicles equipped with a manual transaxle).
- **TO START SELECT N OR P** - Displays when attempting to start the vehicle and the transaxle is not in NEUTRAL or PARK (vehicles equipped with an automatic transaxle).
- **VEHICLE NOT IN PARK SELECT P** - Displays when the start/stop switch is pressed to shut off the engine with the transaxle selector lever in any position other than PARK (vehicles equipped with an automatic transaxle).
- **KEY OUTSIDE CAR** - Whenever a door is opened and then closed while the engine is running, the RFA module searches for the IA key. This message displays if the key is not detected by the module.
- **KEY NOT DETECTED** - Displays if the IA key is not detected by the RFA module when attempting to enter ON mode or attempting to start the vehicle. If this message is observed with the IA key located inside the vehicle, go to Section 419-01B to diagnose the IA key.

Remote Function Actuator (RFA) Module Programming

If it is necessary to replace the RFA module, the replacement module must be programmed. Carry out the following scan tool functions if an RFA module is installed new:

NOTE: All of the following scan tool functions must be completed before the vehicle will start.

- Programmable Module Installation (PMI) - This process configures the new module with specific vehicle information. Refer to Programmable Module Installation (PMI) in Section 418-01 .
- PATS Parameter Reset - This process initiates an exchange of information between the module and the PCM specific to the anti-theft/engine immobilizer feature. Carry out a PATS parameter reset when

either the RFA module or the PCM is installed new. For additional information, refer to Passive Anti-Theft System (PATS) Parameter Reset-Intelligent Access (IA) in Section 419-01B .
- IA Key Programming - This process programs the IA keys to the RFA module. If the RFA module is installed new, 2 IA keys will have to be programmed before the vehicle will start. For additional information, refer to Key Programming Using Diagnostic Equipment-Intelligent Access (IA) in Section 419-01B .

Multifunction Switches

The multifunction switches control the various components (high beam headlamps, flash-to-pass, turn signal, trip computer display and windshield wiper/washer) by grounding certain Body Control Module (BCM) or Instrument Panel Cluster (IPC) circuits. When the BCM or IPC detects the ground signal, voltage is sent to activate the appropriate component. The BCM controls the high beam headlamps, flash-to-pass, turn signals and windshield wipers/washers. The IPC controls the trip computer display.

For multifunction switch concerns, refer to one of the following sections:

- For high beam headlamps, flash-to-pass and turn signal concerns, refer to Section 417-01 .
- For wiper and washer concerns, refer to Section 501-16 .
- For trip computer concerns, refer to Section 413-01 .

Inspection and Verification

NOTE: Make sure the vehicle battery is fully charged and in good condition before diagnosing any ignition switch concerns.

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• CPP switch (if equipped with a manual transaxle) • Cruise control deactivator switch (if equipped with an automatic transaxle) • Ignition lock cylinder (if equipped with an ignition key) • Ignition key (if equipped with an ignition switch) • Ignition switch (if equipped) • Intelligent Access (IA) key (if equipped with a push button start system) • Multifunction switches • Start/stop switch (if equipped with a push button start system) • Steering column shrouds	• Battery Junction Box (BJB) fuse(s): ♦ 5 (60A) ♦ 7 (60A) • Wiring, terminals or connectors • Central Junction Box (CJB) fuse(s): ♦ 1 (15A) ♦ 19 (7.5A) ♦ 20 (10A) ♦ 21 (10A) ♦ 22 (7.5A) ♦ 23 (10A) ♦ 26 (7.5A) ♦ 34 (30A) • Ignition switch (if equipped)

	• Start/stop switch (if equipped with a push button start system) • Remote Function Actuator (RFA) module (if equipped with a push button start system)

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 VCM .

6. If the scan tool does not communicate with the vehicle:
   - verify the ignition is ON.
     - ♦ The air bag warning indicator prove-out confirms ignition ON (other indicators may NOT prove ignition is ON). If ignition does not turn ON, GO to Symptom Chart .
   - refer to Section 418-00 Inspection and Verification to establish a scan tool session.
   - verify the scan tool operation with a known good vehicle.

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. If equipped with a start/stop switch, carry out the self-test diagnostics for the RFA module.

9. If the DTCs retrieved are related to the concern, refer to the Remote Function Actuator (RFA) Module DTC Chart. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

DTC Charts

Remote Function Actuator (RFA) Module DTC Chart

NOTE: This module utilizes a 5-character DTC followed by a 2-character failure-type code. The failure-type code provides information about specific fault conditions such as opens or shorts to ground. CMDTCs have an additional 2-character DTC status code suffix to assist in determining DTC history.

DTC	Description	Action
B108B:23	Start Button Circuit "A": Signal Stuck Low	GO to Pinpoint Test E .
B108B:29	Start Button Circuit "A": Signal Invalid	GO to Pinpoint Test E .
B108C:23	Start Button Circuit "B": Signal Stuck Low	GO to Pinpoint Test E .

B10E7:11	Ignition On Relay: Circuit Short to Ground	GO to Pinpoint Test F .
B10E7:12	Ignition On Relay: Circuit Short to Battery	GO to Pinpoint Test F .
B10E7:16	Ignition On Relay: Circuit Voltage Below Threshold	GO to Pinpoint Test F .
B10E7:17	Ignition On Relay: Circuit Voltage Above Threshold	GO to Pinpoint Test F .
U3004:11	Accessory Power Relay: Circuit Short to Ground	GO to Pinpoint Test G .
U3004:12	Accessory Power Relay: Circuit Short to Battery	GO to Pinpoint Test G .
U300E:62	Ignition Input On: Signal Compare Failure	GO to Pinpoint Test I .
U300F:62	Ignition Input Accessory: Signal Compare Failure	GO to Pinpoint Test I .
U3010:62	Ignition Input Start: Signal Compare Failure	GO to Pinpoint Test I .
U3011:62	Ignition Input Off: Signal Compare Failure	GO to Pinpoint Test I .
-	All Other Remote Function Actuator (RFA) Module DTCs	REFER to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: No Power in All Ignition Switch Positions - Vehicles With an Igni Switch

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

Normal Operation

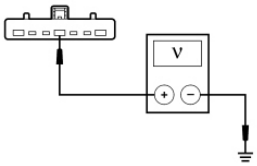
The ignition switch receives fused battery voltage from Central Junction Box (CJB) fuse 1 (15A). The ignition switch distributes this voltage to the PCM and/or the CJB depending on the ignition switch position.

This pinpoint test is intended to diagnose the following:

- CJB fuse
- Battery Junction Box (BJB) fuse
- Wiring, terminals or connectors
- Ignition switch

PINPOINT TEST A: NO POWER IN ALL IGNITION SWITCH POSITIONS - VEHICLES WITH AN IGNITION SWITCH

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
A1 CHECK FOR POWER TO CJB FUSE 1 (15A)	
Yes GO to A2 . **No** VERIFY BJB fuse 5 (60A) is OK. If OK, REPAIR circuit SBB05 (GY/RD). If not OK, REFER to the Wiring Diagrams manual to identify the possible cause of the circuit short. TEST the system for normal operation.	
A2 CHECK CJB FUSE 1 (15A)	
• Check fuse: CJB fuse 1 (15A). • **Is the resistance less than 5 ohms?**	**Yes** GO to A3 . **No** REFER to the Wiring Diagrams manual to identify the possible cause of the circuit short. TEST the system for normal operation.
A3 CHECK FOR POWER TO THE IGNITION SWITCH	
• Connect: CJB Fuse 1 (15A). • Disconnect: Ignition Switch C250. • Measure the voltage between ignition switch C250-4, circuit SBP01 (RD), harness side and ground.  A0089808 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation. **No** VERIFY in-line connector C212 is OK. If not OK, REPAIR as necessary. If OK, REPAIR circuit SBP01 (RD). TEST the system for normal operation.

Pinpoint Test B: No Power in ACC - Vehicles With an Ignition Switch

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

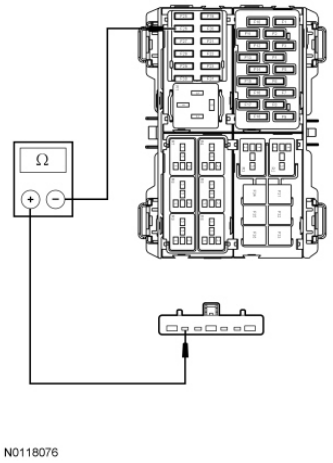
Normal Operation

When the ignition switch is in the ACC position, voltage is provided to Central Junction Box (CJB) fuses 19 (7.5A) and 26 (7.5A).

This pinpoint test is intended to diagnose the following:
- CJB fuse(s)
- Wiring, terminals or connectors
- Ignition switch

PINPOINT TEST B: NO POWER IN ACC - VEHICLES WITH AN IGNITION SWITCH

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
B1 CHECK THE IGNITION ACC CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Ignition Switch C250. • Disconnect: CJB Fuse 26 (7.5A). • Measure the resistance between CJB fuse 26 (7.5A), circuit CDC33 (VT/GN), input cavity and ignition switch C250-6, circuit CDC33 (VT/GN), harness side.  N0118076 • **Is the resistance less than 5 ohms?**	**Yes** VERIFY CJB fuses 19 (7.5A) and 26 (7.5A) are OK. If OK, INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible cause of the circuit short. TEST the system for normal operation. **No** REPAIR circuit CDC33 (VT/GN). TEST the system for normal operation.

Pinpoint Test C: No Power in ON - Vehicles With an Ignition Switch

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

Normal Operation

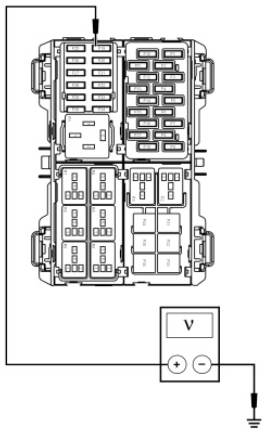
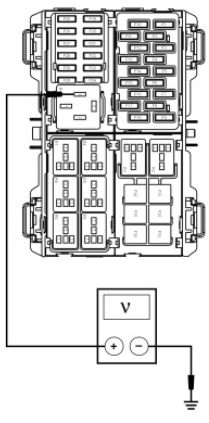
The switch side of the ignition relay receives fused battery voltage from Battery Junction Box (BJB) fuse 7 (60A). When the ignition switch is in the ON position, voltage is provided to Central Junction Box (CJB) fuses 19 (7.5A), 20 (10A), 21 (10A), 22 (7.5A), 23 (10A), 26 (7.5A) and the coil side of the ignition relay.

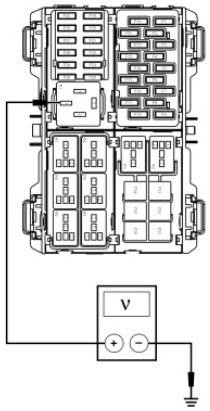
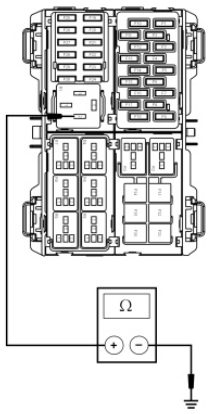
This pinpoint test is intended to diagnose the following:

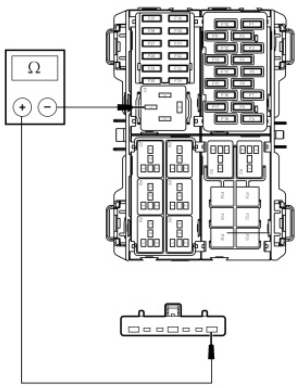
- CJB fuse(s)
- Wiring, terminals or connectors
- Ignition switch

PINPOINT TEST C: NO POWER IN ON - VEHICLES WITH AN IGNITION SWITCH

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
C1 CHECK FOR POWER TO CJB FUSE 19 (7.5A)	
• Disconnect: CJB Fuse 19 (7.5A). • Ignition ON. • Measure the voltage between CJB fuse 19 (7.5A), circuit CDC33 (VT/GN), input cavity and ground.  N0118068 • **Is the voltage greater than 10 volts?**	**Yes** GO to C2 . **No** GO to Pinpoint Test B .
C2 CHECK FOR POWER TO THE SWITCH SIDE OF THE IGNITION RELAY	
• Disconnect: Ignition Relay. • Measure the voltage between ignition relay cavity 3, circuit SBB07 (WH/RD), and ground.  N0117042 • **Is the voltage greater than 10 volts?**	**Yes** GO to C3 . **No** VERIFY BJB fuse 7 (60A) is OK. If OK, REPAIR circuit SBB07 (WH/RD). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. REPAIR as necessary. TEST the system for normal operation.

C3 CHECK FOR POWER AT THE COIL SIDE OF THE IGNITION RELAY	
• Measure the voltage between ignition relay cavity 1, circuit CDC32 (BN/YE), and ground.  N0118073 • **Is the voltage greater than 10 volts?**	**Yes** GO to C4 . **No** GO to C5 .
C4 CHECK THE IGNITION RELAY COIL GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between ignition relay cavity 2, circuit GD145 (BK/BU), and ground.  N0119754 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new ignition relay. TEST the system for normal operation. **No** REPAIR circuit GD145 (BK/BU). TEST the system for normal operation.
C5 CHECK THE IGNITION ON CIRCUIT FOR AN OPEN	

• Measure the resistance between ignition switch C250-1, circuit CDC32 (BN/YE), harness side and ignition relay cavity 1, circuit CDC32 (BN/YE).  N0118074 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation. **No** REPAIR circuit CDC32 (BN/YE). TEST the system for normal operation.

Pinpoint Test D: No Power in START - Vehicles With an Ignition Switch

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

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

Normal Operation

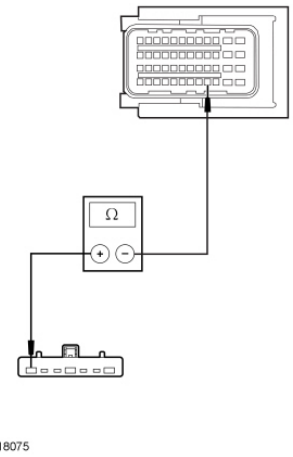
When the ignition switch is in the START position, voltage is sent to the PCM.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Ignition switch

PINPOINT TEST D: NO POWER IN START - VEHICLES WITH AN IGNITION SWITCH

NOTICE: **Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standmulti-meter probes.**

Test Step	Result / Action to Take
D1 CHECK THE IGNITION START CIRCUIT FOR AN OPEN	

• Ignition OFF. • Disconnect: Ignition Switch C250. • Disconnect: PCM C175B. • Measure the resistance between ignition switch C250-7, circuit CDC35 (BU/WH), harness side and PCM C175B-9, circuit CDC35 (BU/WH), harness side.  N0118075 • **Is the resistance less than 5 ohms?**	**Yes** GO to D2 . **No** REPAIR circuit CDC35 (BU/WH). TEST the system for normal operation.
D2 ISOLATE THE IGNITION SWITCH	
• Carry out the ignition switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Is the ignition switch OK?**	**Yes** INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation. **No** REFER to Section 303-06 to continue diagnosing the starting system.

Pinpoint Test E: DTCs B108B:23, 29 and B108C:23

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

Normal Operation

The start stop/switch is a momentary, dual-contact, normally-open switch. This means that the 2 internal contacts will only remain closed for as long as the switch is pressed. As soon as the switch is released, the contacts will open. The start/stop switch is connected to the Remote Function Actuator (RFA) module by 2 circuits. When the switch is pressed, both contacts close and connect to a ground circuit. The RFA module detects this ground signal and enters into 1 of the 3 ignition modes, depending on other RFA module inputs. The start/stop switch uses 2 sets of contacts and 2 circuits for redundancy; if there is a concern in one of the 2 circuits/contacts, the other can still provide a ground signal to the RFA module. Also, if there is a concern in one of the 2 circuits/contacts, the RFA module sets one or more DTCs.

- DTC B108B:23 (Start Button Circuit "A": Signal Stuck Low) - Pressing the start/stop switch starts a 120 second timer in the RFA module. This DTC sets if the signal from circuit "A" is still present when the timer expires. Pressing and holding the start/stop switch for more than 120 seconds also

causes this DTC to set. This DTC only sets during normal operation and not during a module self-test.
- DTC B108B:29 (Start Button Circuit "A": Signal Invalid) - Pressing and releasing the start/stop switch causes both internal contacts to change state (open to closed and then closed to open) at the same time. The RFA module detects this change in state and increases an internal counter by 1 if the change does not happen at the same time or if only one of the contacts changes state. When the internal counter reaches 5, the RFA module sets this DTC. This DTC only sets during normal operation and not during a module self-test.
- DTC B108C:23 (Start Button Circuit "B": Signal Stuck Low) - Pressing the start/stop switch starts a 120 second timer in the RFA module. This DTC sets if the signal from circuit "B" is still present when the timer expires. Pressing and holding the start/stop switch for more than 120 seconds also causes this DTC to set. This DTC only sets during normal operation and not during a module self-test.

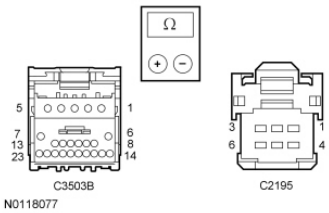
This pinpoint test is intended to diagnose the following:
- Start/stop switch
- Wiring, terminals or connectors
- RFA module

PINPOINT TEST E: B108B:23, 29 AND B108C:23

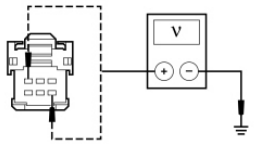
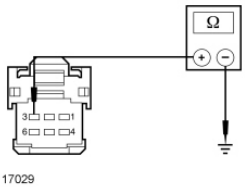
Test Step	Result / Action to Take
E1 CHECK THE START/STOP SWITCH	
• Ignition OFF. • Disconnect: Start/Stop Switch C2195. • Carry out the start/stop switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the start/stop switch pass the test?**	**Yes** GO to E2 . **No** INSTALL a new start/stop switch. CLEAR the DTCs. TEST the system for normal operation.
E2 ISOLATE THE DTC	
• Review the RFA module DTCs recorded during Inspection and Verification. • **Is DTC B108B:29 the only DTC present?**	**Yes** GO to E3 . **No** If DTC B108B:23 is also present, GO to E5 . If DTC B108C:23 is also present, GO to E6 .
E3 CHECK THE RFA MODULE START/STOP SWITCH INPUT CIRCUITS FOR AN OPEN	
• Disconnect: RFA Module C3503B. • Measure resistance between RFA module C3503B, harness side and start/stop switch C2195, harness side using the following chart:	**Yes** GO to E4 . **No** REPAIR the affected circuit(s). CLEAR the DTC. TEST the system for normal operation.

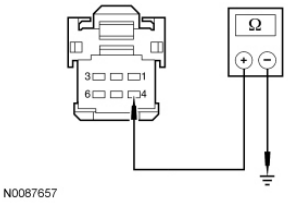
RFA Module	Circuit	Start/Stop Switch
C3503B-23	CPK35 (YE/OG)	C2195-4

C3503B-22	CPK34 (BN/VT)	C2195-3



- **Are the resistances less than 5 ohms?**

E4 CHECK THE RFA MODULE START/STOP SWITCH INPUT CIRCUITS FOR A SHORT TO VOLTAGE	
• Connect: RFA Module C3503B. • Connect: Start/Stop Switch C2195. • Ignition ON. • Disconnect: Start/Stop Switch C2195. • Measure the voltage between ground and: ♦ start/stop switch C2195-3, circuit CPK34 (BN/VT), harness side. ♦ start/stop switch C2195-4, circuit CPK35 (YE/OG), harness side.  • **Are the voltages greater than 5 volts?**	**Yes** REPAIR the affected circuit(s). CLEAR the DTC. TEST the system for normal operation. **No** GO to E7 .
E5 CHECK START/STOP SWITCH CIRCUIT A FOR A SHORT TO GROUND	
• Disconnect: RFA Module C3503B. • Measure the resistance between start/stop switch C2195-3, circuit CPK34 (BN/VT), harness side and ground.  • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to E7 . **No** REPAIR circuit CPK34 (BN/VT). CLEAR the DTCs. TEST the system for normal operation.

E6 CHECK START/STOP SWITCH CIRCUIT B FOR A SHORT TO GROUND	
• Disconnect: RFA Module C3503B. • Measure the resistance between start/stop switch C2195-4, circuit CPK35 (YE/OG), harness side and ground.  N0087657 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to E7 . **No** REPAIR circuit CPK35 (YE/OG). CLEAR the DTCs. TEST the system for normal operation.
E7 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect all RFA module electrical connectors. • Check connectors for: ♦ corrosion ♦ pushed-out pins ♦ bent pins ♦ spread terminals • Connect all RFA module electrical connectors and make sure they are seated correctly. • Connect: Start/Stop Switch C2195. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new RFA module. REFER to Section 419-10 . CONFIGURE the new RFA module. REFER to Programmable Module Installation (PMI) in Section 418-01 . CARRY OUT a Passive Anti-Theft System (PATS) Parameter Reset. REFER to Passive Anti-Theft System (PATS) Parameter Reset-Intelligent Access (IA) in Section 419-01B . PROGRAM 2 Intelligent Access (IA) keys. REFER to Key Programming Using Diagnostic Equipment-Intelligent Access (IA) in Section 419-01B . 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. TEST the system for normal operation.

Pinpoint Test F: DTCs B10E7:11, 12, 16 and 17

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

Normal Operation

The Remote Function Actuator (RFA) module controls and monitors the coil side of the smart keyless entry ignition relay. When the RFA module enters ON mode, it activates the relay. When energized, the relay sends power to the Central Junction Box (CJB), the main ignition relay and back to the RFA module. The RFA module uses this voltage input for diagnostic purposes.

- DTC B10E7:11 (Ignition On Relay: Circuit Short To Ground) - The RFA module monitors the output to the coil side of the smart keyless entry ignition relay. This DTC sets if the module detects a short to ground on this circuit during normal operation or during an RFA module on-demand self test.
- DTC B10E7:12 (Ignition On Relay: Circuit Short To Battery) - The RFA module monitors the output to the coil side of the smart keyless entry ignition relay. This DTC sets if the module detects a short to battery voltage on this circuit during normal operation or during an RFA module on-demand self test.
- DTC B10E7:16 (Ignition On Relay: Circuit Voltage Below Threshold) - The RFA module monitors the smart keyless entry ignition relay coil input circuit and the relay switch output. This DTC sets if the RFA module activates the relay but does not receive input voltage from the relay due to a short to ground or an open on the relay switch output ciran open in the relay coil input circuit or a relay fault. This DTC sets only if DTC B10E7:11 is not set and sets during normal operation or during an RFA module on-demand self test.
- DTC B10E7:17 (Ignition On Relay: Circuit Voltage Above Threshold) - The RFA module monitors the input from the smart keyless entry ignition relay. This DTC sets if the RFA module receives an input voltage from the relay but has not activated the relay. This DTC sets only if DTC B10E7:12 is not set and sets during normal operation or during an RFA module on-demand self test.

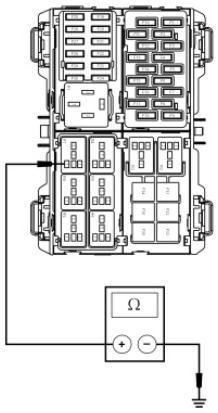
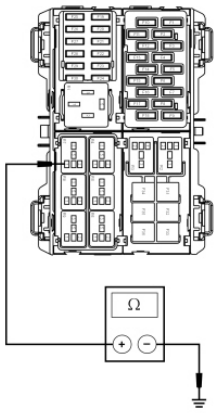
This pinpoint test is intended to diagnose the following:

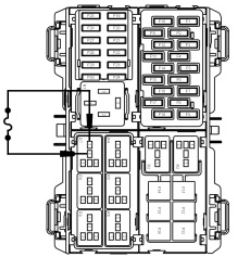
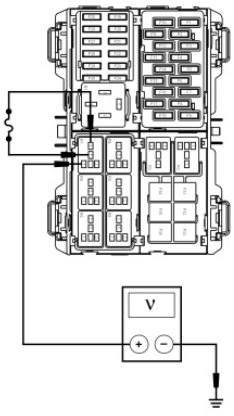
- Wiring, terminals or connectors
- Smart keyless entry ignition relay
- RFA module

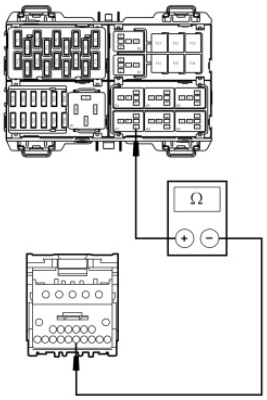
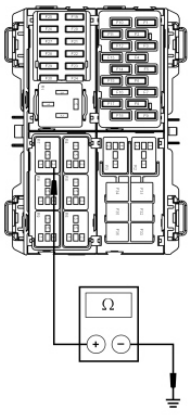
PINPOINT TEST F: DTCs B10E7:11, 12, 16 and 17

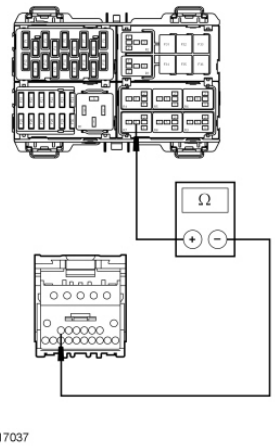
NOTICE: **Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.**

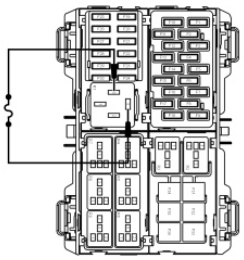
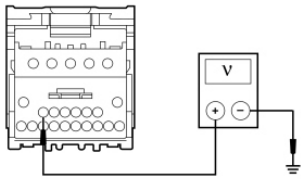
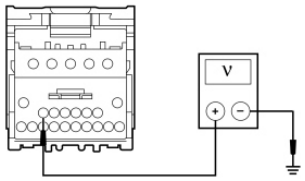
Test Step	Result / Action to Take
F1 REVIEW THE RFA MODULE DTCs	
• Review the DTCs retrieved and recorded during Inspection and Verification. • **Is DTC B10E7:11, 12, 16 or 17 present?**	**Yes** For B10E7:11, GO to F2 . For B10E7:12, GO to F4 . For B10E7:16, GO to F5 . For B10E7:17, GO to F9 . **No** For all other RFA module DTCs, REFER to the Remote Function Actuator (RFA) Module DTC Chart in this section.
F2 CHECK THE SMART KEYLESS ENTRY IGNITION RELAY CONTROL CIRCUIT AND RFA MODULE FOR A SHORT TO GROUND	

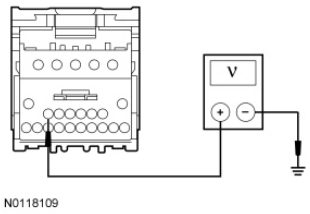
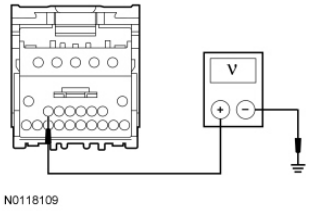
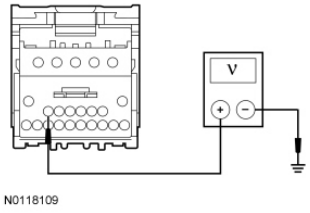
• Ignition OFF. • Disconnect: Smart Keyless Entry Ignition Relay. • Measure the resistance between smart keyless entry ignition relay cavity 1, circuit ZA102 (OG/YE), and ground.  N0117031 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL a new smart keyless entry ignition relay. CLEAR the DTC. REPEAT the self-test. **No** GO to F3 .
F3 ISOLATE THE SMART KEYLESS ENTRY IGNITION RELAY CONTROL CIRCUIT AND CHECK FOR A SHORT TO GROUND	
• Disconnect: RFA Module C3503B. • Measure the resistance between smart keyless entry ignition relay cavity 1, circuit ZA102 (OG/YE), and ground.  N0117031 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to F14 . **No** REPAIR circuit ZA102 (OG/YE). CLEAR the DTCs. REPEAT the self-test.
F4 CHECK THE SMART KEYLESS ENTRY IGNITION RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: Smart Keyless Entry Ignition Relay. • Disconnect: RFA Module C3503B. • Connect a fused jumper wire between smart keyless entry ignition relay cavity 3, circuit SBP01 (RD) and smart keyless entry ignition relay cavity 5, circuit CDC32 (BN/YE).  N0117032 • Measure the voltage between smart keyless entry ignition relay cavity 1, circuit ZA102 (OG/YE), and ground.  N0117033 • **Is any voltage present?**	**Yes** REPAIR circuit ZA102 (OG/YE). CLEAR the DTCs. REPEAT the self-test. **No** GO to F14 .
F5 CHECK THE SMART KEYLESS ENTRY IGNITION RELAY CONTROL CIRCUIT FOR AN OPEN	

• Ignition OFF. • Disconnect: Smart Keyless Entry Ignition Relay. • Disconnect: RFA Module C3503B. • Measure the resistance between smart keyless entry ignition relay cavity 1, circuit ZA102 (OG/YE), and RFA module C3503B-18, circuit ZA102 (OG/YE), harness side.  N0117035 • **Is the resistance less than 5 ohms?**	**Yes** GO to F6 . **No** REPAIR circuit ZA102 (OG/YE). CLEAR the DTC. REPEAT the self-test.
F6 CHECK THE RELAY CONTROL GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between smart keyless entry ignition relay cavity 2, circuit GD145 (BK/BU), and ground.  N0117036 • **Is the resistance less than 5 ohms?**	**Yes** GO to F7 . **No** REPAIR circuit GD145 (BK/BU). CLEAR the DTC. REPEAT the self-test.
F7 CHECK THE RELAY OUTPUT CIRCUIT FOR AN OPEN	

• Measure the resistance between smart keyless entry ignition relay cavity 5, circuit CDC32 (BN/YE), and RFA module C3503B-13, circuit CDC32 (BN/YE), harness side.  N0117037 • **Is the resistance less than 5 ohms?**	**Yes** GO to F8 . **No** REPAIR circuit CDC32 (BN/YE). CLEAR the DTC. REPEAT the self-test.
F8 CHECK THE SMART KEYLESS ENTRY IGNITION RELAY OPERATION	
• Carry out the micro ISO relay component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the relay pass the test?**	**Yes** GO to F14 . **No** INSTALL a new smart keyless entry ignition relay. CLEAR the DTC. REPEAT the self-test.
F9 CHECK THE SMART KEYLESS ENTRY IGNITION RELAY OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: RFA Module C3503B. • Disconnect: Ignition Relay. • **NOTE:** This step may cause one or more DTCs to set in the RFA module. • Connect a fused jumper wire between ignition relay cavity 3, circuit SBB07 (WH/RD) and ignition relay cavity 5, circuit CDC21 (GY/BN).	**Yes** GO to F10 . **No** INSTALL a new smart keyless entry ignition relay. CLEAR the DTC. REPEAT the self-test.

 N0118107 • Measure the voltage between RFA module C3503B-13, circuit CDC32 (BN/YE), harness side and ground.  N0118109 • **Is any voltage present?**	
F10 ISOLATE CJB FUSE 20 (10A) OUTPUT CIRCUIT AND RECHECK THE RELAY OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Disconnect: CJB Fuse 20 (10A). • Measure the voltage between RFA module C3503B-13, circuit CDC32 (BN/YE), harness side and ground.  N0118109 • **Is any voltage present?**	**Yes** GO to F11 . **No** REFER to the Wiring Diagrams manual to identify possible causes of the short on circuit CBP20 (YE/VT). REPAIR as necessary. CLEAR the DTC. REPEAT the self-test.
F11 ISOLATE CJB FUSE 21 (10A) OUTPUT CIRCUIT AND RECHECK THE RELAY OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	

• Disconnect: CJB Fuse 21 (10A). • Measure the voltage between RFA module C3503B-13, circuit CDC32 (BN/YE), harness side and ground.  N0118109 • **Is any voltage present?**	**Yes** GO to F12 . **No** REFER to the Wiring Diagrams manual to identify the cause of the short on circuit CBP21 (BU/GY). REPAIR as necessary. CLEAR the DTC. REPEAT the self-test.
F12 ISOLATE CJB FUSE 22 (7.5A) OUTPUT CIRCUIT AND RECHECK THE RELAY OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Disconnect: CJB Fuse 22 (7.5A). • Measure the voltage between RFA module C3503B-13, circuit CDC32 (BN/YE), harness side and ground.  N0118109 • **Is any voltage present?**	**Yes** GO to F13 . **No** REFER to the Wiring Diagrams manual to identify the cause of the short on circuit CBP22 (GN/OG). REPAIR as necessary. CLEAR the DTC. REPEAT the self-test.
F13 ISOLATE CJB FUSE 23 (10A) OUTPUT CIRCUIT AND RECHECK THE RELAY OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Disconnect: CJB Fuse 23 (10A). • Measure the voltage between RFA module C3503B-13, circuit CDC32 (BN/YE), harness side and ground.  N0118109 • **Is any voltage present?**	**Yes** GO to F14 . **No** REFER to the Wiring Diagrams manual to identify the cause of the short on circuit CBP23 (BN/YE). REPAIR as necessary. CLEAR the DTC. REPEAT the self-test.

F14 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect all RFA module electrical connectors. • Check connectors for: ♦ corrosion ♦ pushed-out pins ♦ bent pins ♦ spread terminals • Connect all RFA module electrical connectors and make sure they are seated correctly. • Connect: Smart Keyless Entry Ignition Relay. • Connect: Ignition Relay (if previously disconnected). • Connect: CJB Fuse 20 (10A) (if previously disconnected). • Connect: CJB Fuse 21 (10A) (if previously disconnected). • Connect: CJB Fuse 22 (7.5A) (if previously disconnected). • Connect: CJB Fuse 23 (10A) (if previously disconnected). • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new RFA module. REFER to Section 419-10 . CONFIGURE the new RFA module. REFER to Programmable Module Installation (PMI) in Section 418-01 . CARRY OUT a Passive Anti-Theft System (PATS) Parameter Reset. REFER to Passive Anti-Theft System (PATS) Parameter Reset-Intelligent Access (IA) in Section 419-01B . PROGRAM 2 Intelligent Access (IA) keys. REFER to Key Programming Using Diagnostic Equipment-Intelligent Access (IA) in Section 419-01B . 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. TEST the system for normal operation.

Pinpoint Test G: DTCs U3004:11 and 12

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

Normal Operation

The Remote Function Actuator (RFA) module controls and monitors the coil side of the smart keyless entry accessory relay. When the RFA module enters ACC mode, it activates the relay. When energized, the relay sends power to the Audio Control Module (ACM) and the Instrument Panel Cluster (IPC) through Central Junction Box (CJB) fuse 19 (7.5A); and to the Tire Pressure Monitoring System (TPMS)/Vehicle Security Module (VSM) through CJB fuse 26 (7.5A).

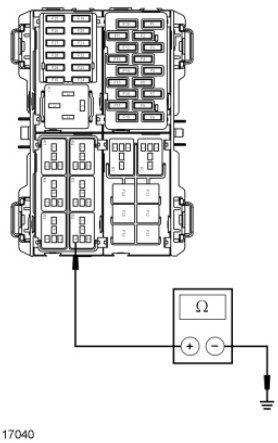
- DTC U3004:11 (Accessory Power Relay: Circuit Short To Ground) - The RFA module monitors the output to the coil side of the smart keyless entry accessory relay. This DTC sets if the module detects a short to ground on this circuit. This DTC only sets during normal operation.
- DTC U3004:12 (Accessory Power Relay: Circuit Short To Battery) - The RFA module monitors the output to the coil side of the s keyless entry accessory relay. This DTC sets if the module detects a short to battery voltage on this circuit. This DTC only sets during normal operation.

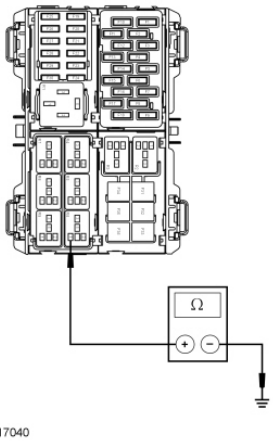
This pinpoint test is intended to diagnose the following:

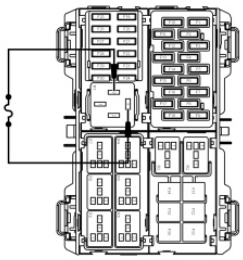
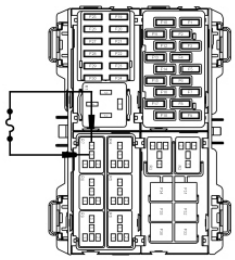
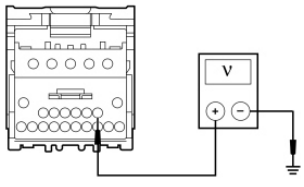
- Wiring, terminals or connectors
- Smart keyless entry accessory relay
- RFA module

PINPOINT TEST G: DTCs U3004:11 AND 12

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
G1 REVIEW THE RFA MODULE DTCs	
• Review the DTCs retrieved and recorded during Inspection and Verification. • **Is DTC U3004:11 or U3004:12 present?**	**Yes** For U3004:11, GO to G2 . For U3004:12, GO to G4 . **No** For all other RFA module DTCs, REFER to the Remote Function Actuator (RFA) Module DTC Chart in this section.
G2 CHECK THE SMART KEYLESS ENTRY ACCESSORY RELAY CONTROL FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: Smart Keyless Entry Accessory Relay. • Measure the resistance between smart keyless entry accessory relay cavity 1, circuit ZA101 (OG), and ground.  N0117040 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL a new smart keyless entry accessory relay. CLEAR the DTC. TEST the system for normal operation. **No** GO to G3 .
G3 ISOLATE THE SMART KEYLESS ENTRY ACCESSORY RELAY CONTROL CIRCUIT AND RECHECK FOR A SHORT TO GROUND	

• Disconnect: RFA Module C3503C. • Measure the resistance between smart keyless entry accessory relay cavity 1, circuit ZA101 (OG), and ground.  N0117040 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to G5 . **No** REPAIR circuit ZA101 (OG). CLEAR the DTC. TEST the system for normal operation.
G4 CHECK THE SMART KEYLESS ENTRY ACCESSORY RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: RFA Module C3503C. • Disconnect: Ignition Relay. • Disconnect: Smart Keyless Entry Ignition Relay. • Disconnect: Smart Keyless Entry Accessory Relay. • **NOTE:** This step may cause one or more DTCs to set in the RFA module. • Connect a fused jumper wire between ignition relay cavity 3, circuit SBB07 (WH/RD) and ignition relay cavity 5, circuit CDC21 (GY/BN).	**Yes** REPAIR circuit ZA101 (OG). CLEAR the DTC. TEST the system for normal operation. **No** GO to G5 .

 N0118107 • **NOTE:** This step may cause one or more DTCs to set in the RFA module. • Connect a fused jumper wire between smart keyless entry ignition relay cavity 3, circuit SBP01 (RD) and smart keyless entry ignition relay cavity 5, circuit CDC32 (BN/YE).  N0117032 • Measure the voltage between RFA module C3503C-8, circuit ZA101 (OG), and ground.  N0118111 • **Is any voltage present?**	
G5 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect all RFA module electrical connectors.	**Yes** INSTALL a new RFA module. REFER to Section 419-10 .

• Check connectors for: ♦ corrosion ♦ pushed-out pins ♦ bent pins ♦ spread terminals • Connect all RFA module electrical connectors and make sure they are seated correctly. • Connect: Ignition Relay. • Connect: Smart Keyless Entry Accessory Relay. • Connect: Smart Keyless Entry Ignition Relay. • Operate the system and verify the concern is still present. • **Is the concern still present?**	CONFIGURE the new RFA module. REFER to Programmable Module Installation (PMI) in Section 418-01 . CARRY OUT a Passive Anti-Theft System (PATS) Parameter Reset. REFER to Passive Anti-Theft System (PATS) Parameter Reset-Intelligent Access (IA) in Section 419-01B . PROGRAM 2 Intelligent Access (IA) keys. REFER to Key Programming Using Diagnostic Equipment-Intelligent Access (IA) in Section 419-01B . 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. TEST the system for normal operation.

Pinpoint Test H: No Power in ON/No Power in START - Vehicles With a Push Button Start System

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

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

Refer to Wiring Diagrams Cell 37 , Shift Interlock for schematic and connector information.

Normal Operation

To place the vehicle in ON mode, place the Intelligent Access (IA) key inside the vehicle and press the start/stop switch for at least one second without applying the brake pedal (or clutch pedal if equipped with a manual transmission). When in ON mode, the Remote Function Actuator (RFA) module applies battery voltage to the coil side of the smart keyless entry ignition relay and the smart keyless entry accessory relay. When activated, the smart keyless entry ignition relay provides battery voltage to the main ignition relay and several fuses in the Central Junction Box (CJB). The main ignition relay provides power to various vehicle systems. When activated, the smart keyless entry accessory relay provides battery voltage to CJB fuses 19 (7.5A) and 26 (7.5A).

To start the engine; place the IA key inside the vehicle, shift the transaxle into PARK (automatic transaxle) or NEUTRAL (automatic or manual transaxle), place the vehicle in either OFF mode or ON mode, press and hold the brake pedal (automatic transaxle) or clutch pedal (manual transaxle), then press the start/stop switch.

At that time, the RFA module sends a voltage signal to the input side of the starter inhibit relay coil. If the Passive Anti-Theft System (PATS) authorizes the system to start the engine, the PCM supplies a ground to the coil of the starter inhibit relay, closing the relay and engaging the starter motor.

In the event the vehicle will not enter ON or START mode, the Front Control/Display Interface Module (FCDIM) displays messages that may indicate possible causes.

This pinpoint test is intended to diagnose the following:

- Fuses
- Wiring, terminals or connectors
- Start/stop switch
- Smart keyless entry ignition relay
- Smart keyless entry accessory relay
- Ignition relay
- Cruise control deactivation switch
- Clutch Pedal Position (CPP) switch
- Starting system
- PATS
- RFA module

PINPOINT TEST H: NO POWER IN ON/NO POWER IN START - VEHICLES WITH A PUSH BUTTON START SYSTEM

Test Step	Result / Action to Take
H1 CONFIRM THE IA KEY ALLOWS VEHICLE ENTRY	
• **NOTE:** Do not place the IA key inside the vehicle during this test step. • With the driver door unlocked and the IA key within 1 meter (3 feet) of the driver door, press the button on the driver door handle; the driver door should lock. • **Did the driver door lock?**	**Yes** GO to H3 . **No** GO to H2 .
• Carry out the Battery Condition Test. Refer to Section 414-01 . • **Is the battery OK?**	**Yes** REFER to Section 501-14 to diagnose the Remote Keyless Entry (RKE) system. **No** CORRECT the battery condition. TEST the system for normal operation.
H3 ATTEMPT VEHICLE START WHILE MONITORING THE FCDIM	
• With the vehicle in PARK (automatic transaxle) or NEUTRAL (automatic or manual transaxle) and the IA key in the vehicle, press the brake pedal (automatic transaxle) or clutch pedal (manual transaxle) and then press the start/stop switch while monitoring FCDIM messages. • **Did the engine crank?**	**Yes** CARRY OUT Key ON Engine OFF (KOEO) self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual to diagnose the no start concern. **No** If NO KEY DETECTED is displayed in the FCDIM , REFER to Section 419-01B to diagnose the RFA module and interior antenna concern.

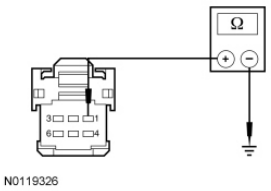
	If TO START PRESS BRAKE is displayed in the FCDIM , GO to H19 . If TO START SELECT N OR P is displayed in the FCDIM , GO to H24 . If TO START PRESS CLUTCH is displayed in the FCDIM , GO to H29 . If there is no message displayed in the FCDIM , GO to H4 .
H4 CHECK FOR IGNITION ON MODE	
• **NOTE:** The air bag warning indicator in the Instrument Panel Cluster (IPC) only illuminates and proves out when the vehicle successfully enters ON mode. • Monitor the air bag warning indicator while attempting to enter ON mode. • **Did the air bag warning indicator illuminate for approximately 6 seconds and then go out?**	**Yes** GO to H11 . **No** GO to H5 .
H5 CARRY OUT A NETWORK TEST	
NOTE: Entering the vehicle with the IA key will cause the RFA module to "wake up". While the RFA module is awake, it is able to report DTCs from a Network Test. Other modules may not be able to pass the Network Test with the ignition in the OFF mode. • Enter the following diagnostic mode on the scan tool: Network Test. • **Did the RFA module pass the Network Test?**	**Yes** GO to H6 . **No** REFER to Section 418-00 to diagnose no communication with the RFA module.
H6 CHECK THE START/STOP SWITCH PIDs	
NOTE: The RFA module is able to provide DataLogger information with the ignition in the OFF mode. When the scan tool indicates "Turn the Ignition ON", ignore this command and press or click the "continue" button. • Enter the following diagnostic mode on the scan tool: DataLogger - RFA Module. • Monitor the following RFA module PIDs while pressing and releasing the start/stop switch: ♦ Start Button Circuit A (START_SW_1) ♦ Start Button Circuit B (START_SW_2) • **Do both PIDs display ON when the switch is pressed and OFF when the switch is released?**	**Yes** GO to H12 . **No** GO to H7 .
H7 CHECK THE START/STOP SWITCH	

<table>
<tr><td>
• Ignition OFF.
• Disconnect: Start/Stop Switch C2195.
• Carry out the start/stop switch component test.

Refer to Wiring Diagrams Cell 149 for component testing.
• Does the start/stop switch pass the test?
</td><td>
Yes
GO to H8 .

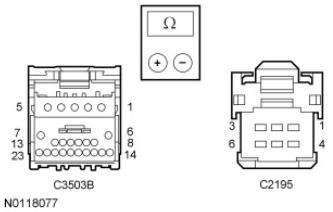
No
INSTALL a new start/stop switch.

CLEAR the DTCs. TEST the system for normal operation.
</td></tr>
<tr><td>H8 CHECK THE START/STOP SWITCH GROUND CIRCUIT FOR AN OPEN</td><td></td></tr>
<tr><td>
• Measure the resistance between start/stop switch C2195-1, circuit GD115 (BK/GY), and ground.

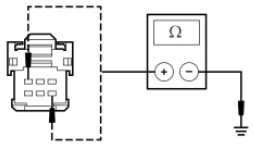

N0119326
• Is the resistance less than 5 ohms?
</td><td>
Yes
GO to H9 .

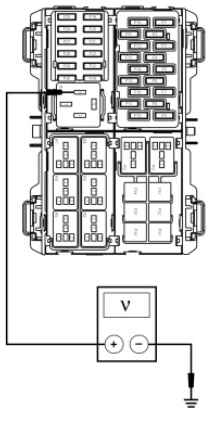
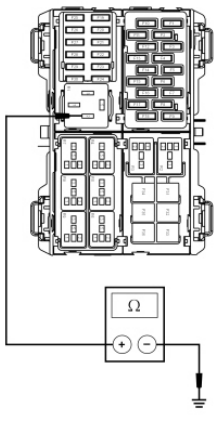
No
REPAIR circuit GD115 (BK/GY).

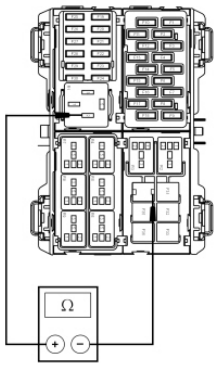
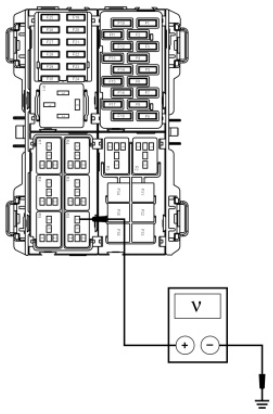
TEST the system for normal operation.
</td></tr>
<tr><td>H9 CHECK THE RFA MODULE START/STOP SWITCH INPUT CIRCUITS FOR AN OPEN</td><td></td></tr>
<tr><td>
• Disconnect: RFA Module C3503B.
• Measure resistance between RFA module C3503B, harness side and start/stop switch C2195, harness side using the following chart:

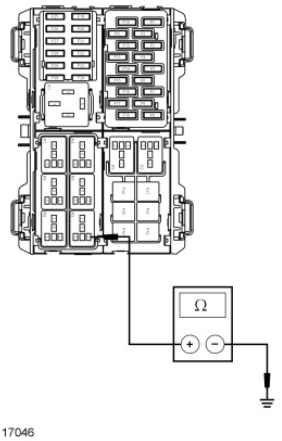
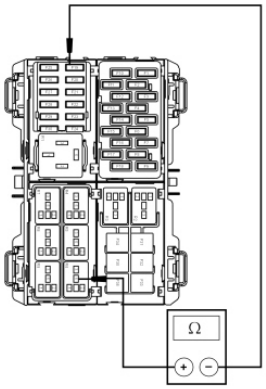
<table>
<tr><th>RFA Module</th><th>Circuit</th><th>Start/Stop Switch</th></tr>
<tr><td>C3503B-23</td><td>CPK35 (YE/OG)</td><td>C2195-4</td></tr>
<tr><td>C3503B-22</td><td>CPK34 (BN/VT)</td><td>C2195-3</td></tr>
</table>

C3503B C2195
N0118077
• Are the resistances less than 5 ohms?
</td><td>
Yes
GO to H10 .

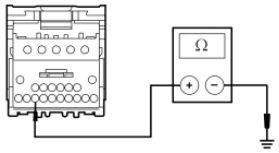
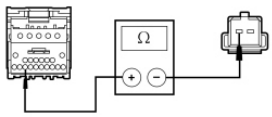
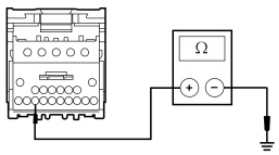
No
REPAIR the affected circuit(s). CLEAR the DTC. TEST the system for normal operation.
</td></tr>
<tr><td>H10 CHECK THE RFA MODULE START/STOP SWITCH INPUT CIRCUITS FOR A SHORT TO GROUND</td><td></td></tr>
</table>

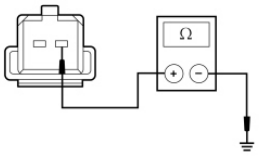
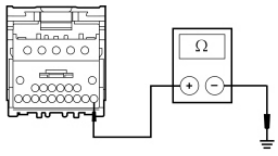
• Measure the resistance between ground and: ♦ start/stop switch C2195-3, circuit CPK34 (BN/VT), harness side. ♦ start/stop switch C2195-4, circuit CPK35 (YE/OG), harness side.  N0118112 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to H34 . **No** REPAIR the affected circuit(s). CLEAR the DTC. TEST the system for normal operation.
H11 CARRY OUT AN RFA MODULE SELF-TEST	
• Enter the following diagnostic mode on the scan tool: Self Test - RFA Module. • Review the results of the self-test. • **Are any RFA module DTCs present?**	**Yes** For DTCs B108B:23, B108B:29 and B108C:23, GO to Pinpoint Test E . For DTCs B10E7:11, B10E7:12, B10E7:16 and B10E7:17, GO to Pinpoint Test F . For DTCs U3004:11 and U3004:12, GO to Pinpoint Test G . For DTCs U300E:62, U300F:62, U3010:62 and U3011:62, GO to Pinpoint Test I . For all other RFA module DTCs, REFER to the Remote Function Actuator (RFA) Module DTC Chart in this section. **No** REFER to Section 303-06 to diagnose the starting system.
H12 ISOLATE THE IGNITION RELAY	
• Ignition OFF. • Disconnect: Ignition Relay. • Carry out the appropriate relay component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Is the relay OK?**	**Yes** GO to H13 . **No** INSTALL a new ignition relay. CLEAR the DTCs. TEST the system for normal operation.
H13 CHECK FOR POWER TO THE IGNITION RELAY	
• Disconnect: Ignition Relay. • Measure the voltage between ignition relay cavity 3, circuit SBB07 (WH/RD), and ground.	**Yes** GO to H14 . **No** VERIFY Battery Junction Box (BJB) fuse 7 (60A) is OK. If OK, REPAIR circuit SBB07

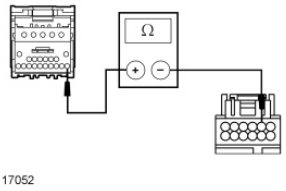
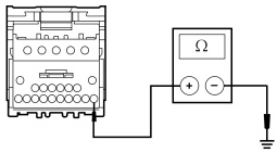
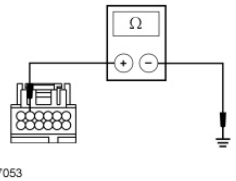
 N0117042 • **Is the voltage greater than 10 volts?**	(WH/RD). If not OK, REFER to the Wiring Diagrams manual to identify possible causes of the circuit short. REPAIR as necessary. TEST the system for normal operation.
H14 CHECK THE IGNITION RELAY GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between ignition relay cavity 2, circuit GD145 (BK/BU), and ground.  N0117043 • **Is the resistance less than 5 ohms?**	**Yes** GO to H15 . **No** REPAIR circuit GD145 (BK/BU). TEST the system for normal operation.
H15 CHECK THE IGNITION RELAY OUTPUT CIRCUIT FOR AN OPEN	
• Disconnect: CJB Fuse 34 (30A). • Measure the resistance between ignition relay pin 5, circuit CDC21 (GY/BN), and CJB fuse 34 (30A), circuit CDC21 (GY/BN), input side.	**Yes** GO to H16 . **No** REPAIR circuit CDC21 (GY/BN). TEST the system for normal operation.

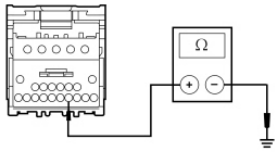
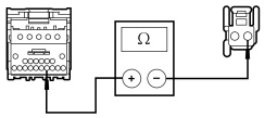
 N0117044 • **Is the resistance less than 5 ohms?**	
H16 CHECK FOR POWER TO THE SMART KEYLESS ENTRY ACCESSORY RELAY	
• Ignition OFF. • Disconnect: Smart Keyless Entry Accessory Relay. • Measure the voltage between smart keyless entry accessory relay cavity 3, circuit SBP01 (RD), and ground.  N0117045 • **Is the voltage greater than 10 volts?**	**Yes** GO to H17 . **No** VERIFY CJB fuse 1 (15A) is OK. If OK, REPAIR circuit SBP01 (RD). If not OK, REFER to the Wiring Diagrams manual to identify possible causes of the circuit short. REPAIR as necessary. TEST the system for normal operation.
H17 CHECK THE SMART KEYLESS ENTRY ACCESSORY RELAY GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between smart keyless entry accessory relay cavity 2, circuit GD145 (BK/BU), and ground.	**Yes** GO to H18 . **No** REPAIR circuit GD145 (BK/BU). TEST the system for normal operation.

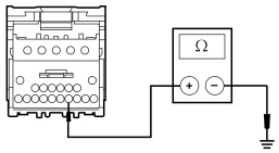
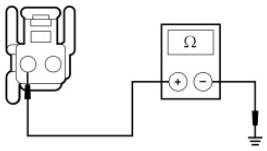
 N0117046 • **Is the resistance less than 5 ohms?**	
H18 CHECK THE SMART KEYLESS ENTRY ACCESSORY RELAY OUTPUT CIRCUIT FOR AN OPEN	
• Measure the resistance between smart keyless entry accessory relay cavity 5, circuit CDC33 (VT/GN), and CJB fuse 19 (7.5A), circuit CDC33 (VT/GN), input side.  N0117047 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new smart keyless entry accessory relay. TEST the system for normal operation. **No** REPAIR circuit CDC33 (VT/GN). TEST the system for normal operation.
H19 CHECK THE RFA MODULE BRAKE SWITCH (BRAKE_SW) PID	
NOTE: The RFA module is able to provide DataLogger information with the ignition in the OFF mode. When the scan tool indicates "Turn the Ignition ON", ignore this command and press or click the "continue" button. • Enter the following diagnostic mode on the scan tool: DataLogger - RFA Module. • Monitor the BRAKE_SW PID while applying the brake pedal. • **Does the PID change from NO to YES when the brake pedal is applied?**	**Yes** GO to H34 . **No** GO to H20 .
H20 CHECK THE RFA MODULE CRUISE CONTROL DEACTIVATOR SWITCH INPUT	

• Disconnect: RFA Module C3503B. • While pressing and releasing the brake pedal, measure the resistance between RFA module C3503B-21, circuit CCA29 (GN/BU), harness side and ground.  N0117048 • **Is the resistance less than 5 ohms with the brake pedal released and greater than 10,000 ohms with the brake pedal applied?**	**Yes** GO to H34 . **No** GO to H21 .
H21 CHECK THE RFA MODULE CRUISE CONTROL DEACTIVATOR SWITCH INPUT CIRCUIT FOR AN OPEN	
• Disconnect: Cruise Control Deactivator Switch C278. • Measure the resistance between RFA module C3503B-21, circuit CCA29 (GN/BU), harness side and cruise control deactivator switch C278-2, circuit CCA29 (GN/BU), harness side.  N0117049 • **Is the resistance less than 5 ohms?**	**Yes** GO to H22 . **No** REPAIR circuit CCA29 (GN/BU). TEST the system for normal operation.
H22 CHECK THE RFA MODULE CRUISE CONTROL DEACTIVATOR SWITCH INPUT CIRCUIT FOR A SHORT TO GROUND	
• Measure the resistance between RFA module C3503B-21, circuit CCA29 (GN/BU), harness side and ground.  N0117048 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to H23 . **No** REPAIR circuit CCA29 (GN/BU). TEST the system for normal operation.
H23 CHECK THE RFA MODULE CRUISE CONTROL DEACTIVATOR SWITCH GROUND CIRCUIT FOR AN OPEN	

• Measure the resistance between cruise control deactivator switch C278-1, circuit GD187 (BK/GN), harness side.  N0117050 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new cruise control deactivator switch. REFER to Section 419-03 . TEST the system for normal operation. **No** REPAIR circuit GD187 (BK/GN). TEST the system for normal operation.
H24 CHECK THE RFA MODULE CRANK FACTOR PARK (CRK_FACT_PK) PID	
NOTE: The RFA module is able to provide DataLogger information with the ignition in the OFF mode. When the scan tool indicates "Turn the Ignition ON", ignore this command and press or click the "continue" button. • Enter the following diagnostic mode on the scan tool: DataLogger - pan title="Remote Function Actuator" class="popup" onmouseover="this.className='popupnounderline';" onmouseout="this.className='popup';">RFA Module. • Monitor the Crk_Fact_Pk PID while shifting the transaxle into and out of PARK and NEUTRAL. • **Does the PID display YES with the transaxle in PARK/NEUTRAL and NO with the transaxle out of PARK/NEUTRAL?**	**Yes** GO to H34 . **No** GO to H25 .
H25 CHECK THE RFA MODULE PARK POSITION SWITCH INPUT	
• Select PARK. • Disconnect: RFA Module C3503C. • Measure the resistance between RFA module C3503C-14, circuit CDC41 (WH/BN), harness side and ground.  N0117051 • **Is the resistance less than 5 ohms with the transaxle in PARK?**	**Yes** GO to H34 . **No** GO to H26 .
H26 CHECK THE RFA MODULE PARK POSITION SWITCH INPUT CIRCUIT FOR AN OPEN	

• Disconnect: Floor Shifter C3245. • Measure the resistance between RFA module C3503C-14, circuit CDC41 (WH/BN), harness side and floor shifter C3245-2, circuit CDC41 (WH/BN), harness side.  N0117052 • **Is the resistance less than 5 ohms?**	**Yes** GO to H27 . **No** REPAIR circuit CDC41 (WH/BN). TEST the system for normal operation.
H27 CHECK THE RFA MODULE PARK POSITION SWITCH INPUT CIRCUIT FOR A SHORT TO GROUND	
• Measure the resistance between RFA module C3503C-14, circuit CDC41 (WH/BN), harness side and ground.  N0117051 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to H28 . **No** REPAIR circuit CDC41 (WH/BN). TEST the system for normal operation.
H28 CHECK THE RFA MODULE PARK POSITION SWITCH GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between floor shifter C3245-5, circuit GD115 (BK/GY), harness side and ground.  N0117053 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new transaxle selector lever (floor shifter). REFER to Section 307-05 . TEST the system for normal operation. **No** REPAIR circuit CDC41 (WH/BN). TEST the system for normal operation.
H29 CHECK THE RFA CLUTCH SWITCH (CLUTCH_SW) PID	
NOTE: The RFA module is able to provide DataLogger information with the ignition in the OFF mode. When the scan tool indicates "Turn the Ignition ON", ignore this command and press or click the "continue" button.	**Yes** GO to H34 . **No** GO to H30 .

• Enter the following diagnostic mode on the scan tool: DataLogger - RFA Module. • Monitor the CLUTCH_SW PID while pressing and releasing the clutch pedal. • **Does the PID display YES with the clutch pedal fully applied and NO with the clutch pedal released?**	
H30 CHECK THE RFA MODULE CPP SWITCH INPUT	
• Disconnect: RFA Module C3503B. • While pressing and releasing the clutch pedal, measure theesistance between RFA module C3503B-17, circuit CE903 (BU/OG), harness side and ground.  N0117054 • **Is the resistance less than 5 ohms with the clutch pedal fully applied and greater than 10,000 ohms with the clutch pedal released?**	**Yes** GO to H34 . **No** GO to H31 .
H31 CHECK THE RFA MODULE CPP SWITCH INPUT CIRCUIT FOR AN OPEN	
• Disconnect: CPP Switch C257. • Measure the resistance between RFA module C3503B-17, circuit CE903 (BU/OG), harness side and CPP switch C257-1, circuit CE903 (BU/OG), harness side.  N0119755 • **Is the resistance less than 5 ohms?**	**Yes** GO to H32 . **No** REPAIR circuit CE903 (BU/OG). TEST the system for normal operation.
H32 CHECK THE RFA MODULE CPP SWITCH INPUT CIRCUIT FOR A SHORT TO GROUND	
• Measure the resistance between RFA module C3503B-17, circuit CE903 (BU/OG), harness side and ground.	**Yes** GO to H33 . **No** REPAIR circuit CE903 (BU/OG). TEST the system for normal operation.

 N0117054 • **Is the resistance greater than 10,000 ohms?**	
H33 CHECK THE RFA MODULE CPP SWITCH GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between CPP switch C257-2, circuit GD187 (BK/GN), harness side.  N0119756 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new CPP switch. TEST the system for normal operation. **No** REPAIR circuit GD187 (BK/GN). TEST the system for normal operation.
H34 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect all RFA module electrical connectors. • Check connectors for: ♦ corrosion ♦ pushed-out pins ♦ bent pins ♦ spread terminals • Connect all RFA module electrical connectors and make sure they are seated correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new RFA module. REFER to Section 419-10 . CONFIGURE the new RFA module. REFER to Programmable Module Installation (PMI) in Section 418-01 . CARRY OUT a Passive Anti-Theft System (PATS) Parameter Reset. REFER to Passive Anti-Theft System (PATS) Parameter Reset-Intelligent Access (IA) in Section 419-01B . PROGRAM 2 Intelligent Access (IA) keys. REFER to Key Programming Using Diagnostic Equipment-Intelligent Access (IA) in Section 419-01B . 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. TEST the system for normal operation.

Pinpoint Test I: DTCs U300E:62, U300F:62, U3010:62 and U3011:62

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

Refer to Wiring Diagrams Cell 20 , Starting System for schematic and connector information.

Normal Operation

The Remote Function Actuator (RFA) module receives a direct input from the start/stop switch. After receiving this input, the RFA module activates the smart keyless entry ignition relay, the smart keyless entry accessory relay and the main ignition relay. The Instrument Panel Cluster (IPC) receives power from the 2 smart keyless entry relays and sends an ignition status message to the RFA module over the Controller Area Network (CAN), the RFA module uses this status message as a way to self-test.

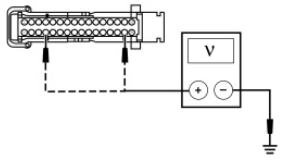
DTC Description	Fault Trigger Condition
• U300E:62 - Ignition Input On: Signal Compare Failure • U300F:62 - Ignition Input Accessory: Signal Compare Failure • U3010:62 - Ignition Input Start: Signal Compare Failure • U3011:62 - Ignition Input Off: Signal Compare Failure	One or more of these DTCs are set if the IPC ignition status message received by the RFA module does not match the start/stop switch input to the RFA module. This can be caused by a communication issue between the IPC and the RFA module, a wiring concern in the CAN , a wiring concern in the ignition input to the RFA module, a wiring concern in the relay inputs to the IPC , a failure of the start/stop switch or a failure in either module. The input from the start/stop switch to the RFA module supersedes the input message from the IPC .

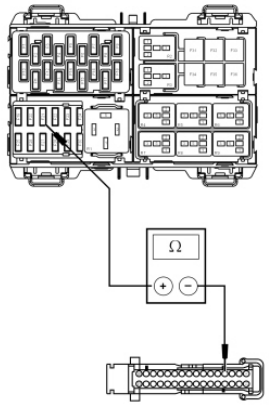
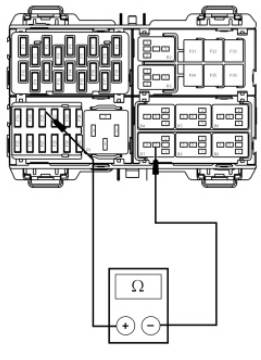
This pinpoint test is intended to diagnose the following:

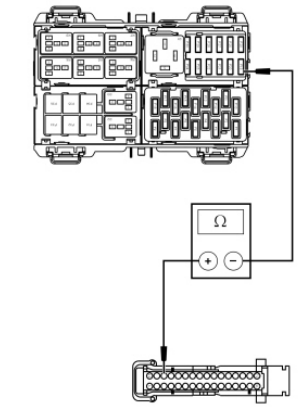
- Fuses
- Wiring, terminals or connectors
- Smart keyless entry accessory relay
- Start/stop switch
- IPC
- RFA module

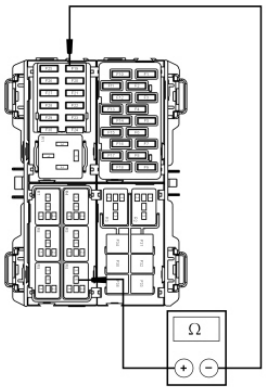
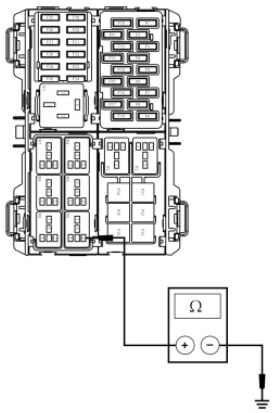
PINPOINT TEST I: DTCs U300E:62, U300F:62, U3010:62 AND U3011:62

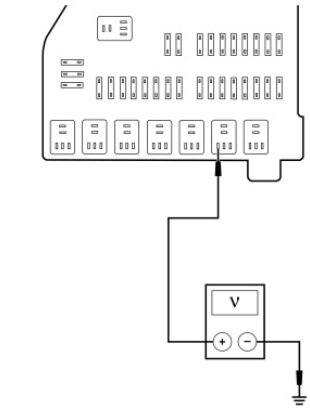
NOTICE: **Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.**

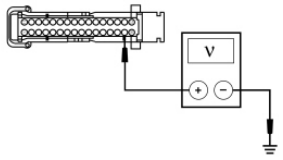
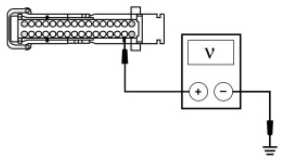
Test Step	Result / Action to Take
I1 CARRY OUT THE IPC SELF-TEST	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - IPC . • **Did the IPC communicate with the scan tool?**	**Yes** GO to I9 . **No** GO to I2 .
I2 CHECK THE IGNITION AND ACCESSORY INPUTS TO THE IPC	
NOTE: Record the results for this pinpoint test step, they will be referred to later in this pinpoint test. • Ignition OFF. • Disconnect: IPC C220. • Ignition ON. • Measure the voltage between ground and: ♦ IPC C220-4, circuit CBP21 (BU/GY), harness side. ♦ IPC C220-15, circuit CBP19 (BN/WH), harness side.  N0117057 • **Are the voltages greater than 10 volts?**	**Yes** REFER to Section 418-00 to diagnose no communication with the IPC . **No** If the voltage on **both** CBP21 (BU/GY) **and** CBP19 (BN/WH) are less than 10 volts, GO to I3 . If only the voltage on CBP19 (BN/WH) is less than 10 volts, GO to I5 . If only the voltage on CBP21 (BU/GY) is less than 10 volts, GO to I7 .
I3 CHECK THE IPC SMART KEYLESS ENTRY IGNITION RELAY INPUT CIRCUIT FOR AN OPEN	

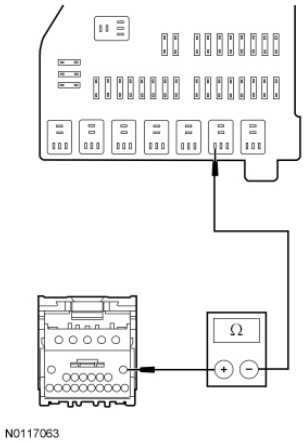
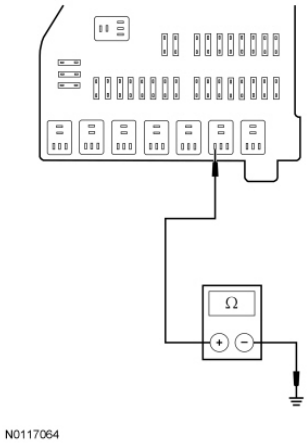
• Ignition OFF. • Disconnect: CJB Fuse 21 (10A). • Measure the resistance between IPC C220-4, circuit CBP21 (BU/GY), harness side and CJB fuse 21 (10A), circuit CBP21 (BU/GY), output side.  N0117058 • **Is the resistance less than 5 ohms?**	**Yes** VERIFY CJB fuse 21 (10A) is OK. If OK, GO to I4 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. **No** REPAIR circuit CBP21 (BU/GY). CLEAR the DTCs. REPEAT the self-test.
I4 CHECK THE SMART KEYLESS ENTRY IGNITION RELAY OUTPUT TO CJB FUSE 21 (10A)	
• Disconnect: Smart Keyless Entry Ignition Relay. • Measure the resistance between smart keyless entry ignition relay cavity 5, circuit CDC32 (BN/YE), and CJB fuse 21 (10A), circuit CDC32 (BN/YE), input side.  N0117059	**Yes** If the voltage measured on CBP19 (BN/WH) in Step I2 was also less than 10 volts, GO to I5 . If the voltage measured on CBP19 (BN/WH) in Step I2 was greater than 10 volts, GO to I10 . **No** REPAIR circuit CDC32 (BN/YE). CLEAR the DTCs. REPEAT the self-test.

• **Is the resistance less than 5 ohms?**	
I5 CHECK THE IPC SMART KEYLESS ENTRY ACCESSORY RELAY INPUT CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: CJB Fuse 19 (7.5A). • Measure the resistance between IPC C220-15, circuit CBP19 (BN/WH), harness side and CJB fuse 19 (7.5A), circuit CBP19 (BN/WH), output side.  N0117060 • **Is the resistance less than 5 ohms?**	**Yes** VERIFY CJB fuse 19 (7.5A) is OK. If OK, GO to I6 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. **No** REPAIR circuit CBP19 (BN/WH). CLEAR the DTCs. REPEAT the self-test.
I6 CHECK THE SMART KEYLESS ENTRY ACCESSORY RELAY OUTPUT TO CJB FUSE 19 (7.5A)	
• Disconnect: Smart Keyless Entry Accessory Relay. • Measure the resistance between smart keyless entry accessory relay cavity 5, circuit CDC33 (VT/GN), and CJB fuse 19 (7.5A), circuit CDC33 (VT/GN), input side.	**Yes** GO to I7 . **No** REPAIR circuit CDC33 (VT/GN). CLEAR the DTCs. REPEAT the self-test.

 N0117047 • **Is the resistance less than 5 ohms?**	
I7 CHECK THE SMART KEYLESS ENTRY ACCESSORY RELAY GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between smart keyless entry accessory relay cavity 2, circuit GD145 (BK/BU), and ground.  N0117046 • **Is the resistance less than 5 ohms?**	**Yes** GO to I8 . **No** REPAIR circuit GD145 (BK/BU). CLEAR the DTCs. REPEAT the self-test.
I8 ISOLATE THE SMART KEYLESS ENTRY ACCESSORY RELAY	
• Carry out the appropriate relay component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Is the relay OK?**	**Yes** GO to I10 . **No** INSTALL a new smart keyless entry accessory relay. CLEAR the DTCs. TEST the system for normal operation.
I9 ACT ON IPC DTCs	

• Refer to the results of the IPC self-test. • **Were any IPC DTCs present?**	**Yes** REFER to the Instrument Panel Cluster (IPC) DTC Chart in Section 413-01 . **No** GO to I10 .
I10 REVIEW THE RFA MODULE DTCs	
• Review the RFA module DTCs retrieved during Inspection and Verification. • **Are any DTCs other than U300E:62, U300F:62, U3010:62 and/or U3011:62 present?**	**Yes** DIAGNOSE all other RFA module DTCs before diagnosing U300E:62, U300F:62, U3010:62 and U3011:62. For DTCs B108B:23, B108B:29 and B108C:23, GO to Pinpoint Test E . For DTCs B10E7:11, B10E7:12, B10E7:16 and B10E7:17, GO to Pinpoint Test F . For DTCs U3004:11 and U3004:12, GO to Pinpoint Test G . For all other RFA module DTCs, REFER to the Remote Function Actuator (RFA) Module DTC Chart in this section. **No** For DTCs U300E:62, U300F:62 and/or U3011:62, GO to I11 . For DTC U3010:62, GO to I12 .
I11 CHECK THE STARTER MOTOR CONTROL SENSE CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: RFA Module C3503C. • Disconnect: IPC C220. • Disconnect: Starter Inhibit Relay. • Disconnect: ACM C240A (Vehicles Built After 1/14/2011). • Ignition ON. • Measure the voltage between starter inhibit relay, cavity 1, circuit CDC54 (WH/GN), harness side and ground.  N0117061	**Yes** REPAIR circuit CDC54 (WH/GN). CLEAR the DTCs. REPEAT the self-test. **No** GO to I12 .

• **Is any voltage present?**	
I12 CHECK THE IPC ACCESSORY INPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: IPC C220 (if not previously disconnected). • Connect: CJB Fuse 19 (7.5A) (if previously disconnected). • Connect: Smart Keyless Entry Accessory Relay (if previously disconnected). • Ignition ON. • Measure the voltage between IPC C220-15, circuit CBP19 (BN/WH), harness side and ground.  N0117062 • **Is any voltage present?**	**Yes** GO to I13 . **No** GO to I14 .
I13 ISOLATE THE SMART KEYLESS ENTRY ACCESSORY RELAY AND CHECK THE IPC ACCESSORY INPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Disconnect: Smart Keyless Entry Accessory Relay. • Measure the voltage between IPC C220-15, circuit CBP19 (BN/WH), harness side and ground.  N0117062 • **Is any voltage present?**	**Yes** REPAIR circuit CBP19 (BN/WH). CLEAR the DTCs. REPEAT the self-test. **No** INSTALL a new smart keyless entry accessory relay. CLEAR the DTCs. REPEAT the self-test.
I14 CHECK THE STARTER MOTOR CONTROL SENSE CIRCUIT FOR AN	

OPEN CIRCUIT	
• Ignition OFF. • Measure the resistance between starter inhibit relay cavity 1, circuit CDC54 (WH/GN), and RFA module C3503C-6, circuit CDC54 (WH/GN), harness side.  • **Is the resistance less than 5 ohms?**	**Yes** GO to I15 . **No** REPAIR circuit CDC54 (WH/GN). CLEAR the DTCs. REPEAT the self-test.
I15 CHECK THE STARTER MOTOR CONTROL SENSE CIRCUIT FOR A SHORT TO GROUND	
• Measure the resistance between starter inhibit relay cavity 1, circuit CDC54 (WH/GN), and ground.  • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to I16 . **No** REPAIR circuit CDC54 (WH/GN). CLEAR the DTCs. REPEAT the self-test.

I16 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect all RFA module electrical connectors. • Check connectors for: ♦ corrosion ♦ pushed-out pins ♦ bent pins ♦ spread terminals • Connect all RFA module electrical connectors and make sure they are seated correctly. • Connect all other disconnected module connectors, relays and/or fuses. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new RFA module. REFER to Section 419-10 . CONFIGURE the new RFA module. REFER to Programmable Module Installation (PMI) in Section 418-01 . CARRY OUT a Passive Anti-Theft System (PATS) Parameter Reset. REFER to Passive Anti-Theft System (PATS) Parameter Reset-Intelligent Access (IA) in Section 419-01B . PROGRAM 2 Intelligent Access (IA) keys. REFER to Key Programming Using Diagnostic Equipment-Intelligent Access (IA) in Section 419-01B . 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. TEST the system for normal operation.

Pinpoint Test J: The Ignition Key Cannot Be Returned to the OFF Position

Refer to Wiring Diagrams Cell 37 , Shift Interlock for schematic and connector information.

Normal Operation

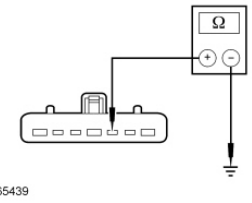
The key removal inhibit solenoid (part of the ignition switch) receives battery voltage from Central Junction Box (CJB) fuse 1 (15A). Moving the selector lever out of the PARK position closes the park detect switch (part of the selector lever) and provides a ground path for the key removal inhibit solenoid. The ground path activates the solenoid and prevents the ignition lock cylinder from being turned to the OFF position, which prevents the ignition key from being removed. The Instrument Panel Cluster (IPC) also receives input from the park detect switch along the same circuit as the key removal inhibit solenoid.

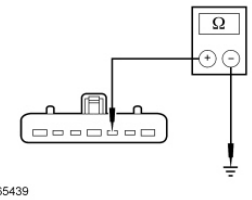
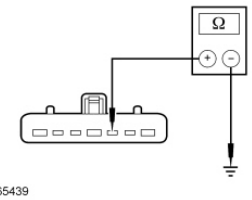
This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Key removal inhibit solenoid (part of the ignition switch)
- Ignition lock cylinder
- Park detect switch (part of the selector lever)
- IPC

PINPOINT TEST J: THE IGNITION KEY CANNOT BE RETURNED TO THE OFF POSITION

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

J1 CHECK FOR AN ENERGIZED KEY REMOVAL INHIBIT SOLENOID	
• Remove CJB fuse 1 (15A). • Attempt to turn the ignition lock cylinder to the RUN position and then back to the OFF position and remove the key. • **Does the ignition lock cylinder turn to the OFF position and can the key be removed?**	**Yes** GO to J3 . **No** GO to J2 .
J2 CHECK THE IGNITION SWITCH FOR MECHANICAL DAMAGE	
• Remove the ignition switch. Refer to Ignition Switch in this section. • Attempt to turn the ignition lock cylinder to the OFF position and remove the ignition key. • **Does the ignition lock cylinder turn to the OFF position and can the key be removed?**	**Yes** INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation. **No** REFER to Section 501-14 to continue diagnosis of the ignition lock cylinder.
J3 CHECK THE KEY REMOVAL INHIBIT SOLENOID CIRCUIT FOR A SHORT TO GROUND	
• Disconnect: Ignition Switch C250. • Measure the resistance between ignition switch C250-3, circuit CDC41 (WH/BN), harness side and ground.  N0065439 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation. **No** GO to J4 .
J4 ISOLATE THE IPC	
• Disconnect: IPC C220. • Measure the resistance between ignition switch C250-3, circuit CDC41 (WH/BN), harness side and ground.	**Yes** GO to J6 . **No** GO to J5 .

 N0065439 • **Is the resistance greater than 10,000 ohms?**	
J5 ISOLATE THE SHORT TO GROUND IN THE KEY REMOVAL INHIBIT SOLENOID CIRCUIT	
• Disconnect: Floor Shifter C3245. • Measure the resistance between ignition switch C250-3, circuit CDC41 (WH/BN), harness side and ground.  N0065439 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL a new selector lever. REFER to Section 307-05 . TEST the system for normal operation. **No** REPAIR circuit CDC41 (WH/BN). TEST the system for normal operation.
J6 CHECK FOR CORRECT IPC OPERATION	
• Check IPC C220 for: ♦ corrosion ♦ pushed-out pins ♦ bent pins ♦ spread terminals • Connect: IPC C220. • Connect: Ignition Switch C250. • Make sure the connectors are seated correctly, then operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . 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. TEST the system for normal operation.

Pinpoint Test K: The Ignition Key Can Be Turned to the OFF Position When the Selector Lever is Not In PARK

Refer to Wiring Diagrams Cell 37 , Shift Interlock for schematic and connector information.

Normal Operation

The key removal inhibit solenoid (part of the ignition switch) receives battery voltage from Central Junction Box (CJB) fuse 1 (15A). Moving the selector lever out of the PARK position closes the park detect switch (part of the selector lever) and provides a ground path for the key removal inhibit solenoid. The ground path

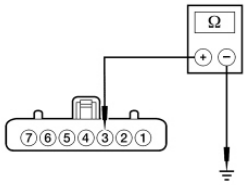
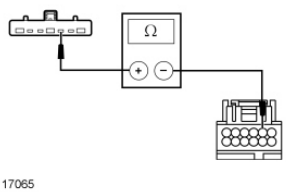
activates the solenoid and prevents the ignition lock cylinder from being turned to the OFF position, which prevents the ignition key from being removed. The Instrument Panel Cluster (IPC) also receives input from the park detect switch along the same circuit as the key removal inhibit solenoid.

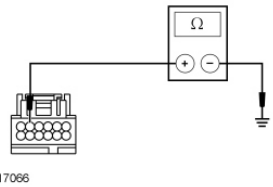
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Key removal inhibit solenoid (part of the ignition switch)
- Park detect switch (part of the selector lever)

PINPOINT TEST K: THE IGNITION KEY CAN BE TURNED TO THE OFF POSITION WHEN THE SELECTOR LEVER IS NOT IN PARK

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
K1 CHECK THE KEY INHIBIT SOLENOID CIRCUIT FOR GROUND	
• Select NEUTRAL. • Disconnect: Ignition Switch C250. • Measure the resistance between ignition switch C250-3, circuit CDC41 (WH/BN), harness side and ground.  N0105910 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation. **No** GO to K2 .
K2 CHECK THE KEY INHIBIT SOLENOID CIRCUIT FOR AN OPEN	
• Disconnect: Floor Shifter C3245. • Measure the resistance between ignition switch C250-3, circuit CDC41 (WH/BN), harness side and floor shifter C3245-2, circuit CDC41 (WH/BN), harness side.  N0117065 • **Is the resistance less than 5 ohms?**	**Yes** GO to K3 . **No** REPAIR circuit CDC41 (WH/BN). TEST the system for normal operation.

K3 CHECK THE FLOOR SHIFTER GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between floor shifter C3245-5, circuit GD115 (BK/GY), harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new selector lever (floor shifter). REFER to Section 307-05 . TEST the system for normal operation. **No** REPAIR circuit GD115 (BK/GY). TEST the system for normal operation.

Component Tests

Ignition Switch - Mechanical

The following conditionsan 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. Have a new ignition key made as necessary.

2. Turn the key to the ACC position and then the ON position.
   - If the ignition key turns to the ACC and ON position, continue with Step 3.
   - If the ignition key will not turn to the ACC and ON position, continue with Step 4.

3. **NOTE:** The ignition switch and lock cylinder should return from the START position back to the ON 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 ON 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 ON 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, install a new ignition switch. Refer to Ignition Switch in this section.

- If the lock cylinder does not operate correctly, install a new ignition lock cylinder. Refer to Section 501-14 .

Ignition Switch - Electrical

Refer to Wiring Diagrams Cell 149 for component testing.

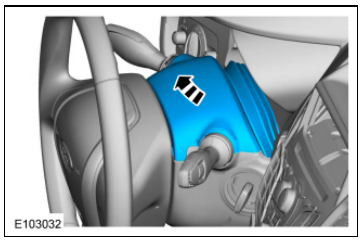
Multifunction Switch - Electrical

Refer to Wiring Diagrams Cell 149 for component testing.

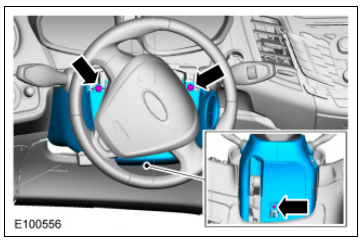
Ignition Switch

Removal and Installation

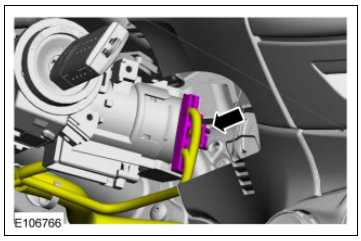
1. Pulling upward, detach the upper steering column shroud from the lower steering column shroud.
   - Slide the upper steering column shroud out of the Instrument Cluster (IC) trim panel and remove the shroud.



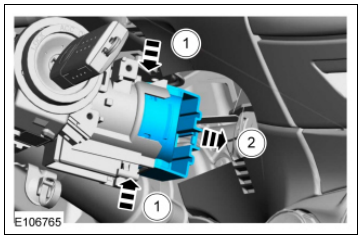
2. Remove the 3 screws and the lower steering column shroud.



3. Disconnect the ignition switch electrical connector.



4. Remove the ignition switch in the sequence shown.
   1. Press the 2 retaining tabs.
   2. Remove the ignition switch.

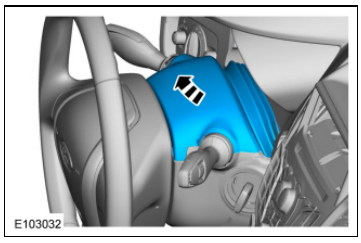


5. To install, reverse the removal procedure.

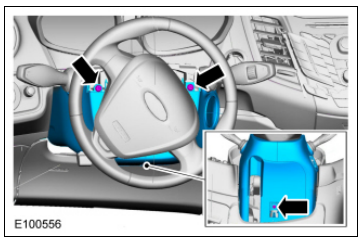
Steering Column Multifunction Switch

Removal and Installation

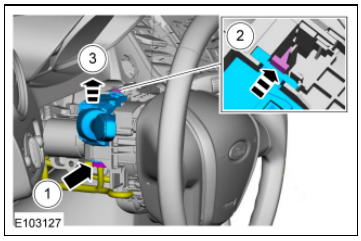
1. Pulling upward, detach the upper steering column shroud from the lower steering column shroud.
    - Slide the upper steering column shroud out of the Instrument Cluster (IC) trim panel and remove the shroud.



2. Remove the 3 screws and the lower steering column shroud.

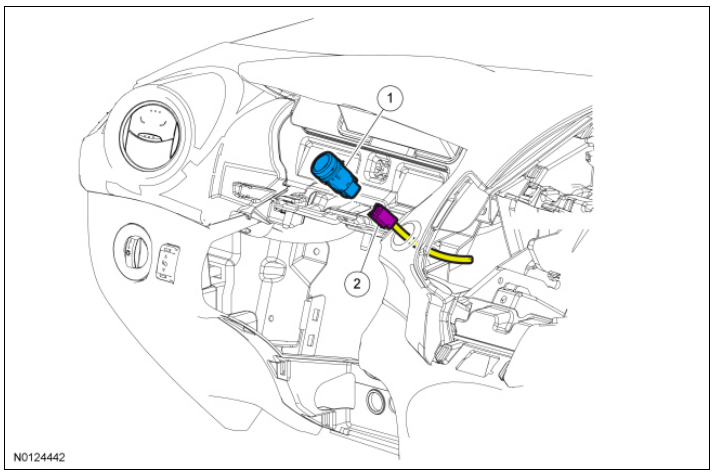


3. Remove the multifunction switch in the sequence shown.
    1. Disconnect the electrical connector.
    2. Push inward to release the locking clip.
    3. Slide the multifunction switch upward on the carrier and remove the multifunction switch.



4. To install, reverse the removal procedure.

Start/Stop Switch

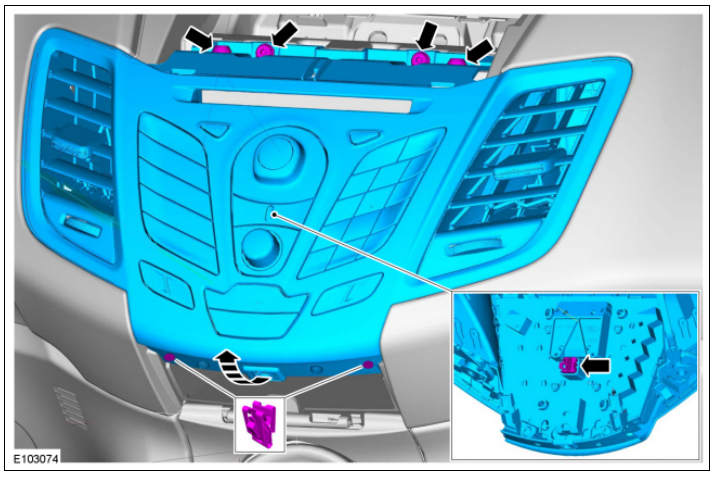


Item	Part Number	Description
1	11572	Start/stop switch
2	-	Start/stop switch electrical connector (part 14K024)

Removal and Installation

1. Remove the upper instrument panel finish panel. For additional information, refer to Section 501-12 .

2. Position aside the Front Controls Interface Module (FCIM) finish panel in the following order.
    1. Remove the 4 upper screws.
    2. Pull outward to detach the 2 lower clips.
    3. Disconnect the FCIM electrical connector and position the FCIM finish panel aside.



3. Release the 2 start/stop switch tabs (upper and lower) and detach the start/stop switch from the instrument panel.

4. Disconnect the start/stop switch electrical connector and remove the start/stop switch.

5. To install, reverse the removal procedure.

General Specifications

Item	Specification
A/C Compressor Magnetic Clutch	
Air gap between pulley and hub	0.3-0.6 mm (0.012-0.024 in)
A/C Pressure Relief Valve	
Open	3,682 kPa (534 psi) minimum
A/C Evaporator Discharge Air Temperature Sensor	
Cut-in/cut-out	2.2°C (36°F)/0.6°C (33°F)

Material

Item	Specification	Fill Capacity			
Motorcraft® A/C Cooling Coil Coating YN-29	-	- tr valign="top">	Motorcraft® A/C System Flushing Solvent YN-23	-	-
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B	100 ml (3.4 fl oz)			
Motorcraft® R-134a Refrigerant YN-19 (US); CYN-16-R (Canada)	WSH-M17B19-A	0.54 kg (19 oz) (1.19 lb)			
Stay-Brite® R-134a Leak Detection Dye 164-R6060 (Rotunda)	-	-			

Climate Control System

Climate Control System Operation

⚠ 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 manufactuDecomposition 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, observe the following precautions.**

- Identify and analyze the A/C refrigerant of all vehicles 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 R-134a refrigerant gas while the engine is 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, collect the refrigerant 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 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.
- R-134a Refrigerant 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 described as direct substitutes for 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 R-134a refrigerant.

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.

- 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 new 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 PAG 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 specifications. 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 climate control system, **not equipped with A/C** , consists of the following components:

- Heater core and evaporator core housing
- HVAC module
- Instrument Panel Cluster (IPC)
- Temperature blend door actuator
- Floor/defrost/panel mode door actuator
- Air inlet mode door actuator
- Blower motor resistor
- Blower motor

The climate control system, **equipped with A/C** , consists of the following components:

- A/C compressor
- A/C compressor clutch assembly
- A/C condenser core
- A/C evaporator core
- Receiver/drier
- Connecting refrigerant lines
- Thermostatic Expansion Valve (TXV)
- Heater core and evaporator core housing
- HVAC module
- Instrument Panel Cluster (IPC)
- Temperature blend door actuator
- Floor/defrost/panel mode door actuator
- Air inlet mode door actuator
- Blower motor resistor
- Blower motor
- Evaporator discharge air temperature sensor

HVAC System Operation

The Electronic Manual Temperature Control (EMTC) system heats or cools the vehicle depending on the HVAC control panel selection.

- The control panel selection determines heating or cooling, air distribution and enables blower motor operation.
- The temperature control setting determines the air outlet temperature.
- The blower motor switch varies the blower motor speed.
- During A/C operation (if equipped), the system reduces the relative humidity of the air inside the vehicle.

HVAC System Airflow and Mode Description

Max A/C (if equipped)

When MAX A/C is selected:

- the air inlet door closes off outside air and admits only recirculated air.
- the RECIRC button is disabled and the indicator is illuminated. (RECIRC forced on)
- the defrost/panel/floor door directs airflow to the instrument panel registers.
- blended air temperature is available.
- the A/C request button disabled and the indicator is illuminated.
- the A/C compressor operates if the outside temperature is above approximately 0°C (32°F).
- the blower motor is on.

PANEL

When PANEL is selected:

- the RECIRC request button is enabled. If the RECIRC request button is selected (indicator on), the air inlet door closes off outside air from entering the passenger compartment. If the RECIRC request button is not selected (indicator off), the air inlet door admits only outside air into the passenger compartment.
- the defrost/panel/floor door directs airflow to the instrument panel registers.
- blended air temperature is available. Only when A/C compressor operation (if equipped) has been selected by pressing the A/C request button (indicator on), can the airflow temperature be cooled below the outside air temperature.
- the A/C request button (if equipped) is enabled. The A/C compressor operates and the indicator illuminates if the A/C request button is selected and the outside temperature is above approximately 0°C (32°F).
- the blower motor is on.

PANEL/FLOOR

When PANEL/FLOOR is selected:

- the RECIRC request button is enabled. If the RECIRC request button is selected (indicator on), the air inlet door closes off outside air from entering the passenger compartment. If the RECIRC request button is not selected (indicator off), the air inlet door admits only outside air into the passenger compartment.
- the defrost/panel/floor door directs airflow to the floor duct and the instrument panel A/C registers. A small amount of airflow from the side window demisters and defrost duct is present.
- blended air temperature is available. Only when A/C compressor operation (if equipped) has been selected by pressing the A/C request button (indicator on), can the airflow temperature be cooledow the outside air temperature.

- the A/C request button (if equipped) is enabled. The A/C compressor operates and the indicator illuminates if the A/C request button is selected and the outside temperature is above approximately 0°C (32°F).
- the blower motor is on.

OFF

When OFF is selected:

- the RECIRC request button is disabled.
- the air inlet door closes off outside air and admits only recirculated air.
- the A/C request button (if equipped) is disabled.
- the blower motor is off.

FLOOR

When FLOOR is selected:

- the RECIRC request button is enabled. If the RECIRC request button is selected (indicator on), the air inlet door closes off outside air from entering the passenger compartment. If the RECIRC request button is not selected (indicator off), the air inlet door admits only outside air into the passenger compartment. When RECIRC is selected, the air inlet mode door remains in recirculated air mode for 5 minutes. After 5 minutes, the RECIRC indicator turns off and the air inlet mode door changes to fresh air mode.
- the defrost/panel/floor door directs airflow to the floor duct. A small amount of airflow from the defroster duct and side window demisters is present.
- blended air temperature is available. Only when A/C compressor operation (if equipped) has been selected by pressing the A/C request button (indicator on), can the airflow temperature be cooled below the outside air temperature.
- the A/C request button is enabled. The A/C compressor operates and the indicator illuminates if the A/C request button is selected and the outside temperature is above approximately 0°C (32°F).
- the blower motor is on.

FLOOR/DEFROST

When the FLOOR/DEFROST is selected:

- the RECIRC request button is enabled. If the RECIRC request button is selected (indicator on), the air inlet door closes off ode air from entering the passenger compartment. If the RECIRC request button is not selected (indicator off), the air inlet door admits only outside air into the passenger compartment. When RECIRC is selected, the air inlet mode door remains in recirculated air mode for 5 minutes. After 5 minutes, the RECIRC indicator turns off and the air inlet mode door changes to fresh air mode.
- the defrost/panel/floor door actuator directs airflow to the floor duct, the defroster duct and the side window demisters.
- blended air temperature is available.
- the A/C request button (if equipped) indicates the last status and the indicator can be toggled. To reduce fogging, the A/C compressor operates automatically, regardless of indicator status, if the outside temperature is above approximately 0°C (32°F).
- the blower motor is on.

DEFROST

When DEFROST is selected:

- the RECIRC request button is disabled. The air inlet door opens, admitting only outside air into the passenger compartment.
- the defrost/panel/floor door directs airflow to the defroster duct and side window demisters. A small amount of airflow from the floor duct is present.
- blended air temperature is available.
- the A/C request button (if equipped) will indicate the last status and the indicator can be toggled. To reduce fogging, the A/C compressor will operate automatically, regardless of indicator status, if the outside temperature is above approximately 0°C (32°F).
- the blower motor is on.

Climate Control System

Special Tool(s)

 ST2985-A	A/C Flush Adapter Kit 219-00074 or equivalent
 ST3282-A	Adapters/O-rings for Filter 219-00077 or equivalent
 ST2574-A	Flex Probe Kit NUD105-R025D 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
 ST3094-A	Test Light SGT27000 or equivalent 250-300 mA incandescent bulb test lamp
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Principles of Operation

The Refrigerant Cycle

During stabilized conditions (A/C system shutdown), the refrigerant 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, 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 and enters the inlet side of the A/C receiver/drier. The receiver/drier is designed to remove moisture from the refrigerant.

The outlet of the receiver/drier is connected to the Thermostatic Expansion Valve (TXV). The TXV provides the orifice which is the restriction in the refrigerant system and separates the high and low pressure sides of the A/C system. As the liquid refrigerant passes across 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, it absorbs heat from the airflow passing over the plate/fin sections of the A/C evaporator. This addition of heat causes the refrigerant to boil (convert to gas). The now cooler 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.

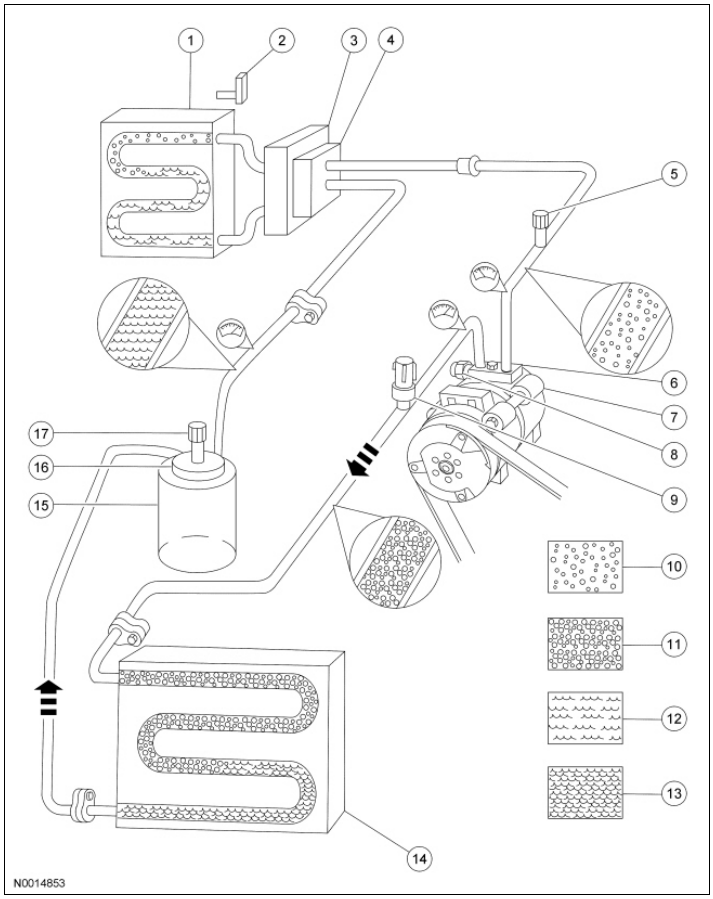
The refrigerant cycle is now repeated with the A/C compressor again increasing the pressure and temperature of the refrigerant.

The evaporator discharge air temperature sensor monitors the temperature of the evaporator core controls A/C clutch cycling. If the temperature of the evaporator core is low enough to cause the condensed water vapor to freeze, the A/C clutch is disengaged by the PCM.

The high-side line pressure is monitored by the A/C pressure transducer so that A/C compressor operation is interrupted if the system pressure becomes too high or is determined to be too low (low charge condition).

The A/C compressor relief valve opens and vents refrigerant to relieve unusually high system pressure.

Thermostatic Expansion Valve (TXV) Type Refrigerant System



Item	Description
1	A/C evaporator core
2	A/C evaporator core temperature sensor
3	Thermostatic Expansion Valve (TXV)
4	Manifold and tube assembly - TXV
5	A/C charge valve port (low side)
6	Manifold and tube assembly - A/C compressor
7	A/C compressor
8	A/C pressure relief valve
9	A/C pressure transducer
10	Low-pressure vapor
11	High-pressure vapor
12	Low-pressure liquid
13	High-pressure liquid
14	A/C condenser core
15	A/C receiver/drier
16	Manifold and tube assembly - receiver/drier
17	A/C charge port (high side)

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
• Loose, missing or damaged A/C compressor drive belt • Loose or disconnected A/C clutch • Broken or leaking refrigerant lines	• Battery Junction Box (BJB) fuse(s): ♦ 4 (40A) ♦ 29 (10A) • Central Junction Box (CJB) fuse(s): ♦ 2 (10A) ♦ 7 (7.5A) ♦ 21 (10A) • Blower motor inoperative • A/C compressor inoperative • Circuitry open/shorted • Disconnected electrical connectors

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 voltage 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 voltage 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 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 CMDTCs and carry out the self-test diagnostics from the Instrument Panel Cluster (IPC) and 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 PCM DTCs retrieved are related to the concern, go to the PCM DTC Chart. If the IPC DTCs retrieved are related to the concern, go to the Instrument Panel Cluster (IPC) 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 - Climate Control Systems or GO to Symptom Chart - NVH .

Self-Test - Retrieving And Clearing HVAC Module DTCs

To retrieve HVAC module DTCs, Carry out the following steps:

1. With the ignition on, select any mode except OFF on the HVAC controls.
2. While pressing the RECIRC mode button, select OFF on the HVAC controls.
3. Continue holding the RECIRC mode button for 5 seconds after OFF is selected.

The recirc mode indicator flashes at the rate of 1 flash per second for the first digit of the DTC, pause for 2 seconds, then resumes flashing at 1 flash per second for the second digit of the DTC. There is a 5 second pause between DTCs. DTC 1-1 indicates no faults present.

To exit **without clearing DTCs** , select any mode **except** FLOOR or PANEL/FLOOR or turning the ignition off after retrieving HVAC module DTCs.

To exit and **clear HVAC DTCs** , select FLOOR after retrieving HVAC module DTCs. The recirc mode indicator flashes 5 times a second for 2 seconds, then resumes flashing to indicate any DTCs. DTC 1-1 indicates no faults present.

Calibrating the HVAC Actuators

NOTE: The HVAC module will initialize and calibrate the actuators. The purpose of the HVAC module actuator position calibration is to allow the HVAC module to reinitialize and calibrate the actuator stop points.

To calibrate HVAC actuators, Carry out the following steps:

1. With the ignition on, select any mode except OFF on the HC controls.
2. While pressing the RECIRC mode button, select OFF on the HVAC controls.
3. Continue holding the RECIRC mode button for 5 seconds after OFF is selected.
4. Select PANEL/FLOOR mode on the HVAC controls.

The recirc mode indicator flashes at the rate of 1 flash per second for the duration of the actuator calibration. After the calibration is complete, the recirc mode indicator resumes flashing to indicate any DTCs. DTC 1-1 indicates no faults present.

DTC Charts

PCM DTC Chart

DTC	Description	Action to Take
P0531:2F	A/C Refrigerant Pressure Sensor A Circuit Range/Performance: Signal Erratic	INSPECT the refrigerant system for leaks. REFER to Electronic Leak Detection or Fluorescent Dye Leak Detection . If refrigerant system leaks or is low, RECHARGE the refrigerant system. REFER to Specifications in this section. If the refrigerant system does not leak and is properly charged, INSTALL a new A/C pressure transducer. CLEAR the DTCs and REPEAT the self-test. TEST the system for normal operation.
P0532:16	A/C Refrigerant Pressure Sensor A Circuit Low: Circuit Voltage Below Threshold	GO to Pinpoint Test a .
P0533:17	A/C Refrigerant Pressure Sensor A Circuit High: Circuit Voltage Above Threshold	GO to Pinpoint Test a .
P0645:13	A/C Clutch Relay Control Circuit: Circuit Open	GO to Pinpoint Test b .
P0646:11	A/C Clutch Relay Control Circuit Low: Circuit Short To Ground	GO to Pinpoint Test B .
P0647:12	A/C Clutch Relay Control Circuit High: Circuit Short To Battery	GO to Pinpoint Test B .
All Other DTCs	-	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Instrument Panel Cluster (IPC) DTC Chart

DTC	Description	Action to Take
B101E:01	Air Conditioning Mode Switch: General Electrical Failure	PLACE the HVAC selector in the OFF position, CLEAR the DTCs and REPEAT the self-test. If the DTC does not return, ignore the DTC and continue diagnosing other DTCs or symptoms. If the DTC returns and HVAC DTC 5-2 **is** also set, GO to Pinpoint Test l and diagnose HVADTC 5-2. If the DTC returns and HVAC DTC 5-2 is **not** also set, INSTALL a new Instrument Panel Cluster (IPC). REFER to Section 413-01 .
B1B71:11	Evaporator Temperature Sensor: Circuit Short to Ground	GO to Pinpoint Test C .
B1B71:13	Evaporator Temperature Sensor: Circuit Open	GO to Pinpoint Test C .
All Other DTCs	-	REFER to Section 413-01 .

HVAC Module DTC Chart

NOTE: Some PCM and Instrument Panel Cluster (IPC) DTCs may inhibit A/C operation. If any PCM or IPC DTCs are retrieved, diagnose those first. Refer to the PCM DTC Chart or the Instrument Panel Cluster (IPC) DTC Chart.

DTC	Description	Action to Take
1-0	Recirculation Button Performance	If the RECIRC button is held for more than 2 minutes, this DTC sets. ATTEMPT to clean buttons. CLEAR the DTCs. REPEAT the self-test. If DTC returns, INSTALL a new HVAC module. REFER to Section 412-01 . TEST the system for normal operation.
1-1	Diagnostics Mode Entered - No DTC Set	This DTC indicates that no HVAC faults are present at this time.
1-2	A/C Button Performance	If the A/C button is held for more than 2 minutes, this DTC sets. ATTEMPT to clean buttons. CLEAR the DTCs. REPEAT the self-test. If code returns, INSTALL a new HVAC module. REFER to 2-1
2-2	Blend Motor Driver Circuit/Performance	GO to Pinpoint Test m .
2-3	Blend Actuator Calibration Performance	GO to Pinpoint Test m .
3-1	Mode Feedback Circuit/Performance	GO to Pinpoint Test h .
3-2	Mode Motor Driver Circuit/Performance	GO to Pinpoint Test h .
3-3	Mode Actuator Calibration Performance	GO to Pinpoint Test h .
4-2	Recirculation Motor Driver Circuit/Performance	GO to Pinpoint Test g .
4-4	Feedback Reference Circuit/Performance	GO to Pinpoint Test d .
5-1	Blower Relay Driver Circuit/Performance	If the blower motor is inoperative, GO to Pinpoint Test n . If the blower motor is always on, GO to Pinpoint Test o .
5-2	A/C Select Drive Circuit/Performance	If the A/C is inoperative, GO to Pinpoint Test j . If the A/C is always commanded on, GO
Blend Feedback Circuit/Performance		GO to Pinpoint Test m .

		to Pinpoint Test l .
5-3	Battery Voltage Low	GO to Pinpoint Test e .
5-4	Battery Voltage High	GO to Pinpoint Test e .

Symptom Chart - Climate Control System

Symptom Chart - Climate Control System
NOTE: Some PCM DTCs may inhibit A/C operation. If any PCM DTCs are retrieved, diagnose those first. Refer to the PCM DTC Chart.

Condition	Possible Sources	Action
• All HVAC functions inoperative	• Fuse • Wiring, terminals or connectors • HVAC module	• GO to Pinpoint Test P .
• Unable to duate the customer concern and no DTCs present		
• Incorrect functioning of the HVAC system and/or related components		• GO to Pinpoint Test F .
• Reduced outlet airflow	• Wiring, terminals or connectors • A/C compressor clutch air gap • A/C pressure transducer • Evaporator discharge air temperature sensor • A/C clutch relay • Blower motor • Blower motor resistor • HVAC module • PCM	• If the vehicle is not equipped with A/C, GO to Pinpoint Test O • If the A/C compressor is engaged and does not cycle, GO to Pinpoint Test K . • If the A/C compressor cycles normally, GO to Pinpoint Test O .
• The air inlet door is inoperative	• Wiring, terminals or connectors • Air inlet mode door actuator • Air inlet mode door binding or stuck • HVAC module	• GO to Pinpoint Test G .

- Incorrect/erratic direction of airflow from outlets

- Wiring, terminals or connectors
- Defrost/panel/floor mode door actuator
- Defrost/panel/floor mode door binding or stuck
- HVAC module

- GO to Pinpoint Test H .

- Insufficient, erratic or no heat

- Low engine coolant level
- Plugged or partially plugged heater core
- Temperature blend door binding or stuck
- Temperature blend door actuator

- GO to Pinpoint Test I .

- The air conditioning (A/C) is inoperative

- Fuse(s)
- Wiring, terminals or connectors
- A/C system discharged/low charge
- PCM
- HVAC module
- A/C clutch relay
- A/C compressor clutch air gap
- A/C pressure transducer
- Evaporator discharge air temperature sensor
- A/C compressor clutch field coil

- GO to Pinpoint Test J .

- The air conditioning (A/C) is always on - A/C compressor does not cycle

- Wiring, terminals or connectors
- PCM
- A/C clutch relay
- A/C compressor clutch air gap
- Evaporator discharge air temperature sensor

- GO to Pinpoint Test K .

- The A/C is always on - A/C mode always commanded ON

- Wiring, terminals or connectors
- HVAC module
- PCM

-
- Temperature control is inoperative/does not operate correctly

- Wiring, terminals or connectors
- HVAC module

- Temperature blend door is binding or stuck
- Temperature blend door actuator

- GO to Pinpoint Test M .

- The blower motor is inoperative

- Fuse(s)
- Wiring, terminals or connectors
- HVAC module
- Blower motor relay
- Blower motor

- GO to Pinpoint Test N .

- The blower motor does not operate correctly

- Wiring, terminals or connectors
- A/C blower motor resistor
- HVAC module

- GO to Pinpoint Test O .

- 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.

Pinpoint Tests

Pinpoint Test A: DTC P0532:16 or P0533:17

Refer to Wiring Diagrams Cell 23 , Electronic Engine Controls for schematic and connector information.

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

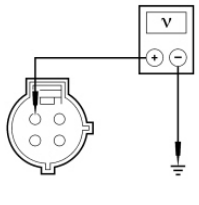
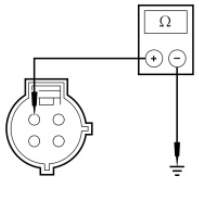
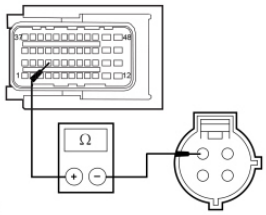
Under normal operation, the A/C pressure transducer receives a ground from the PCM. A 5-volt reference voltage is supplied to the A/C pressure transducer from the PCM. The A/C pressure transducer then sends a voltage to the PCM to indicate the A/C pressure.

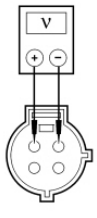
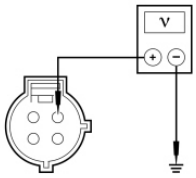
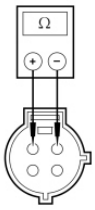
- DTC P0532:16 (A/C Refrigerant Pressure Sensor A Circuit Low: Circuit Voltage Below Threshold) - The A/C pressure transducer inputs a feedback voltage to the PCM. This DTC sets if the feedback voltage is less than 0.26 volts for at least 2 seconds and the ambient air temperature is greater than 0°C (32°F).
- DTC P0533:17 (A/C Refrigerant Pressuensor A Circuit High: Circuit Voltage Above Threshold) - The A/C pressure transducer inputs a feedback voltage to the PCM. This DTC sets if the feedback voltage is greater than 4.95 volts for at least 2 seconds and the ambient air temperature is greater than 0°C (32°F).

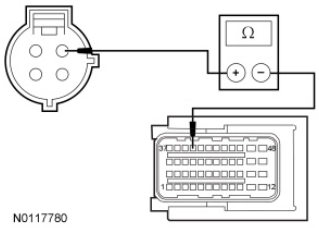
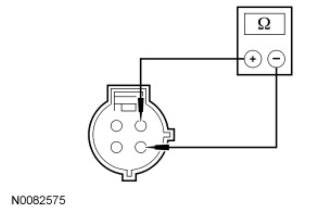
This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- A/C pressure transducer
- PCM

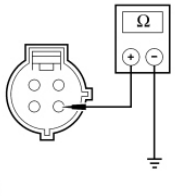
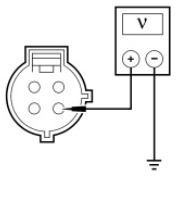
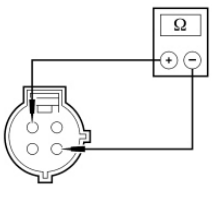
PINPOINT TEST A: DTC P0532:16 OR P0533:17

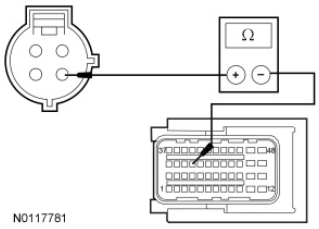
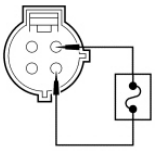
Test Step	Result / Action to Take
A1 CHECK THE PCM OUTPUT VOLTAGE	
• Ignition OFF. • Disconnect: A/C Pressure Transducer C1260. • Ignition ON. • Measure the voltage between ground and A/C pressure transducer C1260-2, circuit LH108 (GY/BN), harness side.	**Yes** GO to A4 . **No** If the voltage is less than 4.7 volts, GO to A2 . If the voltage is greater than 5.1 volts REPAIR circuit LH108 (GY/BN) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 N0082573 • **Is the voltage between 4.7 and 5.1 volts?**	
A2 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: PCM C175B. • Measure the resistance between ground and A/C pressure transducer C1260-2, circuit LH108 (GY/BN), harness side.  N0115312 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to A3 . **No** REPAIR circuit LH108 (GY/BN) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A3 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR AN OPEN	
• Measure the resistance between A/C pressure transducer C1260-2, circuit LH108 (GY/BN), harness side and PCM C175B-16, circuit LH108 (GY/BN), harness side.  N0116059 • **Is the resistance less than 5 ohms?**	**Yes** GO to A15 . **No** REPAIR circuit LH108 (GY/BN) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A4 CHECK THE PCM SENSOR GROUND	
• Measure the voltage between A/C pressure transducer C1260-1, circuit RH108 (BN), harness side and A/C pressure transducer C1260-2, circuit LH108 (GY/BN), harness side.	**Yes** If diagnosing **DTC P0532** , GO to A8 . If diagnosing **DTC P0533** , GO to A11 . **No** GO to A5 .

 A0047632 • **Is the voltage greater than 4.7 volts?**	
A5 CHECK THE SIGNAL RETURN CIRCUIT FOR VOLTAGE	
• Ignition OFF. • Disconnect: PCM C175B. • Ignition ON. • Measure the voltage between ground and A/C pressure transducer C1260-1, circuit RH108 (BN), harness side.  N0115314 • **Is any voltage present?**	**Yes** REPAIR circuit RH108 (BN) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to A6 .
A6 CHECK THE SIGNAL RETURN CIRCUIT FOR A SHORT TO THE REFERENCE VOLTAGE CIRCUIT	
• Measure the resistance between A/C pressure transducer C1260-1, circuit RH108 (BN), harness side and A/C pressure transducer C1260-2, circuit LH108 (GY/BN), harness side.  N0116056 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to A7 . **No** REPAIR circuit RH108 (BN) for a short to circuit LH108 (GY/BN). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A7 CHECK THE SIGNAL RETURN CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between A/C pressure transducer C1260-1, circuit RH108 (BN), harness side and PCM C175B-40, circuit RH108 (BN), harness side.	**Yes** GO to A15 . **No** REPAIR circuit RH108 (BN) for an open. CLEAR the DTCs. REPEAT the

 • **Is the resistance less than 5 ohms?**	self-test. TEST the system for normal operation.
A8 CHECK THE A/C PRESSURE TRANSDUCER	
• Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Observe the A/C Pressure Sensor (ACP_V) PCM PID voltage. • **Does the ACP_V PCM PID voltage read greater than 4.7 volts?**	**Yes** INSTALL a new A/C pressure transducer. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to A9 .
A9 CHECK THE A/C PRESSURE TRANSDUCER FEEDBACK CIRCUIT FOR A SHORT TO THE SIGNAL RETURN CIRCUIT	
• Ignition OFF. • Disconnect: PCM C175B. • Measure the resistance between A/C pressure transducer C1260-3, circuit VH442 (GN/BN), harness side and A/C pressure transducer C1260-1, circuit RH108 (BN), harness side.  • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to A10 . **No** REPAIR circuit VH442 (GN/BN) for a short to circuit RH108 (BN). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A10 CHECK THE A/C PRESSURE TRANSDUCER FEEDBACK CIRCUIT FOR A SHORT TO GROUND	
• Measure the resistance between ground and A/C pressure transducer C1260-3, circuit VH442 (GN/BN), harness side.	**Yes** GO to A15 . **No** REPAIR circuit VH442 (GN/BN) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 A0047688 • **Is the resistance greater than 10,000 ohms?**	
A11 CHECK THE A/C PRESSURE TRANSDUCER FEEDBACK CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: PCM C175B. • Ignition ON. • Measure the voltage between ground and A/C pressure transducer C1260-3, circuit VH442 (GN/BN), harness side.  A0047689 • **Is any voltage present?**	**Yes** REPAIR circuit VH442 (GN/BN) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to A12 .
A12 CHECK THE A/C PRESSURE TRANSDUCER FEEDBACK CIRCUIT FOR A SHORT THE REFERENCE VOLTAGE CIRCUIT	
• Measure the resistance between A/C pressure transducer C1260-3, circuit VH442 (GN/BN), harness side and A/C pressure transducer C1260-2, circuit LH108 (GY/BN), harness side.  N0082576 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to A13 . **No** REPAIR circuit VH442 (GN/BN) for a short to circuit LH108 (GY/BN). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A13 CHECK THE A/C PRESSURE TRANSDUCER FEEDBACK CIRCUIT FOR AN OPEN	

• Measure the resistance between A/C pressure transducer C1260-3, circuit VH442 (GN/BN), harness side and PCM C175B-28, circuit VH442 (GN/BN), harness side.  N0117781 • **Is the resistance less than 5 ohms?**	**Yes** GO to A14 . **No** REPAIR circuit VH442 (GN/BN) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A14 CHECK THE A/C PRESSURE SENSOR (ACP_V) PCM PID WITH THE A/C PRESSURE TRANSDUCER SHORTED	
NOTE: If the jumper fuse opens while carrying out this test step, repair circuit VH442 (GN/BN) for a short to ground. • Ignition OFF. • Connect: PCM C175B. • Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • While observing the ACP_V PCM PID, connect a fused jumper between A/C pressure transducer C1260-1, circuit RH108 (BN), harness side and A/C pressure transducer C1260-3, circuit VH442 (GN/BN), harness side.  A0008127 • **Does the ACP_V PCM PID voltage read 0 volts?**	**Yes** INSTALL a new A/C pressure transducer. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to A15 .
A15 CHECK THE PCM CONNECTION	
• Disconnect all the PCM connectors. • Inspect the PCM connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the PCM connectors. • Operate the system and verify the concern is still present.	**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 caused by a loose or corroded connector.

• **Is the concern still present?**	

Pinpoint Test B: DTC P0645:13, P0646:11 or P0647:12

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

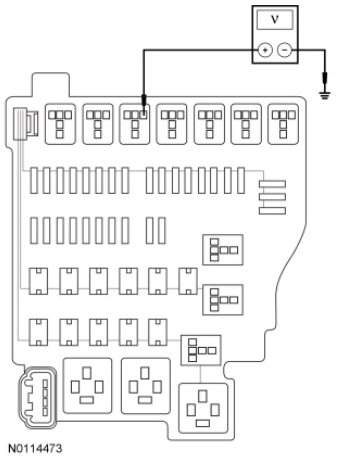
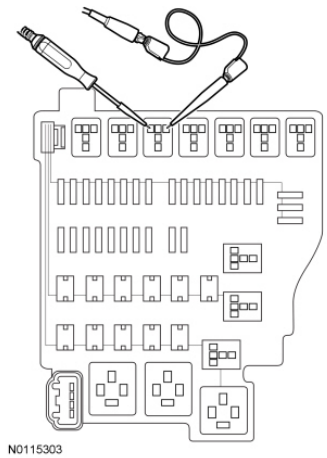
Voltage is provided to the A/C clutch relay coil. When A/C is requested and A/C line pressures allow, a ground is provided to the A/C clutch relay coil from the PCM, energizing the A/C clutch relay.

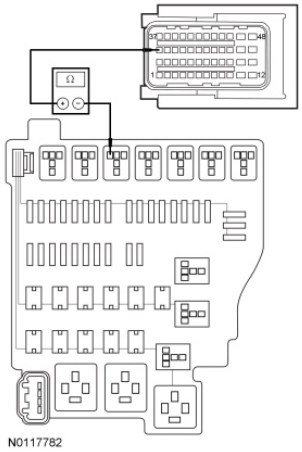
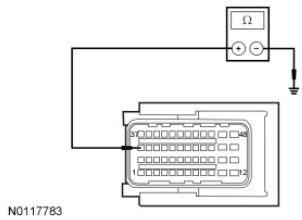
- DTC P0645:13 (A/C Clutch Relay Control Circuit: Circuit Open) - This DTC sets when the relay circuit is OFF and no voltage is detected on the relay circuit. The PCM expects to detect voltage coming through the relay coil to the relay circuit when it is not grounding it.
- DTC P0646:11 (A/C Clutch Relay Control Circuit Low: Circuit Short To Ground) - This DTC sets when the relay circuit is OFF and ground is detected on the relay circuit. The PCM expects to detect voltage comthrough the relay coil to the relay circuit when it is not grounding it.
- DTC P0647:12 (A/C Clutch Relay Control Circuit High: Circuit Short To Battery) - This DTC sets when the PCM grounds the relay circuit and excessive current draw (short to voltage) is detected on the relay circuit.

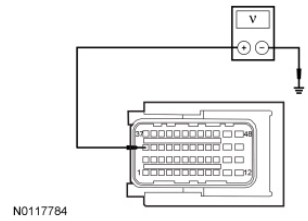
This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- A/C clutch relay
- PCM

PINPOINT TEST B: DTC P0645:13, P0646:11 OR P0647:12

Test Step	Result / Action to Take
B1 CHECK PCM DTCS	
• Ignition ON. • Check the PCM DTCs retrieved during the self-test. • **Is DTC P0645:13 present?**	**Yes** GO to B2 . **No** **For DTC P0646:11** , GO to B5 . **For DTC P0647:12** , GO to B6 .
B2 CHECK THE VOLTAGE TO THE A/C CLUTCH RELAY COIL	
• Ignition OFF. • Disconnect: A/C Clutch Relay. • Ignition ON. • Measure the voltage between ground and the A/C clutch relay socket pin 1, circuit CBP02 (GN).	**Yes** GO to B3 . **No** VERIFY Central Junction Box (CJB) fuse 2 (10A) is OK. If OK, REPAIR circuit CBP02 (GN) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the

 N0114473 • **Is the voltage greater than 10 volts?**	possible causes of the circuit short.
B3 CHECK THE A/C CLUTCH 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 or equivalent. 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.** • Start the engine. • Select PANEL and press the A/C button (indicator on) on the HVAC controls. • With the engine running, connect a 12-volt test light between A/C clutch relay socket pin 1, circuit CBP02 (GN) and A/C clutch relay socket pin 2, circuit CH302 (WH/BN).  N0115303 • **Does the test light illuminate?**	**Yes** INSTALL a new A/C clutch relay. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to B4 .
B4 CHECK THE A/C CLUTCH RELAY COIL SWITCHED GROUND CIRCUIT FOR AN OPEN	

• Ignition OFF. • Disconnect: PCM C175B. • Measure the resistance between A/C clutch relay socket pin 2, circuit CH302 (WH/BN) and PCM C175B-25, circuit CH302 (WH/BN), harness side.  N0117782 • **Is the resistance less than 5 ohms?**	**Yes** GO to B7 . **No** REPAIR circuit CH302 (WH/BN) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B5 CHECK THE A/C CLUTCH RELAY COIL SWITCHED GROUND CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: A/C Clutch Relay. • Disconnect: PCM C175B. • Measure the resistance between ground and PCM C175B-25, circuit CH302 (WH/BN), harness side.  N0117783 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to B7 . **No** REPAIR circuit CH302 (WH/BN) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B6 CHECK THE A/C CLUTCH RELAY COIL SWITCHED GROUND CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: A/C Clutch Relay. • Disconnect: PCM C175B. • Ignition ON. • Measure the voltage between ground and PCM C175B-25, circuit CH302 (WH/BN), harness side.	**Yes** REPAIR circuit CH302 (WH/BN) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** CARRY OUT the A/C clutch relay

 • **Is any voltage present?**	component test. Refer to Refer to Wiring Diagrams Cell 149 for component testing. If the relay tests OK, GO to B7 .
B7 CHECK THE PCM CONNECTION	
• Disconnect all the PCM connectors. • Inspect the PCM connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the PCM connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**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 caused by a loose or corroded connector.

Pinpoint Test C: DTC B1B71:11 or B1B71:13

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

The evaporator discharge air temperature sensor receives a ground from the Instrument Panel Cluster (IPC). The sensor varies its resistance with the temperature. As the temperature rises, the resistance falls. As the temperature falls, the resistance rises. The IPC measures this resistance on the feedback circuit to determine the temperature at the sensor. The sensor value is sent from the IPC to the PCM through the High Speed Controller Area Network (HS-CAN).

The evaporator discharge air temperature sensor is used for A/C compressor cycling. An accurate evaporator discharge air temperature is critical to prevent evaporator icing. The PCM uses the temperature measurement to turn off the A/C compressor before the evaporator temperature is cold enough to freeze the condensation. This prevents ice blockage of airflow over the evaporator core.

- DTC B1B71:11 (Evaporator Discharge Air Temperature Sensor: Circuit Short to Ground) - The module senses lower than expected voltage on the sensor feedback circuit, indicating a short to ground.
- DTC B1B71:13 (Evaporator Discharge Air Temperature Sensor: Circuit Open) - The module senses greater than expected voltage on the sensor feedback circuit, indicating an open circuit or sensor.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Evaporator discharge air temperature sensor
- IPC

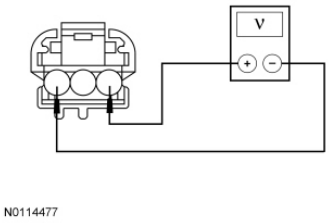
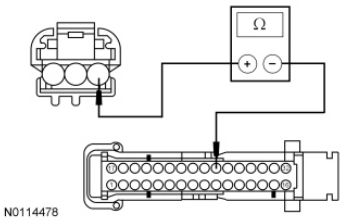
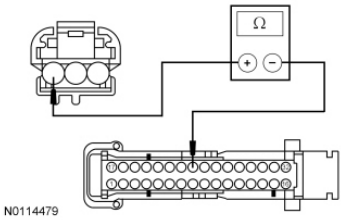
PINPOINT TEST C: DTC B1B71:11 OR B1B71:13

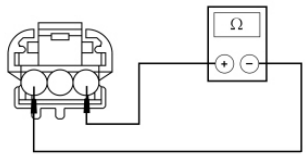
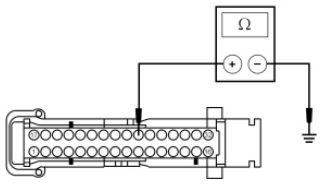
<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>C1 CHECK THE SENSOR RESISTANCE</td><td></td></tr>
<tr><td>
• Ignition OFF.
• Disconnect: Evaporator Discharge Air Temperature Sensor C296.
• Allow enough time for the evaporator to stabilize to the ambient temperature.
• Measure the resistance between evaporator discharge air temperature sensor C296 terminals and compto the table below.
<table>
<tr><th>Ambient Temperature</th><th>Resistance</th></tr>
<tr><td>0-10°C (32-50°F)</td><td>5,892-9,893 ohms</td></tr>
<tr><td>10-20°C (50-68°F)</td><td>3,689-6,048 ohms</td></tr>
<tr><td>20-25°C (68-77°F)</td><td>2,950-3,805 ohms</td></tr>
<tr><td>25-30°C (77-86°F)</td><td>2,374-3,050 ohms</td></tr>
<tr><td>30-35°C (86-95°F)</td><td>1,923-2,460 ohms</td></tr>
<tr><td>35-40°C (95-104°F)</td><td>1,566-1,996 ohms</td></tr>
<tr><td>40-50°C (104-122°F)</td><td>1,057-1,630 ohms</td></tr>
</table>
• Is the resistance within the specified values for the temperatures?
</td><td>
Yes
GO to C2 .

No
INSTALL a new evaporator discharge air temperature sensor. REFER to Section 412-01 . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal opera/tr>
</td></tr>
<tr><td>C2 CHECK THE IPC SENSOR OUTPUT VOLTAGE</td><td></td></tr>
<tr><td>
• Ignition ON.
• Select PANEL and press the A/C button (indicator on) on the HVAC controls.
• Measure the voltage between evaporator discharge air temperature sensor C296-1, circuit VH406 (VT/BN), harness side and C296-3, circuit RH119 (YE/VT), harness side.
</td><td>
Yes
INSTALL a new evaporator discharge air temperature sensor. REFER to Section 412-01 . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. If the DTC returns, GO to C7 .

No
If diagnosing DTC B1B71:13 , GO to C3 .

If diagnosing DTC B1B71:11 , GO to C5 .
</td></tr>
</table>

 N0114477 • **Is the voltage between 4.7 and 5.1 volts?**	
C3 CHECK THE EVAPORATOR TEMPERATURE SENSOR FEEDBACK CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Instrument Panel Cluster (IPC) C220. • Measure the resistance between IPC C220-26, circuit VH406 (VT/BN), harness side and evaporator discharge air temperature sensor C296-1, circuit VH406 (VT/BN), harness side.  N0114478 • **Is the resistance less than 5 ohms?**	**Yes** GO to C4 . **No** REPAIR circuit VH406 (VT/BN) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C4 CHECK THE SIGNAL RETURN CIRCUIT FOR AN OPEN	
• Measure the resistance between IPC C220-24, circuit RH119 (YE/VT), harness side and evaporator discharge air temperature sensor C296-3, circuit RH119 (YE/VT), harness side.  N0114479 • **Is the resistance less than 5 ohms?**	**Yes** GO to C7 . **No** REPAIR circuit RH119 (YE/VT) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C5 CHECK THE EVAPORATOR TEMPERATURE SENSOR FEEDBACK CIRCUIT FOR A SHORT TO THE SIGNAL RETURN CIRCUIT	

• Ignition OFF. • Disconnect: IPC C220. • Measure the resistance between evaporator discharge air temperature sensor C296-1, circuit VH406 (VT/BN), harness side and C296-3, circuit RH119 (YE/VT), harness side.  N0114480 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to C6 . **No** REPAIR circuits VH406 (VT/BN) and RH119 (YE/VT) for a short together. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C6 CHECK THE EVAPORATOR TEMPERATURE SENSOR FEEDBACK CIRCUIT FOR A SHORT TO GROUND	
• Measure the resistance between IPC C220-26, circuit VH406 (VT/BN), harness side and ground.  N0114481 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to C7 . **No** REPAIR circuit VH406 (VT/BN) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C7 CHECK THE IPC CONNECTION	
• Disconnect all the IPC connectors. • Inspect the IPC connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the IPC connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . 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. TEST the system for normal operation.

Pinpoint Test D: DTC 4-4

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

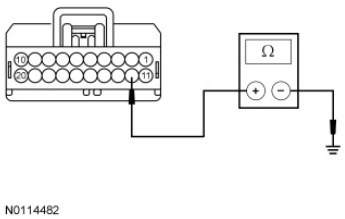
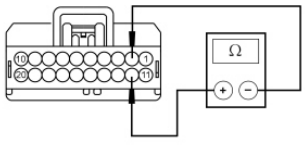
A 5-volt reference voltage is supplied to the sensors and actuators from the HVAC module.

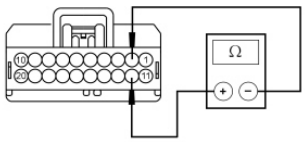
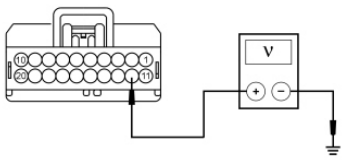
- DTC 4-4 (Feedback Reference Circuit/Performance) - The module senses less than expected voltage on the reference voltage circuit, indicating a short directly to ground or the module senses greater than expected voltage on the sensor reference voltage circuit, indicating an open or a short directly to voltage.

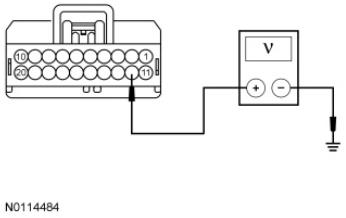
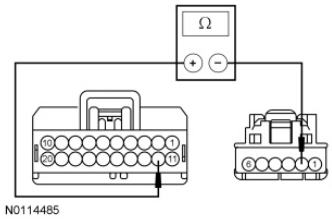
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- HVAC module

PINPOINT TEST D: DTC 4-4

Test Step	Result / Action to Take
D1 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Measure the resistance between ground and HVAC module C228A-12, circuit 232 (WH/BN), harness side.  N0114482 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to D2 . **No** REPAIR circuit CH232 (WH/BN) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
D2 CHECK THE REFERENCE VOLTAGE CIRCUIT AND THE SIGNAL RETURN CIRCUIT FOR A SHORT TOGETHER	
• Measure the resistance between HVAC module C228A-12, circuit CH232 (WH/BN), harness side and HVAC module C228A-2, circuit CH233 (VT/BN), harness side.  N0114483	**Yes** GO to D4 . **No** GO to D3 .

• **Is the resistance greater than 100 ohms?**	
D3 CHECK THE ACTUATORS	
• Measure the resistance between HVAC module C228A-2, circuit CH233 (VT/BN), harness side and HVAC module C228A-12, circuit CH232 (WH/BN), harness side.  N0114483 • While measuring the resistance, disconnect the following components one at a time, in order. Stop disconnecting components if the measured resistance rises above 100 ohms. • Defrost/panel/floor door actuator C236 • Temperature blend door actuator C2092 • **Did the resistance rise above 100 ohms?**	**Yes** INSTALL a new actuator (the last one to be disconnected). REFER to Section 412-01 . CONNECT the actuator electrical connector before the HVAC module connector(s). This allows the actuator to be calibrated when the HVAC module is reconnected. TEST the system for normal operation. **No** REPAIR circuits CH233 (VT/BN) and CH232 (WH/BN) for a short together. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
D4 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition ON. • Measure the voltage between ground and HVAC module C228A-12, circuit CH232 (WH/BN), harness side  N0114484 • **Is any voltage present?**	**Yes** REPAIR circuit CH232 (WH/BN) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to D5 .
D5 CHECK THE RETURN CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition ON. • Measure the voltage between ground and HVAC module C228A-2, circuit CH233 (VT/BN), harness side	**Yes** REPAIR circuit CH233 (VT/BN) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to D6 .

 N0114484 • **Is any voltage present?**	
D6 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Temperature Blend Door Actuator C2092. • Measure the resistance between ground and HVAC module C228A-12, circuit CH232 (WH/BN), harness side and temperature blend door actuator C2092-2, circuit CH232 (WH/BN).  N0114485 • **Is the resistance less than 5 ohms?**	**Yes** GO to D7 . **No** REPAIR circuit CH232 (WH/BN) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
D7 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . 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. TEST the system for normal operation.

Pinpoint Test E: DTCs 5-3 and 5-4

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

NOTE: DTCs 5-3 and 5-4 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.

Normal Operation

The HVAC module receives a ground. The HVAC module is supplied constant battery voltage and ignition voltage.

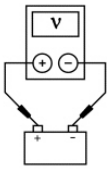
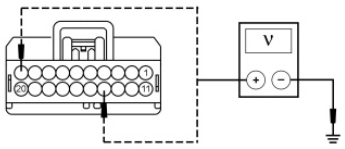
- DTC 53 (Battery Voltage Low) - The module senses when battery voltage is less than 8 volts for more than 2 seconds.
- DTC 54 (Battery Voltage High) - The module senses when battery voltage is greater than 16 volts for more than 2 seconds.

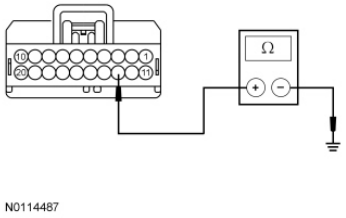
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- HVAC module
- Battery
- Charging system concern

PINPOINT TEST E: DTCs 5-3 AND 5-4

Test Step	Result / Action to Take
E1 RETRIEVE ALL CMDTCs IN ALL MODULES	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self Test - All CMDTCs . • **Are any charging system DTCs present in the PCM??**	**Yes** REFER to Section 414-00 for diagnosis of the battery and charging system. **No** GO to E2 .
E2 CHECK BATTERY CONDITION	
• Ignition OFF. • Refer to Section 414-01 and carry out the Battery - Condition Test. • **Does the battery pass the condition test?**	**Yes** If the battery passed the condition test but required a recharge, REFER to Section 414-00 to diagnose the charging system. CLEAR all Continuous Memory Diagnostic Trouble Codes (CMDTCs). TEST the system for normal operation. If the battery passed the condition test and did not require a recharge, GO to E3 . **No** INSTALL a new battery. CLEAR all CMDTCs . TEST the system for normal operation.
E3 CHECK THE CHARGING SYSTEM VOLTAGE	
NOTE: Do not allow the engine rpm to exceed above 2,000 rpm while performing this step or the generator may self-excite and result in default charging system output voltage. If engine rpm has exceeded 2,000 rpm, shut the vehicle off and restart the engine before performing this step.	**Yes** **If diagnosing DTC 5-3** , GO to E4 . **If diagnosing DTC 5-4** , INSTALL a new HVAC module. REFER to Section 412-01 . CLEAR all CMDTCs . REPEAT the self-test.

• Start the engine. • Measure the voltage of the battery: ♦ **For DTC 54** , turn on headlights and HVAC fan on high and run engine at 1,500 rpm for a minimum of 2 minutes. ♦ **For DTC 53** , turn off all accessories and run the engine at 1,500 rpm for a minimum of 2 minutes.  AJ0210-A • **Is the battery voltage between 13 and 15.2 volts?**	**No** REFER to Section 414-00 to diagnose the charging system. CLEAR all CMDTCs . TEST the system for normal operation.
E4 CHECK THE HVAC MODULE VOLTAGE SUPPLY CIRCUITS	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Ignition ON. • With the engine running, measure the voltage between ground and: ♦ HVAC module C228A-10, circuit SBP07 (WH/RD), harness side. ♦ HVAC module C228A-14, circuit CBP21 (BU/GY), harness side.  N0114486 • **Are the voltages greater than 10 volts?**	**Yes** GO to E5 . **No** REPAIR circuit SBP07 (WH/RD) or CBP21 (BU/GY) for high resistance. CLEAR all CMDTCs . REPEAT the self-test.
E5 CHECK THE HVAC MODULE GROUND CIRCUIT	
• Ignition OFF. • Measure the resistance between ground and HVAC module C228A-13, circuit GD115 (BK/GY), harness side.	**Yes** GO to E6 . **No** REPAIR circuit GD115 (BK/GY) for high resistance. CLEAR all CMDTCs . REPEAT the self-test. TEST the system for normal operation.

 N0114487 • **Is the resistance less than 5 ohms?**	
E6 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . 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. TEST the system for normal operation.

Pinpoint Test F: Unable to Duplicate the Customer Concern and No DTCs Present

Normal Operation

This pinpoint test tests the functions of the HVAC system and identifies the correct HVAC symptom pinpoint test.

This pinpoint test is intended to diagnose the following:
- Incorrect functioning of the HVAC system and/or related components

PINPOINT TEST F: UNABLE TO DUPLICATE THE CUSTOMER CONCERN AND NO DTCS PRESENT

Test Step	Result / Action to Take
F1 CHECK THE BLOWER MOTOR OPERATION	
• Ignition ON. • Select PANEL mode. • Observe blower motor operation and select each blower motor speed. • **Does the blower motor operate in all selections and change speed in each?**	**Yes** GO to F2 . **No** If the blower motor does not operate in any setting, GO to Pinpoint Test N . If the blower motor does not properly change speeds or shut off, GO to Pinpoint Test O .
F2 CHECK AIRFLOW OPERATION	
• Select the highest blower motor setting. • **NOTE:** Refer to Description and Operation in this section for proper airflow	**Yes** GO to F3 . **No**

descriptions. • While observing the airflow, select each of the airflow positions (PANEL, PANEL/FLOOR, FLOOR, FLOOR/DEFROST, DEFROST). • **Is the airflow directed to the proper outlets?**	GO to Pinpoint Test H .
F3 VERIFY TEMPERATURE CONTROL OPERATION	
• Start the vehicle and allow it to reach normal operating temperature. • Select PANEL and press the A/C button (indicator on) (if equipped) on the HVAC controls. • Change the temperature setting from the coldest to the warmest and back to the coldest. • **Does the temperature change between very warm to cool?**	**Yes** If the vehicle **is equipped** with A/C, GO to F4 . If the vehicle **is not equipped** with A/C, GO to F6 . **No** If the temperature does not get very warm, GO to Pinpoint Test I . If the temperature does not change at all, GO to Pinpoint Test M .
F4 VERIFY THE A/C CLUTCH DOES NOT ENGAGE WITH A/C OFF	
• Start the engine. • Select PANEL and press the A/C button (indicator off) on the HVAC controls. • Select the coldest temperature setting. • **Is the outlet temperature close to ambient temperature?**	**Yes** GO to F5 . **No** If the temperature is warmer than ambient temperature, GO to Pinpoint Test M and diagnose for inoperative blend door. If the outlet temperature is significantly colder than ambient temperature and the A/C compressor clutch cycles normally, GO to Pinpoint Test L . If the outlet temperature is significantly colder than ambient temperature and the A/C compressor clutch is engaged and does not cycle, GO to Pinpoint Test K .
F5 VERIFY A/C CLUTCH ENGAGEMENT IN THE A/C MODE	
• Make sure the ambient air temperature is above 0°C (32°F). • Select PANEL mode on the HVAC controls. • Press the A/C button (indicator on). • **Does the A/C clutch engage when the PANEL and A/C button (indicator on) is pressed?**	**Yes** GO to F6 . **No** GO to Pinpoint Test J .
F6 CHECK THE RECIRC OPERATION	
	Yes The system is operating normally.

• With the engine running, press the RECIRC button (indicator off). • Select PANEL mode. • Select the highest blower motor setting. • Observe airflow noise. • Press the RECIRC button (indicator on). • **Does the airflow noise increase when the RECIRC mode is selected (indicator on)?**	**No** GO to Pinpoint Test G .

Pinpoint Test G: The Air Inlet Door is Inoperative

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

The HVAC module supplies voltage and ground to the air inlet mode door actuator through the actuator motor circuits to rotate the air inlet mode door actuator. To reverse the air inlet mode door actuator rotation, the HVAC module reverses voltage and ground on the circuits.

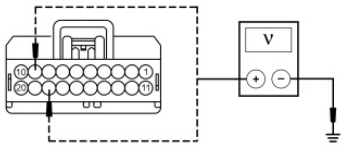
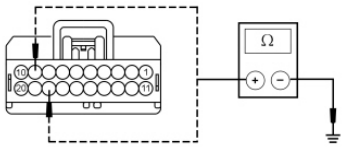
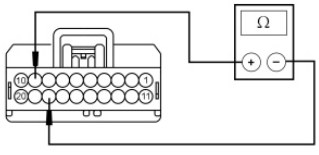
When the HVAC is in FLOOR/DEFROST or FLOOR mode, RECIRC is a timed function. When RECIRC is selected, the air inlet mode door remains in recirculated air mode for 5 minutes. After 5 minutes, the RECIRC indicator turns off and the air inlet mode door changes to fresh air mode.

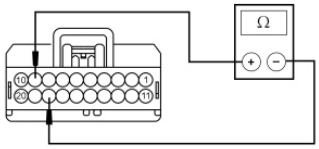
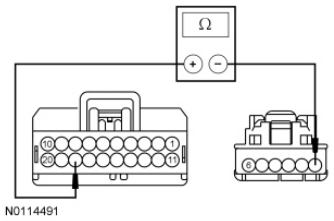
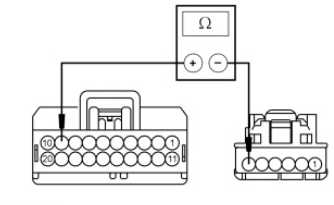
- DTC 4-2 (Recirculation Motor Driver Circuit/Performance) - This DTC sets when either of the following occurs:
  - ♦ The module senses lower than expected voltage on an actuator motor circuit when voltage is applied to drive the motor, indicating a short to ground.
  - ♦ The module senses greater than expected voltage on the actuator motor circuit when ground is applied to drive the motor, indicating a short to voltage.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Air inlet mode door actuator
- HVAC module
- Air inlet mode door binding or stuck

PINPOINT TEST G: THE AIR INLET DOOR IS INOPERATIVE

Test Step	Result / Action to Take
G1 CHECK THE HVAC MODULE FOR DTCs	
• Ignition ON. • CARRY OUT the HVAC module self-test. • Check for HVAC DTCs retrieved during the self-test. • **Is DTC 4-2 present?**	**Yes** GO to G2 . **No** GO to G6 .
G2 CHECK THE AIR INLET MODE DOOR ACTUATOR MOTOR CIRCUITS FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: HVAC Module C228A. • Ignition ON. • Measure the voltage between ground and: ♦ HVAC module C228A-9, circuit CH206 (YE/VT), harness side. ♦ HVAC module C228A-18, circuit CH208 (GN/OG), harness side.  N0114488 • **Are any voltages present?**	**Yes** REPAIR circuit CH206 (YE/VT) or CH208 (GN/OG) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to G3 .
G3 CHECK THE AIR INLET MODE DOOR ACTUATOR MOTOR CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between ground and: ♦ HVAC module C228A-9, circuit CH206 (YE/VT), harness side. ♦ HVAC module C228A-18, circuit CH208 (GN/OG), harness side.  N0114489 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to G4 . **No** REPAIR circuit CH206 (YE/VT) or CH208 (GN/OG) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
G4 CHECK THE AIR INLET MODE DOOR ACTUATOR MOTOR RESISTANCE	
• Measure the resistance between HVAC module C228A-9, circuit CH206 (YE/VT), harness side and HVAC module C228A-18, circuit CH208 (GN/OG), harness side.  N0114490	**Yes** GO to G8 . **No** GO to G5 .

• **Is the resistance greater than 30 ohms?**	
G5 CHECK THE AIR INLET MODE DOOR ACTUATOR MOTOR CIRCUITS FOR A SHORT TOGETHER	
• Disconnect: Air Inlet Mode Door Actuator C289. • Measure the resistance between HVAC module C228A-9, circuit CH206 (YE/VT), harness side and HVAC module C228A-18, circuit CH208 (GN/OG), harness side.  N0114490 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL a new air inlet actuator. REFER to Section 412-01 . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** REPAIR circuits CH208 (GN/OG) and CH206 (YE/VT) for a short together. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
G6 CHECK THE AIR INLET MODE DOOR ACTUATOR MOTOR CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Disconnect: Air Inlet Mode Door Actuator C289. • Measure the resistance between HVAC module C228A-18, circuit CH208 (GN/OG), harness side and air inlet mode door actuator C289-1, circuit CH208 (GN/OG), harness side.  N0114491 • Measure the resistance between HVAC module C228A-9, circuit CH206 (YE/VT), harness side and air inlet mode door actuator C289-6, circuit CH206 (YE/VT), harness side.  N0114492	**Yes** GO to G7 . **No** REPAIR circuit CH206 (YE/VT) or CH208 (GN/OG) for an open. TEST the system for normal operation.

• **Are the resistances less than 5 ohms?**	
G7 CHECK THE AIR INLET MODE DOOR AND LINKAGE	
• Disconnect: Air Inlet Mode Door Actuator C289. • REMOVE the air inlet mode mode door actuator. REFER to Section 412-01 . • INSPECT the air inlet mode mode door and linkage for a broken, loose or binding condition. • **Is any binding condition found during inspection?**	**Yes** REPAIR the air inlet mode mode door or linkage TEST the system for normal operation. **No** GO to G8 .
G8 CHECK THE AIR INLET MODE DOOR ACTUATOR CONNECTION	
• Disconnect the air inlet mode door actuator connector. • Inspect the air inlet door actuator connector for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat the actuator connector. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** CARRY OUT the Air Inlet Mode Door Actuator component test in this section. INSTALL a new air inlet mode door if necessary. REFER to Section 412-01 . If the actuator tests OK, GO to G9 . **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.
G9 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . 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. TEST the system for normal operation.

Pinpoint Test H: Incorrect/Erratic Direction of Airflow From Outlets

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

The HVAC module supplies voltage and ground to the defrost/panel/floor mode door actuator motor through the actuator motor circuits to rotate the defrost/panel/floor mode door actuator. To reverse the defrost/panel/floor mode door actuator rotation, the HVAC module reverses voltage and ground on the circuits.

The defrost/panel/floor mode door actuator feedback resistor is supplied a 5-volt reference voltage and ground from the HVAC module. The HVAC module measures the resistance on the defrost/panel/floor mode door actuator feedback circuit to determine the defrost/panel/floor mode door actuator position by the position of

the actuator feedback resistor wiper arm.

During an actuator calibration cycle, the HVAC module drives the defrost/panel/floor mode door until the door reaches both internal stops in the HVAC case. If the defrost/panel/floor mode 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 from the expected outlets.

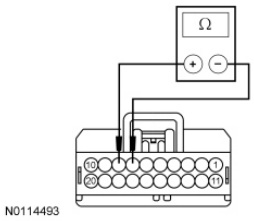
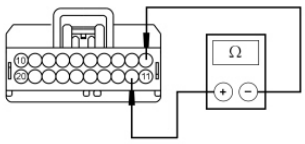
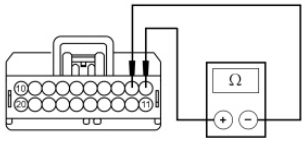
- DTC 3-1 (Mode Feedback Circuit/Performance) - The module senses no changes in the feedback circuit when motor movement is commanded and no motor electrical DTCs are present. This indicates an open actuator motor, an open or shorted feedback circuit, an open feedback resistor reference voltage circuit, or an internal electrical or mechanical failure.
- DTC 3-2 (Mode Motor Driver Circuit/Performance) - The module senses lower than expected voltage on an actuator motor circuit when voltage is applied to drive the motor. This indicates a short to ground or the module senses greater than expected voltage on the actuator motor circuit when ground is applied to drive the motor, indicating a short to voltage.
- DTC 3-3 (Mode Actuator Calibration Performance) - The module senses the actuator has moved outside its travel limits during calibration. This indicates broken/disconnected linkage or door or an internal mechanical failure.

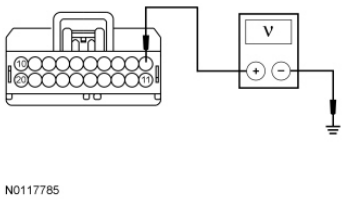
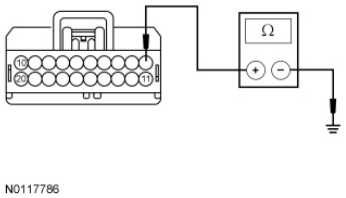
This pinpoint test is intended to diagnose the following:

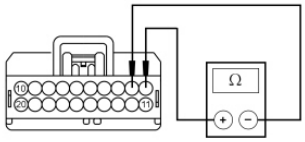
- Wiring, terminals or connectors
- Defrost/panel/floor mode door actuator
- HVAC module
- Defrost/panel/floor mode door binding or stuck

PINPOINT TEST H: INCORRECT/ERRATIC DIRECTION OF AIRFLOW FROM OUTLETS

Test Step	Result / Action to Take
H1 CHECK THE HVAC MODULE FOR DTCs	
NOTE: If HVAC DTC 4-4 is present, GO to Pinpoint Test D and diagnose that DTC first. • Ignition ON. • OUT the HVAC module self-test. • Check for HVAC DTCs retrieved during the self-test. • **Are HVAC DTCs present?**	**Yes** **For DTC 3-1** , GO to H2 . **For DTC 3-2** , GO to H9 . **For DTC 3-3** , GO to H8 . **No** GO to H7 .
H2 CHECK THE ACTUATOR MOTOR AND CIRCUITS	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Measure the resistance between HVAC module C228A-7, circuit CH202 (BU/GN), harness side and HVAC module C228A-8, circuit CH203 (GN/BN), harness side.	**Yes** GO to H4 . **No** GO to H3 .

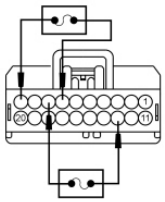
 N0114493 • **Is the resistance less than 40 ohms?**	
H3 CHECK THE DEFROST/PANEL/FLOOR MODE DOOR ACTUATOR	
• Ignition OFF. • Disconnect: Defrost/Panel/Floor Mode Door Actuator C236. • CARRY OUT the Defrost/Panel/Floor Mode Door Actuator component test in this section. • **Did the defrost/panel/floor mode door actuator test OK?**	**Yes** REPAIR circuit CH202 (BU/GN) or CH203 (GN/BN) for an open or high resistance. REPEAT the self-test. TEST the system for normal operation. **No** GO to H13 .
H4 CHECK THE POTENTIOMETER LOW- AND HIGH-SIDE RESISTANCE	
• Measure the **high-side** resistance between HVAC module C228A-12, circuit CH232 (WH/BN), harness side and HVAC module C228A-1, circuit CH204 (GY/OG), harness side.  N0114494 • Measure the **low-side** resistance between HVAC module C228A-2, circuit CH233 (VT/BN), harness side and HVAC module C228A-1, circuit CH204 (GY/OG), harness side.  N0115268	**Yes** GO to H5 . **No** CARRY OUT the Defrost/Panel/Floor Mode Door Actuator component test in this section. INSTALL a new defrost/panel/floor mode door actuator if necessary. REFER to Section 412-01 . If the actuator tests OK and: If the **high-side** resistance only is greater than 4,375 ohms, REPAIR circuit CH232 (WH/BN) for an open. If the **high-side** resistance only is less than 215 ohms, REPAIR circuits CH204 (GY/OG) and CH232 (WH/BN) for a short together. If the **low-side** resistance only is greater than 4,375 ohms, REPAIR circuit CH233 (VT/BN) for an open. If the **low-side** resistance only is less than 215 ohms, REPAIR circuits CH204 (GY/OG) and CH233 (VT/BN) for a short together. If both the **high-side and low-side** resistance is greater than 4,375 ohms, REPAIR circuit CH204 (GY/OG) for an open. Once the repair is complete, CALIBRATE the

• **Are the resistances between 215 and 4,375 ohms?**	actuators. REFER to Calibrating the HVAC Actuators in this section. TEST the system for normal operation.
H5 CHECK THE ACTUATOR FEEDBACK CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition ON. • Measure the voltage between ground and HVAC module C228A-1, circuit CH204 (GY/OG), harness side.  N0117785 • **Is any voltage present?**	**Yes** REPAIR circuit CH204 (GY/OG) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to H6 .
H6 CHECK THE ACTUATOR FEEDBACK CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between ground and HVAC module C228A-1, circuit CH204 (GY/OG), harness side.  N0117786 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to H7 . **No** REPAIR circuit CH204 (GY/OG) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
H7 CHECK THE DEFROST/PANEL/FLOOR MODE DOOR ACTUATOR OPERATION	
• Ignition OFF. • Disconnect: HVAC Module C228A (If not previously disconnected). • Measure the resistance between HVAC module C228A-2, circuit CH233 (VT/BN), harness side and HVAC module C228A-1, circuit CH204 (GY/OG), harness side.	**Yes** GO to H14 . **No** GO to H8 .



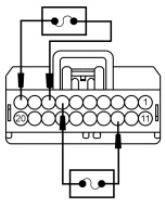
N0115268

- Connect a fused jumper wire between:
  - ♦ HVAC module C228A-10, circuit SBP07 (WH/RD), harness side and HVAC module C228A-7, circuit CH202 (BU/GN), harness side.
  - ♦ HVAC module C228A-13, circuit GD115 (BK/GY), harness side and HVAC module C228A-8, circuit CH203 (GN/BN), harness side.



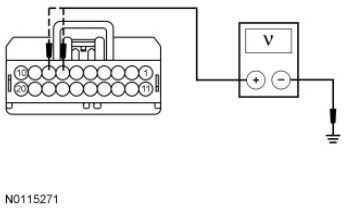
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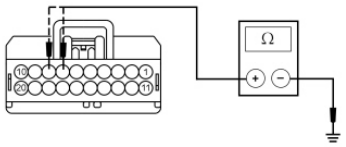
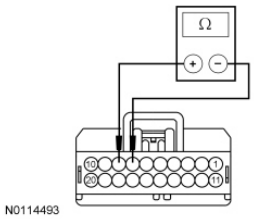
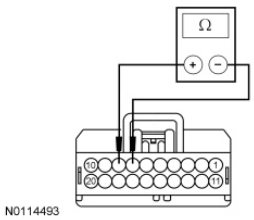
- Remove the fused jumpers.
- Connect a fused jumper wire between:
  - ♦ HVAC module C228A-13, circuit GD115 (BK/GY), harness side and HVAC module C228A-7, circuit CH202 (BU/GN), harness side.
  - ♦ HVAC module C228A-10, circuit SBP07 (WH/RD), harness side and HVAC module C228A-8, circuit CH203 (GN/BN), harness side.



N0116058

- **Does the resistance smoothly increase to approximately 3,500 ohms and/or decrease to approximately 290 ohms when the jumpers are connected?**

H8 CHECK THE DEFROST/PANEL/FLOOR MODE DOOR AND LINKAGE	
• Disconnect: Defrost/Panel/Floor Mode Door Actuator C236. • REMOVE the defrost/panel/floor mode door actuator. REFER to Section 412-01 . • INSPECT the defrost/panel/floor mode door and linkage for a broken, loose or binding condition. • **Is any condition found during inspection?**	**Yes** REPAIR the defrost/panel/floor mode door or linkage REINSTALL the defrost/panel/floor mode door actuator. CALIBRATE the actuators. REFER to Calibrating the HVAC Actuators in this section. TEST the system for normal operation. **No** GO to H13 .
H9 CHECK THE ACTUATOR MOTOR DRIVE CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Ignition ON. • Measure the voltage between ground and: ♦ HVAC module C228A-7, circuit CH202 (BU/GN), harness side. ♦ HVAC module C228A-8, circuit CH203 (GN/BN), harness side.  N0115271 • **Are any voltages present?**	**Yes** REPAIR circuit CH202 (BU/GN) or CH203 (GN/BN) for a short to voltage. TEST the system for normal operation. **No** GO to H10 .
H10 CHECK THE ACTUATOR MOTOR DRIVE CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between ground and: ♦ HVAC module C228A-7, circuit CH202 (BU/GN), harness side. ♦ HVAC module C228A-8, circuit CH203 (GN/BN), harness side.	**Yes** GO to H11 . **No** REPAIR circuit CH202 (BU/GN) or CH203 (GN/BN) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 N0115272 • **Are the resistances greater than 10,000 ohms?**	
H11 CHECK THE ACTUATOR MOTOR AND CIRCUIT RESISTANCE	
• Measure the resistance between HVAC module C228A-7, circuit CH202 (BU/GN), harness side and HVAC module C228A-8, circuit CH203 (GN/BN), harness side.  N0114493 • **Is the resistance greater than 30 ohms?**	**Yes** GO to H14 . **No** GO to H12 .
H12 CHECK THE ACTUATOR MOTOR CIRCUITS FOR A SHORT TOGETHER	
• Disconnect: Defrost/Panel/Floor Mode Door Actuator C236. • Measure the resistance between HVAC module C228A-7, circuit CH202 (BU/GN), harness side and HVAC module C228A-8, circuit CH203 (GN/BN), harness side.  N0114493 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to H13 . **No** REPAIR circuits CH202 (BU/GN) and CH203 (GN/BN) for a short together. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
H13 CHECK THE DEFROST/PANEL/FLOOR MODE DOOR ACTUATOR CONNECTION	

• Disconnect the defrost/panel/floor mode door actuator connector. • Inspect the defrost/panel/floor mode door actuator connector for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • REINSTALL the defrost/panel/floor mode door actuator, If removed. • Connect and correctly seat the defrost/panel/floor mode door actuator connector. • CALIBRATE the actuators. REFER to Calibrating the HVAC Actuators in this section. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new defrost/panel/floor mode door actuator. REFER to Section 412-01 . CALIBRATE the actuators. REFER to Calibrating the HVAC Actuators in this section. 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. TEST the system for normal operation.
H14 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . TEST the system for normal operation. **No** 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 door travel. CHECK any actuator external linkage. If condition recurs, INSPECT actuator linkage and door for binding and CHECK HVAC case for foreign objects.

Pinpoint Test I: Insufficient, Erratic or No Heat

Normal Operation

Coolant flows from the engine through the heater core and back to the engine. Proper coolant temperatures are critical for good heater performance.

This pinpoint test is intended to diagnose the following:

- Plugged or partially plugged heater core
- Low engine coolant level
- Temperature blend door actuator
- Temperature blend door binding or stuck

PINPOINT TEST I: INSUFFICIENT, ERRATIC OR NO HEAT

Test Step	Result / Action to Take

I1 CHECK FOR CORRECT ENGINE COOLANT LEVEL	
• Ignition OFF. • Check the engine coolant level. • **Is the engine coolant at the correct level as indicated on the engine coolant recovery reservoir?**	**Yes** GO to I3 . **No** GO to I2 .
I2 CHECK THE ENGINE COOLING SYSTEM FOR LEAKS	
• Pressure test the cooling system for leaks. Refer to Section 303-03 . • **Does the engine cooling system leak?**	**Yes** REPAIR the engine coolant leak. TEST the system for normal operation. **No** FILL and BLEED the cooling system. REFER to Section 303-03 . After filling and bleeding the cooling system, GO to I3 .
I3 CHECK FOR COOLANT FLOW TO THE HEATER CORE	
• 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. • Using a suitable temperature measuring device, check the heater core inlet hose to see if it is hot. • **Is the heater core inlet hose temperature above 65.5°C (150°F)?**	**Yes** GO to I4 . **No** REFER to Section 303-03 to diagnose the engine not reaching normal operating temperature.
I4 CHECK FOR A PLUGGED OR RESTRICTED HEATER CORE	
• Using a suitable temperature measuring device, measure the heater core outlet hose temperature. • **Is the heater core outlet hose temperature similar to the inlet hose temperature (within approximately 6-17°C [10-30°F])?**	**Yes** GO to Pinpoint Test M . **No** INSTALL a new heater core. REFER to Section 412-01 . TEST the system for normal operation.

Pinpoint Test J: The Air Conditioning (A/C) is Inoperative

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

When A/C is requested the HVAC module grounds a circuit to the Instrument Panel Cluster (IPC). The IPC then sends an A/C request through the High Speed Controller Area Network (HS-CAN) to the PCM.

Voltage is provided to the A/C clutch relay coil and switch contacts. 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. 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.

The evaporator discharge air temperature sensor is used for A/C compressor cycling. An accurate evaporator temperature is critical for compressor engagement. The PCM uses the temperature measurement to turn the A/C compressor off before the evaporator temperature is cold enough to freeze the condensation on the evaporator core.

When an A/C request is received by the PCM, the A/C compressor clutch only engages the A/C clutch relay if all of the following conditions are met:

- The A/C pressure transducer does not indicate excessively low or high refrigerant pressure. Refer to Specifications in this section.
- The PCM does not detect excessively high engine coolant temperature.
- The PCM does not detect an ambient air temperature below 0°C (32°F).
- The PCM has not detected a Wide Open Throttle (WOT) condition.
- The HVAC module does not detect an evaporator discharge air temperature below 0.6°C (33°F).

- DTC 52 (A/C Select Drive Circuit/Performance) - This DTC sets when any of the following occur during a self-test:
    - ♦ The module senses ground on the A/C request circuit when the circuit is not grounded by the HVAC module, indicating a short directly to ground.
    - ♦ The module senses voltage on the A/C request circuit when the circuit is grounded by the HVAC module, indicating a short directly to voltage.
    - ♦ The module senses no voltage on the A/C request circuit when the relay is not grounded by the HVAC module, indicating an open.

This pinpoint test is intended to diagnose the following:

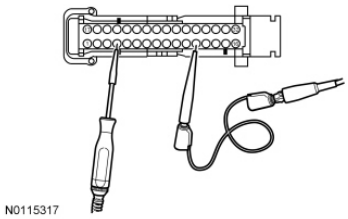
- Fuse(s)
- Wiring, terminals or connectors
- A/C system discharged/low charge
- PCM
- HVAC module
- IPC
- Evaporator discharge air temperature sensor
- A/C pressure transducer
- A/C compressor clutch field coil
- A/C clutch relay
- A/C compressor clutch air gap

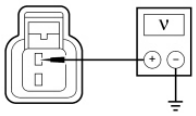
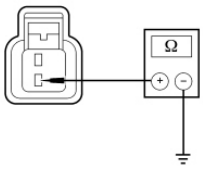
PINPOINT TEST J: THE AIR CONDITIONING (A/C) IS INOPERATIVE

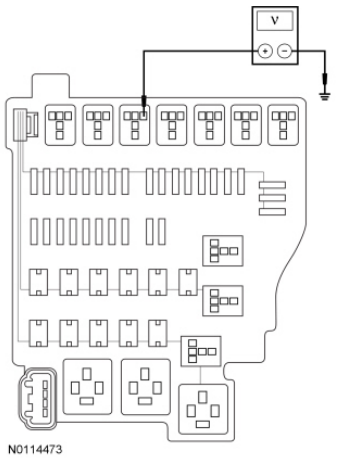
NOTE: Some PCM and Instrument Panel Cluster (IPC) DTCs may inhiC operation. If any PCM or IPC DTCs are retrieved, diagnose those first. Refer to the PCM DTC Chart or the Instrument Panel Cluster (IPC) DTC Chart.

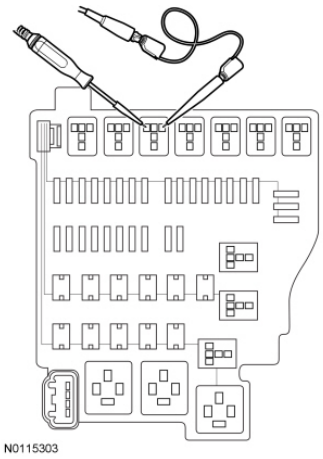
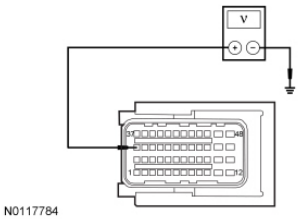
Test Step	Result / Action to Take
J1 CHECK THE HVAC MODULE FOR DTCs	
• Ignition ON. • CARRY OUT the HVAC module self-test. • Check for HVAC DTCs retrieved during the self-test. • **IS DTC 52 present?**	**Yes** GO to J19 . **No** GO to J2 .

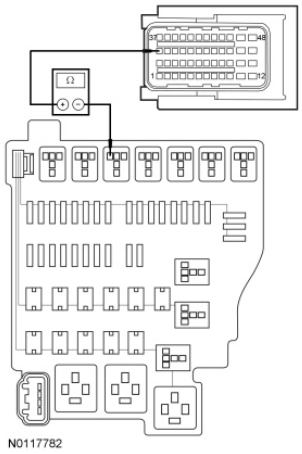
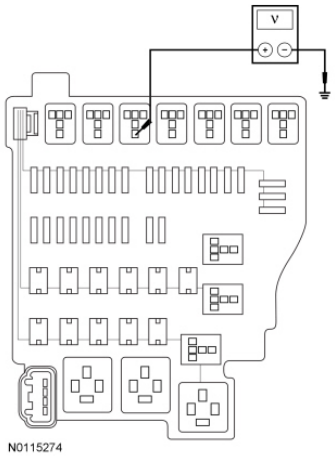
J2 CHECK THE A/C SYSTEM PRESSURE	
• Ignition OFF. • With the R-134a manifold gauge set connected, check the A/C system pressure. • **Is the A/C system pressure above 290 kPa (42 psi) ?**	**Yes** GO to J3 . **No** CHECK the A/C system for leaks. REFER to Fluorescent Dye Leak Detection or Electronic Leak Detection in this section. RECHARGE the A/C system. REFER to Air Conditioning (A/C) System Recovery, Evacuation and Charging . TEST the system for normal operation.
J3 CHECK THE A/C PRESSURE SENSOR (ACP_PRESS) PCM PID	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • With the R-134a manifold gauge set connected, compare the pressure readings of the manifold gauge set and the ACP_PRESS PCM PID. • **Are the pressure values of the manifold gauge set and the ACP_PRESS PCM PID similar?**	**Yes** GO to J4 . **No** INSTALL a new A/C pressure transducer. TEST the system for normal operation.
J4 CHECK THE A/C EVAPORATOR TEMPERATURE (EVAP_TEMP) INSTRUMENT PANEL CLUSTER (IPC) PID	
• Allow the vehicle exterior and interior to stabilize to the ambient temperature. • Enter the following diagnostic mode on the scan tool: IPC DataLogger. • Monitor the EVAP_TEMP IPC PID • **Does the EVAP_TEMP IPC PID read similar to the ambient temperature?**	**Yes** GO to J5 . **No** GO to J21
J5 CHECK THE AIR CONDITIONING SWITCH (A/C_SWITCH) IPC PID WITH THE A/C ON	
• Enter the following diagnostic mode on the scan tool: IPC DataLogger. • Monitor the A/C_SWITCH IPC PID • Select PANEL and press the A/C button (indicator on) on the HVAC controls. • **Does the A/C_SWITCH IPC PID read ACTIVE?**	**Yes** GO to J7 . **No** GO to J6 .
J6 CHECK THE A/C REQUEST TO THE IPC	
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**	**Yes** GO to J24 . **No** GO to J22 .

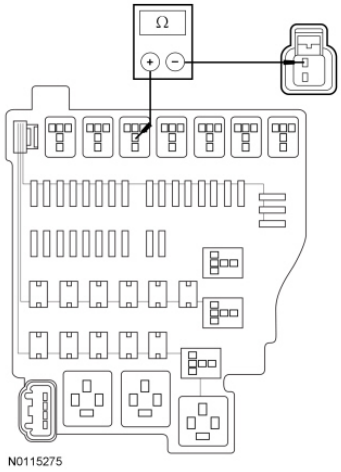
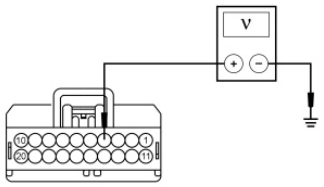
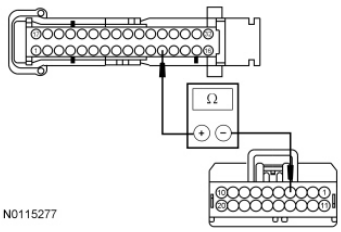
test light probe directly on any connector. • Ignition OFF. • Disconnect: Instrument Panel Cluster (IPC) C220. • Ignition ON. • Connect a 12-volt test light between IPC C220-4, circuit CBP21 (BU/GY), harness side and IPC C220-12, circuit CH434 (GY/YE), harness side.  N0115317 • Select PANEL and press the A/C button (indicator on) on the HVAC controls. • **Does the test light illuminate?**	
J7 CHECK THE AIR CONDITIONING REQUEST SIGNAL (AC_REQ) PCM PID WITH THE A/C ON	
• Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Select PANEL and press the A/C button (indicator on) on the HVAC controls. • Monitor the AC_REQ PCM PID • **Does the AC_REQ PCM PID read YES?**	**Yes** GO to J8 . **No** GO to J24 .
J8 CHECK THE AIR CONDITIONING COMPRESSOR COMMANDED STATE (ACC_CMD) PCM PID WITH THE A/C ON	
• Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Select PANEL and press the A/C button (indicator on) on the HVAC controls. • Monitor the ACC_CMD PCM PID • **Does the ACC_CMD PCM PID read ON?**	**Yes** GO to J9 . **No** GO to J23 .
J9 CHECK THE VOLTAGE AT THE A/C COMPRESSOR CLUTCH FIELD COIL	
• Ignition OFF. • Disconnect: A/C Compressor Clutch Field Coil C100. • Start the engine. • Select MAX A/C on the HVAC module. • Measure the voltage between ground and A/C compressor clutch field coil C100-1, circuit CH401 (VT/WH), harness side.	**Yes** GO to J10 . **No** GO to J13 .

 A0048576 • **Is the voltage greater than 10 volts?**	
J10 CHECK THE GROUND AT THE A/C COMPRESSOR CLUTCH FIELD COIL	
• Ignition OFF. • Measure the resistance between ground and A/C compressor clutch field coil C100-2, circuit GD120 (BK/GN), harness side.  N0003086 • **Is the resistance less than 5 ohms?**	**Yes** GO to J11 . **No** REPAIR circuit GD120 (BK/GN) for an open. TEST the system for normal operation.
J11 CHECK THE A/C COMPRESSOR CLUTCH FIELD COIL	
• Measure the resistance between the A/C compressor clutch field coil C100 terminals, component side. • **Is the resistance between 2 and 5 ohms?**	**Yes** GO to J12 . **No** INSTALL a new A/C compressor clutch field coil. REFER to Section 412-01 . TEST the system for normal operation.
J12 CHECK THE A/C COMPRESSOR CLUTCH FIELD COIL FOR A SHORT TO GROUND	
• Measure the resistance between the A/C compressor clutch field coil C100 terminals, component side and ground. • **Is the resistance greater than 10,000 ohms?**	**Yes** ADJUST the A/C compressor clutch gap. REFER to Air Conditioning (A/C) Clutch Air Gap Adjustment in this section. TEST the system for normal operation. **No** INSTALL a new A/C compressor clutch field coil. REFER to Section 412-01 . TEST the system for normal operation.
J13 CHECK THE VOLTAGE TO THE A/C CLUTCH RELAY COIL	

• Ignition OFF. • Disconnect: A/C Clutch Relay. • Start the engine. • Measure the voltage between A/C clutch relay socket pin 1, circuit CBP02 (GN) and ground.  • **Is the voltage greater than 10 volts?**	**Yes** GO to J14 . **No** VERIFY Central Junction Box (CJB) fuse 2 (10A) is OK. If OK, REPAIR circuit CBP02 (GN) 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.
J14 CHECK THE A/C CLUTCH 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 or equivalent. 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.** • Start the engine. • Select PANEL and press the A/C button (indicator on) on the HVAC controls. • With the engine running, connect a 12-volt test light between A/C clutch relay socket pin 1, circuit CBP02 (GN) and A/C clutch relay socket pin 2, circuit CH302 (WH/BN).	**Yes** GO to J17 . **No** GO to J15 .

 N0115303 • **Does the test light illuminate?**	
J15 CHECK THE A/C CLUTCH RELAY COIL SWITCHED GROUND CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: PCM C175B. • Ignition ON. • Measure the voltage between ground and PCM C175B-25, circuit CH302 (WH/BN), harness side.  N0117784 • **Is any voltage present?**	**Yes** REPAIR circuit CH302 (WH/BN) for a short to voltage. TEST the system for normal operation. **No** GO to J16 .
J16 CHECK THE A/C CLUTCH RELAY COIL SWITCHED GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between A/C clutch relay socket pin 2, circuit CH302 (WH/BN) and PCM C175B-25, circuit CH302 (WH/BN), harness side.	**Yes** GO to J23 . **No** REPAIR circuit CH302 (WH/BN) for an open. TEST the system for normal operation.

 N0117782 • **Is the resistance less than 5 ohms?**	
J17 CHECK THE VOLTAGE TO THE A/C CLUTCH RELAY SWITCH CONTACTS	
• Measure the voltage between ground and the A/C clutch relay socket pin 3, circuit SBB29 (GY/RD).  N0115274 • **Is the voltage greater than 10 volts?**	**Yes** GO to J18 . **No** VERIFY Battery Junction Box (BJB) fuse 29 (10A) is OK. If OK, REPAIR circuit SBB29 (GY/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.
J18 CHECK THE A/C COMPRESSOR CLUTCH FIELD COIL VOLTAGE CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between A/C clutch relay socket pin 5, circuit CH401 (VT/WH) and A/C compressor clutch field coil C100-1, circuit CH401 (VT/WH), harness side.	**Yes** INSTALL a new A/C clutch relay. TEST the system for normal operation. **No** REPAIR circuit CH401 (VT/WH) for an open. TEST the system for normal operation.

 N0115275 • **Is the resistance less than 5 ohms?**	
J19 CHECK THE A/C REQUEST CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Disconnect: Instrument Panel Cluster (IPC) C220. • Ignition ON. • Measure the voltage between ground and HVAC module C228A-4, circuit CH434 (GY/YE), harness side.  N0115276 • **Is any voltage present?**	**Yes** REPAIR circuit CH434 (GY/YE) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to J20 .
J20 CHECK THE A/C REQUEST CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between HVAC module C228A-4, circuit CH434 (GY/YE), harness side and IPC C220-12, circuit CH434 (GY/YE), harness side.  N0115277 • **Is the resistance less than 5 ohms?**	**Yes** GO to J22 . **No** REPAIR circuit CH434 (GY/YE) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

J21 CHECK THE EVAPORATOR TEMPERATURE AIR TEMPERATURE SENSOR	
• Ignition OFF. • Disconnect: Evaporator Discharge Air Temperature Sensor C296. • CARRY OUT the Evaporator Discharge Air Temperature Sensor component test in this section. • **Did the evaporator discharge air temperature sensor test OK?**	**Yes** GO to J24 . **No** INSTALL a new evaporator discharge air temperature sensor. REFER to Section 412-01 . TEST the system for normal operation.
J22 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
J23 CHECK THE PCM CONNECTION	
• Disconnect all the PCM connectors. • Inspect the PCM connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the PCM connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**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 caused by a loose or corroded connector.
J24 CHECK THE IPC CONNECTION	
• Disconnect all the IPC connectors. • Inspect the IPC connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the IPC connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Pinpoint Test K: 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.

Normal Operation

When A/C is requested the HVAC module grounds a circuit to the Instrument Panel Cluster (IPC). The IPC then sends an A/C request through the High Speed Controller Area Network (HS-CAN) to the PCM.

Voltage is provided to the A/C clutch relay coil and switch contacts. 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. 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.

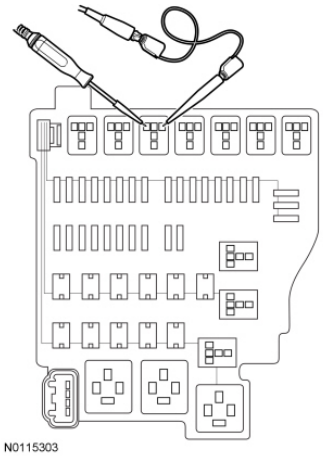
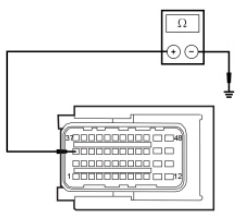
The evaporator discharge air temperature sensor is used for A/C compressor cycling. An accurate evaporator temperature is critical for compressor engagement. The PCM uses the temperature measurement to turn the A/C compressor off before the evaporator temperature is cold enough to freeze the condensation on the evaporator core.

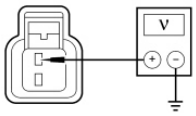
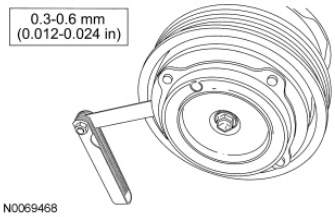
This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- PCM

IPC
- Evaporator discharge air temperature sensor
- A/C clutch relay
- A/C compressor clutch air gap

PINPOINT TEST K: THE AIR CONDITIONING (A/C) IS ALWAYS ON - A/C COMPRESSOR DOES NOT CYCLE

Test Step	Result / Action to Take
K1 CHECK THE A/C EVAPORATOR TEMPERATURE (EVAP_TEMP) INSTRUMENT PANEL CLUSTER (IPC) PID	
• Ignition ON. • Allow the vehicle exterior and interior to stabilize to the ambient temperature. • Enter the following diagnostic mode on the scan tool: IPC DataLogger. • Monitor the EVAP_TEMP IPC PID • **Does the EVAP_TEMP IPC PID read similar to the ambient temperature?**	**Yes** GO to K2 . **No** GO to K8 .
K2 CHECK AIR CONDITIONING COMPRESSOR COMMANDED STATE (ACC_CMD) PCM PID WITH THE A/C OFF	
• Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Select PANEL and press the A/C button (indicator off) on the HVAC controls. • Monitor the ACC_CMD PCM PID • **Does the ACC_CMD PCM PID read OFF?**	**Yes** GO to K3 . **No** GO to K10 .
K3 CHECK THE A/C RELAY	
• Ignition OFF.	**Yes** GO to K4 .

• Disconnect: A/C Clutch Relay. • Start the engine. • OBSERVE A/C compressor clutch operation. • **Does the A/C compressor clutch disengage?**	**No** GO to K6 .
K4 CHECK THE A/C CLUTCH 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 or equivalent. 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.** • Connect a 12-volt test light between A/C clutch relay socket pin 1, circuit CBP02 (GN) and A/C clutch relay socket pin 2, circuit CH302 (WH/BN).  N0115303 • **Does the test light illuminate?**	**Yes** GO to K5 . **No** INSTALL a new A/C clutch relay. TEST the system for normal operation.
K5 CHECK THE A/C CLUTCH RELAY COIL SWITCHED GROUND CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: PCM C175B. • Measure the resistance between ground and PCM C175B-25, circuit CH302 (WH/BN), harness side.  N0117783 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to K10 . **No** REPAIR circuit CH302 (WH/BN) for a short to ground. TEST the system for normal operation.

K6 CHECK FOR VOLTAGE TO THE A/C COMPRESSOR CLUTCH FIELD COIL	
• Ignition OFF. • Disconnect: A/C Compressor Clutch Field Coil C100. • Ignition ON. • Measure the voltage between A/C compressor clutch field coil C100-1, circuit CH401 (VT/WH), harness side and ground.  A0048576 • **Is any voltage present?**	**Yes** REPAIR circuit CH401 (VT/WH) for a short to voltage. TEST the system for normal operation. **No** GO to K7 .
K7 CHECK THE A/C COMPRESSOR CLUTCH AIR GAP	
• Measure the A/C compressor clutch air gap at 3 equally spaced locations between the clutch hub and the A/C compressor clutch pulley.  N0069468 • **Is the A/C compressor clutch air gap average less than 0.3 mm (0.012 in)?**	**Yes** ADJUST the A/C compressor clutch gap. REFER to Air Conditioning (A/C) Clutch Air Gap Adjustment in this section. TEST the system for normal operation. **No** INSTALL a new A/C compressor clutch. REFER to Section 412-01 . TEST the system for normal operation.
K8 CHECK THE EVAPORATOR TEMPERATURE AIR TEMPERATURE SENSOR	
• Ignition OFF. • Disconnect: Evaporator Discharge Air Temperature Sensor C296. • CARRY OUT the Evaporator Discharge Air Temperature Sensor component test in this section. • **Did the evaporator discharge air temperature sensor test OK?**	**Yes** GO to K9 . **No** INSTALL a new evaporator discharge air temperature sensor. REFER to Section 412-01 . TEST the system for normal operation.
K9 CHECK THE IPC CONNECTION	
• Disconnect all the IPC connectors. • Inspect the IPC connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals.	**Yes** INSTALL a new IPC . REFER to Section 413-01 . TEST the system for normal operation. **No**

• Connect and correctly seat all the IPC connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	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. TEST the system for normal operation.
K10 CHECK THE PCM CONNECTION	
• Disconnect all the PCM connectors. • Inspect the PCM connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the PCM connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**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 caused by a loose or corroded connector.

Pinpoint Test L: 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.

Normal Operation

Under normal operation, when A/C is requested the HVAC module grounds a circuit to the Instrument Panel Cluster (IPC). The IPC then sends an A/C request through the High Speed Controller Area Network (HS-CAN) to the PCM.

- DTC 52 (A/C Select Drive Circuit/Performance) - This DTC sets when any of the following occur during a self-test:
  - ♦ The module senses ground on the A/C request circuit when the circuit is not grounded by the HVAC module, indicating a short directly to ground.
  - ♦ The module senses voltage on the A/C request circuit when the circuit is grounded by the HVAC module, indicating a shortectly to voltage.
  - ♦ The module senses no voltage on the A/C request circuit when the relay is not grounded by the HVAC module, indicating an open.

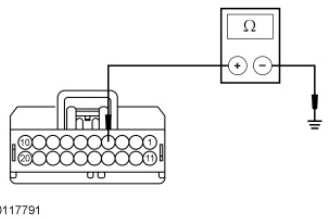
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- PCM
- HVAC module

PINPOINT TEST L: THE AIR CONDITIONING (A/C) IS ALWAYS ON - A/C MODE ALWAYS COMMANDED ON

NOTE: Some PCM and Instrument Panel Cluster (IPC) DTCs may inhibit A/C operation. If any PCM or IPC DTCs are retrieved, diagnose those first. Refer to the PCM DTC Chart or the Instrument Panel Cluster (IPC) DTC Chart.

Test Step	Result / Action to Take
L1 CHECK THE HVAC MODULE FOR DTCs	

• Ignition ON. • Select OFF on the HVAC controls. • CARRY OUT the HVAC module self-test. • Check for HVAC DTCs retrieved during the self-test. • **Is DTC 52 present?**	**Yes** GO to L2 . **No** GO to L3 .
L2 CHECK THE A/C REQUEST CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Disconnect: Instrument Panel Cluster (IPC) C220. • Ignition ON. • Measure the resistance between ground and HVAC module C228A-4, circuit CH434 (GY/YE), harness side.  N0117791 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to L8 . **No** REPAIR circuit CH434 (GY/YE) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
L3 CHECK THE AIR CONDITIONING SWITCH (A/C_SWITCH) IPC PID WITH THE A/C OFF	
• Enter the following diagnostic mode on the scan tool: IPC DataLogger. • Monitor the A/C_SWITCH IPC PID • Select PANEL and press the A/C button (indicator off) on the HVAC controls. • **Does the A/C_SWITCH IPC PID read INACTIVE?**	**Yes** GO to L4 . **No** GO to L6 .
L4 CHECK THE AIR CONDITIONING REQUEST SIGNAL (AC_REQ) PCM PID WITH THE A/C OFF	
• Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Select PANEL and press the A/C button (indicator off) on the HVAC controls. • Monitor the AC_REQ PCM PID • **Does the AC_REQ PCM PID read NO?**	**Yes** GO to L5 . **No** GO to L7 .
L5 CHECK AIR CONDITIONING COMPRESSOR COMMANDED STATE (ACC_CMD) PCM PID WITH THE A/C OFF	

• Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Select PANEL and press the A/C button (indicator off) on the HVAC controls. • Monitor the ACC_CMD PCM PID • **Does the ACC_CMD PCM PID read OFF?**	**Yes** GO to L6 . **No** GO to L7 .
L6 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
L7 CHECK THE PCM CONNECTION	
• Disconnect all the PCM connectors. • Inspect the PCM connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the PCM connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**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 caused by a loose or corroded connector.
L8 CHECK THE IPC CONNECTION	
• Disconnect all the IPC connectors. • Inspect the IPC connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the IPC connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Pinpoint Test M: Temperature Control is Inoperative/Does Not Operate Correctly

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

The HVAC module supplies voltage and ground to the temperature blend door actuator motor through the actuator motor circuits to rotate the temperature blend door actuator. To reverse the temperature blend door actuator rotation, the HVAC module reverses the voltage and ground on the circuits.

The temperature blend door actuator feedback resistor is supplied a 5-volt reference voltage and ground from the HVAC module. The HVAC module measures the resistance on the temperature blend door actuator feedback circuit 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.

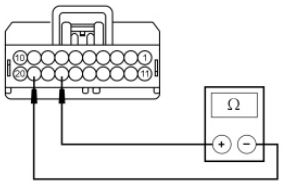
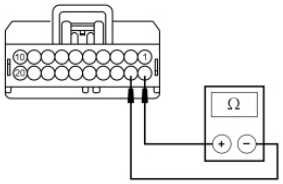
- DTC 2-1 (Blend Feedback Circuit/Performance) - The module senses no changes in the feedback circuit when motor movement is commanded and no motor electrical DTCs are present. This indicates an open actuator motor, an open or shorted feedback circuit, an open feedback resistor reference voltage circuit, or an internal electrical or mechanical failure.
- DTC 2-2 (Blend Motor Driver Circuit/Performance) - The module senses lower than expe voltage on an actuator motor circuit when voltage is applied to drive the motor. This indicates a short to ground or the module senses greater than expected voltage on the actuator motor circuit when ground is applied to drive the motor, indicating a short to voltage.
- DTC 2-3 (Blend Actuator Calibration Performance) - The module senses the actuator has moved outside its travel limits during calibration. This indicates broken/disconnected linkage or door or an internal mechanical failure.

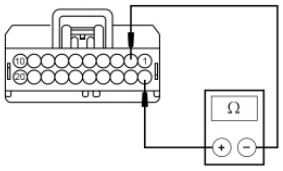
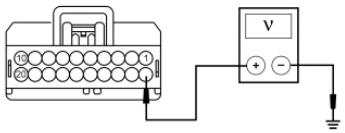
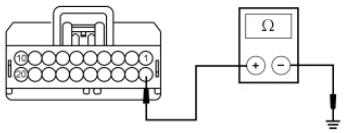
This pinpoint test is intended to diagnose the following:

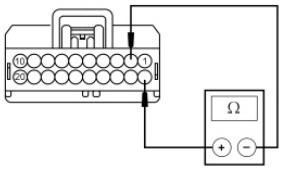
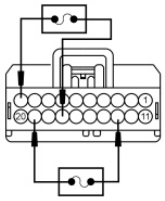
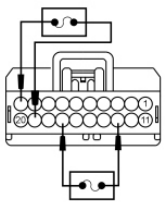
- Wiring, terminals or connectors
- Temperature blend door actuator
- HVAC module
- Temperature blend door is binding or stuck

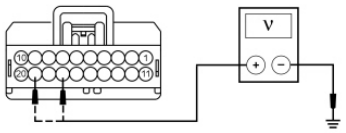
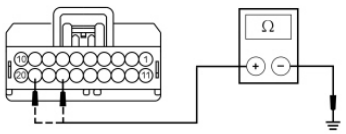
PINPOINT TEST M: TEMPERATURE CONTROL IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

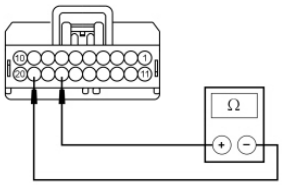
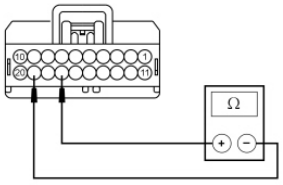
Test Step	Result / Action to Take
M1 CHECK THE HVAC MODULE FOR DTCs	
NOTE: If HVAC DTC 4-4 is present, GO to Pinpoint Test D and diagnose that DTC first. • Ignition ON. • CARRY OUT the HVAC module self-test. • Check for HVAC DTCs retrieved during the self-test. • **Are HVAC DTCs present?**	**Yes** **For DTC 2-1** , GO to M2 . **For DTC 2-2** , GO to M9 . **For DTC 2-3** , GO to M8 . **No** GO to M7 .
M2 CHECK THE ACTUATOR MOTOR AND CIRCUITS	

• Ignition OFF. • Disconnect: HVAC Module C228A. • Measure the resistance between HVAC module C228A-17, circuit CH235 (BU), harness side and HVAC module C228A-19, circuit CH236 (WH), harness side.  N0115278 • **Is the resistance less than 40 ohms?**	**Yes** GO to M4 . **No** GO to M3 .
M3 CHECK THE TEMPERATURE BLEND DOOR ACTUATOR	
• Ignition OFF. • Disconnect: Temperature Blend Door Actuator C2092. • CARRY OUT the Temperature Blend Door Actuator component test in this section. • **Did the temperature blend door actuator test OK?**	**Yes** REPAIR circuit CH235 (BU) or CH236 (WH) for an open or high resistance. REPEAT the self-test. TEST the system for normal operation. **No** GO to M13 .
M4 CHECK THE POTENTIOMETER LOW- AND HIGH-SIDE RESISTANCE	
• Measure the **high-side** resistance between HVAC module C228A-12, circuit CH232 (WH/BN), harness side and HVAC module C228A-11, circuit CH206 (YE/VT), harness side.  N0115279 • Measure the **low-side** resistance between HVAC module C228A-2, circuit CH233 (VT/BN), harness side and HVAC module C228A-11, circuit CH206 (YE/VT), harness side.	**Yes** GO to M5 . **No** CARRY OUT the Temperature Blend Door Actuator component test in this section. INSTALL a new defrost/panel/floor mode door actuator if necessary. REFER to Section 412-01 . If the actuator tests OK and: If the **high-side** resistance only is greater than 4,375 ohms, REPAIR circuit CH232 (WH/BN) for an open. If the **high-side** resistance only is less than 215 ohms, REPAIR circuits CH206 (YE/VT) and CH232 (WH/BN) for a short together. If the **low-side** resistance only is greater than 4,375 ohms, REPAIR circuit CH233 (VT/BN) for an open. If the **low-side** resistance only is less than 215

 N0115280 • **Are the resistances between 215 and 4,375 ohms?**	ohms, REPAIR circuits CH206 (YE/VT) and CH233 (VT/BN) for a short together. If both the **high-side and low-side** resistance is greater than 4,375 ohms, REPAIR circuit CH206 (YE/VT) for an open. Once the repair is complete, CALIBRATE the actuators. REFER to Calibrating the HVAC Actuators in this section. TEST the system for normal operation.
M5 CHECK THE ACTUATOR FEEDBACK CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition ON. • Measure the voltage between ground and HVAC module C228A-11, circuit CH206 (YE/VT), harness side.  N0117787 • **Is any voltage present?**	**Yes** REPAIR circuit CH206 (YE/VT) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to M6 .
M6 CHECK THE ACTUATOR FEEDBACK CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between ground and HVAC module C228A-11, circuit CH206 (YE/VT), harness side.  N0117788 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to M7 . **No** REPAIR circuit CH206 (YE/VT) or CH233 (VT/BN) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
M7 CHECK THE TEMPERATURE BLEND DOOR ACTUATOR OPERATION	

• Ignition OFF. • Disconnect: HVAC Module C228A (If not previously disconnected). • Measure the resistance between HVAC module C228A-2, circuit CH233 (VT/BN), harness side and HVAC module C228A-11, circuit CH206 (YE/VT), harness side.  N0115280 • Connect a fused jumper wire between: ♦ HVAC module C228A-10, circuit SBP07 (WH/RD), harness side and HVAC module C228A-17, circuit CH235 (BU), harness side. ♦ HVAC module C228A-13, circuit GD115 (BK/GY), harness side and HVAC module C228A-19, circuit CH236 (WH), harness side.  N0117789 • Remove the fused jumpers. • Connect a fused jumper wire between: ♦ HVAC module C228A-13, circuit GD115 (BK/GY), harness side and HVAC module C228A-17, circuit CH235 (BU), harness side. ♦ HVAC module C228A-10, circuit SBP07 (WH/RD), harness side and HVAC module C228A-19, circuit CH236 (WH), harness side.  N0117790 • **Does the resistance smoothly increase to approximately 3,500 ohms and/or decrease to**	**Yes** GO to M14 . **No** GO to M8 .

approximately 290 ohms when the jumpers are connected?	
M8 CHECK THE TEMPERATURE BLEND DOOR AND LINKAGE	
• Disconnect: Temperature Blend Door Actuator C2092. • REMOVE the temperature blend door actuator. REFER to Section 412-01 . • INSPECT the temperature blend door and linkage for a broken, loose or binding condition. • **Is any condition found during inspection?**	**Yes** REPAIR the temperature blend door or linkage REINSTALL the temperature blend door actuator. CALIBRATE the actuators. REFER to Calibrating the HVAC Actuators in this section. TEST the system for normal operation. **No** GO to M13 .
M9 CHECK THE ACTUATOR MOTOR DRIVE CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Ignition ON. • Measure the voltage between ground and: ♦ HVAC module C228A-17, circuit CH235 (BU), harness side. ♦ HVAC module C228A-19, circuit CH236 (WH), harness side.  N0115283 • **Are any voltages present?**	**Yes** REPAIR circuit CH235 (BU) or CH236 (WH) for a short to voltage. TEST the system for normal operation. **No** GO to M10 .
M10 CHECK THE ACTUATOR MOTOR DRIVE CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between ground and: ♦ HVAC module C228A-17, circuit CH235 (BU), harness side. ♦ HVAC module C228A-19, circuit CH236 (WH), harness side.  N0115284 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to M11 . **No** REPAIR circuit CH235 (BU) or CH236 (WH) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

M11 CHECK THE ACTUATOR MOTOR AND CIRCUIT RESISTANCE	
• Measure the resistance between HVAC module C228A-17, circuit CH235 (BU), harness side and HVAC module C228A-19, circuit CH236 (WH), harness side.  N0115278 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to M14 . **No** GO to M12 .
M12 CHECK THE ACTUATOR MOTOR CIRCUITS FOR A SHORT TOGETHER	
• Disconnect: Temperature Blend Door Actuator C2092. • Measure the resistance between HVAC module C228A-17, circuit CH235 (BU), harness side and HVAC module C228A-19, circuit CH236 (WH), harness side.  N0115278 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to M13 . **No** REPAIR circuits CH235 (BU) and CH236 (WH) for a short together. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
M13 CHECK THE ACTUATOR CONNECTION	
• Disconnect the temperature blend door actuator connector. • Inspect the temperature blend door actuator connector for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • REINSTALL the temperature blend door actuator, If removed. • Connect and correctly seat the temperature blend door actuator connector. • CALIBRATE the actuators. REFER to Calibrating the HVAC Actuators in this section.	**Yes** INSTALL a new temperature blend door actuator. REFER to Section 412-01 . CALIBRATE the actuators. REFER to Calibrating the HVAC Actuators in this section. 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. TEST the system for normal operation.

• Operate the system and verify the concern is still present. • **Is the concern still present?**	
M14 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . TEST the system for normal operation. **No** 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 door travel. CHECK any actuator external linkage. If condition recurs, INSPECT actuator linkage and door for binding and CHECK HVAC case for foreign objects.

Pinpoint Test N: The Blower Motor is Inoperative

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Normal Operation

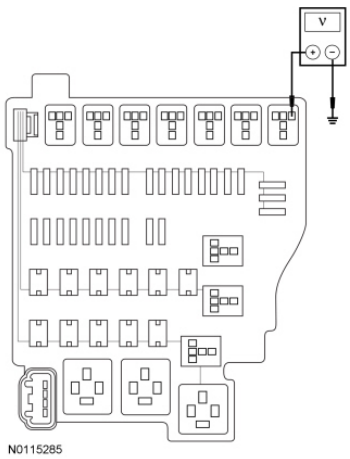
The blower motor relay coil and relay switch contacts receive voltage. The blower motor relay is energized when the coil receives ground from the HVAC module, if the HVAC power is on. When the relay coil is energized, voltage is delivered to the blower motor. Ground for the blower motor is provided from the blower resistor or the blower switch (HI). The blower resistor is grounded through the blower motor switch. The blower motor switch is grounded. The blower motor switch is part of the HVAC module and can not be replaced separately.

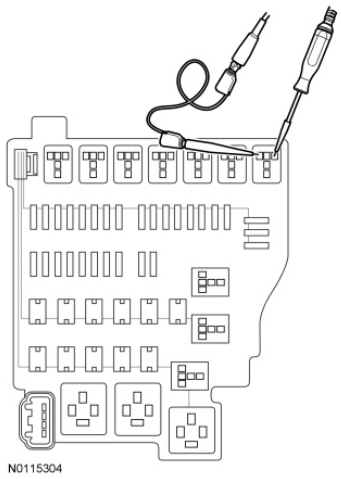
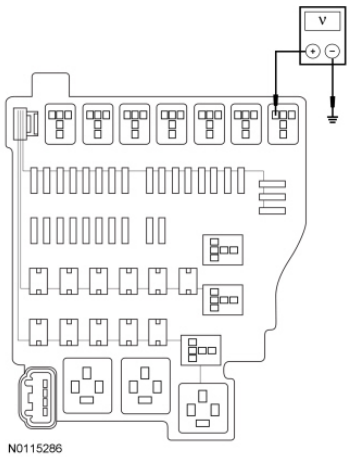
- DTC 51 (Blower Relay Driver Circuit/Performance) - This DTC sets when any of the following occur:
  - ♦ The module senses ground on the relay coil ground circuit when the relay is not grounded by the HVAC module, indicating a short directly to ground.
  - ♦ The module senses voltage on the relay coil ground circuit when the relay is grounded by the HVAC module, indicating a short directly to voltage.
  - ♦ The module senses no voltage on the relay coil ground circuit when the relay is not grounded by the HVAC module, indicating an open.

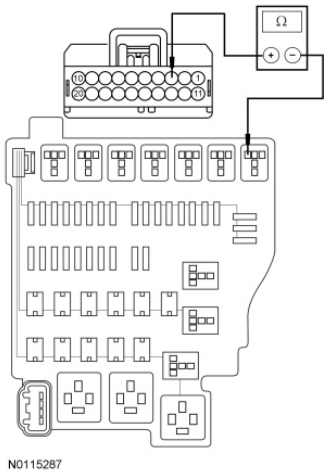
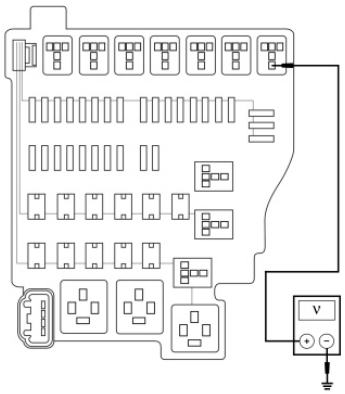
This pinpoint test is intended to diagnose the following:

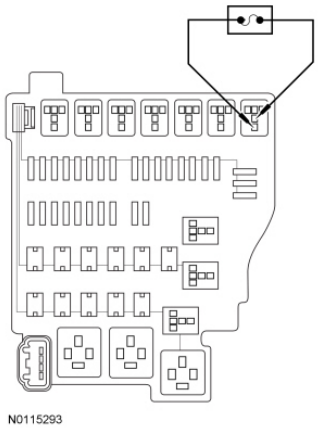
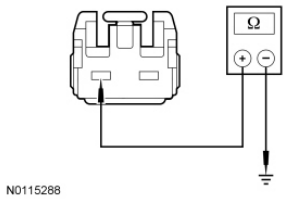
- Fuse
- Wiring, terminals or connectors
- Blower motor
- Blower motor relay
- HVAC module

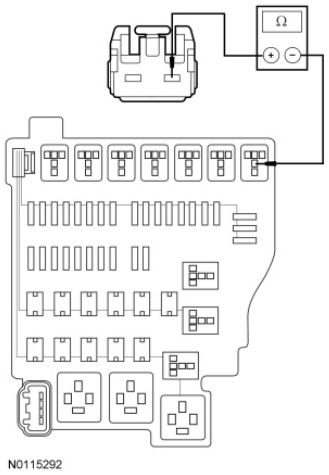
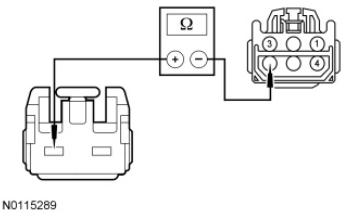
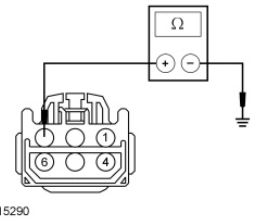
PINPOINT TEST N: THE BLOWER MOTOR IS INOPERATIVE

Te Step	Result / Action to Take
N1 CHECK THE HVAC MODULE FOR DTCs	
• Ignition ON. • CARRY OUT the HVAC module self-test. • Check for HVAC DTCs retrieved during the self-test. • **Is DTC 51 present?**	**Yes** GO to N2 . **No** GO to N6 .
N2 CHECK THE BLOWER MOTOR RELAY COIL SUPPLY VOLTAGE	
• Ignition OFF. • Disconnect: Blower Motor Relay. • Ignition ON. • Measure the voltage between blower motor relay socket pin 1, circuit CBP21 (BU/GY) and ground.  • **Is the voltage greater than 10 volts?**	**Yes** GO to N3 . **No** REPAIR circuit CBP21 (BU/GY) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
N3 CHECK THE BLOWER MOTOR RELAY COIL	
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 or equivalent. 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.** • Select PANEL on the HVAC controls. • Connect a 12-volt test light between blower motor relay socket pin 1, circuit CBP21 (BU/GY) and blower motor relay socket pin 2, circuit CH123 (VT/GN).	**Yes** INSTALL a new blower motor relay. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to N4 .

 N0115304 • **Does the test light illuminate?**	
N4 CHECK THE BLOWER MOTOR RELAY COIL GROUND CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: HVAC Module C228A. • Ignition ON. • Measure the voltage between blower motor relay socket pin 2, circuit CH123 (VT/GN) and ground.  N0115286 • **Is any voltage present?**	**Yes** REPAIR circuit CH123 (VT/GN) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to N5 .
N5 CHECK THE BLOWER MOTOR RELAY COIL GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between blower motor relay socket pin 2, circuit CH123 (VT/GN) and HVAC module C228A-3, circuit CH123 (VT/GN), harness side.	**Yes** GO to N12 . **No** REPAIR circuit CH123 (VT/GN) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 N0115287 • **Is the resistance less than 5 ohms?**	
N6 CHECK THE BLOWER MOTOR RELAY SWITCH CONTACTS SUPPLY VOLTAGE	
• Ignition OFF. • Disconnect: Blower Motor Relay. • Ignition ON. • Measure the voltage between blower motor relay socket pin 3, circuit SBB04 (GN/RD) and ground.  N0115305 • **Is the voltage greater than 10 volts?**	**Yes** GO to N7 . **No** VERIFY Battery Junction Box (BJB) fuse 4 (40A) is OK. If OK, REPAIR circuit SBB04 (GN/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.
N7 CHECK THE BLOWER MOTOR RELAY	
• Select the highest blower motor speed on HVAC controls. • Connect a fused jumper lead between blower motor relay socket pin 3, circuit SBB04 (GN/RD) and blower motor relay socket pin 5, circuit CH402 (YE/GN).	**Yes** INSTALL a new blower motor relay. TEST the system for normal operation. **No** GO to N8 .

 N0115293 • **Does the blower motor operate?**	
N8 CHECK THE BLOWER MOTOR GROUND CIRCUIT	
• Ignition OFF. • Disconnect: Blower Motor C2004. • Turn the blower motor switch to the HI position. • Measure the resistance between blower motor connector C2004-2, circuit CH430 (VT/OG), harness side and ground.  N0115288 • **Is the resistance less than 5 ohms?**	**Yes** GO to N9 . **No** GO to N10 .
N9 CHECK THE BLOWER MOTOR VOLTAGE CIRCUIT FOR AN OPEN	
• Measure the resistance between blower motor relay socket pin 5, circuit CH402 (YE/GN) and blower motor C2004-1, circuit CH402 (YE/GN), harness side.	**Yes** INSTALL a new blower motor. TEST the system for normal operation. **No** REPAIR circuit CH402 (YE/GN) for an open. TEST the system for normal operation.

 N0115292 • **Is the resistance less than 5 ohms?**	
N10 CHECK THE BLOWER MOTOR GROUND CIRCUIT FOR AN OPEN	
• Disconnect: HVAC Module C228B. • Measure the resistance between HVAC module C228B-6, circuit CH430 (VT/OG), harness side and blower motor C2004-2, circuit CH430 (VT/OG), harness side.  N0115289 • **Is the resistance less than 5 ohms?**	**Yes** GO to N11 . **No** REPAIR circuit CH430 (VT/OG) for an open. TEST the system for normal operation.
N11 CHECK THE BLOWER MOTOR SWITCH GROUND CIRCUIT FOR AN OPEN	
• Measure the resistance between HVAC module C228B-3, circuit GD115 (BK/GY), harness side and ground.  N0115290 • **Is the resistance less than 5 ohms?**	**Yes** GO to N12 . **No** REPAIR circuit GD115 (BK/GY) for an open. TEST the system for normal operation.
N12 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion.	**Yes** INSTALL a new HVAC module. REFER to Section 412-01 . TEST the system for normal operation.

♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**No** 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. TEST the system for normal operation.

Pinpoint Test O: The Blower Motor Does Not Operate Correctly

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 part of the blower resistor in LO, MED-LO and MED-HI blower setting. The blower motor resistor is grounded through the blower motor switch in any setting except HI. In HI, the blower motor is grounded directly through the blower motor switch. The blower switch is provided a ground. The blower motor switch is part of the HVAC module and can not be replaced separately.

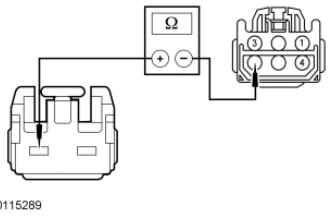
- DTC 51 (Blower Relay Driver Circuit/Performance) - This DTC sets when any of the following occur:
  - ♦ The module senses ground on the relay coil ground circuit when the relay is not grounded by the HVAC module, indicating a short directly to ground.
  - ♦ The module senses voltage on the relay coil ground circuit when the relay is grounded by the HVAC module, indicating a short directly to voltage.
  - ♦ The module senses no voltage on the relay coil ground circuit when the relay is not grounded by the HVAC module, indicating an open.

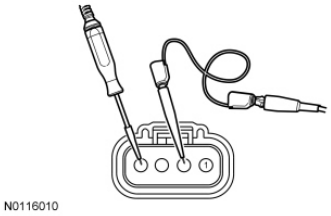
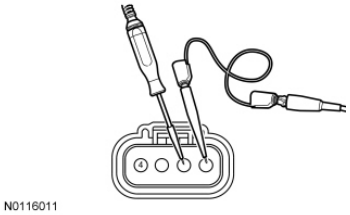
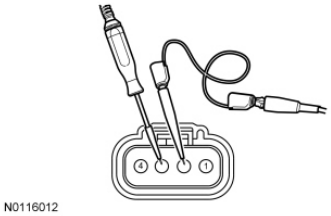
This pinpoint test is intended to diagnose the following:

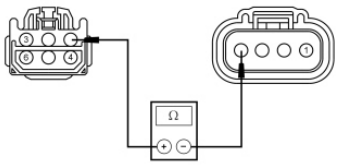
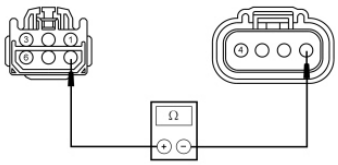
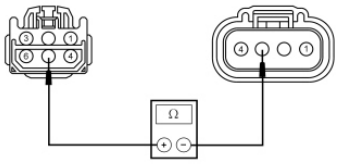
- Wiring, terminals or connectors
- Blower motor resistor
- HVAC module

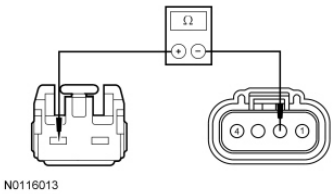
PINPOINT TEST O: THE BLOWER MOTOR DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
O1 CHECK THE HVAC MODULE FOR DTCs	
• Ignition ON. • CARRY OUT the HVAC module self-test. • Check for HVAC DTCs retrieved during the self-test. • **Is DTC 51 present?**	**Yes** REPAIR circuit CH123 (VT/GN) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to O2 .
O2 CHECK THE BLOWER MOTOR OPERATION	

• Turn the function selector switch to the FLOOR position. • Select all blower speed positions. • **Does the blower motor operate in any position?**	**Yes** If the blower motor will not turn off, REPAIR circuit CH402 (YE/GN) for a short to voltage. TEST the system for normal operation. If the blower motor does not operate in HI setting only, GO to O3 . If the blower motor does not operate in LO, MED-LO or MED-HI setting only, GO to O4 . If the blower motor operates in HI setting only, GO to O6 . For all other symptoms, GO to O7 . **No** GO to Pinpoint Test N .
O3 CHECK THE BLOWER MOTOR GROUND CIRCUIT TO THE BLOWER MOTOR SWITCH FOR AN OPEN	
• Ignition OFF. • Disconnect: HVAC Module C228B. • Disconnect: Blower Motor C2004. • Measure the resistance between HVAC module C228B-6, circuit CH430 (VT/OG), harness side and blower motor C2004-2, circuit CH430 (VT/OG), harness side.  N0115289 • **Is the resistance less than 5 ohms?**	**Yes** GO to O9 . **No** REPAIR circuit CH430 (VT/OG) for an open. TEST the system for normal operation.
O4 CHECK THE BLOWER MOTOR RESISTOR	
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 OFF.	**Yes** INSTALL a new blower motor resistor. REFER to Section 412-01 . TEST the system for normal operation. **No** GO to O5 .

• Disconnect: Blower Motor Resistor C293. • Ignition ON. • Turn the function selector switch to the FLOOR position. **For LO inoperative**  N0116010 • **For LO inoperative** : With the blower motor switch in the LO speed position, connect a 12-volt test light between blower motor resistor C293-2, circuit CH430 (VT/OG), harness side and blower motor resistor C293-4, circuit CH427 (BN), harness side. **For MED-LO inoperative**  N0116011 • **For MED-LO inoperative** : With the blower motor switch in the MED-LO speed position, connect a 12-volt test light between blower motor resistor C293-2, circuit CH430 (VT/OG), harness side and blower motor resistor C293-1, circuit CH428 (GN/WH), harness side. **For MED-HI inoperative**  N0116012 • **For MED-HI inoperative** : With the blower motor switch in the MED-HI speed position, connect a 12-volt test light between blower motor resistor C293-2, circuit CH430 (VT/OG), harness side and blower motor resistor C293-3, circuit CH429 (GY/BN), harness side. • **Does the test light illuminate?**	
O5 CHECK THE BLOWER MOTOR RESISTOR TO BLOWER MOTOR SWITCH CIRCUITS	

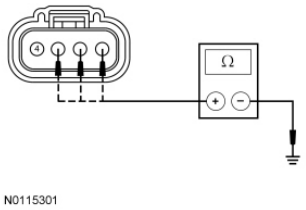
• Disconnect: HVAC Module C228B. **For LO inoperative**  N0115297 • **For LO inoperative** , measure the resistance between HVAC module C228B-1, circuit CH427 (BN), harness side and blower motor resistor C293-4, circuit CH427 (BN), harness side. **For MED-LO inoperative**  N0115298 • **For MED-LO inoperative** , measure the resistance between HVAC module C228B-4, circuit CH428 (GN/WH), harness side and blower motor resistor C293-1, circuit CH428 (GN/WH), harness side. **For MED-HI inoperative**  N0115299 • **For MED-HI inoperative** , measure the resistance between HVAC module C228B-5, circuit CH429 (GY/BN), harness side and blower motor resistor C293-3, circuit CH429 (GY/BN), harness side. • **Is the resistance less than 5 ohms?**	**Yes** GO to Q9 . **No** REPAIR circuit CH427 (BN), CH428 (GN/WH) or CH429 (GY/BN) for an open. TEST the system for normal operation.
O6 CHECK THE BLOWER MOTOR GROUND CIRCUIT TO THE BLOWER MOTOR RESISTOR FOR AN OPEN	
• Ignition OFF. • Disconnect: Blower Motor C2004. • Disconnect: Blower Motor Resistor C293. • Measure the resistance between blower motor resistor C293-2, circuit CH430 (VT/OG), harness side and blower motor C2004-2, circuit CH430 (VT/OG), harness side.	**Yes** INSTALL a new blower motor resistor. REFER to Section 412-01 . TEST the system for normal operation. **No** REPAIR circuit CH430 (VT/OG) for an open. TEST the system for normal operation.



- **Is the resistance less than 5 ohms?**

O7 CHECK THE BLOWER MOTOR RESISTOR CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect: Blower Motor C2004.
- Disconnect: Blower Motor Resistor C293.
- Disconnect: HVAC Module C228B.
- Measure the resistance between ground and blower motor resistor:
  - C293-1, circuit CH428 (GN/WH), harness side.
  - C293-3, circuit CH429 (GY/BN), harness side.
  - C293-2, circuit CH430 (VT/OG), harness side.



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

Yes
GO to O8 .

No
REPAIR the affected circuit for a short to ground. TEST the system for normal operation.

O8 CHECK THE BLOWER MOTOR RESISTOR CIRCUITS FOR SHORTS TOGETHER

- Measure the resistance between blower motor resistor C293, harness side using the following chart:

Blower Motor Resistor	Circuit	Blower Motor Resistor	Circuit
C293-1	CH428 (GN/WH)	C293-2	CH430 (VT/OG)
C293-1	CH428 (GN/WH)	C293-3	CH429 (GY/BN)
C293-1	CH428 (GN/WH)	C293-4	CH427 (BN)
C293-2	CH430 (VT/OG)	C293-3	CH429 (GY/BN)
C293-2	CH430 (VT/OG)	C293-4	CH427 (BN)
C293-3	CH429 (GY/BN)	C293-4	CH427 (BN)

Yes
GO to O9 .

No
REPAIR the affected circuits. TEST the system for normal operation.

 N0115302 • **Are the resistances greater than 10,000 ohms?**	
O9 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Pinpoint Test P: All HVAC Functions Inoperative

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

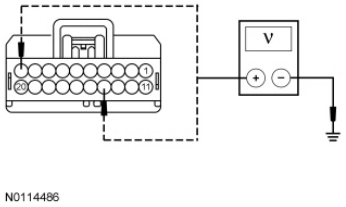
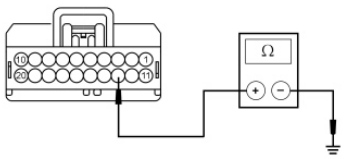
Normal Operation

The HVAC module receives a ground. The HVAC module is supplied constant battery voltage and ignition voltage.

This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- HVAC module
- Battery
- Charging system concern

PINPOINT TEST P: ALL HVAC FUNCTIONS INOPERATIVE

Test Step	Result / Action to Take
P1 CHECK THE HVAC MODULE VOLTAGE SUPPLY CIRCUITS FOR AN OPEN	

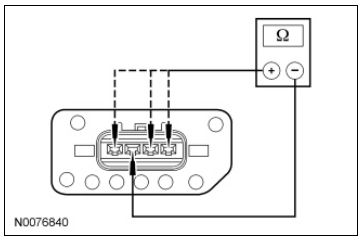
• Ignition OFF. • Disconnect: HVAC Module C228A. • Ignition ON. • With the engine running, measure the voltage between ground and: ♦ HVAC module C228A-10, circuit SBP07 (WH/RD), harness side. ♦ HVAC module C228A-14, circuit CBP21 (BU/GY), harness side.  N0114486 • **Are the voltages greater than 10 volts?**	**Yes** GO to P2 . **No** REPAIR circuit SBP07 (WH/RD) or CBP21 (BU/GY) for high resistance. CLEAR all CMDTCs . REPEAT the self-test.
P2 CHECK THE HVAC MODULE GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between ground and HVAC module C228A-13, circuit GD115 (BK/GY), harness side.  N0114487 • **Is the resistance less than 5 ohms?**	**Yes** GO to P3 . **No** REPAIR circuit GD115 (BK/GY) for high resistance. CLEAR all CMDTCs . REPEAT the self-test. TEST the system for normal operation.
P3 CHECK THE HVAC MODULE CONNECTION	
• Disconnect all the HVAC module connectors. • Inspect the HVAC module connectors for: ♦ corrosion. ♦ pushed-out terminals. ♦ damaged terminals. • Connect and correctly seat all the HVAC module connectors. • 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 . 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. TEST the system for normal operation.

Component Tests

Evaporator Discharge Air Temperature Sensor

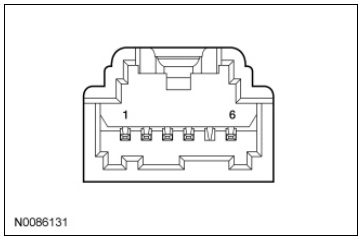
Ambient Temperature	Resistance
0-10°C (32-50°F)	5,892-9,893 ohms
10-20°C (50-68°F)	3,689-6,048 ohms
20-25°C (68-77°F)	2,950-3,805 ohms
25-30°C (77-86°F)	2,374-3,050 ohms
30-35°C (86-95°F)	1,923-2,460 ohms
35-40°C (95-104°F)	1,566-1,996 ohms
40-50°C (104-122°F)	1,057-1,630 ohms

Blower Motor Resistor



Blower Motor Resistor Pins	Resistance
4 and 2	2.0-2.6 ohms
2 and 3	0.2-0.4 ohms
2 and 1	0.8-1.1 ohms

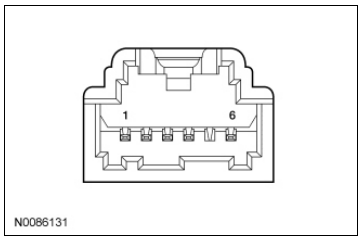
Defrost/Panel/Floor Mode Door Actuator



Actuator Pins	Approx. Resistance
1 and 6	30-40 ohms
2 and 4	215-4,375 ohms
3 and 4	215-4,375 ohms

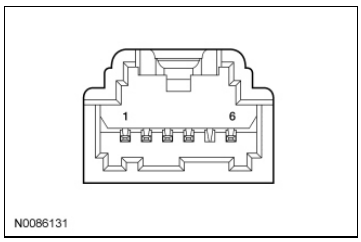
2 and 3	2,800-4,200 ohms

Temperature Blend Door Actuator



Actuator Pins	Approx. Resistance
1 and 6	30-40 ohms
2 and 4	215-4,375 ohms
3 and 4	215-4,375 ohms
2 and 3	2,800-4,200 ohms

Air Inlet Mode Door Actuator



Actuator Pins	Approx. Resistance
1 and 6	30-40 ohms

Heater Core

1. **NOTE:** If a heater core leak is suspected, test he heater core by following the plugged heater core component test before the heater core pressure test. Carry out a system inspection by checking the heater system thoroughly.

   Inspect for evidence of coolant leakage at the heater hose to heater core attachments. A coolant leak in the heater 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-specified clamps can cause leakage at the heater hose connection and damage the heater core.

   Check the integrity of the heater hose clamps.

Heater Core - Plugged

1. Verify 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, check the heater core inlet and outlet hoses toee if they are hot.

4. If the outlet only is not hot the heater core may have an air pocket or may be plugged.

5. If the inlet only is not hot the thermostat may not be working correctly.

Heater Core - Pressure Test

Use the Pressure Test Kit to carry out the pressure test.

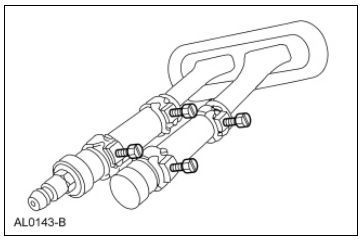
1. **NOTE:** Due to space limitations, a bench test may be necessary for pressure testing.

   Drain the coolant from the cooling system.

2. Disconnect the heater hoses from the heater core.

3. Install a short piece of heater hose, approximately 101 mm (4 in) long on each heater core tube.

4. Fill the heater core and heater hoses with water and install the plug BT-7422-B and the adapter BT-7422-A from the Pressure Test Kit. Secure the heater hoses, plug and adapter with hose clamps.



5. Attach the pump and gauge assembly from the Pressure Test Kit 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 hose connections to the heater core tubes for leaks. If the heater hoses do not leak, remove the heater core from the vehicle and carry out the bench test.

Heater Core - Bench Test

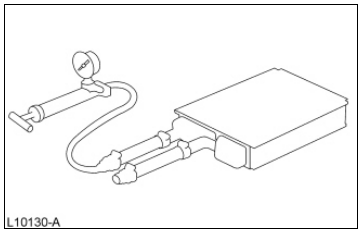
1. Remove the heater core from the vehicl

2. Drain all of the coolant from the heater core.

3. Connect the 101 mm (4 in) test heater hoses with plug and adapter to the heater core tubes. Then connect the Pressure Test Kit 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.



Evaporator/Condenser Core - On-Vehicle Leak Test

1. Discharge and recover the refrigerant. Refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

2. Disconnect the suspect evaporator core or condenser core from the A/C system.

3. Clean the manifold fittings.

4. Connect the appropriate test fittings from the A/C Flush Adapter Kit to the condenser or evaporator core 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 that will activate the valve. The test is notalid if the shut-off valve does not open.

   Attach the correct adapters from the Adapters/O-rings for Filter kit to the test fittings and connect the red and blue hoses from the R-134a Manifold Gauge Set to the test fittings on the evaporator core or 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 evaporator core or condenser core. If the refrigerant is not completely removed from the oil, outgassing degrades the vacuum and appears 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 evaporator core or 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 kPa (10 in-Hg) or more 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 evaporator core or condenser core. Then recheck for loss of vacuum.

- If a very small leak is suspected, allow the system to sit overnight with vacuum applied and check for vacuum loss.

9. If the evaporator core or condenser core leaks, as verified by the above procedure, install a new evaporator core or condenser core.

A/C Compressor - External Leak Test

1. Install the adapter from the A/C Flush Adapter Kit on the port of the A/C compressor, using the existing manifold retaining bolt.

2. Connect the high and low pressure lines of a manifold gauge set or a refrigerant recovery/recycling station to the corresponding fittings on the adapter.

3. Attach the center hose of a manifold gauge set to a refrigerant container standing in an upright position.

4. 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.

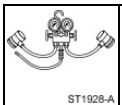
5. Using the Refrigerant Leak Detector, check for leaks at the compressor shaft.

6. If an external leak is found, install a new A/C compressor.

7. When the leak test is complete, recover the refrigerant from the compressor.

Refrigerant System Tests

Special Tool(s)

 ST1928-A	R-134a Manifold Gauge Set 023-00047 or equivalent
 ST3079A	R-134a Refrigt Management Machine (SAE J-2788 Compliant) 023-00181 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

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 an R-134a Manifold Gauge Set or R-134a Refrigerant Management Machine with high-pressure and low-pressure gauges to the refrigerant system.

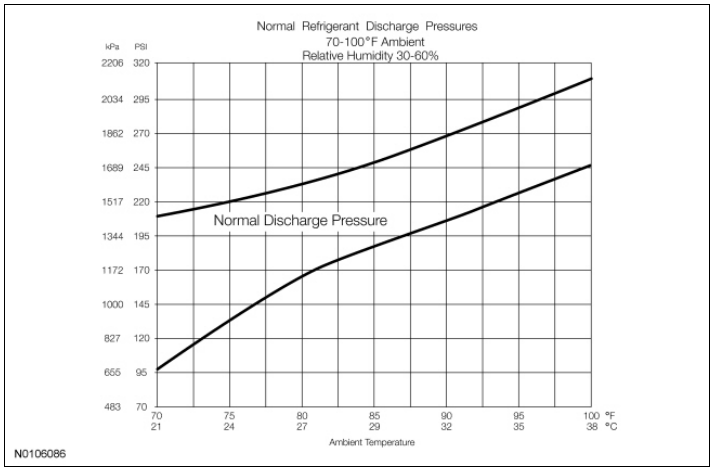
4. Open all vehicle windows and leave the hood open for the test. Open the rear doors.

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.

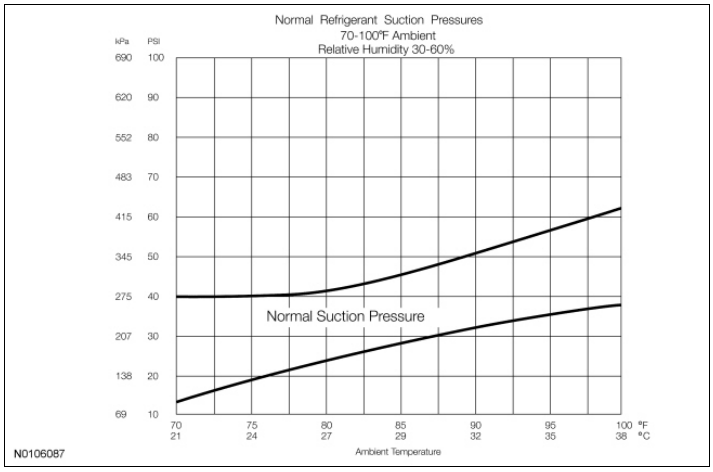
7. Record the discharge pressure. If the pressure is fluctuating, record the average value.

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 an 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 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.

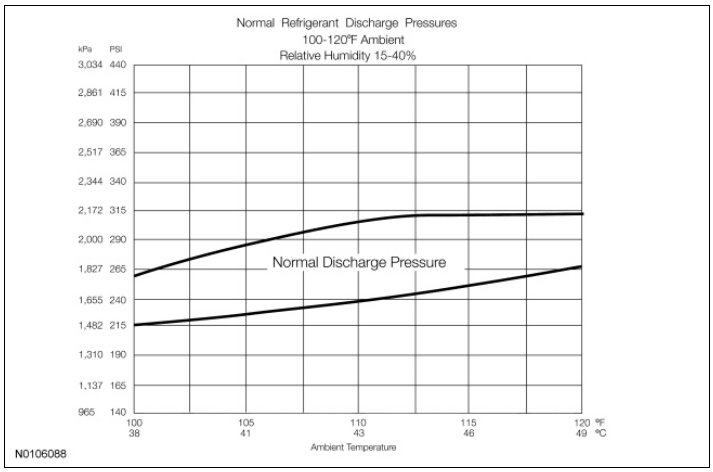
4. Open all vehicle windows and leave the hood open for the test. Open the rear hatch and/or rear doors (if equipped).

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.

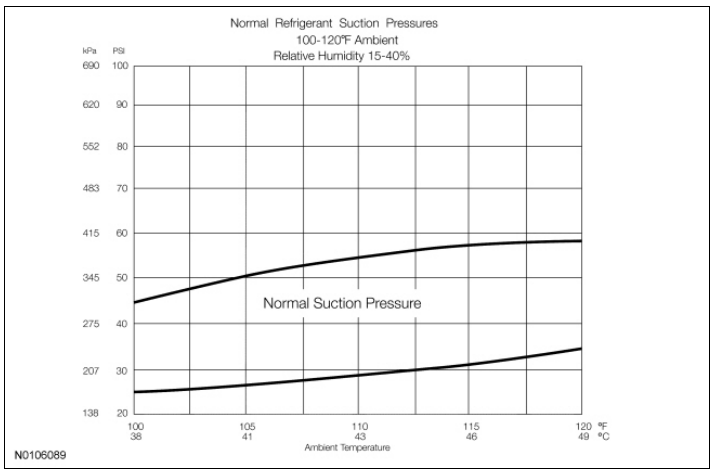
7. Record the discharge pressure. If the pressure is fluctuating, record the average value.

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	Normal to High	A/C suction line - partially restricted or plugged. [a]
Normal to Low	Low or Clutch Cycling	Low refrigerant charge, A/C suction line - partially restricted or plugged. [b]
Erratic Operation or Compressor Not Running		Evaporator discharge air temperature sensor or A/C pressure transducer - poor connection at A/C clutch connector. A/C electrical circuit erratic - see A/C Electrical Circuit Wiring Diagram.
Normal to Low	High	Compressor - low performance.
Additional Possible Cause Components Associated With Inadequate Compressor Operation		
• Compressor Drive Belt - loose • Compressor Clutch - slipping • Clutch Coil Open - shorted, or loose mounting • HVAC Module • Clutch Wiring Circuit - high resistance, open or blown fuse • Compressor Operation Interrupted by PCM		
Additional Possible Cause Components Associated With a Damaged Compressor		
• Incorrect Clutch Air-gap • Refrigerant Leaks		

[a] Low pressure reading will be normal to high if restriction is downstream of service access valve.

[b] Low pressure reading will be low restriction is upstream of service access valve.

Air Conditioning (A/C) Odor Treatment

Special Tool(s)

 ST2940-A	Flexible Applicator Tool 258-00005

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 componennd 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 outside of the A/C system. Refer to the following chart for examples.

Odor Source	Odor Description
Chemical Odors	
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
Environmental Odors	
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
Human and Other Interior Generated Odors	
Body Secretions	Body odor
Perfuming Agents	Sweet or fragrance smell
Clothing	Musty, mildew or body odors
Food/Beverage	Sweet, musty, mildew or fishy smell
Microbiological Odors	
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.

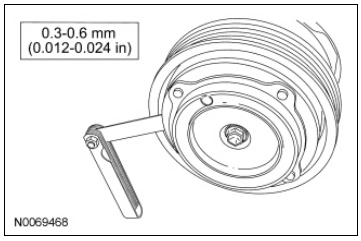
11. Insert the nozzle into the evaporator housing and direct the spray toward the evaporator core face. Spray the entire evaporator core face until empty.

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.

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. If the A/C clutch air gap is out of rangemove the clutch plate. Add or remove spacers between the clutch plate hub and the compressor shaft until the clearance is within specification.

Electronic Leak Detection

Special Tool(s)

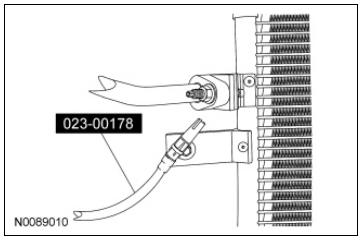
 ST3072-A	Heated Pentode Halogen Leak Detector 023-00178 or equivalent

NOTE: Good veilation 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-4a 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 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.

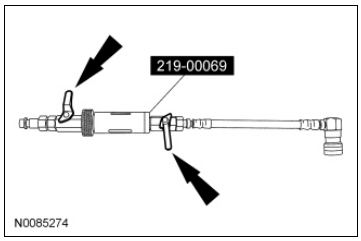
NOTE: Before using the R-134a Loop/Add On Injector Kit-Set for the first time, refer to the manufacturer's instructions on evacuation of any non-condensable gases from the hoses.

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.

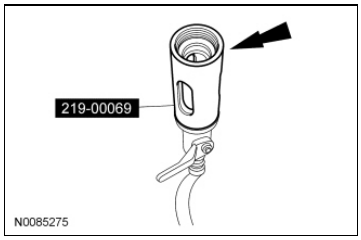
1. **NOTE:** If no R-134a pressure is present in the refrigerant system, the system should be evacuated before carrying out the injection procedure. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

   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.

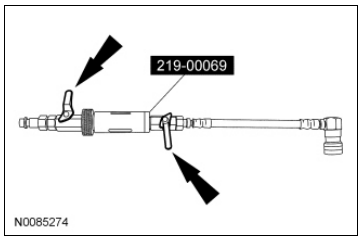
Fluorescent Dye Injection Using a R-134a Loop/Add On Injector Kit-Set - Vehicles Not Requiring R-134a Addition

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.

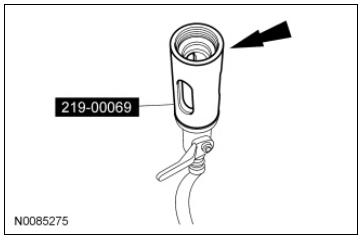
NOTE: Before using the R-134a Loop/Add On Injector Kit-Set for the first time, refer to the equipment manufacturer's instructions on evacuation of non-condensable gases from the hoses.

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.



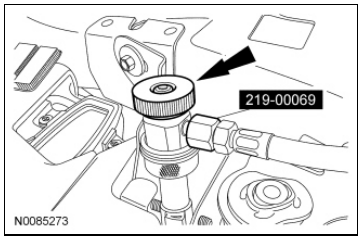
3. Install the R-134a Loop/Add On Injector Kit-Set between the high-pressure and low-pressure service gauge port valves.

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.

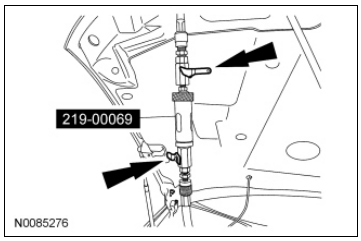
5. Set the A/C to the ON position.

6. Open the high-pressure service valve.

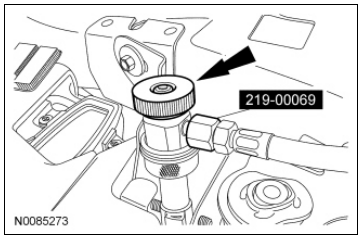


7. **NOTE:** To prevent pressure spike/liquid slug, crack the R-134a Loop/Add On Injector Kit-Set valves and slowly open to inject the fluorescent dye into the refrigerant system.

   Open the R-134a Loop/Add On Injector Kit-Set valves and inject the fluorescent dye into the refrigerant system.

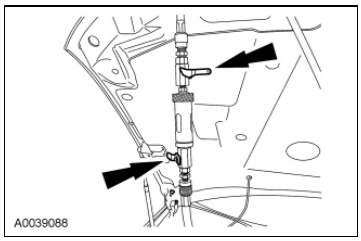


8. Close the high-pressure service valve to allow the pressure inside the R-134a Loop/Add On Injector Kit-Set to equalize with the suction side of the refrigerant system.



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 Flushing

Special Tool(s)

 ST2985-A	A/C Flush Adapter Kit 219-00074 or equivalent
 ST2466-A	A/C Flush and Purge Machine 219-00022 (part of 219-00023) or equivalent
 ST3046A	Connector, Refrigerant Flushing Equipment 412-145

Material

Item	Specification
Motorcraft® A/C System Flushing Solvent YN-23	-
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

⚠ WARNING: Use extreme care and observe all safety and service precautions related to the use of refrigerants as outlined on refrigerant tank and on recovery and charging equipment. Failure to follow these instructions may result in 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 addnal information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

NOTICE: **An Air Conditioning (A/C) refrigerant analyzer must be used before the recovery of any vehicle A/C refrigerant. Failure to do so puts the shop bulk refrigerant at risk of contamination. If the vehicle A/C refrigerant is contaminated, refer the customer to the repair facility that carried out the last A/C repair. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturer procedures and instructions.**

NOTICE: **The Thermostatic Expansion Valve (TXV) 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.**

NOTE: Prior to using the A/C Flush and Purge Machine 219-00022 for the first time, review the operating

instructions.

NOTE: Only the A/C Flush and Purge Machine kit, which includes A/C Flush and Purge Machine, A/C Flush and Purge Fitting Kit and the A/C Systems Flushing Solvent, is approved for use. No other flushing device or solvent is approved for flushing heat exchangers (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.

NOTE: Ford Motor Company has approved a procedure to provide technicians with a non-Chlorofluorocarbons (CFC) method of flushing contaminated A/C system heat exchangers. The procedure allows the specific components to be cleaned and flushed while installed in their normal in-vehicle location. The types of contamination flushed include particle matter that results from A/C compressor or desiccant failure and gummy residue that can form when refrigerant oil is overheated during A/C compressor seizure. The flushing process is a 2-step procedure that involves the use of an A/C Flush and Purge Machine to:

- circulate the flushing solvent through the heat exchanger in the reverse direction of normal refrigerant flow (back-flushing). Particulate matter picked up during flushing is filtered from the returning solvent before the solvent is returned to the reservoir for continued circulation.
- remove the flushing solvent from the heat exchanger. In this step of the procedure, pressurized air 621-862 kPa (90-125 psi) is used to push and evaporate any remaining flush solvent from the heat exchanger.

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. Connect the A/C Flush and Purge Machine to the heat exchanger to be flushed using the Refrigerant Flushing Equipment Connector or the correct adapters from the A/C Flush Adapter Kit. Do not flush through the evaporator core orifice or hoses. The internal plumbing and material make-up of these components make it impossible to correctly remove foreign material or residual flushing solvent.

4. **NOTE:** 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 and the flushing unit filter is intended for one vehicle only.

   Flush the heat exchanger for a minimum of 15 minutes.

5. Apply 621-862 kPa (90-125 psi) of 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 Thermostatic Expansion Valve (TXV) in any vehicle being repaired for an internal A/C compressor or desiccant failure.

7. Install new refrigerant hoses if clogged with foreign material.

8. Install a new receiver/drier in any vehicle being repaired for an internal A/C compressor or desiccant

failure.

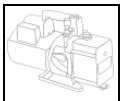
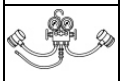
9. Reconnect the heat exchanger being repaired.

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.

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
 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
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 ecovery (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.

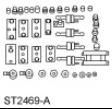
2. Assemble the R-134a Manifold Gauge Set, Automatic Refrigerant Charging Meter and R-134a supply tank following the Automatic Refrigerant Charging Meter operating instructions.

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.

Refrigerant System Filtering Following Air Conditioning (A/C) Compressor Installation

Special Tool(s)

 ST2985-A	A/C Flush Adapter Kit 219-00074 or equivalent
 ST2469-A	A/C Flush and Purge Fitting Kit 219-00024 or equivalent

Material

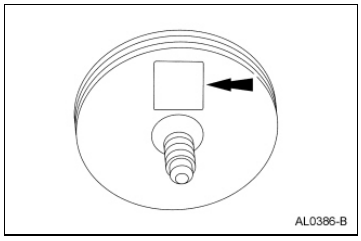
Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

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 mateial. 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.

Refrigerant Oil Adding



Special Tool(s) R-134a Loop/Add On Injector Kit-Set 219-00069 or equivalent

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	Inject to low-side service port during system charging.

	recovery [a]	
O-ring Leak Repair	60 ml (2 fl oz) added to the amount collected during refrigerant recovery [b]	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.

[a] 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.
[b] 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.

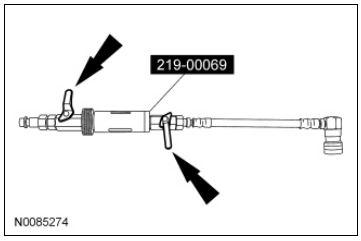
Oil Injection Using a Dye/Lubricant Injector

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.

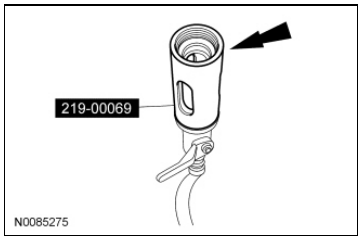
1. Evacuate the refrigerant system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

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)

 ST3090-A	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.

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.

Material

Item	Specification	Fill Capacity
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B	100 ml (3.4 fl oz)
Motorcraft® R-134a Refrigerant r>YN-19 (US); CYN-16-R (Canada)	WSH-M17B19-A	0.54 kg (19 oz) (1.19 lb)

Torque Specifications

Description	Nm	lb-ft	lb-in
A/C clutch disc and hub bolt	13	-	115
A/C compressor bolts	24	18	-
A/C compressor fitting nuts (suction and discharge)	15	-	133
A/C compressor pressure relief valve	10	-	89
A/C compressor stud-bolt	24	18	-
Compressor-to-condenser discharge line bracket nut	7	-	62
Condenser fitting nuts (outlet and inlet)	8	-	71
Evaporator outlet line bracket nut	8	-	71
Evaporator outlet line fitting nut	8	-	71
Heater core and evaporator core housing bolt	6	-	53
Heater core and evaporator core housing nuts	6	-	53
Radiator support reinforcement bolts	8	-	71
Receiver/drier fitting nuts	8	-	71
Thermostatic Expansion Valve (TXV) bolts	8	-	71
TXV fitting nuts (high-pressure and low-pressure)	10	-	89

Air Conditioning

The refrigerant system components include the following:

- A/C compressor and clutch assembly
- A/C condenser core
- A/C evaporator core
- Receiver/drier
- Connecting refrigerant lines
- Thermostatic Expansion Valve (TXV)

The A/C compressor contains a pressure relief valve to protect the refrigerant system against excessively high refrigerant pressures.

A/C Compressor and Clutch Assembly

NOTE: Internal A/C compressor components are not serviced separately. The A/C compressor is serviced as an assembly. A new A/C pressure relief valve is included with replacement A/C compressors, but the valve is also available as a separate component and can be independently replaced if needed. The A/C compressor clutch, A/C compressor pulley and A/C clutch field coil can be serviced separately.

The A/C compressor has the following characteristics:

- A non-serviceable shaft seal.
- Uses PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D. This oil contains special additives required for the A/C compressor.
- The A/C compressor oil may darken over time while maintaining normal oil viscosity. This is normal because of break-in wear.
- Use the refrigerant oil adding procedure specified for this vehicle when installing a new A/C compressor or any other A/C component. Refer to the Refrigerant Oil Adding procedure in Section 412-00 .

When battery voltage is applied to the A/C compressor clutch field coil, the clutch disc and hub assembly is drawn toward the A/C compressor pulley. The magnetic force locks the clutch disc and hub assembly and the A/C compressor pulley together as one unit, causing the compressor shaft to rotate with the engine. When battery voltage is removed from the A/C compressor clutch field coil, springs in the clutch disc and hub assembly move the clutch disc away from the A/C compressor pulley.

A/C Pressure Relief Valve

NOTE: If the A/C compressor is operating within limits and the A/C pressure relief valve is venting or leaking around the threads, install a new A/C pressure relief valve and O-ring. If the new A/C pressure relief valve still vents after it is installed, 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 can be serviced separately from the A/C compressor. It is necessary to recover the refrigerant before removing the A/C pressure relief valve.

A/C Condenser Core

The condenser core 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 condenses gas to liquid refrigerant as it is cooled.

A/C Evaporator Core

The evaporator core is an aluminum plate/fin type and is located in the heater core and evaporator core housing. A mixture of liquid refrigerant and oil enters the bottom of the evaporator core through the evaporator core inlet tube and continues out of the evaporator core through the evaporator core outlet tube as a vapor. During A/C compressor operation, air flow from the blower motor is cooled and dehumidified as it flows through the evaporator core fins.

Thermostatic Expansion Valve (TXV)

The Thermostatic Expansion Valve (TXV) is located at the evaporator core inlet and outlet tubes at the center rear of the engine compartment. The TXV provides a restriction to the flow of refrigerant from the high-pressure side of the refrigerant system and separates the low-pressure and high-pressure sides of the refrigerant system. Refrigerant entering and exiting the evaporator core passes through the TXV through 2 separate flow paths. An internal temperature sensing bulb senses the temperature of the refrigerant flowing out of the evaporator core and adjusts an internal pin-type valve to meter the refrigerant flow into the evaporator core. The internal pin-type valve decreases the amount of refrigerant entering the evaporator core at lower temperatures and increases the amount of refrigerant entering the evaporator core at higher temperatures.

Receiver/Drier

NOTE: Installation of a new receiver/drier is not required when repairing the A/C system, unless there is physical evidence of contamination from a failed A/C compressor or damage to the receiver/drier. Damage to the receiver/drier includes leaks, physical damage to the receiver/drier 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 refrigerant system before repairs are carried out, a new receiver/drier should not be installed.

The receiver/drier is mounted to the RH side of the condenser core above the condenser outlet fitting. It stores high-pressure liquid after it leaves the condenser core. A desiccant cartridge mounted inside the receiver/drier removes moisture from the refrigerant.

Evaporator Discharge Air Temperature Sensor

The evaporator discharge air temperature sensor contains a thermistor. The resistance of this thermistor varies by a specific amount based on the evaporator discharge air temperature. The PCM measures a voltage ratio between the reference voltage it supplies to the sensor and the sensor voltage to determine this resistance and the associated evaporator discharge air temperature.

As the evaporator core removes heat and moisture from the air flow moving through the evaporator core fins, the removed moisture condensates on the exterior of the evaporator core. The PCM uses input from the evaporator discharge air temperature sensor to prevent this moisture from freezing on the exterior of the evaporator core, and inhibiting air flow through the evaporator core fins. When the evaporator core temperature drops to a temperature near the freezing point of water, the PCM switches off the A/C compressor. The A/C compressor is switched back on when the evaporator core temperature rises to an acceptable level.

The evaporator discharge air temperature sensor is located below the glove compartment outside of the heater core and evaporator core housing.

A/C Pressure Transducer

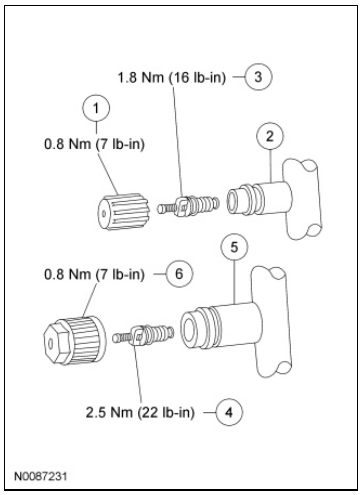
The A/C pressure transducer monitors the compressor discharge pressure and communicates with the PCM. The PCM interrupts A/C compressor operation in the event the A/C pressure transducer indicates high system discharge pressures. It also to senses low charge conditions. If the pressure is below a predetermined value for a given ambient temperature, the PCM will not allow the clutch to engage.

The A/C pressure transducer is located at the lower RH corner of the condenser core near the condenser outlet fitting. It is not necessary to recover the refrigerant before removing the A/C pressure transducer.

Service Gauge Port Valves

The high-pressure service gauge port valve is located on the compressor-to-condenser discharge line near the condenser inlet fitting.

The low-pressure service gauge port valve is located on the A/C compressor suction line near the RH shock tower.



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 core
4	19D701	High-pressure Schrader-type valve core
5	-	High-pressure service gauge port valve
6	19D702	A/C charging valve cap

The service gauge port valve is an integral part of the refrigerant system line or component.

- Special couplings are required for both the high-side and low-side service gauge ports.
- A very small amount of leakage is always detectable around the Schrader-type valve with the service gauge port valve cap removed, and is considered normal. If the seal leaks excessively, install a new Schrader-type valve core.
- The service gauge port valve caps each include an O-ring seal used as a primary seal in the refrigerant system to prevent any leakage through the Schrader-type valves from reaching the atmosphere. Check the service gauge port valve cap O-ring seals when checking the refrigerant system for leaks and install a new cap if necessary. 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 when using a Rotunda-approved ultraviolet black light. 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 receiver/driers are shipped with a fluorescent dye "wafer" included in the desiccant bag, which dissolves after approximately 30 minutes of continued A/C operation. It is not necessary to add dye after flug or filtering the refrigerant system because a new receiver/drier is installed as part of the flushing or filtering procedure. Only add additional refrigerant system dye if more than 50% of the refrigerant system lubricant capacity has been lost due to a fitting separation or hose rupture. Refer to Section 412-00 .

Air Distribution and Filtering

Air Distribution and Filtering

NOTE: The air distribution system is equipped with a factory installed cabin air filter.

There are 2 sources of air available to the air distribution system:

- Fresh (outside) air
- Recirculated air

Recirculated air is always used when the HVAC module is set to the MAX A/C mode and can be selected in any mode except DEFROST or FLOOR/DEFROST.

Air distribution within the vehicle is determined by the air flow mode selected. Electric mode door actuator-positioned airflow mode control doors direct airflow within the heater core and evaporator core housing.

Air enters the passenger compartment from the following outlets:

- Instrument panel registers
- Floor duct outlets
- Windshield defroster
- Side window demisters
- Rear footwell duct

Passenger compartment air is exhausted from the vehicle through open windows or body air vents.

Cabin Air Filter

The cabin air filter is located in the heater core and evaporator core housing. For cabin air filter maintenance intervals, refer to Section 100-03 .

Control Components

Electronic Manual Temperature Control (EMTC)

The HVAC module allows the vehicle occupants to select the following:

- Air inlet source (outside or recirculated)
- Blower motor speed
- Discharge air temperature (temperature blend)
- Discharge air location (defrost, panel, floor, panel/floor, defrost/floor)
- A/C compressor operation
- Rear window defroster operation

Control System Inputs

The blower motor speed switch is mounted in the HVAC module and controls blower motor speed by adding or bypassing resistors in the blower motor resistor in all modes except OFF. The blower motor speed switch is serviced only as an assembly with the HVAC module.

The temperature control switch adjusts the discharge air temperature. Movement of the temperature knob from COOL (blue) to WARM (red) causes a corresponding movement of the temperature blend door. The position of the temperature blend door determines the discharge air temperature that the air distribution system will maintain. The temperature control selector is an integral part of the HVAC module and cannot be serviced separately.

The airflow mode setting adjusts the discharge air outlet location. Movement of the airflow mode selector causes a corresponding movement of the airflow mode doors and determines the discharge air outlet location. The airflow mode selector is an integral part of the HVAC module and cannot be serviced separately.

The A/C request button determines A/C compressor operation, except when the airflow mode selector is in the OFF, MAX A/C, DEFROST or FLOOR/DEFROST mode. The A/C request button is an integral part of the HVAC module and cannot be serviced separately.

The recirculated air request button can select recirculated air in any mode except DEFROST, and fresh air in any mode except MAX A/C or OFF. The recirculated air request button is an integral part of the HVAC module and cannot be serviced separately.

The rear defog button signals activation of the heated backlight. Under certain conditions, the heated backlight may be activated automatically by the PCM and Body Control Module (BCM). The rear defog button indicator may remain off during this time. The rear defog button is an integral part of the HVAC module and cannot be serviced separately.

Control System Outputs

The Electronic Manual Temperature Control (EMTC) system has 4 system outputs.

Blower Motor Speed

The HVAC module blower motor speed selector varies the blower motor ground circuit resistance by adding or bypassing series resistance in the blower motor resistor. Increased resistance lowers the blower motor speed, and lowered resistance increases blower motor speed. When the blower motor is in the HI (4) position, the blower motor resistor is bypassed.

The blower motor resistor is located on the heater core and evaporator core housing below the glove compartment.

Temperature Blend Door Position

The temperature blend door actuator moves the temperature blend door on command from the HVAC module.

The temperature blend door actuator contains a reversible electric motor and a potentiometer. The potentiometer circuit reports the position of the temperature blend door to the HVAC module. The HVAC module drives the temperature blend door actuator motor in whichever direction is necessary to move the temperature blend door to the position set by the vehicle occupants.

The temperature blend door actuator is mounted to the RH side of the heater core and evaporator core housing and can be serviced separately.

Airflow Mode Door Position

The airflow mode door actuator controls the airflow mode door actuating assembly to position the airflow mode doors on command from the HVAC module.

The airflow mode door actuator contains a reversible electric motor and potentiometer. The potentiometer circuit reports the position of the airflow mode doors to the HVAC module. The HVAC module drives the actuator motor in whichever direction is necessary to move the airflow mode doors to the position set by the vehicle occupants. The airflow mode door actuating assembly contains a cam and gear arrangement which transfers the rotation of the airflow mode door actuator to the individual airflow mode doors.

The airflow mode door actuating assembly is mounted to the LH side of the heater core and evaporator core housing and can be serviced separately. The airflow mode door actuator is mounted to the airflow mode door actuating assembly and can be serviced separately.

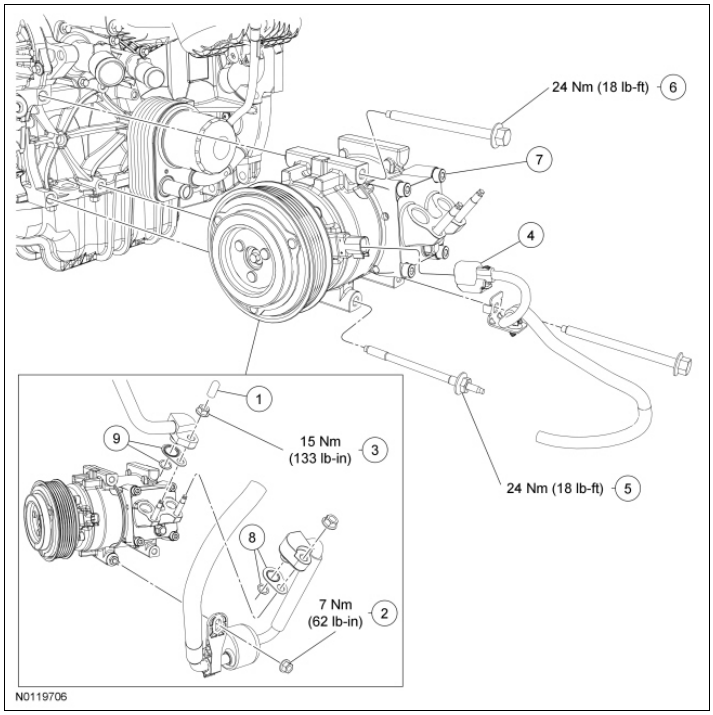
Air Inlet Mode Door Position

The air inlet mode door actuator moves the air inlet door between the fresh and RECIRC positions on command from the HVAC module. The air inlet mode door actuator is driven to, and will automatically stop at, the full RECIRC or full fresh air inlet position and does not require a potentiometer circuit to monitor its position. The airflow mode door does not stop at any point between the RECIRC or fresh air inlet position. When the air inlet mode is switched, the airflow mode door actuator is driven by the HVAC module for 9 seconds, and will stall at the end of travel until the 9 second timer has expired.

The air inlet mode door actuator is mounted to the air inlet duct and can be accessed through the glove compartment. The air inlet mode door actuator can be serviced separately.

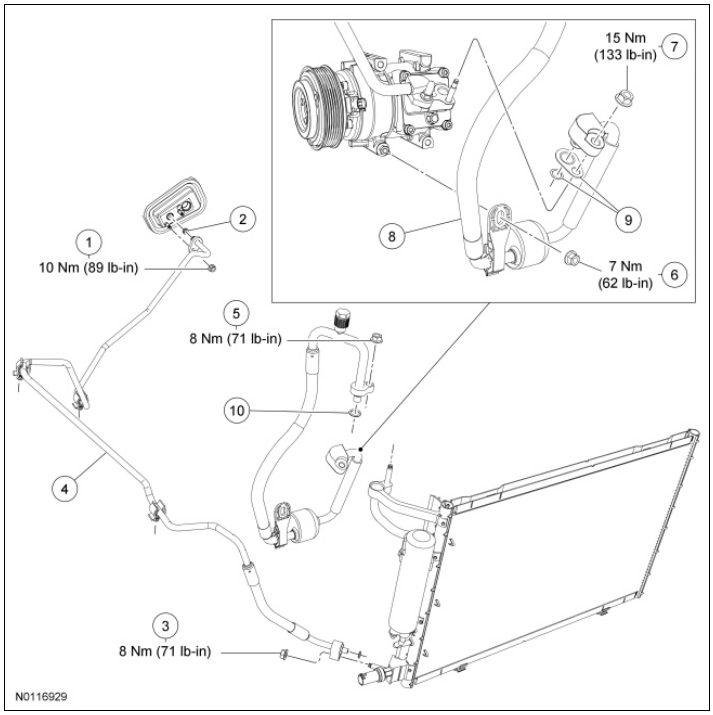
Air Conditioning - Exploded View

A/C Compressor



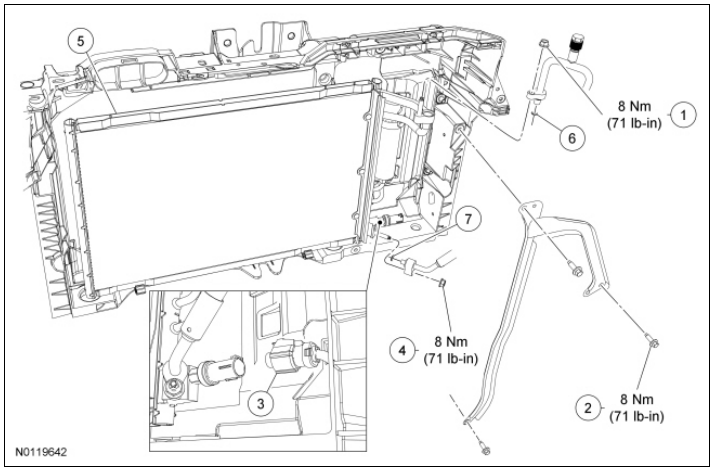
Item	Part Number	Description
1	386802-S	Rubber cap
2	W520111	Compressor-to-condenser discharge line bracket nut
3	W520413	A/C compressor fitting nut (2 required)
4	-	A/C compressor electrical connector (part of 12A522)
5	W714403	A/C compressor stud-bolt
6	W701331	A/C compressor bolt (2 required)
7	19703	A/C compressor
8	19B596	O-ring seal and gasket seal kit
9	19B596	O-ring seal and gasket seal kit

A/C High-Pressure Lines



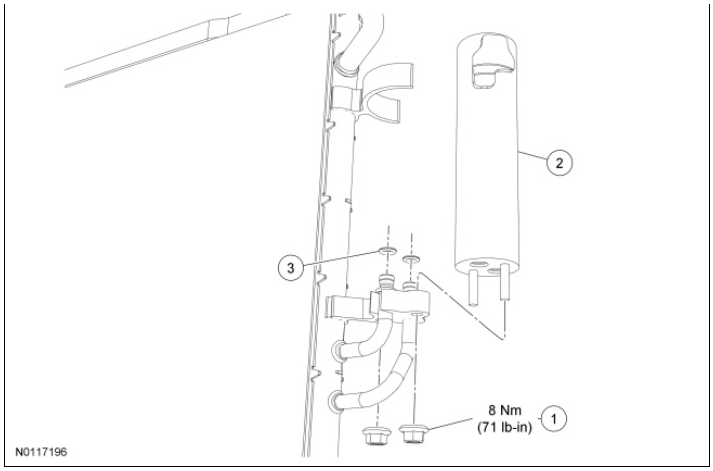
Item	Part Number	Description
1	W520412	Thermostatic Expansion Valve (TXV) high-pressure fitting nut
2	19E889	O-ring seal (2 required)
3	W520413	Condenser outlet fitting nut
4	19835	Condenser-to-evaporator line
5	W520413	Condenser inlet fitting nut
6	W520111	Compressor-to-condenser discharge line bracket nut
7	W520413	A/C compressor discharge fitting nut
8	19972	Compressor-to-condenser discharge line
9	19B596	O-ring seal and gasket seal kit
10	19E889	O-ring seal

A/C Condenser Core



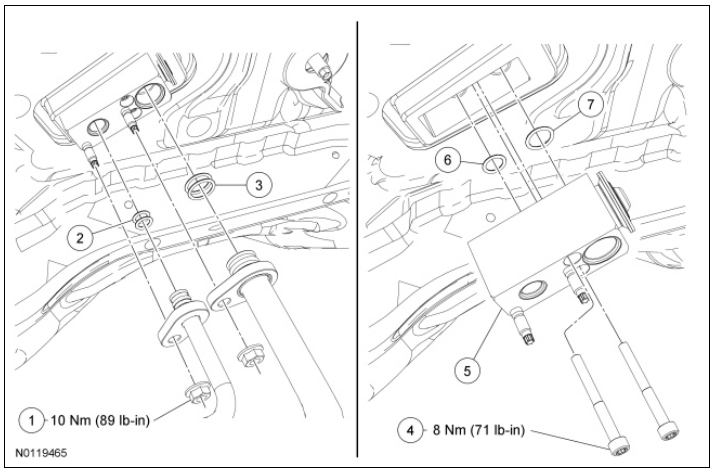
Item	Part Number	Description
1	W520413	Condenser inlet fitting nut
2	W500213	Radiator support reinforcement bolt (3 required)
3	-	A/C pressure transducer electrical connector (part of 12A522)
4	W520413	Condenser outlet fitting nut
5	19712	Condenser core
6 td>	19E889	O-ring seal
7	19E889	O-ring seal

Receiver/Drier



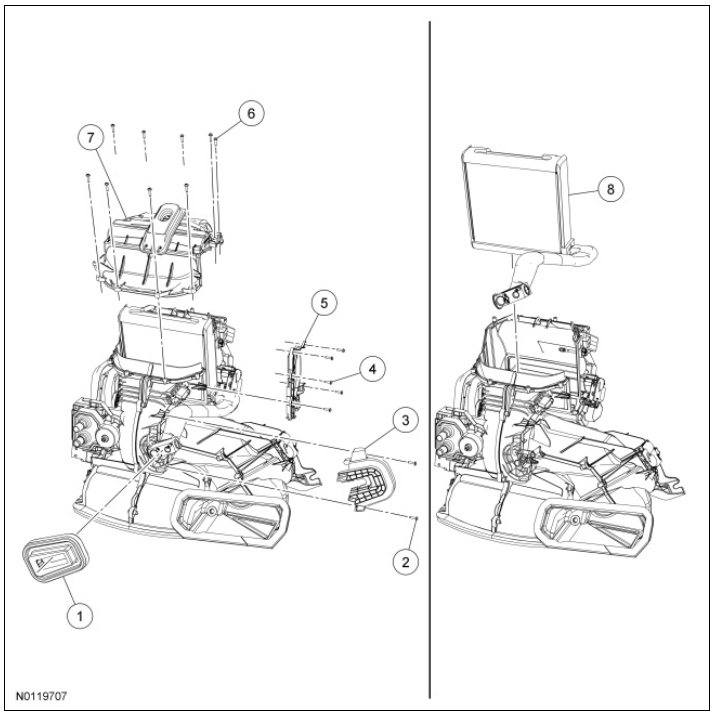
Item	Part Number	Description
1	W705460	Receiver/drier fitting nut (2 required)
2	19959	Receiver/drier
3	19E889	O-ring seal (2 required)

Thermostatic Expansion Valve (TXV)



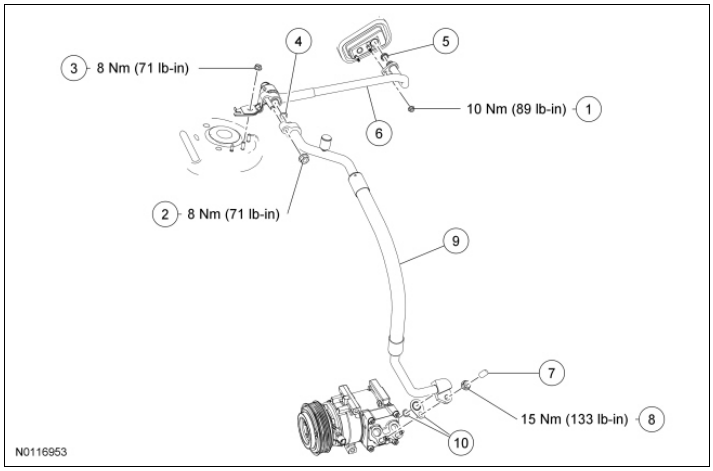
Item	Part Number	Description
1	W520412	Thermostatic Expansion Valve (TXV) fitting nut (2 required)
2	19E889	O-ring seal (2 required)
3	19E889	O-ring seal (2 required)
4	-	TXV bolt (2 required) (part of 19849)
5	19849	TXV
6	19E889	O-ring seal
7	19E889	O-ring seal

Evaporator Core



Item	Part Number	Description
1	19B588	Dash panel seal
2	W506945	Evaporator tube bracket screw (2 required)
3	-	Evaporator tube bracket (part of 19850)
4	W506945	Cabin air filter access cover screw (5 required)
5	19D672	Cabin air filter access cover
6	W506945	Evaporator core cover screw (9 required)
7	-	Evaporator core cover (part of 19850)
8	19860	Evaporator core

A/C Low-Pressure Lines



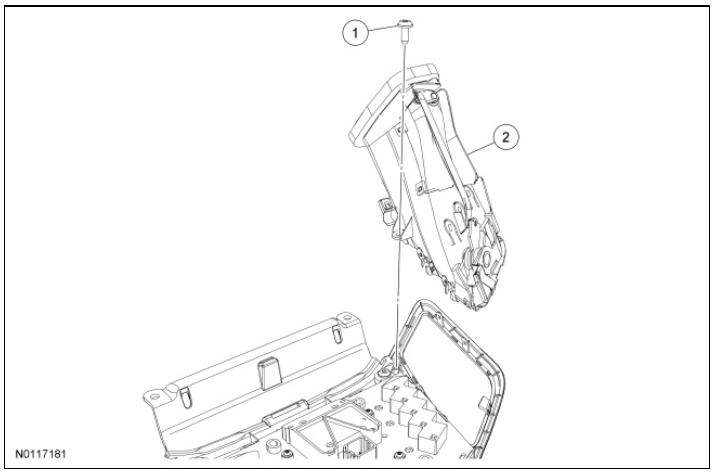
Item	Part Number	Description
1	W520412	Thermostatic Expansion Valve (TXV) low-pressure fitting nut
2	W520413	Evaporator outlet line fitting nut
3	W520412	Evaporator outlet line bracket nut
4	19E889	O-ring seal
5	19E889	O-ring seal (2 required)
6	19867	Evaporator outlet line
7	386802	Rubber cap
8	W520413	A/C compressor suction fitting
9	19D734	Evaporator-to-compressor suction line
10	19D596	O-ring seal and gasket seal kit

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Air Distribution and Filtering - Exploded View

Center Registers

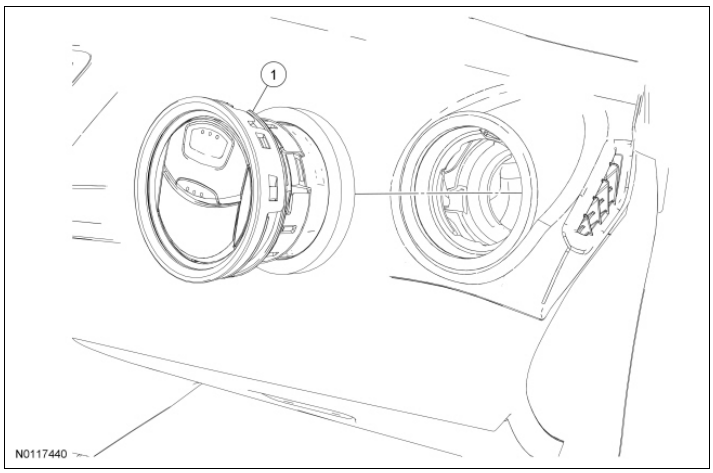
NOTE: LH center register shown, RH similar



Item	Part Number	Description
1	W506962	Center register screw
2	19893	Center register

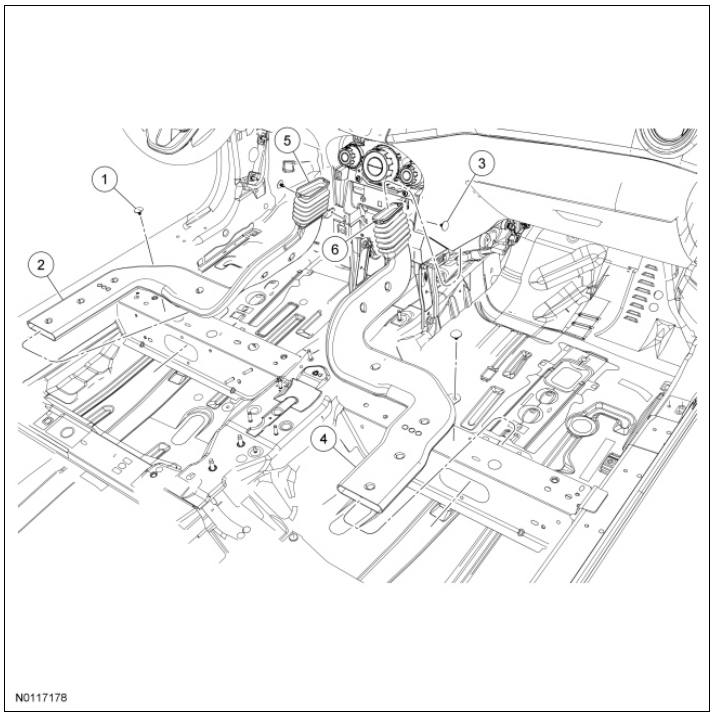
Outer Registers

NOTE: RH outer register shown, LH similar



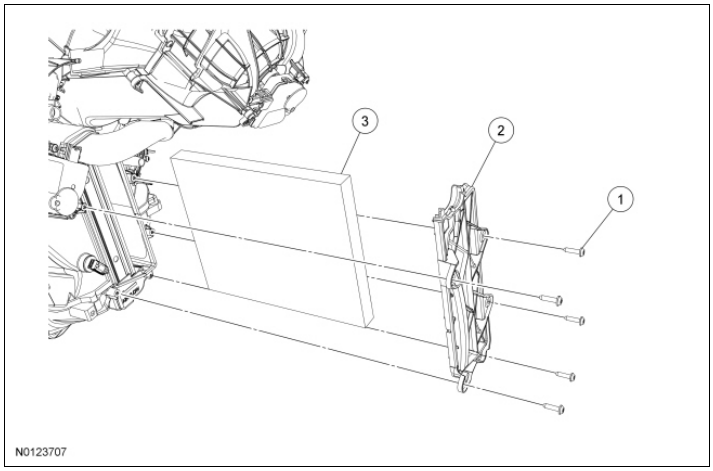
Item	Part Number	Description
1	19893	Outer register

Rear Footwell Ducts



Item	Part Number	Description
1	W701374	LH rear footwell duct pin-type retainer (2 required)
2	18C297	LH rear footwell duct
3	W701374	RH rear footwell duct pin-type retainer (2 required)
4	18C297	RH rear footwell duct
5	18C297	LH rear footwell duct adapter
6	18C297	RH rear footwell duct adapter

Cabin Air Filter



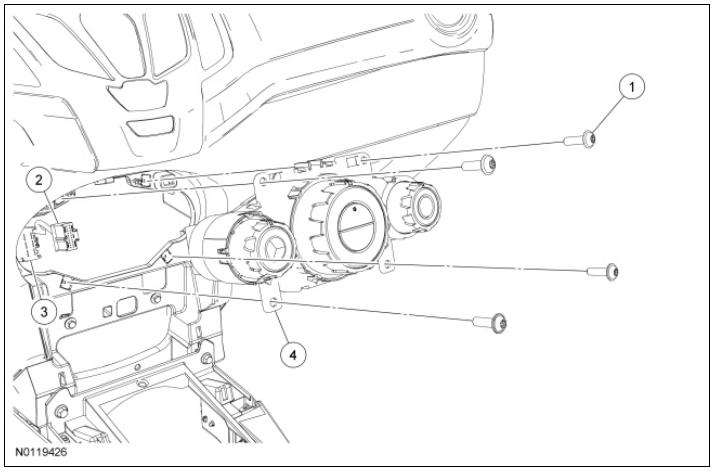
Item	Part Number	Description
1	W506945	Cabin air filter access cover screw (5 required)
2	19D672	Cabin air filter access cover

3	19N619	Cabin air filter

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

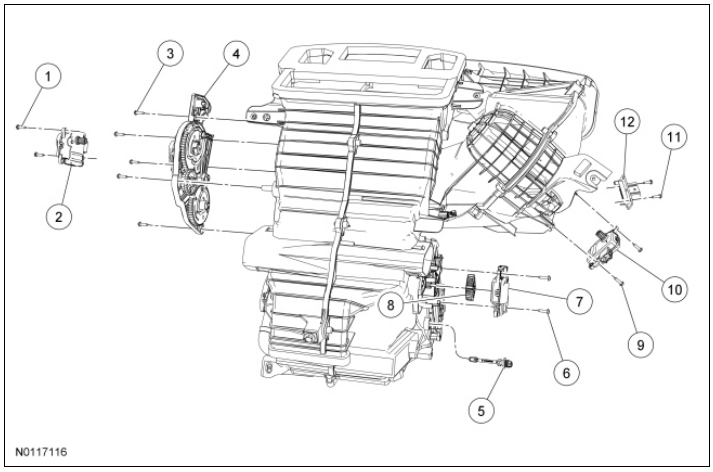
Control Components - Exploded View

HVAC Housing



Item	Part Number	Description
1	W707628	HVAC module screw (4 required)
2	-	HVAC module electrical connector (part of 14401)
3	-	HVAC module blower motor switch electrical connector (part of 14401)
4	18549	HVAC module (vehicles not equipped with A/C)
4	19980	HVAC module (vehicles equipped with A/C)

HVAC Control Components



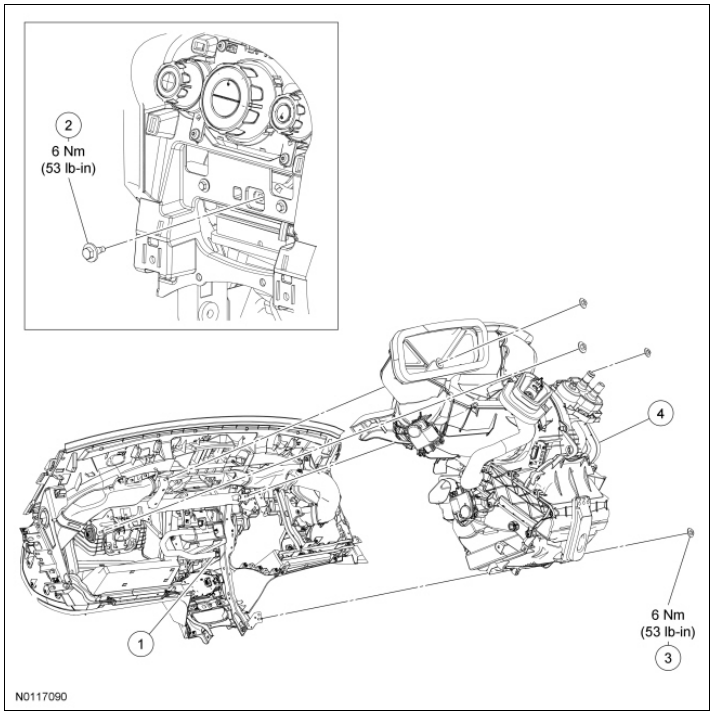
Item	Part Number	Description
1	W506945	Airflow mode door actuator screw (2 required)

2	19E616	Airflow mode door actuator			
3	W506945	Airflow mode door actuating assembly screw (5 required)	4	19788	Airflow mode door actuating assembly
5	19C734	Evaporator discharge air temperature sensor			
6	W506945	Temperature blend door actuator screw (2 required)			
7	-	Temperature blend door actuator (part of 19788)			
8	-	Temperature blend door actuator cam (part of 19788)			
9	W506945	Air inlet mode door actuator screw (2 required)			
10	19E616	Air inlet mode door actuator			
11	W506945	Blower motor resistor screw (2 required)			
12	18591	Blower motor resistor			

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

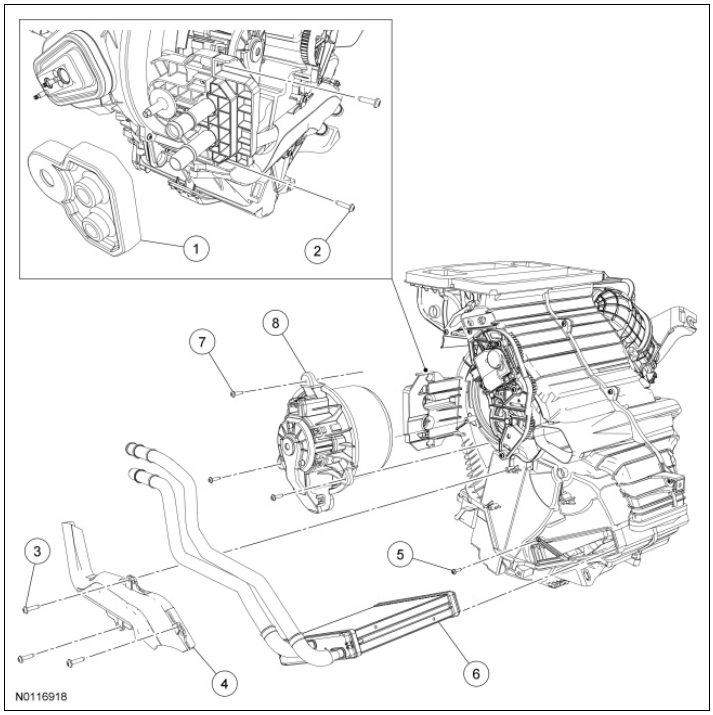
Heating and Ventilation - Exploded View

Heater Core and Evaporator Core Housing



Item	Part Number	Description
1	19D888	Radio vent tube
2	W505422	Heater core and evaporator core housing bolt
3	W700430	Heater core and evaporator core housing nut (4 required)
4	19850	Heater core and evaporator core housing

Blower Motor and Heater Core



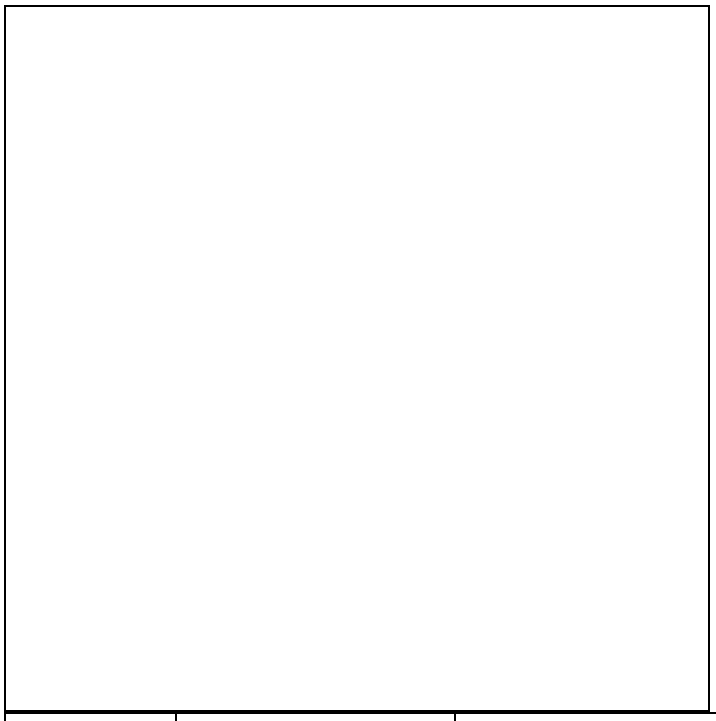
Item	Part Number	Description
1	19B588	Dash panel seal
2	W506495	Heater core tube bracket screw (2 required)
3	W506495	Heater tube cover screw (3 required)
4	-	Heater core tube cover
5	W506495	Heate retainer screw
6	18476	Heater core
7	W506495	Blower motor screw (3 required)
8	19805	Blower motor

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Air Conditioning (A/C) Compressor

Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	386802-S	Rubber cap
2	W520111	Compressor-to-condenser discharge line bracket nut
3	W520413	A/C compressor fitting nut (2 required)
4	-	A/C compressor electrical connector (part of 12A522)
5	W714403	A/C compressor stud-bolt
6	W701331	A/C compressor bolt (2 required)
7	-	A/C compressor wire harness bracket (part of 12A522)
8	19703	A/C compressor
9	19B596	O-ring seal and gasket seal kit
10	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, the following procedures must be carried out to remove contamination from the A/C system. Failure to remove contamination from the A/C system, if present, will result in poor A/C performance and/or damage to the new A/C compressor and other components.**

- If A/C flushing equipment is available, carry out 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 Thermostatic Expansion Valve (TXV), as directed by the A/C flushing or filtering procedure.
- Install a new receiver/drier as directed by the A/C flushing or filtering procedure.

NOTE: Installation of a new receiver/drier 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 receiver/drier. Damage to the receiver/drier includes leaks in the receiver/drier, physical damage to the receiver/drier 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 receiver/drier should not be replaced.

NOTE: A new A/C compressor may come equipped with an A/C clutch disc and hub, A/C compressor pulley and A/C clutch field coil already installed. If these components are not pre-installed, it will be necessary to transfer these parts from the old A/C compressor to the new compressor prior to installation of the A/C compressor if suitable for reuse.

1. If flushing of the refrigerant system has not been carried out, recover the refrigerant. For additional information, refer to Section 412-00 .

2. Remove the compressor-to-condenser discharge line bracket nut.
   - To install, tighten to 7 Nm (62 lb-in).

3. Remove the 2 A/C compressor fitting nuts and disconnect the fitting.
   - Discard the O-ring seals and gasket seals.
   - To install, tighten to 15 Nm (133 lb-in).

4. Remove the accessory drive belt. For additional information, refer to Section 303-05 .

5. Disconnect the A/C clutch field coil electrical connector.

6. Detach the wire harness from the A/C compressor wire harness bracket.

7. Remove the 2 A/C compressor bolts, the A/C compressor stud bolt and the A/C compressor wire harness bracket.
   - To install, tighten to 24 Nm (18 lb-ft).

8. Remove the A/C compressor.

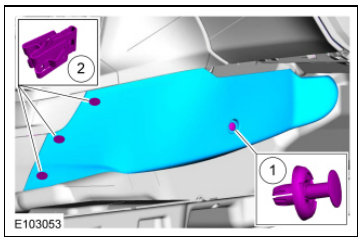
9. To install, reverse the removal procedure.
   - Install new O-ring seals and gasket seals.
   - If filtering of the refrigerant system is not to be carried out, add the correct amount of clean PAG oil to the refrigerant system. For additional information, refer to the Refrigerant Oil Adding procedure in Section 412-00 .

10. If filtering of the refrigerant system is not to be carried out, evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

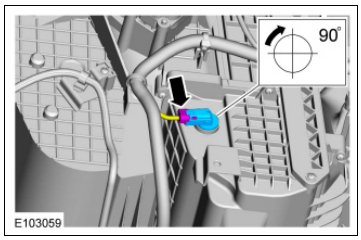
Air Conditioning (A/C) Evaporator Discharge Air Temperature Sensor

Removal and Installation

1. Remove the RH floor console trim panel.
    1. Remove the pin-type retainer.
    2. Detach the 3 clips and remove the trim panel.



2. Disconnect the evaporator discharge air temperature sensor electrical connector and rotate the sensor clockwise to remove.



3. To install, reverse the removal procedure.

Air Conditioning (A/C) Pressure Relief Valve

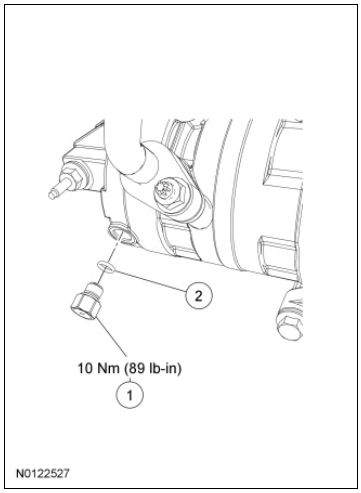
Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

Removal and Installation

1. Recover the refrigerant. For additional information, refer to Section 412-00 .

2. Remove the A/C compressor pressure relief valve and O-ring seal.
   - To install, tighten to 10 Nm (89 lb-in).



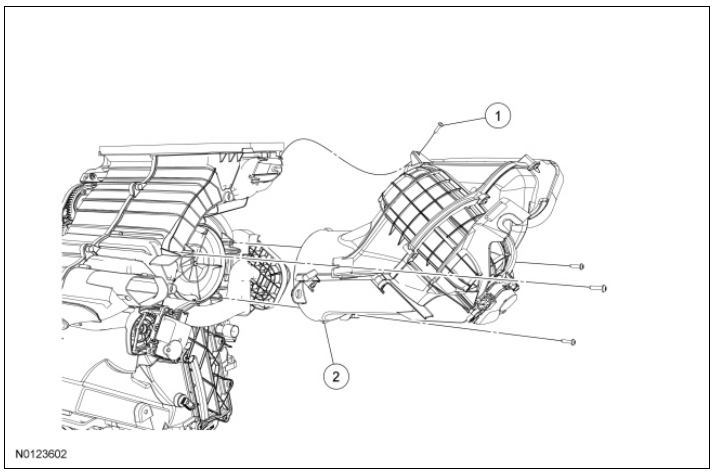
3. **NOTE:** A new O-ring seal will already be installed on the new A/C compressor pressure relief valve service part.

   To install, reverse the removal procedure.

   - Add the correct amount of clean PAG oil to the refrigerant system. For additional information, refer to the Refrigerant Oil Adding procedure in Section 412-00 .

4. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Air Inlet Duct



Item	Part Number	Description
1	W506945	Air inlet duct screw (4 required)
2	19A618	Air inlet duct

Removal and Installation

1. Remove the heater core and evaporator core housing. For additional information, refer to Heater Core And Evaporator Core Housing in this section.
2. Remove the 4 air inlet duct screws.
3. Remove the air inlet duct.
4. To install, reverse the removal procedure.

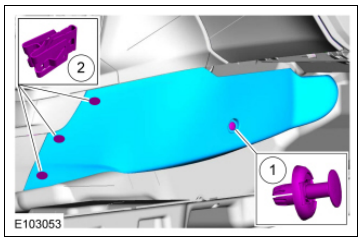
Blower Motor

Removal and Installation

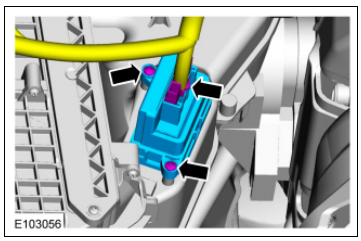
1. With the ignition in the ON position , select the PANEL climate control mode. Switch the ignition to the OFF position.
2. Remove the brake pedal and bracket assembly. For additional information, refer to Section 206-06 .
3. Disconnect the blower motor electrical connector.
4. Remove the 3 blower motor screws.
5. Remove the blower motor.
6. To install, reverse the removal procedure.

Blower Motor Resistor

1. Remove the RH floor console side panel.
    1. Remove the side panel pin-type retainer.
    2. Detach the clips and remove the RH floor console side panel.



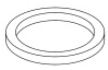
2. Remove the blower motor resistor.
    - Disconnect the blower motor resistor electrical connector.
    - Remove the 2 blower motor resistor screws and the blower motor resistor.

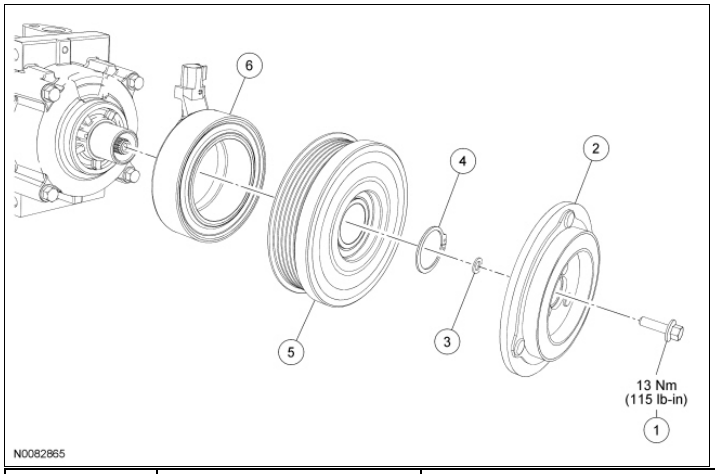


3. To install, reverse the removal procedure.

Clutch and Clutch Field Coil

Special Tool(s)

 ST2946-A	Holding Tool, Compressor Clutch 412-134
 ST1232-A	Installer, A/C Compressor Coil 412-065 (T89P-19623-EH)
 ST1234-A	Installer, A/C Compressor Field Coil 412-078 (T91L-19623-CH)
 ST1233-A	Remover, A/C Compressor Field Coil 412-067 (T89P-19623-FH)
 ST2382-A	Remover, Compressor Pulley 412-001 (T71P-19703-B)



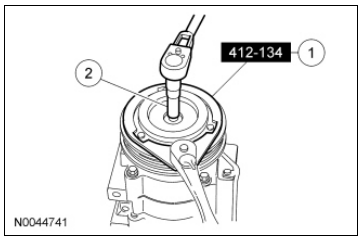
Item	Part Number	Description
1	W711877	A/C clutch disc and hub bolt
2	19D786	A/C clutch disc and hub
3	19D648	A/C clutch disc and hub spacer
4	N805338	A/C compressor pulley snap ring
5	19D784	A/C compressor pulley
6	19D798	A/C clutch field coil

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. Using the Compressor Clutch Holding Tool, hold the A/C clutch disc and hub.
2. Remove the A/C clutch disc and hub bolt.



3. Remove the A/C clutch disc and hub.

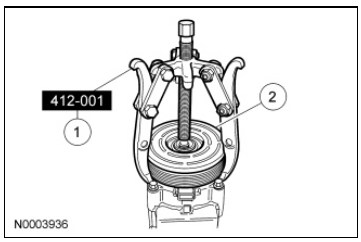
4. Remove the A/C clutch disc and hub spacer(s).

5. Remove the A/C compressor pulley snap ring.

6. ***NOTICE:*** **Do not use air tools. Damage to the Air Conditioning (A/C) compressor pulley or A/C compressor may result.**

   Remove the A/C compressor pulley.

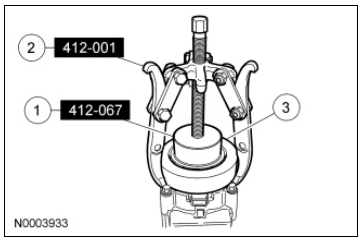
   1. Install the Compressor Pulley Remover.
   2. Remove the A/C compressor pulley.



7. ***NOTICE:*** **Do not use air tools. Damage to the Air Conditioning (A/C) clutch field coil or A/C compressor may result.**

   Remove the A/C clutch field coil.

   1. Install the A/C Compressor Field Coil Remover.
   2. Install the Compressor Pulley Remover.
   3. Remove the A/C clutch field coil.



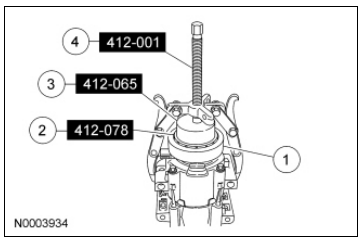
Installation

1. Clean the A/C clutch field coil and pulley mounting surfaces.

2. ***NOTICE:*** **Do not use air tools. Damage to the Air Conditioning (A/C) clutch field coil or A/C compressor may result.**

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 A/C Compressor Field Coil Installer on the A/C clutch field coil.
3. Place the A/C Compressor Coil Installer on the A/C Compressor Field Coil Installer.
4. Use the Compressor Pulley Remover to install the A/C clutch field coil.

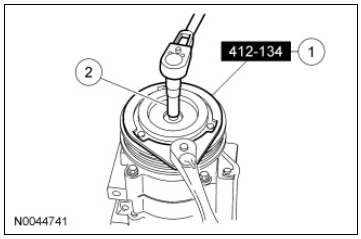


3. Install the A/C compressor pulley.

4. Install the A/C compressor pulley snap ring.

5. Install the A/C clutch disc and hub spacer(s) and the A/C clutch disc and hub.

6. 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. Tighten to 13 Nm (115 lb-in).



7. Measure and adjust the clutch air gap by adding or removing A/C clutch disc and hub spacers. For additional information, refer to the A/C clutch air gap procedure in Section 412-00 .

8. Install the A/C compressor. For additional information, refer to Air Conditioning (A/C) Compressor in this section.

Compressor to Condenser Discharge Line

Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

Removaland Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Recover the refrigerant. For additional information, refer to Section 412-00 .

3. Remove the condenser inlet fitting nut and disconnect the fitting.
   - Discard the O-ring seal.
   - To install, tighten to 8 Nm (71 lb-in).

4. Remove the compressor-to-condenser discharge line bracket nut.
   - To install, tighten to 7 Nm (62 lb-in).

5. 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).

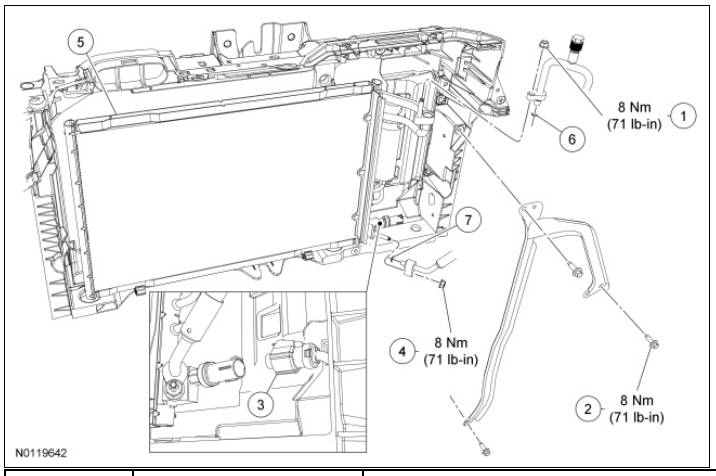
6. To install, reverse the removal procedure.
   - Install new O-ring seals and a new gasket seal.
   - Add the correct amount of clean PAG oil to the refrigerant system. For additional information, refer to Section 412-00 .

7. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Condenser Core

Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	W520413	Condenser inlet fitting nut
2	W500213	Radiator support reinforcement bolt (3 required)
3	-	A/C pressure transducer electrical connector (part of 12A522)
4	W520413	Condenser outlet fitting nut
5	19712	Condenser core
6	19E889	O-ring seal
7	19E889	O-ring seal

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Recover the refrigerant. For additional information, refer to Section 412-00 .

3. Remove the cooling fan motor and shroud. For additional information, refer to Section 303-03 .

4. Remove the condenser inlet fitting nut and disconnect the fitting.
   - Discard the O-ring seal.
   - To install, tighten to 8 Nm (71 lb-in).

Condenser to Evaporator Line

Material

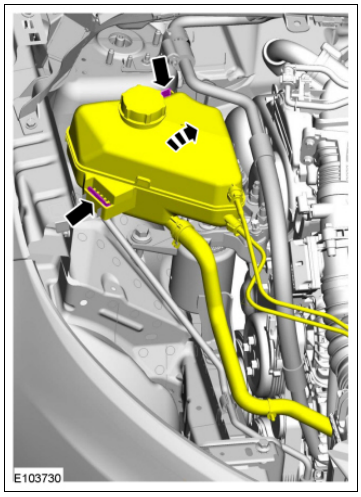
Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

Removal and Installation

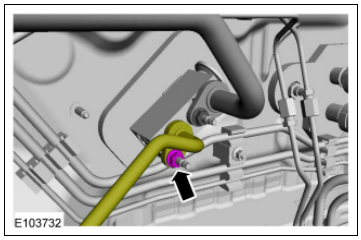
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Recover the refrigerant. For additional information, refer to Section 412-00 .

3. Release the clips and position the coolant bottle aside.

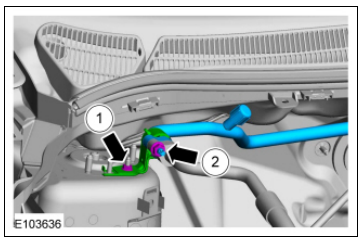


4. Remove the Thermostatic Expansion Valve (TXV) inlet fitting nut and disconnect the fitting.
   - Discard the O-ring seals.
   - To install, tighten to 10 Nm (80 lb-in).

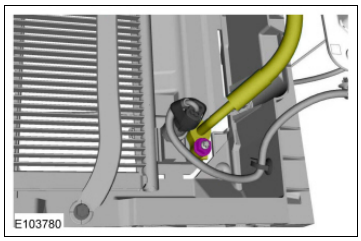


5. Disconnect the evaporator outlet line fitting.
   1. Remove the evaporator outlet line bracket nut.
   2. Remove the evaporator outlet line fitting nut and disconnect the fitting.
   - Discard the O-ring seal.
   - To install, tighten the evaporator outlet line fitting nut to 8 Nm (71 lb-in).

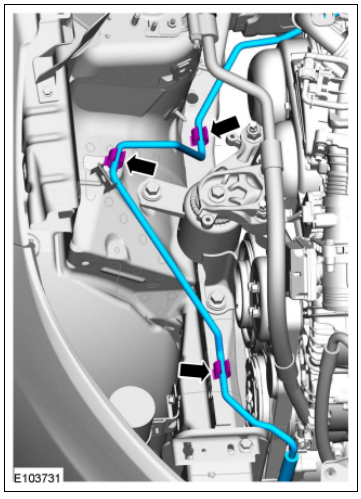
- To install, tighten the evaporator outlet line bracket nut to 8 Nm (71 lb-in).



6. Remove the condenser outlet fitting nut and disconnect the fitting.
   - Discard the O-ring seal.
   - To install, tighten to 8 Nm (71 lb-in).



7. Detach the condenser-to-evaporator line from the clips.



8. Remove the condenser-to-evaporator line.

9. To install, reverse the removal procedure.
   - Install new O-ring seals.
   - Add the correct amount of clean PAG oil to the refrigerant system. For additional information, refer to the Refrigerant Oil Adding procedure in Section 412-00 .

10. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Evaporator Outlet Line

Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

Removal and Installation

1. Recover the refrigerant. For additional information, refer to Section 412-00 .

2. Remove the Thermostatic Expansion Valve (TXV) outlet fitting nut and disconnect the fitting.
   - Discard the O-ring seals.
   - To install, tighten to 10 Nm (89 lb-in).

3. Remove the evaporator outlet line bracket nut.
   - To install, tighten to 8 Nm (71 lb-in).

4. Remove the A/C 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).

5. Remove the evaporator outlet line.

6. To install, reverse the removal procedure.
   - Install new O-ring seals, and a new gasket seal.
   - Add the correct amount of clean PAG oil to the refrigerant system. For additional information, refer to the Refrigerant Oil Adding procedure in Section 412-00 .

7. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Evaporator to Compressor Suction Line

Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

1. Recover the refrigerant. For additional information, refer to Section 412-01 .

2. Remove the evaporator outlet line fitting nut.
   - Discard the O-ring seal.
   - To install, tighten to 8 Nm (71 lb-in).

3. Remove the rubber cap from the A/C compressor suction fitting stud.

4. Remove the A/C compressor suction fitting nut.
   - Discard the gasket seal.
   - To install, tighten to 15 Nm (133 lb-in).

5. To install, reverse the removal procedure.
   - Install a new gasket seal and new O-ring seals.
   - Add the correct amount of clean PAG oil to the refrigerant system. 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 .

Footwell Duct - Rear

Removal and Installation

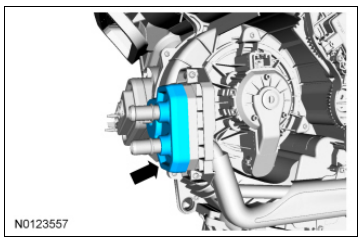
1. Remove the front seats. For additional information, refer to Section 501-10 .
2. Remove the LH and RH front scuff plates, and the RH and LH cowl side trim panels. For additional information, refer to Section 501-05 .
3. Remove the 2 LH rear footwell duct pin-type retainers and the LH rear footwell duct.
4. Remove the 2 RH rear footwell duct pin-type retainers and the RH rear footwell duct.
5. To install, reverse the removal procedure.

Heater Core

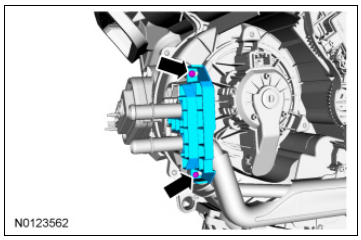
Removal and Installation

1. Remove the heater core and evaporator core housing. For additional information, refer to Heater Core And Evaporator Core Housing in this section.

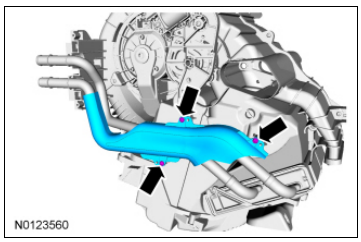
2. Remove the dash panel seal.



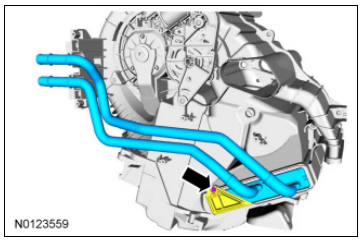
3. Remove the 2 heater core tube bracket screws and remove the bracket.



4. Remove the 3 heater tube cover screws and remove the heater tube cover



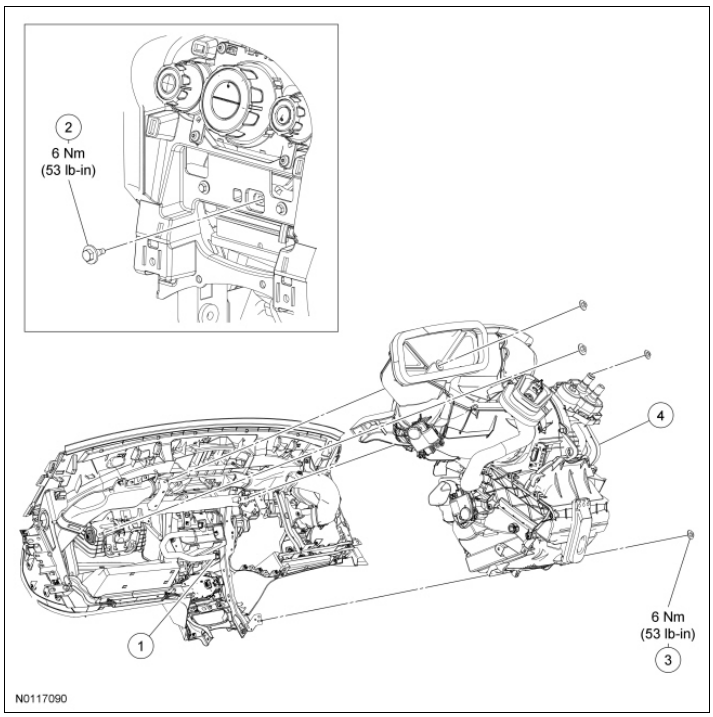
5. Remove the heater core retainer screw and position the retainer aside.



6. Remove the heater core.

7. To install, reverse the removal procedure.

Heater Core And Evaporator Core Housing

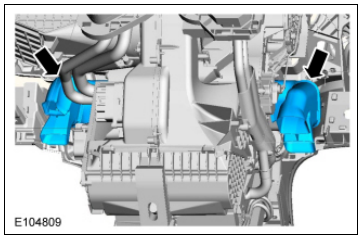


Item	Part Number	Description
1	19D888	Audio unit vent tube
2	W505422	Heater core and evaporator core housing bolt
3	W700430	Heater core and evaporator core housing nuts (4 required)
4	19850	Heater core and evaporator core housing

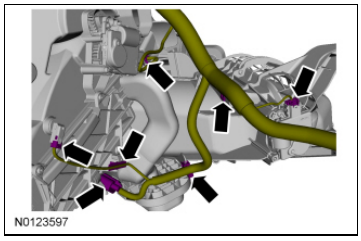
Removal and Installation

1. Remove the instrument panel. For additional information, refer to Section 501-12 .

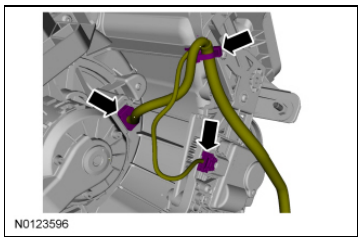
2. Remove the 2 floor ducts.



3. Disconnect the electrical connectors and detach the wire harness clips from the RH side of the heater core and evaporator core housing.



4. Disconnect the electrical connectors and detach the wire harness retainer from the LH side of the heater core and evaporator core housing.

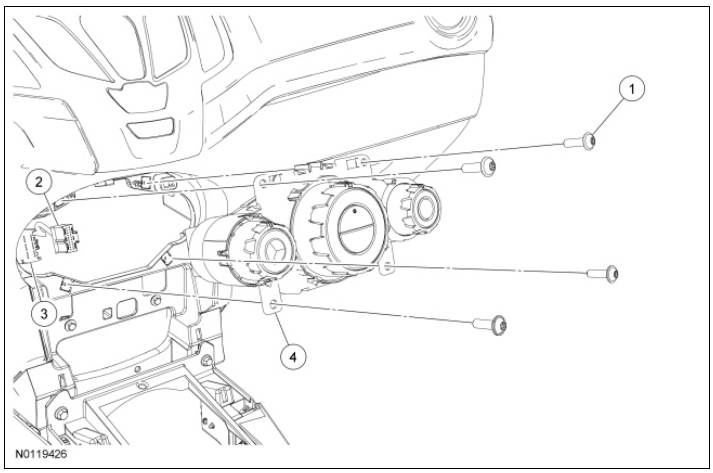


5. Release the clamp and detach the audio unit vent tube from the heater core and evaporator core housing.

6. Remove the 4 heater core and evaporator core housing nuts, and the heater core and evaporator core housing bolt.
    - To install, tighten to 6 Nm (53 lb-in).

7. To install, reverse the removal procedure.

Heating Ventilation Air Conditioning (HVAC) Module



Item	Part Number	Description
1	W707628	HVAC module screw (4 required)
2	-	HVAC module electrical connector (part of 14401)
3	-	HVAC module blower motor switch electrical connector (part of 14401)
4	18549	HVAC module (vehicles not equipped with A/C)
4	19980	HVAC module (vehicles equipped with A/C)

Removal and Installation

1. Remove the lower instrument panel finish panel. For additional information, refer to Section 501-12 .
2. Remove the 4 HVAC module screws.
3. Disconnect the 2 HVAC module electrical connectors.
4. Remove the HVAC module.
5. To install, reverse the removal procedure.

Mode Door Actuator - Air Inlet Door

Removal and Installation

1. Lower and remove the glove compartment.
2. Disconnect the air inlet mode door actuator electrical connector.
3. Remove the 2 air inlet mode door actuator screws.
4. Remove the air inlet mode door actuator.
5. To install, reverse the removal procedure.

Mode Door Actuator - Defrost/Panel/Floor Door

Removal and Installation

1. If replacing the defrost/panel/floor mode door actuator motor only, remove the knee air bag module and the lower steering column shroud. For additional information, refer to Section 501-20B and Section 211-04 .

2. If replacing the airflow mode door actuating assembly, remove the heater core and evaporator core housing. For additional information, refer to Heater Core And Evaporator Core Housing in this section.

3. Disconnect the defrost/panel/floor mode door actuator electrical connector.

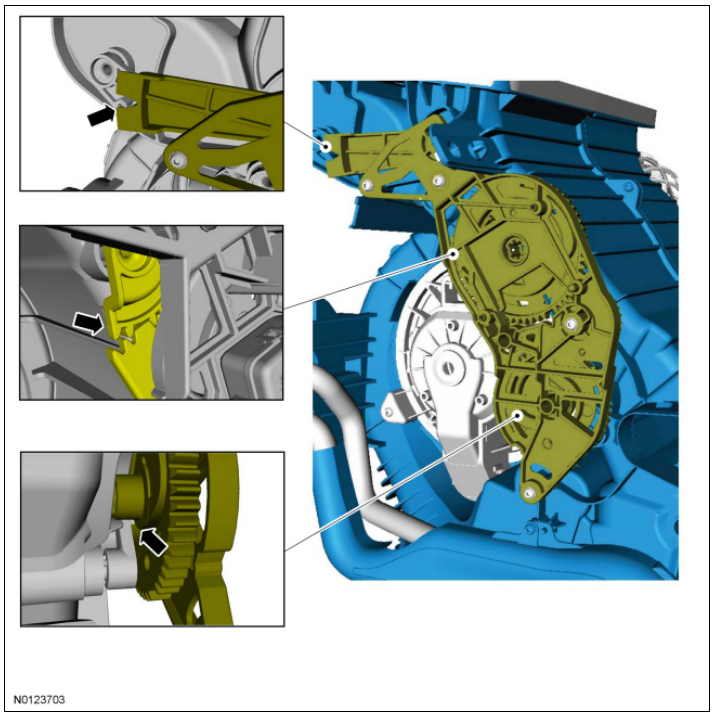
4. Remove the 2 defrost/panel/floor mode door actuator screws and the defrost/panel/floor door mode door actuator.

5. Remove the defrost/panel/floor mode door actuator.

6. If removing the airflow mode door actuating assembly, remove the 5 airflow door actuating assembly screws and the actuating assembly.

7. **NOTE:** When installing the airflow mode door actuating assembly, make sure that each airflow mode door gear or lever is correctly aligned with the actuating assembly.

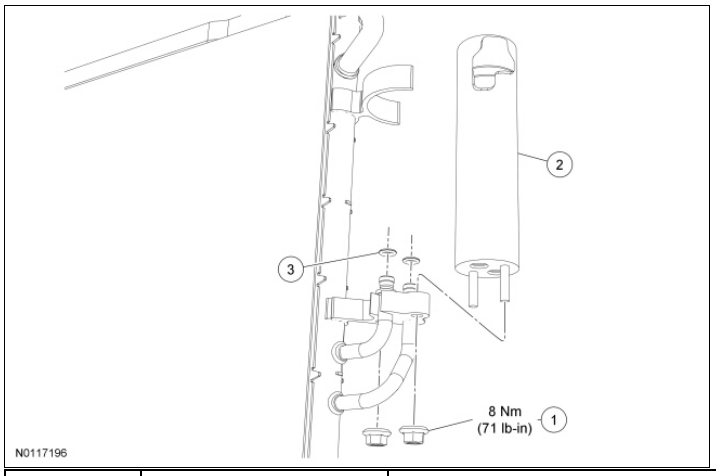
   To install, reverse the removal procedure.



Receiver Drier

Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	W705460	Receiver/drier fitting nut (2 required)
2	19959	Receiver/drier
3	19E889	O-ring seal (2 required)

Removal and Installation

NOTE: Installation of a new receiver/drier 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 receiver/drier. Damage to the receiver/drier includes leaks in the receiver/drier, physical damage to the receiver/drier 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 receiver/drier should not be replaced.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Recover the refrigerant. For additional information, refer to Section 412-00 .

3. Remove the 2 receiver/drier fitting nuts.
   - To install, tighten to 8 Nm (71 lb-in).

4. Remove the receiver/drier.
   - Discard the O-ring seals.

5. To install, reverse the removal procedure.
    - Install new O-ring seals.
    - Add the correct amount of clean PAG oil to the refrigerant system. 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 .

Register

Removal and Installation

Outer registers

1. With a non-metallic trim-type tool, gently pry out on the outer rim of the register to release and remove the register.

Center registers

2. Remove the FCIM finish panel. For additional information, refer to Section 501-12 .

3. Remove the center register screws.

4. Release the center register clips and remove the center registers.

All registers

5. To install, reverse the removal procedure.

Temperature Blend Door Actuator

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 2 temperature blend door actuator screws.

4. Remove the temperature blend door actuator.

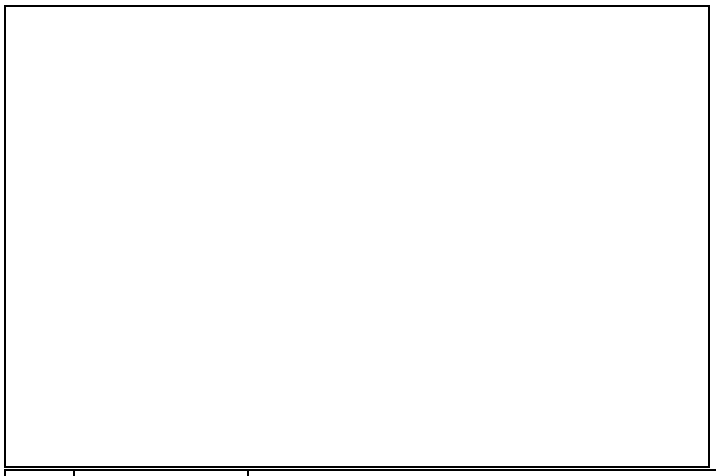
5. **NOTE:** When installing the temperature blend door actuator, be sure that the actuator gear, and the blend door gear are aligned so that the center (keyed) portion of each gear mates with the center (keyed) portion of the opposite gear as the gears are rotated.

   To install, reverse the removal procedure.

Thermostatic Expansion Valve

Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	W520412	Thermostatic Expansion Valve (TXV) fitting nut (2 required)
2	19E889	O-ring seal (2 required)
3	19E889	O-ring seal (2 required)
4	-	TXV bolt (2 required) (part of 19849 kit)
5	19849	TXV
6	19E889	O-ring seal
7	19E889	O-ring seal

Removal and Installation

1. Recover the refrigerant. For additional information, refer to Section 412-00 .

2. Remove the 2 Thermostatic Expansion Valve (TXV) fitting nuts and disconnect the fittings.
   - Discard the O-ring seals.
   - To install, tighten to 10 Nm (89 lb-in).

3. Remove the 2 TXV bolts.
   - To install, tighten to 8 Nm (71 lb-in).

4. Remove the TXV .
   - Discard the O-ring seals.

5. To install, reverse the removal procedure.

- Install new O-ring seals.
- Add the correct amount clean PAG oil to the refrigerant system. 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 .

Instrument Cluster and Panel Illumination

Overview

The backlighting system consist of dimmable components and non-dimmable components.

Dimmable Components

The functional dimmable components are:

- Driver heated seat switch
- Floor shifter
- Instrument panel dimmer switch
- Front Controls Interface Module (FCIM)
- Headlamp switch
- HVAC module
- Passenger heated seat/ambient lighting switch
- Start/stop switch
- Steering wheel switches
- Instrument Panel Cluster (IPC) (via network message)
- Front Control/Display Interface Module (FCDIM) (via network message)
- Body Control Module (BCM)

The dimmable backlighting is controlled by the BCM . The dimmable switches and components are illuminated when the parking lamps are on. The instrument panel dimmer switch is a single detent rocker switch used to control all dimmable interior illuminated components. The up detent increases dimmable backlighting intensity and the down detent decreases dimmable backlighting intensity. When the parking lamps are off, the Instrument Panel Cluster (IPC) is illuminated to full brightness.

Non-Dimmable Components

The functional non-dimmable components are:

- Window control switches

The non-dimmable illumination provides backlighting to the window switches when the ignition relay is energized.

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
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent

Principles of Operation

Dimmable Backlighting

When the parking lamps are on, the Body Control Module (BCM) monitors the input from the instrument panel dimmer switch. The BCM sends voltage to the dimmable components based on input received from the instrument panel dimmer switch.

If a fault is detected by the BCM on the dimmable illumination output circuit, the BCM sets a DTC and disables the circuit function until the fault is cleared and an ignition cycle takes place.

The BCM also sends a message over the network to the Front Control/Display Interface Module (FCDIM) and the Instrument Panel Cluster (IPC) to control the backlighting intensity level.

If the receiving module does not receive the backlighting status message from the BCM , or if the data received is deemed invalid for more than 5 seconds, the receiving module sets a missing message related DTC in continuous memory and defaults the backlighting to full nighttime intensity.

Non-Dimmable Backlighting

When the ignition relay (located in the Central Junction Box (CJB)) is energized, switched voltage is supplied to the window control switches.

Field-Effect Transistor (FET) Protection

Field-Effect Transistor (FET) is a type of transistor that when used with module software, monitors and controls current flow on module outputs. The FET protection strategy prevents module damage in the event of excessive current flow.

The BCM utilizes an FET protective circuit strategy for many of its outputs, for example a backlighting illumination output circuit. Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down when a fault event is detected. A short circuit DTC sets when the fault occurs.

The FET protection continues to shut off the circuit so long as the fault exists. When the fault is corrected and the ignition state is cycled off and then back on, the module resets the FET protection and allows the circuit to function.

The FET protected circuit for the dimmable backlighting system is the dimmable backlighting illumination circuit.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Headlamp switch • Instrument panel dimmer switch	• Illuminated components

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 release software.

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

5. **NOTE:** The Vehicle Communication Module (VCM) 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 with 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 BCM .

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

DTC Charts

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B134E:23	Switch Illumination Adjustment Control: Signal Stuck low	GO to Pinpoint Test A .
U2010:11	Switch Illumination: Circuit Short To Ground	GO to Pinpoint Test B .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: All Dimmable Illumination Does Not Increase/Decrease Brightness

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

Normal Operation

The instrument panel dimmer switch is a rocker style switch with 2 inputs to the Body Control Module (BCM) to increase or decrease the backlighting illumination. When the instrument panel dimmer switch is pressed up or down, a ground signal is routed to the BCM .

Based on the ground signal input from the instrument panel dimmer switch, the BCM sends a message over the network to the modules with backlighting output indicating the backlighting intensity level, and provides voltage to the hard-wired dimmable illumination sources.

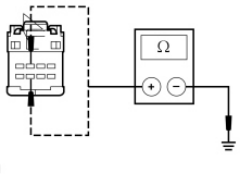
- DTC B134E:23 (Switch Illumination Adjustment Control: Signal Stuck low) - a continuous and on-demand DTC that sets when the BCM detects the instrumentanel dimmer switch is stuck or held low for more than 2 minutes or the increase or decrease control circuits are shorted to ground. If the instrument panel dimmer switch is stuck low the BCM defaults the backlighting illumination to full backlighting intensity.

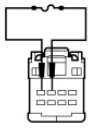
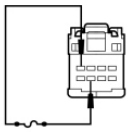
This pinpoint test is intended to diagnose the following:

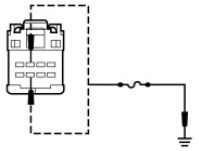
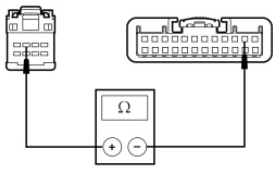
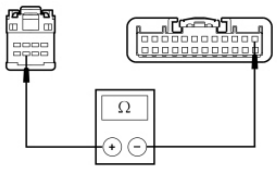
- Wiring, terminals or connectors
- Instrument panel dimmer switch
- BCM

PINPOINT TEST A: ALL DIMMABLE ILLUMINATION DOES NOT INCREASE/DECREASE BRIGHTNESS

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
A1 CHECK THE RECORDED RESULTS FROM THE BCM ON-DEMAND SELF-TEST	
• Ignition OFF. • Review the recorded results from the BCM on-demand self-test. • **Is DTC B134E:23 present?**	**Yes** GO to A2 . **No** GO to A4 .
A2 CHECK THE INSTRUMENT PANEL DIMMER SWITCH FOR A SHORT TO GROUND	
• Disconnect: Instrument Panel Dimmer Switch C2298. • Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM Self-Test. • Clear the DTCs and repeat the BCM self-test. • **Is on-demand DTC B134E:23 still present?**	**Yes** GO to A3 . **No** INSTALL a new instrument panel dimmer switch. REFER to Instrument Panel Dimmer Switch in this section. TEST the system for normal operation.
A3 CHECK THE INSTRUMENT PANEL DIMMER SWITCH INPUT CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280E. • Measure the resistance between the instrument panel dimmer switch C2298-3, circuit CLN56 (BN/VT), harness side and ground; and between the instrument panel dimmer switch C2298-7, circuit CLN55 (YE/VT), harness side and ground.  N0115751 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to A7 . **No** REPAIR the circuit in question for a short to ground. CLEAR the DTCs. REPEAT the self-test.
A4 CHECK THE INSTRUMENT PANEL DIMMER SWITCH	

• Disconnect: Instrument Panel Dimmer Switch C2298. • **NOTE:** For this step, the PID should indicate "DIMMER" each time the fused jumper wire is connected. • For the illumination decrease function, while monitoring the BCM PID IP_DIMMER_SW, connect and disconnect a fused jumper wire between the instrument panel dimmer switch C2298-3, circuit CLN56 (BN/VT), harness side and the instrument panel dimmer switch C2298-4, circuit GD115 (BK/GY), harness side.  N0115795 • **NOTE:** For this step, the PID should indicate "BRIGHTER" each time the fused jumper wire is connected. • For the illumination increase function, while monitoring the BCM PID IP_DIMMER_SW, connect and disconnect a fused jumper wire between the instrument panel dimmer switch C2298-7, circuit CLN55 (YE/VT), harness side and the instrument panel dimmer switch C2298-4, circuit GD115 (BK/GY), harness side.  N0115752 • **Does the PID indication agree with the fused jumper wire position?**	**Yes** INSTALL a new instrument panel dimmer switch. REFER to Instrument Panel Dimmer Switch in this section. TEST the system for normal operation. **No** GO to A5 .
A5 CHECK THE INSTRUMENT PANEL DIMMER SWITCH GROUND CIRCUIT	
• **NOTE:** For this step, the PID should indicate "DIMMER" each time the fused jumper wire is connected to C2298-3, and "BRIGHTER" each time the fused jumper wire is connected to C2298-7. • While monitoring the BCM PID IP_DIMMER_SW, connect and disconnect a fused jumper wire between the instrument panel dimmer switch C2298-3, circuit CLN56 (BN/VT), harness side and ground; and between the instrument panel dimmer switch C2298-7, circuit CLN55 (YE/VT), harness side and ground.	**Yes** REPAIR circuit GD115 (BK/GY) for an open. TEST the system for normal operation. **No** GO to A6 .

 N0115753 • **Does the PID indication agree with the fused jumper wire position?**	
A6 CHECK THE INSTRUMENT PANEL DIMMER SWITCH DIM UP AND DIM DOWN CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280E. • Measure the resistance between the instrument panel dimmer switch C2298-3, circuit CLN56 (BN/VT), harness side and the BCM C2280E-11, circuit CLN56 (BN/VT), harness side.  N0115754 • Measure the resistance between the instrument panel dimmer switch C2298-7, circuit CLN55 (YE/VT), harness side and the BCM C2280E-12, circuit CLN55 (YE/VT), harness side.  N0115755 • **Are the resistances less than 5 ohms?**	**Yes** GO to A7 . **No** REPAIR the circuit in question for an open. TEST the system for normal operation.
A7 CHECK FOR CORRECT BCM OPERATION	
• Connect all disconnected connectors. • Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 B: All Dimmable Non-Networked Illumination Is Inoperative

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

Normal Operation

When the parking lamps are on, the Body Control Module (BCM) provides voltage to the hard-wired dimmable illumination sources based on the hard-wired inputs from the instrument panel dimmer switch to the BCM .

- DTC U2010:11 (Switch Illumination: Circuit Short To Ground) - A continuous and on-demand DTC that sets when the BCM has temporarily shut down the output driver. The module has temporarily disabled the backlighting output because an excessive current draw exists (such as a short to ground). The BCM cannot enable the backlighting output until the cause of the short is corrected, the DTCs have been cleared and an ignition cycle takes place.

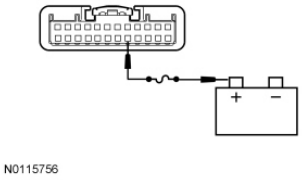
This pinint test is intended to diagnose the following:

- Wiring, terminals or connectors
- BCM

PINPOINT TEST B: ALL DIMMABLE NON-NETWORKED 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
B1 CHECK THE INSTRUMENT PANEL DIMMER SWITCH	
• While observing the Instrument Panel Cluster (IPC), press the instrument panel dimmer switch up and down. • **Does the backlighting in the IPC increase and decrease intensity?**	**Yes** GO to B2 . **No** GO to Pinpoint Test A .
B2 BYPASS THE BCM	
• Ignition OFF. • Disconnect: BCM C2280E . • **NOTE:** If the jumper wire fails, refer to the Wiring Diagrams manual to identify the possible causes of the circuit short. After the repair: If no DTCs are present, test the system for normal operation. If DTCs are present, clear the DTCs and repeat the self-test. Test the system for normal operation. • Connect a fused jumper wire between the BCM C2280E-20, circuit CLN04 (BU/BN) and battery positive.	**Yes** REMOVE the jumper wire. GO to B3 . **No** REMOVE the jumper wire. REPAIR circuit CLN04 (BU/BN) for an open. TEST the system for normal operation.

 N0115756 • **Do the backlighting components illuminate?**	
B3 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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: All Dimmable Non-Networked Illumination Is Always On

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

Normal Operation

When the parking lamps are on, the Body Control Module (BCM) provides voltage to the hard-wired dimmable illumination sources based on the hard-wired inputs from the instrument panel dimmer switch to the BCM .

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- BCM

PINPOINT TEST C: ALL DIMMABLE NON-NETWORKED ILLUMINATION 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
C1 CHECK THE EXTERIOR LIGHTING	
• Place the headlamp switch in the OFF position. • Observe the parking lights. • **Are the parking lights illuminated?**	**Yes** REFER to Section 417-01 . **No** GO to C2 .
C2 CHECK THE BCM BACKLIGHTING OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
	Yes

• Ignition OFF. • Disconnect: BCM C2280E. • Ignition ON. • **Do the dimmable backlighted components continue to illuminate?**	REPAIR circuit CLN04 (BU/BN) for a short to voltage. TEST the system for normal operation. **No** GO to C3 .
C3 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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: The Steering Wheel Switch Illumination Is Inoperative

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends voltage to the steering wheel switches. The voltage passes through the clockspring to the steering wheel harness and on to the steering wheel switches.

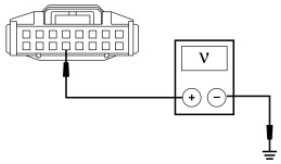
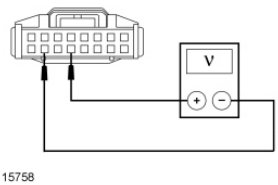
This pinpoint test is intended to diagnose the following:

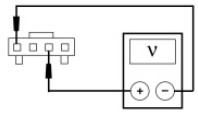
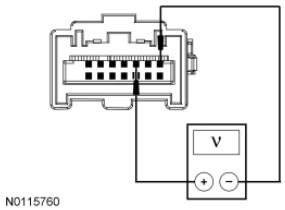
- Wiring, terminals or connectors
- Steering wheel switch(es)
- Steering wheel harness
- Clockspring

PINPOINT TEST D: THE STEERING WHEEL 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
D1 CHECK THE OTHER DIMMABLE LIGHTING SWITCHES	
• Ignition OFF. • Place the headlamp switch in the PARKING LAMPS ON position. • Press and hold the instrument panel dimmer switch up to the full illumination position and observe other dimmable	**Yes** GO to Pinpoint Test B . **No** GO to D2 .

switches. • **Are all the dimmable switches inoperative?**	
D2 CHECK THE HORN OPERATION	
• Press the driver air bag module against the steering wheel. • **Does the horn sound?**	**Yes** GO to D3 . **No** REFER to Section 413-06 to diagnose the horn is inoperative.
D3 CHECK FOR VOLTAGE TO THE CLOCKSPRING	
• Place the headlamp switch in the OFF position. • Disconnect: Clockspring C218B. • Place the headlamp switch in the PARKING LAMPS ON position. • Press and hold the instrument panel dimmer switch up to the full illumination position. • Measure the voltage between the clockspring C218B-13, circuit CLN04 (BU/BN), harness side and ground.  N0115757 • **Is the voltage greater than 10 volts?**	**Yes** GO to D4 . **No** REPAIR circuit CLN04 (BU/BN) for an open. TEST the system for normal operation.
D4 CHECK THE GROUND CIRCUIT TO THE CLOCKSPRING FOR CONTINUITY	
• Measure the voltage between the clockspring C218B-13, circuit CLN04 (BU/BN), harness side and the clockspring C218B-15, circuit GD115 (BK/GY), harness side.  N0115758 • **Is the voltage greater than 10 volts?**	**Yes** GO to D5 . **No** REPAIR circuit GD115 (BK/GY) for an open. TEST the system for normal operation.
D5 CHECK FOR VOLTAGE TO THE STEERING WHEEL SWITCH	

• Connect: Clockspring C218B. • Place the headlamp switch in the OFF position. • Remove the driver air bag module. Refer to Section 501-20B . • Disconnect: Inoperative Steering Wheel Switch. • Place the headlamp switch in the PARKING LAMPS ON position. • For the cruise control switch, measure the voltage between the cruise control switch C2999-3, harness side and the cruise control switch C2999-1, harness side. • For the steering wheel controls switch, measure the voltage between the steering wheel controls switch C2998-3, harness side and the steering wheel controls switch C2998-1, harness side.  N0115850 • **Is the voltage greater than 10 volts?**	**Yes** REPLACE the inoperative steering wheel switch. For the cruise control switch, REFER to Section 419-03 . For the steering wheel controls switch, REFER to Section 415-00 TEST the system for normal operation. **No** GO to D6 .
D6 CHECK FOR VOLTAGE TO THE UPPER CLOCKSPRING	
• Disconnect: Clockspring C218C . • Measure the voltage between the clockspring C218C-6, component side and the clockspring C218C-8, component side.  N0115760 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new steering wheel. REFER to Section 211-04 . TEST the system for normal operation. **No** INSTALL a new clockspring. REFER to Section 501-20B . TEST the system for normal operation.

Pinpoint Test E: One Or More Switch Illumination is Inoperative

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends voltage to the dimmable components.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Illuminated switch

PINPOINT TEST E: 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.**

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>E1 CHECK THE VOLTAGE TO THE SINGLE ILLUMINATION</td><td></td></tr>
<tr><td>
NOTE: If the instrument panel dimmer switch illumination is the inoperative source, increase the backlighting brightness to the highest setting before disconnect the instrument panel dimmer switch connector.

• Ignition OFF.
• Disconnect: Inoperative Illumination Source.
• Ignition ON.
• NOTE: If the headlamp switch illumination is the inoperative source, unplugging the headlamp switch connector causes the BCM to turn the exterior lights on by default, so there is no need to turn the parking lamps on.
• Place the headlamp switch to the PARKING LAMPS ON position.
• Increase the backlighting brightness to the highest setting.
• Measure the voltage between the inoperative illumination source, harness side and ground as follows:

<table>
<tr><th>Component</th><th>Connector-Pin</th><th>Circuit</th></tr>
<tr><td>Instrument panel dimmer switch</td><td>C2298-2</td><td>CLN04 (BU/BN)</td></tr>
<tr><td>Headlamp switch</td><td>C205-1</td><td>CLN04 (BU/BN)</td></tr>
<tr><td>Front Controls Interface Module (FCIM)</td><td>C2402-3</td><td>CLN04 (BU/BN)</td></tr>
<tr><td>HVAC module</td><td>C228A-6</td><td>CLN04 (BU/BN)</td></tr>
<tr><td>Floor shifter</td><td>C3245-4</td><td>CLN04 (BU/BN)</td></tr>
<tr><td>Driver heated seat switch</td><td>C2400-5</td><td>CLN04 (BU/BN)</td></tr>
<tr><td>Passenger heated seat/ambient lighting switch</td><td>C2401-5</td><td>CLN04 (BU/BN)</td></tr>
<tr><td>Start/stop switch</td><td>C2195-6</td><td>CLN04 (BU/BN)</td></tr>
</table>
• Is the voltage greater than 10 volts?
</td><td>
Yes
GO to E2 .

No
REPAIR circuit CLN04 (BU/BN) for an open. TEST the system for normal operation.
</td></tr>
</table>

E2 CHECK THE GROUND CIRCUIT TO THE ILLUMINATION SOURCE FOR CONTINUITY

- Measure the voltage between the inoperative illumination source pins, harness side as follows:

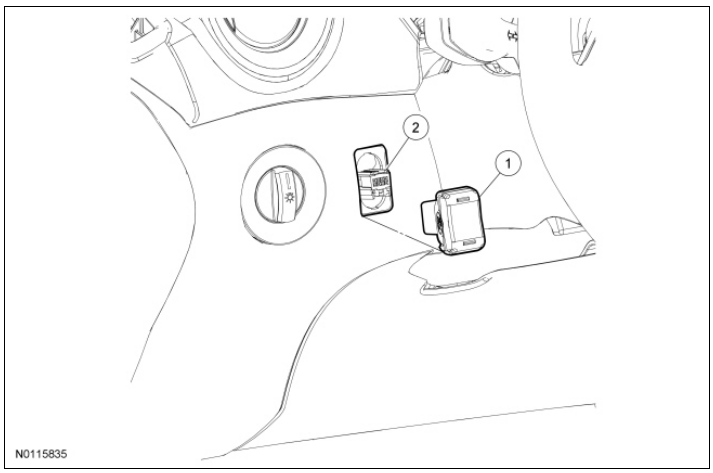
Component	Connector-Pin/ Circuit	Connector-Pin/ Circuit
Instrument panel dimmer switch	C2298-2 CLN04 (BU/BN)	C2298-1 GD115 (BK/GY)
Headlamp switch	C205-1 CLN04 (BU/BN)	C205-8 GD115 (BK/GY)
Front Controls Interface Module (FCIM)	C2402-3 CLN04 (BU/BN)	C2402-5 GD115 (BK/GY)
HVAC module	C228A-6 CLN04 (BU/BN)	C228A-13 GD115 (BK/GY)
Floor shifter	C3245-4 CLN04 (BU/BN)	C3245-5 GD115 (BK/GY)
Driver heated seat switch	C2400-5 CLN04 (BU/BN)	C2400-4 GD115 (BK/GY)
Passenger heated seat/ambient lighting switch	C2401-5 CLN04 (BU/BN)	C2401-4 GD115 (BK/GY)
Start/stop switch	C2195-6 CLN04 (BU/BN)	C2195-1 GD115 (BK/GY)

- **Is the voltage greater than 10 volts?**

Yes
INSTALL a new component in question. TEST the system for normal operation.

No
REPAIR the ground circuit in question for an open. TEST the system for normal operation.

Instrument Panel Dimmer Switch



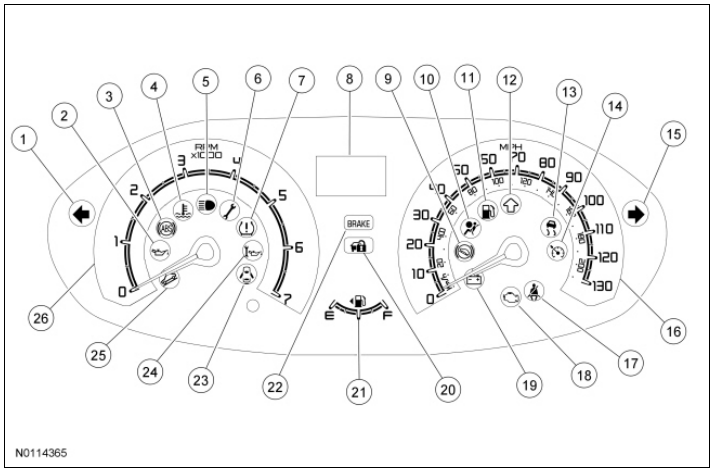
Item	Part Number	Description
1	11691	Instrument panel dimmer switch
2	-	Instrument panel dimmer switch electrical connector (part of 14K024)

Removal and Installation

1. Using a suitable non-marring tool, pry the dimmer switch from the instrument panel.
    - Disconnect the electrical connector.

2. To install, reverse the removal procedure.

Instrument Panel Cluster (IPC)



Item	Part Number	Description
1	-	LH turn indicator
2	-	Low engine oil pressure warning indicator
3	-	ABS warning indicator
4	-	Engine over-temperature warning indicator
5	-	High beam indicator
6	-	Powertrain malfunction (wrench) warning indicator
7	-	Tire Pressure Monitoring System (TPMS) warning indicator (Note that the TPMS warning indicator is the only indication on this vehicle. There are no additional warnings for low tire pressure.)
8	-	Odometer display area
9	-	Hill start assist indicator
10	-	Air bag warning indicator
11	-	Low fuel warning indicator
12	-	Upshift indicator
13	-	Traction control indicator
14	-	Cruise control indicator
15	-	RH turn indicator
16	-	Speedometer
17	-	Safety belt warning indicator
18	-	Malfunction Indicator Lamp (MIL)
19	-	Charging system warning indicator
20	-	Anti-theft indicator
Fuel gauge		

22	-	Brake warning indicator
23	-	Door ajar warning indicator
24	-	Oil change minder
25	-	Overdrive off
26	-	Tachometer

The Instrument Panel Cluster (IPC) contains gauges, informational indicators, warning indicators and an integrated circuit display designed to provide the driver with system status and to alert the driver when certain conditions exist in the vehicle.

The integrated circuit display, located in the top center of the IPC , uses a 3-line Liquid Crystal Display (LCD) of basic informational items such as the odometer, trip odometer, gear position display, Distance To Empty (DTE), average fuel economy and outside air temperature.

Gauges

Gauges inform the driver of the status of systems. The systems that use gauges are as follows:

- Engine rpm
- Fuel level
- Vehicle speed

Transport Mode

The vehicle is placed in a transport mode at the completion of production to reduce the drain on the battery. Various systems may be altered in how they operate or are disabled when in the transport mode. The vehicle automatically reverts to normal operation after 80 km (50 miles). To disable or turn off the transport mode, carry out the following within 10 seconds:

- Verify the battery is fully charged.
- With ignition in RUN, press brake pedal 5 times.
- Press hazard switch 4 times (on, off, on, off).

Informational Indicators/Warning Indicators

Informational indicators inform the drivele conditions. Warning indicators inform the driver of conditions that could potentially cause personal injury or alter vehicle performance.

Hardwired Inputs

The hardwired inputs are provided from the following systems or components:

- Accelerator Pedal Position (APP) sensor
- A/C request switch
- Ambient temperature sensor
- Brake fluid level switch
- Evaporator temperature sensor
- Clutch pedal switch
- Cruise control switch
- Fuel pump module
- Message center switch (located in the multifunction switch)
- Network communications High Speed Controller Area Network (HS-CAN) and Medium Speed Controller Area Network (MS-CAN)
- Park detect switch

- Parking brake switch
- Passive Anti-Theft System (PATS) transceiver

Network Messaged Inputs

Module messaging has increased over time and has become the standard for sending and receiving information required to operate the IPC . For a complete list of module messages with the message origination sources, refer to Section 418-00 .

The following is a partial list of status and information messages the IPC requires from other vehicle inputs:

- ABS
  - ♦ ABS braking
  - ♦ Stability/traction control
- Chassis
  - ♦ Electronic Power Assist Steering (EPAS)
  - ♦ Tire Pressure Monitoring System (TPMS)
- Lighting system
  - ♦ LH/RH turn
  - ♦ High beam
- Powertrain
  - ♦ Charging system
  - ♦ Cruise control system
  - ♦ Engine emission system
  - ♦ Engine oil pressure
  - ♦ Engine rpm
  - ♦ Engine temperature
  - ♦ Overdrive status
  - ♦ Hill start assist status
  - ♦ Oil life
  - ♦ Tow haul status
  - ♦ Transaxle range
  - ♦ Transaxle upshift (manual transaxle)
  - ♦ Transaxle fault
  - ♦ Vehicle speed
- Security/safety
  - ♦ Door ajar
- Supplemental Restraint System (SRS)
  - ♦ Air bag
  - ♦ Safety belt/Belt-Minder®

Information And Message Center

The message center consists of the following:

- Instrument Panel Cluster (IPC)
- Front Control/Display Interface Module (FCDIM)

The message center is integrated into the FCDIM , which displays message center warning messages, message center warning indicators and audio information. The message center displays are controlled by the IPC through messages sent to the FCDIM over the High Speed Controller Area Network (HS-CAN) communication bus. The message center constantly monitors different vehicle systems and displays all warnings and message center functions in the FCDIM . The message center notifies the driver of potential vehicle concerns by displaying a warning message pertaining to the system in which a fault has been detected.

Oil Change Minder

The message center provides an oil change minder to inform the driver that an oil change is required. The calculated interval between oil changes is based on mileage and time. The interval for the oil change minder is 16,093 km (10,000 miles) or 1 year. The oil change minder can be reset by the driver. Refer to Message Center Configuration in this section.

Message Center Indicators

The FCDIM displays message center indicators along with warning messages. Many of the message center indicators use the same or similar iconic representations that are used in the IPC as informational or warning indicators. For example: the door ajar message center warning indicator is represented by the same door ajar symbol used in the IPC . The message center indicators are displayed along with warning messages and may also be accompanied by a warning chime.

System Warning Messages

The system warning messages alert the operator to possible concerns or malfunctions in the vehicle operating systems. The warning messages that are displayed in the message center are as follows:

Body

- AIR BAG MALFUNCTION SERVICE NOW
- ALARM SYSTEM MALFUNCTION NEXT SERVICE
- ALARM TRIGGERED CHECK VEHICLE
- DRIVER DOOR OPEN
- DRIVER'S REAR DOOR OPEN
- HOOD OPEN
- PASSENGER DOOR OPEN
- PASSENGER REAR DOOR OPEN
- TRUNK OPEN

Chassis

- ABS MALFUNCTION SERVICE NOW

- BRAKE FLUID LEVEL LOW SERVICE NOW
- BRAKE SYSTEM MALFUNCTION STOP SAFELY
- STEERING ASSIST FAULT SERVICE NOW
- TCS OFF

Intelligent Access (IA)

- KEY BATTERY LOW REPLACE BATTERY
- KEY NOT DETECTED
- TURN IGNITION OFF USE POWER BUTTON
- KEY OUTSIDE CAR
- TO START PRESS BRAKE
- CLOSE TRUNK OR USE SPARE KEY
- TO START PRESS CLUTCH
- IMMOBILIZER MALFUNCTION SERVICE NOW
- TO START PRESS BRAKE
- VEHICLE NOT IN PARK SELECT P
- TO START SELECT N
- TO START SELECT N OR P

Powertrain

- DOOR OPEN APPLY BRAKE
- ENGINE OIL CHANGE NEXT SERVICE
- ENGINE OIL PRESSURE LOW STOP SAFELY
- ENGINE MALFUNCTION SERVICE NOW
- TRANSMISSION HOT STOP OR SPEED UP
- TRANSMISSION HOT STOP SAFELY
- TRANSMISSION MALFUNCTION SERVICE NOW
- TRANSMISSION HOT WAIT 1 MINUTE
- TRANSMISSION HOT WAIT XX MINUTES
- TRANSMISSION HOT WAIT...
- TRANSMISSION READY
- USE BRAKE TO STOP SAFELY

Warning Chimes

The warning chimes provide the driver with an audible warning that acts as a supplemental alert to the Instrument Panel Cluster (IPC) indication and message center warnings. The IPC controls all warning chimes based on messages received from external modules.

The warning chime system consists of the following:

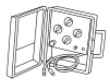
- IPC
- Safety belt warning indicator switch(es)
- Door ajar switch(es)
- Headlamp switch
- Key-in-ignition warning switch (without Intelligent Access (IA))
- Parking brake warning indicator switch
- Body Control Module (BCM)

The following chimes are controlled by the IPC :

- Belt-Minder®
- Door ajar
- Headlamps on
- Key-in-ignition
- Parking brake applied
- Safety belt warning
- Turn signal/hazard

Instrumentation, Message Center and Warning Chimes

Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST1388-A	Instrument Gauge System Tester 014-R1063 or equivalent
 ST2834-A	Vehicle Security Module (VSM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent

Principles of Operation

NOTE: Whenever a network message is suspected as missing or confirmed by a missing message DTC (U-code), it is important to look for other conditions that may also be present in the Instrument Panel Cluster (IPC) and throughout the vehicle. Once a DTC sets in the IPC , 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 problems.

The IPC uses input messages from other modules to control the gauges, informational indicators, warning indicators, message center and warning chimes 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 illuminated, the indicator remains in the on state until the next good message is received. If the message remains missing or invalid for more than 5 seconds, the IPC 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. Refer to the normal operation descriptions located before each individual pinpoint test for further description of the default action specific to each indicator or gauge. If the messaged input to the IPC returns at any time, the normal function of the gauge or indicator resumes.

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 communication network to another module.
- which module controls the output of the feature.

Instrument Panel Cluster (IPC)

The IPC utilizes a microprocessor to control the gauge and indicator functions. Data is sent to the IPC over the Medium Speed Controller Area Network (MS-CAN) and the High Speed Controller Area Network (HS-CAN) bus lines and through hardwired circuitry from individual components. The IPC uses each input to output an action to the gauges or indicators.

IPC Gateway Function

The IPC acts as a gateway module by receiving information in one format and transmitting it to other modules using another format. For example, the IPC receives the vehicle speed data from the PCM over the HS-CAN , converts the data into an MS-CAN message and sends (gateways) the message to other network modules such as the Body Control Module (BCM). This enables network communication between modules that do not communicate using the same network (HS-CAN or MS-CAN).

IPC Configuration

The IPC contains items that are configurable. Configurable items include customer preference items, which can be set with a scan tool. The remaining items can be set only through the Programmable Module Installation (PMI) procedure using As-Built data. Refer to Section 418-01 .

NOTE: When installing a new IPC , it is necessary to upload the module configuration to the scan tool. Following installation of the IPC download the module configuration from the scan tool into the new IPC . It is also necessary to carry out key programming and parameter reset whenever a new IPC or PCM is installed. Refer to Section 419-01B .

IPC Configuration Parameters

Customer Preference	As-Built Parameter	
TD>	Engine start up	
Cruise control	Informational	3 seconds
Door ajar	Informational	No prove-out
Engine over-temperature	Warning	3 seconds
High beam	Informational	No prove-out
Low engine oil pressure	Warning	Engine start up
Low fuel	Informational	3 seconds
Malfunction Indicator Lamp (MIL)	Warning	Engine start up
Overdrive off	Informational	No prove-out
RH/LH turn signals	Informational	No prove-out
Safety belt	Warning	60 seconds if the safety belt is unbuckled, turns off when the safety belt is buckled (controlled by the Restraints Control Module (RCM))

Tire Pressure Monitoring System (TPMS)	Warning	3 seconds
Traction control	Informational	3 seconds (controlled by the ABS module)
Upshift	Informational	3 seconds

Information and Message Center

The message center is integrated into the Front Control/Display Interface Module (FCDIM). The message center is controlled by the IPC and acts upon much of the same information that is input and used to operate the IPC gauges, informational indicators, and warning indicators. The FCDIM receives the message center display information from the IPC over the MS-CAN communication bus.

Whenever conditions are present that require a warning message, the message center replaces the last selected display with the new warning message. Once the message is reset or cleared, the message center returns to the last selected display. If multiple warnings are present, the message center displays each warning for approximately 4 seconds. Warning messages are also generally associated with other observable IPC indications. For example, when the LH front door is opened, the message center displays the message DRIVER DOOR AJAR along with the door ajar warning indicator. This allows the message center to be a more informative supplement to the IPC gauges and indicators.

Warning Chimes

The IPC uses inputs that are both hardwired to individual components and messages that are sent from other modules over the HS-CAN or MS-CAN to control the warning chime functions.

Warning Chime Characteristics

Each warning chime has unique characteristics that help identify and differentiate one warning chime from another. The warning chimes use volume, chime frequency, length of time the chime sounds and the number of chime tones to identify which chime is sounding. The IPC prioritizes the chimes according to a preset hierarchy programmed into the IPC software. Generally, when more than one chime request is received by the IPC , the most important chime sounds. If a lower priority chime is currently sounding, the higher priority request takes over and replaces the lower priority chime.

There are 3 different chimes as listed below:

- Repetitive
- Single tone
- Tick-tock

The following table provides a summary of the chime characteristics including the chime priority:

IPC Chime Characteristics

Chime Name	Chime Type	Condition Description
Belt-Minder® A and B	Repetitive	Belt-Minder® A is a repetitive on/off chime tone sequence that sounds for as long as the IPC receives the Belt-Minder® chime request.

		Belt-Minder® B is a repetitive on/off chime tone sequence that increases the tone frequency and duration of the tone. On for as long as the IPC receives the Belt-Minder® chime request.
Door ajar	Single tone	A single on/off chime tone that sounds whenever the IPC receives a door ajar message.
Headlamps on	Repetitive	A repetitive on/off chime tone sequence that sounds for as long as the headlamps are on and the IPC receives the chime on command.
Key-in-ignition	Repetitive	A repetitive on/off chime tone sequence that sounds for as long as the key is in the ignition (without Intelligent Access (IA)) or with the ignition in the off state and the transaxle range selector out of park (with IA) with the door ajar and IPC receives the chime on command.
Parking brake on	Repetitive	A repetitive on/off chime tone sequence that sounds for as long as the parking brake is applied and the IPC receives the chime on command.
Safety belt	Repetitive	A series of 4 on/off chime tone sequences that sound when the safety belt is unbuckled and the IPC receives the chime on command.
Turn signal/hazard	Tick-tock	Repetitive tick-tock sound for as long as the RH or LH turn signal, or hazard lamps are on and the IPC receives the chime on command.

Belt-Minder®

The Belt-Minder® is configurable. To configure the Belt-Minder®, refer to Belt-Minder® Deactivating/Activating in this section.

The Belt-Minder® feature supplements the current safety belt warning function and is enabled after the current safety belt warning is complete. The Belt-Minder® informs the driver that the driver or front passenger safety belt is unbuckled by intermittently and simultaneously sounding a chime and illuminating the safety belt warning indicator in the IPC once the vehicle speed has exceeded 9.7 km/h (6 mph). The Belt-Minder® remains active for 5 minutes from the time it is started. While activated, the Belt-Minder® chime provides a series of 6 chimes/safety belt warning indicator flash sequences, which consist of a 1-second chime tone and safety belt warning indicator on/off state. The Belt-Minder® chime and the safety belt warning indicator sound and flash for 6 seconds, then the chime stops and the safety belt warning indicator remains on for 30 seconds. The IPC repeats the chime cycle for 5 minutes.

If the vehicle speed drops below 4.8 km/h (3 mph) once the Belt-Minder® chime has activated, the chime turns off and the safety belt warning indicator remains on. When the vehicle speed exceeds 9.7 km/h (6 mph) again, the Belt-Minder® chime resumes.

The Belt-Minder® warning chime inputs are the:

- Ignition state.
- Safety belt warning request communicated by the RCM to the IPC through the HS-CAN .
- Belt-Minder® chime request communicated by the RCM to the IPC through the HS-CAN .

Safety Belt Warning Chime

The safety belt warning chime warns that the driver safety belt is not fastened and sounds when the driver safety belt is not fastened, the ignition is transitioned from the OFF/LOCK or ACC state to the RUN or START state.

The safety belt warning chime stops sounding when the safety belt is fastened, the ignition is transitioned from the RUN or START state to the OFF/LOCK or ACC state, or the chime has sounor approximately 6

seconds.

The safety belt warning chime inputs are the:

- Ignition state.
- Driver safety belt warning request communicated by the RCM to the IPC through the HS-CAN .
- Driver safety belt warning chime request communicated by the RCM to the IPC through the HS-CAN .

Door Ajar Warning Chime

The door ajar warning chime warns that a door is open or not fully closed. The chime sounds when any door, or the luggage compartment lid becomes ajar while the ignition is in the RUN state.

The door ajar warning chime stops sounding and resets when all of the doors and the luggage compartment lid are closed, or the ignition is placed in the OFF/LOCK or ACC state.

The door ajar warning chime inputs are the:

- Ignition state.
- Door ajar data communicated by the BCM to the IPC through the MS-CAN .

Headlamps On Warning Chime

The headlamps on warning chime sounds if the driver door is ajar, the headlamp switch is in the PARK or HEADLAMP position, and the ignition is in the OFF/LOCK state with the key removed (IA only).

The headlamps on warning chime stops sounding when any one of the above conditions are removed or the battery saver has expired.

The headlamps on warning chime inputs are the:

- Ignition state.
- Door ajar input from the driver door ajar switch to the BCM .
- Headlamp switch input to the BCM .
- Headlamps on chime request communicated by the BCM to the IPC through the MS-CAN .

Key-In-Ignition Warning Chime

On vehicles without IA , the key-in-ignition warning chime warns that the key is still in the ignition when the driver door is ajar. On vehicles with IA , the key-in-ignition warning chime sounds when the ignition is in the ON state with the door ajar.

On vehicles with IA and a automatic transaxle, the key-in-ignition warning chime is also used when the ignition is in the OFF mode with the transaxle range selector out of park. The message center displays a warning message and the chime sounds.

The key-in-ignition warning chime inputs are:

- Ignition state.
- Key-in-ignition chime request to the IPC from the BCM over the MS-CAN (without IA).
- Key-in-ignition chime request to the IPC from the Remote Function Actuator (RFA) module over the MS-CAN (with IA).
- Door ajar input to the BCM .

Parking Brake Warning Chime

The parking brake warning chime warns that the parking brake is engaged when the vehicle is in motion. The parking brake warning chime sounds if the ignition is in the ON state, the parking brake is engaged, and the vehicle speed is greater than 4.8 km/h (3 mph).

The parking brake warning chime stops sounding and resets if the parking brake is released, the ignition is not in the ON state, if the vehicle speed is less than 4.8 km/h (3 mph), or after 90 seconds from the time the chime is activated.

The parking brake warning chime inputs are:

- Ignition state.
- Parking brake switch status to the IPC .
- Vehicle speed data communicated by the PCM to the IPC through the HS-CAN .

Turn/Hazard On Tone

The IPC provides a tick-tock tone along with the visual turn signal indicators to indicate that the RH/LH TURN or HAZARD indicators are on.

The turn/hazard on tone inputs are:

- Left turn indicator signal from the BCM to the IPC through the HS-CAN .
- Right turn indicator signal from the BCM to the IPC through the HS-CAN .

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Accessory drive belt • Brake fluid level • Door adjustment • Engine oil level • Engine coolant level • Fuel evaporative system • Fuel tank • Tire pressure • Tire size	• Central Junction Box (CJB) fuse(s): ♦ 3 (7.5A) ♦ 19 (7.5A) ♦ 21 (10A) • Wiring, terminals or connectors • Message center switch • Instrument Panel Cluster (IPC)

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 is in the ON state.
     - The air bag indicator (other indicators may not prove ignition on) confirms ignition ON. If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
   - 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 IPC , Body Control Module (BCM), PCM, ABS module and Restraints Control Module (RCM).

9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart - Instrument Panel Cluster (IPC) , GO to Symptom Chart - Information And Message Center or GO to Symptom Chart - Warning Chimes .

DTC Charts

Instrument Panel Cluster (IPC) DTC Chart

DTC	Description	Action
B101E:01	Air Conditioning Mode Switch: General Electrical Failure	REFER to Section 412-00 .
B1029:11	Accelerator Pedal Sensor: Circuit Short To Ground	FOLLOW the PCM diagnostics in section 3, Powertrain Control Module (PCM) Quick Test, of the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B1029:13	Accelerator Pedal Sensor: Circuit Open	FOLLOW the PCM diagnostics in section 3, Powertrain Control Module (PCM) Quick Test, of the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

B1048:01	Brake Fluid Level Switch: General Electrical Failure	GO to Pinpoint Test M .
B1053:11	Fuel Tank Level Sensor: Circuit Short To Ground	GO to Pinpoint Test B .
B1053:13	Fuel Tank Level Sensor: Circuit Open	GO to Pinpoint Test B .
B10BD:01	Multifunctional Switch: General Electrical Failure	GO to Pinpoint Test AE .
B10D5:94	PATS Antenna: Unexpected Operation	REFER to Section 419-01B .
B10D7:05	PATS Key: System Programming Failure	REFER to Section 419-01B .
B10D7:51	PATS Key: Not Programmed	REFER to Section 419-01B .
B10D7:81	PATS Key: Invalid Data Signal Received	REFER to Section 419-01B .
B10D7:87	PATS Key: Missing Message	REFER to Section 419-01B .
B10D7:94	PATS Key: Unexpected Operation	REFER to Section 419-01B .
B10D8:00	PATS Key Less Than Minimum Programmed: No Sub Type Information	REFER to Section 419-01B .
B10DA:51	PATS PCM Identifier: Not Programmed	REFER to Section 419-01B .
B10DA:62	PATS PCM Identifier: Signal Compare Failure	REFER to Section 419-01B .
B1A14:11	RCM Warning Lamp: Circuit Short To Ground	CLEAR the DTC. REPEAT the self-test. If DTC B1A14:11 returns, INSTALL a new Instrument Panel Cluster (IPC). REFER to Instrument Panel Cluster (IPC) . TEST the system for normal operation.
B1A14:13	RCM Warning Lamp: Circuit Open	CLEAR the DTC. REPEAT the self-test. If DTC B1A14:13 returns, INSTALL a new IPC . REFER to Instrument Panel Cluster (IPC) . TEST the system for normal operation.
B1A68:11	Ambient Temperature Sensor: Circuit Short To Ground	GO to Pinpoint Test AD .
B1A68:13	Ambient Temperature Sensor: Circuit Open	GO to Pinpoint Test AD .
B1A84:41	Car Configuration Data: General Checksum Failure	CARRY OUT Programmable Module Installation (PMI) (when the original module is not available). REFER to Section 418-01 . TEST the system for normal operation.
B1A84:51	Car Configuration Data: Not Programmed	CARRY OUT PMI (when the original module is not available). REFER to Section 418-01 . TEST the system for normal operation.
B1B71:11	Evaporator Temperature Sensor: Circuit Short To Ground	REFER to Section 412-00 .
B1B71:13	Evaporator Temperature Sensor: Circuit Open	REFER to Section 412-00 .
P0565:01	Cruise Control ON Signal: General Electrical Failure	REFER to Section 419-03 .

P0566:01	Cruise Control OFF Signal: General Electrical Failure	REFER to Section 419-03 .
P0567:01	Cruise Control RESUME Signal: General Electrical Failure	REFER to Section 419-03 .
P0568:01	Cruise Control SET Signal: General Electrical Failure	REFER to Section 419-03 .
P0569:01	Cruise Control COAST Signal: General Electrical Failure	REFER to Section 419-03 .
P0579:01	Cruise Control Multi-Function Input A Circuit Range/Performance: General Electrical Failure	REFER to Section 419-03 .
P0581:13	Cruise Control Multi-Function Input A Circuit High: Circuit Open	REFER to Section 419-03 .
P0704:01	Clutch Switch Input Circuit: General Electrical Failure	REFER to Section 419-03 .
P081C:01	Park Input Circuit: General Electrical Failure	GO to Pinpoint Test AG .
P1536:01	Parking Brake Switch Circuit: General Electrical Failure	GO to Pinpoint Test M .
P1572:01	Brake Pedal Switch Circuit: General Electrical Failure	REFER to Section 419-03 .
P1607:81	MIL Output Circuit: Invalid Serial Data Received	DTC P1607:81 sets when the IPC receives invalid network data from the PCM. 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 and Section 419-10 for navigation of all DTCs. TEST the system for normal operation.
P1607:87	MIL Output Circuit: Missing Message	GO to Pinpoint Test AM .
U0100:00	Lost Communication With ECM/PCM "A": No Sub Type Information	GO to Pinpoint Test AM .
U0101:00	Lost Communication With TCM : No Sub Type Information	GO to Pinpoint Test AN .
U0121:00	Lost Communication With Anti-Lock Brake System (ABS) Control Module: No Sub Type Information	GO to Pinpoint Test AO .
U0131:00	Lost Communication With Power Steering Control Module: No Sub Type Information	GO to Pinpoint Test AP .
U0140:00	Lost Communication With Body Control Module: No Sub Type Information	GO to Pinpoint Test AQ .

U0151:00	Lost Communication With Restraints Control Module: No Sub Type Information	GO to Pinpoint Test AR .
U0214:00	Lost Communication With Remote Function Actuation: No Sub Type Information	GO to Pinpoint Test AS .
U0257:00	Lost Communication With Front Controls / Display Interface Module: No Sub Type Information	GO to Pinpoint Test AT .
U0401:68	Invalid Data Received From ECM/PCM "A": Event Information	DTC U0401:68 sets when the IPC receives invalid network data from the PCM for the vehicle speed, engine rpm, engine temperature or odometer count input. 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 and Section 419-10 for navigation of all DTCs. TEST the system for normal operation.
U2023 (this may display as DTC U0427:68)	Fault Received From External Node (this may display Invalid Data Received From Vehicle Security Module: Event Information)	DTC U2023 (U0427:68) sets when the IPC receives invalid network data from the Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) for the Tire Pressure Monitoring System (TPMS) input. RETRIEVE and REPAIR all non-network DTCs in the TPM / VSM and other modules on the network. REFER to Section 204-04 for navigation of all DTCs. TEST the system for normal operation.
U2101:00	Control Module Configuration Incompatible: No Sub Type Information	DTC U2101:00 sets when the IPC configuration does not match the configuration of the other vehicle modules. DETERMINE which module was recently installed and CARRY OUT Programmable Module Installation (PMI) (when the original module is not available) for that specific module. REFER to Section 418-01 . TEST the system for normal operation.
U2104:01	Trip Meter Reset Button: General Electrical Failure	CLEAR the DTC. REPEAT the self-test. If DTC U2104:01 is still present, INSTALL a new IPC . REFER to Instrument Panel Cluster (IPC) . TEST the system for normal operation.
U3000:00	Control Module: No Sub Type Information	CLEAR the DTC. REPEAT the self-test. If DTC U3000:00 returns, INSTALL a new IPC . REFER to Instrument Panel Cluster (IPC) . TEST the system for normal operation.
U3006:16	Control Module Input Power "A": Circuit Voltage Below Threshold	GO to Pinpoint Test AU .
U3006:17	Control Module Input Power "A": Circuit Voltage Above Threshold	GO to Pinpoint Test AV .
U3010:01	Ignition Input Start: General Electrical Failure	GO to Pinpoint Test AW .

PCM DTC Chart

DTC	Description	Action
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, GO to Pinpoint Test B .
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, GO to Pinpoint Test B .
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, GO to Pinpoint Test B .
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, GO to Pinpoint Test B .
All other DTCs	-	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B10F1:23	Key In Switch:ignal Stuck Low	GO to Pinpoint Test AI .
All other DTCs	-	REFER to Section 419-10 .

Instrument Panel Cluster (IPC) Dealer Test Mode

To enter the IPC dealer test mode, begin with the ignition in the OFF mode. Press and hold the IPC TRIP/RESET button. Place the ignition in the RUN mode and hold the TRIP/RESET button until the display indicates tESt, usually within 3 to 5 seconds. Press the TRIP/RESET button once to advance through each stage of the self-test. To exit the IPC dealer test mode, turn the ignition to the OFF position.

NOTE: The displays listed in the table below use 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 pending on the type of display. For example, DTC xxxx xxxx xxxx may display DTC C0100. Note that there were 12 x's in the display description but only 4 digits in the actual display.

IPC Display	Description
Test	Initial entry display into the dealer test mode.
Gauge	Carries out the gauge sweep of all gauges, then displays the present gauge values.
LED	Illuminates all the microprocessor controlled lamps and LEDs.
Read-Only Memory (ROM) level	Displays the hexadecimal ROM level. For a ROM checksum fault, FAIL displays on the bottom line
Non-Volatile Memory (NVM) target ROM	Displays the hexadecimal ROM level and type as stored in NVM . For an NVM checksum fault is detected, FAIL displays on the bottom line
NVM Electrically Erasable Programmable Read-Only Memory (EEPROM) level	Displays the hexadecimal value for the EEPROM level. For an NVM checksum fault, FAIL displays on the bottom line
Manufacturing date	Displays the hexadecimal coding of the final manufacturing test date.
DTC	Displays DTCs detected in continuous operation not during self-test.
Speed mph	Displays the English speed value being inputs in tenths of mph to the IPC , the speedometer indicates the present filtered speed.
Speed km/h	Displays the metric speed value being inputs in tenths of km/h to the IPC , the speedometer indicates the present filtered speed.
Speedometer	Displays corresponding speedometer gauge driver counts output for present filtered speed.
Engine rpm	Displays the tachometer value being input in rpm to the IPC , tachometer indicates the present filtered rpm.
Tachometer	Displays corresponding tachometer driver counts output for present filtered engine rpm.
Odometer	Displays the odometer rolling count input to the IPC .
Fuel analog/digital input	Displays the present fuel level analog/digital input in decimal. The IPC indicates the present fuel level.
Fuel gauge	Displays corresponding fuel gauge driver counts output for present filtered fuel level.
Fuel flow	Displays the present filtered fuel flow status in decimal (used for Distance To Empty (DTE) calculation).
Fuel percent	Displays the present fuel level percent status in decimal.
Engine temperature	Displays the last temperature gauge input value from the High Speed Controller Area Network (HS-CAN) in degrees C, temperature gauge indicates the present filtered temperature.
Temperature gauge	Displays corresponding temperature gauge driver counts output for present filtered temperature value.
Battery voltage	Displays the present battery monitor reading in volts.
Analog/digital input	Displays hexadecimal value of the analog/digital port input reads.
Personality input	Displays the vehicle configuration for the personality settings.
Port input	Displays hexadecimal value of the digital port reads.
DTE	Displays the calculated DTE .
Average fuel economy	Displays the running average fuel economy in decimal.
Passive Anti-Theft System (PATS)	Displays the current PATS settings.
Manufacturing start date	Displays the hexadecimal manufacturing start date.

Symptom Charts

Symptom Chart - Instrument Panel Cluster (IPC)

Symptom Chart - Information And Message Center

Symptom Chart - Warning Chimes

• The parking brake warning chime is inoperative	• Brake warning indication concern • IPC	• GO to Pinpoint Test AL .
• The turn signal/hazard on tone is inoperative	• Turn signal indication concern • IPC	• VERIFY that the turn signal indicator operates correctly. ♦ If the turn signal indicator does not operate correctly, GO to Pinpoint Test X . ♦ If the turn signal indicator operates correctly, INSTALL a new IPC . REFER to Instrument Panel Cluster (IPC) . TEST the system for normal operation.

Pinpoint Tests

Pinpoint Test A: The Instrument Panel Cluster (IPC) Is Inoperative

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

Normal Operation

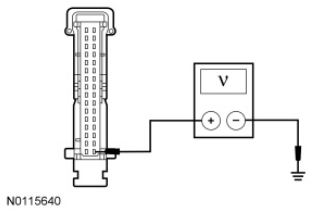
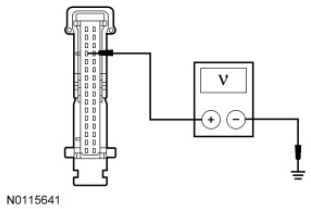
The Instrument Panel Cluster (IPC) receives the ignition RUN state input from Central Junction Box (CJB) fuse 21 (10A). The IPC receives the ignition ACC state input from CJB fuse 19 (7.5A). The IPC receives hot at all times B+ voltage from CJB fuse 22 (7.5A). The IPC is grounded through a single hardwired ground circuit.

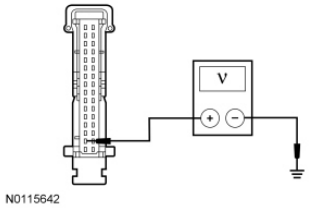
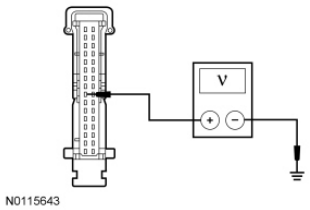
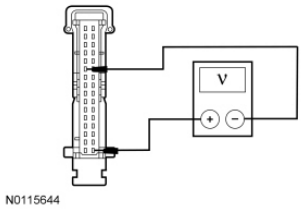
This pinpoint test is intended to diagnose the following:

- Fuse(s)
- Wiring, terminals or connectors
- IPC

PINPOINT TEST A: THE IPC 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
A1 RETRIEVE THE RECORDED DTCs FROM THE IPC SELF-TEST	
• Check for recorded IPC DTCs from the self-test. • **Is DTC U3010:01 recorded?**	**Yes** GO to Pinpoint Test AW . **No** GO to A2 .
A2 CHECK THE IPC B+ VOLTAGE SUPPLY	
• Ignition OFF. • Disconnect: IPC C220. • Measure the voltage between the IPC C220-32, circuit SBP03 (BU/RD), harness side and ground.  N0115640 • **Is the voltage greater than 10 volts?**	**Yes** GO to A3 . **No** VERIFY the CJB fuse 3 (7.5A) is OK. If OK, REPAIR circuit SBP03 (BU/RD) 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.
A3 CHECK THE IPC RUN VOLTAGE SUPPLY	
• Ignition ON. • Measure the voltage between the IPC C220-4, circuit CBP21 (BU/GY), harness side and ground.  N0115641 • **Is the voltage greater than 10 volts?**	**Yes** GO to A4 . **No** VERIFY the CJB fuse 21 (10A) is OK. If OK, REPAIR circuit CBP21 (BU/GY) 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.
A4 CHECK THE IPC ACC VOLTAGE SUPPLY	

• Ignition In ACC. • Measure the voltage between the IPC C220-15, circuit CBP19 (BN/WH), harness side and ground.  N0115642 • **Is the voltage greater than 10 volts?**	**Yes** GO to A5 . **No** VERIFY the CJB fuse 19 (7.5A) is OK. If OK, REPAIR circuit CBP19 (BN/WH) 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.
A5 CHECK THE IPC START VOLTAGE SUPPLY	
• Place the ignition in the START position. • Measure the voltage between the IPC C220-9, circuit CDC54 (WH/GN), harness side and ground.  N0115643 • **Is the voltage greater than 10 volts?**	**Yes** GO to A6 . **No** REPAIR circuit CDC54 (WH/GN) for an open. TEST the system for normal operation.
A6 CHECK THE IPC GROUND CIRCUIT FOR AN OPEN	
• Ignition ON. • Measure the voltage between the IPC C220-32, circuit SBP03 (BU/RD), harness side and the IPC C220-6, circuit GD115 (BK/GY), harness side.  N0115644 • **Is the voltage greater than 10 volts?**	**Yes** GO to A7 . **No** REPAIR circuit GD115 (BK/GY) for an open. TEST the system for normal operation.
A7 CHECK FOR CORRECT IPC OPERATION	

• Disconnect the IPC connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the IPC connector and make sure it seats correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Instrument Panel Cluster (IPC) in this section. 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 B: Incorrect Fuel Gauge Indication

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

Normal Operation

The fuel pump module is hardwired to the Instrument Panel Cluster (IPC) between the fuel level signal circuit and the fuel level signal return circuit. The fuel level sender (float and card) is a variable resistor attached to the fuel pump module that ranges from 180 ohms ± 4 ohms at empty (E) and 10 ohms ± 2 ohms at full (F). The IPC provides a reference voltage to the fuel pump module on the fuel level input circuit. As the fuel level changes, a float actuates a variable resistor on the fuel level sensor card and raises or lowers the fuel level signal voltage depending on the resistance of the fuel level sensor. The IPC monitors the changes in voltage and commands the fuel gauge with a corresponding movement of theointer. If the IPC detects a fault on the fuel level input circuit, fuel level return circuit or the fuel pump module, the IPC defaults the fuel gauge to the empty (E) position and illuminates the low fuel warning indicator.

IPC DTCs

DTC Description	Fault Trigger Conditions
• B1053:11 - Fuel Tank Level Sensor: Circuit Short to Ground	A continuous and on-demand DTC that sets after 33 seconds if the IPC detects that the fuel sender is out of range on the fuel level input circuit with a short to ground. The IPC defaults the fuel gauge to empty (E) once the IPC detects a fault and sets DTC B1053:11.
• B1053:13 - Fuel Tank Level Sensor: Circuit Open	A continuous and on-demand DTC that sets after 33 seconds if the IPC detects that the fuel sender is out of range on the fuel level input circuit with an open or short to voltage. The IPC defaults the fuel gauge to empty (E) once the IPC detects a fault and sets DTC B1053:13.

PCM DTCs

DTC Description	Fault Trigger Conditions
	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

• P0460 - Fuel Level Sensor A Circuit	with the calculated fuel usage.
• P0461 - Fuel Level Sensor A Circuit Range/Performance	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.
• P0462 - Fuel Level Sensor A Circuit Low	Sets when the PCM detects a short to ground on the fuel pump module signal circuit based on the messaged input received from the IPC

Belt-Minder® Deactivating/Activating

Preparation

NOTE: The driver and front passenger Belt-Minder® are deactivated/activated independently. When deactivating/activating one seating position, do nouckle the other position, as this terminates the procedure.

NOTE: The Belt-Minder® can also be deactivated/activated using the scan tool.

1. Before deactivating/activating the Belt-Minder®, set the parking brake (manual transaxle).

2. Place the transmission selector lever in PARK (automatic transaxle).

3. Turn the ignition switch to the OFF position.
   - For vehicles with push-button start, push the start/stop switch to turn the vehicle off completely.

4. Unbuckle the driver and front passenger safety belts.

Deactivating/Activating

1. Turn the ignition switch to the RUN position (do not start the engine).
   - For vehicles with push-button start, push the start/stop switch and release quickly, do not attempt to start the engine.

2. Wait approximately 1 minute until the safety belt warning indicator turns off.

3. **NOTE:** Complete Step 3 within 50 seconds after the safety belt warning indicator turns off.

   NOTE: Buckle and unbuckle the safety belt at a moderate rate. If the safety belt buckle/unbuckle/buckle sequence is carried out too quickly, the Restraints Control Module (RCM) can fail to recognize one of the sequences and the procedure must be repeated.

   To disable the seating position, buckle then unbuckle the safety belt 3 times, ending in the unbuckled state.

   - After Step 3, the safety belt warning indicator illuminates for 3 seconds then turns off.

4. Within 7 seconds of the indicator turning off, buckle then unbuckle the safety belt.
   - If currently enabled this disables the Belt-Minder® feature for that seating position. As confirmation, the safety belt warning indicator flashes 1 time percond for 3 seconds.
   - If currently disabled this enables the Belt-Minder® feature for that seating position. As confirmation, the safety belt warning indicator flashes 4 times per second for 3 seconds, followed by 3 seconds with the indicator ff, then followed by the safety belt warning indicator flashing 1 times per second for 3 seconds again.

Message Center Configuration

Oil Life Reset

NOTE: This procedure resets the oil life telltale in the Instrument Panel Cluster (IPC), and the oil change reminder message in the message center display.

1. Press the brake and accelerator pedals at the same time.
   - For vehicles with push button start, press accelerator pedal only.

2. Turn ignition switch to RUN position (do not start the engine).
   - For vehicles with push button start, push the start/stop button and release quickly. While holding accelerator pedal, depress brake pedal.

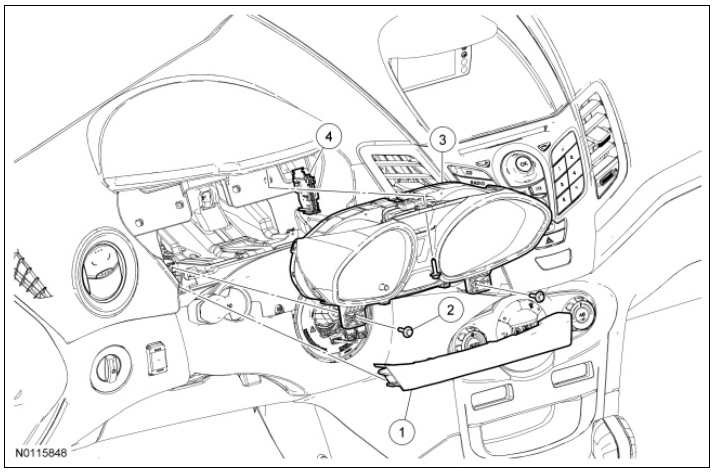
3. Keep the pedals fully depressed for a minimum of 20 seconds.

4. Rotate the key to the OFF position.
   - For vehicles with push-button start, push the start/stop button to turn the vehicle off completely.

5. Start the vehicle. Make sure that the oil life telltale is not illuminated in the IPC , and the oil change reminder message is no longer displayed in the message center.

Instrument Panel Cluster (IPC)

NOTE: Steering wheel removed for clarity.



Item	Part Number	Description
1	-	IPC finish panel
2	W707628	IPC screws (3 required)
3	10849	IPC
4	-	IPC electrical connector (part of 14K024)

Removal

NOTE: If installing a new Instrument Panel Cluster (IPC), all vehicle keys are erased during the parameter reset procedure. Verify at least 2 of the vehicle keys are available prior to carrying out this procedure.

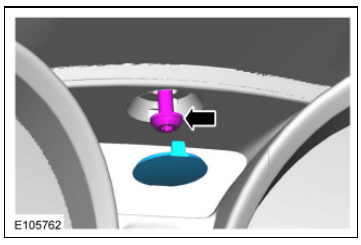
NOTE: If a new non-Intelligent Access (IA) IPC is installed, the IPC and the PCM require a parameter reset to allow the IPC and the PCM to recognize each other. Failure to carry out the parameter reset to the IPC and the PCM may result in a no start condition.

start="1">

- If installing a new IPC , upload the IPC configuration information to the scan tool. For additional information, refer to Programmable Module Installation (PMI) in Section 418-01 .

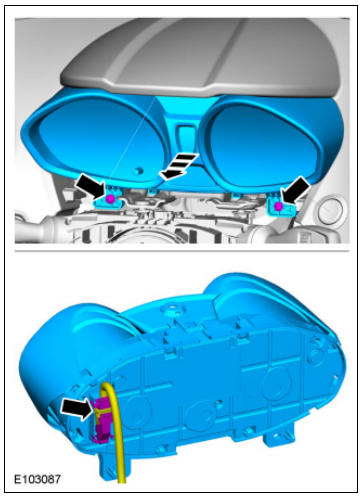
2. Lower the tilt steering column to the lowest setting.

3. Remove the IPC center bolt cover and bolt.



4. Position back the instrument cluster finish panel.

5. Remove the two lower IPC bolts and the IPC .
    - Disconnect the electrical connector.

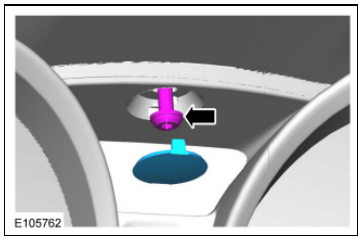


Installation

1. Position the IPC in the instrument panel, connect the electrical connector and install the 2 lower IPC screws.

2. Reposition the instrument cluster finish panel.

3. Install the IPC center bolt cover and bolt.



4. If installing a new IA IPC remove relay R7 from the Central Junction Box (CJB) and jumper pins 3 and 5 together. Download the IPC configuration information from the scan tool into the new IPC . For additional information, refer to PMI in Section 418-01 .
    - After configuration, remove the jumper and reinstall relay R7.

5. If installing a new non- IA IPC , carry out the parameter reset procedure. For additional information, refer to Section 418-01 .

6. If installing a new non- IA IPC , carry out the key programming procedure. For additional information, refer to Section 419-01B .

Torque Specifications

Description	Nm	lb-in
Horn bracket bolt	9	80

Horn

The horn system consists of the following components:

- Body Control Module (BCM)
- Clockspring
- Driver air bag module
- Horn relay (integral to the BCM)
- Horn (located below the RH headlamp and behind the RH fender)

Horn

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 NUD105-R025D or equivalent

Principles of Operation

The Battery Junction Box (BJB) supplies the switched and control voltage to the horn relay (part of the Body Control Module (BCM)). When the driver air bag module is pressed, the horn switch (which is integrated into the driver air bag module) is closed and ground is supplied to the BCM which is routed through the clockspring. The horn relay then energizes, sending voltage to the horn, enabling the horn to sound.

The horn switch is not a single component, but consists of contact points located on the steering wheel and driver air bag module. The contact points are separated by springs. One set of contacts is part of the steering wheel itself and the other set is part of a metal plate mounted to the rear of the driver air bag module. Springs mounted to the metal plate are isolated by plastic seats on the steering wheel. When the driver air bag module is pressed against the steering wheel, the contacts on the driver air bag module and the steering wheel touch to complete the circuit.

Anti-Theft Horn

On vehicles equipped with perimeter alarm, the vehicle has a separate anti-theft horn. Refer to Section 419-01A , for information on the perimeter alarm and anti-theft horn.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical

• Horn	• Battery Junction Box (BJB) fuse 32 (20A) • Wiring, terminals or connectors

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 Horn Is Inoperative

Refer to Wiring Diagrams Cell 44 , Horn/Cigar Lighter for schematic and connector information.

Normal Operation

When the driver air bag module is pressed, the normally open horn switch (which is part of the driver air bag module) is closed and ground is routed through the clockspring to the horn relay, energizing the horn relay. The Battery Junction Box (BJB) supplies the switched and control voltage to the horn relay, which is integrated into the Body Control Module (BCM). The horn relay then provides voltage to the horn, enabling the horn to sound.

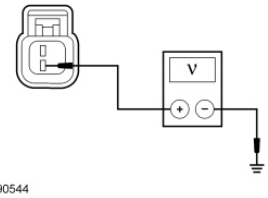
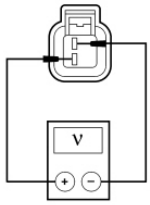
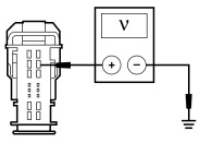
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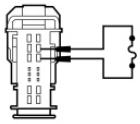
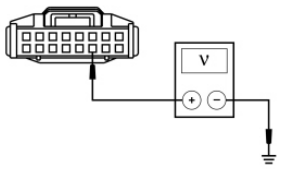
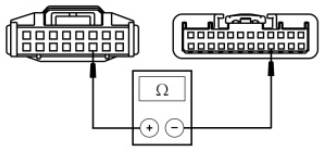
- Fuse
- Wiring, terminals or connectors
- Steering wheel harness
- Horn
- Clockspring
- Driver air bag module
- BCM

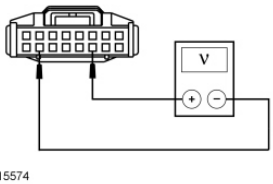
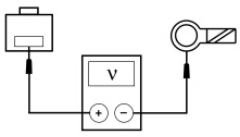
PINPOINT TEST A: THE HORN IS INOPERATIVE

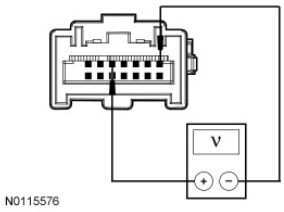
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

Test Step	Result / Action to Take
A1 CHECK FOR VOLTAGE TO THE HORN	

• Ignition OFF. • Disconnect: Horn C131. • While pressing the horn switch, measure the voltage between the horn C131-2, circuit CRH04 (VT/GN), harness side and ground.  N0090544 • **Is the voltage greater than 10 volts?**	**Yes** GO to A2 . **No** GO to A3 .
A2 CHECK FOR VOLTAGE TO THE HORN USING THE CONNECTOR GROUND	
• While pressing the horn switch, measure the voltage between the horn C131-2, circuit CRH04 (VT/GN), harness side and the horn C131-1, circuit GD123 (BK/GY), harness side.  N0013171 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new horn. REFER to Horn in this section. TEST the system for normal operation. **No** REPAIR circuit GD123 (BK/GY) for an open. TEST the system for normal operation.
A3 CHECK FOR VOLTAGE TO THE BCM	
• Connect: Horn C131. • Disconnect: BCM C2280A. • Measure the voltage between the BCM C2280A-2, circuit SBB32 (VT/RD), harness side and ground.  N0115570 • **Is the voltage greater than 10 volts?**	**Yes** GO to A4 . **No** VERIFY the BJB fuse 32 (20A) is OK. If OK, REPAIR circuit SBB32 (VT/RD) 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.
A4 BYPASS THE BCM	

• Connect a fused jumper wire between the BCM C2280A-2, circuit SBB32 (VT/RD), harness side and the BCM C2280A-3, circuit CRH04 (VT/GN), harness side.  N0115571 • **Does the horn sound?**	**Yes** REMOVE the jumper wire. GO to A5 . **No** REMOVE the jumper wire. REPAIR circuit CRH04 (VT/GN) for an open. TEST the system for normal operation.
A5 CHECK FOR VOLTAGE TO THE CLOCKSPRING	
• Connect: BCM C2280A. • Disconnect: Clockspring C218B . • Measure the voltage between the clockspring C218B-11, circuit CRH03 (BN), harness side and ground.  N0115572 • **Is the voltage greater than 10 volts?**	**Yes** GO to A7 . **No** GO to A6 .
A6 CHECK HORN RELAY COIL GROUND CONTROL CIRCUIT FOR AN OPEN	
• Disconnect: BCM C2280E. • Measure the resistance between the clockspring C218B-11, circuit CRH03 (BN), harness side and the BCM C2280E-21, circuit CRH03 (BN), harness side.  N0115573 • **Is the resistance less than 5 ohms?**	**Yes** GO to A10 . **No** REPAIR circuit CRH03 (BN) for an open. TEST the system for normal operation.
A7 CHECK FOR VOLTAGE TO THE CLOCKSPRING USING THE CONNECTOR	

GROUND	
• Measure the voltage between the clockspring C218B-11, circuit CRH03 (BN), harness side and the clockspring C218B-15, circuit GD115 (BK/GY), harness side.  N0115574 • **Is the voltage greater than 10 volts?**	**Yes** GO to A8 . **No** REPAIR circuit GD115 (BK/GY) for an open. TEST the system for normal operation.
A8 CHECK FOR VOLTAGE TO THE HORN SWITCH CONNECTOR	
• Connect: BCM C2280E. • Connect: Clockspring C218B. • Remove the driver air bag module. Refer to Section 501-20B . • Disconnect: Horn Switch C217A. • Disconnect: Horn Switch C217B. • Measure the voltage between the horn switch C217A-1, circuit (RD), harness side and the horn switch C217B-1, circuit (VT), harness side.  N0115575 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new driver air bag module. REFER to Section 501-20B . TEST the system for normal operation. **No** GO to A9 .
A9 CHECK FOR VOLTAGE TO THE CLOCKSPRING	
• Disconnect: Clockspring C218C. • Measure the voltage between the clockspring connector C218C pin 4, component side and the clockspring C218C pin 8 component side.	**Yes** The steering wheel harness has an open circuit. INSTALL a new steering wheel. REFER to Section 211-04 . TEST the system for normal operation. **No** INSTALL a new clockspring. REFER to Section 501-20B . TEST the system for normal operation.

 • **Is the voltage greater than 10 volts?**	
A10 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 B: The Horn Is Always On

Refer to Wiring Diagrams Cell 44 , Horn/Cigar Lighter for schematic and connector information.

Normal Operation

When the driver air bag module is pressed, the normally open horn switch (which is part of the driver air bag module) is closed and ground is routed through the clockspring to the horn relay, energizing the horn relay. The Battery Junction Box (BJB) supplies the switched and control voltage to the horn relay, which is integrated into the Body Control Module (BCM). The horn relay then provides voltage to the horn, enabling the horn to sound. If incorrectly installed, the horn pad can cause the horn switch to be closed at all times.

The Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) is also wired to the horn relay coil controlled circuit. The TPM / VSM sounds the horn during TPMS sensor training.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Steering wheel harness
- Clockspring
- Driver air bag module
- BCM
- TPM / VSM

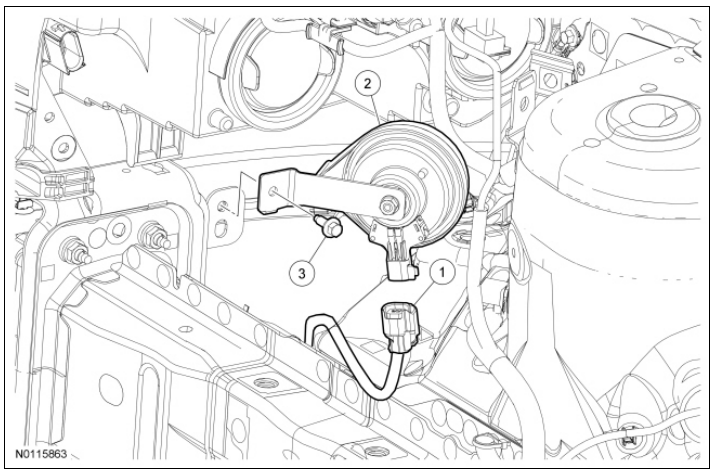
PINPOINT TEST B: THE HORN IS ALWAYS ON

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
B1 CHECK THE HORN SWITCH INPUT TO THE BCM	
• Ignition OFF. • Disconnect: BCM C2280E. • Disconnect: BCM C2280D. • Ignition ON. • **Does the horn continue to sound?**	**Yes** GO to B2 . **No** GO to B3 .
B2 CHECK THE HORN CIRCUIT FOR SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: BCM C2280A. • Ignition ON. • **Does the horn continue to sound?**	**Yes** REPAIR circuit CHR04 (VT/GN) for a short to voltage. TEST the system for normal operation. **No** GO to B7 .
B3 CHECK THE TPM / VSM	
• Ignition OFF. • Connect: BCM C2280E. • Connect: BCM C2280D. • Disconnect: TPM / VSM C4321B. • **Does the horn continue to sound?**	**Yes** GO to B4 . **No** GO to B8 .
B4 CHECK THE HORN SWITCH INPUT CIRCUIT FOR A SHORT TO GROUND	
• Disconnect: Clockspring C218B. • **Does the horn continue to sound?**	**Yes** REPAIR circuit CRH03 (BN) for a short to ground. TEST the system for normal operation. **No** GO to B5 .
B5 CHECK HORN SWITCH	
• Connect: Clockspring C218B. • Remove the driver air bag module. Refer to Section 501-20B . • Disconnect: Horn Switch C217A. • **Does the horn continue to sound?**	**Yes** GO to B6 . **No** INSTALL a new driver air bag module. REFER to Section 501-20B . TEST the system for normal operation.
B6 CHECK THE CLOCKSPRING FOR A SHORT TO GROUND	
• Disconnect: Clockspring C218C. • **Does the horn continue to sound?**	**Yes** INSTALL a new clockspring. REFER to Section 501-20B . TEST the system for normal operation. **No** The steering wheel harness has a short circuit. INSTALL a new steering wheel. REFER to Section 211-04 . TEST the system for normal operation.

B7 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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.
B8 CHECK FOR CORRECT TPM / VSM OPERATION	
• Disconnect all the TPM / VSM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the TPM / VSM 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 TPM module. REFER to Section 204-04 . 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.

Horn



Item	Part Number	Description
1	-	Horn electrical connector (part of 14K012)
2	13832	Horn
2	W702498	Horn bracket bolt

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Disconnect the electrical connector.

3. Remove the horn bracket bolt and the horn.
   - To install, tighten to 10 Nm (89 lb-in).

4. To install, reverse the removal procedure.

General Specifications

Item	Specification
Generator	
Generator pulley ratio	2.62:1
Rating	81 amps @ 750 rpm (min) - 124 amps @ 2,300 rpm (max)
Voltage regulator type	Electronic internal with generator

Torque Specifications

Description	Nm	lb-ft	lb-in
Generator B+ terminal nut	15	-	133
Generator nut	48	35	-
Generator stud bolt	10	-	89
Lower generator bolt	48	35	-
Upper generator bolt	48	35	-

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.

The generator is driven by the accessory drive belt. When the engine is started, the generator begins to generate AC voltage which is internally converted to DC voltage. The DC voltage is controlled by the voltage regulator (located on the rear of the generator) and supplied to the battery. The PCM controls the voltage regulator set point, communicating with the generator internal voltage regulator over a dedicated Local Interconnect Network (LIN) communication circuit.

Principles of Operation

The PCM-controlled charging system, or Smart Charge charging system, determines the optimal voltage setpoint for the charging system and communicates this information to the voltage regulator. The Smart Charge charging system is designed to set 1 of 9 DTCs any time a charging system fault is present. All of the DTCs can set continuous faults, but not all DTCs set as on-demand faults.

DTC	Key ON Engine OFF (KOEO)	Key ON Engine Running (KOER)	Continuous
P065B:09		X	X
P065C:09		X	X
P0A3B:09		X	X
P1794:16	X	X	X
P1794:17	X	X	X
U0120:13	X	X	X
U0469:09		X	X
U3003:16	X	X	X
U3003:17	X	X	X

This system uses a dedicated Local Interconnect Network (LIN) communication circuit. The generator uses this LIN circuit to communicate the desired setpoint from the PCM to the voltage regulator. The generator also uses this LIN circuit to communicate the generator load and error conditions to the PCM.

The PCM simultaneously controls and monitors the output of the generator. When the usage of current is high or the battery is discharged, the PCM raises 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 uses the measurement from the Intake Air Temperature (IAT) sensor to adjust the charging voltage according to the battery temperature. The PCM also uses other inputs to control charging system voltage such as the Vehicle Speed Sensor (VSS) and Engine Coolant Temperature (ECT) sensor. The voltage setpoint is calculated by the PCM and communicated to the voltage regulator by the LIN circuit based on the needs of the vehicle and the operating 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 Panel Cluster (IPC) module. The IPC module controls the charging system warning indication based on the message from the PCM. The IPC module controls the charging system indication based on the message from the PCM, turning it on or off. If equipped with a Front Control/Display Interface Module (FCDIM) (message center), the IPC module displays 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 additional information regarding the IPC module, refer to Section 413-01 . For additional information regarding the FCDIM , refer to Section 415-00 .

Under certain circumstances the charging system may have a concern but still keep the battery charged and the vehicle running. The LIN normally initiates charging from the PCM, but the generator may continue charging when a fault is present on 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 the charging system diagnosis are listed below:

PID Chart

PID	Description	Normal Display	Associated Circuit Name	Connector, Circuit
GENVDSD	Generator Voltage Desired	Voltage varies by vehicle needs - May be controlled by an output state control	-	-
VPWR	Module Supply Voltage	Within 0.5 volt of battery voltage	-	-

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

⚠ 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 or fuses.**

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
• Battery • Front End Accessory Drive (FEAD) belt • Generator pulley	• Wiring, terminals or connectors • Cables • Battery • Generator • Fuses

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 usually sets 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

DTCs	Description	Source	Action
P065B:09	Generator Control Circuit Range/Performance: Component Failure	PCM	INSTALL a new generator. Refer to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
P065C:09	Generator Mechanical Performance: Component Failure	PCM	GO to Pinpoint Test D .
P0A3B:09	Generator Over Temperature: Component Failure	PCM	INSTALL a new generator. Refer to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
P1794:16	Battery Voltage Circuit: Circuit Voltage Below Threshold	PCM	GO to Pinpoint Test B .
P1794:17	Battery Voltage Circuit: Circuit Voltage Above Threshold	PCM	GO to Pinpoint Test A .
U0120:13	Lost Communication with Starter/Generator Control Module: Circuit Open	PCM	GO to Pinpoint Test C .
U0469:09	Invalid Data Received From Starter/Generator Control Module: Component Failure	PCM	INSTALL a new generator. Refer to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	PCM	GO to Pinpoint Test B .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	PCM	GO to Pinpoint Test A .
All other DTCs	-	Various Modules	REFER to the Section 303-14 or the Powertrain Control/Emissions Diagnosis (PC/ED) manual. If directed to this section from another section, GO to Symptom Chart in this section.

Symptom Chart

Symptom Chart

Pinpoint Test

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

Pinpoint Test A: System Voltage High

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

NOTE: DTC P1794:17 or U3003:17 can 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 operates of the various vehicle systems and modules. Many modules monitor this voltage and set a DTC if the voltage exceeds their calibrated setpoint.

- DTC P1794:17 (Battery Voltage Circuit: Circuit Voltage Above Threshold) - Sets when the module senses battery voltage is greater than 16 volts.
- DTC U3003:17 (Battery Voltage: Circuit Voltage Above Threshold) - Sets when the module senses battery voltage is greater than 16 volts.

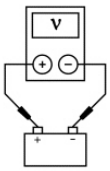
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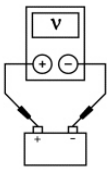
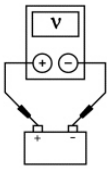
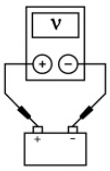
- Wiring, terminals or connectors
- Engine, generator and battery grounds
- Battery
- Generator
- PCM

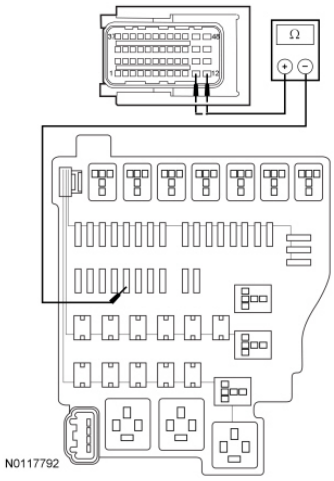
PINPOINT TEST A: SYSTEM VOLTAGE HIGH

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
A1 CHECK BATTERY CONDITION	
• Refer to Section 414-01 and carry out Pinpoint Test A: Battery Condition Test to determine if the battery can hold a charge and is OK for use. • **Does the battery pass the condition test?**	**Yes** GO to A2 . **No** INSTALL a new battery. REFER to Section 414-01 . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
A2 MONITOR PCM PID GENERATOR VOLTAGE DESIRED (GENVDSD)	
• Start the engine. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor the GENVDSD PID. • **Does the GENVDSD PID indicate 15.9 volts or less?**	**Yes** GO to A3 . **No** GO to A8 .
A3 MONITOR PCM PID GENERATOR VOLTAGE DESIRED (GENVDSD)	
• With the engine still running at idle, measure battery voltage and record.  AJ0210-A • Monitor the GENVDSD PID. • **Is battery voltage within ±0.6 volt of the PID GENVDSD?**	**Yes** The fault is not present at this time. 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** GO to A4 .
A4 MONITOR PCM PID GENERATOR VOLTAGE DESIRED (GENVDSD) WHILE COMMANDED	
• Monitor the GENVDSD PID. • Using the active command, set GENVDSD PID to 14 volts. • With the engine still running at idle, measure battery voltage and record.	**Yes** GO to A5 . **No** INSTALL a new generator. REFER to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 AJ0210-A • **Is battery voltage within ±0.6 volt of the PID GENVDSD?**	
A5 CHECK THE GENERATOR OUTPUT	
• Increase engine rpm until generator starts to generate output. • With the engine running, measure battery voltage and record.  AJ0210-A • **Is the voltage greater than 14.5 volts?**	**Yes** INSTALL a new generator. REFER to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to A6 .
A6 COMPARE PCM SUPPLY VOLTAGE (VPWR) PID TO BATTERY VOLTAGE	
• With the engine still running at idle, measure the battery voltage at the battery and monitor the PCM VPWR PID.  AJ0210-A • **Does PCM VPWR PID accurately display battery voltage within ±0.5 volt?**	**Yes** INSTALL a new generator. REFER to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to A7 .
A7 CHECK PCM SUPPLY VOLTAGE CIRCUITS	
• Ignition OFF. • Disconnect: PCM C175B. • Inspect the connector pins for damage. Measure resistance between Battery Junction Box (BJB) fuse 16 (15A), output side and: ♦ PCM C175B-11, circuit CBB16 (BU/GN), harness side.	**Yes** GO to A8 . **No** REPAIR high resistance or loose connections in the affected circuit(s). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

♦ PCM C175B-12, circuit CBB16 (BU/GN), harness side.  • **Are the resistances less than 0.5 ohm?**	
A8 CHECK FOR CORRECT PCM OPERATION	
• Ignition OFF. • Check the PCM harness and component side connectors for: ♦ corrosion. ♦ pushed-out/bent pins. • Connect the PCM and generator, make sure the connectors seat correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new PCM. REFER to Section 303-14 . CLEAR the DTCs. REPEAT the self-test. 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. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Pinpoint Test B: System Voltage Low or Battery is Discharged

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

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 operates the various vehicle systems and modules. Many modules monitor this voltage and set a DTC if the voltage drops below their calibrated setpoint.

- DTC P1794:16 (Battery Voltage Circuit: Circuit Voltage Below Threshold) - Sets when the module senses battery voltage is less than 9 volts.
- DTC P065B:09 (Generator Control Circuit Range/Performance: Component Failure) - Sets when the generator reports an internal regulator failure.
- DTC U3003:16 (Battery Voltage: Circuit Voltage Below Threshold) - Sets when the module senses battery voltage is less than 9 volts.

This pinpoint test is intended to diagnose the following:

- High-current fuse assembly

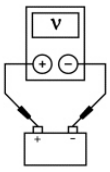
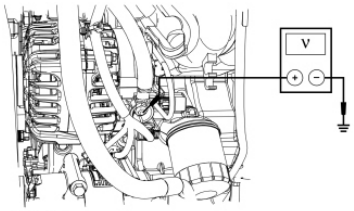
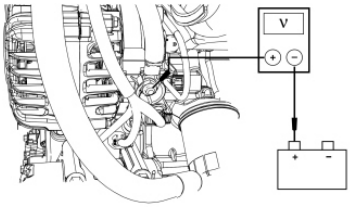
- Abnormal ignition-off current drain(s)
- Engine, generator and battery grounds
- Positive battery cable
- Wiring, terminals or connectors
- Battery
- Generator
- PCM

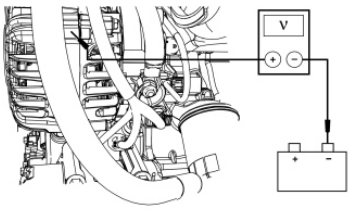
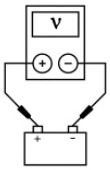
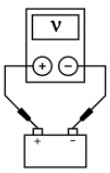
PINPOINT TEST B: SYSTEM VOLTAGE LOW ORRY IS DISCHARGED

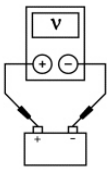
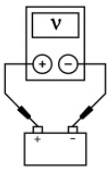
NOTE: Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.

NOTE: Do not have a battery charger attached during vehicle testing.

Test Step	Result / Action to Take
B1 CHECK THE PCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test - PCM. • Check the PCM for DTCs. • **Is DTC P065B:09 present?**	**Yes** INSTALL a new generator. REFER to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to B2 .
B2 CHECK BATTERY CONDITION	
• Refer to Section 414-01 and rry out Pinpoint Test A: Battery Condition Test to determine if the battery can hold a charge and is OK for use. • **Does the battery pass the condition test?**	**Yes** GO to B3 . **No** INSTALL a new battery. REFER to Section 414-01 . TEST the system for normal operation.
B3 CHECK THE GENERATOR CONNECTIONS	
• Ignition OFF. • Inspect generator C102A connection. Connector should be installed correctly and tight. • Inspect generator C102A for bent and/or pushed-out pins. • Inspect generator C102B, B+ circuit SBF01 (RD) connection. The connection should be tight. • Measure the battery voltage.	**Yes** GO to B4 . **No** TIGHTEN or INSTALL a new C102B (B+ nut) or REPAIR connection as needed. REFER to Specifications in this section. VERIFY the high current fuse assembly is OK. If the fuse assembly is OK, REPAIR circuit SBF01 (RD). If the fuse assembly 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.

 AJ0210-A • Measure the voltage between generator C102B, B+ circuit SBF01 (RD) and ground.  N0115310 • **Is the generator C102B connection tight and does the generator B+ measure battery voltage within ±0.5 volt?**	
B4 CHECK THE VOLTAGE DROP IN THE B+ CIRCUIT	
• Start the engine. • With the engine running at idle, headlamps on and blower on high, measure the voltage drop between generator B+ C102B, circuit SBF01 (RD) and the positive battery terminal.  N0115311 • Carry out a wiggle test of the generator wiring and connections while measuring voltage drop. • **Is the voltage drop less than 0.5 volt?**	**Yes** GO to B5 . **No** INSPECT and REPAIR any corrosion in the B+ circuit SBF01 (RD) or positive battery cable connections. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B5 CHECK THE VEHICLE GROUNDS	
• Start the engine. • With the engine running at idle, headlamps on and heater blower on high, measure the voltage drop between the generator housing and the negative battery terminal.	**Yes** GO to B6 . **No** INSPECT and REPAIR the engine ground, generator ground or the battery ground for corrosion. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 N0117821 • **Is the voltage drop less than 0.5 volt?**	
B6 COMPARE PCM SUPPLY VOLTAGE (VPWR) PID	
• Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor PCM VPWR PID. • With the engine still running at idle, headlamps on and blower on high, measure the battery voltage at the battery and monitor the PCM VPWR PID.  AJ0210-A • **Does PCM VPWR PID display battery voltage within ±0.5 volt?**	**Yes** GO to B7 . **No** REPAIR high resistance or loose connections in the affected PCM power circuit(s). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
B7 CHECK PCM GROUND FOR HIGH RESISTANCE	
• Monitor PCM VPWR PID. • With the engine still running at idle, turn off all accessory loads, measure the battery voltage at the battery and note the PCM VPWR PID.  AJ0210-A • With the engine still running at idle, turn headlamps on and blower on hig, measure the battery voltage at the battery and monitor the PCM VPWR PID.	**Yes** GO to B8 . **No** REPAIR the affected PCM ground circuits. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 AJ0210-A • **Does the VPWR PID read within ±0.5 volt with accessory loads on as compared to accessory loads off?**	
B8 MONITOR PID VPWR AT WOT	
• With the engine still running at idle, turn off all accessory loads, measure the battery voltage at the battery and monitor the PCM VPWR PID.  AJ0210-A • Monitor the VPWR PID and momentarily accelerate the engine to WOT and release. Repeat this step 4-5 times while continuing to monitor the VPWR PID. • **Does the VPWR PID stay within 0.5 volt of battery voltage when the engine rpms are increased?**	**Yes** CARRY OUT the Component Test, Battery - Drain Test. REFER to Section 414-01 . **No** INSTALL a new PCM. REFER to Section 303-14 . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

Pinpoint Test C: DTC U0120:13

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

Normal Operation

The charging system supplies voltage to the battery and the vehicle electrical system through the battery B+ cable. The PCM monitors the generator output through a dedicated Local Interconnect Network (LIN) communicaon circuit. The generator uses this LIN circuit to communicate the desired voltage setpoint from the PCM to the voltage regulator. The generator also uses this LIN circuit to communicate the generator load and error conditions to the PCM.

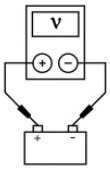
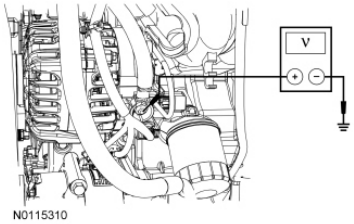
- DTC U0120:13 (Lost Communication with Starter/Generator Control Module: Circuit Open) - Sets when the PCM does not detect communication through the LIN circuit. This can be a result of an open or short in the LIN circuit. This DTC also sets if the B+ circuit is open.

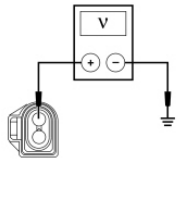
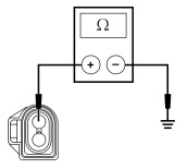
This pinpoint test is intended to diagnose the following:
- Wiring, terminals or connectors
- Generator
- PCM

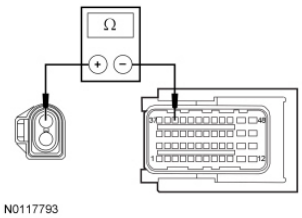
PINPOINT TEST C: DTC U0120:13

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
C1 CHECK THE GENERATOR CONNECTIONS	
• Ignition OFF. • Inspect generator C102A connection. Connector should be installed correctly and tight. • Inspect generator C102A for bent and/or pusd-out pins. • Inspect generator C102B, B+ circuit SBF01 (RD) connection. The connection should be tight. • Measure the battery voltage.  AJ0210-A • Measure the voltage between generator C102B, B+ circuit SBF01 (RD) and ground.  N0115310 • **Is the generator C102B connection tight and does the generator B+ measure battery voltage within ±0.5 volt?**	**Yes** GO to C2 . **No** TIGHTEN or INSTALL a new C102B (B+ nut) or REPAIR connection as needed. REFER to Specifications in this section. VERIFY the high current fuse assembly is OK. If the fuse assembly is OK, REPAIR circuit SBF01 (RD). If the fuse assembly 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.
C2 CHECK THE GENERATOR LIN CIRCUIT FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: Generator C102A. • Disconnect: PCM C175E. • Ignition ON. • Measure the voltage between generator C102A-1, circuit CDC15 (VT), harness side and ground.  N0116048 • **Is any voltage present?**	**Yes** REPAIR circuit CDC15 (VT) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. **No** GO to C3 .
C3 CHECK THE GENERATOR LIN CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between the generator C102A-1, circuit CDC15 (VT), harness side and ground.  N0116049 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to C4 . **No** REPAIR circuit CDC15 (VT) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.
C4 CHECK THE GENERATOR LIN CIRCUIT FOR AN OPEN	
• Inspect the following harness connectors for damaged or pushed-out pins: ♦ PCM C175E-39, circuit CDC15 (VT) ♦ Generator C102A-1, circuit CDC15 (VT) • Measure the resistance between PCM C175E-39, circuit CDC15 (VT), harness side and generator C102A-1, circuit CDC15 (VT),	**Yes** INSTALL a new generator. Refer to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. If DTC U0120:13 returns, INSTALL a new PCM. Refer to Section 303-14 . TEST the system for normal operation. **No** REPAIR circuit CDC15 (VT) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

harness side.  N0117793 • **Are the connectors and pins free of damage and is the resistance less than 5 ohms?**	

Pinpoint Test D: 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. Sources of generator noise include bearing noise, electrical fault noise and generator or belt pulley misalignment. A generator with certain types of diode or stator failures may also produce an audible noise.

- DTC P065C:09 (Generator Mechanical Performance: Component Failure) - Sets when the generator reports an internal mechanical failure. This DTC also sets if the generator has a bad bearing, pulley, axle or belt.

This pinpoint test is intended to diagnose the following:
- Front End Accessory Drive (FEAD) drive belt
- Loose bolts/brackets
- Generator/pulley

PINPOINT TEST D: THE GENERATOR IS NOISY

Test Step	Result / Action to Take
D1 CHECK FOR ACCESSORY DRIVE BELT NOISE AND LOOSE MOUNTING BRACKETS	
• Ignition OFF. • Check the accessory drive belt and tensioner for damage and correct installation. Refer to Section 303-05 . • Check the accessory mounting brackets and generator pulley for looseness or misalignment. • **Is the accessory drive OK?**	**Yes** GO to D2 . **No** REPAIR as necessary. REFER to Section 303-05 for diagnosis and testing of the accessory drive system. TEST the system for normal operation.
D2 CHECK THE GENERATOR MOUNTING	
• Check the generator mounting for loose bolts or misalignment.	**Yes** GO to D3 .

• **Is the generator mounted correctly?**	**No** REPAIR as necessary. TEST the system for normal operation.
D3 CHECK THE GENERATOR FOR NOISE	
• With the engine running, use a stethoscope or equivalent listening device to probe the generator and the accessory drive area for unusual mechanical noise. • **Is the generator the noise source?**	**Yes** INSTALL a new generator. REFER to the Generator in this section. **No** REFER to Section 303-00 to diagnose the source of the engine noise.

Pinpoint Test E: 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 audio system 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 E: 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 carrying out this pinpoint test.

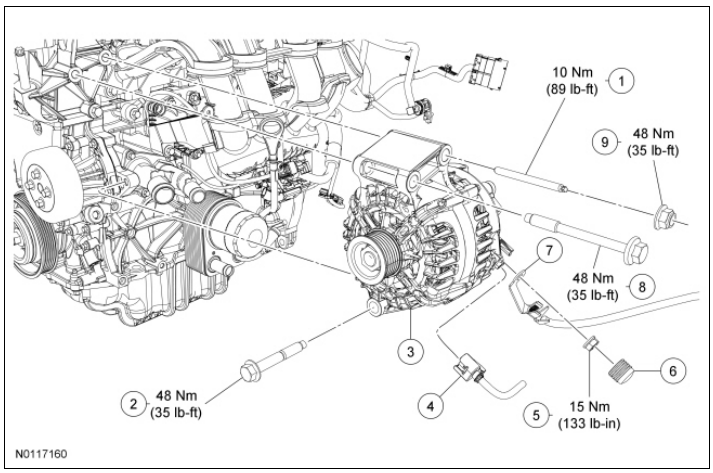
NOTE: If the engine is operated at greater than 2,000 rpm momentarily, the generator self-excites. Make sure the engine rpm remains below 2,000 rpm when the generator is disconnected. If it rises above 2,000 rpm, turn the ignition to the OFF position and restart the test.

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
E1 VERIFY THE GENERATOR IS THE SOURCE OF THE RADIO INTERFERENCE	
• Start the engine and allow the engine to idle. • Tune the audio unit to a station where the interference is present. • Ignition OFF. • Disconnect: Generator C102B. • Start the engine and allow the engine to	**Yes** REFER to Section 415-00 for diagnosis and testing of the in-vehicle entertainment system. **No** INSTALL a new generator. REFER to Generator in this section. TEST the system for normal operation.

idle, determine if the interference is still present. • **Is the interference present with the generator disconnected?**	

Generator



Item	Part Number	Description
1	W703175	Generator stud bolt
2	W715065	Lower generator bolt
3	10346	Generator
4	-	Generator electrical connector (part of 12A522)
5	W707759	Generator B+ terminal nut (part of 10346)
6	10A375	Generator B+ terminal protective cover
7	-	Generator B+ terminal (part of 12A522)
8	W703957	Upper generator bolt
9	W520103	Generator nut

Removal

1. Disconnect the battery. For additional information, refer to Section 414-01 .
2. Remove the accessory drive belt. For additional information, refer to Section 303-05 .
3. Remove the generator B+ terminal protective cover and nut. Position the generator B+ terminal aside.
4. Disconnect the generator electrical connector.
5. Detach the upper degas bottle hose from the fuel rail and position aside.
6. Remove the generator nut and the stud bolt.
7. Remove the upper and lower generator bolts.
8. Remove the generator.

Installation

Install the generator and generator upper and lower bolts. Hand-tighten the bolts. Do not torque the bolt at this time.

2. Install the generator stud bolt.
    - Tighten to 10 Nm (89 lb-in).

3. Install the generator nut.
    - Tighten to 48 Nm (35 lb-ft).

4. Tighten the generator upper and lower bolts.
    - Tighten to 48 Nm (35 lb-ft).

5. Attach the upper degas bottle hose to the fuel rail.

6. Connect the generator electrical connector.

7. Position the generator B+ terminal on the generator and install the nut.
    - Tighten the nut to 15 Nm (133 lb-in).
    - Install the generator B+ terminal protective cover.

8. Install the accessory drive belt. For additional information, refer to Section 303-05 .

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

General Specifications

Item	Specification
Battery	
Cold Cranking Amps (CCA) measured at -18°C (0°F)	500 CCA

Torque Specifications

Description	Nm	lb-ft	lb-in
Battery ground cable body terminal bolt	13	-	115
Battery hold-down bracket nuts	5	-	44
Battery terminal nuts	5	-	44
Battery tray bolts	10	-	89
High current battery junction box side terminal nuts	5	-	44
High current battery junction box upper terminal nuts	10	-	89

Battery and Cables

Vehicles are equipped with a 12-volt, maintenance-free battery.

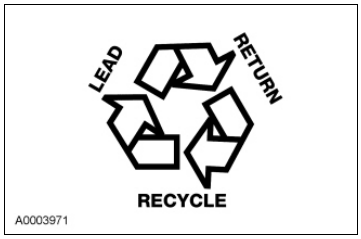
The battery and cable system consists of the following components:

- 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 fuln 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.

Type of Battery Discharge	Pulse Charger	Standard Charger
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

Inspection And Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Battery • Battery mounting	• Battery cables • Battery posts

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

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
A1 TEST THE BATTERY CONDITION	
NOTE: A red test-eye indicates the battery is discharged, not necessarily defective. **NOTE:** Failure to fully charge the battery before retesting may cause false readings. • Verify the battery condition using the Intelligent Diagnostic Charger. • **Is the battery OK?**	**Yes** RETURN the battery to service. **No** If the analyzer reads REPLACE BATTERY or REPLACE-BAD CELL, INSTALL a new battery. REFER to Battery and Battery Tray - Exploded View in this section.

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 curately 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.

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.

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 set point may also vary. The vehicle may need to be driven to relearn its strategy.

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.

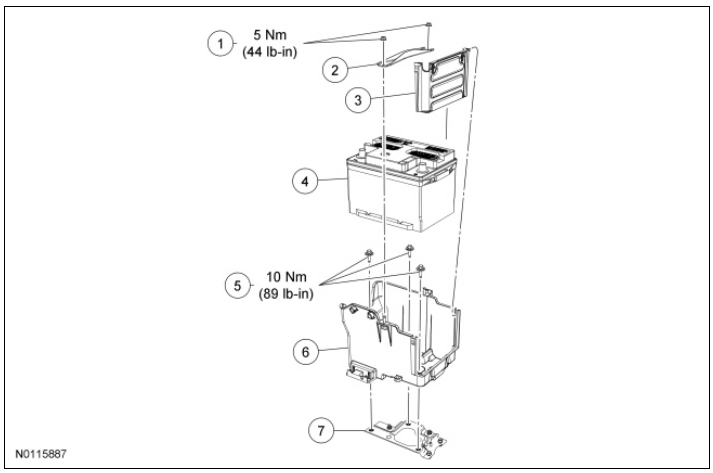
NOTE: Wait one minute between ignition OFF and disconnecting the negative battery cable or the ABS module sets DTC U3000:41.

1. Disconnect the battery ground terminal.
   - To connect, tighten to 5 Nm (44 lb-in).

2. Disconnect the positive battery terminal.
   - To connect, tighten to 5 Nm (44 lb-in).

3. To connect, reverse the disconnect procedure.

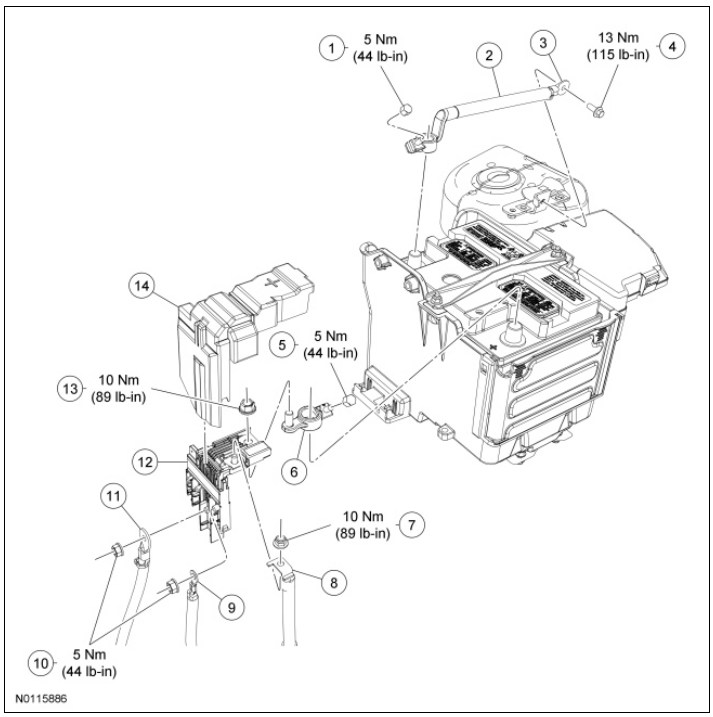
Battery and Battery Tray - Exploded View



Item	Part Number	Description
1	W520412	Battery hold-down bracket nut (2 required)
2	10718	Battery hold-down bracket
3	10757	Battery heat shield
4	10655	Battery
5	W701695	Battery tray bolt (3 required)
6	10732	Battery tray
7	10732	Battery tray support bracket

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Battery Cables - Exploded View



Item	Part Number	Description
1	-	Battery ground cable terminal nut (part of 14301)
2	14301	Battery ground cable
3	-	Battery ground cable body terminal (part of 14301)
4	W505253	Battery ground cable body terminal bolt
5	-	Battery positive terminal nut (part of 14450)
6	14450	Battery positive terminal
7	W520101	Engine harness wire terminal-to-high current battery junction box terminal nut
8	-	Engine harness wire terminal (part of 12A522)
9	-	Engine compartment harness wire terminal (part of 14K012)
10	W705790	Engine compartment harness wire terminal-to-high current battery junction box side terminal nuts (2 required)
11	-	Engine compartment harness wire terminal (part of 14K012)
12	67010	High current battery junction box
13	W711953	High current battery junction box-to-battery posit
14	14A003	High current battery junction box cover

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of

removal.

Torque Specifications

Description	Nm	lb-in
Antenna cable bolt (part of the antenna cable)	9	80
Door subwoofer bolts	3	27

Information and Entertainment System

Functional Components

The functional components of the audio system (and their locations) are as follows:

- Audio Front Control Module (ACM)
- Front Controls Interface Module (FCIM)
- Front Control/Display Interface Module (FCDIM)
- Accessory Protocol Interface Module (APIM) (if equipped), located under the RH side of the instrument panel
- Global Positioning System Module (GPSM) (if equipped), located in the top center area of the instrument panel
- Speakers (see Audio Line-Up for locations)
- Antenna (either AM/FM, or combination AM/FM/satellite)
- Antenna cables
- Clockspring
- Audio input jack
- Steering wheel controls (if equipped)
- Universal Serial Bus (USB) port and cable (if equipped)
- Microphone (if equipped)

Audio Line-Up

The vehicle is equipped with one of the following audio systems:

- Base
  - ♦ AM/FM stereo (CD with MP3 optional)
  - ♦ Four speakers (2 front door woofers, 2 front door tweeters)
- High
  - ♦ AM/FM/Single CD with MP3
  - ♦ Six speakers (2 front door woofers, 2 front door tweeters, 2 rear door full-range speakers)

All audio systems include the following features:

- Audio input jack

The following options are also available:

- Steering wheel controls
- Satellite radio system
  - ♦ Provides satellite broadcast audio channels
- SYNC system
  - ♦ Provides mobile phone and media device functionality with the vehicle audio system

Antenna

All vehicles utilize a fixed-mast antenna for AM/FM reception. If the vehicle is equipped with satellite radio, a combination AM/FM/satellite radio antenna is utilized.

Satellite Radio

The satellite radio system is comprised of the following:

- Satellite radio receiver (built-in to the ACM)
- Antenna
- Antenna cables

SYNC System

The SYNC system is comprised of the following:

- APIM
- SYNC-specific steering wheel controls
- Microphone
- USB port and cable
- Audio input jack
- GPSM

SYNC is a hands-free communications and entertainment system that allows the following interactions:

- Send and receive phone calls via a Bluetooth-enabled phone
- Send and receive text messages via a Bluetooth-enabled phone
- Connect media devices (such as an iPod® or USB flash device) in order to play audio files
- Play media files via a Bluetooth-enabled media audio device
- Produce vehicle health reports
- Initiate an emergency call (eCall) when the air bags deploy
- Provide turn-by-turn traffic directions through the use of the signal received by the GPSM

Not all features are available with every phone.

For additional information on audio system operation, including the SYNC system, refer to the Owner's Literature.

Information and Entertainment 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
 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent
 ST3104-A	Backprobe Pins POM6411 or equivalent
 ST3051-A	Universal Serial Bus (USB) Male-A to Male-A Cable CCMUSB2-AM-AM-10 or equivalent
 ST3086-A	Multi-Media Interface Tester 105-00120

Principles of Operation

Audio Front Control Module (ACM)

The Audio Front Control Module (ACM) can be operated while the key is in RUN or ACC. Additionally, the one hour mode feature allows the audio system to be operated for 1 hour when the ignition is transitioned to OFF and the ON/OFF button is pressed.

The ACM can produce its own DTCs, which can be communicated to the scan tool. The ACM communicates on the Infotainment Controller Area Network (I-CAN), with the Front Control/Display Interface Module (FCDIM) acting as the gateway to the Medium Speed Controller Area Network (MS-CAN).

Front Controls Interface Module (FCIM)

The Front Controls Interface Module (FCIM) is the customer interface to the audio system. It is separate from the ACM , and utilizes a dedicated Local Interconnect Network (LIN) with the FCDIM to transmit button press information.

Front Control/Display Interface Module (FCDIM)

The FCDIM is a stand-alone module. It receives messages for all of its displays, which include:

- Audio information

- Warning and information messages

The FCDIM acts as the gateway between the MS-CAN and the I-CAN .

Satellite Audio

The satellite audio system consists of the ACM , the AM/FM/satellite radio combination antenna, and the antenna cables. The antenna receives digital audio signals and sends them to the ACM .

Antenna

The fixed-mast antenna receives AM/FM radio waves and sends them to the ACM via the antenna co-axial cable. If the vehicle is equipped with satellite audio, a combination AM/FM/satellite radio antenna is utilized.

The antenna receives voltage from the ACM in order to amplify the audio signals.

SYNCÂ® System

The SYNCÂ® system allows interaction with several types of customer devices, including mobile phones and media devices. The system is comprised of the Accessory Protocol Interface Module (APIM), a microphone, the Universal Serial Bus (USB) cable and port, and the audio input jack. The APIM contains an on-board BluetoothÂ® chipset, which enables certain wireless devices to interact with the system.

The APIM consists of 2 internal modules: the Consumer Interface Processor (CIP) and the Vehicle Interface Processor (VIP). The modules are not replaceable individually, but can be flashed independently, if required.

The CIP interfaces with all of the customer inputs to the APIM . The CIP contains an analog-to-digital-to-analog converter, as well as the BluetoothÂ® chipset. Any consumer-available application upgrades that are available are loaded directly to the CIP through the USB port.

The VIP provides an interface between the CIP and the vehicle. The main functions of the VIP are controlling the APIM power management and translating both inbound and outbound signals over the CAN .

The APIM can receive inputs from the following sources:

- USB port
- Audio input jack
- BluetoothÂ®

The USB port can be used for connecting a media device (such as an iPodÂ®) with the device's available cable, or for directly plugging in a portable mass storage device (such as a "thumb drive"). When playing media files stored on a mass storage device, the SYNCÂ® system only plays files that do not have Digital Rights Management (DRM) protection. The USB port can also be used for uploading vehicle application upgrades.

The USB port is powered by the APIM , so no external power source is needed to power a device plugged into the USB port.

The audio input jack can be used for connecting a media device (such as an iPodÂ®) utilizing a 1/8-inch audio jack. When a device is connected through the audio input jack, only the speaker volume can be controlled by the ACM . All other functions (such as seek, fast forward, pause, etc.) must be carried out on the device itself.

The BluetoothÂ® interface can accommodate both BluetoothÂ®-enabled mobile phones and

BluetoothÂ®-enabled media devices. Any BluetoothÂ® device used with the SYNCÂ® system must first be paired with the system before it is operational.

BluetoothÂ® is a secure, short-range radio frequency that allows devices to communicate wirelessly through radio waves. The operating range of a BluetoothÂ® signal is a maximum of 32 feet.

Only one BluetoothÂ® phone and one BluetoothÂ® media device can be connected to the system at any one time. If an additional device of either type is paired with the system and made active, the APIM disconnects any active connections and establishes a connection with the new device.

It is important to understand that not all mobile phones have the same level of features when interacting with the SYNCÂ® system. For a list of compatible phones, refer to the SyncMyRide website .

In addition to audio information, metadata may also be sent to the APIM from a device plugged into the USB port. Metadata consists of such information as artist, album title, song title, and genre. The metadata is used by the APIM to create indexes that can be used to sort for particular music, based on customer preference. Not all USB devices send metadata to the APIM ; also, no metadata is transferred when a device is connected through the audio input jack. When a new media device is connected to the SYNCÂ® system, the APIM automatically indexes the information. This can take up to several minutes (depending on the amount of data on the device), and is considered normal operation. When a device that was previously connected to the SYNCÂ® system is reconnected, the APIM updates the index (rather than creating a new one), which reduces the amount of time needed to create the index.

The APIM receives both stereo and mono sound inputs, and can also transmit both stereo and mono sound. The mono function is used to receive the microphone input, and to send sound to the ACM for voice prompts, the Text-To-Speech (TTS) feature, ringtones, and any audio received through a connected mobile phone. The TTS feature speaks information so that it does not have to be read from the display.

The Global Positioning System Module (GPSM) provides vehicle location for real-time traffic reports and re-routing, and for identifying vehicle location in the event of a collision (part of the e911 feature). The vehicle location information is broadcast to the APIM over the CAN .

The APIM communicates via the I-CAN and High Speed Controller Area Network (HS-CAN). Communication with the scan tool is established through the HS-CAN .

Steering Wheel Controls

The steering wheel controls consist of a series of resistors. Each steering wheel controls switch function corresponds with a specific resistance value within the switch. When a switch is pressed, the FCDIM (or the APIM) monitors the change in reference voltage to determine the requested function.

On vehicles equipped with the SYNCÂ® system, the PUSH-TO-TALK (an icon of a person speaking) switch interfaces directly with the APIM , while the other audio steering wheel controls interface with the FCDIM .

Audio Input Jack

The audio input jack allows for a portable MP3 audio device to be connected to the vehicle audio system. When a portable MP3 player is connected, audio from the MP3 audio device can be played through the vehicle speakers. The audio stream from the audio input jack routes to the APIM if the vehicle is equipped with the SYNCÂ® system, or directly to the ACM if the vehicle is not equipped with the SYNCÂ® system.

Audio Signals

Stereo signals contain left and right channel information, and are used for most audio signals.

A mono signal is used for the microphone input to the APIM . A mono signal is also used for the voice prompts, the TTS feature, ringtones, and any audio received through a connected mobile phone. These audio signals are output from the APIM to the ACM . The mono and stereo outputs from the APIM utilize separate circuits.

A digital signal is used to transmit data from a media device connected through the USB port to the APIM . The APIM then converts the signal to analog and relays the signal to the ACM .

A wireless signal is used to broadcast audio signals from a BluetoothÂ® device to the APIM . As with a digital signal sent through the USB port, the APIM converts the wireless audio signal to analog and relays it to the ACM .

Network Communication

There are numerous messages internal to the audio system. The functions of these message include (but are not limited to):

- Changing the audio source
- Updating the FCDIM display

In addition, the numerous messages are utilized by the audio system in conjunction with systems outside of the audio system. Refer to Section 418-00 for a complete list of network messages.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Front Control/Display Interface Module (FCDIM) • Front Controls Interface Module (FCIM) • Antenna • Universal Serial Bus (USB) port • Audio input jack • Steering wheel controls • Speaker mounting/speaker cones • Trim panels	• Body Control Module (BCM) fuse(s): ♦ 7 (7.5A) ♦ 10 (15A) ♦ 16 (15A) ♦ 19 (7.5A) • Wiring, terminals or connectors

3. If the fault is 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. **NOTE:** Do not press any buttons on the FCIM while the ACM is carrying out the self-test.

   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. 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 .

9. If no DTCs related to the concern are retrieved, refer to the Symptom Charts.

DTC Charts

Audio Front Control Module (ACM) DTC Chart

NOTE: This module utilizes a 5-character DTC followed by a 2-character failure-type code. The failure-type code provides information about specific fault conditions such as opens, or shorts to ground. Continuous memory DTCs have an additional 2-character DTC status code suffix to assist in determining DTC history.

DTC	Description	Action
B1A01:01	Speaker #1: General Electrical Failure	GO to Pinpoint Test F .
B1A01:11	Speaker #1: Circuit Short to Ground	GO to Pinpoint Test F .
B1A01:12	Speaker #1: Circuit Short to Battery	GO to Pinpoint Test F .
B1A01:13	Speaker #1: Circuit Open	GO to Pinpoint Test F .
B1A02:01	Speaker #2: General Electrical Failure	GO to Pinpoint Test F .
B1A02:11	Speaker #2: Circuit Short to Ground	GO to Pinpoint Test F .
B1A02:12	Speaker #2: Circuit Short to Battery	GO to Pinpoint Test F .
B1A02:13	Speaker #2: Circuit Open	GO to Pinpoint Test F .

B1A03:01	Speaker #3: General Electrical Failure	GO to Pinpoint Test F .
B1A03:11	Speaker #3: Circuit Short to Ground	GO to Pinpoint Test F .
B1A03:12	Speaker #3: Circuit Short to Battery	GO to Pinpoint Test F .
B1A03:13	Speaker #3: Circuit Open	GO to Pinpoint Test F .
B1A04:01	Speaker #4: General Electrical Failure	GO to Pinpoint Test F .
B1A04:11	Speaker #4: Circuit Short to Ground	GO to Pinpoint Test F .
B1A04:12	Speaker #4: Circuit Short to Battery	GO to Pinpoint Test F .
B1A04:13	Speaker #4: Circuit Open	GO to Pinpoint Test F .
B1A56:1D	Antenna: Circuit Current Out of Range	GO to Pinpoint Test A .
B1A56:21	Antenna: Signal Amplitude â © Minimum	**NOTE:** If DTC B1A56:21 sets after running the bezel diagnostic tests disregard this DTC. This test is used for end of line or repair bay testing at the Ford plant. Each plant has its own assigned frequency and signal strength requirements. The running and passing of this test depends on local radio stations. If no local station is broadcasting on the required frequency the test will fail. Therefore test ran from the bezel diagnostic screen and the DTC generated from the test can be disregarded. DISREGARD this DTC.
B1A89:11	Satellite Antenna: Circuit Short to Ground	GO to Pinpoint Test B .
B1A89:13	Satellite Antenna: Circuit Open	GO to Pinpoint Test B .
B1D19:4B	Compact Disc Unit: Over Temperature	The ACM was over-temperature. This may occur during extended use. Audio operation can resume after the ACM cools. CLEAR the DTCs. This is normal operation.
U0074:00	Control Module Communication Bus "B" Off: No Sub Type Information	REFER to Section 418-00 .
U0140:00	Lost Communication With Body Control Module: No Sub Type Information	GO to Pinpoint Test P .
U0253:00	Lost Communication With Accessory Protocol Interface Module: No Sub Type Information	GO to Pinpoint Test Q .
U0257:00	Lost Communication With Front Controls/Display Interface Module: No Sub Type Information	GO to Pinpoint Test R .

U2100:00	Initial Configuration Not Complete: No Sub Type Information	REPROGRAM the Audio Front Control Module (ACM). REFER to the Programmable Module Installation (PMI) procedure in Section 418-01 . TEST the system for normal operation.
U2101:00	Control Module Configuration Incompatible: No Sub Type Information	REPROGRAM the ACM . REFER to the PMI procedure in Section 418-01 . TEST the system for normal operation.
U3000:41	Control Module: General Checksum Failure	CLEAR the DTCs. REPEAT the self-test. If DTC U3000:41 is retrieved again, INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. TEST the system for normal operation.
U3000:42	Control Module: General Memory Failure	CLEAR the DTCs. REPEAT the self-test. If DTC U3000:41 is retrieved again, INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. TEST the system for normal operation.
U3000:49	Control Module: Internal Electronic Failure	CLEAR the DTCs. REPEAT the self-test. If DTC U3000:49 is retrieved again, INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. TEST the system for normal operation.
U3000:96	Control Module: Component Internal Failure	GO to Pinpoint Test C .
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	GO to Pinpoint Test S .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	GO to Pinpoint Test T .

Front Control/Display Interface Module (FCDIM) DTC Chart

NOTE: This module utilizes a 5-character DTC followed by a 2-character failure-type code. The failure-type code provides information about specific fault conditions such as opens, or shorts to ground. Continuous memory DTCs have an additional 2-character DTC status code suffix to assist in determining DTC history.

DTC	Description	Action
B10BD:11	Multifunctional Switch: Circuit Short to Ground	GO to Pinpoint Test D .
B10BD:13	Multifunctional Switch: Circuit Open	GO to Pinpoint Test D .
B10BD:23	Multifunctional Switch: Signal Stuck Low	GO to Pinpoint Test D .
U0010:88	Medium Speed CAN Communication Bus: Bus Off	REFER to Section 418-00 .
U0074:88	Control Module Communication Bus "B" Off: Bus Off	REFER to Section 418-00 .
U1A00:00	Private Communication Network: No Sub Type Information	GO to Pinpoint Test Y .
U0140:00	Lost Communication With Body Control Module: No Sub Type Information	GO to Pinpoint Test P .
U0155:00	Lost Communication With Instrument Panel Cluster (IPC) Control Module: No	GO to Pinpoint Test U .

	Sub Type Information	
U0193:00	Lost Communication With "Digital Audio Control Module A": No Sub Type Information	GO to Pinpoint Test X .
U0423:68	Invalid Data Received From Instrument Panel Cluster Control Module: Event Information	RETRIEVE and FOLLOW other DTCs present in the FCDIM or IPC .
U2100:00	Initial Configuration Not Complete: No Sub Type Information	PROGRAM the FCDIM . REFER to the Programmable Module Installation (PMI) procedure in Section 418-01 . TEST the system for normal operation.
U3000:00	Control Module: No Sub Type Information	INSTALL a new FCDIM . REFER to Front Controls/Display Interface Module (FCDIM) in this section. TEST the system for normal operation.
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	GO to Pinpoint Test AE .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	GO to Pinpoint Test AF .

Accessory Protocol Interface Module (APIM) DTC Chart

NOTE: This module utilizes a 5-character DTC followed by a 2-character failure-type code. The failure-type code provides information about specific fault conditions such as opens, or shorts to ground. Continuous memory DTCs have an additional 2-character DTC status code suffix to assist in determining DTC history.

DTC	Description	Action
B1201:1C	Steering Wheel Audio Switch Pack 2: Circuit Voltage Out of Range	GO to Pinpoint Test I .
B1201:63	Steering Wheel Audio Switch Pack 2: Circuit / Component Protection Time-Out	GO to Pinpoint Test I .
B1252:04	USB Port: System Internal Failure	GO to Pinpoint Test H .
B1252:11	USB Port: Circuit Short to Ground	GO to Pinpoint Test H .
B1D79:01	Microphone Input: General Electrical Failure	GO to Pinpoint Test I .
U0100:00	Lost Communication With ECM /PCM "A": No Sub Type Information	GO to Pinpoint Test Z .
U0140:00	Lost Communication With Body Control Module: No Sub Type Information	GO to Pinpoint Test P .
U0151:00	Lost Communication With Restraints Control Module: No Sub Type Information	GO to Pinpoint Test AA .
U0155:00	Lost Communication With Instrument Panel Cluster (IPC): No Sub Type Information	GO to Pinpoint Test U .
U016A:00		GO to Pinpoint Test AB .

	Lost Communication With Global Positioning System Module: No Sub Type Information	
U0184:00	Lost Communication With Radio: No Sub Type Information	GO to Pinpoint Test X .
U0255:00	Lost Communication With Front Display Interface Module: No Sub Type Information	GO to Pinpoint Test R .
U0422:00	Invalid Data Received From Body Control Module: No Sub Type Information	RETRIEVE and FOLLOW other DTCs present in the Accessory Protocol Interface Module (APIM) or Body Control Module (BCM).
U0423:00	Invalid Data Received From Instrument Panel Control Module: No Sub Type Information	RETRIEVE and FOLLOW other DTCs present in the APIM or Instrument Panel Cluster (IPC).
U046B:00	Invalid Data Received From Global Positioning System Module: No Sub Type Information	RETRIEVE and FOLLOW other DTCs present in the APIM or Global Positioning System Module (GPSM).
U0485:00	Invalid Data Received From Radio: No Sub Type Information	RETRIEVE and FOLLOW other DTCs present in the APIM or Audio Front Control Module (ACM).
U2100:00	Initial Configuration Not Complete: No Sub Type Information	PROGRAM the APIM . REFER to the Programmable Module Installation (PMI) procedure in Section 418-01 . TEST the system for normal operation.
U2101:00	Control Module Configuration Incompatible: No Sub Type Information	PROGRAM the APIM . REFER to the PMI procedure in Section 418-01 . TEST the system for normal operation.
U3000:04	Control Module: System Internal Failure	GO to Pinpoint Test M .
U3000:41	Control Module: General Checksum Failure	INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. TEST the system for normal operation.
U3000:42	Control Module: General Memory Failure	INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. TEST the system for normal operation.
U3000:88	Control Module: Bus Off	REFER to Section 418-00 .
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	GO to Pinpoint Test AC .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	GO to Pinpoint Test AD .

Global Positioning System Module (GPSM) DTC Chart

NOTE: This module utilizes a 5-character DTC followed by a 2-character failure-type code. The failure-type code provides information about specific fault conditions such as opens, or shorts to ground. Continuous memory DTCs have an additional 2-character DTC status code suffix to assist in determining DTC history.

DTC	Description	Action

U0140:00	Lost Communication With Body Control Module: No Sub Type Information	GO to Pinpoint Test P .
U0155:00	Lost Communication With Instrument Panel Cluster (IPC): No Sub Type Information	GO to Pinpoint Test U .
U0422:00	Invalid Data Received From Body Control Module: No Sub Type Information	RETRIEVE and FOLLOW other DTCs present in the Global Positioning System Module (GPSM) or Body Control Module (BCM).
U0423:00	Invalid Data Received From Instrument Panel Control Module: No Sub Type Information	RETRIEVE and FOLLOW other DTCs present in the GPSM or Instrument Panel Cluster (IPC).
U3000:09	Control Module: Component Failure	INSTALL a new GPSM . REFER to Global Positioning System Module (GPSM) in this section. TEST the system for normal operation.
U3000:41	Control Module: General Checksum Failure	INSTALL a new GPSM . REFER to Global Positioning System Module (GPSM) in this section. TEST the system for normal operation.
U3000:42	Control Module: General Memory Failure	INSTALL a new GPSM . REFER to Global Positioning System Module (GPSM) in this section. TEST the system for normal operation.
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	GO to Pinpoint Test AG .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	GO to Pinpoint Test AH .

Symptom Chart â General Audio System

General Audio System

Symptom Chart â Sound Quality

Sound Quality

Symptom Chart â Satellite Radio

Satellite Radio

Symptom Chart â SYNCÂ® System

SYNCÂ® System

Pinpoint Tests

Pinpoint Test A: Poor Reception â AM/FM

Normal Operation

The antenna receives AM and FM radio waves and sends them to the Audio Front Control Module (ACM) through the antenna cable. The ACM powers the antenna in order to amplify the AM signal.

- DTC B1A56:1D (Antenna: Circuit Current Out of Range) â sets continuously when the antenna enable circuit current is outside of limits. The current is checked once every 5 seconds.
- DTC B1A56:21 (Antenna: Signal Amplitude â © Minimum) â sets on-demand when no signal is detected from the antenna.

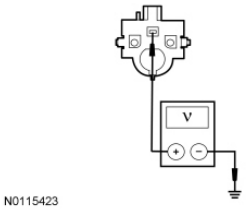
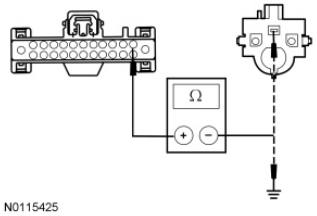
This pinpoint test is intended to diagnose the following:

- Antenna
- Antenna cable
- Charging system
- Ignition system
- ACM

PINPOINT TEST A: POOR RECEPTION â AM/FM

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
A1 CHECK THE AUDIO SYSTEM RECEPTION	
• Operate the audio system in radio tuner (AM/FM) mode. • Check the reception with the engine running, and with the engine off. • **Does the poor reception only occur with the engine running?**	**Yes** GO to A2 . **No** GO to A4 .
A2 CHECK THE GENERATOR	
• Ignition OFF. • Disconnect the wiring harness from the generator voltage regulator. • Start the engine. • Operate the audio system in radio tuner (AM/FM) mode. • **Is the reception OK?**	**Yes** INSTALL a new generator. REFER to Section 414-00 . TEST the system for normal operation. **No** GO to A3 .
A3 CHECK THE IGNITION CIRCUITS	
• Ignition OFF. • Connect the wiring harness to the voltage regulator.	**Yes** USE a jumper cable to ground various parts of the vehicle to the frame (for example: engine, fenders, quarter panels, stone deflectors, air cleaner, body

• Visually inspect the engine compartment and make sure all ignition coils are correctly and securely connected, and that there are no visible cracks in the coil housings. • Inspect all the wiring harnesses and connectors for damaged insulation and loose or broken conditions. • **Are the ignition components OK?**	sheet metal). When the noise is eliminated, PROVIDE a permanent ground where necessary. TEST the system for normal operation. **No** REPAIR the ignition system as necessary. TEST the system for normal operation.
A4 CHECK THE ANTENNA ENABLE CIRCUIT	
• Ignition OFF. • Disconnect: Antenna C9021. • Operate the audio system in radio tuner (AM/FM) mode. • Measure the voltage between the antenna C9021-1, circuit CME44 (BU), harness side and ground.  N0115423 • **Is the voltage greater than 10 volts?**	**Yes** GO to A6 . **No** GO to A5 .
A5 CHECK THE ANTENNA ENABLE CIRCUIT FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Disconnect: ACM C240A. • Measure the resistance between the ACM C240A-2, circuit CME44 (BU), harness side and the antenna C9021-1, circuit CME44 (BU); and between the ACM C240A-2, circuit CME44 (BU), harness side and ground.  N0115425 • **Is the resistance less than 5 ohms between the ACM and the antenna, and greater than 10,000 ohms between the ACM and**	**Yes** GO to A9 . **No** REPAIR the circuit. TEST the system for normal operation.

ground?	
A6 CHECK THE AM/FM ANTENNA CABLE	
• Ignition OFF. • Disconnect: AM/FM Antenna In-Line Connection At RH Kick Panel. • Disconnect: AM/FM Antenna Cable At ACM . • Measure the resistance of the rear AM/FM antenna cable core between the antenna and the front AM/FM antenna cable in-line connection; and between the rear AM/FM antenna cable core and shield. • Measure the resistance of the front AM/FM antenna cable core between the ACM and the rear AM/FM antenna cable in-line connection; and between the front AM/FM antenna cable core and shield. • **Is the resistance of each AM/FM antenna cable core less than 2 ohms, and the resistance between the core and shield of each AM/FM antenna cable greater than 10,000 ohms?**	**Yes** GO to A7 . **No** INSTALL a new front or rear AM/FM antenna cable. REFER to Antenna Cable â AM/FM/Satellite Radio in this section. TEST the system for normal operation.
A7 ISOLATE THE ANTENNA	
• Connect: AM/FM Antenna In-Line Connection At RH Kick Panel. • Connect: AM/FM Antenna Cable At ACM . • Install a new antenna. Refer to Antenna in this section. • Operate the audio system in radio tuner (AM/FM) mode. • **Is the reception OK?**	**Yes** The concern was caused by an inoperative AM/FM antenna. The system is now operating correctly. **No** GO to A8 .
A8 ISOLATE THE ANTENNA CABLE	
• Ignition OFF. • Substitute each antenna cable by routing a new component. Do not remove the original antenna cable at this time. • Operate the audio system in radio tuner (AM/FM) mode. • **Is the reception OK?**	**Yes** INSTALL a new antenna cable for the inoperative cable. REFER to Antenna Cable â AM/FM/Satellite Radio in this section. TEST the system for normal operation. **No** REMOVE the substitute antenna cable. GO to A9 .
A9 CHECK FOR CORRECT ACM OPERATION	
• Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM connectors and make sure they seat correctly.	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. 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

• Operate the system and verify the concern is still present. • **Is the concern still present?**	corroded connector.

Pinpoint Test B: Poor Reception/Poor Sound Quality/No Sound â Satellite Radio

Normal Operation

Digital signals are received by the satellite radio antenna and sent to the Audio Front Control Module (ACM) through the satellite radio antenna cable.

A short to ground in the satellite radio antenna typically has no effect on the antenna signal. However, an open in the antenna circuit results in no sound from the satellite radio system. A short to voltage in the antenna circuit can have varying effects on the system.

Obstructions to the antenna line of sight can affect reception, but this is considered normal operation. Possible obstructions include hills, tall buildings, tunnels, and being parked inside a garage. Make sure the vehicle is in a clear area, free of obstructions, before testing satellite radio reception.

- DTC B1A89:11 (Satellite Antenna: Circuit Short to Ground) â sets when the satellite radio antenna circuit is shorted to voltage or ground for greater than 250 ms. This DTC can be either continuous or on-demand.
- DTC B1A89:13 (Satellite Antenna: Circuit Open) â sets when an open is detected in the satellite radio antenna circuit for greater than 250 ms. This DTC can be either continuous or on-demand.

This pinpoint test is intended to diagnose the following:

- Obstructions to the antenna line of sight
- No channel found in the selected category
- Antenna
- Antenna cable
- ACM

PINPOINT TEST B: POOR RECEPTION/POOR SOUND QUALITY/NO SOUND â SATELLITE RADIO

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
B1 CHECK THE RECEPTION AND CATEGORY FILTER SETTING	
• Turn the category filter function off. For additional information, refer to the Owner's Literature. • Drive the vehicle to an open location, free of obstacles. • Scan for a good channel. • **Does the satellite audio system find a good channel with normal reception?**	**Yes** The system is operating correctly at this time. The concern was a result of no channel being found in the selected category or obstructions to the antenna line of sight. **No** GO to B2 .

B2 CHECK THE SATELLITE SIGNAL PID (SAT_SIG_STR)	
• Enter the following diagnostic mode on the scan tool: ACM DataLogger. • Monitor the ACM satellite signal strength PID (SAT_SIG_STR). • **Does the PID indicate "No Signal"?**	**Yes** GO to B3 . **No** GO to Pinpoint Test C .
B3 CHECK THE SATELLITE RADIO ANTENNA CABLE RESISTANCE	
• Ignition OFF. • Disconnect: Satellite Radio Antenna Connection At ACM . • Disconnect: Satellite Radio Antenna Cable In-Line Connection At RH Kick Panel. • Disconnect: Antenna C9021. • Measure the resistance of the front satellite radio antenna cable core between the ACM and the satellite radio antenna in-line connection; and between the front satellite radio antenna cable core and shield. • Measure the resistance of the rear satellite radio antenna cable core between the antenna C9021, harness side and the satellite radio antenna cable in-line connection; and between the rear satellite radio antenna cable core and shield. • **Is the resistance of each satellite radio antenna cable core less than 2 ohms, and the resistance between the core and shield of each satellite radio antenna cable greater than 10,000 ohms?**	**Yes** GO to B4 . **No** INSTALL a new antenna cable. REFER to Antenna Cable â AM/FM/Satellite Radio in this section. CLEAR any DTCs present. TEST the system for normal operation.
B4 ISOLATE THE ANTENNA	
• Connect: Satellite Radio Antenna Connection At ACM . • Connect: Satellite Radio Antenna Cable In-Line Connection At RH Kick Panel. • Install a new antenna. Refer to Antenna in this section. • Operate the audio system in satellite radio mode. • **Is the reception OK?**	**Yes** The concern was caused by an inoperative antenna. The system is now operating correctly. CLEAR any DTCs present. TEST the system for normal operation. **No** GO to B5 .
B5 CHECK FOR CORRECT ACM OPERATION	
• Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM 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 ACM . REFER to Audio Control Module (ACM) in this section. 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 Satellite Radio Is Inoperative/Does Not Operate Correctly

Normal Operation

Digital signals are received by the antenna and sent to the Audio Front Control Module (ACM) through the satellite radio antenna. The satellite radio receiver is internal to the ACM .

When a satellite radio subscription is activated, the Electronic Serial Number (ESN) of the built-in satellite radio receiver is associated with the Vehicle Identification Number (VIN). As a result, the ACM cannot be swapped from one vehicle to another.

- DTC U3000:96 (Control Module: Component Internal Failure) â sets when the ACM detects an internal failure with the built-in satellite radio receiver.

This pinpoint test is intended to diagnose the following:

- Subscription status
- Satellite radio system concern
- ACM

PINPOINT TEST C: THE SATELLITE RADIO 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
C1 VERIFY AN ACTIVE SUBSCRIPTION	
• Operate the audio system in satellite radio mode and observe the display. • **Does the display indicate the subscription has expired?**	**Yes** The subscription has expired. INFORM the customer to contact Sirius to re-activate the subscription. **No** GO to C2 .
C2 CHECK THE SATELLITE SIGNAL PID (SAT_SIG_STR)	
• Enter the following diagnostic mode on the scan tool: ACM DataLogger. • Monitor the ACM satellite signal strength PID (SAT_SIG_STR). • **Does the PID indicate "No Signal"?**	**Yes** GO to Pinpoint Test B . **No** GO to C3 .
C3 CHECK FOR CORRECT ACM OPERATION	
• Ignition OFF.	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. TEST the system for normal

• Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM connectors and make sure they seat correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	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: 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

A reference voltage is sent from the appropriate module to the steering wheel controls. When a switch is pressed, the voltage is routed through a specific resistor value for each function, then to ground through the module. The module uses this voltage signal to determine which control input function has been selected.

All switches are wired to the Front Control/Display Interface Module (FCDIM) except for the VOICE switch, which is wired directly to the Accessory Protocol Interface Module (APIM) for vehicles with the SYNCÂ® system. If the VOICE switch is inoperative, the entire voice recognition system is inoperative. To diagnose this concern, GO to Pinpoint Test I .

- B10BD:11 (Multifunctional Switch: Circuit Short to Ground) â sets when a short to ground is detected in the steering wheel controls circuit.
- B10BD:13 (Multifunctional Switch: Circuit Open) â sets when an open is detected in the steering wheel controls circuit.
- B10BD:23 (Multifunctional Switch: Signal Stuck Low) â sets in continuous memory when the FCDIM detects a steering wheel controls switch stuck for more than 2 minutes during normal operation.

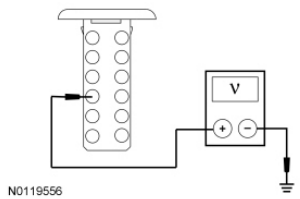
This pinpoint test is intended to diagnose the following:

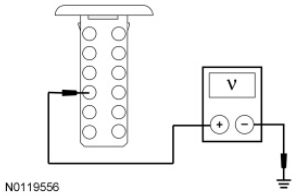
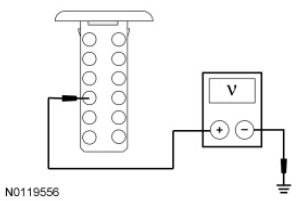
- Wiring, terminals or connectors
- Steering wheel controls
- Clockspring
- ACM

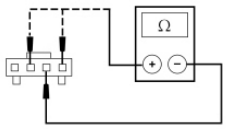
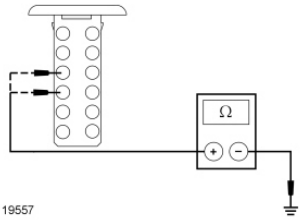
PINPOINT TEST D: THE STEERING WHEEL CONTROLS ARE INOPERATIVE/DO NOT OPERATE CORRECTLY

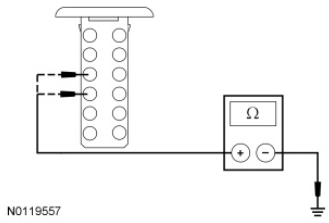
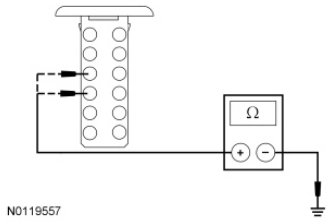
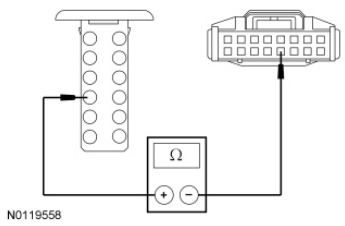
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

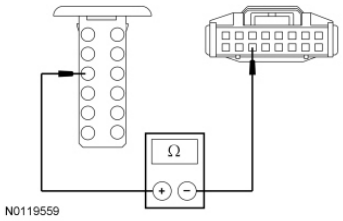
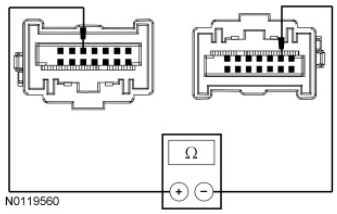
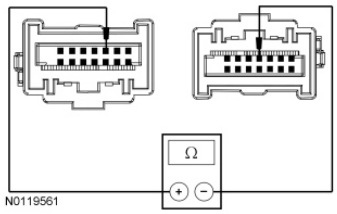
Test Step	Result / Action to Take
D1 CHECK THE DTCs	
• Carry out the FCDIM self-test.	**Yes** INSTALL new steering wheel controls.

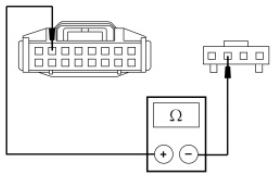
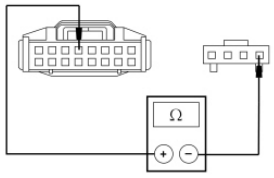
• **Is DTC B10BD:23 retrieved?**	REFER to Steering Wheel Controls in this section. CLEAR the DTCs. TEST the system for normal operation. **No** GO to D2 .
D2 MONITOR THE STEERING WHEEL CONTROLS PIDs (FCDIM -CONTROLLED SWITCHES)	
• Enter the following diagnostic mode on the scan tool: FCDIM DataLogger. • Monitor the steering wheel controls PIDs while pressing each steering wheel controls switch as follows: **Steering Wheel Controls Switch / PID** VOL- / SCS_VOLDOWN VOL+ / SCS_VOLUP SEEK- / SCS_SEEKMINUS SEEK+ / SCS_SEEKPLUS MODE / SCS_MODE • **Do the PID values agree with the switch positions?**	**Yes** GO to D13 . **No** If only one PID value is incorrect or the PID value always reads one particular switch position, INSTALL new steering wheel controls. REFER to Steering Wheel Controls in this section. CLEAR any DTCs present. TEST the system for normal operation. Otherwise, GO to D3 .
D3 CHECK THE STEERING WHEEL CONTROLS REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: FCDIM C2123 . • Ignition ON. • Turn the parking lamps on. • Measure the voltage between the FCDIM C2123-10, circuit VME14 (GY/YE), harness side and ground.  • **Is any voltage present?**	**Yes** TURN the parking lamps off. GO to D4 . **No** TURN the parking lamps off. GO to D7 .

D4 CHECK THE STEERING WHEEL CONTROLS REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO VOLTAGE WITH THE CLOCKSPRING DISCONNECTED	
• Ignition OFF. • Disconnect: Clockspring C218B . • Ignition ON. • Turn the parking lamps on. • Measure the voltage between the FCDIM C2123-10, circuit VME14 (GY/YE), harness side and ground.  • **Is any voltage present?**	**Yes** REPAIR the circuit. CLEAR any DTCs present. TEST the system for normal operation. **No** TURN the parking lamps off. GO to D5 .
D5 CHECK THE CLOCKSPRING FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Connect: Clockspring C218B . • ⚠ **WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any airbag when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.** • Remove the driver air bag module. Refer to Section 501-20B . • Disconnect: Clockspring C218C . • Connect the battery. • Ignition ON. • Turn the parking lamps on. • Measure the voltage between the FCDIM C2123-10, circuit VME14 (GY/YE), harness side and ground.  • **Is any voltage present?**	**Yes** INSTALL a new clockspring. REFER to Section 501-20B . CLEAR any DTCs present. TEST the system for normal operation. **No** GO to D6 .

D6 CHECK THE STEERING WHEEL CONTROLS CIRCUITRY FOR A SHORT TO THE ILLUMINATION CIRCUIT	
• Ignition OFF. • Disconnect: Steering Wheel Controls C2998 . • Measure the resistance between the steering wheel controls C2998-2, harness side and the steering wheel controls C2998-3, harness side; and between the steering wheel controls C2998-4, harness side and the steering wheel controls C2998-3, harness side.  N0117590 • **Is the resistance greater than 10,000 ohms?**	**Yes** INSTALL new steering wheel controls. REFER to Steering Wheel Controls in this section. CLEAR any DTCs present. TEST the system for normal operation. **No** REPAIR the steering wheel harness or INSTALL a new steering wheel. REFER to Section 211-04 . TEST the system for normal operation.
D7 CHECK THE STEERING WHEEL CONTROLS CIRCUITRY FOR A SHORT TO GROUND	
• Ignition OFF. • Remove the driver air bag module. Refer to Section 501-20B . • Disconnect: Steering Wheel Controls C2998 . • Measure the resistance between the FCDIM C2123-10, circuit VME14 (GY/YE), harness side and ground; and between the FCDIM C2123-9, circuit RME24 (BU/WH), harness side and ground  N0119557 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to D10 . **No** GO to D8 .
D8 CHECK THE CLOCKSPRING FOR A SHORT TO GROUND	
• Disconnect: Clockspring C218B . • Measure the resistance between the FCDIM C2123-10, circuit VME14 (GY/YE), harness side and ground; and between the FCDIM C2123-9, circuit RME24 (BU/WH), harness side and	**Yes** GO to D9 . **No** REPAIR the circuit in question. CLEAR any DTCs present. TEST the system for normal

ground  • **Are the resistances greater than 10,000 ohms?**	operation.
D9 CHECK THE STEERING WHEEL HARNESS FOR A SHORT TO GROUND	
• Connect: Clockspring C218B . • Disconnect: Clockspring C218C . • Measure the resistance between the FCDIM C2123-10, circuit VME14 (GY/YE), harness side and ground; and between the FCDIM C2123-9, circuit RME24 (BU/WH), harness side and ground  • **Are the resistances greater than 10,000 ohms?**	**Yes** REPAIR the steering wheel harness or INSTALL a new steering wheel. REFER to Section 211-04 . TEST the system for normal operation. **No** INSTALL a new clockspring. REFER to Section 501-20B . CLEAR any DTCs present. TEST the system for normal operation.
D10 CHECK THE STEERING WHEEL CONTROLS CIRCUITRY FOR AN OPEN	
• Disconnect: Clockspring C218B . • Measure the resistance between the FCDIM C2123-10, circuit VME14 (GY/YE), harness side and the clockspring C218B-12, circuit VME14 (GY/YE), harness side.  • Measure the resistance between the FCDIM C2123-9, circuit RME24 (BU/WH), harness side and the clockspring C218B-14, circuit RME24 (BU/WH), harness side.	**Yes** GO to D11 . **No** REPAIR the circuit in question. CLEAR any DTCs present. TEST the system for normal operation.

 • **Are the resistances less than 5 ohms?**	
D11 CHECK THE CLOCKSPRING FOR AN OPEN	
• Disconnect: Clockspring C218C . • Measure the resistance between the clockspring C218B-12, component side and the clockspring C218C-7, component side.  • Measure the resistance between the clockspring C218B-14, component side and the C218C-5, component side.  • **Are the resistances less than 5 ohms?**	**Yes** GO to D12 . **No** INSTALL a new clockspring. REFER to Section 501-20B . CLEAR any DTCs present. TEST the system for normal operation.
D12 CHECK THE STEERING WHEEL HARNESS FOR AN OPEN	
• Disconnect: Clockspring C218C . • Measure the resistance between the clockspring C218C-7, harness side and the steering wheel controls C2998-2, harness side.	**Yes** INSTALL new steering wheel controls. REFER to Steering Wheel Controls in this section. CLEAR any DTCs present. TEST the system for normal operation. **No** REPAIR the steering wheel harness or INSTALL a new steering wheel. REFER to Section 211-04 . TEST the system for normal operation.

 N0119562 • Measure the resistance between the clockspring C218C-5, harness side and the steering wheel controls C2998-4, harness side.  N0119563 • **Are the resistances less than 5 ohms?**	
D13 CHECK FOR CORRECT FCDIM OPERATION	
• Connect: All Disconnected Connectors. • Disconnect the FCDIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the FCDIM connector and make sure it seats correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new FCDIM . REFER to Front Controls/Display Interface Module (FCDIM) in this section. 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. CLEAR any DTCs present. TEST the system for normal operation.

Pinpoint Test E: The Audio Input Jack Is Inoperative/Does Not Operate Correctly

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation â Vehicles Without the SYNCÂ® System

Audio signals are sent from the audio input jack to the Audio Front Control Module (ACM). There are no external power or ground circuits to the audio input jack.

Vehicles With the SYNCÂ® System

Audio signals are sent from the audio input jack to the Accessory Protocol Interface Module (APIM). The signals are then sent to the ACM . There are no external power or ground circuits to the audio input jack.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Audio input jack

- ACM
- APIM (if equipped)

PINPOINT TEST E: THE AUDIO INPUT JACK IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

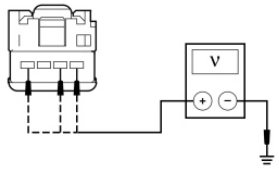
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

NOTE: Before carrying out this pinpoint test, make sure the MP3 device is operating correctly.

Test Step	Result / Action to Take
E1 CHECK THE AUDIO INPUT JACK AUDIO	
• Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, attempt to play an audio file using the audio input jack. • **Does the file play correctly?**	**Yes** The system is operating correctly at this time. The concern may be with the customer device. **No** GO to E2 .
E2 DETERMINE THE VEHICLE CONTENT	
• Determine if the vehicle is equipped with the SYNCÂ® system. • **Is the vehicle equipped with the SYNCÂ® system?**	**Yes** GO to E3 . **No** GO to E4 .
E3 CHECK THE APIM AUDIO OUTPUT	
• Using the Multi-Media Interface Tester, attempt to play an audio file using either the Universal Serial Bus (USB) port or BluetoothÂ®. • **Is the audio output OK for the USB port or BluetoothÂ®?**	**Yes** GO to E4 . **No** GO to Pinpoint Test M .
E4 CHECK THE AUDIO INPUT JACK CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: Audio Input Jack C3312. • Disconnect: ACM C240B or APIM C2383 (If Equipped). • Ignition ON. • Measure the voltage between the audio input jack, harness side and ground as follows:	**Yes** REPAIR the circuit in question. TEST the system for normal operation. **No** GO to E5 .

Positive Meter Lead	Negative Meter Lead
C3312-1 VME46 (BU/GN)	Ground

C3312-2 RME46 (WH/GN)	Ground
C3312-4 RME45 (YE/GN)	Ground



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- **Is any voltage present?**

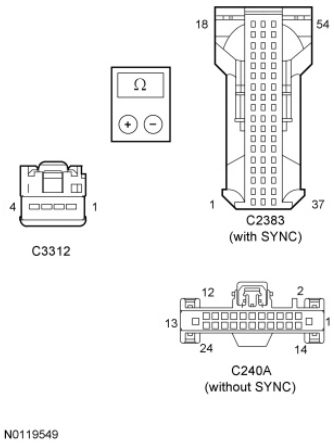
E5 CHECK THE AUDIO INPUT JACK CIRCUITS FOR AN OPEN OR SHORT TO GROUND

- Ignition OFF.
- Measure the resistance between the audio input jack, harness side and the ACM (or APIM , if equipped), harness side; and between the audio input jack, harness side and ground follows:

Positive Meter Lead	Negative Meter Lead	Circuit
C3312-1	C240A-18 or C2383-47, then ground	VME46 (BU/GN)
C3312-2	C240A-6 or C2383-48, then ground	RME45 (YE/GN)
C3312-4	C240A-17 or C2383-45, then ground	VME45 (BU)

Yes
GO to E6 .

No
REPAIR the circuit in question. TEST the system for normal operation.

 • **Is the resistance less than 5 ohms between the audio input jack and the ACM (or APIM), and greater than 10,000 ohms between the audio input jack and ground?**	
E6 ISOLATE THE AUDIO INPUT JACK	
• Disconnect: ACM C240A or APIM C2383 (If Equipped). • Install a new audio input jack. Refer to Audio Input Jack in this section. • Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, attempt to play an audio file using the audio input jack. • **Does the file play correctly?**	**Yes** The concern was caused by an inoperative audio input jack. The system is now operating correctly. **No** For vehicles without the SYNCÂ® system, GO to E7 . For vehicles with the SYNCÂ® system, GO to E8 .
E7 CHECK FOR CORRECT ACM OPERATION	
• Ignition OFF. • Connect: Audio Input Jack C2401. • Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM connectors and make sure they seat correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. 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.
E8 CHECK FOR CORRECT APIM OPERATION	
• Ignition OFF. • Connect: Audio Input Jack C2401. • Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. TEST the system for normal operation. **No** The system is operating correctly at

• Connect the APIM connector and make sure it seats correctly. • Turn the radio on and press the PUSH-TO-TALK button. • Wait 2 minutes for the APIM to re-initalize. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test F: No Sound From One Or More Speakers (Not All Speakers)

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation

The Audio Front Control Module (ACM) directs audio signals to the speakers in the form of a fluctuating AC voltage. The ACM has an overload protection function that protects the ACM if an over-current condition is present. As a result, if there is a short to ground on the circuitry to any of the interior speakers, the ACM can mute the sound to all of the interior speakers.

Root DTC Description	Failure Types	Fault Trigger Conditions
B1A01 â Speaker #1	01, 11, 12, 13	Sets when an open, short to ground, or short to voltage is detected in the LF speaker circuits. The test period is typically 100 ms.
B1A02 â Speaker #2	01, 11, 12, 13	Sets when an open, short to ground, or short to voltage is detected in the RF speaker circuits. The test period is typically 100 ms.
B1A03 â Speaker #3	01, 11, 12, 13	Sets when an open, short to ground, or short to voltage is detected in the LR speaker circuits. The test period is typically 100 ms.
B1A04 â Speaker #4	01, 11, 12, 13	Sets when an open, short to ground, or short to voltage is detected in the LR speaker circuits. The test period is typically 100 ms.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Speaker
- ACM

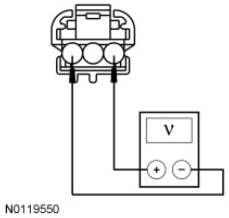
PINPOINT TEST F: NO SOUND FROM ONE OR MORE SPEAKERS (NOT ALL SPEAKERS)

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
F1 DETERMINE THE INOPERATIVE SPEAKER	
NOTE: For vehicles with a 4-speaker system, proceed directly to Step F5.	**Yes** GO to F2 .

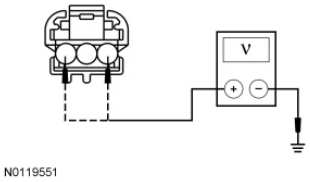
• Manually adjust the fade/balance to test for sound at each individual speaker. • **Is there a concern with a front door tweeter speaker?**	**No** GO to F5 .
F2 CHECK THE AUDIO SIGNAL TO THE TWEETER SPEAKER	
• Ignition OFF. • Disconnect: Suspect Speaker. • Operate the audio system in radio tuner (AM/FM) mode. • Measure the AC voltage between the suspect tweeter speaker pins, harness side as follows: • **Is a fluctuating AC voltage present?**	**Yes** INSTALL a new tweeter speaker. REFER to Speaker â Tweeter in this section. CLEAR any DTCs present. TEST the system for normal operation. **No** GO to F3 .
F3 CHECK THE AUDIO CIRCUITS TO THE TWEETER FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: LF Door Speaker C536 (LH Speaker Concern) or RF Door Speaker C628 (RH Speaker Concern). • Ignition ON. • Measure the voltage between the suspect tweeter speaker, harness side and ground as follows:	**Yes** REPAIR the circuit in question. CLEAR any DTCs present. TEST the system for normal operation. **No** GO to F4 .

Suspect Tweeter Speaker	Positive Meter Lead	Negative Meter Lead
LH	C513-1 VME08 (GN/OG)	C513-3 RME08 (GY/OG)
RH	C613-1 VME11 (VT/OG)	C613-3 RME11 (YE/OG)



Suspect Tweeter Speaker	Positive Meter Lead	Negative Meter Lead
LH	C513-1 VME08 (GN/OG)	Ground

	C513-3 RME08 (GY/OG)	Ground
RH	C613-1 VME11 (VT/OG)	Ground
	C613-3 RME11 (YE/OG)	Ground



- **Is any voltage present?**

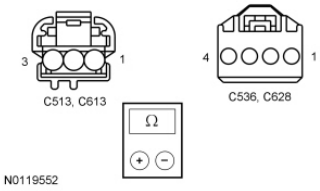
F4 CHECK THE AUDIO CIRCUITS TO THE TWEETER FOR AN OPEN OR SHORT TO GROUND

- Measure the resistance between the suspect tweeter speaker, harness side and the corresponding door speaker, harness side; and between the suspect tweeter speaker, harness side and ground as follows:

Yes
GO to F8 .

No
REPAIR the circuit in question.
CLEAR any DTCs present.
TEST the system for normal operation.

Suspect Tweeter Speaker	Positive Meter Lead	Negative Meter Lead	Circuit
LH	C513-1	C536-2, then ground	VME08 (GN/OG)
	C513-3	C536-3, then ground	RME08 (GY/OG)
RH	C613-1	C628-2, then ground	VME11 (VT/OG)
	C613-3	C628-3, then ground	RME11 (YE/OG)

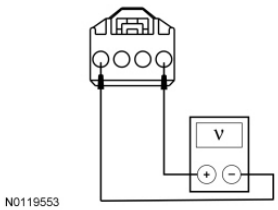


- **Are the resistances less than 5 ohms between the suspect tweeter speaker and the corresponding door speaker, and greater than 10,000 ohms between the suspect tweeter speaker and ground?**

F5 CHECK THE AUDIO SIGNAL TO THE SUSPECT SPEAKER

- Ignition OFF.
- Disconnect: Suspect Speaker.
- Operate the audio system in radio tuner (AM/FM) mode.
- Measure the AC voltage between the suspect speaker pins, harness side as follows:

Suspect Speaker	Positive Meter Lead	Negative Meter Lead
LF door	C536-1 VME07 (WH)	C536-4 RME07 (WH/BN)
RF door	C628-1 VME10 (WH/VT)	C628-4 RME10 (WH/OG)
LR door	C702-1 VME09 (WH/GN)	C702-4 RME09 (BN/YE)
RR door	C802-1 VME12 (BN/WH)	C802-4 RME12 (BN/BU)



- **Is a fluctuating AC voltage present?**

Yes
INSTALL a new door speaker. REFER to Speaker â Front Door or Speaker â Rear Door in this section. CLEAR any DTCs present. TEST the system for normal operation.

No
GO to F6 .

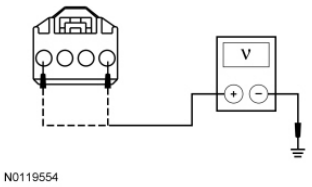
F6 CHECK THE AUDIO CIRCUITS TO THE SUSPECT SPEAKER FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect: ACM C240A.
- Ignition ON.
- Measure the voltage between the suspect speaker, harness side and ground as follows:

Yes
REPAIR the circuit in question. CLEAR any DTCs present. TEST the system for normal operation.

No
GO to F7 .

Suspect Speaker	Positive Meter Lead	Negative Meter Lead
LF door	C536-1 VME07 (WH)	Ground
	C536-4 RME07 (WH/BN)	Ground
RF door	C628-1 VME10 (WH/VT)	Ground
	C628-4 RME10 (WH/OG)	Ground
LR door	C702-1 VME09 (WH/GN)	Ground
	C702-4 RME09 (BN/YE)	Ground
RR door	C802-1 VME12 (BN/WH)	Ground
	C802-4 RME12 (BN/BU)	Ground



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- **Is any voltage present?**

F7 CHECK THE AUDIO CIRCUITS TO THE SUSPECT SPEAKER FOR AN OPEN OR SHORT TO GROUND

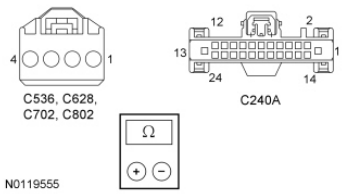
- Measure the resistance between the suspect speaker, harness side and the ACM , harness side; and between the suspect speaker, harness side and ground as follows:

Suspect Speaker	Positive Meter Lead	Negative Meter Lead	Circuit
LF door	C536-1	C240A-22, then ground	VME07 (WH)

Yes
GO to F8 .

No
REPAIR the circuit in question.
CLEAR any DTCs present.
TEST the system for normal operation.

	C536-4	C240A-10, then ground	RME07 (WH/BN)
RF door	C628-1	C240A-23, then ground	VME10 (WH/VT)
	C628-4	C240A-11, then ground	RME10 (WH/OG)
LR door	C702-1	C240A-21, then ground	VME09 (WH/GN)
	C702-4	C240A-9, then ground	RME09 (BN/YE)
RR door	C802-1	C240A-24, then ground	VME12 (BN/WH)
	C802-4	C240A-12, then ground	RME12 (BN/BU)



- **Are the resistances less than 5 ohms between the suspect speaker and the ACM , and greater than 10,000 ohms between the suspect speaker and ground?**

F8 CHECK FOR CORRECT ACM OPERATION	
• Connect: All Disconnected Connectors. • Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM connectors and make sure they seat correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. 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 G: No Sound From All Speakers

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation

The Audio Front Control Module (ACM) receives the START signal through the Controller Area Network (CAN). When it receives this signal, it mutes the audio output to prevent voltage spikes from producing a popping noise through the speakers during engine cranking.

If the ACM loses power or ground, the scan tool cannot communicate with it. Refer to Section 418-00 to continue diagnosis.

If a speaker fault DTC is set in the ACM , the cause of the concern is likely a short to ground or short to voltage in the circuitry to an individual speaker, which has caused the ACM overload protection to activate.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- ACM

PINPOINT TEST G: NO SOUND FROM ALL SPEAKERS

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
G1 CHECK FOR SPEAKER DTCs	
• Ignition ON. • Carry out the ACM self-test. • **Are any speaker fault DTCs present?**	**Yes** GO to Pinpoint Test F . **No** GO to G2 .
G2 CHECK FOR CORRECT ACM OPERATION	
• Ignition OFF. • Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM connectors and make sure they seat correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. 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 H: The Universal Serial Bus (USB) Port Is Inoperative/Does Not Operate Correctly

Normal Operation

The Universal Serial Bus (USB) port is connected to the Accessory Protocol Interface Module (APIM) through the USB cable. The USB port can be used to play audio files or upload software from mass storage devices, or for connecting a media device.

If supported by the user device, the USB can provide charging. Because of this feature, when a USB device is plugged into the USB port, the SYNCÂ® system does not automatically switch to the device.

If a USB mass storage device is used to play an audio file, the SYNCÂ® system only plays audio files that do not have Digital Rights Management (DRM) protection.

The USB cable and port are not serviceable separately.

- DTC B1252:04 (USB Port: System Internal Failure) â sets when the APIM detects an over-temperature condition in the USB circuit. This can be caused by a fault in the USB cable and port, or by the customer USB device.
- DTC B1252:11 (USB Port: Circuit Short to Ground) â sets when the APIM detects an over-current condition in the USB circuit. This can be caused by a fault in the USB cable and port, or by the customer USB device.

This pinpoint test is intended to diagnose the following:

- Customer USB device
- USB cable and port
- APIM

PINPOINT TEST H: THE USB PORT IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
H1 CHECK THE USB CONNECTION	
• Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, attempt to play a file using the USB port. • **Does the audio file play successfully using the USB connection?**	**Yes** The SYNCÂ® system is operating correctly. REVIEW the operation of the USB port with the customer. If the customer device still does not operate correctly, the fault is with the customer device. **No** GO to H2 .
H2 INSPECT THE USB CABLE	
• Ignition OFF. • Disconnect: USB Cable At APIM . • Inspect the USB cable for damage. • Connect: USB Cable At APIM . • Ignition ON. • Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, attempt to play a file using the USB port. • **Does the audio file play successfully using the USB connection?**	**Yes** The concern was caused by the USB connection not being seated correctly. The system is now operating correctly. **No** GO to H3 .
H3 RESET THE APIM AND RECHECK SYNCÂ® SYSTEM OPERATION	
NOTE: Carrying out a Master Reset returns all preference settings to the factory defaults, erases all the phone book and call histories, and deletes any devices paired with the SYNCÂ® system.	**Yes** The SYNCÂ® system is operating correctly at this time. CARRY OUT a SYNCÂ® system Master Reset. REFER to the Owner's Literature. REVIEW the SYNCÂ® system operation with

• Carry out an APIM power reset by disconnecting the battery for 5 minutes, then reconnecting it. • Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, test the audio output for the audio input jack, USB port, and Bluetooth connection using the VOICE switch on the steering wheel controls to enter each mode. • **Do all of the SYNCÂ® inputs function correctly?**	the customer. If the customer device still does not operate correctly, the fault is with the customer device. **No** If only the USB port is inoperative, GO to H4 . If additional inputs are inoperative, GO to Symptom Chart to diagnose the observed symptom. If all inputs are inoperative, INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section.
H4 ISOLATE THE USB CABLE AND PORT	
• Install a new USB cable and port. Refer to Universal Serial Bus (USB) Cable and Port in this section. • Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, attempt to play a file using the USB port. • **Does the audio file play successfully using the USB connection?**	**Yes** The concern was caused by an inoperative USB cable. The system is now operating correctly. **No** GO to H5 .
H5 CHECK FOR CORRECT APIM OPERATION	
• Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the APIM connector and make sure it seats correctly. • Wait 2 minutes for the APIM to re-initalize. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. 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. CLEAR any DTCs present.

Pinpoint Test I: Voice Recognition Is Inoperative/Does Not Operate Correctly

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation

When the VOICE switch is pressed, it changes a reference voltage signal and the audio system enters voice recognition mode. The VOICE switch is wired to the Accessory Protocol Interface Module (APIM). The microphone receives the voice command and sends a signal to the APIM . The microphone is also used to detect outgoing audio during a phone call.

- DTC B1201:1C (Steering Wheel Audio Switch Pack 2: Circuit Voltage Out of Range) â sets when the APIM detects the VOICE switch circuit out-of-range for greater than 250 ms.
- DTC B1201:63 (Steering Wheel Audio Switch Pack 2: Circuit / Component Protection Time-Out) â sets when the APIM detects the VOICE switch stuck within range for greater than 120 seconds during normal operation, or for greater than 3 seconds during the on-demand self-test.

- DTC B1D79:01 (Microphone Input: General Electrical Failure) â sets during the on-demand self-test if the APIM does not detect the microphone.

This pinpoint test is intended to diagnose the following:

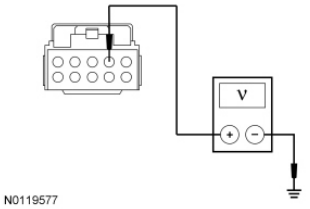
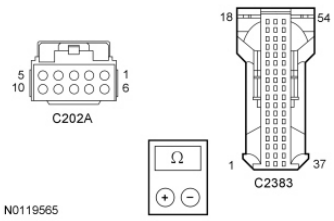
- Wiring, terminals or connectors
- Steering column multifunction switch
- Microphone
- APIM

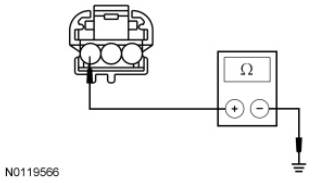
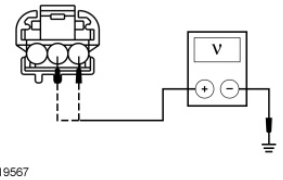
PINPOINT TEST I: VOICE RECOGNITION IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

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

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
I1 CHECK THE OPERATION OF THE VOICE SWITCH	
• Operate the audio system in radio tuner (AM/FM) mode. • Adjust the audible prompt volume to an acceptable range. Refer to the Owner's Literature. • Press the VOICE switch. • **Does the audio system enter voice recognition mode?**	**Yes** GO to I6 . **No** GO to I2 .
I2 MONITOR THE VOICE SWITCH PID	
• Enter the following diagnostic mode on the scan tool: APIM DataLogger. • Monitor the VOICE switch PID (SCS_VOICE) while pressing and releasing the VOICE switch. • **Does the PID value agree with the switch position?**	**Yes** GO to I11 . **No** If the switch always reads active, INSTALL a new steering column multifunction switch. REFER to Section 211-05 . CLEAR any DTCs present. TEST the system for normal operation. For all other PID values, GO to I3 .
I3 CHECK THE REFERENCE VOLTAGE CIRCUIT TO THE VOICE SWITCH FOR A SHORT TO VOLTAGE	
• Disconnect: Steering Column Multifunction Switch C202A. • Disconnect: APIM C2383 . • Ignition ON. • Measure the voltage between the steering column multifunction switchC202A-2, circuit VME14	**Yes** REPAIR the circuit. CLEAR any DTCs present. TEST the system for normal operation. **No** GO to I4 .

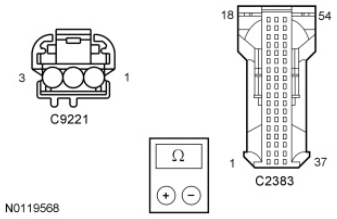
(GY/YE), harness side and ground.  • **Is any voltage present?**	
I4 CHECK THE CIRCUITS TO THE VOICE SWITCH FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between the steering column multifunction switch, harness side and the APIM , harness side; and between the steering column multifunction switch, harness side and ground as follows: **Positive Meter Lead** / **Negative Meter Lead** / **Circuit** C202A-2 / C2383-15, then ground / VME14 (GY/YE) C202A-7 / C2383-14, then ground / RME24 (BU/WH)  • **Is the resistance less than 5 ohms between the steering column multifunction switch and the APIM , and greater than 10,000 ohms between the steering column multifunction switch and ground?**	**Yes** GO to I5 . **No** REPAIR the circuit in question. CLEAR any DTCs present. TEST the system for normal operation.
I5 ISOLATE THE VOICE SWITCH	
• Connect: APIM C2383. • Install a new steering column multifunction switch. Refer to Section 211-05 . • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** GO to I11 . **No** The system is operating correctly at this time. The concern was caused by an inoperative steering column multifunction

	switch. CLEAR any DTCs present.
I6 CHECK THE OPERATION OF THE VOICE RECOGNITION	
• Press the VOICE switch. • Wait for the SYNCÂ® system to acknowledge the VOICE switch being pressed. • While still in voice recognition mode, speak the command "PHONE", and observe the audio system. • **Does the SYNCÂ® system acknowledge the command "PHONE"?**	**Yes** The system is operating correctly at this time. ADVISE the customer on the correct operation of the voice recognition system. **No** GO to I7 .
I7 CHECK THE MICROPHONE SHIELD CIRCUIT FOR CONTINUITY TO GROUND	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Disconnect: Microphone C9221. • Measure the resistance between the microphone C9221-3, circuit GD111, harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** GO to I8 . **No** REPAIR the circuit. TEST the system for normal operation.
I8 CHECK THE MICROPHONE CIRCUITS FOR A SHORT TO VOLTAGE	
• Connect: Negative Battery Cable. • Disconnect: APIM 2383. • Ignition ON. • Measure the voltage between the microphone C9221-1, circuit VMT02 (GN/OG), harness side and ground; and between the microphone C9221-2, circuit VMM13 (YE/GN), harness side and ground.  • **Is any voltage present?**	**Yes** REPAIR the circuit in question. CLEAR any DTCs present. TEST the system for normal operation. **No** GO to I9 .
I9 CHECK THE MICROPHONE CIRCUITS FOR AN OPEN OR SHORT TO GROUND	

<table>
<tr><td>

- Ignition OFF.
- Measure the resistance between the microphone, harness side and the APIM , harness side as follows:

Positive Meter Lead	Negative Meter Lead	Circuit
C9221-1	C2383-18, then ground	VMT02 (GN/OG)
C9221-2	C2383-5, then ground	VMM13 (YE/GN)



- **Are the resistances less than 5 ohms between the microphone and the APIM , and greater than 10,000 ohms between the microphone and ground?**

</td><td>

Yes
GO to I10 .

No
REPAIR the circuit in question. TEST the system for normal operation.

</td></tr>
<tr><td>I10 ISOLATE THE MICROPHONE</td><td></td></tr>
<tr><td>

- Connect: APIM C2383.
- Install a new microphone. Refer to Microphone in this section.
- Operate the audio system in radio tuner (AM/FM) mode.
- Press the VOICE switch and attempt several voice commands.
- **Does the voice recognition operate correctly?**

</td><td>

Yes
The fault was caused by an inoperative microphone. The system is now operating correctly.

No
GO to I11 .

</td></tr>
<tr><td>I11 RESET THE APIM AND RECHECK SYNCÂ® SYSTEM OPERATION</td><td></td></tr>
<tr><td>

NOTE: Carrying out a Master Reset returns all preference settings to the factory defaults, erases all the phone book and call histories, and deletes any devices paired with the SYNCÂ® system.

- Carry out an APIM power reset by disconnecting the battery for 5 minutes, then reconnecting it.
- Connect: Multi-Media Interface Tester.
- Using the Multi-Media Interface Tester, test the audio output for the audio input jack, USB port, and Bluetooth connection using the VOICE switch on the steering wheel controls to enter each mode.
- **Do all of the SYNCÂ® inputs function correctly?**

</td><td>

Yes
The SYNCÂ® system is operating correctly at this time. CARRY OUT a SYNCÂ® system Master Reset. REFER to the Owner's Literature.

REVIEW the SYNCÂ® system operation with the customer. If the customer device still does not operate correctly, the fault is with the customer device.

No
GO to I12 .

</td></tr>
</table>

I12 CHECK FOR CORRECT APIM OPERATION	
• Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the APIM connector and make sure it seats correctly. • Turn the radio on and press the PUSH-TO-TALK button. • Wait 2 minutes for the APIM to re-initalize. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. 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 J: Poor Quality/Distorted/No Sound While In SYNCÂ® Mode

Refer to Wiring Diagrams Cell 130 , Audio System/Navigation for schematic and connector information.

Normal Operation

The Accessory Protocol Interface Module (APIM) transmits left and right channel analog audio signals to the Audio Front Control Module (ACM). These signals include inputs from the Universal Serial Bus (USB) port, the audio input jack, and a BluetoothÂ® media device.

If a USB mass storage device is used to play an audio file, the SYNCÂ® system only plays audio files that do not have Digital Rights Management (DRM) protection.

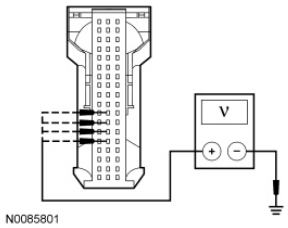
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- ACM
- APIM

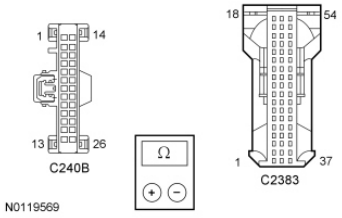
PINPOINT TEST J: POOR QUALITY/DISTORTED/NO SOUND WHILE IN SYNCÂ® MODE

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
J1 VERIFY THE OPERATION OF THE SYNCÂ® SYSTEM AUDIO SOURCES	
• Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, test the audio output for the audio input jack, USB port and BluetoothÂ®. • **Is there poor quality/distorted/no sound from each SYNCÂ® audio source?**	**Yes** GO to J2 . **No** If the concern is only with some of the audio sources, GO to Symptom Chart - SYNCÂ® System to diagnose the observed symptom.

	If all audio sources operate correctly, the concern is with the customer device.
J2 CHECK THE AUDIO CIRCUITS FROM THE APIM FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: ACM C240B. • Disconnect: APIM C2383. • Ignition ON. • Measure the voltage between the APIM , harness side and ground as follows: **Positive Meter Lead** / **Negative Meter Lead** C2383-23 VME53 (VT/GN) — Ground C2383-24 RME53 (BN/WH) — Ground C2383-25 VME52 (BU) — Ground C2383-26 RME52 (GY/OG) — Ground  N0085801 • **Is any voltage present?**	**Yes** REPAIR the circuit in question. TEST the system for normal operation. **No** GO to J3 .
J3 CHECK THE CIRCUITS FROM THE APIM FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between the ACM , harness side, and the APIM , harness side; and between the ACM , harness side and ground as follows: **Circuit**	**Yes** GO to J4 . **No** REPAIR the circuit in question. TEST the system for normal operation.

Positive Meter Lead	Negative Meter Lead	
C240B-13	C2383-23, then ground	VME53 (VT/GN)
C240B-26	C2298-24, then ground	RME53 (BN/WH)
C240B-12	C2298-25, then ground	VME52 (BU)
C240B-25	C2298-26, then ground	RME52 (GY/OG)



- **Are the resistances less than 5 ohms between the ACM and the APIM , and greater than 10,000 ohms between the ACM and ground?**

J4 CHECK FOR CORRECT APIM OPERATION	
• Connect: All Disconnected Connectors. • Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the APIM connector and make sure it seats correctly. • Turn the radio on and press the PUSH-TO-TALK button. • Wait 2 minutes for the APIM to re-initalize. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. TEST the system for normal operation. If the concern is still present, GO to J5 . **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
J5 CHECK FOR CORRECT ACM OPERATION	
• Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM 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 ACM . REFER to Audio Control Module (ACM) in this section. 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 K: The Entire Audio System is Inoperative

Normal Operation

With the ignition in RUN or ACC, the audio system can be powered on. When the ON button is pressed on the Front Controls Interface Module (FCIM) (or the ignition is turned to RUN or ACC and the audio system was on when the ignition was turned off), a wake-up signal is provided to the Front Control/Display Interface Module (FCDIM) via the dedicated Local Interconnect Network (LIN) line. The FCDIM then broadcasts a message over the Infotainment Controller Area Network (I-CAN) to the other modules in the audio system.

When a button is pressed on the FCIM , there is a corresponding display on the FCDIM . The FCDIM displays base audio system information, warning message and icons, SYNCÂ® information (if equipped), and satellite radio information (if equipped). The information is sent to the FCDIM via the MS-CAN .

This pinpoint test is intended to diagnose the following:

- Communication network concern
- FCIM
- FCDIM
- ACM

PINPOINT TEST K: THE ENTIRE AUDIO SYSTEM IS INOPERATIVE

Test Step	Result / Action to Take
K1 CHECK FOR SCAN TOOL COMMUNICATION	
• Carry out the network test with the scan tool. • **Do either the ACM or the FCDIM fail to communicate with the scan tool?**	**Yes** REFER to Section 418-00 to diagnose The ACM Does Not Respond To The Scan Tool or The FCDIM Does Not Respond To The Scan Tool. **No** GO to K2 .
K2 CHECK THE POWER SWITCH INPUT TO THE FCDIM	
• Enter the following diagnostic mode on the scan tool: FCDIM DataLogger. • Monitor the FCDIM power switch PID (BTN_POWER) while pressing and releasing the power switch on the FCIM . • **Does the PID display the correct the power switch positions?**	**Yes** GO to K3 . **No** GO to Pinpoint Test Y .
K3 CHECK FOR LOST COMMUNICATION DTCs	
• Using the scan tool, clear the ACM and FCDIM continuous DTCs. • Ignition OFF. • Ignition ON.	**Yes** REFER to DTC Charts in this section. **No** GO to K4 .

• Wait at least 10 seconds. • Repeat the ACM and FCDIM self-tests. • **Is DTC U0140:00, U0193:00, or U0257:00 present in either module?**	
K4 CHECK FOR CORRECT ACM OPERATION	
• Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM 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 ACM . REFER to Audio Control Module (ACM) in this section. CLEAR any DTCs present. 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. CLEAR any DTCs present.

Pinpoint Test L: The Front Control/Display Interface Module (FCDIM) Illumination Does Not Operate Correctly

Normal Operation

The Front Control/Display Interface Module (FCDIM) receives the illumination signal from the Body Control Module (BCM) and dims the illumination based on the position of the dimmer switch. In the event this signal is lost, the FCDIM defaults to full nighttime brightness, resulting in a symptom of the FCDIM being unable to dim.

This pinpoint test is intended to diagnose the following:

- Backlighting system concern
- FCDIM

PINPOINT TEST L: THE FDIM ILLUMINATION DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
L1 CHECK FOR DTC U0140:00	
• Carry out the FCDIM self-test. • **Is DTC U0140:00 present?**	**Yes** GO to Pinpoint Test P . **No** GO to L2 .
L2 CHECK FOR CORRECT FCDIM OPERATION	
• Disconnect the FCDIM connector. • Check for: ♦ corrosion ♦ damaged pins	**Yes** INSTALL a new FCDIM . REFER to Front Controls/Display Interface Module (FCDIM) in this section. TEST the system for normal operation. **No**

♦ pushed-out pins • Connect the FCDIM connector and make sure it seats correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test M: The SYNCÂ® System Is Completely Inoperative

Normal Operation

The Accessory Protocol Interface Module (APIM) takes action based on network message it receives from other audio system modules, and from the VOICE switch (part of the multifunction switch). The APIM sends display data to the Front Control/Display Interface Module (FCDIM) in order to update the display screen.

- DTC U3000:04 (Control Module: System Internal Failure) â sets when the APIM detects a fault due to a device conflict or an internal failure.

This pinpoint test is intended to diagnose the following:

- Audio system concern
- Communication network concern
- Customer error
- Customer device
- APIM

PINPOINT TEST M: THE SYNCÂ® SYSTEM IS COMPLETELY INOPERATIVE

Test Step	Result / Action to Take
M1 CHECK FOR SCAN TOOL COMMUNICATION WITH THE APIM	
• Carry out the network test using the scan tool. • **Does the APIM pass the network test?**	**Yes** GO to M2 . **No** REFER to Section 418-00 .
M2 CHECK THE SYNCÂ® SYSTEM OPERATION	
NOTE: Carrying out a Master Reset returns all preference settings to the factory defaults, erases all the phone book and call histories, and deletes any devices paired with the SYNCÂ® system. • Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester,	**Yes** The SYNCÂ® system is operating correctly at this time. CARRY OUT a SYNCÂ® system Master Reset. REFER to the Owner's Literature. REVIEW the SYNCÂ® system operation with the customer. If the customer device still does not operate correctly, the fault is with the customer device.

test the audio output for the audio input jack, USB port, and Bluetooth connection using the VOICE switch on the steering wheel controls to enter each mode. • **Do all of the SYNCÂ® inputs function correctly?**	**No** GO to M3 .
M3 RESET THE APIM AND RECHECK SYNCÂ® SYSTEM OPERATION	
• Carry out an APIM power reset by disconnecting the battery for 5 minutes, then reconnecting it. • Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, test the audio output for the audio input jack, USB port, and Bluetooth connection using the VOICE switch on the steering wheel controls to enter each mode. • **Do all of the SYNCÂ® inputs function correctly?**	**Yes** The SYNCÂ® system is operating correctly at this time. CARRY OUT a SYNCÂ® system Master Reset. REFER to the Owner's Literature. REVIEW the SYNCÂ® system operation with the customer. If the customer device still does not operate correctly, the fault is with the customer device. **No** If only some (but not all) of the inputs are inoperative, GO to Symptom Chart to diagnose the observed symptom. If all inputs are inoperative and/or DTC U3000:04 is present, INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section.

Pinpoint Test N: Unable To Pair BluetoothÂ® Device

Normal Operation

When a new BluetoothÂ® device is added, the Accessory Protocol Interface Module (APIM) and the BluetoothÂ® device must be paired together. Most BluetoothÂ® devices can pair with the SYNCÂ® system, although functionality varies. To determine if a BluetoothÂ® device is supported, retrieve the Consumer Interface Processor (CIP) software level using the Accessory Protocol Interface Module (APIM) Software Level Check in this section, and verify the customer device is on the compatibility list for the current CIP software level.

Pairing a BluetoothÂ® device is accomplished through the "Add Device" selection of the phone menu. When pairing a device, the SYNCÂ® system generates a unique Personal Identification Number (PIN) that must be entered on the BluetoothÂ® device in order for the pairing process to be successful. There are also some device-specific actions that must take place. For additional information on the pairing process, refer to the Owner's Literature.

This pinpoint test is intended to diagnose the following:

- Incompatible BluetoothÂ® device
- Customer error
- Customer BluetoothÂ® device
- APIM

PINPOINT TEST N: UNABLE TO PAIR BluetoothÂ® DEVICE

Test Step	Result / Action to Take
N1 CHECK THE BLUETOOTHÂ® CONNECTION	
NOTE: Carrying out a Master Reset returns all preference settings to the factory defaults, erases all the phone book and call histories and deletes any devices paired with the SYNCÂ® system. • Connect: Multi-Media Interface Tester. • Using the Multi-Media Interface Tester, connect to the SYNCÂ® system using BluetoothÂ®. Follow the tool instructions. • Enter the following diagnostic mode on the scan tool: APIM DataLogger. • Monitor the BluetoothÂ® device paired PID (BT_PAIR) and the BluetoothÂ® device connected PID (BT_CONN). • **Do the PIDs both read "Yes"?**	**Yes** The SYNCÂ® system is operating correctly at this time. CARRY OUT a SYNCÂ® system Master Reset. REFER to the Owner's Literature. REVIEW the pairing process with the customer. If the customer device still does not pair, the fault is with the customer device. **No** GO to N2 .
N2 CHECK FOR CORRECT APIM OPERATION	
• Ignition OFF. • Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pints • Connect the APIM connector and make sure it seats correctly. • Turn the radio on and press the PUSH-TO-TALK button. • Wait 2 minutes for the APIM to re-initalize. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. 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 O: The SYNCÂ® System Audible Prompts Are Inoperative/Do Not Operate Correctly

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation

The Text-To-Speech (TTS) and voice prompt features speak certain text information and interaction requests in order to minimize driver distraction while driving. The ringtone alerts the driver to an incoming call.

Audible prompts can range from a simple tone to more elaborate spoken text, based on the customer setting. When interaction mode is set to standard, detailed guidance is provided. When interaction mode is set to advanced, most prompts are tones only and minimal audible guidance is provided. Refer to the Owner's Literature for further information on voice interaction.

The audio signals for the TTS and voice prompt features, the ringtones, and audio from an outside device during a phone call, are sent from the Accessory Protocol Interface Module (APIM) to the Audio Front

Control Module (ACM).

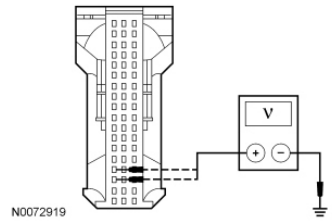
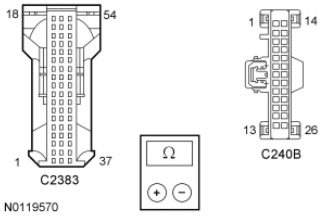
This pinpoint test is intended to diagnose the following:

- Customer setting
- Wiring, terminals or connectors
- ACM
- APIM

PINPOINT TEST O: THE SYNCÂ® SYSTEM AUDIBLE PROMPTS 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
O1 CHECK THE AUDIBLE PROMPT SETTING	
• Operate the audio system in SYNCÂ® mode. • Verify the audible prompts are enabled. Refer to "SYNCÂ® Voice Recognition Feature" in the Owner's Literature. • Press the VOICE button on the steering wheel controls and observe the SYNCÂ® audible prompt. • **Does the SYNCÂ® system produce an audible prompt correctly?**	**Yes** The system is operating correctly at this time. The concern was caused by a customer setting. INSTRUCT the customer in the correct operation of the audible prompt feature. **No** GO to O2 .
O2 CHECK FOR A VOLTAGE SIGNAL FROM THE APIM	
NOTICE: **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.** • Operate the audio system in SYNCÂ® mode. • While pressing the VOICE button repeatedly, measure the AC voltage by backprobing between the ACM C240B-8, circuit VMN14 (WH/VT), harness side and the ACM C240B-21, circuit RMN14 (GY/BN), harness side. • **Is an AC voltage produced each time the VOICE switch is pressed?**	**Yes** GO to O6 . **No** GO to O3 .
O3 CHECK THE AUDIBLE PROMPT CIRCUITS FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: ACM C240B. • Disconnect: APIM C2383. • Ignition ON. • Measure the voltage between the APIM C2383-3, circuit VMN14 (WH/VT), harness side and ground; and between the APIM C2383-4, circuit RMN14 (GY/BN), harness side and ground.  • **Is any voltage present?**	**Yes** REPAIR the circuit in question. TEST the system for normal operation. **No** GO to O4 .
O4 CHECK THE AUDIBLE PROMPT CIRCUITS FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between the APIM , harness side and the ACM , harness side; and between the APIM , harness side and ground as follows: **Positive Meter Lead** / **Negative Meter Lead** / **Circuit** C2383-3 / C240B-8, then ground / VMN14 (WH/VT) C2383-4 / C240B-21, then ground / RMN14 (GY/BN)  • **Are the resistances less than 5 ohms between the APIM and the ACM , and greater than 10,000 ohms between the APIM and ground?**	**Yes** GO to O5 . **No** REPAIR the circuit in question. TEST the system for normal operation.
O5 CHECK FOR CORRECT APIM OPERATION	
• Ignition OFF. • Connect: ACM C240B. • Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the APIM connector and make sure it seats correctly. • Turn the radio on and press the PUSH-TO-TALK button.	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. TEST the system for normal operation.

• Wait 2 minutes for the APIM to re-initalize. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
O6 CHECK FOR CORRECT ACM OPERATION	
• Ignition OFF. • Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM 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 ACM . REFER to Audio Control Module (ACM) in this section. 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 P: DTC U0140:00

Normal Operation

Several audio system modules receive network messages from the Body Control Module (BCM) via the Medium Speed Controller Area Network (MS-CAN). The following information is included in the messages:

- ♦ Light and chime request
- ♦ Illumination dimmer control

As more than one module receives these messages, all modules receiving a particular message should exhibit a symptom if the message is missing.

- DTC U0140:00 (Lost Communication With Body Control Module: No Sub Type Information) â set by the Audio Front Control Module (ACM), the Front Control/Display Interface Module (FCDIM), the Accessory Protocol Interface Module (APIM), or the Global Positioning System Module (GPSM) when network messages are missing from the BCM for greater than 5 seconds with the ignition in RUN.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- Audio system concern
- BCM

PINPOINT TEST P: DTC U0140:00

Test Step	Result / Action to Take
P1 CHECK FOR LOST COMMUNICATION DTCs	
• Ignition ON. • Clear continuous DTCs from all modules. • Ignition OFF. • Ignition ON. • Wait at least 10 seconds. • Retrieve all continuous DTCs from all modules. • **Is DTC U0140:00 set in any audio system module?**	**Yes** GO to P2 . **No** The system is operating correctly at this time. The DTC may been set due to an intermittent fault in the network wiring.
P2 CHECK FOR BATTERY VOLTAGE OUT-OF-RANGE DTCs	
• Carry out the self-test for the following modules: ♦ ACM ♦ FCDIM ♦ APIM ♦ GPSM ♦ BCM • **Is DTC U3003:16 or DTC U3003:17 recorded in any module?**	**Yes** For an audio system module, REFER to DTC Charts in this section. For the BCM , REFER to Section 419-10 . **No** GO to P3 .
P3 CHECK FOR DTC U0140:00 SET IN MULTIPLE MODULES	
• Review the recorded results from the self-test. • **Is DTC U0140:00 set in more than one audio system module?**	**Yes** If all audio system modules except the FCDIM set DTC U0140:00, INSTALL a new FCDIM . REFER to Front Controls/Display Interface Module (FCDIM) in this section. TEST the system for normal operation. Otherwise, GO to P4 . **No** If there is an observable symptom, GO to Symptom Chart - General Audio System to diagnose the observed symptom. If there is no observable symptom, the system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
P4 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Disconnect all the BCM	**Yes** INSTALL a new BCM . REFER to Section 419-10 . CLEAR all continuous DTCs. TEST the system for normal operation.

connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pints • Connect all the BCM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR all continuous DTCs. REPEAT the self-test for the module(s) that set DTC U0140:00.

Pinpoint Test Q: DTC U0253:00

- DTC U0253:00 (Lost Communication With Accessory Protocol Interface Module: No Sub Type Information) â set by the Audio Front Control Module (ACM) when network messages are missing from the Accessory Protocol Interface Module (APIM) over the Medium Speed Controller Area Network (MS-CAN) for greater than 5 seconds with the ignition in RUN.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- Audio system concern
- APIM

PINPOINT TEST Q: DTC U0253:00

Test Step	Result / Action to Take
Q1 CHECK FOR LOST COMMUNICATION DTCs	
• Ignition ON. • Clear continuous DTCs from all modules. • Ignition OFF. • Ignition ON. • Wait at least 10 seconds. • Retrieve all continuous DTCs from all modules. • **Is DTC U0253:00 or DTC U0197:00 set in any module?**	**Yes** GO to Q2 . **No** The system is operating correctly at this time. The DTC may been set due to an intermittent fault in the network wiring.
Q2 CHECK FOR BATTERY VOLTAGE OUT-OF-RANGE DTCs	
• Carry out the self-test for the following modules: ♦ ACM ♦ APIM	**Yes** REFER to DTC Charts in this section. **No** GO to Q3 .

• **Is DTC U3003:16 or DTC U3003:17 recorded in any module?**	
Q3 CHECK FOR DTC U0253:00 OR DTC U0197:00 SET IN MULTIPLE MODULES	
• Review the recorded results from the self-test. • **Are DTC U0253:00 or DTC U0197:00 set in more than one module?**	**Yes** GO to Q4 . **No** If there is an observable symptom, GO to Symptom Chart - General Audio System to diagnose the observed symptom. If there is no observable symptom, the system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
Q4 CHECK FOR CORRECT APIM OPERATION	
• Ignition OFF. • Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pints • Connect the APIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. CLEAR all continuous DTCs. 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. CLEAR all continuous DTCs. REPEAT the self-test for the module(s) that set DTC U0197:00 or DTC U0253:00.

Pinpoint Test R: DTC U0255:00 Or DTC U0257:00

- DTC U0255:00 (Lost Communication With Front Display Interface Module: No Sub Type Information) â set by the Accessory Protocol Interface Module (APIM) when network messages are missing from the Front Control/Display Interface Module (FCDIM) for greater than 5 seconds with the ignition in RUN.
- DTC U0257:00 (Lost Communication With Front Controls/Display Interface Module: No Sub Type Information) â set by the Audio Front Control Module (ACM) when network messages are missing from the FCDIM for greater than 5 seconds with the ignition in RUN.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- ACM
- APIM
- FCDIM

PINPOINT TEST R: DTC U0255:00 OR DTC U0257:00

NOTE: Disregard the pinpoint test steps for the APIM if the concern is on a vehicle without the SYNCÂ® system.

Test Step	Result / Action to Take
R1 CHECK FOR LOST COMMUNICATION DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not have been carried out. • Ignition ON. • Clear the ACM and APIM DTCs. • Ignition OFF. • Ignition ON. • Wait at least 10 seconds. • Repeat the ACM and APIM self-test. • **Is DTC U0255:00 or DTC U0257:00 still present?**	**Yes** GO to R2 . **No** The system is operating correctly at this time. The DTC may have been set due to an intermittent fault in the network wiring.
R2 VERIFY THE CUSTOMER CONCERN	
• Operate the audio system in various modes (radio tuner, SYNCÂ®, etc.). • Verify there is an observable symptom present. • **Is an observable symptom present?**	**Yes** GO to R3 . **No** The system is operating correctly at this time. The DTC may have been set due to an intermittent fault in the network wiring. CHECK the network wiring between the FCDIM and the module in question for an intermittent fault.
R3 CHECK THE COMMUNICATION NETWORK	
• Carry out the network test using the scan tool. • **Does the FCDIM pass the network test?**	**Yes** GO to R4 . **No** REFER to The FCDIM Does Not Respond To The Scan Tool in Section 418-00 .
R4 CHECK FOR BATTERY VOLTAGE OUT-OF-RANGE DTCs	
• Carry out the self-test for the following modules: ♦ ACM ♦ APIM ♦ FCDIM • **Are any low or high voltage DTCs recorded in any module?**	**Yes** REFER to DTC Charts in this section. **No** INSTALL a new FCDIM . REFER to Front Controls Interface Module (FCIM) in this section. CLEAR the ACM and APIM DTCs. REPEAT the ACM and APIM self-tests. If DTC U0257:00 is still present in the

	ACM , INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. TEST the system for normal operation. If DTC U0255:00 is still present in the APIM , INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. TEST the system for normal operation.

Pinpoint Test S: DTC U3003:16 (Audio Front Control Module (ACM))

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation

- DTC U3003:16 (Battery Voltage: Circuit Voltage Below Threshold) â set by the Audio Front Control Module (ACM) as a continuous or on-demand DTC when the supply voltage falls below 10 volts for at least 10 seconds during normal operation, or for greater than 250 milliseconds during the self-test.

This pinpoint test is intended to diagnose the following:

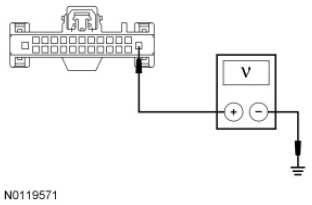
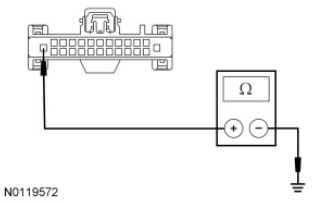
- Wiring, terminals or connectors
- High circuit resistance
- ACM

PINPOINT TEST S: DTC U3003:16 (ACM)

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
S1 RECHECK THE ACM DTCs	
• Clear the ACM DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Repeat the ACM self-test. • **Is DTC U3003:16 still present?**	**Yes** GO to S2 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition.
S2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Retrieve the continuous memory DTCs from all modules.	**Yes** REFER to Section 414-00 . **No**

• **Are any voltage-related DTCs set in the PCM?**	GO to S3 .
S3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE	
• Check the battery condition and verify that the battery is fully charged. Refer to Section 414-01 . • **Is the battery OK and fully charged?**	**Yes** GO to S4 . **No** REFER to Section 414-01 .
S4 CHECK THE ACM VOLTAGE SUPPLY	
• Ignition OFF. • Measure and record the voltage at the battery. • Disconnect: ACM C240A. • Ignition ON. • Measure the voltage between the ACM C240A-1, circuit SBP10 (YE/RD), harness side and ground.  N0119571 • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to S5 . **No** REPAIR the circuit for high resistance. CLEAR the DTC. REPEAT the self-test.
S5 CHECK THE ACM GROUND CIRCUIT FOR CONTINUITY	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the ACM C240A-13, circuit GD111 (BK/BU), harness side and ground.  N0119572 • **Is the resistance less than 5 ohms?**	**Yes** GO to S6 . **No** REPAIR the circuit for high resistance. CLEAR the DTCs. REPEAT the self-test.
S6 CHECK FOR CORRECT ACM OPERATION	
• Connect: Negative Battery Cable. • Disconnect all the ACM connectors.	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. TEST the

• Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	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 T: DTC U3003:17 (Audio Front Control Module (ACM))

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation

- DTC U3003:17 (Battery Voltage: Circuit Voltage Above Threshold) â set by the Audio Front Control Module (ACM) when the supply voltage is greater than 15.8 volts for more than 250 milliseconds during normal operation or the self-test.

This pinpoint test is intended to diagnose the following:

- Charging system concern
- ACM

PINPOINT TEST T: DTC U3003:17 (ACM)

NOTE: DTC U3003:17 may be stored in the module memory due to past battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
T1 CHECK FOR HIGH VOLTAGE DTCs SET IN OTHER MODULES	
• Ignition ON. • Retrieve all continuous DTCs from all modules. • **Are high voltage DTCs (e.g., B1317, U3003:17, P0563) set in more than one module?**	**Yes** REFER to Section 414-00 to diagnose an overcharging condition. **No** GO to T2 .
T2 CHECK THE BATTERY VOLTAGE	
• Turn off all interior/exterior lights and accessories. • Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage. • **Does the battery voltage rise to 15.5 volts or higher?**	**Yes** REFER to Section 414-00 to diagnose an overcharging condition. **No** GO to T3 .
T3 RECHECK FOR DTC U3003:17	

• Ignition OFF. • Ignition ON. • Clear the ACM DTCs. • Repeat the ACM self-test. • **Is DTC U3003:17 present?**	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.

Pinpoint Test U: DTC U0155:00

Normal Operation

Several audio system modules receive network messages from the Instrument Panel Cluster (IPC) via the Medium Speed Controller Area Network (MS-CAN). The following information is included in the messages:

- ♦ Date/time data
- ♦ Ignition switch position
- ♦ Vehicle speed data
- ♦ Warning indicator status

As more than one module receives these messages, all modules receiving a particular message can exhibit a symptom if the message is missing.

- DTC U0155:00 (Lost Communication With Instrument Panel Cluster (IPC) Control Module: No Sub Type Information) â set by the Front Control/Display Interface Module (FCDIM), the Accessory Protocol Interface Module (APIM), or the Global Positioning System Module (GPSM) when network messages are missing from the IPC for greater than 5 seconds with the ignition in RUN.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- Audio system concern
- IPC

PINPOINT TEST U: DTC U0155:00

Test Step	Result / Action to Take
U1 CHECK FOR LOST COMMUNICATION DTCs	
• Ignition ON. • Clear continuous DTCs from all modules. • Ignition OFF. • Ignition ON. • Wait at least 10 seconds. • Retrieve all continuous DTCs from all modules.	**Yes** GO to U2 . **No** The system is operating correctly at this time. The DTC may have been set due to an intermittent fault in the network wiring.

• **Is DTC U0155:00 set in any audio system module?**	
U2 CHECK FOR BATTERY VOLTAGE OUT-OF-RANGE DTCs	
• Carry out the self-test for the following modules: ♦ FCDIM ♦ APIM (if equipped) ♦ GPSM (if equipped) ♦ IPC • **Are any low or high voltage DTCs recorded in any module?**	**Yes** For an audio system module, REFER to DTC Charts in this section. For the IPC , REFER to Section 413-01 . **No** GO to U3 .
U3 CHECK FOR DTC U0155:00 SET IN MULTIPLE MODULES	
• Review the recorded results from the self-test. • **Is DTC U0155:00 set in more than one audio system module?**	**Yes** GO to U4 . **No** If there is an observable symptom, GO to Symptom Chart - General Audio System to diagnose the observed symptom. If there is no observable symptom, the system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
U4 CHECK FOR CORRECT IPC OPERATION	
• Ignition OFF. • Disconnect the IPC connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the IPC connector and make sure it seats correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . CLEAR all continuous DTCs. 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. CLEAR all continuous DTCs. REPEAT the self-test for the module(s) that set DTC U0155:00.

Pinpoint Test V: One Or More Front Control/Display Interface Module (FCDIM) Displays Is Inoperative/Does Not Operate Correctly

Normal Operation

All of the displays on the Front Control/Display Interface Module (FCDIM) screen are controlled through network messages. The modules sending display data to the FCDIM are:

- Audio Front Control Module (ACM): audio system information (including satellite radio information)
- Instrument Panel Cluster (IPC): warning messages and indicators
- Accessory Protocol Interface Module (APIM): SYNCÂ® system information

If the FCDIM loses the signal from any of these modules, only those specific displays are inoperative.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- ACM
- IPC
- APIM (if equipped)
- FCDIM

PINPOINT TEST V: ONE OR MORE FCDIM DISPLAYS IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>V1 CHECK FOR SCAN TOOL COMMUNICATION WITH THE FCDIM</td><td></td></tr>
<tr><td>• Carry out the network test using the scan tool.
• Does the scan tool communicate with the FCDIM ?</td><td>Yes
GO to V2 .

No
REFER to The FCDIM Does Not Respond To The Scan Tool in Section 418-00 .</td></tr>
<tr><td>V2 CHECK FOR LOST COMMUNICATION DTCs SET IN THE FCDIM</td><td></td></tr>
<tr><td>• Using the scan tool, retrieve all continuous DTCs.
• Is DTC U0155:00 or U0193:00 present in the FCDIM ?</td><td>Yes
REFER to DTC Charts in this section.

No
GO to V3 .</td></tr>
<tr><td>V3 CHECK THE FCDIM DISPLAY SEGMENTS</td><td></td></tr>
<tr><td>• Enter the following diagnostic mode on the scan tool: FCDIM DataLogger.
• Command all of the LCD segments on using the FCDIM active command LCD_SEG (All LCD Segments).
• Do all of the FDIM segments illuminate?</td><td>Yes
GO to V4 .

No
GO to V5 .</td></tr>
<tr><td>V4 OBSERVE THE SPECIFIC INOPERATIVE DISPLAY</td><td></td></tr>
<tr><td>• Observe the inoperative FCDIM display while carrying out the indicated diagnostic method as follows:

<table><tr><th>Inoperative Display</th><th>Diagnostic Method</th><th>Expected Results</th></tr><tr><td>Audio system</td><td></td><td></td></tr></table></td><td>Yes
The system is operating correctly at this time. INFORM the customer on the operation of the FCDIM display.

No
For a warning message or indicator concern, REFER to Section 413-01 .

For all other display concerns, GO to V5 .</td></tr>
</table>

	Turn the audio system on, press the AM/FM button, and tune to several channels.	The FCDIM display updates to show the change in audio setting.	
SYNCÂ® system (if equipped)	Turn the audio system on, press the phone button, and observe the display.	The FCDIM display shows information relating to the phone.	
• **Does the suspect display operate correctly based on the expected results?**			
V5 CHECK FOR CORRECT FCDIM OPERATION			
• Ignition OFF. • Disconnect the FCDIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the FCDIM connector and make sure it seats correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**			**Yes** INSTALL a new FCDIM . REFER to Front Controls/Display Interface Module (FCDIM) in this section. 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 W: The Speed Sensitive Volume Does Not Operate Correctly

Normal Operation

The speed sensitive volume function adjusts the volume based on the Vehicle Speed Sensor (VSS) signal, which is received over the Controller Area Network (CAN) Other modules also receive this signal and should exhibit symptoms if the signal is lost.

This pinpoint test is intended to diagnose the following:

- Speed sensitive volume setting
- VSS signal concern
- Communication network concern
- ACM

PINPOINT TEST W: THE SPEED SENSITIVE VOLUME DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
W1 CHECK THE SPEEDOMETER OPERATION	
• Drive the vehicle and observe the speedometer. • **Does the speedometer operate correctly?**	**Yes** GO to W2 . **No**

	REFER to Section 413-01 .
W2 CHECK THE SPEED SENSITIVE VOLUME SETTING	
• Turn the speed sensitive volume off. Refer to the Owner's Literature. • Operate the audio system in radio tuner (AM/FM) mode. • Drive the vehicle at various speeds and observe the speaker volume. • Set the speed sensitive volume to maximum compensation. Refer to the Owner's Literature. • Operate the audio system in radio tuner (AM/FM) mode. • Drive the vehicle at various speeds and observe the speaker volume. • **Does the volume remain constant with the speed sensitive volume turned off, and increase and decrease with vehicle speed with the speed sensitive volume set to maximum?**	**Yes** The system is operating correctly at this time. INSTRUCT the customer in the correct usage of the speed sensitive volume feature. **No** GO to W3 .
W3 CHECK FOR DTC U0155:00 SET IN THE FCDIM	
• Carry out the FCDIM self-test. • **Is DTC U0155:00 present?**	**Yes** GO to Pinpoint Test U . **No** GO to W4 .
W4 CHECK FOR CORRECT ACM OPERATION	
• Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM connectors and make sure they seat correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. 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 X: DTC U0184:00 Or DTC U0193:00

Normal Operation

Several audio system modules receive network messages from the Audio Front Control Module (ACM). These messages consist mainly of audio setting information.

As more than one module receives each of these messages, all modules receiving a particular message can exhibit a symptom if the message is missing.

- DTC U0184:00 (Lost Communication With Radio: No Sub Type Information) â set by the Accessory Protocol Interface Module (APIM) when network messages are missing from the ACM for greater than 5 seconds with the ignition in RUN.

- DTC U0193:00 (Lost Communication With "Digital Audio Control Module A": No Sub Type Information) â set by the Front Control/Display Interface Module (FCDIM) when network messages are missing from the ACM for greater than 5 seconds with the ignition in RUN.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- Audio system concern
- ACM

PINPOINT TEST X: DTC U0184:00 OR DTC U0193:00

Test Step	Result / Action to Take
X1 CHECK FOR LOST COMMUNICATION DTCs	
• Ignition ON. • Clear continuous DTCs from all modules. • Ignition OFF. • Ignition ON. • Wait at least 10 seconds. • Retrieve all continuous DTCs from all modules. • **Is DTC U0184:00 or DTC U0193:00 set in any audio system module?**	**Yes** GO to X2 . **No** The system is operating correctly at this time. The DTC may have been set due an intermittent fault in the network wiring.
X2 CHECK FOR BATTERY VOLTAGE OUT-OF-RANGE DTCs	
• Carry out the self-test for the following modules: ♦ ACM ♦ FCDIM ♦ APIM (if equipped) • **Are any low or high voltage DTCs recorded in any module?**	**Yes** REFER to DTC Charts in this section. **No** GO to X3 .
X3 CHECK FOR DTC U0184:00 OR DTC U0193:00 SET IN MULTIPLE MODULES	
• Review the recorded results from the self-test. • **Is DTC U0184:00 or DTC U0193:00 set in more than one module?**	**Yes** GO to X4 . **No** If there is an observable symptom, GO to Symptom Chart - General Audio System to diagnose the observed symptom. If there is no observable symptom, the system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.

X4 CHECK FOR CORRECT ACM OPERATION	
• Ignition OFF. • Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM connectors and make sure they seat correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ACM . REFER to Audio Control Module (ACM) in this section. CLEAR all continuous DTCs. 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. CLEAR all continuous DTCs. REPEAT the self-test for the module(s) that set DTC U0184 or DTC U0184:00.

Pinpoint Test Y: The Audio System Does Not Operate Correctly From The Front Controls Interface Module (FCIM)

Normal Operation

The Front Controls Interface Module (FCIM) exchanges information with the Front Control/Display Interface Module (FCDIM) over the Local Interconnect Network (LIN). This information includes (among others) button press data and display data.

- DTC U1A00:00 (Private Communication Network: No Sub Type Information) â sets when the FCDIM does not receive information from the FCIM over the LIN for greater than 2 seconds. This does not necessarily indicate a fault in the LIN wiring, as a loss of power or ground to the FCIM can also cause a lack of communication.

This pinpoint test is intended to diagnose the following:

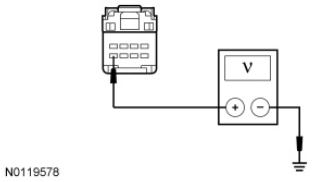
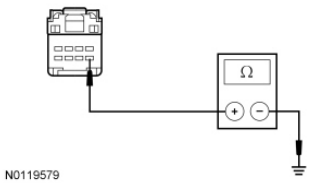
- Wiring, terminals or connectors
- FCIM
- FCDIM

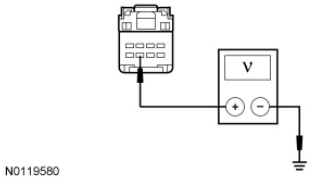
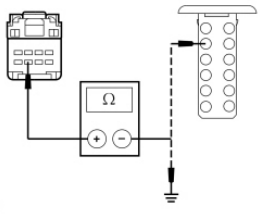
PINPOINT TEST Y: THE AUDIO SYSTEM DOES NOT OPERATE CORRECTLY FROM THE FCIM

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
Y1 CHECK THE FCDIM BUTTON PIDs	
• Ignition ON.	**Yes** GO to Y6 .

• Enter the following diagnostic mode on the scan tool: FCDIM DataLogger. • **NOTE:** The button PIDs begin with the prefix "BTN_" and end with the indicated button. For example, PID BTN_FM correlates with the FM button on the FCIM . • Monitor several of the FCDIM button PIDs. • **Do the PID states agree with the button presses?**	**No** GO to Y2 .
Y2 CHECK FOR VOLTAGE TO THE FCIM	
• Ignition OFF. • Disconnect: FCIM C2402. • Ignition ON. • Measure the voltage between the FCIM C2402-8, circuit SBP07 (WH/RD), harness side and ground.  N0119578 • **Is the voltage greater than 10 volts?**	**Yes** GO to Y3 . **No** REPAIR the circuit. TEST the system for normal operation.
Y3 CHECK THE FCIM GROUND CIRCUIT FOR CONTINUITY	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the FCIM C2402-5, circuit GD115 (BK/GY), harness side and ground.  N0119579 • **Is the resistance less than 5 ohms?**	**Yes** GO to Y4 . **No** REPAIR the circuit. TEST the system for normal operation.
Y4 CHECK THE LIN CIRCUIT FOR A SHORT TO VOLTAGE	
• Disconnect: FCDIM C2123. • Measure the voltage between the FCIM C2402-7, circuit VDB21 (OG), harness side and ground.	**Yes** REPAIR the circuit. CLEAR any DTCs present. TEST the system for normal operation. **No** GO to Y5 .

 N0119580 • **Is any voltage present?**	
Y5 CHECK THE LIN CIRCUIT FOR AN OPEN OR SHORT TO GROUND	
• Measure the resistance between the FCIM C2402-7, circuit VDB21 (OG), harness side and the FCDIM C2123-8, circuit VDB21 (OG), harness side; and between the FCIM C2402-7, circuit VDB21 (OG), harness side and ground.  N0119581 • **Is the resistance less than 5 ohms between the FCIM and the FCDIM , and greater than 10,000 ohms between the FCIM and ground?**	**Yes** INSTALL a new FCIM . REFER to Front Controls Interface Module (FCIM) in this section . TEST the system for normal operation. GO to Y6 . **No** REPAIR the circuit. CLEAR any DTCs present. TEST the system for normal operation.
Y6 CHECK FOR CORRECT FCDIM OPERATION	
• Connect: All Disconnected Connectors. • Disconnect the FCDIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the FCDIM connector and make sure it seats correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new FCDIM . REFER to Front Controls/Display Interface Module (FCDIM) in this section. 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 Z: DTC U0100:00

Normal Operation

The Accessory Protocol Interface Module (APIM) receives network messages from the PCM via the High Speed Controller Area Network (HS-CAN). These messages include the odometer reading and the fuel level.

As other modules outside of the audio system also receive these messages, all modules receiving a particular message can exhibit a symptom if the message is missing.

- DTC U0100:00 (Lost Communication With ECM /PCM "A": No Sub Type Information) â set by the APIM when it is missing messages from the PCM over the HS-CAN for greater than 5 seconds with the ignition in the RUN position.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- PCM

PINPOINT TEST Z: DTC U0100:00

Test Step	Result / Action to Take
Z1 CHECK FOR LOST COMMUNICATION DTCs	
• Ignition ON. • Clear continuous DTCs from all modules. • Ignition OFF. • Ignition ON. • Wait at least 10 seconds. • Retrieve all continuous DTCs from all modules. • **Is DTC U0100 or DTC U0100:00 set in any modules?**	**Yes** GO to Z2 . **No** The system is operating correctly at this time. The DTC may have been set due to an intermittent fault in the network wiring.
Z2 CHECK FOR BATTERY VOLTAGE OUT-OF-RANGE DTCs	
• Carry out the self-test for the following modules: ♦ APIM ♦ PCM ♦ Instrument Panel Cluster (IPC) • **Are any low or high voltage DTCs recorded in any module?**	**Yes** For the APIM , REFER to DTC Charts in this section. For all other modules, REFER to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 . **No** GO to Z3 .
Z3 CHECK FOR DTC U0100 OR DTC U0100:00 SET IN MULTIPLE MODULES	
• Review the recorded results from the self-test. • **Is DTC U0100 or DTC U0100:00 set in more than one module?**	**Yes** GO to Z4 . **No** If there is an observable symptom, GO to Symptom Chart - General Audio System to diagnose the observed symptom. If there is no observable symptom, the system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
Z4 CHECK FOR CORRECT PCM OPERATION	

• Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM connectors and make sure they seat correctly. • **Is the concern still present?**	**Yes** INSTALL a new PCM. REFER to Section 303-14 . CLEAR all continuous DTCs. REPEAT the APIM self-test. **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR all continuous DTCs. REPEAT the APIM self-test.

Pinpoint Test AA: DTC U0151:00

Normal Operation

The Accessory Protocol Interface Module (APIM) receives the emergency call notification message from the Restraints Control Module (RCM) via the High Speed Controller Area Network (HS-CAN). The APIM uses this message to activate the emergency call system.

As other modules outside of the audio system also receive this message, all modules receiving it can exhibit a symptom if the message is missing.

- DTC U0151:00 (Lost Communication With Restraints Control Module: No Sub Type Information) â set by the APIM when it is missing the air bag deployment notification message from the RCM over the HS-CAN for greater than 5 seconds with the ignition in the RUN position.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- Restraints system concern

PINPOINT TEST AA: DTC U0151:00

Test Step	Result / Action to Take
AA1 CHECK FOR LOST COMMUNICATION DTCs	
• Ignition ON. • Clear continuous DTCs from all modules. • Ignition OFF. • Ignition ON. • Wait at least 10 seconds. • Retrieve all continuous DTCs from all modules. • **Is DTC U0151 or DTC U0151:00 set in any modules?**	**Yes** GO to AA2 . **No** The system is operating correctly at this time. The DTC may have been set due to an intermittent fault in the network wiring.
AA2 CHECK FOR BATTERY VOLTAGE OUT-OF-RANGE DTCs	
	Yes

• Carry out the self-test for the following modules: ♦ APIM ♦ PCM ♦ RCM ♦ Instrument Panel Cluster (IPC) • **Are any low or high voltage DTCs recorded in any module?**	For the APIM , REFER to DTC Charts in this section. For all other modules, REFER to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 . **No** GO to AA3 .
AA3 CHECK FOR DTC U0151 OR DTC U0151:00 SET IN MULTIPLE MODULES	
• Review the recorded results from the self-test. • **Is DTC U0151 or DTC U0151:00 set in more than one module?**	**Yes** GO to AA4 . **No** If there is an observable audio system symptom, GO to Symptom Chart - General Audio System to diagnose the observed symptom. If there is an observable restraints system symptom, REFER to Section 501-20B to diagnose the symptom. If there is no observable symptom, the system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
AA4 CHECK FOR CORRECT RCM OPERATION	
• Disconnect all the RCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the RCM connectors and make sure they seat correctly. • **Is the concern still present?**	**Yes** INSTALL a new RCM . REFER to Section 501-20B . CLEAR all continuous DTCs. REPEAT the APIM self-test. **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR all continuous DTCs. REPEAT the APIM self-test.

Pinpoint Test AB: DTC U016A:00

- DTC U016A:00 (Lost Communication With Global Positioning System Module: No Sub Type Information) â set by the Accessory Protocol Interface Module (APIM) when it is missing network messages from the Global Positioning System Module (GPSM) over the Medium Speed Controller Area Network (MS-CAN) for greater than 5 seconds with the ignition in the RUN position.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- GPSM
- APIM
- Compass display

PINPOINT TEST AB: DTC U016A:00

Test Step	Result / Action to Take
AB1 CHECK THE APIM DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not have been carried out. • Ignition ON. • Clear the APIM DTCs. • Ignition OFF. • Ignition ON. • Wait at least 10 seconds. • Retrieve the APIM self-test. • **Is DTC U016A:00 still present?**	**Yes** GO to AB2 . **No** The system is operating correctly at this time. The DTC may have been set due to an intermittent fault in the network wiring.
AB2 VERIFY THE CUSTOMER CONCERN	
• Operate the audio system in various modes (radio tuner, SYNCÂ®, etc.). • Observe the compass display for normal operation. • **Is an observable symptom present?**	**Yes** GO to AB3 . **No** The system is operating correctly at this time. The DTC may have been set due to an intermittent fault in the network wiring. CHECK the MS-CAN wiring between the APIM and the GPSM for an intermittent fault.
AB3 CHECK THE COMMUNICATION NETWORK	
• Carry out the network test using the scan tool. • **Does the GPSM pass the network test?**	**Yes** GO to AB4 . **No** REFER to The GPSM Does Not Respond To The Scan Tool in Section 418-00 .
AB4 CHECK FOR BATTERY VOLTAGE OUT-OF-RANGE DTCs	
• Carry out the self-test for the following modules: ♦ APIM ♦ GPSM • **Is DTC U3003:16 or DTC U3003:17 recorded in either module?**	**Yes** REFER to DTC Charts in this section. **No** INSTALL a new GPSM . REFER to Global Positioning System Module (GPSM) in this section. CLEAR the APIM DTCs. REPEAT the APIM self-test. If DTC U016A:00 is still present, INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. TEST

	the system for normal operation.

Pinpoint Test AC: DTC U3003:16 (Accessory Protocol Interface Module (APIM))

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation

- DTC U3003:16 (Battery Voltage: Circuit Voltage Below Threshold) â set by the Accessory Protocol Interface Module (APIM) when the supply voltage falls below 10 volts for at least 10 seconds during normal operation, or for more than 250 ms during the self-test.

This pinpoint test is intended to diagnose the following:

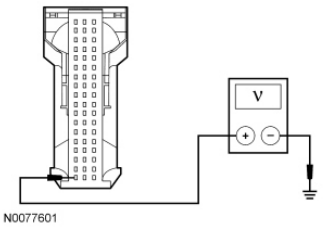
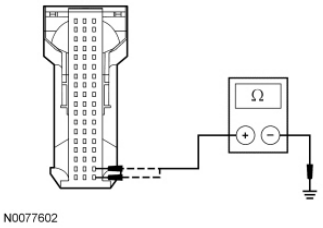
- Wiring, terminals or connectors
- High circuit resistance
- APIM

PINPOINT TEST AC: DTC U3003:16 (APIM)

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
AC1 RECHECK THE APIM DTCs	
• Clear the APIM DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Repeat the APIM self-test. • **Is DTC U3003:16 still present?**	**Yes** GO to AC2 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition.
AC2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Retrieve the continuous memory DTCs from all modules. • **Are any low voltage DTCs set in the PCM?**	**Yes** REFER to Section 414-00 . **No** GO to AC3 .
AC3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE	
• Check the battery condition and verify that the battery is fully charged. Refer to Section 414-01 . • **Is the battery OK and fully charged?**	**Yes** GO to AC4 . **No** REFER to Section 414-01 .

AC4 CHECK THE APIM VOLTAGE SUPPLY	
• Ignition OFF. • Measure and record the voltage at the battery. • Disconnect: APIM C2383. • Ignition ON. • Measure the voltage between the APIM C2383-1, circuit SBP10 (YE/RD), harness side and ground.  N0077601 • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to AC5 . **No** REPAIR the circuit for high resistance. CLEAR the DTC. REPEAT the self-test.
AC5 CHECK THE APIM GROUND CIRCUIT FOR CONTINUITY	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the APIM C2383-37, circuit GD111 (BK/BU), harness side and ground; and between the APIM C2383-38, circuit GD111 (BK/BU), harness side and ground.  N0077602 • **Are the resistances less than 5 ohms?**	**Yes** GO to AC6 . **No** REPAIR the circuit in question for high resistance. CLEAR the DTCs. REPEAT the self-test.
AC6 CHECK FOR CORRECT APIM OPERATION	
• Connect: Negative Battery Cable. • Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the APIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. 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 AD: DTC U3003:17 (Accessory Protocol Interface Module (APIM))

Normal Operation

- DTC U3003:17 (Battery Voltage: Circuit Voltage Above Threshold) â set by the Accessory Protocol Interface Module (APIM) when the supply voltage is greater than 15.8 volts for greater than 250 milliseconds during normal operation or the self-test.

This pinpoint test is intended to diagnose the following:

- Charging system concern
- APIM

PINPOINT TEST AD: DTC U3003:17 (APIM)

NOTE: DTC U3003:17 may be stored in the module memory due to past battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
AD1 CHECK FOR HIGH VOLTAGE DTCs SET IN OTHER MODULES	
• Ignition ON. • Retrieve the continuous memory DTCs from all modules. • **Are high voltage DTCs (e.g., B1317, U3003:17, P0563) set in more than one module?**	**Yes** REFER to Section 414-01 to diagnose an overcharging. **No** GO to AD2 .
AD2 CHECK THE BATTERY VOLTAGE	
• Turn off all interior/exterior lights and accessories. • Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage. • **Does the battery voltage rise to 15.5 volts or higher?**	**Yes** REFER to Section 414-00 . **No** GO to AD3 .
AD3 RECHECK FOR DTC U3003:17	
• Ignition OFF. • Ignition ON. • Clear the APIM DTCs. • Repeat the APIM self-test. • **Is DTC U3003:17 present?**	**Yes** INSTALL a new APIM . REFER to Accessory Protocol Interface Module (APIM) in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.

Pinpoint Test AE: DTC U3003:16 (Front Control/Display Interface Module (FCDIM))

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

Normal Operation

- DTC U3003:16 (Battery Voltage: Circuit Voltage Below Threshold) â set by the Front Control/Display Interface Module (FCDIM) when the supply voltage falls below 9 volts for greater than 1 second during normal operation.

This pinpoint test is intended to diagnose the following:

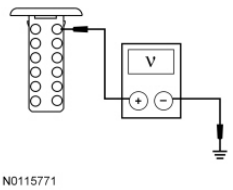
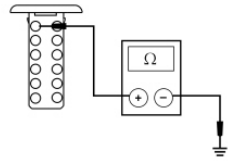
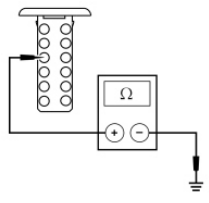
- Wiring, terminals or connectors
- High circuit resistance
- FDIM

PINPOINT TEST AE: DTC U3003:16 (FCDIM)

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
AE1 RECHECK THE FCDIM DTCs	
• Clear the FCDIM DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Repeat the FCDIM self-test. • **Is DTC U3003:16 still present?**	**Yes** GO to AE2 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition.
AE2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Retrieve the continuous memory DTCs from all modules. • **Are any low voltage DTCs set in the PCM?**	**Yes** REFER to Section 414-00 . **No** GO to AE3 .
AE3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE	
• Check the battery condition and verify that the battery is fully charged. Refer to Section 414-01 . • **Is the battery OK and fully charged?**	**Yes** GO to AE4 . **No** REFER to Section 414-01 .
AE4 CHECK THE TCIL VOLTAGE SUPPLY	
• Ignition OFF. • Measure and record the voltage at the battery. • Disconnect: FCDIM C2123. • Ignition ON. • Measure the voltage between the FCDIM C2123-1, circuit SBP07 (WH/RD), harness side	**Yes** GO to AE5 . **No** REPAIR the circuit for high resistance. CLEAR the DTC. REPEAT the self-test.

and ground.  N0115771 • **Is the voltage within 0.2 volt of the recorded battery voltage?**	
AE5 CHECK THE FCDIM GROUND CIRCUIT FOR CONTINUITY	
• Ignition OFF. • Disconnect: Negative Battery Cable. • For vehicles built up to 1/14/2011, measure the resistance between the FCDIM C2123-7, circuit GD115 (BK/GY), harness side and ground.  N0117689 • For vehicles built after 1/14/2011, measure the resistance between the FCDIM C2123-9, circuit GD115 (BK/GY), harness side and ground.  N0133863 • **Is the resistance less than 5 ohms?**	**Yes** GO to AE6 . **No** REPAIR the circuit for high resistance. CLEAR the DTCs. REPEAT the self-test.
AE6 CHECK FOR CORRECT FCDIM OPERATION	
• Connect: Negative Battery Cable. • Disconnect the FCDIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins	**Yes** INSTALL a new FCDIM . REFER to Front Controls/Display Interface Module (FCDIM) in this section. TEST the system for normal operation. **No** The system is operating correctly at this time.

• Connect the FCDIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	The concern may have been caused by a loose or corroded connector.

Pinpoint Test AF: DTC U3003:17 (Front Control/Display Interface Module (FCDIM))

Normal Operation

- DTC U3003:17 (Battery Voltage: Circuit Voltage Above Threshold) â set by the Front Control/Display Interface Module (FCDIM) when the supply voltage is greater than 16 volts for greater than 1 second during normal operation.

This pinpoint test is intended to diagnose the following:

- Charging system concern
- FCDIM

PINPOINT TEST AF: DTC U3003:17 (FCDIM)

NOTE: DTC U3003:17 may be stored in the module memory due to past battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
AF1 CHECK FOR HIGH VOLTAGE DTCs SET IN OTHER MODULES	
• Ignition ON. • Retrieve the continuous memory DTCs from all modules. • **Are high voltage DTCs (e.g., B1317, U3003:17, P0563) set in more than one module?**	**Yes** REFER to Section 414-01 to diagnose an overcharging. **No** GO to AF2 .
AF2 CHECK THE BATTERY VOLTAGE	
• Turn off all interior/exterior lights and accessories. • Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage. • **Does the battery voltage rise to 15.5 volts or higher?**	**Yes** REFER to Section 414-00 . **No** GO to AF3 .
AF3 RECHECK FOR DTC U3003:17	
• Ignition OFF. • Ignition ON. • Clear the FCDIM DTCs. • Repeat the FCDIM self-test.	**Yes** INSTALL a new FCDIM . REFER to Front Controls/Display Interface Module (FCDIM) in this section. TEST the system for normal operation.

• **Is DTC U3003:17 present?**	**No** The system is operating correctly at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.

Pinpoint Test AG: DTC U3003:16 (Global Positioning System Module (GPSM))

Refer to Wiring Diagrams Cell 130 , Audio System/Navigation for schematic and connector information.

Normal Operation

- DTC U3003:16 (Battery Voltage: Circuit Voltage Below Threshold) â set by the Global Positioning System Module (GPSM) when the supply voltage falls below 10 volts for at least 10 seconds during normal operation or for greater than 250 milliseconds during the self-test.

This pinpoint test is intended to diagnose the following:

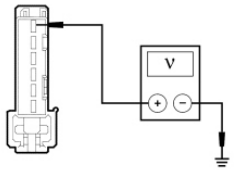
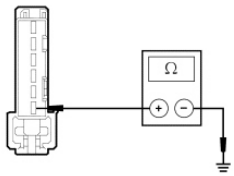
- Wiring, terminal or connectors
- High circuit resistance
- GPSM

PINPOINT TEST AG: DTC U3003:16 (GPSM)

NOTICE: **Use the correct probe adaptor(s) when making measurements. Failure to use the correct probe adaptor(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
AG1 RECHECK THE GPSM DTCs	
• Clear the GPSM DTCs. • Ignition OFF. • Ignition ON. • Wait at least 15 seconds. • Repeat the GPSM self-test. • **Is DTC U3003:16 still present?**	**Yes** GO to AG2 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition.
AG2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Retrieve the continuous memory DTCs from all modules. • **Are any low voltage DTCs set in the PCM?**	**Yes** REFER to Section 414-00 . **No** GO to AG3 .
AG3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE	
• Check the battery condition and verify that the battery is fully charged. Refer to Section 414-01 .	**Yes** GO to AG4 .

• **Is the battery OK and fully charged?**	**No** REFER to Section 414-01 .
AG4 CHECK THE GPSM VOLTAGE SUPPLY	
• Ignition OFF. • Measure and record the voltage at the battery. • Disconnect: GPSM C2398. • Measure the voltage between the GPSM C2398-1, circuit SBP16 (VT/RD) for vehicles built up to 1/14/2011, or circuit SBP10 (YE/RD) for vehicles built after 1/14/2011, harness side and ground.  N0094349 • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to AG5 . **No** REPAIR the circuit for high resistance. CLEAR the DTC. REPEAT the self-test.
AG5 CHECK THE GPSM GROUND CIRCUIT FOR CONTINUITY	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the GPSM C2398-6, circuit GD111 (BK/BU), harness side and ground.  N0094350 • **Is the resistance less than 5 ohms?**	**Yes** GO to AG6 . **No** REPAIR the circuit for high resistance. CLEAR the DTC. REPEAT the self-test.
AG6 CHECK FOR CORRECT GPSM OPERATION	
• Disconnect the GPSM connector. • Connect: Negative Battery Cable. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the GPSM connector and make sure it seats correctly. • **Is the concern still present?**	**Yes** INSTALL a new GPSM . REFER to Global Positioning System Module (GPSM) in this section. 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 AH: DTC U3003:17 (Global Positioning System Module (GPSM))

Normal Operation

- DTC U3003:17 (Battery Voltage: Circuit Voltage Above Threshold) â set by the Global Positioning System Module (GPSM) when the supply voltage is greater than 15.8 volts for greater than 250 milliseconds during normal operation or the self-test.

This pinpoint test is intended to diagnose the following:

- Charging system concern
- GPSM

PINPOINT TEST AH: DTC U3003:17 (GPSM)

NOTE: DTC U3003:17 may be stored in the module memory due to past battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
AH1 CHECK FOR HIGH VOLTAGE DTCs SET IN OTHER MODULES	
• Ignition ON. • Retrieve the continuous memory DTCs from all modules. • **Are high voltage DTCs (e.g., B1317, U3003:17, P0563) set in more than one module?**	**Yes** REFER to Section 414-01 to diagnose an overcharging. **No** GO to AH2 .
AH2 CHECK THE BATTERY VOLTAGE	
• Turn off all interior/exterior lights and accessories. • Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage. • **Does the battery voltage rise to 15.5 volts or higher?**	**Yes** REFER to Section 414-00 . **No** GO to AH3 .
AH3 RECHECK FOR DTC U3003:17	
• Ignition OFF. • Ignition ON. • Clear the GPSM DTCs. • Repeat the GPSM self-test. • **Is DTC U3003:17 present?**	**Yes** INSTALL a new GPSM . REFER to Global Positioning System Module (GPSM) in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.

Pinpoint Test AI: 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 AI: POOR SOUND QUALITY OR DISTORTED SOUND FROM ONE OR MORE SPEAKERS (NOT ALL SPEAKERS)

Test Step	Result / Action to Take
AI1 ISOLATE THE ZONE	
• Operate the audio system using digital media (CD, MP3, etc.). • 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. • Locate and apply pressure to the trim panel(s) around the poor sound quality area in question. • **Does applying pressure to a trim panel reduce or eliminate the audible noise?**	**Yes** REPAIR or REPLACE the trim panel as needed. **No** GO to AI2 .
AI2 REMOVE AND INSPECT BEHIND/UNDERNEATH THE SUSPECT TRIM PANEL(S)	
• Remove the trim panel to access the suspect speaker. • Operate the audio system using digital media (CD, MP3, etc.). • Validate where the poor sound quality area is located. • Check: ♦ Trim panel for loose components (e.g. speaker grille) around the speaker area. ♦ Trim panel joining components for missing or broken pieces. ♦ Lock and handle mechanical parts for correct attachment. ♦ Wire harnesses for correct routing. ♦ Wire harness fasteners for correct attachment.	**Yes** REPAIR or REPLACE any loose or broken component or fastener as needed. **No** GO to AI3 .

♦ Watershield for correct placement (speaker air path not blocked). ♦ Watershield for correct bonding to sheet metal. ♦ Storage areas for loose items. ♦ All child safety belt anchors (if equipped). ♦ All safety belt retractors. ♦ All speaker bracket fasteners and other fasteners are secured and tightened to specified torque. • **Was the source of the noise located?**	
AI3 CHECK THE SUSPECT SPEAKER FOR WATER INTRUSION	
• Inspect for watermarks. • Check the: ♦ Cone. ♦ Magnet. ♦ Basket. • **Are any watermarks present on the speaker?**	**Yes** VERIFY the water shield is in the correct location, REPAIR or REPLACE any trim, door, or speaker seal as required. DRY the speaker in question and TEST the system for normal operation. **No** GO to AI4 .
AI4 ISOLATE SPEAKER TO VERIFY NOISE	
• Remove the suspect speaker from its location and leave the speaker connected to the harness. • Hold the speaker away from any trim panel(s) and ensure the speaker is isolated from contact. • Operate the audio system using digital media (CD, MP3, etc.). • **Is the noise still present in the suspect speaker?**	**Yes** INSTALL a new speaker for the one in question. **No** LOCATE the source of the noise and REPAIR as needed.

Accessory Protocol Interface Module (APIM) Software Level Check

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST3051-A	Universal Serial Bus (USB) Male-A to Male-A Cable CCMUSB2-AM-AM-10 or equivalent

NOTE: This procedure applies to checking the Accessory Protocol Interface Module (APIM) software level. To program the APIM , refer to Accessory Protocol Interface Module (APIM) Programming in Section 418-01 .

1. Turn the Audio Front Control Module (ACM) on.

2. Connect the scan tool to the Data Link Connector (DLC).

3. Connect one end of the Universal Serial Bus (USB) male-A to male-A cable to the scan tool.

4. Connect the other end of the USB male-A to male-A cable to the vehicle USB port.

5. From the technician service publication website, run On-Line Automotive Service Information System (OASIS) using Quick Start or by manually entering the Vehicle Identification Number (VIN).

6. From the OASIS tab, select the "Sync/APIM" bullet.

7. Select the "Read APIM" button to verify the current APIM software level.
   - The display shows both the Vehicle Interface Processor (VIP) and Consumer Interface Processor (CIP) software levels.

8. The scan tool displays the following information:
   - Last Recorded State - Hardware
     - VIN : vehicle identification number associated with the current APIM
     - Installed date: date the APIM was installed
     - Radio: currently identified ACM in the vehicle
     - HW Part No.: APIM hardware part number
     - Un-installed date: date (if any) the APIM was uninstalled
     - S/N: APIM serial number
   - Last Recorded State - Software
     - Date/Time: date and time of last recorded software installation
     - VIP : VIP software that was installed at that time
     - CIP : CIP software that was installed at that time
     - Description: a description of the content of the software revision
   - History - Software
     - Date/Time: date and time of any recorded software installation
     - VIP : VIP software that was installed at that time

- ♦ CIP : CIP software that was installed at that time
- ♦ Description: a description of the content of the software revision

- Available Software for Programming
  - ♦ Select: allows the software package to be selected
  - ♦ Lineage: the original software release, if the software available is a revision
  - ♦ VIP : VIP software level that is available with the selection
  - ♦ CIP : CIP software level that is available with the selection
  - ♦ Description: a description of the content of the software revision

9. Click a CIP software level to view the device compatibility list associated with the CIP software level, if desired.

10. To exit the APIM software level check, disconnect the scan tool from the DLC and the USB port, or exit the OASIS screen.

Satellite Radio Receiver Electronic Serial Number (ESN) Retrieval

Satellite Radio Electronic Serial Number (ESN) Retrieval

NOTE: If the SDARS is inoperable the Electronic Serial Number (ESN) may be obtained from a label affixed to the chassis.

1. Operate the audio system in satellite radio mode.

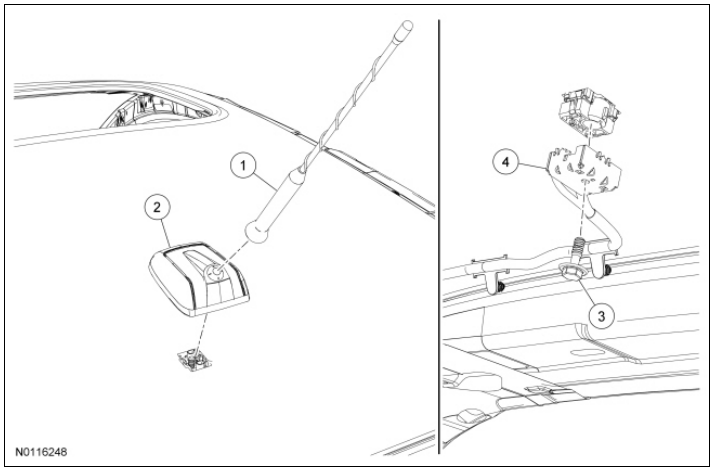
2. Depending on vehicle configuration, press and hold the AUX button and preset button 1 or the SIRIUS button and preset button 1, simultaneously.
   - The Satellite Digital Audio Receiver System (SDARS) module Electronic Serial Number (ESN) displays on the screen.

3. Record the SDARS module ESN .

4. Turn the audio system off.

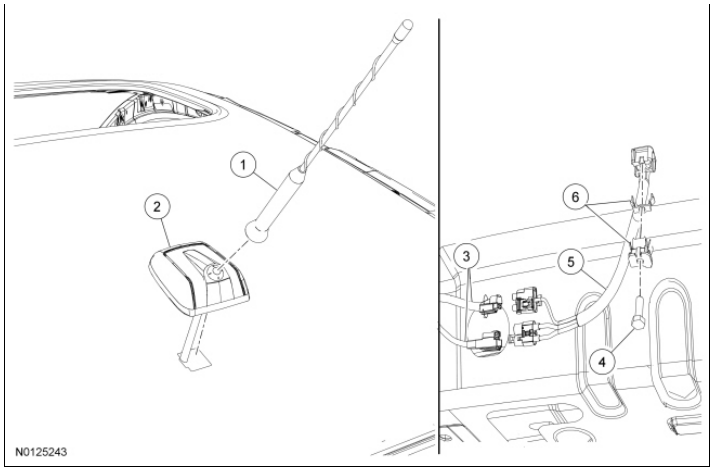
Antenna

Early Build



Item	Part Number	Description
1	18813	Antenna mast
2	18936	Antenna
3	-	Antenna cable bolt (part of 18812)
4	18812	Antenna cable

Late Build



Item	Part Number	Description
1	18813	Antenna mast
2	18936	Antenna
3	18812	Antenna cable
4	-	Antenna cable bolt (part of 18936)
5	-	Antenna pigtail (part of 18936)

6	-	Antenna retainers (part of 18936)

Removal and Installation

All

1. Remove the headliner. For additional information, refer to Section 501-05 .

Early build

2. Remove the bolt from the antenna base and remove the antenna cable connector from the antenna base.
    - To install, tighten to 9Nm (80 lb-in).

Late build

3. Disconnect the antenna cable electrical connectors. Remove the bolt from tna base and remove the antenna base retainers.
    - To install, tighten to 9Nm (80 lb-in).

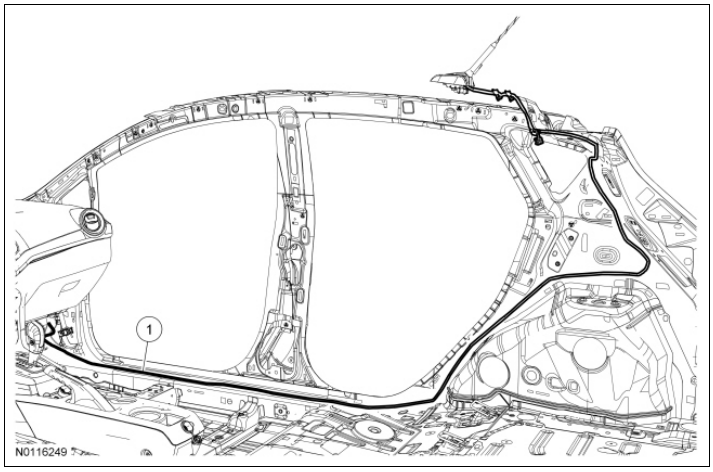
All

4. Remove the satellite radio antenna from the top of the roof.

5. To install, reverse the removal procedure.

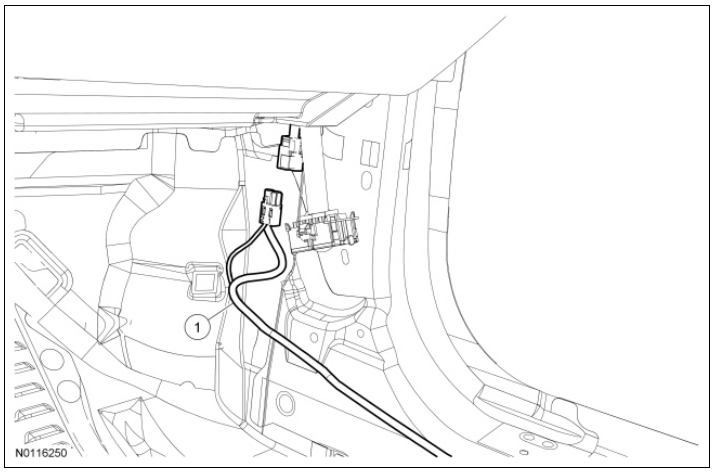
Antenna Cable - AM/FM/Satellite Radio

Cable Routing - Rear



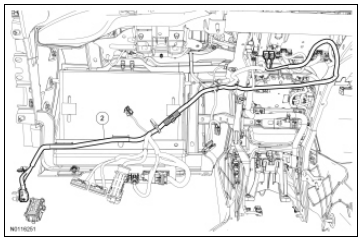
Item	Part Number	Description
1	18812	AM/FM/Satellite radio rear antenna cable

Cable Connection



Item	Part Number	Description
1	18812	AM/FM/Satellite radio rear antenna cable

Cable Routing - Front



Item	Part Number	Description
2	18812	AM/FM/Satellite radio front antle

Removal

NOTE: The AM/FM/Satellite radio antenna cables are part of the vehicle wiring harness. Because the cables cannot be removed from the harness, this procedure applies to replacement of the cables only.

Front cable

1. Remove the Audio Front Control Module (ACM) and disconnect the AM/FM/Satellite radio antenna cable connection(s). For additional information, refer to Audio Control Module (ACM) in this section.

2. Remove the glove compartment. For additional information, refer to Section 501-12 .

3. Remove the right lower cowl side trim panel. For additional information, refer to Section 501-05 .

4. Disconnect the AM/FM/Satellite radio front antenna cable in-line connection(s) at the lower right side of the cowl.

Rear cable

5. Remove the headliner, C-pillar upper trim panel, C-pillar lower trim panel, rear scuff plate, B-pillar lower trim panel, front scuff plate and the RH side cowl side trim panel. For additional information, refer to Section 501-05 .

6. Remove the AM/FM/Satellite radio antenna cable bolt, and disconnect the AM/FM/Satellite radio rear antenna cable from the antenna base.

7. Disconnect the AM/FM/Satellite radio rear antenna cable in-line connection(s) at the lower right side of the cowl.

Installation

Front cable

1. Overlay the new AM/FM/Satellite radio front antenna cable on the vehicle wiring harness, following the routing of the original cable.

2. Secure the new AM/FM/Satellite radio front antenna cable to the wiring harness with tape or zip ties as necessary.

3. Connect the AM/FM/Satellite radio front antenna cable in-line connection(s) at the lower right side of the cowl.

4. Install the right lower cowl side trim panel. For additional information, refer to Section 501-05 .

5. Install the glove compartment. For additional information, refer to Section 501-12 .

6. Install the Audio Front Control Module (ACM) and connect the AM/FM/Satellite radio front antenna cable connection(s). For additional information, refer to Audio Control Module (ACM) in this section.

Rear cable

7. Overlay the new AM/FM/Satellite radio rear antenna cable on the vehicle wiring harness, following the routing of the original cable.

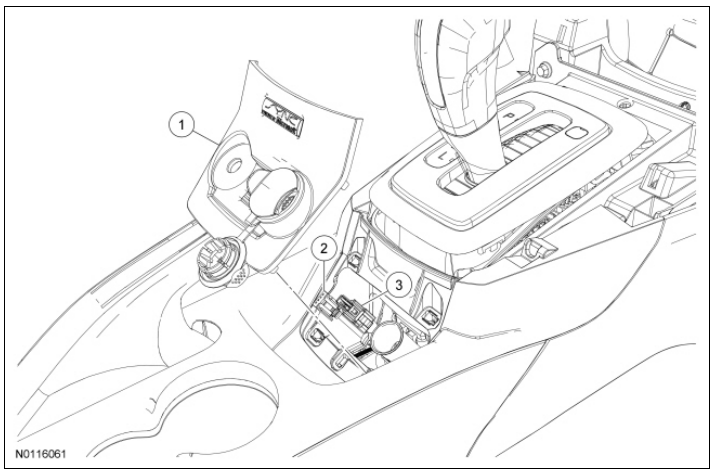
8. Secure the new AM/FM/Satellite radio rear antenna cable to the wiring harness with tape or zip ties as necessary.

9. Connect the AM/FM/Satellite radio rear antenna cable to the AM/FM/Satellite radio antenna cable base and install the antenna cable bolt.
    - Tighten to 6 Nm (53 lb-in).

10. Connect the AM/FM/Satellite radio rear antenna cable in-line connection(s) at the lower right side of the cowl and at the right side quarter trim panel.

11. Install the headliner, C-pillar upper trim panel, C-pillar lower trim panel, rear scuff plate, B-pillar lower trim panel, front scuff plate and the RH side cowl side trim panel. For additional information, refer to Section 501-05 .

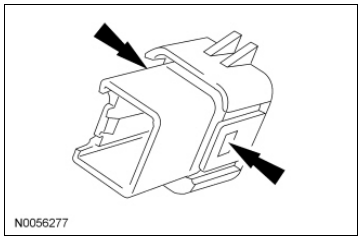
Audio Input Jack



Item	Part Number	Description
1	19C149	Console bezel
2	19A164	Audio input jack
3	14D202	Universal Serial Bus (USB) port and cable

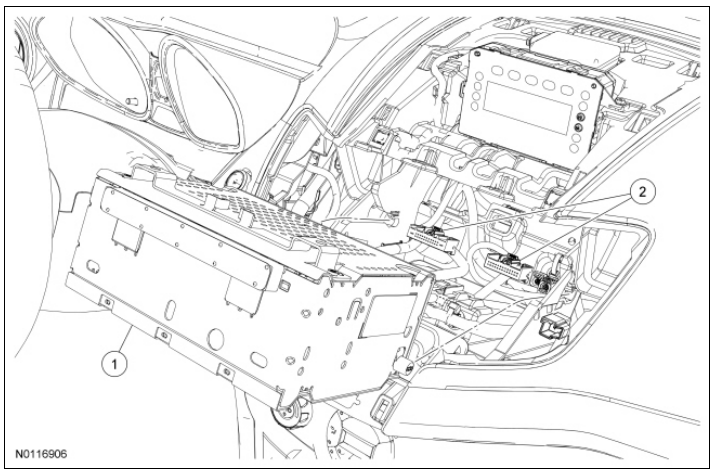
Removal and Installation

1. Remove the instrument panel lower finish panel. For additional information, refer to Section 501-12 .
2. With a non-marring tool, lift the corners of the console bezel upward to release the retaining clips.
3. Disconnect the electrical connector from the audio input jack.
4. Release the tabs and remove the audio input jack from the bezel.



5. To install, reverse the removal procedure.
    - Make sure to align the finish panel retaining clips to the adjacent retaining clip holes.

Audio Control Module (ACM)



Item	Part Number	Description
1	18K810 / 18C869	ACM
2	-	ACM electrical connectors (part of 14K024)

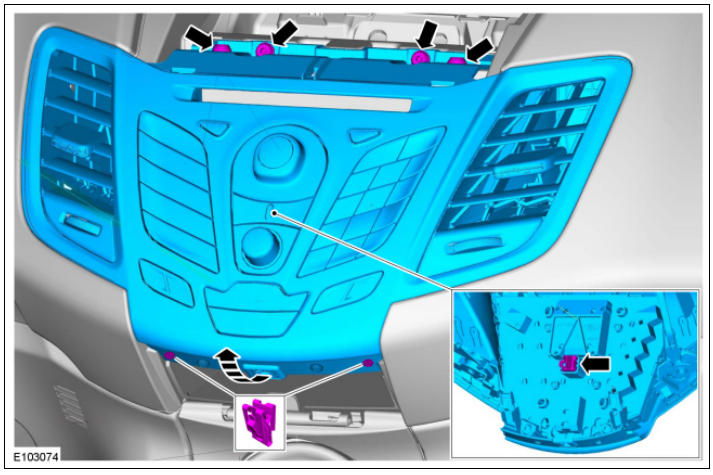
Removal and Installation

NOTE: Module configuration is required when a new ACM is being installed.

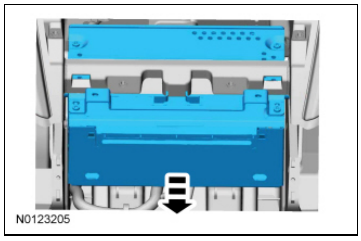
1. Upload the ACM configuration information to the scan tool. For additional information, refer to PMI in Section 418-01 .

2. Remove the instrument panel upper finish panel. For additional information, refer to Section 501-12 .

3. Remove the 4 Front Controls Interface Module (FCIM) finish panel screws and rotate upwards from the bottom to release the 3 clips. Remove the Front Controls Interface Module (FCIM) finish panel.
   - Disconnect the electrical connecr.



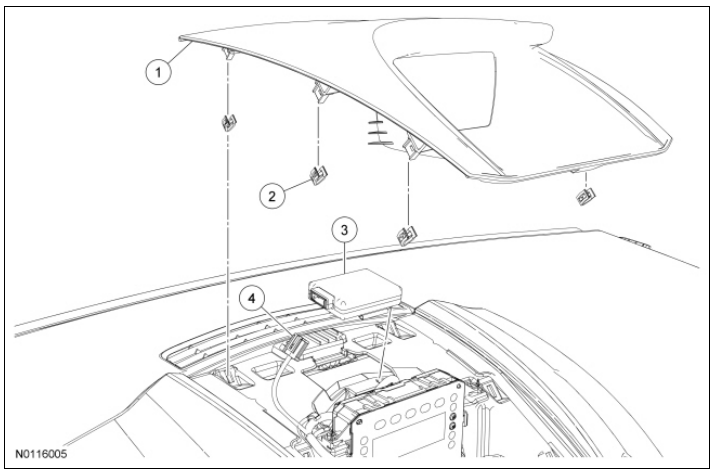
4. Remove the ACM .
   - Disconnect the ACM electrical connectors.



5. To install, reverse the removal procedure.

6. Download the configuration information to the ACM . For additional information, refer to PMI in Section 418-01 .

Global Positioning System Module (GPSM)



Item	Part Number	Description
1	042A82	Upper finish panel
2	W714972	Upper finish panel clips (6 required)
3	10E893	Global Positioning System Module (GPSM)
4	-	GPSM electrical connector (part of 14K024)

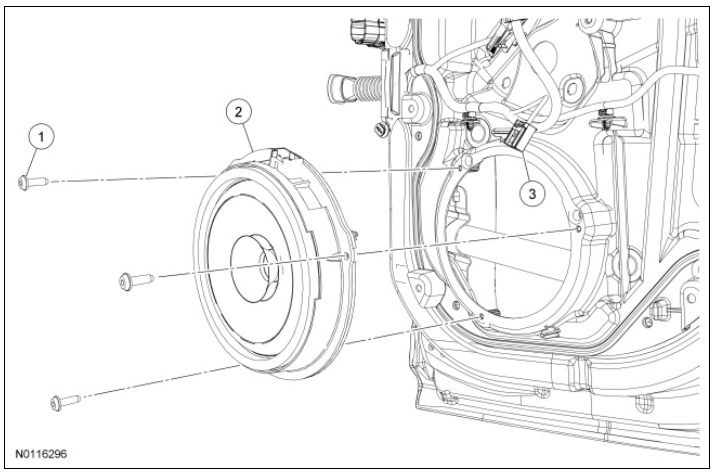
Removal and Installation

1. Remove the instrument panel upper finish panel. For additional information, refer to Section 501-12 .

2. Slide the GPSM and bracket rearward and remove.
   - Disconnect the electrical connector.

3. To install, reverse the removal procedure.

Speaker - Rear Door



Item	Part Number	Description
1	W506964-S	Speaker screws (3 required)
2	18808C	Door speaker
3	-	Door speaker electrical connector (part of 14631)

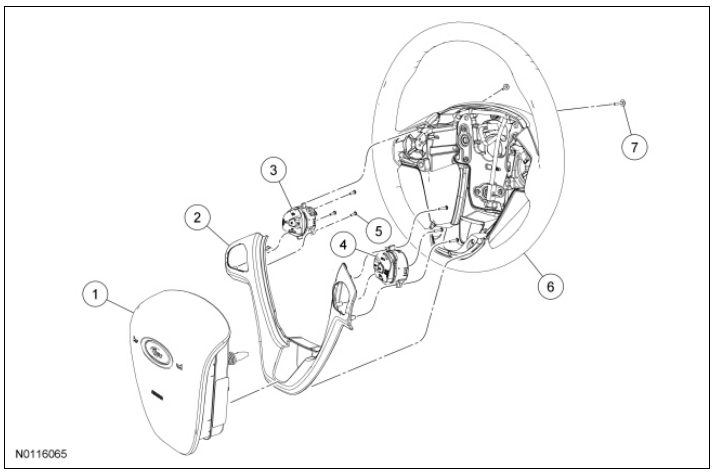
Removal and Installation

1. Remove the rear door trim panel. For additional information, refer to Section 501-05 .

2. Remove the 3 screws from the rear door speaker and remove the speaker.
   - Disconnect the electrical connector.

3. To install, reverse the removal procedure.

Steering Wheel Controls



Item	Part Number	Description
1	043B13	Driver air bag module
2	-	Steering wheel finish panel
3	9C888	Audio control switch
4	9C888	Cruise control switch
5	-	Switch screws (3 required)
6	3600	Steering wheel
7	-	Steering wheel finish panel screws (2 required)

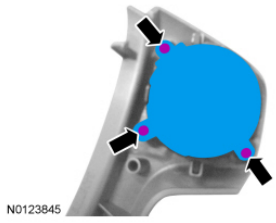
Removal and Installation

1. Remove the driver air bag module. For additional information, refer to Section 501-20B .

2. Remove the 2 steering wheel finish panel screws on the back of the steering wheel and remove the steering wheel finish panel.



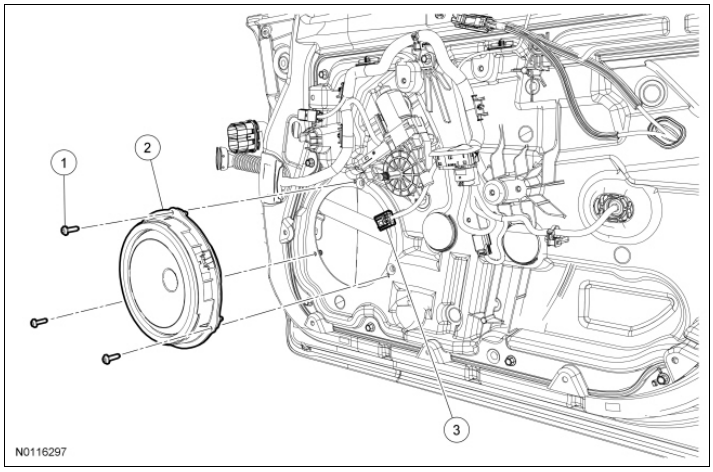
3. Remove the 3 screws on the steering wheel control switch and remove the switch from the steering wheel finish panel.
   - Disconnect the electrical connector.



4. To install, reverse the removal procedure.

Speaker - Front Door

Speaker - subwoofer



Item	Part Number	Description
1	W506964-S	Speaker screws (3 required)
2	18808A	Speaker
3	-	Speaker electrical connector (part of 14631)

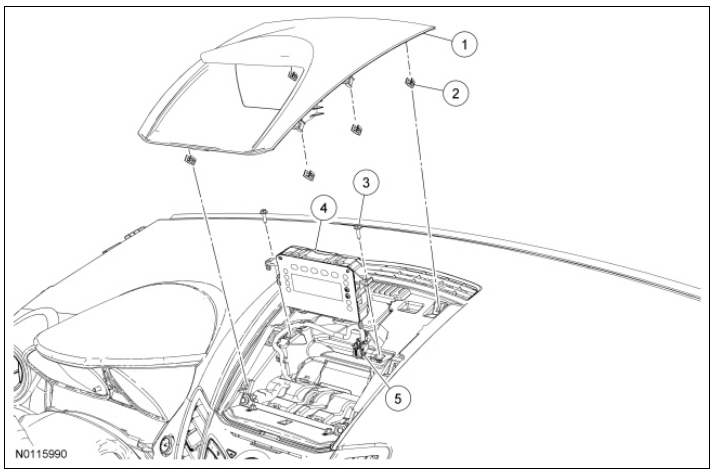
Removal and Installation

1. Remove the front door trim panel. For additional information, refer to Section 501-05 .

2. Remove the 3 speakers screws and remove the speaker.
   - Disconnect the electrical connector.

3. To install, reverse the removal procedure.

Front Controls/Display Interface Module (FCDIM)

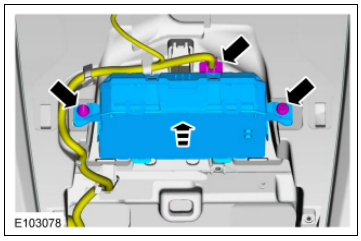


Item	Part Number	Description
1	042A82	Upper finish panel
2	W714972	Upper finish panel clips (6 required)
3	N806272	FCDIM screws (2 required)
4	10D885	FCDIM
5	-	FCDIM electrical connector (part of 14K024)

Removal and Installation

1. Remove the instrument panel upper finish panel. For additional information, refer to Section 501-12 .

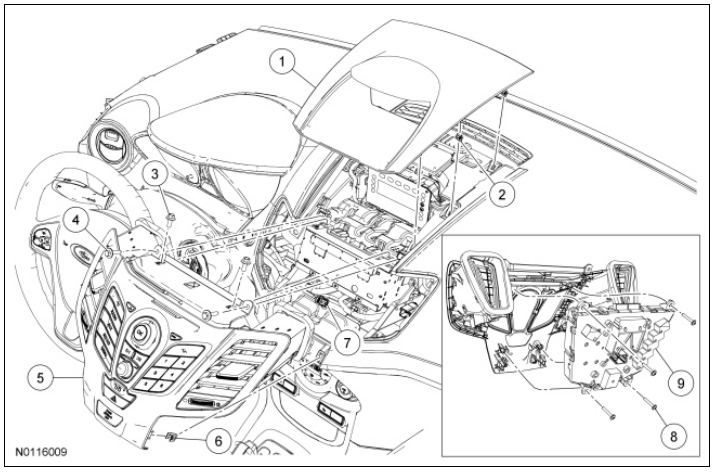
2. Remove the two screws and remove the FCDIM .
   - Disconnect the FCDIM electrical connectors.



3. To install, reverse the removal procedure.

Front Controls Interface Module (FCIM)

Front Controls Interface Module (FCIM)

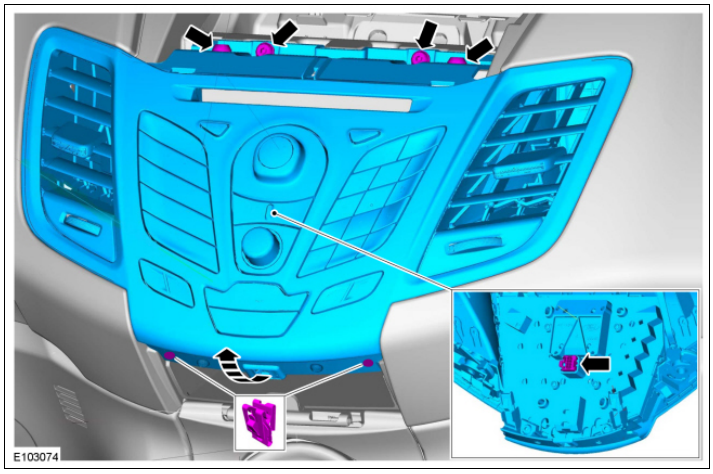


Item	Part Number	Description
1	042A82	Upper finish panel
2	W714972	Upper finish panel clips (6 required)
3	W505142	FCIM finish panel screws (2 required)
4	W707628	FCIM finish panel screws (2 required)
5	18A802	Finish panel
6	-	Finish panel clip (2 required)
7	18812	FCIM electrical connector (part of 14K024)
8	W506962	FCIM screws (4 required)
9	18842	FCIM

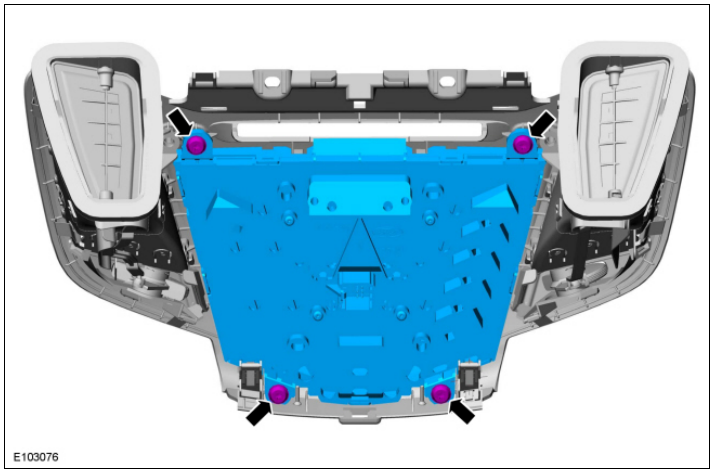
Removal and Installation

1. Remove the upper finish panel. For additional information, refer to Section 501-12 .

2. Remove the 4 Front Controls Interface Module (FCIM) finish panel screws and rotate upwards from the bottom to release the 3 clips. Remove the FCIM finish panel.
    - Disconnect the electrical connector and release the Passenger Air Bag Deactivation (PAD) indicator from the FCIM finish panel.

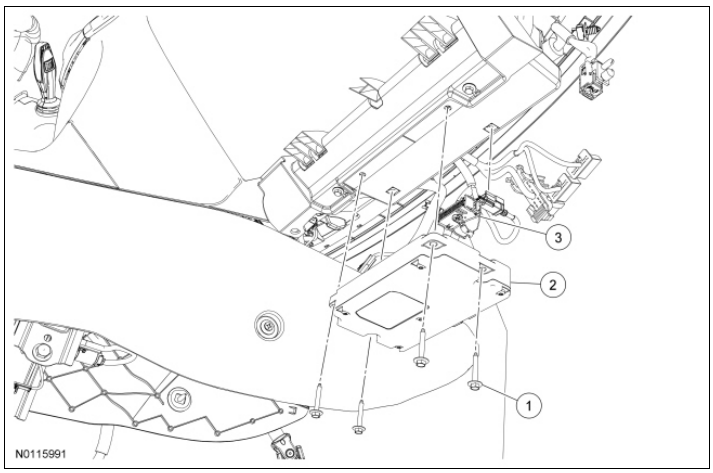


3. Remove the 4 screws from the FCIM and remove the FCIM from the finish panel.



4. To install, reverse the removal procedure.

Accessory Protocol Interface Module (APIM)



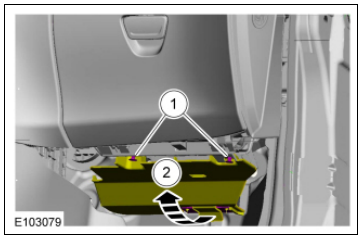
Item	Part Number	Description
1	W505156	APIM screws (4 required)
2	14D212	APIM
3	-	APIM connector (part of 14K024)

Removal and Installation

1. **NOTE:** It is necessary to record the current Accessory Protocol Interface Module (APIM) software and hardware level when a new APIM is being installed to make sure that the new component is the same version as the component being replaced.

   Retrieve and record the current APIM software and hardware level. For additional information, refer to Accessory Protocol Interface Module (APIM) Software Level Check in this section.

2. Disengage the two push pins and remove the hush panel from the lower right side of the instrument panel.

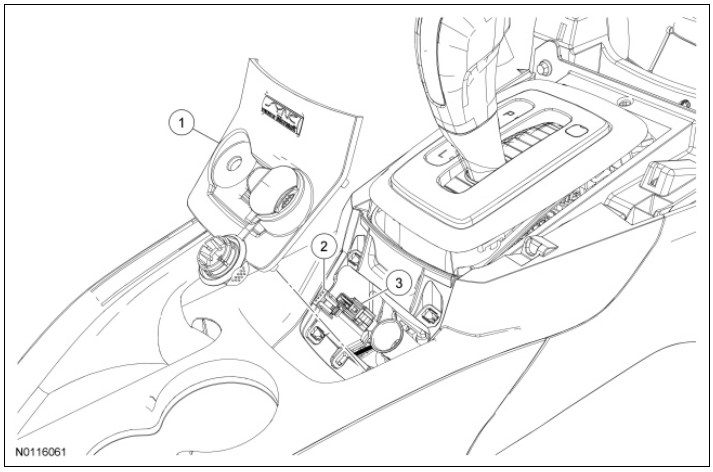


3. Remove the 4 screws and the APIM .
   - Disconnect the electrical connector and the Universal Serial Bus (USB) cable.

4. To install, reverse the removal procedure.
   - If a new APIM is being installed, program the APIM to the correct software level. For additional information, refer to Section 418-01 .

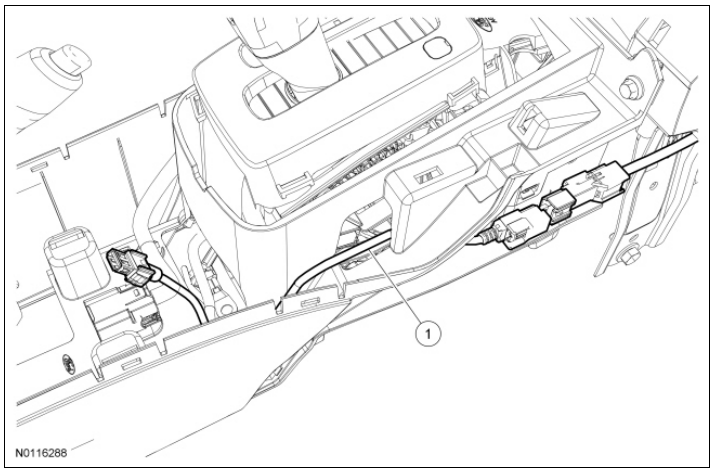
Universal Serial Bus (USB) Cable and Port

USB Port



Item	Part Number	Description
1	19C149	Console bezel
2	19A164	Audio input jack
3	14D202	Universal Serial Bus (USB) port and cable

USB Cable - Console



Item	Part Number	Description
1	14D202	USB cable - console

Removal

NOTE: The Universal Serial Bus (USB) cable is a two piece cable. The USB cable routed through the floor console can be removed and replaced. The USB cable routed through the instrument panel is taped into the wiring harness. Because the instrument panel USB cable cannot be removed from the harness, this procedure applies to replacement of that cable only.

USB Port and Cable - Console

1. Remove the instrument panel lower finish panel and the RH floor console side panel. For additional information, refer to Section 501-12 .

2. Release the push-pins and remove the Universal Serial Bus (USB) port and cable from the floor console bezel.

3. Disconnect the floor console to instrument panel USB cable electrical connector and remove the USB cable.

USB Cable Cable - Instrument panel

4. Remove the instrument panel lower finish panel and the RH floor console side panel. For additional information, refer to Section 501-12 .

5. Disconnect the floor console to instrument panel USB cable electrical connector and push pin.

6. Disconnect the USB cable at the Accessory Protocol Interface Module (APIM). For additional information, refer to Section 415-00 .

Installation

USB Port and Cable - Console

1. Route the USB cable through the floor console. Connect the floor console to instrument panel USB cable electrical connector.

2. Connect the USB port and cable to the floor console bezel.

3. Install the instrument panel lower finish panel and the RH floor console side panel. For additional information, refer to Section 501-12 .

USB Cable Cable - Instrument panel

4. Overlay the new USB cable on the vehicle wiring harness, following the routing of the original cable.

5. Secure the new USB cable to the wiring harness with tape or zip ties as necessary.

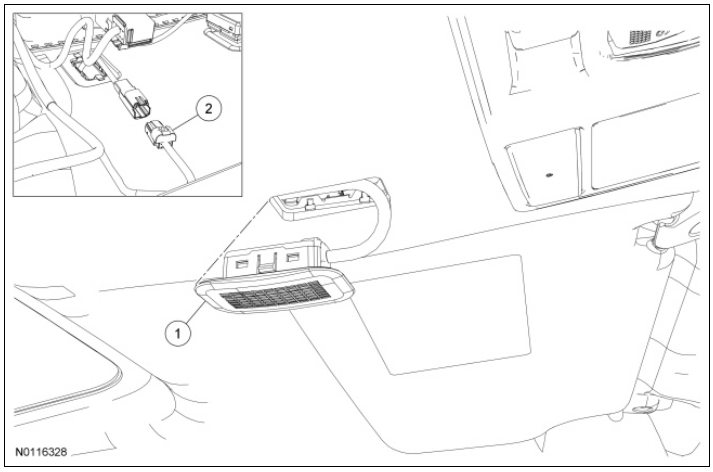
6. Connect the floor console to instrument panel USB cable electrical connector and push pin.

7. Connect the USB cable at the Accessory Protocol Interface Module (APIM). For additional information, refer to Section 415-00 .

8. Install the instrument panel lower finish panel and the RH floor console side panel. For additional information, refer to Section 501-12 .

Microphone

Microphone - SYNC



Item	Part Number	Description
1	19A391	Microphone
2	W713933	Microphone connector (Part of 14335)

Removal

NOTE: If the microphone is removed from the headliner, a new microphone must be installed.

1. Using a suitable tool, (such as a thin small flat head screwdriver) twist and pry the microphone bezel from the headliner metal mounting bracket.

2. Remove the microphone from the headliner by grasping the microphone pigtail.
   - Disconnect the microphone electrical connector.

Installation

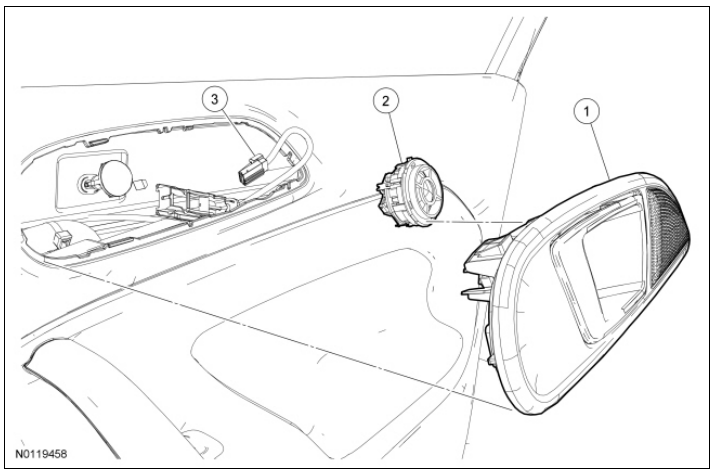
1. Reconnect the microphone electrical connector.

2. Wrap the connection with anti-rattle tape.

3. Feed the microphone pigtail into the headliner through the microphone hole.
   - Verify the microphone pigtail points towards the front of the vehicle.

4. Snap the microphone into the headliner mounting bracket.
   - Verify the mounting bracket and microphone are snug to the headliner.

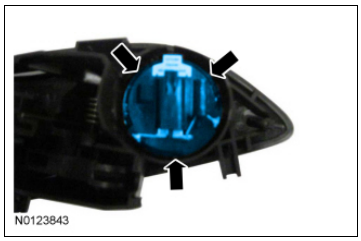
Speaker - Tweeter



Item	Part Number	Description
1	22600 RH/ 22601 LH	Interior door handle
2	18808B	Speaker
3	-	Speaker connector (part of 14631)

Removal and Installation

1. Remove the front interior door handle. For additional information, refer to Section 501-14 .
2. Release the 3 tabs and remove the speaker from the front interior door handle.



3. To install, reverse the removal procedure.

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SECTION 419-10: Multifunction Electronic Modules

Torque Specifications

Description	Nm	lb-in
Headlamp assembly bolts	5	44
High mounted stoplamp screws (5-door hatchback)	1.9	17
Reversing lamp switch	14	124

Exterior Lighting

The exterior lighting system consists of the following components:

- Headlamp assemblies
- Body Control Module (BCM) (located under the glove compartment)
- Stoplamp switch
- Low beam relay
- High beam relay
- Reversing lamp relay
- Daytime Running Lamps (DRL) relay (if equipped)
- Headlamp switch
- Multifunction switch
- Reversing lamp switch (manual transaxle)
- Exterior mirror turn lamps
- High mounted stoplamp
- Rear lamp assemblies
- License plate lamps

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 mist forms on the interior of the lens. The thin mist eventually clears and exits through the vents during normal operation. The amount of time it takes to clear the lens of acceptable mist varies with ambient humidity and lamp types. 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 quad-beam pattern system. It consists of replaceable low and high beam bulbs. The headlamp assembly has the park/turn indicator and side marker lamp integrated into the headlamp assembly. The headlamps do not illuminate when the ignition is OFF or in ACC and the headlamp switch is in the HEADLAMPS ON position.

If the headlamps are in the high beam mode when the headlamp switch is turned off, the BCM defaults the headlamps to the low beam mode the next time the headlamp switch is placed in the HEADLAMPS ON position.

Flash-to-Pass and High Beam

When the ignition is in RUN, the high beams are illuminated when the multifunction switch is placed in the FLASH-TO-PASS position and remain illuminated until the multifunction switch is released.

If the low beams are on when the multifunction switch is placed in the HIGH BEAM position, the high beams are illuminated in addition to the low beams (high beam mode). The high beams turn off (low beam mode) when the multifunction switch is placed in the HIGH BEAM position again or the headlamp switch is switched out of the HEADLAMPS ON position.

Headlamp Exit Delay

When the ignition is OFF or in ACC and the multifunction switch is placed in the FLASH-TO-PASS position and released, the parking lamps and low beams are illuminated. They remain illuminated until one of the following occurs:

- 3 minutes have elapsed with a door open
- 30 seconds have elapsed after all doors are closed
- the multifunction switch is placed in the FLASH-TO-PASS position again
- the ignition changes to RUN

With all the doors closed, but within the 30 second delay, opening any door results in the 3 minute timer restarting.

Daytime Running Lamps (DRL)

If the vehicle is equipped with Daytime Running Lamps (DRL), the BCM is configured for this feature. The DRL feature illuminates the low beam headlamps at a reduced intensity when the ignition is in RUN and the headlamp switch is in the OFF position.

The DRL feature is inactive when the flash-to-pass feature is active.

The DRL feature is not a programmable parameter for this vehicle.

Stoplamps

The stoplamp switch is located on the brake pedal assembly. The stoplamps illuminate when the brake pedal is applied. The rear lamps are combination stop/turn lamps on 4-door vehicles.

Turn Signal/Hazard Lamps

The front turn signal lamps are located within the headlamp assemblies. The rear lamps on 4-door vehicles share functionality with the stoplamps (combination stop/turn lamps). If equipped, there are turn signal lamps located within the exterior mirrors.

When the multifunction switch is place in the LH or RH LANE CHANGE position (first detent down or up) and released, the turn signals flash 1 or 3 times. This setting is programmed by the driver from the center display (Front Control/Display Interface Module (FCDIM)) in the instrument panel.

When the multifunction switch is placed in the LH or RH TURN position (second detent down or up), the BCM cycles the voltage on and off approximately 75 times per minute. If a front or rear turn bulb is inoperative, the BCM cycles the voltage on and off approximately 150 times per minute.

The hazard flasher switch is integrated into the Front Controls Interface Module (FCIM). When the hazard flasher switch is pressed, the BCM cycles the voltage on and off to all the turn lamps approximately 75 times per minute.

Parking Lamps

The BCM supplies voltage to the parking lamps when demanded. The parking lamp system includes the following:

- Front parking lamps
- Front side marker lamps
- Rear parking lamps
- License plate lamps

Reversing Lamps

When the transaxle is placed in REVERSE (R) with the ignition in RUN, the reversing lamp relay (automatic transaxle) or the reversing lamp switch (manual transaxle) provides voltage to the reversing lamps. The reversing lamps are located within the rear lamp assemblies.

Diagnostic Trouble Code (DTC) Chart

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B1007:92	High-Beam Headlamp Switch: Performance Or Incorrect Operation	GO to Pinpoint Test D .
B1092:12	Daytime Running Light Relay: Circuit Short To Battery	GO to Pinpoint Test F .
B1092:14	Daytime Running Light Relay: Circuit Short To Ground Or Open	If the Daytime Running Lamps (DRL) are inoperative, GO to Pinpoint Test F . If the DRL are on with the ignition off, GO to Pinpoint Test G .
B1098:11	Left Position Light: Circuit Short To Ground	GO to Pinpoint Test P .
B1098:15	Left Position Light: Circuit Short To Battery Or Open	If the parking lamps are inoperative, GO to Pinpoint Test P . If the parking lamps are always on, GO to Pinpoint Test Q .
B1099:11	Right Position Light: Circuit Short To Ground	GO to Pinpoint Test P .
B1099:15	Right Position Light: Circuit Short To Battery Or Open	If the parking lamps are inoperative, GO to Pinpoint Test P . If the parking lamps are always on, GO to Pinpoint Test Q .
B109A:12	High Beam Relay: Circuit Short To Battery	GO to Pinpoint Test B .
B109A:14	High Beam Relay: Circuit Short To Ground Or Open	If the high beams are inoperative, GO to Pinpoint Test B . If the high beams are always on, GO to Pinpoint Test D .
B10A6:92	Main Light Switch: Performance Or Incorrect Operation	GO to Pinpoint Test C .
B10A8:12	Low Beam Relay: Circuit Short To Battery	GO to Pinpoint Test A .
B10A8:14	Low Beam Relay: Circuit Short To Ground Or Open	If the low beams are inoperative, GO to Pinpoint Test A . If the low beams are always on, GO to Pinpoint Test C .
B1118:11	Left Rear Sidemarker: Circuit Short To Ground	GO to Pinpoint Test P .
B1118:15	Left Rear Sidemarker: Circuit Short To Battery Or Open	If the parking lamps are inoperative, GO to Pinpoint Test P .

		If the parking lamps are always on, GO to Pinpoint Test Q .
B132B:12	Left Stop/Turn Lamp: Circuit Short To Battery	GO to Pinpoint Test M .
B132B:14	Left Stop/Turn Lamp: Circuit Short To Ground Or Open	If the LH stoplamp is inoperative, GO to Pinpoint Test I . If the LH rear turn lamp function is inoperative, GO to Pinpoint Test M .
B132C:12	Right Stop/Turn Lamp: Circuit Short To Battery	GO to Pinpoint Test M .
B132C:14	Right Stop/Turn Lamp: Circuit Short To Ground Or Open	If the RH stoplamp is inoperative, GO to Pinpoint Test I . If the RH rear turn lamp function is inoperative, GO to Pinpoint Test M .
B1D06:11	Left Turn Indicator: Circuit Short To Ground	For 4-door vehicles, GO to Pinpoint Test M . For 5-door vehicles, GO to Pinpoint Test N .
B1D06:15	Left Turn Indicator: Circuit Short To Battery Or Open	For 4-door vehicles, GO to Pinpoint Test M . For 5-door vehicles, GO to Pinpoint Test N .
B1D07:11	Right Turn Indicator: Circuit Short To Ground	For 4-door vehicles, GO to Pinpoint Test M . For 5-door vehicles, GO to Pinpoint Test N .
B1D07:15	Right Turn Indicator: Circuit Short To Battery Or Open	For 4-door vehicles, GO to Pinpoint Test M . For 5-door vehicles, GO to Pinpoint Test N .
B1D35:23	Hazard Switch: Signal Stuck Low	GO to Pinpoint Test O .
B1D36:92	Turn Indicator Switch: Performance Or Incorrect Operation	GO to Pinpoint Test L .
C1137:24	Reverse Gear Switch: Signal Stuck High	GO to Pinpoint Test T .
All other DTCs	-	REFER to Section 419-10 .

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 NUD105-R025D or equivalent

Principles of Operation

Exterior Lighting

The Body Control Module (BCM) monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground to indicate the headlamp switch position.

If, when the ignition is in RUN, the BCM does not detect any active inputs from the headlamp switch or if the BCM detects multiple headlamp switch input circuits short to ground, the BCM turns the parking lamps and headlamps on and keeps them on until the ignition is transitioned OFF.

If either situation occurs, the BCM **cannot** be ruled immediately as being at fault. This is normal behavior of the BCM design as a fault has been detected with the inputs from the headlamp switch.

Flash-to-Pass and High Beam

The BCM monitors the multifunction switch for a flash-to-pass or high beam request. With the ignition in RUN and the multifunction switch in the FLASH-TO-PASS position, the BCM energizes the high beam relay until the multifunction switch is released.

If the low beams are on when the BCM detects the multifunction switch is in the HIGH BEAM position, the BCM energizes the high beam relay to provide voltage to the high beams (high beam mode). The BCM defaults to low beam mode if the headlamps are turned off using the headlamp switch or the ignition transitions out of RUN.

Field-Effect Transistor (FET) Protection

A Field-Effect Transistor (FET) is a type of transistor that, when used with module software, monitors and controls current flow on module outputs. The FET protection strategy prevents module damage in the event of excessive current flow.

The BCM utilizes a FET protective circuit strategy for many of its outputs (such as a turn lamp output circuit). Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down when a fault event is detected. A short circuit DTC sets when the fault event occurs.

The circuit remains off until the fault is corrected and the ignition is cycled off and then back on, the module resets the FET protection and allows the circuit to function.

The FET protected circuits for the headlamp system are the low and high beam relay coil ground circuits.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Headlamp switch • Multifunction switch	• Battery Junction Box (BJB) fuse(s): ♦ 12 (10A) (LH high beam) ♦ 13 (10A) (RH high beam) ♦ 14 (10A) (LH low beam) ♦ 15 (10A) (RH low beam) ♦ 23 (7.5A) (low beam relay coil) ♦ 31 (20A) (low beam relay) • Central Junction Box (CJB) fuse 21 (10A) (ignition ON input) • Low beam relay • High beam relay • Bulb(s) • Wiring, terminals or connectors

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 is ON.

- ♦ The air bag warning indicator prove-out confirms ignition ON (other indicators may not prove ignition ON). If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
- 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 BCM .

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: One Or Both Low Beams Are Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps for schematic and connector information.

Normal Operation

The low beams do not turn on unless the ignition is in RUN. The Body Control Module (BCM) monitors a circuit that is provided voltage when the ignition is in RUN.

Voltage is provided at all times to the switch and coil sides of the low beam relay. When the BCM detects the headlamp switch in the HEADLAMPS ON position, the BCM provides ground for the low beam relay coil. When the low beam relay energizes, voltage is routed through Battery Junction Box (BJB) fuses 14 (10A) (LH low beam) and 15 (10A) (RH low beam) to the headlamps.

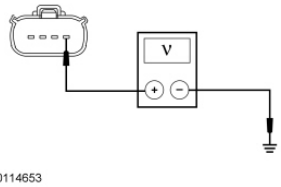
- DTC B10A8:12 (Low Beam Relay: Circuit Short To Battery) - a continuous and on-demand DTC that sets when the BCM detects a short to voltage from the low beam relay coil ground controlled circuit.
- DTC B10A8:14 (Low Beam Relay: Circuit Short To Ground Or Open) - a continuous and on-demand DTC that sets when the BCM detects an open from the low beam relay coil ground controlled circuit.

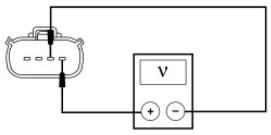
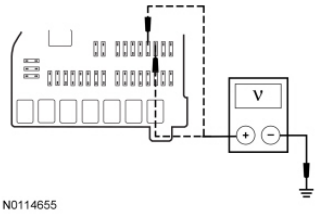
This pinpoint test is intended to diagnose the following:

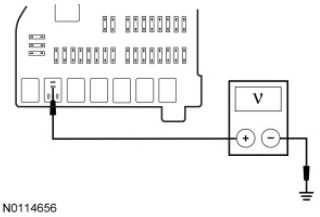
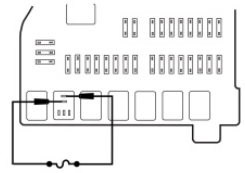
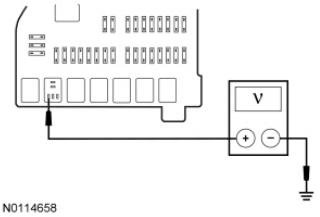
- Fuse
- Wiring, terminals or connectors
- Low beam relay
- Headlamp assembly
- BCM

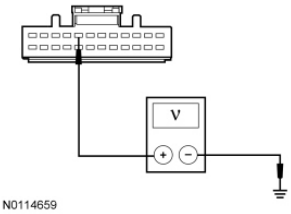
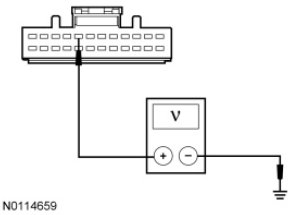
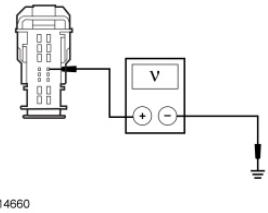
PINPOINT TEST A: ONE OR BOTH LOW BEAMS ARE INOPERATIVE

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
A1 DETERMINE IF BOTH HEADLAMPS ARE INOPERATIVE	
• Ignition ON. • Place the headlamp switch in the HEADLAMPS ON position and observe the headlamps. • **Are both headlamps inoperative?**	**Yes** VERIFY the BJB fuses 23 (7.5A) and 31 (20A) are OK. If OK, GO to A5 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. **No** VERIFY the BJB fuse 14 (10A) (LH low beam) or fuse 15 (10A) (RH low beam) is OK. If OK, GO to A2 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.
A2 CHECK FOR VOLTAGE TO THE HEADLAMP	
• Place the headlamp switch in the HEADLAMPS OFF position. • Ignition OFF. • Disconnect: Inoperative Headlamp. • Ignition ON. • Place the headlamp switch in the HEADLAMPS ON position. • Measure the voltage between the LH headlamp C1021-1, circuit CBB14 (VT/OG), harness side and ground; or between the RH headlamp C1041-1, circuit CBB15 (BN/BU), harness side and ground.  N0114653 • **Is the voltage greater than 10 volts?**	**Yes** GO to A3 . **No** GO to A4 .
A3 CHECK THE HEADLAMP GROUND CIRCUIT FOR AN OPEN	

• Measure the voltage between the LH headlamp C1021-1, circuit CBB14 (VT/OG), harness side and the LH headlamp C1021-2, circuit GD123 (BK/GY), harness side; or between the RH headlamp C1041-1, circuit CBB15 (BN/BU), harness side and the RH headlamp C1041-2, circuit GD188 (BK/YE), harness side.  N0114654 • **Is the voltage greater than 10 volts?**	**Yes** REPAIR or INSTALL a new headlamp assembly. REFER to Headlamp Assembly in this section. TEST the system for normal operation. **No** REPAIR the circuit GD123 (BK/GY) (LH headlamp) or circuit GD188 (BK/YE) (RH headlamp) for an open. TEST the system for normal operation.
A4 CHECK FOR VOLTAGE TO THE LOW BEAM FUSE	
• Disconnect: BJB Fuse 14 (10A) (LH low beam) or Fuse 15 (10A) (RH low beam) . • Measure the voltage between the BJB fuse 14 (10A) (LH low beam), circuit CLF09 (BU/GY), input side and ground; or between the BJB fuse 15 (10A) (RH low beam), circuit CLF09 (BU/GY), input side and ground.  N0114655 • **Is the voltage greater than 10 volts?**	**Yes** REPAIR circuit CBB14 (VT/OG) (LH headlamp) or circuit CBB15 (BN/BU) (RH headlamp) for an open. TEST the system for normal operation. **No** REPAIR circuit CLF09 (BU/GY) for an open. TEST the system for normal operation.
A5 CHECK THE LOW BEAM RELAY	
• Place the headlamp switch in the HEADLAMPS OFF position. • Ignition OFF. • Disconnect: Low Beam Relay. • Substitute a known good relay. • Ignition ON. • Place the headlamp switch in the HEADLAMPS ON position. • **Do the headlamps illuminate?**	**Yes** REMOVE the known good relay. INSTALL a new low beam relay. TEST the system for normal operation. **No** REMOVE the known good relay. GO to A6 .
A6 CHECK FOR VOLTAGE TO THE LOW BEAM RELAY	

• Ignition OFF. • Measure the voltage between the low beam relay pin 5, circuit SBB31 (WH/RD), BJB face side and ground.  N0114656 • **Is the voltage greater than 10 volts?**	**Yes** GO to A7 . **No** REPAIR circuit SBB31 (WH/RD) for an open. TEST the system for normal operation.
A7 BYPASS THE LOW BEAM RELAY	
• Connect a fused jumper wire between the low beam relay pin 5, circuit SBB31 (WH/RD), BJB face side and the low beam relay pin 3, circuit CLF09 (BU/GY), BJB face side.  N0114657 • **Do the headlamps illuminate?**	**Yes** REMOVE the jumper wire. GO to A8 . **No** REMOVE the jumper wire. REPAIR circuit CLF09 (BU/GY) for an open. TEST the system for normal operation.
A8 CHECK FOR VOLTAGE TO THE LOW BEAM RELAY COIL	
• Measure the voltage between the low beam relay pin 1, circuit SBB23 (WH/RD), BJB face side and ground.  N0114658 • **Is the voltage greater than 10 volts?**	**Yes** GO to A9 . **No** REPAIR circuit SBB23 (WH/RD) for an open. CLEAR the DTCs. TEST the system for normal operation.
A9 CHECK THE LOW BEAM RELAY COIL GROUND CONTROLLED CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: BCM C2280D. • Ignition ON. • Measure the voltage between the BCM C2280D-5, circuit CLF04 (BN/BU), harness side and ground.	**Yes** REPAIR circuit CLF04 (BN/BU) for a short to voltage. CYCLE the ignition ON then OFF. CLEAR the DTCs. TEST the system for normal operation.

 N0114659 • **Is any voltage present?**	**No** GO to A10 .
A10 CHECK THE LOW BEAM RELAY COIL GROUND CONTROLLED CIRCUIT FOR AN OPEN	
• Ignition OFF. • Connect: Low Beam Relay. • Ignition ON. • Measure the voltage between the BCM C2280D-5, circuit CLF04 (BN/BU), harness side and ground.  N0114659 • **Is the voltage greater than 10 volts?**	**Yes** GO to A11 . **No** REPAIR circuit CLF04 (BN/BU) for an open. CLEAR the DTCs. TEST the system for normal operation.
A11 CHECK THE IGNITION RUN INPUT CIRCUIT FOR AN OPEN	
• Disconnect: BCM C2280B. • Ignition ON. • Measure the voltage between the BCM C2280B-4, circuit CBP21 (BU/GY), harness side and ground.  N0114660 • **Is the voltage greater than 10 volts?**	**Yes** GO to A12 . **No** REPAIR circuit CBP21 (BU/GY) for an open. CLEAR the DTCs. TEST the system for normal operation.
A12 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No**

• Connect all the BCM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test B: One or Both High Beams are Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps for schematic and connector information.

Normal Operation

Voltage is provided at all times to the switch and coil sides of the high beam relay. The Body Control Module (BCM) sends a voltage signal to the multifunction switch to monitor for a high beam request. The multifunction switch routes the voltage signal to ground when placed in the HIGH BEAM position. When the headlamps are on and the BCM detects a request for the high beams, the BCM provides ground for the high beam relay coil. When the high beam relay energizes, voltage is routed through Battery Junction Box (BJB) fuses 12 (10A) (LH low beam) and 13 (10A) (RH low beam) to the headlamps.

- DTC B109A:12 (High Beam Relay: Circuit Short To Battery) - a continuous and on-demand DTC that sets when the BCM detects a short to voltage from the high beam relay coil ground controlled circuit.
- DTC B109A:14 (High Beam Relay: Circuit Short To Ground Or Open) - a continuous and on-demand DTC that sets when the BCM detects an open from the high beam relay coil ground controlled circuit.

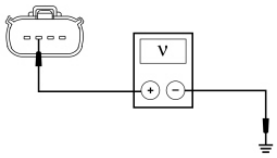
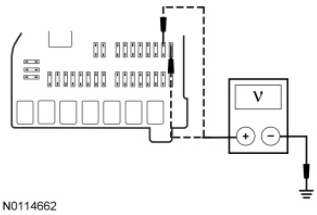
This pinpoint test is intended to diagnose the following:

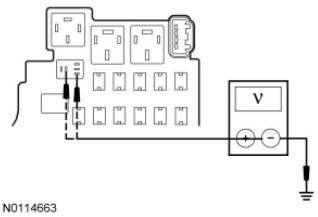
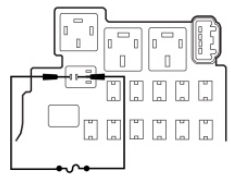
- Fuse
- Wiring, terminals or connectors
- High beam relay
- Multifunction switch
- Headlamp assembly
- BJB
- BCM

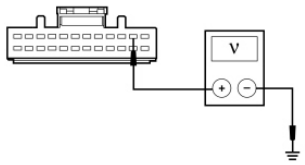
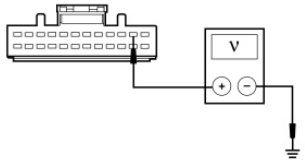
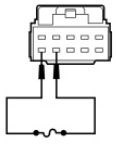
PINPOINT TEST B: ONE OR BOTH HIGH BEAMS ARE INOPERATIVE

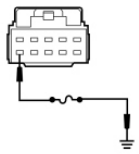
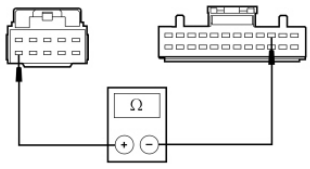
NOTICE: **Use the correct probe adapter(s) when making measurementailure to use the correct probe adapter(s) may damage the connector.**

Test Step	Result / Action to Take
B1 CHECK THE LOW BEAM OPERATION	
• Ignition ON. • Place the headlamp switch in the HEADLAMPS ON position. • **Do both low beams illuminate?**	**Yes** If an individual high beam is inoperative, VERIFY the BJB fuse 12 (10A) (LH high beam) or fuse 13 (10A) (RH high beam) is OK. If OK, GO to B2 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. If both high beams are inoperative, GO to B4 .

	No GO to Pinpoint Test A .
B2 CHECK FOR VOLTAGE TO THE HEADLAMP	
• Place the headlamp switch in the HEADLAMPS OFF position. • Ignition OFF. • Disconnect: Inoperative Headlamp. • Ignition ON. • Place the headlamp switch in the HEADLAMPS ON position and the multifunction switch in the HIGH BEAM position. • Measure the voltage between the LH headlamp C1021-3, circuit CBB12 (GN/WH), harness side and ground; or between the RH headlamp C1041-3, circuit CBB13 (GY/BN), harness side and ground.  N0114661 • **Is the voltage greater than 10 volts?**	**Yes** REPAIR or INSTALL a new headlamp assembly. REFER to Headlamp Assembly in this section. TEST the system for normal operation. **No** GO to B3 .
B3 CHECK FOR VOLTAGE TO THE HIGH BEAM FUSE	
• Ignition OFF. • Disconnect: BJB Fuse 12 (10A) (LH high beam) or Fuse 13 (10A) (RH high beam). • Measure the voltage between the BJB fuse 12 (10A) (LH high beam), circuit CLF08 (YE/VT), input side and ground; or between the BJB fuse 13 (10A) (RH high beam), circuit CLF08 (YE/VT), input side and ground.  N0114662 • **Is the voltage greater than 10 volts?**	**Yes** REPAIR circuit CBB12 (GN/WH) (LH headlamp) or circuit CBB13 (GY/BN) (RH headlamp) for an open. TEST the system for normal operation. **No** REPAIR circuit CLF08 (YE/VT) for an open. TEST the system for normal operation.
B4 CHECK THE BCM MULTIFUNCTION SWITCH PID	
• Enter the following diagnostic mode on the scan tool: BCM DataLogger.	**Yes** GO to B5 .

• Monitor the BCM multifunction switch input PID (HIGH_BEAM_SW) while placing the multifunction switch in the HIGH BEAM position. • **Does the PID indicate a request for high beams?**	**No** GO to B10 .
B5 CHECK THE HIGH BEAM RELAY	
• Place the headlamp switch in the HEADLAMPS OFF position. • Ignition OFF. • Disconnect: High Beam Relay. • Substitute a known good relay. • Ignition ON. • Place the headlamp switch in the HEADLAMPS ON position and the multifunction switch in the HIGH BEAM position. • **Do the high beams illuminate?**	**Yes** REMOVE the known good relay. INSTALL a new high beam relay. TEST the system for normal operation. **No** REMOVE the known good relay. GO to B6 .
B6 CHECK FOR VOLTAGE TO THE HIGH BEAM RELAY	
• Ignition OFF. • Measure the voltage between the high beam relay pin 1, BJB face side and ground; and between the high beam relay pin 5, BJB face side and ground.  N0114663 • **Are the voltages greater than 10 volts?**	**Yes** GO to B7 . **No** INSTALL a new BJB . CLEAR the DTCs. TEST the system for normal operation.
B7 BYPASS THE HIGH BEAM RELAY	
• Connect a fused jumper wire between the high beam relay pin 5, BJB face side and the high beam relay pin 3, circuit CLF08 (YE/VT), BJB face side.  N0114664 • **Do the high beams illuminate?**	**Yes** REMOVE the jumper wire. GO to B8 . **No** REMOVE the jumper wire. REPAIR circuit CLF08 (YE/VT) for an open. TEST the system for normal operation.
B8 CHECK THE HIGH BEAM RELAY COIL GROUND CONTROLLED CIRCUIT FOR A SHORT TO VOLTAGE	

• Disconnect: BCM C2280D . • Ignition ON. • Measure the voltage between the BCM C2280D-11, circuit CLF02 (GY/BN), harness side and ground.  N0114665 • **Is any voltage present?**	**Yes** REPAIR circuit CLF02 (GY/BN) for a short to voltage. CYCLE the ignition ON then OFF. CLEAR the DTCs. TEST the system for normal operation. **No** GO to B9 .
B9 CHECK THE HIGH BEAM RELAY COIL GROUND CONTROLLED CIRCUIT FOR AN OPEN	
• Ignition OFF. • Connect: High Beam Relay. • Ignition ON. • Measure the voltage between the BCM C2280D-11, circuit CLF02 (GY/BN), harness side and ground.  N0114665 • **Is the voltage greater than 10 volts?**	**Yes** GO to B13 . **No** REPAIR circuit CLF02 (GY/BN) for an open. CLEAR the DTCs. TEST the system for normal operation.
B10 BYPASS THE MULTIFUNCTION SWITCH	
• Ignition OFF. • Disconnect: Multifunction Switch C202A. • Ignition ON. • Connect a fused jumper wire between the multifunction switch C202A-10, circuit CLF17 (WH/OG), harness side and the multifunction switch C202A-9, circuit GD115 (BK/GY), harness side.  N0114666 • Enter the following diagnostic mode on the scan tool: BCM DataLogger.	**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 B11 .

• Monitor the BCM multifunction switch input PID (HIGH_BEAM_SW). • **Does the PID indicate a request for high beams?**	
B11 BYPASS THE MULTIFUNCTION SWITCH GROUND CIRCUIT	
• Connect a fused jumper wire between the multifunction switch C202D-10, circuit CLF17 (WH/OG), harness side and ground.  N0114667 • Enter the following diagnostic mode on the scan tool: BCM DataLogger . • Monitor the BCM multifunction switch input PID (HIGH_BEAM_SW). • **Does the PID indicate a request for high beams?**	**Yes** REMOVE the jumper wire. REPAIR circuit GD115 (BK/GY) for an open. TEST the system for normal operation. **No** REMOVE the jumper wire. GO to B12 .
B12 CHECK THE HIGH BEAM REQUEST INPUT CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280F . • Measure the resistance between the multifunction switch C202A-10, circuit CLF17 (WH/OG), harness side and the BCM C2280F-10, circuit CLF17 (WH/OG), harness side.  N0114668 • **Is the resistance less than 5 ohms?**	**Yes** GO to B13 . **No** REPAIR circuit CLF17 (WH/OG) for an open. TEST the system for normal operation.
B13 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM connectors and make sure they seat correctly.	**Yes** INSTALL a new BCM . 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.

• Operate the system and verify the concern is still present. • **Is the concern still present?**	

Pinpoint Test C: The Low Beams Are Always On

Refer to Wiring Diagrams Cell 85 , Headlamps for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends voltage signals to the headlamp switch through the headlamp switch input circuits (off, parking lamps, headlamps). At any given time, the headlamp switch routes one of the input circuits to ground, indicating the headlamp switch position to the BCM . When the BCM detects the headlamp switch in the HEADLAMPS ON position, the BCM provides ground for the low beam relay coil. When the low beam relay energizes, voltage is routed through Battery Junction Box (BJB) fuses 14 (10A) (LH low beam) and 15 (10A) (RH low beam) to the headlamps.

If the BCM detects multiple or no active headlamp switch inputs, the BCM defaults the exterior lamps on.

Vehicles equipped with Daytime Running Lamps (DRL) utilize a separate relay in conjunction with the existing headlamp circuitry to illuminate the low beams at a reduced intensity when the ignition is in RUN.

- DTC B10A6:92 (Main Light Switch: Performance Or Incorrect Operation) - a continuous and on-demand DTC that sets when the BCM detects a no inputs from the headlamp switch are active (circuits open) or more than one headlamp switch input circuits are active (short to ground).
- DTC B10A8:14 (Low Beam Relay: Circuit Short To Ground Or Open) - a continuous and on-demand DTC that sets when the BCM detects a short to ground from the low beam relay coil ground controlled circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Low beam relay
- DRL system concern
- Headlamp switch
- BCM

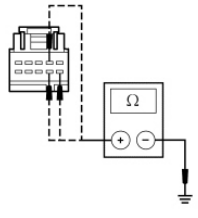
PINPOINT TEST C: THE LOW BEAMS ARE ALWAYS ON

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
C1 CHECK THE BCM HEADLAMP SWITCH PIDs	
NOTE: Make sure the headlamp switch is aligned in the correct position when monitoring the PIDs. **NOTE:** Only one PID should indicate ON at each headlamp switch position.	**Yes** GO to C7 . **No** GO to C2 .

• Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • While moving the headlamp switch through all positions (OFF, PARKING LAMPS and HEADLAMPS), monitor the BCM headlamp switch input PIDs (LIGHTNG_MODE, PARK_LMP_SW, LOW_BEAM_SW). • **Do the headlamp switch positions agree with the PIDs (with only one PID indicating ON in each position?**	
C2 CHECK THE HEADLAMP SWITCH	
• Ignition OFF. • Disconnect: Headlamp Switch C205. • Carry out the headlamp switch component test. Refer to Wiring Diagrams Cell 149 for component testing. • **Does the headlamp switch pass the component test?**	**Yes** GO to C3 . **No** INSTALL a new headlamp switch. REFER to Headlamp Switch in this section. CLEAR the DTCs. TEST the system for normal operation.
C3 DETERMINE IF A HEADLAMP SWITCH INPUT IS SHORT TO GROUND	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM headlamp switch input PIDs (LIGHTNG_MODE, PARK_LMP_SW, LOW_BEAM_SW). • **Do any of the headlamp switch PIDs indicate ON?**	**Yes** GO to C4 . **No** GO to C5 .
C4 CHECK THE HEADLAMP SWITCH INPUT CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280E. • Measure the resistance between the headlamp switch, harness side and ground as follows:	**Yes** GO to C12 . **No** REPAIR the circuit in question for a short to ground. CLEAR the DTCs. TEST the system for normal operation.

Headlamp Switch Connector-Pin	Circuit
C205-6	CLF23 (WH/VT)
C205-2	CLF24 (YE/BU)
C205-7	CLF18 (BU/WH)

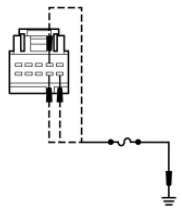


- **Are the resistances greater than 10,000 ohms?**

C5 DETERMINE IF A HEADLAMP SWITCH INPUT IS OPEN

- Enter the following diagnostic mode on the scan tool: BCM DataLogger.
- Monitor the BCM headlamp switch input PIDs while connecting a fused jumper wire between the headlamp switch pins and ground as follows:

PID to Monitor	Headlamp Switch Connector-Pin	Circuit
LIGHTNG_MODE	C205-6	CLF23 (WH/VT)
PARK_LMP_SW	C205-2	CLF24 (YE/BU)
LOW_BEAM_SW	C205-7	CLF18 (BU/WH)



- **Do the PIDs indicate ON with each corresponding connection?**

Yes
REPAIR circuit GD115 (BK/GY) for an open. CLEAR the DTCs. TEST the system for normal operation.

No
GO to C6 .

C6 CHECK THE HEADLAMP SWITCH INPUT CIRCUITS FOR AN OPEN

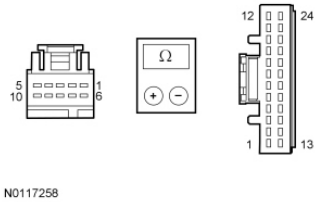
- Ignition OFF.
- Disconnect: BCM C2280E.
- Measure the resistance between the headlamp switch, harness side and the BCM , harness side as follows:

Headlamp Switch Connector-Pin	BCM Connector-Pin	Circuit

Yes
GO to C12 .

No
REPAIR the circuit in question for an open. CLEAR the DTCs. TEST the system for normal operation.

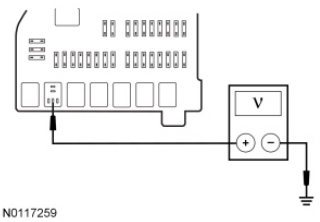
C205-6	C2280E-3	CLF23 (WH/VT)
C205-2	C2280E-9	CLF24 (YE/BU)
C205-7	C2280E-13	CLF18 (BU/WH)



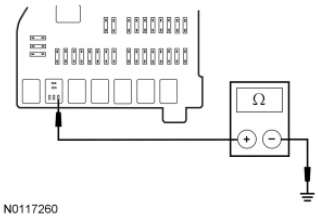
N0117258

- **Are the resistances less than 5 ohms?**

C7 CHECK THE LOW BEAM RELAY OUTPUT	
• Ignition OFF. • Disconnect: Low Beam Relay. • Ignition ON. • **Do the low beams continue to illuminate?**	**Yes** GO to C8 . **No** If equipped with DRL , GO to C9 . If not equipped with DRL , GO to C10 .
C8 ISOLATE THE SHORT TO VOLTAGE	
• Disconnect: BJB Fuses 14 (10A) and 15 (10A). • **Does either low beam continue to illuminate?**	**Yes** REPAIR circuit CBB14 (VT/OG) (LH headlamp) or circuit CBB15 (BN/BU) (RH headlamp) for a short to voltage as necessary. TEST the system for normal operation. **No** REPAIR circuit CLF09 (BU/GY) for a short to voltage. TEST the system for normal operation.
C9 CHECK THE DRL SYSTEM	
• Ignition OFF. • Measure the voltage between the low beam relay pin 4, circuit CLF13 (YE/BU), BJB face side and ground.	**Yes** GO to Pinpoint Test G . **No** GO to C10 .



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• **Is any voltage present?**	
C10 CHECK THE LOW BEAM RELAY	
• Ignition OFF. • Substitute a known good relay. • Ignition ON. • **Do the low beams continue to illuminate?**	**Yes** REMOVE the known good relay. GO to C11 . **No** REMOVE the known good relay. INSTALL a new low beam relay. TEST the system for normal operation.
C11 CHECK THE LOW BEAM RELAY COIL GROUND CONTROLLED CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280D. • Measure the resistance between the low beam relay pin 2, circuit CLF04 (BN/BU), BJB face side and ground.  • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to C12 . **No** REPAIR circuit CLF04 (BN/BU), for a short to ground. CLEAR the DTCs. TEST the system for normal operation.
C12 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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: The High Beams Are Always On

Refer to Wiring Diagrams Cell 85 , Headlamps for schematic and connector information.

Normal Operation

Voltage is provided at all times to the switch and coil sides of the high beam relay. The Body Control Module (BCM) sends two voltage signals to the multifunction switch. One is to monitor for a high beam request and the other for a flash-to-pass request. The multifunction switch routes the corresponding voltage signal to ground when placed in the HIGH BEAM or FLASH-TO-PASS position. When the headlamps are on and the BCM detects a request for the high beams or flash-to-pass feature, the BCM provides ground for the high

beam relay coil. When the high beam relay energizes, voltage is routed through Battery Junction Box (BJB) fuses 12 (10A) (LH high beam) and 13 (10A) (RH high beam) to the headlamps.

- DTC B1007:92 (High-Beam Headlamp Switch: Performance Or Incorrect Operation) - an on-demand DTC that sets when the BCM detects a short to ground from the high beam or flash-to-pass request input circuits.
- DTC B109A:14 (High Beam Relay: Circuit Short To Ground Or Open) - a continuous and on-demand DTC that sets when the BCM detects a short to ground from the high beam relay coil ground controlled circuit.

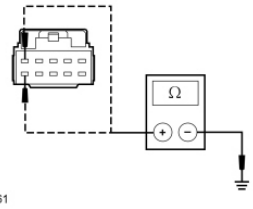
This pinpoint test is intended to diagnose the following:

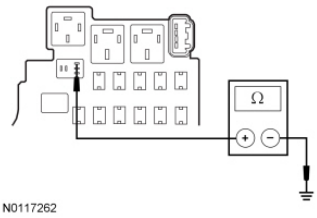
- Wiring, terminals or connectors
- High beam relay
- Multifunction switch
- BCM

PINPOINT TEST D: THE HIGH BEAM(S) ARE 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
D1 CHECK THE MULTIFUNCTION SWITCH INPUT	
• Ignition ON. BCM DataLogger. • Monitor the BCM multifunction switch high beam and flash-to-pass PIDs (HIGH_BEAM_SW, FLASH-to-PASS). • **Does either PID indicate a high beam or flash-to-pass request?**	**Yes** GO to D2 . **No** GO to D4 .
D2 CHECK THE MULTIFUNCTION SWITCH	
• Ignition OFF. • Disconnect: Multifunction Switch C202A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM multifunction switch high beam and flash-to-pass PIDs (HIGH_BEAM_SW, FLASH-to-PASS). • **Does either PID indicate a high beam or flash-to-pass request?**	**Yes** GO to D3 . **No** INSTALL a new multifunction switch. REFER to Section 211-05 . TEST the system for normal operation.
D3 CHECK THE HIGH BEAM AND FLASH-TO-PASS INPUT CIRCUITS FOR A SHORT TO GROUND	

• Ignition OFF. • Disconnect: BCM C2280E and C2280F . • Measure the resistance between the multifunction switch C202A-5, circuit CLF27 (GN/BN), harness side and ground; and between the multifunction switch C202A-10, circuit CLF17 (WH/OG), harness side and ground.  • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to D8 . **No** REPAIR circuit CLF27 (GN/BN) (flash-to-pass) or circuit CLF17 (WH/OG) (high beam) for a short to ground. TEST the system for normal operation.
D4 CHECK THE HIGH BEAM RELAY OUTPUT	
• Ignition OFF. • Disconnect: High Beam Relay. • Ignition ON. • **Do the high beams continue to illuminate?**	**Yes** GO to D5 . **No** GO to D6 .
D5 ISOLATE THE SHORT TO VOLTAGE	
• Disconnect: BJB Fuses 12 (10A) and 13 (10A). • **Does either high beam continue to illuminate?**	**Yes** REPAIR circuit CBB12 (GN/WH) (LH headlamp) or circuit CBB13 (GN/BN) (RH headlamp) for a short to voltage as necessary. TEST the system for normal operation. **No** REPAIR circuit CLF08 (YE/VT) for a short to voltage. TEST the system for normal operation.
D6 CHECK THE HIGH BEAM RELAY	
• Ignition OFF. • Substitute a known good relay. • Ignition ON. • **Do the high beams continue to illuminate?**	**Yes** REMOVE the known good relay. GO to D7 . **No** REMOVE the known good relay. INSTALL a new high beam relay. TEST the system for normal operation.
D7 CHECK THE HIGH BEAM RELAY COIL GROUND CONTROLLED CIRCUIT FOR A SHORT TO GROUND	

• Ignition OFF. • Disconnect: BCM C2280D. • Measure the resistance between the high beam relay pin 2, circuit CLF02 (GY/BN), BJB face side and ground.  N0117262 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to D8 . **No** REPAIR circuit CLF04 (BN/BU), for a short to ground. CLEAR the DTCs. TEST the system for normal operation.
D8 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 E: The Flash-To-Pass Feature Is Inoperative

Normal Operation

The Body Control Module (BCM) sends a voltage signal to the multifunction switch to monitor for a flash-to-pass feature request. The multifunction switch routes the voltage signal to ground when placed in the FLASH-TO-PASS position. When the headlamps are on and the BCM detects a request for the flash-to-pass feature, the BCM activates the high beams.

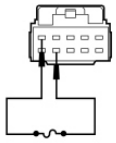
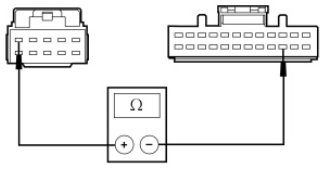
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Multifunction switch
- BCM

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
E1 VERIFY THE HIGH BEAM HEADLAMP OPERATION	
• Ignition ON.	**Yes** GO to E2 .

• Place the headlamp switch in the HEADLAMPS ON position. • Place the multifunction switch in the HIGH BEAM position while observing the headlamps. • **Do the high beams illuminate?**	**No** GO to Pinpoint Test B .
E2 BYPASS THE MULTIFUNCTION SWITCH	
• Place the headlamp switch in the OFF position. • Ignition OFF. • Disconnect: Multifunction Switch C202A. • Ignition ON. • Connect a fused jumper wire between the multifunction switch C202A-5, circuit CLF27 (GN/BN), harness side and the multifunction switch C202A-9, circuit GD115 (BK/GY), harness side.  N0117263 • **Do the high beams 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. GO to E3 .
E3 CHECK THE FLASH-TO-PASS INPUT CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280E. • Measure the resistance between the multifunction switch C202A-5, circuit CLF27 (GN/BN), harness side and the BCM C2280E-22, circuit CLF27 (GN/BN), harness side.  N0117264 • **Is the resistance less than 5 ohms?**	**Yes** GO to E4 . **No** REPAIR circuit CLF27 (GN/BN) for an open. TEST the system for normal operation.
E4 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present.	**Yes** INSTALL a new BCM . 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

• **Is the concern still present?**	by a loose or corroded connector.

Daytime Running Lamps (DRL)

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 NUD105-R025D or equivalent

Principles of Operation

The Body Control Module (BCM) controls the Daytime Running Lamps (DRL) by energizing the DRL relay when the ignition is in RUN and the headlamp switch is not in the HEADLAMPS ON position.

When the DRL relay is energized, voltage is routed through a resistor wire to the low beam relay. The voltage passes through the low beam relay to the existing circuitry for the low beams. The voltage passes through a resistor wire to illuminate the low beams at reduced intensity.

The DRL is not a programmable parameter for this vehicle.

Field-Effect Transistor (FET) Protection

A Field-Effect Transistor (FET) is a type of transistor that, when used with module software, monitors and controls current flow on module outputs. The FET protection strategy prevents module damage in the event of excessive current flow.

The BCM utilizes a FET protective circuit strategy for many of its outputs (such as a turn lamp output circuit). Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down when a fault event is detected. A short circuit DTC sets when the fault event occurs.

The circuit remains off until the fault is corrected and the ignition is cycled off and then back on, the module resets the FET protection and allows the circuit to function.

The FET protected circuit for the DRL system is the DRL relay coil ground circuit.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Electrical
• Battery Junction Box (BJB) fuse 25 (15A) (DRL relay) • Central Junction Box (CJB) fuse 21 (10A) (ignition input) • Daytime Running Lamps (DRL) relay • Wiring, terminals or connectors

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 is ON.
     - ♦ The air bag warning indicator prove-out confirms ignition ON (other indicators may not prove ignition ON). If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
   - 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 BCM .

9. If the DTCs retrieved are related to the concern, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual or 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 Daytime Running Lamps (DRL) Are Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps for schematic and connector information.

Normal Operation

Voltage at all times to the switch and coil sides of the Daytime Running Lamps (DRL) relay. When the ignition is in RUN, voltage the is supplied Body Control Module (BCM) from an ignition switch input circuit.

When the headlamps are not on and the BCM detects the ignition in RUN, the BCM provides ground for the DRL relay coil, energizing the relay. The DRL relay provides voltage to the low beam relay through a resistor wire. The voltage passes through the low beam relay and on to the existing low beam circuitry, illuminating the headlamps at a reduced intensity.

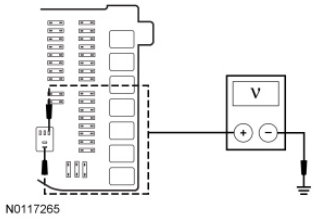
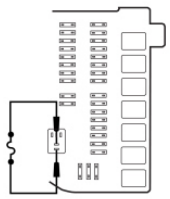
- DTC B1092:12 (Daytime Running Light Relay: Circuit Short To Battery) - a continuous and on-demand DTC that sets when the BCM detects a short to voltage from the DRL relay coil ground controlled circuit.
- DTC B1092:14 (Daytime Running Light Relay: Circuit Short To Ground Or Open) - a continuous and on-demand DTC that sets when the BCM detects an open from the DRL relay coil ground controlled circuit.

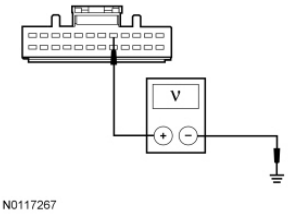
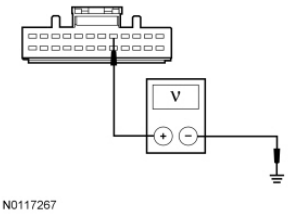
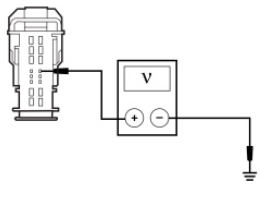
This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- DRL relay
- BCM

PINPOINT TEST F: THE DRL ARE INOPERATIVE

Test Step	Result / Action to Take
F1 CHECK THE LOW BEAM OPERATION	
• Ignition ON. • Place the headlamp switch in the HEADLAMPS ON position. • **Do both low beams illuminate?**	**Yes** VERIFY the BJB fuse 25 (15A) is OK. If OK, GO to F2 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. **No** GO to Pinpoint Test A .
F2 CHECK THE DRL RELAY	
• Place the headlamp switch in the HEADLAMPS OFF position. • Ignition OFF. • Disconnect: DRL Relay. • Substitute a known good relay. • Ignition ON.	**Yes** REMOVE the known good relay. INSTALL a new DRL relay. TEST the system for normal operation. **No** REMOVE the known good relay. GO to F3 .

• **Do the headlamps illuminate?**	
F3 CHECK FOR VOLTAGE TO THE DRL RELAY	
• Ignition OFF. • Measure the voltage between the DRL relay pin 1, circuit SBB25 (RD), BJB face side and ground; and between the DRL relay pin 3, circuit SBB25 (RD), BJB face side and ground.  N0117265 • **Are the voltages greater than 10 volts?**	**Yes** GO to F4 . **No** REPAIR circuit SBB25 (RD) for an open. TEST the system for normal operation.
F4 BYPASS THE DRL RELAY	
• Connect a fused jumper wire between the DRL relay pin 3, circuit SBB25 (RD), BJB face side and the DRL relay pin 5, circuit CLF13 (YE/BU), BJB face side.  N0117266 • **Do the headlamps illuminate?**	**Yes** REMOVE the jumper wire. GO to F6 . **No** LEAVE the jumper wire connected. GO to F5 .
F5 CHECK THE LOW BEAM RELAY	
• Disconnect: Low Beam Relay. • Substitute a known good relay. • **Do the headlamps illuminate?**	**Yes** REMOVE the jumper wire and the known good relay. INSTALL a new low beam relay. TEST the system for normal operation. **No** REMOVE the jumper wire and the known good relay. REPAIR circuit CLF13 (YE/BU) for an open. TEST the system for normal operation.
F6 CHECK THE DRL RELAY COIL GROUND CONTROLLED CIRCUIT FOR A SHORT TO VOLTAGE	

• Disconnect: BCM C2280D. • Ignition ON. • Measure the voltage between the BCM C2280D-8, circuit CLF10 (GN/OG), harness side and ground.  N0117267 • **Is any voltage present?**	**Yes** REPAIR circuit CLF10 (GN/OG) for a short to voltage. CYCLE the ignition ON then OFF. CLEAR the DTCs. TEST the system for normal operation. **No** GO to F7 .
F7 CHECK THE DRL RELAY COIL GROUND CONTROLLED CIRCUIT FOR AN OPEN	
• Ignition OFF. • Connect: DRL Relay. • Ignition ON. • Measure the voltage between the BCM C2280D-8, circuit CLF10 (GN/OG), harness side and ground.  N0117267 • **Is the voltage greater than 10 volts?**	**Yes** GO to F8 . **No** REPAIR circuit CLF10 (GN/OG) for an open. CLEAR the DTCs. TEST the system for normal operation.
F8 CHECK THE IGNITION ON INPUT CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280B. • Ignition ON. • Measure the voltage between the BCM C2280B-4, circuit CBP21 (BU/GY), harness side and ground.  N0114660	**Yes** GO to F9 . **No** VERIFY the CJB fuse 21 (10A) is OK. If OK, REPAIR circuit CBP21 (BU/GY) 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.

• **Is the voltage greater than 10 volts?**	
F9 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 G: The Daytime Running Lamps (DRL) Are On With The Ignition Off

Refer to Wiring Diagrams Cell 85 , Headlamps for schematic and connector information.

Normal Operation

Voltage at all times to the switch and coil sides of the Daytime Running Lamps (DRL) relay. Voltage is supplied from an ignition switch input circuit to the Body Control Module (BCM) when the ignition is in RUN.

When the headlamps are not on and the BCM detects the ignition in RUN, the BCM provides ground for the DRL relay coil, energizing the relay. The DRL relay provides voltage to the low beam relay through a resistor wire. The voltage passes through the low beam relay and on to the existing low beam circuitry, illuminating the headlamps at a reduced intensity.

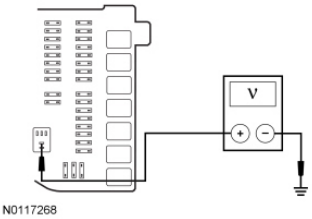
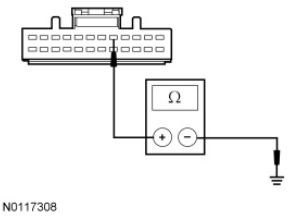
- DTC B1092:14 (Daytime Running Light Relay: Circuit Short To Ground Or Open) - a continuous and on-demand DTC that sets when the BCM detects a short to ground from the DRL relay coil ground controlled circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- DRL relay
- BCM

PINPOINT TEST G: THE DRL ARE ON WITH THE IGNITION OFF

Test Step	Result / Action to Take
G1 CHECK THE DRL RELAY OUTPUT	
• Ignition OFF. • Disconnect: DRL Relay. • **Do the headlamps continue to illuminate?**	**Yes** GO to G2 . **No** GO to G3 .
G2 CHECK THE DRL RELAY OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	

• Disconnect: Low Beam Relay. • Measure the voltage between the DRL relay pin 5, circuit CLF13 (YE/BU), BJB face side and ground.  N0117268 • **Is any voltage present?**	**Yes** REPAIR circuit CLF13 (YE/BU) for a short to voltage. TEST the system for normal operation. **No** GO to Pinpoint Test C .
G3 CHECK THE DRL RELAY	
• Substitute a known good relay. • **Do the headlamps continue to illuminate?**	**Yes** REMOVE the known good relay. GO to G4 . **No** REMOVE the known good relay. INSTALL a new DRL relay. TEST the system for normal operation.
G4 CHECK THE DRL RELAY COIL GROUND CONTROLLED CIRCUIT FOR A SHORT TO GROUND	
• Disconnect: BCM C2280D. • Measure the resistance between the BCM C2280D-8, circuit CLF10 (GN/OG), harness side and ground.  N0117308 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to G5 . **No** REPAIR circuit CLF10 (GN/OG) for a short to ground. CLEAR the DTCs. TEST the system for normal operation.
G5 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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.

Stoplamps

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 NUD105-R025D or equivalent

Principles of Operation

4-Door Vehicles

The stoplamp switch is provided voltage at all times. When the brake pedal is applied, voltage is routed to the high mounted stoplamp and to the LH and RH turn relays. The voltage passes through the turn relays, on to the LH and RH stoplamps. The stoplamps are combination rear stop/turn lamps.

5-Door Vehicles

The stoplamp switch is provided voltage at all times. When the brake pedal is applied, voltage is routed to all of the stoplamps.

Inspection and Verification

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

Visual Inspection Chart

Mechanical	Electrical
• Stoplamp switch	• Central Junction Box (CJB) fuse 18 (10A) (stoplamp switch) • Bulb ♦ • Bulb socket • Wiring, terminals or connectors

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 is ON.
     - The air bag warning indicator prove-out confirms ignition ON (other indicators may not prove ignition ON). If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
   - 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 BCM .

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 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 stoplamp switch is provided voltage at all times from the Central Junction Box (CJB) fuse 18 (10A). The stoplamps are combination rear stop/turn lamps.

On 4-door vehicles, when the brake pedal is applied, voltage is routed to the high mounted stoplamp and to the LH and RH turn relays. The voltage passes through the turn relays, to the LH and RH stoplamps.

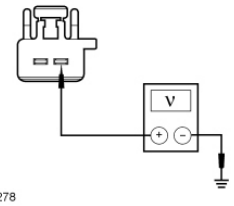
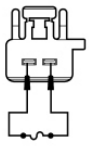
On 5-door vehicles, when the brake pedal is applied, voltage is routed to all of the stoplamps.

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- 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
H1 CHECK FOR VOLTAGE TO THE STOPLAMP SWITCH	
• Ignition OFF. • Disconnect: Stoplamp Switch C2314. • Measure the voltage between the stoplamp switch C2314-1, circuit SBP18 (YE/RD), harness side and ground.  N0037278 • **Is the voltage greater than 10 volts?**	**Yes** GO to H2 . **No** VERIFY the CJB fuse 18 (10A) is OK. If OK, GO to H2 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.
H2 BYPASS THE STOPLAMP SWITCH	
• Connect a fused jumper wire between the stoplamp switch C2314-1, circuit SBP18 (YE/RD), harness side and the stoplamp switch C2314-2, circuit CCA26 (BU/GY), harness side.  N0047016 • **Are the stoplamps illuminated?**	**Yes** REMOVE the jumper wire. INSTALL a new stoplamp switch. REFER to Stoplamp Switch in this section. TEST the system for normal operation. **No** REMOVE the jumper wire. REPAIR circuit CCA26 (BU/GY) for an open. TEST the system for normal operation.

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 - 4-Door

When the brake pedal is applied, voltage is routed to the high mounted stoplamp and to the LH and RH turn relays. The voltage passes through the turn relays, on to the LH and RH stoplamps. When a turn relay is energized (during turn lamp operation), voltage from the stoplamp switch is interrupted. The stoplamps are combination rear stop/turn lamps.

5-Door

On 5-door vehicles, when the brake pedal is applied, voltage is routed to all of the stoplamps.

- DTC B132B:14 (Left Stop/Turn Lamp: Circuit Short To Ground Or Open) - a continuous and on-demand DTC that sets when the BCM detects a short to ground from the LH rear turn lamp relay coil ground controlled circuit.
- DTC B132C:14 (Right Stop/Turn Lamp: Circuit Short To Ground Or Open) - a continuous and on-demand DTC that sets when the BCM detects a short to ground from the RH rear turn lamp relay coil ground controlled circuit.

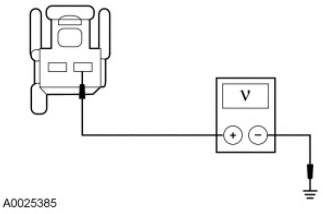
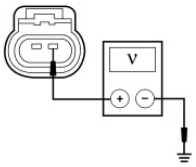
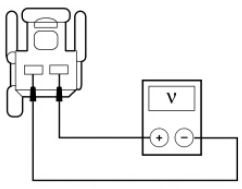
This pinpoint test is intended to diagnose the following:

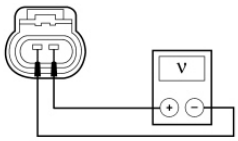
- Wiring, terminals or connectors
- Bulb socket
- High mounted stoplamp
- Turn relay
- BCM

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.**

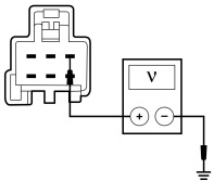
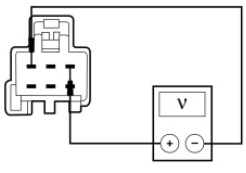
Test Step	Result / Action to Take
>I1 DETERMINE THE INOPERATIVE STOPLAMP	
• Ignition OFF. • Apply the brake pedal and observe the stoplamps. • **Are all the stoplamps inoperative?**	**Yes** GO to Pinpoint Test H . **No** For an inoperative high mounted stoplamp, GO to I2 . For an inoperative rear lamp on a 5-door vehicle, GO to I4 . For an inoperative rear lamp on a 4-door vehicle, GO to I6 .

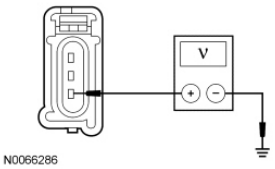
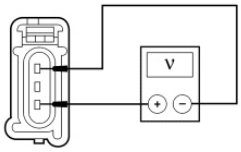
I2 CHECK FOR VOLTAGE TO THE HIGH MOUNTED STOPLAMP	
• Disconnect: High Mounted Stoplamp C904 or C9040. • For 4-door vehicles, while applying the brake pedal, measure the voltage between the high mounted stoplamp C904-1, circuit CCA26 (BU/GY), harness side and ground.  A0025385 • For 5-door vehicles, while applying the brake pedal, measure the voltage between the high mounted stoplamp C9040-1, circuit CCA26 (BU/GY), harness side and ground.  N0107644 • **Is the voltage greater than 10 volts?**	**Yes** GO to I3 . **No** REPAIR circuit CCA26 (BU/GY) for an open. TEST the system for normal operation.
I3 CHECK THE HIGH MOUNTED STOPLAMP GROUND CIRCUIT FOR AN OPEN	
• For 4-door vehicles, while applying the brake pedal, measure the voltage between the high mounted stoplamp C904-1, circuit CCA26 (BU/GY), harness side and the high mounted stoplamp C904-2, circuit GD143 (BK/VT), harness side.  N0090415 • For 5-door vehicles, while applying the brake pedal, measure the voltage between the high mounted stoplamp C9040-1, circuit CCA26 (BU/GY), harness side and the high mounted stoplamp C9040-2, circuit GD143 (BK/VT), harness side.	**Yes** INSTALL a new high mounted stoplamp. REFER to High Mounted Stoplamp in this section. TEST the system for normal operation. **No** REPAIR circuit GD143 (BK/VT) for an open. TEST the system for normal operation.

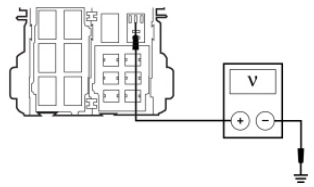
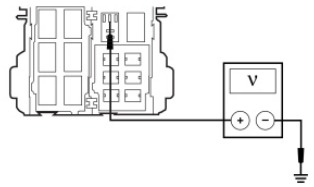
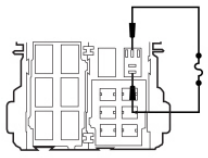
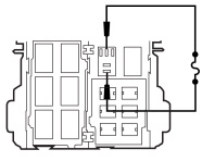


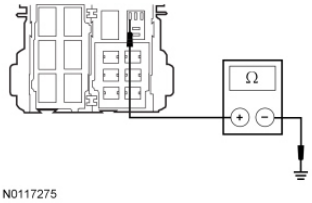
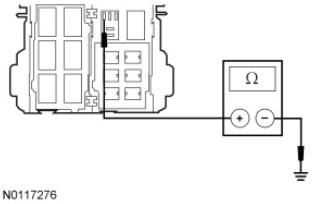
N0107645

- **Is the voltage greater than 10 volts?**

I4 CHECK FOR VOLTAGE TO THE REAR LAMP	
• Disconnect: Inoperative Rear Lamp. • While applying the brake pedal, measure the voltage between the LH rear lamp C414-3, circuit CCA26 (BU/GY), harness side and ground; or between the RH rear lamp C417-3, circuit CCA26 (BU/GY), harness side and ground.  N0117269 • **Is the voltage greater than 10 volts?**	**Yes** GO to I5 . **No** REPAIR circuit CCA26 (BU/GY) for an open. TEST the system for normal operation.
I5 CHECK THE REAR LAMP GROUND CIRCUIT FOR AN OPEN	
• While applying the brake pedal, measure the voltage between the LH rear lamp C414-3, circuit CCA26 (BU/GY), harness side and the LH rear lamp C414-1, circuit GD143 (BK/VT), harness side; or between the RH rear lamp C417-3, circuit CCA26 (BU/GY), harness side and the RH rear lamp C417-1, circuit GD145 (BK/BU), harness side.  N0117270 • **Is the voltage greater than 10 volts?**	**Yes** REPAIR or INSTALL a new rear lamp harness. TEST the system for normal operation. **No** REPAIR circuit GD143 (BK/VT) (LH rear lamp) or circuit GD145 (BK/BU) (RH rear lamp) for an open. TEST the system for normal operation.
I6 CHECK FOR VOLTAGE TO THE BULB SOCKET	
• Disconnect: Inoperative Rear Lamp. • While applying the brake pedal, measure the voltage between the LH rear lamp C412-3, circuit CLS55 (GN/BU), harness side and ground; or between the RH rear lamp C415-3, circuit CLS54 (BU/OG), harness side and ground.	**Yes** GO to I7 . **No** GO to I8 .

 N0066286 • **Is the voltage greater than 10 volts?**	
I7 CHECK THE REAR LAMP GROUND CIRCUIT FOR AN OPEN	
• While applying the brake pedal, measure the voltage between the LH rear lamp C412-3, circuit CLS55 (GN/BU), harness side and the LH rear lamp C412-1, circuit GD143 (BK/VT), harness side; or between the RH rear lamp C415-3, circuit CLS54 (BU/OG), harness side and the RH rear lamp C415-1, circuit GD145 (BK/BU), harness side.  N0088174 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new bulb socket. TEST the system for normal operation. **No** REPAIR circuit GD143 (BK/VT) (LH rear lamp) or circuit GD145 (BK/BU) (RH rear lamp) for an open. TEST the system for normal operation.
I8 CHECK THE TURN RELAY	
• Connect: Inoperative Rear Lamp. • Disconnect: Suspect Turn Relay. • Substitute a known good relay. • Apply the brake pedal and observe the stoplamps. • **Does the stoplamp in question illuminate?**	**Yes** REMOVE the known good relay. INSTALL a new turn relay. TEST the system for normal operation. **No** REMOVE the known good relay. GO to I9 .
I9 CHECK FOR VOLTAGE TO THE TURN RELAY	
• For the LH stoplamp, while applying the brake pedal, measure the voltage between the LH turn relay pin 4, circuit CCA26 (BU/GY), CJB face side and ground.	**Yes** GO to I10 . **No** REPAIR circuit CCA26 (BU/GY) for an open. TEST the system for normal operation.

 N0117271 • For the RH stoplamp, while applying the brake pedal, measure the voltage, between the RH turn relay pin 4, circuit CCA26 (BU/GY), CJB face side and ground.  N0117272 • **Is the voltage greater than 10 volts?**	
I10 BYPASS THE TURN RELAY	
• For the LH stoplamp, connect a fused jumper wire between the LH turn relay pin 4, circuit CCA26 (BU/GY), CJB face side and the LH turn relay pin 3, circuit CLS55 (GN/BU), CJB face side.  N0117273 • For the RH stoplamp, connect a fused jumper wire between the RH turn relay pin 4, circuit CCA26 (BU/GY), CJB face side and the LH turn relay pin 3, circuit CLS54 (BU/OG), CJB face side.  N0117274 • Apply the brake pedal and observe the stoplamps. • **Does the stoplamp in question illuminate?**	**Yes** REMOVE the jumper wire. GO to I11 . **No** REMOVE the jumper wire. REPAIR circuit CLS55 (GN/BU) (LH rear lamp) or circuit CLS54 (BU/OG) (RH rear lamp) for an open. TEST the system for normal operation.
I11 CHECK THE TURN RELAY COIL GROUND CIRCUIT FOR A SHORT TO GROUND	

• Disconnect: BCM C2280D. • For the LH stoplamp, measure the resistance between the LH turn relay pin 2, circuit CLS51 (WH/GN), harness side and the ground.  N0117275 • For the RH stoplamp, measure the resistance between the RH turn relay pin 2, circuit CLS53 (GY/VT), harness side and the ground.  N0117276 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to I12 . **No** REPAIR circuit CLS51 (WH/GN) (LH stoplamp) or circuit CLS53 (GY/VT) for a short to ground. CLEAR the DTCs. TEST the system for normal operation.
I12 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 J: The Stoplamps Are On Continuously

Normal Operation

On 4-door vehicles, when the brake pedal is applied, voltage is routed to the PCM, the high mounted stoplamp and to the LH and RH turn relays. The voltage passes through the turn relays, on to the LH and RH stoplamps.

On 5-door vehicles, when the brake pedal is applied, voltage is routed to the PCM and all of the stoplamps.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Stoplamp switch
- PCM

PINPOINT TEST J: THE STOPLAMPS ARE ON CONTINUOUSLY

Test Step	Result / Action to Take
J1 CHECK THE STOPLAMP SWITCH	
• Disconnect: Stoplamp Switch C2314. • **Do the stoplamps continue to illuminate?**	**Yes** GO to J2 . **No** INSTALL a new stoplamp switch. REFER to Stoplamp Switch in this section. TEST the system for normal operation.
J2 CHECK THE PCM	
• Disconnect: PCM C175B. • **Do the stoplamps continue to illuminate?**	**Yes** For 4-door vehicles, GO to J3 . For 5-door vehicles, REPAIR circuit CCA26 (BU/GY) for a short to voltage. TEST the system for normal operation. **No** GO to J4 .
J3 ISOLATE THE SHORT TO VOLTAGE	
• Disconnect: LH and RH Turn Relays. • **Does the high mounted stoplamp continue to illuminate?**	**Yes** REPAIR circuit CCA26 (BU/GY) for a short to voltage. TEST the system for normal operation. **No** REPAIR circuit CLS55 (GN/BU) (LH stoplamp) or circuit CLS54 (BU/OG) for a short to voltage. TEST the system for normal operation.
J4 CHECK FOR CORRECT PCM OPERATION	
• Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM 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 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 caused by a loose or corroded connector.

Turn Signal 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 NUD105-R025D or equivalent

Principles of Operation

The Body Control Module (BCM) monitors the multifunction switch position by sending voltage signals to the multifunction switch and the Front Controls Interface Module (FCIM). When the multifunction switch is in the LH or RH TURN position, or the hazard flasher lamp switch is pressed, that input signal is routed to ground.

When the BCM receives a request for a turn signal or hazard lamp function, the BCM supplies on/off voltage to the appropriate turn lamps.

On 4-door vehicles, turn relays interrupt the stoplamp switch output and allow the BCM to control voltage to the combination stop/turn lamps.

The timed on/off cycle for the turn lamps is determined by the BCM and is set to flash approximately 75 times per minute if both the front and rear turn lamps operate correctly. If an individual turn lamp is inoperative, the BCM flashes the remaining turn lamp approximately 150 times per minute.

The timed on/off cycle for the hazard lamp function is set to flash all the turn lamps approximately 75 times per minute.

Field-Effect Transistor (FET) Protection

A Field-Effect Transistor (FET) is a type of transistor that, when used with module software, monitors and controls current flow on module outputs. The FET protection strategy prevents module damage in the event of excessive current flow.

The BCM utilizes a FET protective circuit strategy for many of its outputs (such as a turn lamp output circuit). Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down when a fault event is detected. A short circuit DTC sets when the fault event occurs.

The circuit remains off until the fault is corrected and the ignition is cycled off and then back on, the module resets the FET protection and allows the circuit to function.

The FET protected circuits for the turn lamp system are the turn relay coil ground circuits and the front and rear turn lamp voltage supply circuits.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Multifunction switch • Front Controls Interface Module (FCIM)	• Bulb • Bulb socket(s) • Wiring, terminals or connectors

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 is ON.
     - ♦ The air bag warning indicator prove-out confirms ignition ON (other indicators may not prove ignition ON). If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
   - 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 Body Control Module (BCM).

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 Function Is Inoperative

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends voltage signals to the multifunction switch to monitor the LH and RH turn input circuits. The voltage signal is routed to ground when the multifunction switch is placed in the LH or RH TURN position. When the BCM detects the multifunction switch is in the LH or RH TURN position, the BCM sends voltage to the appropriate turn lamps.

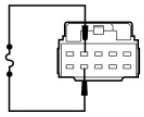
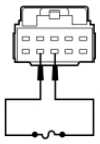
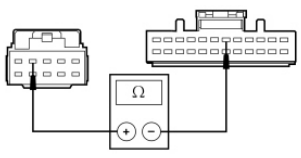
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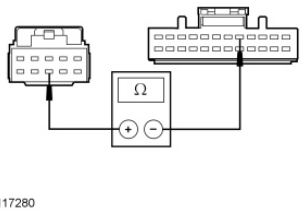
- Wiring, terminals or connectors
- Multifunction switch
- BCM

PINPOINT TEST K: THE TURN SIGNAL FUNCTION 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
K1 CHECK FOR CORRECT HIGH BEAM OPERATION	
• Place the headlamp switch in the HEADLAMPS ON position. • Place the multifunction switch in the HIGH BEAM position while observing the high beam headlamps. • **Do the high beams operate correctly?**	**Yes** GO to K2 . **No** REFER to Headlamps in this section.
K2 BYPASS THE MULTIFUNCTION SWITCH	

• Ignition OFF. • Disconnect: Multifunction Switch C202A. • For an inoperative LH turn signal, connect a fused jumper wire between the multifunction switch C202A-4, circuit CLS39 (VT/WH), harness side and the multifunction switch C202A-9, circuit GD115 (BK/GY), harness side.  N0117277 • For an inoperative RH turn signal, connect a fused jumper wire between the multifunction switch C202A-8, circuit CLS41 (GY/YE), harness side and the multifunction switch C202A-9, circuit GD115 (BK/GY), harness side.  N0117278 • Ignition ON. • **Do the turn signals in question flash on and off?**	**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 K3 .
K3 CHECK THE TURN LAMP REQUEST INPUT CIRCUIT FOR AN OPEN	
• Disconnect: BCM C2280E. • For an inoperative LH turn signal, measure the resistance between the multifunction switch C202A-4, circuit CLS39 (VT/WH), harness side and the BCM C2280E-7, circuit CLS39 (VT/WH), harness side.  N0117279 • For an inoperative RH turn signal, measure the resistance between the multifunction switch C202A-8, circuit CLS41 (GY/YE), harness side and the BCM C2280E-8, circuit CLS41 (GY/YE), harness side.	**Yes** GO to K4 . **No** REPAIR circuit CLS39 (VT/WH) (LH turn) or circuit CLS41 (GY/YE) (RH turn) for an open. TEST the system for normal operation.

 N0117280 • **Is the resistance less than 5 ohms?**	
K4 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 L: The Turn Signal Function Is Always On

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends voltage signals to the multifunction switch to monitor the LH and RH turn input circuits. The voltage signal is routed to ground when the multifunction switch is placed in the LH or RH TURN position. When the BCM detects the multifunction switch is in the LH or RH TURN position, the BCM sends voltage to the appropriate turn lamps.

- DTC B1D36:92 (Turn Indicator Switch: Performance Or Incorrect Operation) - a continuous and on-demand DTC that sets when the BCM detects a short to ground from the LH and/or the RH turn signal switch input.

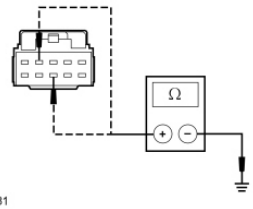
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Multifunction switch
- BCM

PINPOINT TEST L: THE TURN SIGNAL FUNCTION 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
L1 CHECK THE MULTIFUNCTION SWITCH	

• Ignition OFF. • Disconnect: Multifunction Switch C202A. • Ignition ON. • **Do the turn lamps continue to flash on and off?**	**Yes** GO to L2 . **No** INSTALL a new multifunction switch. REFER to Section 211-05 . TEST the system for normal operation.
L2 CHECK THE TURN LAMP REQUEST INPUT CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280E. • Measure the resistance between the multifunction switch C202A-4 (LH turn lamps), circuit CLS39 (VT/WH), harness side and ground; or between the multifunction switch C202A-8 (RH turn lamps), circuit CLS41 (GY/YE), harness side and ground.  N0117281 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to L3 . **No** REPAIR circuit CLS39 (VT/WH) (LH turn) or circuit CLS41 (GY/YE) (RH turn) for a short to ground. TEST the system for normal operation.
L3 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 M: One Turn Signal/Hazard Lamp Is Inoperative/Always On (4-Door)

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

When the Body Control Module (BCM) detects the multifunction switch is in the LH TURN position, the BCM provides ground for the LH turn relay coil to interrupt the stoplamp switch output to the LH rear lamp, and simultaneously provides on/off voltage to the LH front turn lamp on one output circuit, and to the LH turn relay (switch side) and LH exterior mirror turn lamp (if equipped) on another circuit.

When the Body Control Module (BCM) detects the multifunction switch is in the RH TURN position, the BCM provides ground for the RH turn relay coil to interrupt the stoplamp switch output to the RH rear lamp, and simultaneously provides on/off voltage to the RH front turn lamp on one output circuit, and to the RH turn relay (switch side) and RH exterior mirror turn lamp (if equipped) on another circuit.

The rear lamps are combination stop/turn lamps and are controlled through the rear stoplamp circuitry.

DTC Description	Fault Trigger Conditions
• B132B:12 - Left Stop/Turn Lamp: Circuit Short To Battery	A continuous and on-demand DTC that sets when the BCM detects a short to voltage from the LH turn relay coil ground controlled circuit.
• B132B:14 - Left Stop/Turn Lamp: CircShort To Ground Or Open	A continuous and on-demand DTC that sets when the BCM detects an open or short to ground from the LH turn relay coil ground controlled circuit.
• B132C:12 - Right Stop/Turn Lamp: Circuit Short To Battery	A continuous and on-demand DTC that sets when the BCM detects a short to voltage from the RH turn relay coil ground controlled circuit.
• B132C:14 - Right Stop/Turn Lamp: Circuit Short To Ground Or Open	A continuous and on-demand DTC that sets when the BCM detects an open or short to ground from the RH turn relay coil ground controlled circuit.
• B1D06:11 - Left Turn Indicator: Circuit Short To Ground	A continuous and on-demand DTC that sets when the BCM detects a short to ground from the LH front or LH rear turn lamp voltage supply circuits.
• B1D06:15 - Left Turn Indicator: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects an open or short to voltage from the LH front or LH rear turn lamp voltage supply circuits.
• B1D07:11 - Right Turn Indicator: Circuit Short To Ground	A continuous and on-demand DTC that sets when the BCM detects a short to ground from the RH front or RH rear turn lamp voltage supply circuits.
• B1D07:15 - Right Turn Indicator: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects an open or short to voltage from the RH front or RH rear turn lamp voltage supply circuits.

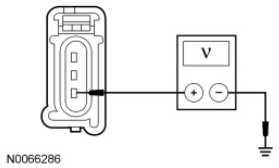
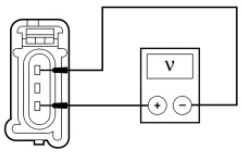
This pinpoint test is intended to diagnose the following:

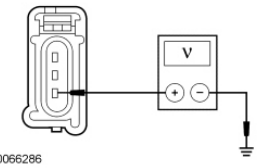
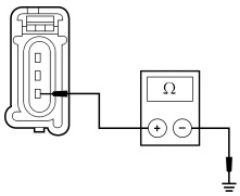
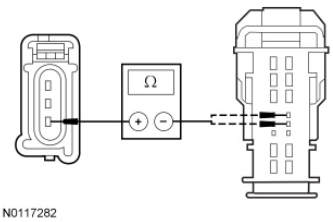
- Wiring, terminals or connectors
- Bulb socket
- Turn relay
- BCM

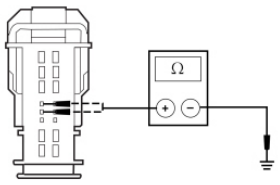
PINPOINT TEST M: ONE TURN SIGNAL/HAZARD LAMP IS INOPERATIVE/ALWAYS ON (4-DOOR)

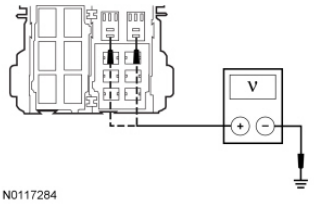
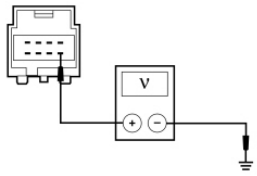
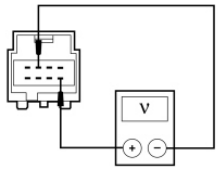
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

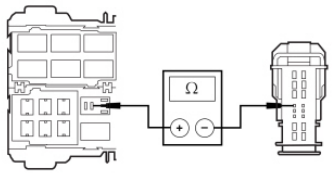
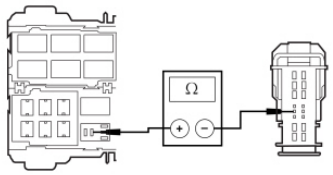
Test Step	Result / Action to Take
M1 CHECK THE STOPLAMPS	
• Ignition OFF. • Apply and release trake pedal while observing the stoplamps. • **Do the stoplamps operate correctly?**	**Yes** GO to M2 . **No** REFER to Stoplamps in this section.
M2 DETERMINE IF A TURN LAMP IS ALWAYS ON	
NOTE: If the turn lamps are flashing, GO to Pinpoint Test L . • Ignition ON. • Activate the hazard lamp function and monitor the turn lamps. • **Is any turn lamp on?**	**Yes** GO to M3 . **No** For a front turn lamp, GO to M4 . For a rear or exterior mirror turn lamp, GO to M9 .
M3 CHECK THE BCM TURN LAMP OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Deactivate the hazard lamp function . • Ignition OFF. • Disconnect: BCM C2280A (Front Turn Lamp). • Disconnect: BCM C2280C (Rear or Exterior Mirror Turn Lamp). • Ignition ON. • Activate the hazard lamp function . • **Does the turn lamp in question continue to illuminate?**	**Yes** For the LH front turn lamp, REPAIR circuit CLS21 (BU/GN) for a short to voltage. CLEAR the DTCs. TEST the system for normal operation. For the RH front turn lamp, REPAIR circuit CLS25 (YE/VT) for a short to voltage. CLEAR the DTCs. TEST the system for normal operation. For the LH rear or exterior mirror turn lamp, REPAIR circuit CLS23 (GY/OG) for a short to voltage. CLEAR the DTCs. TEST the system for normal operation. For the RH rear or exterior mirror turn lamp, REPAIR circuit CLS27 (GN/OG) for a short to voltage. CLEAR the DTCs. TEST the system for normal operation. **No** GO to M19 .
M4 CHECK FOR VOLTAGE TO THE FRONT TURN LAMP	
• Ignition OFF. • Disconnect: Inoperative Front Lamp. • Activate the hazard lamp function . • Measure the voltage between the LH front turn lamp C1023-3, circuit CLS21 (BU/GN), harness	**Yes** GO to M5 . **No** GO to M6 .

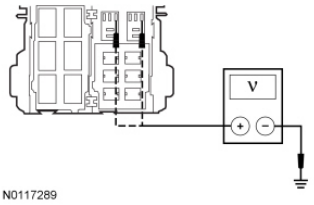
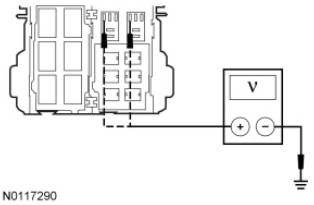
side and ground; or between the RH front turn lamp C1043-3, circuit CLS25 (YE/VT), harness side and ground.  N0066286 • **Does the voltage alternate between 0 volts and greater than 10 volts?**	
M5 CHECK THE FRONT TURN LAMP GROUND CIRCUIT FOR AN OPEN	
• Measure the voltage between the LH front turn lamp C1023-3, circuit CLS21 (BU/GN), harness side and the LH front lamp C1023-1, circuit GD188 (BK/YE), harness side; or between the RH front turn lamp C1043-3, circuit CLS25 (YE/VT), harness side and the RH front lamp C1043-1, circuit GD123 (BK/GY), harness side.  N0088174 • **Does the voltage alternate between 0 volts and greater than 10 volts?**	**Yes** INSTALL a new bulb socket. CLEAR the DTCs. TEST the system for normal operation. **No** REPAIR circuit GD188 (BK/YE) (LH turn) or circuit GD123 (BK/GY) (RH turn) for an open. CLEAR the DTCs. TEST the system for normal operation.
M6 CHECK THE FRONT TURN LAMP BULB SOCKET FOR A SHORT TO GROUND	
• Deactivate the hazard lamp function . • Cycle the ignition on then off. • Activate the hazard lamp function . • Measure the voltage between the LH front turn lamp C1023-3, circuit CLS21 (BU/GN), harness side and ground; or between the RH front turn lamp C1043-3, circuit CLS25 (YE/VT), harness side and ground.	**Yes** INSTALL a new bulb socket. CLEAR the DTCs. TEST the system for normal operation. **No** GO to M7 .

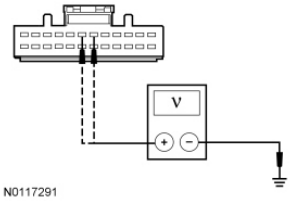
 N0066286 • **Does the voltage alternate between 0 volts and greater than 10 volts?**	
M7 CHECK THE FRONT TURN LAMP VOLTAGE CIRCUIT FOR A SHORT TO GROUND	
• Deactivate the hazard lamp function . • Disconnect: BCM C2280A. • Measure the resistance between the LH front turn lamp C1023-3, circuit CLS21 (BU/GN), harness side and ground; or between the RH front turn lamp C1043-3, circuit CLS25 (YE/VT), harness side and ground.  N0077657 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to M8 . **No** REPAIR circuit CLS21 (BU/GN) (LH turn) or CLS25 (YE/VT) (RH turn) for a short to ground. CLEAR the DTCs. CYCLE the ignition. TEST the system for normal operation.
M8 CHECK THE FRONT TURN LAMP VOLTAGE CIRCUIT FOR AN OPEN	
• Measure the resistance between the LH front turn lamp C1023-3, circuit CLS21 (BU/GN), harness side and the BCM C2280A-5, circuit CLS21 (BU/GN), harness side; or between the RH front turn lamp C1043-3, circuit CLS25 (YE/VT), harness side and the BCM C2280A-6, circuit CLS25 (YE/VT), harness side.  N0117282 • **Is the resistance less than 5 ohms?**	**Yes** GO to M19 . **No** REPAIR circuit CLS21 (BU/GN) (LH turn) or CLS25 (YE/VT) (RH turn) for an open. CLEAR the DTCs. TEST the system for normal operation.
M9 USE THE RECORDED DTCs FROM THE BCM SELF-TEST	

• Deactivate the hazard lamp function. • Check the recorded results from the BCM on-demand self-test. • **Is DTC B1D06:11 or DTC B1D07:11 present?**	**Yes** If equipped with exterior mirror turn lamps, GO to M10 . If not equipped with exterior mirror turn lamps, GO to M11 . **No** GO to M12 .
M10 CHECK THE EXTERIOR MIRROR FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: LH Exterior Mirror C521 (DTC B1D06:11). • Disconnect: RH Exterior Mirror C601 (DTC B1D07:11). • Cycle the ignition on and then off. • Activate the hazard lamp function. • **Does the rear lamp flash on and off?**	**Yes** INSTALL a new exterior mirror. REFER to Section 501-09 . TEST the system for normal operation. **No** GO to M11 .
M11 CHECK THE BCM REAR TURN LAMP OUTPUT CIRCUIT FOR A SHORT TO GROUND	
• Deactivate the hazard lamp function. • Disconnect: Corresponding LH or RH Turn Relay. • Disconnect: BCM C2280C. • Measure the resistance between the BCM C2280C-12 (DTC B1D06:11), circuit CLS23 (GY/OG), harness side and ground; or between the BCM C2280C-13 (DTC B1D07:11), circuit CLS27 (GN/OG), harness side and ground.  N0117312 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to M19 . **No** REPAIR circuit CLS23 (GY/OG) (LH turn) or circuit CLS27 (GN/OG) (RH turn) for a short to ground. CLEAR the DTCs. CYCLE the ignition. TEST the system for normal operation.
M12 CHECK FOR VOLTAGE TO THE TURN RELAY OR EXTERIOR MIRROR	
NOTE: If both the rear turn and exterior mirror turn lamps are inoperative, follow the diagnostics for the rear turn lamp. • Ignition OFF. • Disconnect: Suspect Turn Relay or Exterior Mirror. • Activate the hazard lamp function.	**Yes** For an inoperative exterior mirror turn lamp, GO to M13 . For an inoperative rear turn lamp, GO to M15 . **No** For an inoperative exterior mirror turn lamp, REPAIR circuit CLS23 (GY/OG) (LH turn) or circuit CLS27 (GN/OG) (RH turn) for an open. TEST the system for normal operation. For an

• For an inoperative rear turn lamp, measure the voltage between the LH turn relay pin 5, CJB face side, circuit CLS23 (GY/OG), harness side and ground; or between the RH turn relay pin 5, CJB face side, circuit CLS27 (GN/OG), harness side and ground.  N0117284 • For an inoperative exterior mirror turn lamp, measure the voltage between the LH exterior mirror, C521-8, circuit CLS23 (GY/OG), harness side and ground; or between the RH exterior mirror, C601-8, circuit CLS27 (GN/OG), harness side and ground.  N0117285 • **Does the voltage alternate between 0 volts and greater than 10 volts?**	inoperative rear turn lamp, GO to M14 .
M13 CHECK THE EXTERIOR MIRROR GROUND CIRCUIT FOR AN OPEN	
• Measure the voltage between the LH exterior mirror C521-8, circuit CLS23 (GY/OG), harness side and the LH exterior mirror C521-2, circuit GD143 (BK/VT), harness side; or between RH exterior mirror, C601-8, circuit CLS27 (GN/OG), harness side and the RH exterior mirror C601-2, circuit GD145 (BK/BU), harness side.  N0117286	**Yes** INSTALL a new exterior mirror. REFER to Section 501-09 . TEST the system for normal operation. **No** REPAIR the circuit GD143 (BK/VT) (LH turn) or circuit GD145 (BK/BU) (RH turn) for an open. TEST the system for normal operation.

• **Does the voltage alternate between 0 volts and greater than 10 volts?**	
M14 CHECK THE BCM REAR TURN LAMP OUTPUT CIRCUIT FOR AN OPEN	
• Deactivate the hazard lamp function. • Disconnect: BCM C2280C. • For an inoperative LH rear turn lamp, measure the resistance between the LH turn relay pin 5, circuit CLS23 (GY/OG), CJB face side and the BCM C2280C-12, circuit CLS23 (GY/OG), harness side.  N0117310 • For an inoperative RH rear turn lamp, measure the resistance between the RH turn relay pin 5, circuit CLS27 (GN/OG), CJB face side and the BCM C2280C-13, circuit CLS27 (GN/OG), harness side.  N0117311 • **Is the resistance less than 5 ohms?**	**Yes** GO to M19 . **No** REPAIR circuit CLS23 (GY/OG) (LH turn) or circuit CLS27 (GN/OG) (RH turn) for an open. CLEAR the DTCs. TEST the system for normal operation.
M15 CHECK THE TURN RELAY	
• Deactivate the hazard lamp function. • Substitute a known good relay. • Activate the hazard lamp function. • **Does the suspect rear turn lamp flash on and off?**	**Yes** REMOVE the known good relay. INSTALL a new turn relay. TEST the system for normal operation. **No** REMOVE the known good relay. GO to M16 .
M16 CHECK THE FOR VOLTAGE TO THE TURN RELAY	

• Deactivate the hazard lamp function. • Measure the voltage between the LH turn relay pin 1, circuit SBP18 (YE/RD), CJB face side and ground; or between the RH turn relay pin 1, circuit SBP18 (YE/RD), CJB face side and ground.  N0117289 • **Is the voltage greater than 10 volts?**	**Yes** GO to M17 . **No** REPAIR circuit SBP18 (YE/RD) for an open. TEST the system for normal operation
M17 CHECK THE TURN RELAY GROUND CONTROLLED CIRCUIT FOR A SHORT TO VOLTAGE	
• Disconnect: BCM C2280D. • Ignition ON. • Measure the voltage between the LH turn relay pin 2, circuit CLS51 (WH/GN), CJB face side and ground; or between the RH turn relay pin 2, circuit CLS53 (GY/VT), CJB face side and ground.  N0117290 • **Is any voltage present?**	**Yes** REPAIR circuit CLS51 (WH/GN) (LH turn) or circuit CLS53 (GY/VT) (RH turn) for a short to voltage. CLEAR the DTCs. CYCLE the ignition. TEST the system for normal operation. **No** GO to M18 .
M18 CHECK THE TURN RELAY GROUND CONTROLLED CIRCUIT FOR AN OPEN	
• Ignition OFF. • Connect: Suspect Turn Relay. • Measure the voltage between the BCM C2280D-6 (LH turn), circuit CLS51 (WH/GN), harness side and ground; or between the BCM C2280D-7 (RH turn), circuit CLS53 (GY/VT), harness side and ground.	**Yes** GO to M19 . **No** REPAIR circuit CLS51 (WH/GN) (LH turn) or circuit CLS53 (GY/VT) (RH turn) for an open. CLEAR the DTCs. TEST the system for normal operation.

 • **Is the voltage greater than 10 volts?**	
M19 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 N: One Turn Signal/Hazard Lamp Is Inoperative/Always On (5-Door)

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

When the Body Control Module (BCM) detects the multifunction switch is in the LH TURN position, the BCM provides on/off voltage to the LH front turn lamp on one output circuit, and to the LH rear and LH exterior mirror turn lamp (if equipped) on another circuit.

When the BCM detects the multifunction switch is in the RH TURN position, the BCM provides on/off voltage to the RH front turn lamp on one output circuit, and to the RH rear and RH exterior mirror turn lamp (if equipped) on another circuit.

DTC Description	Fault Trigger Conditions
• B1D06:11 - Left Turn Indicator: Circuit Short To Ground	A continuous and on-demand DTC that sets when the BCM detects a short to ground from the LH front or LH rear turn lamp voltage supply circuits.
• B1D06:15 - Left Turn Indicator: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects an open or short to voltage from the LH front or LH rear turn lamp voltage supply circuits.
• B1D07:11 - Right Turn Indicator: Circuit Short To Ground	A continuous and on-demand DTC that sets when the BCM detects a short to ground from the RH front or RH rear turn lamp voltage supply circuits.

• B1D07:15 - Right Turn Indicator: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects an open or short to voltage from the RH front or RH rear turn lamp voltage supply circuits.

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 NUD105-R025D or equivalent

Principles of Operation

The Body Control Module (BCM) monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground to indicate the headlamp switch position.

If, when the ignition is in RUN, the BCM does not detect any active inputs from the headlamp switch or if the BCM detects multiple headlamp switch input circuits short to ground, the BCM turns the parking lamps and headlamps on and keeps them on until the ignition is transitioned OFF.

If either situation occurs, the BCM **cannot** be ruled immediately as being at fault. This is normal behavior of the BCM design as a fault has been detected with the inputs from the headlamp switch.

When the BCM receives an input from the headlamp switch indicating a request for the parking lamps, the supplies voltage to the exterior lamps.

Field-Effect Transistor (FET) Protection

A Field-Effect Transistor (FET) is a type of transistor that, when used with module software, monitors and controls current flow on module outputs. The FET protection strategy prevents module damage in the event of excessive current flow.

The BCM utilizes a FET protective circuit strategy for many of its outputs (such as a turn lamp output circuit). Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down when a fault event is detected. A short circuit DTC sets when the fault event occurs.

The circuit remains off until the fault is corrected and the ignition is cycled off and then back on, the module resets the FET protection and allows the circuit to function.

The FET protected circuits for the parking lamp system are the LH rear (and license plate lamps), the RH rear, LH front, RH front and front marker lamp voltage supply circuits.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Headlamp switch	• Battery Junction Box (BJB) fuse 22 (15A) • Bulb(s) • Bulb socket(s) • Auxiliary parking lamp(s) • Wiring, terminals or connectors

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 is ON.
     - The air bag warning indicator prove-out confirms ignition ON (other indicators may not prove ignition ON). If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
   - 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 SJB .

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 Is Inoperative

Refer to Wiring Diagrams Cell 92 , Parking, Rear and License Lamps for schematic and connector information.

Normal Operation

The Battery Junction Box (BJB) fuse 22 (15A) provides voltage to the Body Control Module (BCM) for the parking lamps. When the headlamp switch is placed in the PARKING LAMPS ON position, the BCM provides voltage on 5 separate circuits to the front and rear parking and license plate lamps.

If a fault exists with the headlamp switch input, the BCM faults the parking lamps and low beam headlamps on.

DTC Description	Fault Trigger Conditions
• B1098:11 - Left Position Light: Circuit Short To Ground	A continuous and on-demand DTC that sets when the BCM detects a short to ground from the LH front or LH rear parking lamp voltage supply circuits.
• B1098:15 - Left Position Light: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects an open from the LH front or LH rear parking lamp voltage supply circuits.
• B1099:11 - Right Position Light: Circuit Short To Ground	A continuous and on-demand DTC that sets when the BCM detects a short to ground from the RH front or RH rear parking lamp voltage supply circuits.
• B1099:15 - Right Position Light: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects an open from the RH front or RH rear parking lamp voltage supply circuits.
• B1118:11 - Left Rear Sidemarker: Circuit Short To Ground	A continuous and on-demand DTC that sets when the BCM detects a short to ground from the front side marker lamps voltage supply circuit.
	A continuous and on-demand DTC that sets when the BCM detects an open from the front side marker lamps voltage supply circuit.

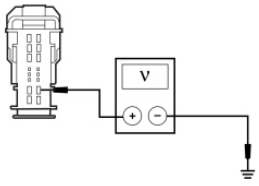
• B1118:15 - Left Rear Sidemarker: Circuit Short To Battery Or Open	

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- Bulb socket
- Auxiliary parking lamp
- BCM

PINPOINT TEST P: ONE OR MORE PARKING, REAR OR LICENSE PLATE LAMPS 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
P1 DETERMINE IF ALL THE PARKING LAMPS ARE INOPERATIVE	
• Ignition OFF. • Place the headlamp switch in the PARKING LAMPS ON position. • **Are all the parking lamps inoperative?**	**Yes** VERIFY the BJB fuse 22 (15A) is OK. If OK, GO to P2 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. **No** GO to P3 .
P2 CHECK FOR VOLTAGE TO THE BCM	
• Place the headlamp switch in the OFF position. • Disconnect: BCM C2280A. • Measure the voltage between the BCM C2280A-7, circuit SBB22 (BN/RD), harness side and ground.  N0117296 • **Is the voltage greater than 10 volts?**	**Yes** GO to P6 . **No** REPAIR circuit SBB22 (BN/RD) for an open. TEST the system for normal operation.
P3 CHECK FOR VOLTAGE TO THE INOPERATIVE PARKING LAMP	

NOTE: If the LH rear and both license plate lamps are inoperative, follow the diagnostics for the rear lamp.

- Place the headlamp switch in the OFF position.
- Disconnect: Inoperative 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	C1023-2	CLS06 (GN/OG)
RH front	C1043-2	CLS07 (BN/YE)
LH front side marker	C1127-2	CLS12 (WH/VT)
RH front side marker	C1126-2	CLS12 (WH/VT)
LH front auxiliary	C1445-1	CLS12 (WH/VT)
RH front auxiliary	C1446-1	CLS12 (WH/VT)
LH rear (4-door)	C412-2	CLS08 (VT/GN)
RH rear (4-door)	C415-2	CLS09 (WH/OG)
LH rear (5-door)	C414-2	CLS08 (VT/GN)
RH rear (5-door)	C417-2	CLS09 (WH/OG)
LH license plate	C452-1	CLS08 (VT/GN)
RH license plate	C462-1	CLS08 (VT/GN)

- **Is the voltage greater than 10 volts?**

Yes
For a license plate lamp, REPAIR circuit GD143 (BK/VT) for an open. TEST the system for normal operation. For all other lamps, GO to P4 .

No
For a license plate lamp, REPAIR circuit CLS08 (VT/GN) for an open. TEST the system for normal operation. If an individual front side marker lamp or either front auxiliary parking lamp is inoperative, REPAIR circuit CLS12 (WH/VT) for an open. TEST the system for normal operation. For all other lamp concerns, GO to P5 .

P4 CHECK THE PARKING LAMP GROUND CIRCUIT FOR AN OPEN

- Measure the voltage between the inoperative lamp pins, harness side as follows:

Inoperative Lamp	Connector-Pin/ Circuit	Connector-Pin/ Circuit
LH front	C1023-2 CLS06 (GN/OG)	C1023-1 GD188 (BK/YE)
RH front	C1043-2 CLS07 (BN/YE)	C1043-1 GD123 (BK/GY)
LH front side marker	C1127-2 CLS12 (WH/VT)	C1127-1 GD188 (BK/YE)
RH front side	C1126-2	C1126-1

Yes
For a front parking or side marker lamp, INSTALL a new bulb socket. TEST the system for normal operation. For a front auxiliary parking lamp, INSTALL a new auxiliary parking lamp. REFER to Parking Lamp - Auxiliary in this section. TEST the system for normal operation. For a rear parking lamp (4-door), INSTALL a new bulb socket. TEST the system for normal operation. For a rear parking lamp (5-door), REPAIR or INSTALL a new rear lamp harness . TEST the system for normal operation.

No
REPAIR the ground circuit in question for an open. CLEAR the DTCs. TEST the system for normal

marker	CLS12 (WH/VT)	GD123 (BK/GY)	operation.
LH front auxiliary	C1445-1 CLS12 (WH/VT)	C1445-2 GD188 (BK/YE)	
RH front auxiliary	C1446-1 CLS12 (WH/VT)	C1446-1 GD123 (BK/GY)	
LH rear (4-door)	C412-2 CLS08 (VT/GN)	C412-1 GD143 (BK/VT)	
RH rear (4-door)	C415-2 CLS09 (WH/OG)	C415-1 GD145 (BK/BU)	
LH rear (5-door)	C414-2 CLS08 (VT/GN)	C414-1 GD143 (BK/VT)	
RH rear (5-door)	C417-2 CLS09 (WH/OG)	C417-1 GD145 (BK/BU)	

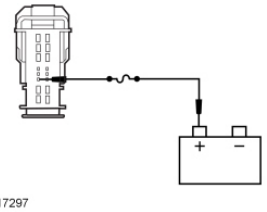
- **Is the voltage greater than 10 volts?**

P5 BYPASS THE BCM

NOTE: If both LH (front and rear) or RH (front and rear) lamps are inoperative, the test must be checked at both lamps to eliminate the circuitry as the cause of the concern.

NOTE: If the fuse in the jumper wire fails, refer to the Wiring Diagrams manual to identify the possible causes of the circuit short. After the repair, cycle the ignition to reset the driver within the BCM . Test the system for normal operation.

- Disconnect: BCM C2280C (Front Side Marker Lamps).
- Disconnect: BCM C2280D (Front Parking Lamps).
- Disconnect: BCM C2280G (Rear Parking Lamps).
- For the front side marker lamps, connect a fused jumper wire between the BCM C2280C-14, circuit CLS12 (WH/VT), harness side and battery positive.

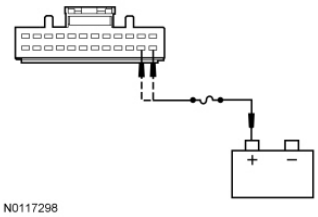
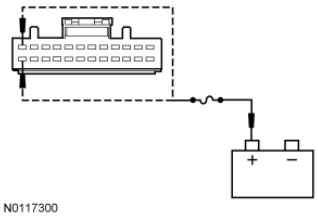


N0117297

- For a front parking lamp, connect a fused jumper wire between the BCM C2280D-24 (LH), circuit CLS06

Yes
REMOVE the jumper wire. GO to P6 .

No
REMOVE the jumper wire. REPAIR the parking lamp voltage supply circuit in question for an open. CLEAR the DTCs. TEST the system for normal operation.

(GN/OG), harness side and battery positive; or between the BCM C2280D-23 (RH), circuit CLS07 (BN/YE), harness side and battery positive.  N0117298 • For a rear parking lamp, connect a fused jumper wire between the BCM C2280G-13 (LH), circuit CLS08 (VT/GN), harness side and battery positive; or between the BCM C2280G-1 (RH), circuit CLS09 (WH/OG), harness side and battery positive.  N0117300 • **Does the parking lamp(s) in question illuminate?**	
P6 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 Q: The Parking, Rear Or 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 Battery Junction Box (BJB) fuse 22 (15A) provides voltage to the Body Control Module (BCM) for the parking lamps. When the headlamp switch is placed in the PARKING LAMPS ON position, the BCM provides voltage on 5 separate circuits to the front and rear parking and license plate lamps.

If a fault exists with the headlamp switch input, the BCM faults the parking lamps and low beam headlamps on.

DTC Description	Fault Trigger Conditions
• B1098:15 - Left Position Light: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects a short to voltage from the LH front or LH rear parking lamp voage supply circuits.
• B1099:15 - Right Position Light: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects a short to voltage from the RH front or RH rear parking lamp voltage supply circuits.
• B1118:15 - Left Rear Sidemarker: Circuit Short To Battery Or Open	A continuous and on-demand DTC that sets when the BCM detects a short to voltage from the front side marker lamps voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- BCM

PINPOINT TEST Q: THE PARKING, REAR OR LICENSE PLATE LAMPS ARE ON CONTINUOUSLY

Test Step	Result / Action to Take
Q1 USE THE RECORDED DTCs FROM THE BCM SELF-TEST	
• Check the recorded results from the BCM self-test. • **Was DTC B10A6:ecorded?**	**Yes** GO to Pinpoint Test C . **No** GO to Q2 .
Q2 CHECK THE BCM PARKING LAMP OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: BCM C2280C (Front Side Marker and Auxiliary Lamps). • Disconnect: BCM C2280D (Front Parking Lamps). • Disconnect: BCM C2280G (Rear Parking Lamps). • Ignition ON. • **Does the parking lamp(s) in question continue to illuminate?**	**Yes** REPAIR the parking lamp voltage supply circuit in question for a short to voltage. CLEAR the DTCs. TEST the system for normal operation. **No** GO to Q3 .
Q3 CHECK FOR CORRECT BCM OPERATION	

• Ignition OFF. • Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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.

Reversing 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 NUD105-R025D or equivalent

Principles of Operation

Automatic Transaxle

The reversing lamps are provided voltage from the reversing lamps relay. Voltage is supplied to the reversing lamps relay when the ignition is in RUN. The Transmission Control Module (TCM) monitors the transaxle gear status. When the TCM detects the transaxle is in REVERSE (R), the TCM provides a ground for the reversing lamps relay coil. When the relay is energized, voltage is supplied to the reversing lamps.

Manual Transaxle

Voltage is supplied to the reversing lamp switch when the ignition is in RUN. When the transaxle is in REVERSE (R), the reversing lamp switch routes voltage to the reversing lamps.

Inspection and Verification

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

Visual Inspection Chart

Electrical
• Central Junction Box (CJB) fuse 6 (10A) • Bulb • Wiring, terminals or connectors

- Reversing lamps relay (automatic transaxle)
- Reversing lamp switch (manual transaxle)

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 is ON.
     - The air bag warning indicator prove-out confirms ignition ON (other indicators may not prove ignition ON). If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
   - 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 Body Control Module (BCM).

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 Reversing Lamps Are Inoperative

Refer to Wiring Diagrams Cell 93 , Reversing Lamps for schematic and connector information.

Normal Operation - Automatic Transaxle

The reversing lamps are provided voltage from the reversing lamps relay. Voltage is supplied to the reversing lamps relay when the ignition is in RUN. The Transmission Control Module (TCM) monitors the transaxle gear status. When the TCM detects the transaxle is in REVERSE (R), the TCM provides a ground for the reversing lamps relay coil. When the relay is energized, voltage is supplied to the reversing lamps.

Manual Transaxle

Voltage is supplied to the reversing lamp switch when the ignition is in RUN. When the transaxle is in REVERSE (R), the reversing lamp switch routes voltage to the reversing lamps.

NOTE: The reversing lamps on 4-door vehicles share the same ground circuit.

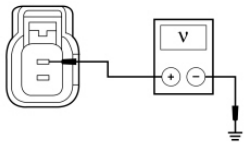
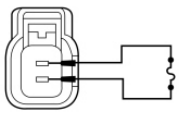
This pinpoint test is intended to diagnose the following:

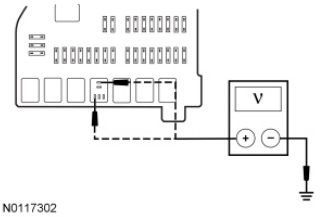
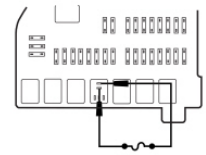
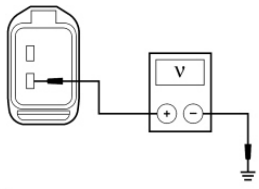
- Fuse
- Wiring, terminals or connectors
- Reversing lamps relay (automatic transaxle)
- Reversing lamp switch (manual transaxle)
- TCM (automatic transaxle)

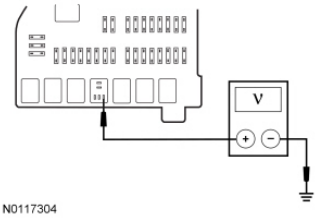
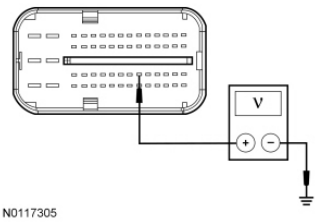
PINPOINT TEST R: BOTH REVERSING LAMPS ARE INOPERATIVE

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
R1 DETERMINE THE TRANSAXLE TYPE	
• Ignition OFF. • Check the vehicle for a manual transaxle. • **Is the vehicle equipped with a manual transaxle?**	**Yes** VERIFY the CJB fuse 6 (10A) is OK. If OK, GO to R2 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. **No** VERIFY the CJB fuse 6 (10A) is OK. If OK, GO to R4 . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.
R2 CHECK FOR VOLTAGE TO THE REVERSING LAMP SWITCH	

• Disconnect: Reversing Lamp Switch C169. • Ignition ON. • Measure the voltage between the reversing lamp switch C169-1, circuit CBP06 (WH/BU), harness side and ground.  N0117309 • **Is the voltage greater than 10 volts?**	**Yes** GO to R3 . **No** REPAIR circuit CBP06 (WH/BU) for an open. TEST the system for normal operation.
R3 BYPASS THE REVERSING LAMP SWITCH	
• Connect a fused jumper wire between the reversing lamp switch C169-1, circuit CBP06 (WH/BU), harness side and the reversing lamp switch C169-2, circuit CET47 (BU), harness side.  N0117301 • **Do the reversing lamps illuminate?**	**Yes** REMOVE the jumper wire. INSTALL a new reversing lamp switch. REFER to Reversing Lamp Switch in this section. TEST the system for normal operation. **No** For 4-door vehicles, LEAVE the jumper wire connected. GO to R7 . For 5-door vehicles, REMOVE the jumper wire. REPAIR circuit CET47 (BU) for an open. TEST the system for normal operation.
R4 CHECK THE REVERSING LAMPS RELAY	
• Disconnect: Reversing Lamps Relay. • Ignition ON. • Substitute a known good relay and recheck the reversing lamps operation. • **Do the reversing lamps operate correctly?**	**Yes** REMOVE the known good relay. INSTALL a new reversing lamps relay. TEST the system for normal operation. **No** REMOVE the known good relay. GO to R5 .
R5 CHECK FOR VOLTAGE TO THE REVERSING LAMPS RELAY	
• Ignition ON. • Measure the voltage between the reversing lamps relay pin 1, circuit CBP06 (WH/BU), BJB face side and ground; and between the reversing lamps relay pin 3, circuit CBP06 (WH/BU), BJB face side and ground.	**Yes** GO to R6 . **No** REPAIR circuit CBP06 (WH/BU) for an open. TEST the system for normal operation.

 N0117302 • **Are the voltages greater than 10 volts?**	
R6 BYPASS THE REVERSING LAMPS RELAY	
• Connect a fused jumper wire between the reversing lamps relay pin 3, circuit CBP06 (WH/BU), BJB face side and the reversing lamps relay pin 5, circuit CET47 (BU), BJB face side.  N0117303 • **Do the reversing lamps illuminate?**	**Yes** REMOVE the jumper wire. GO to R8 . **No** For 4-door vehicles, LEAVE the jumper wire connected. GO to R7 . For 5-door vehicles, REMOVE the jumper wire. REPAIR circuit CET47 (BU) for an open. TEST the system for normal operation.
R7 CHECK FOR VOLTAGE TO THE LH REVERSING LAMP	
• Ignition OFF. • Disconnect: LH Reverse Lamp C487. • Ignition ON. • Measure the voltage between the LH reversing lamp C487-1, circuit CET47 (BU), harness side and ground.  A0057554 • **Is the voltage greater than 10 volts?**	**Yes** REMOVE the jumper wire. REPAIR circuit GD143 (BK/VT) for an open. TEST the system for normal operation. **No** REMOVE the jumper wire. REPAIR circuit CET47 (BU) for an open. TEST the system for normal operation.
R8 CHECK THE REVERSING LAMPS RELAY COIL GROUND CONTROLLED CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: TCM C1750A. • Ignition ON. • Measure the voltage between the reversing lamps relay pin 2, circuit CLS28 (BU/WH), BJB face side and ground.	**Yes** REPAIR circuit CLS28 (BU/WH) for a short to voltage. TEST the system for normal operation. **No** GO to R9 .

 N0117304 • **Is any voltage present?**	
R9 CHECK THE REVERSING LAMPS RELAY COIL GROUND CONTROLLED CIRCUIT FOR AN OPEN	
• Ignition OFF. • Connect: Reversing Lamps Relay. • Ignition ON. • Measure the voltage between the TCM C1750A-40, circuit CLS28 (BU/WH), harness side and ground.  N0117305 • **Is the voltage greater than 10 volts?**	**Yes** GO to R10 . **No** REPAIR circuit CLS28 (BU/WH) for an open. TEST the system for normal operation.
R10 CHECK THE TCM GEAR STATUS INPUT PID	
• Ignition OFF. • Connect: TCM C1750A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: TCM DataLogger. • Monitor the TCM gear status PID (GEAR_ENGAGED) while placing the gear selector lever through all its positions. • **Does the PID agree with the gear selections?**	**Yes** GO to R11 . **No** REFER to Section 307-11 to continue diagnosis of the gear input.
R11 CHECK FOR CORRECT TCM OPERATION	
• Ignition OFF. • Disconnect all the TCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the TCM 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 TCM . REFER to Section 307-11 . 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 S: The Individual Reversing Lamp Is Inoperative

Refer to Wiring Diagrams Cell 93 , Reversing Lamps for schematic and connector information.

Normal Operation

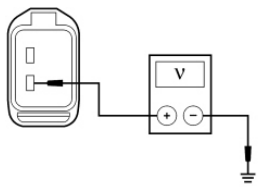
Voltage is routed to the reversing lamps when the reversing lamps relay is energized.

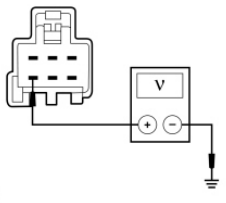
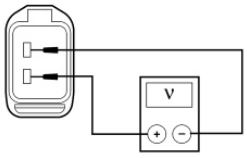
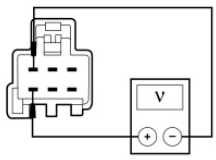
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Bulb socket

PINPOINT TEST S: THE 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
S1 CHECK FOR VOLTAGE TO THE INOPERATIVE REVERSING LAMP	
• Apply the parking brake. • Disconnect: Inoperative Reversing Lamp. • Ignition ON. • Select REVERSE. • For 4-door vehicles, measure the voltage between the LH reversing lamp C487-1, circuit CET47 (BU), harness side and ground; or between the RH reversing lamp C488-1, circuit CET47 (BU), harness side and ground.  A0057554 • For 5-door vehicles, measure the voltage between the LH reversing lamp C414-4, circuit CET47 (BU), harness side and ground; or between the RH reversing lamp C417-4, circuit CET47 (BU), harness side and ground.	**Yes** GO to S2 . **No** REPAIR circuit CET47 (BU) for an open. TEST the system for normal operation.

 N0117306 • **Is the voltage greater than 10 volts?**	
S2 CHECK THE REVERSING LAMP GROUND CIRCUIT FOR AN OPEN	
• For 4-door vehicles, measure the voltage between the LH reversing lamp C487-1, circuit CET47 (BU), harness side and the LH reversing lamp C487-2, circuit GD143 (BK/VT), harness side; or between the RH reversing lamp C488-1, circuit CET47 (BU), harness side and the RH reversing lamp C488-2, circuit GD143 (BK/VT), harness side.  N0088182 • For 5-door vehicles, measure the voltage between the LH reversing lamp C414-4, circuit CET47 (BU), harness side and the LH reversing lamp C414-1, circuit GD143 (BK/VT), harness side; or between the RH reversing lamp C417-4, circuit CET47 (BU), harness side and the RH reversing lamp C417-1, circuit GD143 (BK/BU), harness side.  N0117307 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new bulb socket. TEST the system for normal operation. **No** REPAIR circuit GD143 (BK/VT) or circuit GD143 (BK/VT) for an open. TEST the system for normal operation.

Pinpoint Test T: The Reversing Lamps Are On Continuously

Refer to Wiring Diagrams Cell 93 , Reversing Lamps for schematic and connector information.

Normal Operation

The reversing lamps are illuminated, voltage is also provided to the Body Control Module (BCM), the auto-dimming interior rear view mirror and the Global Positioning System Module (GPSM) if equipped.

Automatic Transaxle

The reversing lamps are provided voltage from the reversing lamps relay. Voltage is supplied to the reversing lamps relay when the ignition is in RUN. The Transmission Control Module (TCM) monitors the transaxle gear status. When the TCM detects the transaxle is in REVERSE (R), the TCM provides a ground for the reversing lamps relay coil. When the relay is energized, voltage is supplied to the reversing lamps.

Manual Transaxle

Voltage is supplied to the reversing lamp switch when the ignition is in RUN. When the transaxle is in REVERSE (R), the reversing lamp switch routes voltage to the reversing lamps.

- DTC C1137:24 (Reverse Gear Switch: Signal Stuck High) - A continuous and on-demand DTC that sets when the BCM detects a short to voltage from the reversing lamp voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Reversing lamps relay (automatic transaxle)
- Reversing lamp switch (manual transaxle)
- Auto-dimming interior rear view mirror
- BCM
- GPSM
- TCM (automatic transaxle)

PINPOINT TEST T: THE REVERSING 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
T1 DETERMINE THE TRANSAXLE TYPE	
• Ignition OFF. • Check the vehicle for a manual transaxle. • **Is the vehicle equipped with a manual transaxle?**	**Yes** GO to T2 . **No** GO to T3 .
T2 CHECK THE REVERSING LAMP SWITCH	
• Ignition OFF. • Disconnect: Reversing Lamp Switch C169. • Ignition ON. • **Do the reversing lamps continue to illuminate?**	**Yes** If equipped with a GPSM , GO to T4 . If not equipped with a GPSM , GO to T5 . **No** INSTALL a new reversing lamp switch. REFER to Reversing Lamp Switch in this section. TEST the system for normal operation.
T3 CHECK THE REVERSING LAMPS RELAY OUTPUT	
• Ignition OFF.	**Yes** If equipped with a GPSM , GO to T4 . If not

• Disconnect: Reversing Lamps Relay. • Ignition ON. • **Do the reversing lamps continue to illuminate?**	equipped with a GPSM , GO to T5 . **No** GO to T7 .
T4 CHECK THE GPSM FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: GPSM C2398. • Ignition ON. • **Do the reversing lamps continue to illuminate?**	**Yes** GO to T5 . **No** GO to T10 .
T5 CHECK THE BCM FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: BCM C2280D. • Ignition ON. • **Do the reversing lamps continue to illuminate?**	**Yes** If equipped with an auto-dimming interior rear view mirror, GO to T6 . If not equipped with an auto-dimming interior rear view mirror, REPAIR circuit CET47 (BU) for a short to voltage. TEST the system for normal operation. **No** GO to T11 .
T6 CHECK THE AUTO-DIMMING INTERIOR REAR VIEW MIRROR FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: Auto-Dimming Interior Rear View Mirror C911. • Ignition ON. • **Do the reversing lamps continue to illuminate?**	**Yes** REPAIR circuit CET47 (BU) for a short to voltage. TEST the system for normal operation. **No** INSTALL a new auto-dimming interior rear view mirror. REFER to Section 501-09 . TEST the system for normal operation.
T7 CHECK THE REVERSING LAMPS RELAY	
• Ignition OFF. • Substitute a known good relay. • Ignition ON. • **Do the reversing lamps continue to illuminate?**	**Yes** REMOVE the known good relay. GO to T8 . **No** REMOVE the known good relay. INSTALL a new reversing lamps relay. TEST the system for normal operation.
T8 CHECK THE REVERSING LAMPS RELAY COIL GROUND CONTROLLED CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Connect: Reversing Lamps Relay. • Disconnect: TCM C1750A. • Ignition ON.	**Yes** REPAIR circuit CLS28 (BU/WH) for a short to ground. TEST the system for normal operation. **No** GO to T9 .

• **Do the reversing lamps continue to illuminate?**	
T9 CHECK THE TCM GEAR STATUS INPUT PID	
• Ignition OFF. • Connect: TCM C1750A. • Ignition ON. • Enter the following diagnostic mode on the scan tool: TCM DataLogger. • Monitor the TCM gear status PID (GEAR_ENGAGED) while placing the gear selector lever through all its positions. • **Does the PID agree with the gear selections?**	**Yes** GO to T12 . **No** REFER to Section 307-11 to continue diagnosis of the gear input.
T10 CHECK FOR CORRECT GPSM OPERATION	
• Ignition OFF. • Disconnect all the GPSM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the GPSM 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 GPSM . REFER to Section 415-00 . 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.
T11 CHECK FOR CORRECT BCM OPERATION	
• Ignition OFF. • Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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.
T12 CHECK FOR CORRECT TCM OPERATION	
• Ignition OFF. • Disconnect all the TCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins	**Yes** INSTALL a new TCM . REFER to Section 307-11 . 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

• Connect all the TCM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	corroded connector.

Headlamp Adjustment

Special Tool(s)

 ST3041-A	Vision 100 Headlamp Aimer 196-00005 or equivalent

Headlamp Aiming

NOTE: For the photometric aiming procedure, refer to the appropriate photometric headlamp aimer instruction manual.

NOTE: Mechanical aimers cannot be used with VOR- or VOL-type headlamps.

NOTE: Consult your state vehicle inspection manual for recommended tolerance ranges for visual aiming.

NOTE: Horizontal aim is not adjustable.

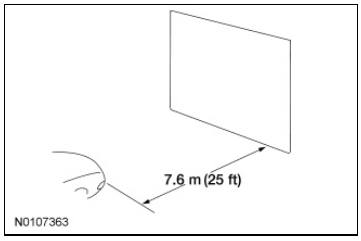
1. The headlamp aiming procedure depends on what type of beam pattern the headlamp is equipped with. Vehicles may come equipped with visually optically aligned left (VOL) or visually optically aligned right (VOR) headlamps. To identify the headlamp beam pattern, look on the headlamp lens. Molded in small letters on the headlamp lens is one of the following:
    - 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- and VOR- headlamps. This is the preferred method of headlamp aiming.
    - Visual or screen method aiming can be used to aim VOL- and VOR- headlamps.
    - 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.

3. Before starting headlamp adjustment:
    - check that the vehicle is on level ground.
    - 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.
    - if the vehicle is equipped with air suspension, make sure that the switch is on.

4. **NOTE:** The vertical wall or screen must be a minimum of 2.4 m (8 ft) wide.

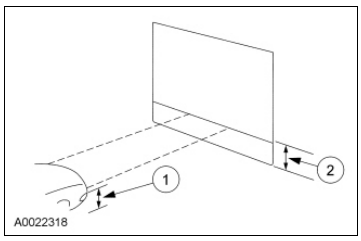
   Park the vehicle on a level surface approximately 7.6 m (25 ft) from the vertical wall or screen directly in front of it.



5. **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.

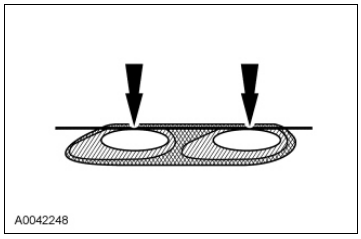


6. **NOTE:** This procedure should be done in a dark environment to effectively see the headlamp beam pattern.

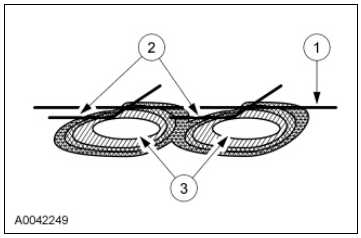
   Turn on the low beam headlamps to illuminate the wall or screen and open the hood.

7. **NOTE:** The appearance of the VOR beam pattern may vary between vehicles.

   For VOR-type headlamps, locate the top edge of this high intensity area a distinct horizontal cutoff in the beam pattern on the wall or screen. Using the adjusting screw, adjust the headlamp until the top edge of this cutoff is even with the horizontal reference line.

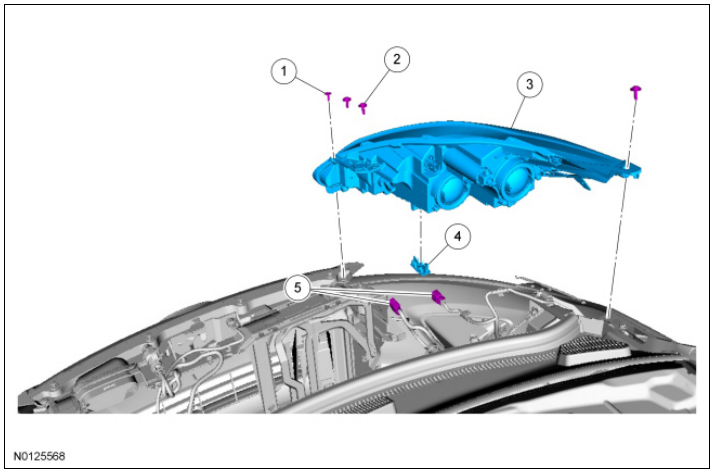


8. For VOL-type headlamps, locate the distinct cutoff in the left portion of the beam pattern. Using the adjusting screw, adjust the headlamp until the edge of this cutoff is positioned 50.2 mm (2 in) below the horizontal reference line.
   1. Horizontal reference line.
   2. Top edge of the beam pattern.
   3. High intensity zone.


2
1
3
A0042249

Headlamp Assembly

NOTE: RH shown, LH similar.



Item	Part Number	Description
1	W714040	Upper radiator grille reinforcement pin-type retainer
2	W702733	Headlamp assembly bolt (3 required)
3	13008	Headlamp assembly (RH / LH)
4	13N129	Headlamp assembly lower clip
5	-	Headlamp assembly electrical connectors (part of 14K102)

Removal and Installation

1. Remove the headlamp assembly-to-upper radiator grille reinforcement pin-type retainer.

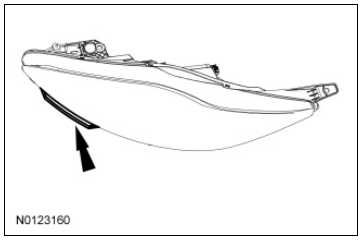
2. Remove the 3 headlamp assembly bolts.
   - To install, tighten to 5 Nm (44 lb-in).

3. Gently lift up on the headlamp assembly to disconnect assembly from the lower clip.

4. Disconnect the headlamp assembly electrical connectors and disengage the wiring assembly clips from the headlamp assembly.

5. **NOTE:** The headlamp assembly has a lip that must fit under the front bumper assembly to insure proper fit.

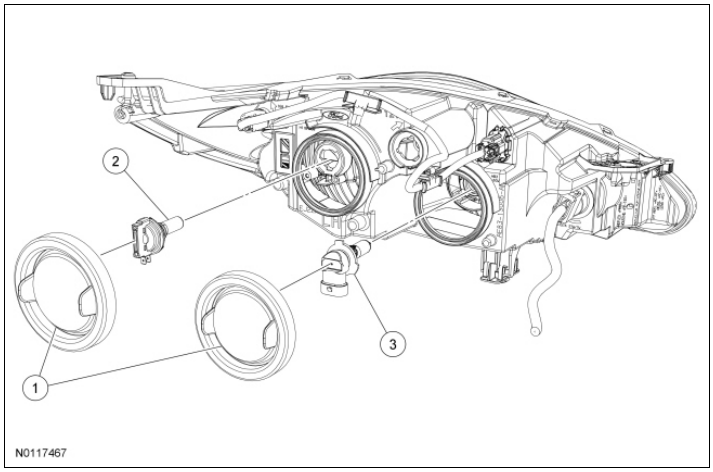
   Remove the headlamp assembly.



6. To install, reverse the removal procedure.
    - If necessary, adjust the headlamps. For additional information, refer to Headlamp Adjustment in this section.

Headlamp Bulb

NOTE: The headlamp assembly is shown removed for clarity.



Item	Part Number	Description
1	13N019	Headlamp bulb cover
2	13N021A	Headlamp low beam bulb
3	13N021B	Headlamp high beam 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 on the headlamps with the bulb removed.

NOTE: Make sure the headlamp switch and the ignition switch are in the OFF position.

Left Hand Side

1. Remove the headlamp assembly. For additional information, refer to Headlamp Assembly in this section.

Right Hand Side

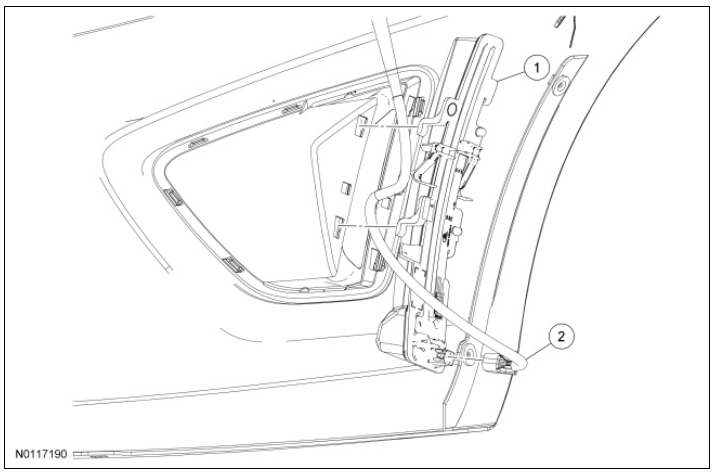
2. Position aside the degas bottle.

Both Sides

3. Remove the headlamp bulb.
    1. Remove the headlamp bulb cover.
    2. Disconnect and remove the headlamp bulb.

4. To install, reverse the removal procedure.

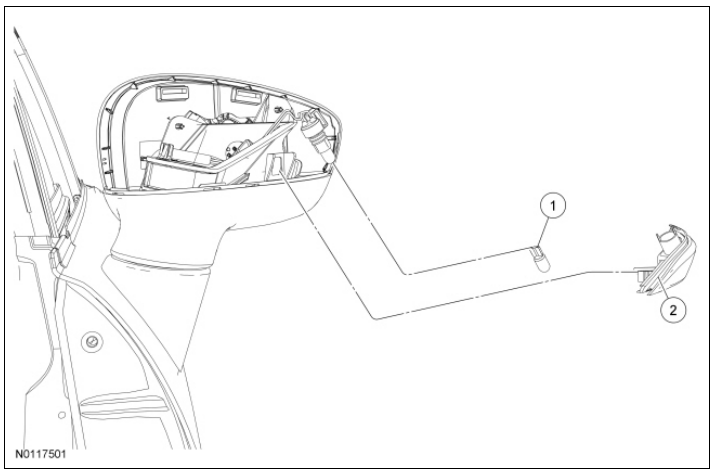
Parking Lamp - Auxiliary



Item	Part Number	Description
1	13200	Supplemental parking lamp assembly (RH/LH)
2	-	Supplemental parking lamp electrical connector (part of 14K012)

1. Remove the front fender splash shield. For additional information, refer to Section 501-02 .
2. Disconnect the supplemental parking lamp electrical connector.
3. Unclip and remove the supplemental parking lamp assembly.
4. To install, reverse the removal procedure.

Turn Signal Lamp - Outside Rear View Mirror

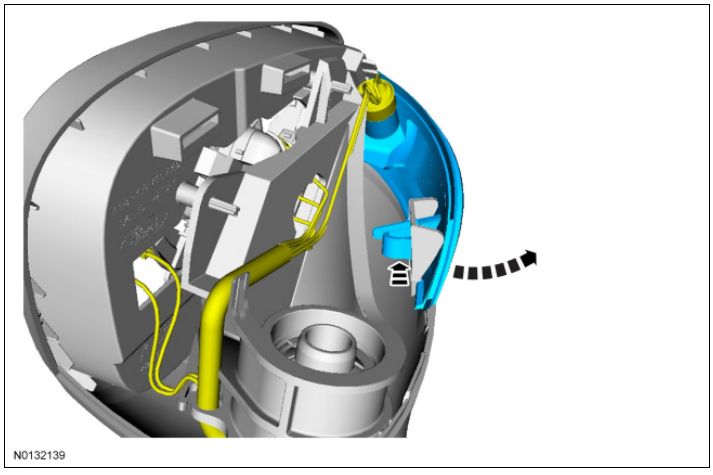


Item	Part Number	Description
1	13466	Outside rear view mirror turn signal lamp bulb
2	13B374	Outside rear view mirror turn signal lamp assembly (RH/LH)

Removal

1. Remove the exterior mirror cover. For additional information, refer to Section 501-09 .

2. Remove the outside rear view mirror turn signal assembly.
    1. Remove the turn signal bulb and socket from the turn signal assembly and position the wiring harness aside.
    2. Release the turn signal clip and remove the turn signal assembly.

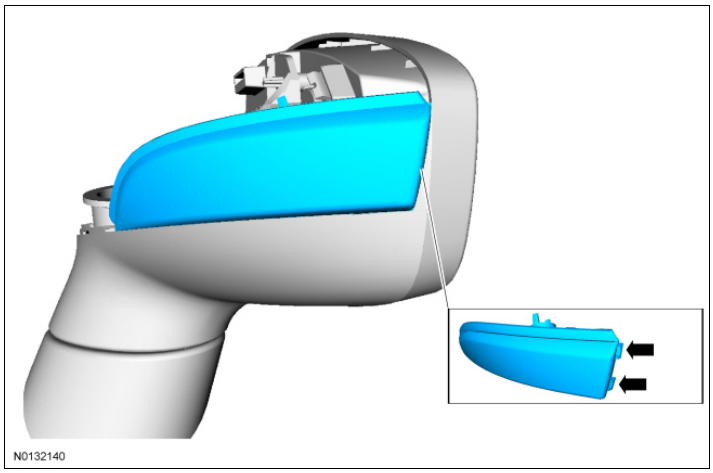


Installation

1. **NOTE:** Bulb and socket will be fully seated in the turn signal assembly when the 2 slots align with the rubber seal.

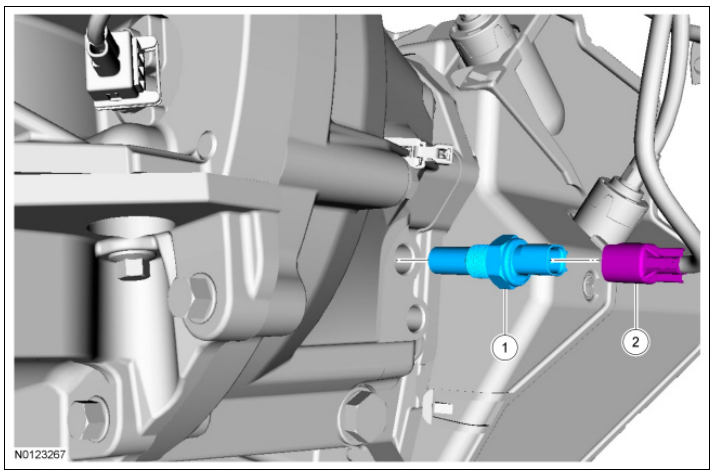
    Install the turn signal bulb and socket into the turn signal assembly.

2. Install the 2 rear hooks of the turn signal assembly under the edge of the rear view mirror and snap the turn signal clip in place.



3. Install the exterior mirror cover. For additional information, refer to Section 501-09 .

Reversing Lamp Switch



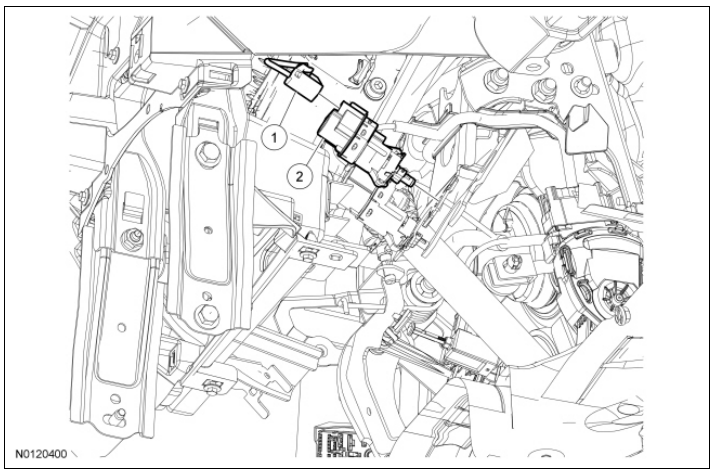
Item	Part Number	Description
1	15520	Reversing lamp switch - 14 Nm (124 lb-in)
2	-	Reversing lamp switch electrical connector (part of 13A690)

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02 .

2. Refer to exploded view(s) and any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Stoplamp Switch



Item	Part Number	Description
1	-	Stoplamp switch electrical connector (part of 14K012)
2	13480	Stoplamp lamp switch

Removal and Installation

NOTICE: **Do not press, pull or otherwise move the brake pedal while installing the stoplamp switch and cruise control deactivation switch. Install these switches 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 results in incorrect adjustment and damages the switches.**

1. **NOTE:** The stoplamp switch is located above the cruise control deactivation switch (if equipped).

   Rotate the stoplamp switch clockwise approximately one-eighth turn to remove the stoplamp switch.

2. To install, reverse the removal procedure.
   - Perform the brake pedal switch adjustment. For additional information, refer to Section 206-09 .

Headlamp Switch



Item	Part Number	Description
1	-	Headlamp switch electrical connector (part of 14K024)
2	11654	Headlamp switch

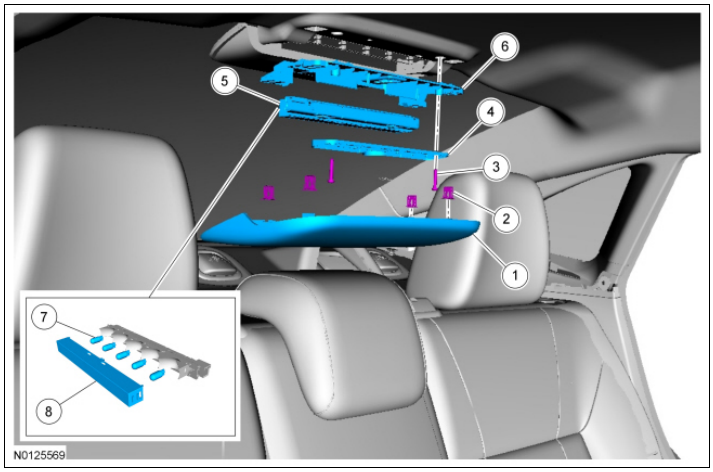
Removal and Installation

1. Using a suitable non-marring tool, work around the outer edge of the switch to release the clips and pull the switch out through the front of the finish panel.
    - Disconnect the electrical connector.

2. To install, reverse the removal procedure.

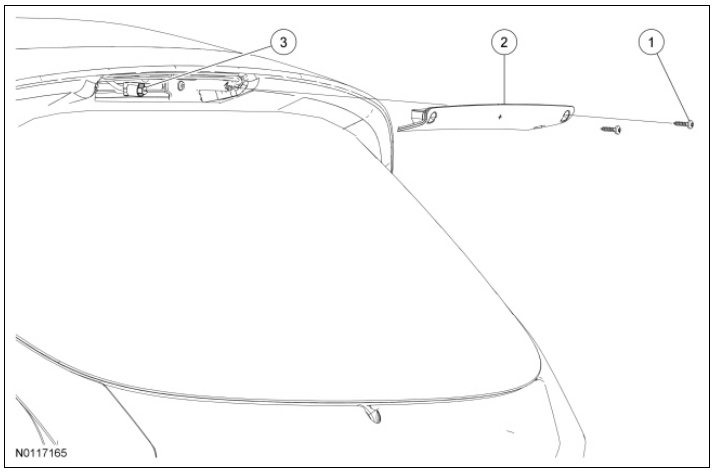
High Mounted Stoplamp

4-Door Sedan



Item	Part Number	Description
1	13466	High mounted stoplamp cover
2	N807389	High mounted stoplamp cover clip (4 required)
3	W502564	High mounted stoplamp screw (2 required)
4	13A624	High mounted stoplamp lower bracket
5	13A613	High mounted stoplamp
6	13A624	High mounted stoplamp upper bracket
7	13466	High mounted stoplamp bulb (5 required)
8	-	High mounted stoplamp lens (part of 13A613)

5-Door Hatchback



Item	Part Number	Description
1	46058	High mounted stoplamp screw (2 required)

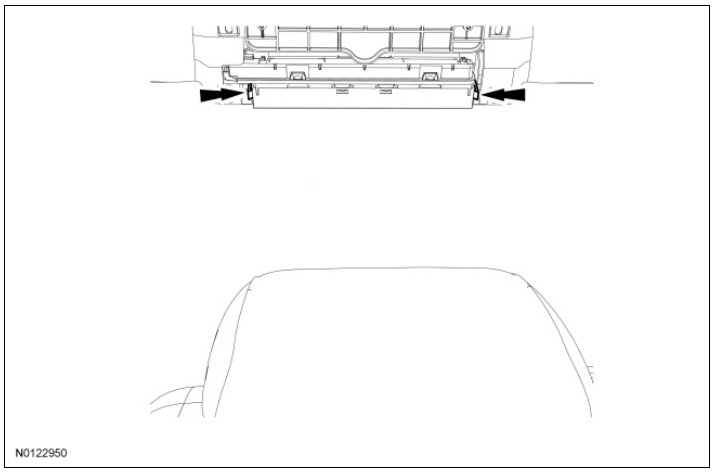
2	13A613	High mounted stoplamp
3	-	High mounted stoplamp connector

Removal and Installation

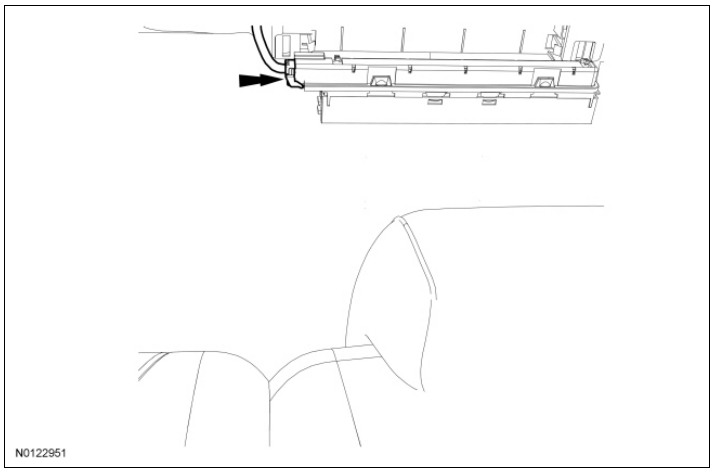
4-Door Sedan

1. Remove the high mounted stoplamp assembly cover.

2. Disconnect the 2 clips on the side of the high mounted stoplamp assembly and lower the high mounted stoplamp assembly down.

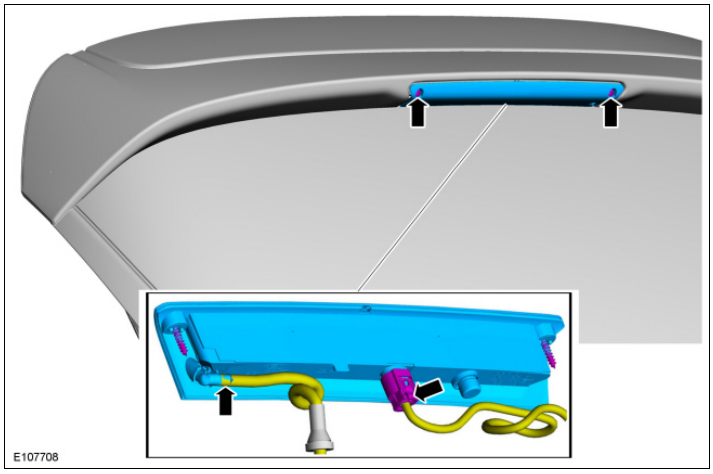


3. Disconnect the high mounted stoplamp assembly electrical connector and remove.



5-Door Hatch

4. Remove the high mounted stoplamp assembly.
    1. Remove the 2 high mounted stoplamp assembly screws.
    2. Disconnect the high mounted stoplamp assembly electrical connector and the rear window washer hose and remove the high mounted stoplamp assembly.

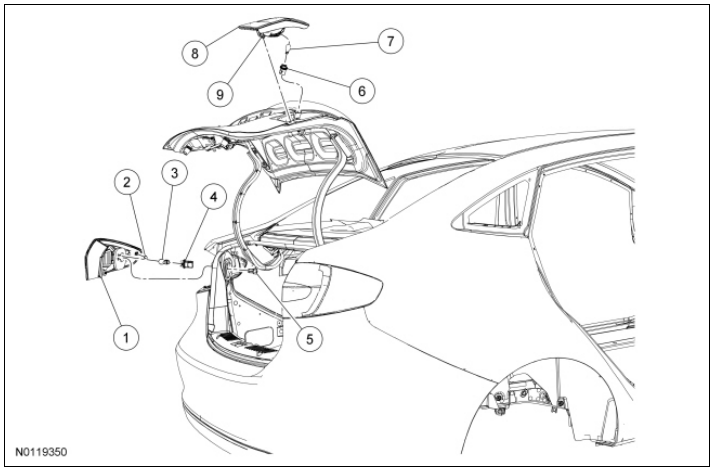


All Vehicles

5. To install, reverse the removal procedure.

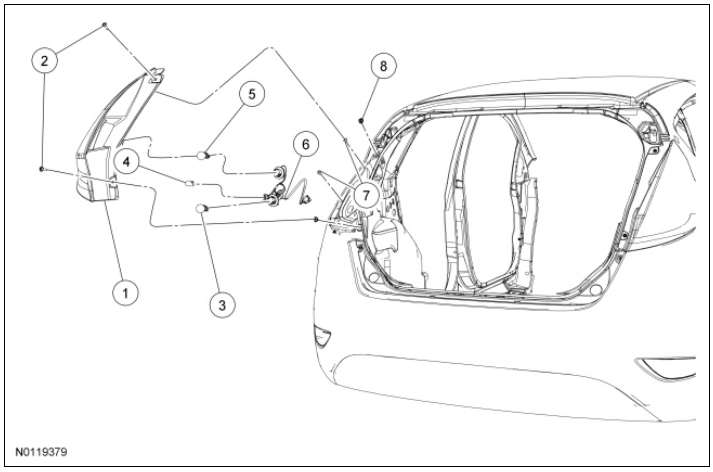
Rear Lamp Assembly

4-Door Sedan



Item	Part Number	Description
1	13404/ 13405	Rear outer lamp assembly (RH/LH)
2	13K262	Rear outer lamp assembly grommet
3	13466	Park/ turn/ stop lamp bulb
4	13411	Park/ turn/ stop lamp bulb socket
5	W707612	Rear outer lamp assembly retaining nut
6	13411	Reverse bulb socket
7	13466	Reverse bulb
8	15500/ 15501	Rear inner lamp assembly (RH/LH)
9	-	Rear inner lamp assembly retaining nut (part of the rear inner lamp assembly)

5-Door Hatchback



Item	Part Number	Description
1	13404/ 13405	Rear lamp assembly (RH/LH)
2	W714309	Rear lamp assembly screws (2 required)
3	13466	Rear lamp assembly lower inner bulb
4	13466	Rear lamp assembly outer bulb
5	13466	Rear lamp assembly upper bulb
6	13410	Rear lamp socket and wire assembly
7	16K262	Rear lamp assembly grommets (2 required)
8	W707977	Rear lamp assembly retainer nut (2 required)

Removal and Installation

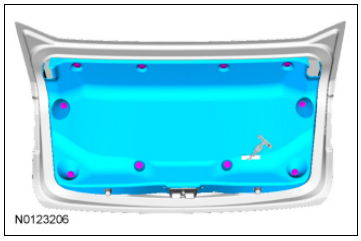
4-Door sedan rear outer lamp assembly

1. Remove the pin-type retainer and position the luggage compartment trim panel aside.

2. Remove the rear outer lamp assembly.
    1. Remove the rear outer lamp assembly retaining nut.
    2. Disconnect and remove the rear outer lamp assembly.

4-Door sedan rear inner lamp assembly

3. Remove the 10 pin-type retainers and the decklid trim panel.



4. Remove the rear inner lamp assembly.
    1. Loosen the rear inner lamp assembly retaining nut.
    2. Disconnect and remove the rear inner lamp assembly.

5-Door hatchback

5. Remove the 2 rear lamp assembly screws.

6. Remove the rear lamp assembly.
    1. Pull the rear lamp assembly out.
    2. Remove the 3 rear lamp assembly bulbs and remove the lamp assembly.

All vehicles

7. To install, reverse removal procedure.

Interior Lighting

The interior lighting system consists of the following components:

- Interior/map lamps
- Luggage compartment lamp
- Door ajar switches (integrated into the door latches)
- Luggage compartment lid/liftgate ajar switch (integrated into the luggage compartment lid/liftgate latch)
- Ambient lighting module (located under the center console)
- Ambient lighting switch (integrated into the passenger heated seat switch)
- Body Control Module (BCM)

The interior lighting system consists of up to 3 subsystems:

- Courtesy lamps
- Demand lamps
- Ambient lighting

Battery Saver

NOTE: Time-out is 10 seconds if the vehicle is in Factory mode or 0 seconds if the vehicle is in Transport mode.

The provides automatic shut-off of the courtesy and demand lamps after a time-out period when the ignition is OFF. A timer in the BCM starts when any of the following occur:

- the ignition is changed to OFF
- any door or luggage compartment lid/liftgate becomes ajar
- the UNLOCK button of the transmitter is pressed
- a door is unlocked using a key
- the door lock switch is pressed

When 10 minutes (30 minutes for demand lamps) have elapsed, the automatically shuts the voltage off to the lamps. The timer restarts (voltage is restored if the BCM is in battery saver mode) if any of the following occurs:

- the ignition is changed out of OFF
- any door, luggage compartment lid or liftgate becomes ajar
- the UNLOCK button of the transmitter is pressed
- a door is unlocked using a key
- the door lock switch is pressed

Courtesy Lamps

The courtesy lamp subsystem consists of the interior/map lamps, the door ajar switches and the BCM . The turns the courtesy lamps on when a door is opened or when an unlock signal is received from the Remote Keyless Entry (RKE) transmitter.

Illuminated Entry/Exit

The illuminated entry and exit features provide temporary illumination of the parking lamps, the dimmable backlighting, the ambient backlighting and the courtesy lamps. Refer to the following table for additional information.

NOTE: An arbitrator (software programming) within the determines which actions take precedence over others (for example, an open door keeps the courtesy lamps on even when a command to lock the doors is received).

NOTE: For vehicles without Intelligent Access (IA), the timer for the backlighting and ambient lighting is reset to 25 seconds when the key is inserted or removed from the ignition lock cylinder.

Action	Parking Lamps	Courtesy Lamps	Dimmable Backlighting	Ambient Lighting
RKE transmitter or mechanical unlocking of the doors	On for 25 seconds	On for 25 seconds	On for 25 seconds	On for 25 seconds
RKE transmitter or mechanical locking of the doors	Off	Off	Off	Off
Open a closed door after previously unlocking (no ignition state change since unlock)	Off (on for remianing time if unlocked from transmitter or mechanical unlocking of the doors)	On	On	On
Close all doors	Off	On for 25 seconds	On for 25 seconds	On for 25 seconds
Ignition changed to ON	Off	On for 25 seconds	Off	On
Ignition changed out of ON	Off	On for 25 seconds	On for 25 seconds	On for 25 seconds
Open a door after the ignition is changed to OFF	Off	On	Off	Off
Ignition is OFF and doors are unlocked from the door lock switch	Off	On for 25 seconds	Off	Off
Ignition is OFF and doors are locked from the door lock switch	Off	Off	Off	Off

Theater Lighting

The theater lighting option ramps-up the courtesy lamps over 0.7 second when courtesy lamp activation is requested. The theater lighting feature ramps-down the courtesy lamps over 1.7 seconds when interior lighting deactivation is requested by any feature other than the panic alarm or battery saver.

Demand Lamps

The demand lamps subsystem consists of the map/reading lamps and the luggage compartment lamp (sedan) or cargo lamp (5-door) lamp. The energizes the battery saver relay to supply voltage to the demand lamps when the battery saver feature is not active.

Ambient Lighting

The ambient lighting LEDs illuminate the cup holders (front and rear) and the front and rear footwell areas. The ambient lighting subsystem consists of the ambient lighting switch, the ambient lighting module, and the harness with hardwired LEDs located within the floor console and under the instrument panel footwell areas. The ambient lighting is operational when the ignition is in any state other than OFF (the exception is when it is used in conjunction with the illuminated entry/exit features). The ambient lighting switch cycles the LEDs through 7 different color combinations or to turn the ambient lighting off.

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 NUD105-R025D or equivalent

Principles of Operation

The Body Control Module (BCM) supplies voltage (and ground for the courtesy lamps) to the interior lighting system. The interior lighting system illuminates the courtesy lamps to enhance visibility of the interior when a vehicle door is ajar. The BCM controls all interior lighting functions and timing by monitoring inputs from the door ajar switches, luggage compartment lid/liftgate ajar switch, door lock switch, input from the Remote Keyless Entry (RKE) system and the ignition state.

The voltage supply circuit to the BCM for the interior lamps is also used for the horn.

Ambient Lighting

The ambient lighting module provides voltage and ground to the LEDs. The ambient lighting switch is an input to the ambient lighting module. With each press of the ambient lighting switch, the ambient lighting module cycles through a different color variation or turns the ambient lighting feature off. There are 3 different color (red, blue and green) LEDs housed within each LED assembly. By illuminating various color combinations, the LEDs are able to produce 7 different colors of ambient light. The module retains the last color setting between ignition cycles.

Field-Effect Transistor (FET) Protection

A FET is a type of transistor that, when used with module software, monitors and controls current flow on module outputs. The FET protection strategy prevents module damage in the event of excessive current flow.

The BCM utilizes a FET protective circuit strategy for many of its outputs (such as a turn lamp output circuit). Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down when a fault event is detected. A short circuit DTC sets when the fault event occurs.

The circuit remains off until the fault is corrected and the ignition is cycled off and then back on, the module resets the FET protection and allows the circuit to function.

The FET protected circuits for the interior lighting system are the interior lamp voltage supply, courtesy lamp ground and ambient lighting module voltage supply circuits.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

• Interior/map lamps • Luggage compartment/cargo lamp	• Bulb(s) • Wiring, terminals or connectors • Interior/map lamps • Luggage compartment/cargo lamp • Ambient lighting switch

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 is ON.
     - The air bag warning indicator prove-out confirms ignition ON (other indicators may not prove ignition ON). If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
   - 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 Body Control Module (BCM).

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

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B1091:12	Courtesy Lamp Sense: Circuit Short To Battery	GO to Pinpoint Test B .
B1175:92	Drivers Door Ajar Switch: Performance Or Incorrect Operation	GO to Pinpoint Test D .
B1176:92	Passenger Door Ajar Switch: Performance Or Incorrect Operation	GO to Pinpoint Test D .
B1178:92	Boot/Trunk Ajar Switch: Performance Or Incorrect Operation	GO to Pinpoint Test C .
B11E9:92	Left Rear Door Ajar Switch: Performance Or Incorrect Operation	GO to Pinpoint Test D .
B11EA:92	Right Rear Door Ajar Switch: Performance Or Incorrect Operation	GO to Pinpoint Test D .
B12F1:11	Ambient Lighting Zone 1 Output: Circuit Short To Ground	GO to Pinpoint Test H .
B12F1:15	Ambient Lighting Zone 1 Output: Circuit Short To Battery Or Open	If the ambient lighting is inoperative, GO to Pinpoint Test H . If the ambient lighting is always on, GO to Pinpoint Test J .
B1D14:11	Interior Lights Circuit "B": Circuit Short To Ground	GO to Pinpoint Test B .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: The Courtesy Lamps Do Not Illuminate With A Door Open

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends a voltage signal to each door ajar switch (integrated into the door latch), which is routed to ground when the door is closed (the door ajar switch is closed when the door is

closed). When the door is opened, the signal to ground is interrupted, indicating an open door to the BCM . When the BCM determines a door is open, the battery saver relay energizes (if not already energized) to supply voltage to the interior lamps and the BCM provides ground to the courtesy lamps.

The demand lamp system (map lamps) uses the interior lamps ground circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Door latch
- BCM

PINPOINT TEST A: THE COURTESY LAMPS DO NOT ILLUMINATE WITH A DOOR OPEN

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

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>A1 CHECK THE OPERATION OF THE COURTESY LAMPS FROM ALL THE DOORS</td><td></td></tr>
<tr><td>NOTE: Make sure the interior lamp switches are in the DOOR or COURTESY position before carrying out this step.

• Open all the doors and observe the interior lamps.
• Do the interior lamps illuminate?</td><td>Yes
CLOSE the doors. GO to A2 .

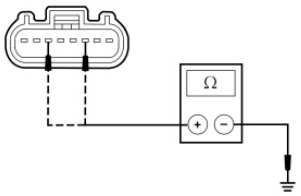
No
CLOSE the doors. GO to Pinpoint Test B .</td></tr>
<tr><td>A2 CHECK THE DOOR AJAR SWITCH OPERATION</td><td></td></tr>
<tr><td>• Ignition OFF.
• Disconnect: Suspect Door Latch .
• Do the courtesy lamps illuminate?</td><td>Yes
INSTALL a new door latch in question. REFER to Section 501-14 . TEST the system for normal operation.

No
GO to A3 .</td></tr>
<tr><td>A3 CHECK THE DOOR AJAR SWITCH CIRCUIT FOR A SHORT TO GROUND</td><td></td></tr>
<tr><td>• Disconnect: BCM C2280G.
• Measure the resistance between the suspect door latch, harness side and ground as follows:

<table><tr><th>Suspect Door Latch</th><th>Connector-Pin</th><th>Circuit</th></tr><tr><td>LH front</td><td>C525-3</td><td>CPL26 (GN/VT)</td></tr></table></td><td>Yes
GO to A4 .

No
REPAIR the circuit in question for a short to ground. TEST the system for normal operation.</td></tr>
</table>

RH front	C609-6	CPL31 (WH)
LH rear	C705-3	CPL36 (GN)
RH rear	C805-6	CPL39 (YE)



N0114650

- **Is the resistance greater than 10,000 ohms?**

A4 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 B: One Or More Courtesy Lamps Are Inoperative

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Normal Operation

The Body Control Module (BCM) supplies voltage and ground to the courtesy lamps when requested. The voltage supply is also used for the demand lamp function (map lamps).

- DTC B1091:12 (Courtesy Lamp Sense: Circuit Short To Battery) - a continuous and on-demand DTC that sets when the BCM detects a short to voltage from the courtesy lamp ground controlled circuit.
- DTC B1D14:11 (Interior Lights Circuit "B": Circuit Short to Ground) - a continuous and on-demand DTC that sets when the BCM detects a short to ground from the courtesy lamp voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Interior lamp
- BCM

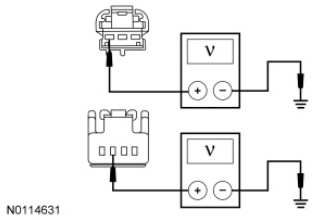
PINPOINT TEST B: ONE OR MORE COURTESY LAMPS ARE INOPERATIVE

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

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>B1 CHECK THE OPERATION OF THE COURTESY LIGHTING WITH THE LH FRONT DOOR OPEN</td><td></td></tr>
<tr><td>NOTE: For vehicles equipped with a moonroof, make sure the interior lamp switches are in the DOOR position before carrying out this step.

• Ignition OFF.
• Open the LH front door and observe the interior lamps.
• Are all the interior lamps inoperative?</td><td>Yes
GO to B4 .

No
GO to B2 .</td></tr>
<tr><td>B2 CHECK FOR VOLTAGE TO THE INOPERATIVE COURTESY LAMP</td><td></td></tr>
<tr><td>• Disconnect: Inoperative Lamp.
• Ignition ON.
• With a door open, measure the voltage between the inoperative interior lamp, harness side and ground as follows:

<table><tr><th>Inoperative Lamp</th><th>Connector-Pin</th><th>Circuit</th></tr><tr><td>Front (with moonroof)</td><td>C926-3</td><td>CLN01 (GN/VT)</td></tr><tr><td>Front (without moonroof)</td><td>C901-3</td><td>CLN01 (GN/VT)</td></tr><tr><td>Rear</td><td>C932-3</td><td>CLN01 (GN/VT)</td></tr></table>
 

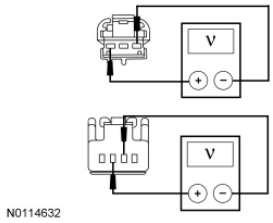
N0114631
• Is the voltage greater than 10 volts?</td><td>Yes
GO to B3 .

No
REPAIR circuit CLN01 (GN/VT) for an open. TEST the system for normal operation.</td></tr>
<tr><td>B3 CHECK THE INOPERATIVE COURTESY LAMP GROUND CONTROLLED CIRCUIT FOR AN OPEN</td><td></td></tr>
<tr><td>• Measure the voltage between the inoperative interior lamp pins, harness side as follows:

<table><tr><th>Inoperative Lamp</th><th>Connector-Pin</th><th>Connector-Pin</th></tr></table></td><td>Yes
INSTALL a new interior lamp for the lamp in question. TEST the system for normal operation.

No
REPAIR circuit CLN03 (YE/GY) for an open. TEST the system for normal operation.</td></tr>
</table>

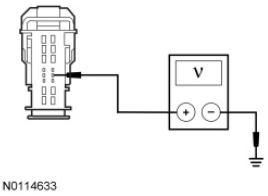
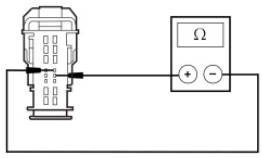
	Circuit	Circuit
Front (with moonroof)	C926-3 CLN01 (GN/VT)	C926-2 CLN03 (YE/GY)
Front (without moonroof)	C901-3 CLN01 (GN/VT)	C901-1 CLN03 (YE/GY)
Rear	C932-3 CLN01 (GN/VT)	C932-1 CLN03 (YE/GY)

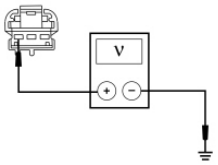
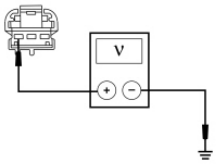
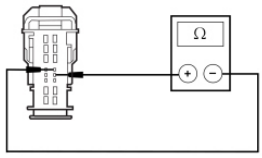


N0114632

- **Is the voltage greater than 10 volts?**

B4 CHECK THE OPERATION OF THE COURTESY LAMPS FROM ALL THE DOORS	
• Open all the doors and observe the interior lamps. • **Do the interior lamps illuminate?**	**Yes** GO to Pinpoint Test A . **No** CLOSE all the doors. GO to B5 .
B5 CHECK THE OPERATION OF THE MAP LAMP	
• Ignition ON. • Use the map lamp function on the front interior lamp and attempt to turn the lamp on. • **Does the front interior lamp illuminate?**	**Yes** GO to B6 . **No** GO to B8 .
B6 CHECK THE COURTESY LAMPS GROUND CONTROLLED CIRCUIT FOR A SHORT TO VOLTAGE	
• Disconnect: BCM C2280C. • Ignition ON. • Measure the voltage between the BCM C2280C-5, circuit CLN03 (YE/GY), harness side and ground.	**Yes** REPAIR circuit CLN03 (YE/GY) for a short to voltage. CYCLE the ignition ON and then OFF. CLEAR the DTCs. TEST the system for normal operation. **No** GO to B7 .

 N0114633 • **Is any voltage present?**	
B7 CHECK THE COURTESY LAMPS GROUND CONTROLLED CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between the BCM C2280C-5, circuit CLN03 (YE/GY), harness side and the BCM C2280C-4, circuit CLN01 (GN/VT), harness side.  N0114634 • **Is the resistance less than 5 ohms?**	**Yes** GO to B13 . **No** REPAIR circuit CLN03 (YE/GY) for an open. TEST the system for normal operation.
B8 ISOLATE THE FRONT INTERIOR LAMP	
• Ignition OFF. • Disconnect: Front Interior Lamp C926 (with moonroof) or C901 (without moonroof). • Cycle the ignition ON and then OFF. • Open the LH front door. • **Does the rear interior lamp illuminate?**	**Yes** INSTALL a new front interior lamp. CLEAR the DTCs. TEST the system for normal operation. **No** CLOSE the LH front door. GO to B9 .
B9 ISOLATE THE LUGGAGE COMPARTMENT/CARGO LAMP	
• Disconnect: Luggage Compartment/Cargo Lamp C489. • Cycle the ignition ON and then OFF. • Open the LH front door. • **Does the rear interior lamp illuminate?**	**Yes** INSTALL a new luggage compartment/cargo lamp. CLEAR the DTCs. TEST the system for normal operation. **No** CLOSE the LH front door. GO to B10 .
B10 ISOLATE THE REAR INTERIOR LAMP	
• Disconnect: Rear Interior Lamp C932. • Cycle the ignition ON and then OFF. • Open the LH front door. • Measure the voltage between the rear interior lamp C932-3, circuit CLN01 (GN/VT), harness side and ground.	**Yes** INSTALL a new rear interior lamp. CLEAR the DTCs. TEST the system for normal operation. **No** GO to B11 .

 N0114635 • **Is the voltage greater than 10 volts?**	
B11 CHECK THE INTERIOR LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND	
• Disconnect: BCM C2280C. • Measure the resistance between the rear interior lamp C932-3, circuit CLN01 (GN/VT), harness side and ground.  N0114635 • **Is the resistance greater than 10,000 ohms?**	**Yes** REPAIR circuit CLN01 (GN/VT) for a short to ground. CYCLE the ignition ON and then OFF. CLEAR the DTCs. TEST the system for normal operation. **No** GO to B12 .
B12 CHECK THE INTERIOR LAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Connect: Front, Rear and Luggage Compartment/Cargo Lamps . • Measure the resistance between the BCM C2280C-5, circuit CLN03 (YE/GY), harness side and the BCM C2280C-4, circuit CLN01 (GN/VT), harness side.  N0114634 • **Is the resistance less than 5 ohms?**	**Yes** GO to B12 . **No** REPAIR circuit CLN01 (GN/VT) for an open. TEST the system for normal operation.
B13 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins	**Yes** INSTALL a new BCM . REFER to Section 419-10 . TEST the system for normal operation. **No**

• Connect all the BCM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test C: The Luggage Compartment/Cargo Lamp Is Inoperative

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends a voltage signal to the luggage compartment lid/liftgate ajar switch (integrated into the latch) to monitor the ajar switch status. The switch is normally closed when the luggage compartment lid/liftgate is closed, and open when the luggage compartment lid/liftgate is open. The ajar switch also controls the ground side of the luggage compartment lamp. The luggage compartment ajar switch completes the path to ground for the luggage compartment/cargo lamp when the luggage compartment lid/liftgate is open.

- DTC B1178:92 (Boot/Trunk Ajar Switch: Performance Or Incorrect Operation) - an on-demand DTC that sets when the BCM detects an open from the luggage compartment lid/liftgate ajar input circuit.

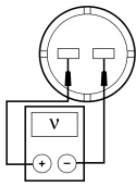
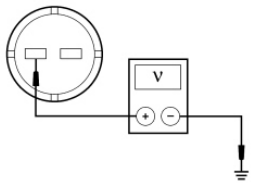
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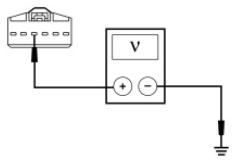
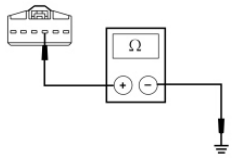
- Wiring, terminals or connectors
- Luggage compartment lid/liftgate latch
- Luggage compartment/cargo lamp

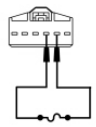
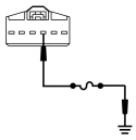
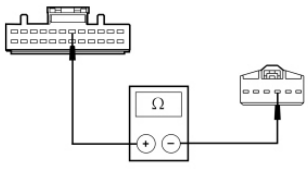
PINPOINT TEST C: THE LUGGAGE COMPARTMENT/CARGO LAMP IS INOPERATIVE

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
C1 CHECK THE COURTESY LAMP OPERATION	
• Open the LH front door and observe the interior lamps. • **Do the courtesy lamps illuminate?**	**Yes** GO to C2 . **No** GO to Pinpoint Test A .
C2 CHECK THE LUGGAGE COMPARTMENT LID/LIFTGATE AJAR PID	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM luggage compartment lid/liftgate ajar switch PID while opening and closing the luggage compartment lid/liftgate. • **Does the PID agree with the luggage compartment**	**Yes** GO to C3 . **No** If the PID always indicates closed, GO to C6 . If the PID always indicates open, GO to C8 .

lid/liftgate positions?	
C3 CHECK FOR VOLTAGE TO THE LUGGAGE COMPARTMENT/CARGO LAMP	
• Ignition OFF. • Open the luggage compartment lid/liftgate. • Disconnect: Luggage Compartment/Cargo Lamp C489. • Measure the voltage between the luggage compartment/cargo lamp C489-1, circuit CLN01 (GN/VT), harness side and the luggage compartment lamp C489-2, circuit CLN13 (WH/BU).  N0089982 • **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new luggage compartment lamp. TEST the system for normal operation. **No** GO to C4 .
C4 CHECK THE LUGGAGE COMPARTMENT/CARGO LAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Measure the voltage between the luggage compartment/cargo lamp C489-1, circuit CLN01 (GN/VT), harness side and ground.  N0075717 • **Is the voltage greater than 10 volts?**	**Yes** GO to C5 . **No** REPAIR circuit CLN01 (GN/VT) for an open. TEST the system for normal operation.
C5 CHECK THE LUGGAGE COMPARTMENT/CARGO LAMP GROUND CIRCUIT FOR AN OPEN	
• Connect: Luggage Compartment/Cargo Lamp C489. • Disconnect: Luggage Compartment Lid/Liftgate Latch C4223. • Measure the voltage between the luggage compartment lid/liftgate latch C4223-4, circuit CLN13 (WH/BU), harness side and ground.	**Yes** INSTALL a new luggage compartment lid/liftgate latch. REFER to Section 501-14 . TEST the system for normal operation. **No** REPAIR circuit CLN13 (WH/BU) for an open. TEST the system for normal operation.

 N0114636 • **Is the voltage greater than 10 volts?**	
C6 RECHECK THE PID WITH THE LUGGAGE COMPARTMENT/LIFTGATE LATCH DISCONNECTED	
• Disconnect: Luggage Compartment Lid/Liftgate Latch C4223. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM luggage compartment lid/liftgate ajar switch PID. • **Does the PID indicate the luggage compartment lid/liftgate is open?**	**Yes** INSTALL a new luggage compartment lid/liftgate latch. REFER to Section 501-14 . TEST the system for normal operation. **No** GO to C7 .
C7 CHECK THE LUGGAGE COMPARTMENT/LIFTGATE AJAR INPUT CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280G. • Measure the resistance between the luggage compartment lid/liftgate latch C4223-3, circuit CPL44 (YE/OG), harness side and ground.  N0114640 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to C11 . **No** REPAIR circuit CPL44 (YE/OG) for a short to ground. TEST the system for normal operation.
C8 BYPASS THE LUGGAGE COMPARTMENT/LIFTGATE LATCH	
• Ignition OFF. • Disconnect: Luggage Compartment Lid/Liftgate Latch C4223. • Ignition ON. • Connect a fused jumper wire between the luggage compartment lid/liftgate latch C4223-3, circuit CPL44 (YE/OG), harness side and the luggage compartment lid/liftgate latch C4223-2, circuit GD143 (BK/VT), harness side.	**Yes** REMOVE the jumper wire. INSTALL a new luggage compartment lid latch. REFER to Section 501-14 . TEST the system for normal operation. **No** REMOVE the jumper wire. GO to C9 .

 N0114638 • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM luggage compartment lid/liftgate ajar switch PID. • **Does the PID indicate the luggage compartment lid/liftgate is closed?**	
C9 BYPASS THE LUGGAGE COMPARTMENT/LIFTGATE LATCH GROUND CIRCUIT	
• Connect a fused jumper wire between the luggage compartment lid/liftgate latch C4223-3, circuit CPL44 (YE/OG), harness side and ground.  N0114639 • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM luggage compartment lid/liftgate ajar switch PID. • **Does the PID indicate the luggage compartment lid/liftgate is closed?**	**Yes** REMOVE the jumper wire. REPAIR circuit GD143 (BK/VT) for an open. TEST the system for normal operation. **No** REMOVE the jumper wire. GO to C10 .
C10 CHECK THE LUGGAGE COMPARTMENT/LIFTGATE AJAR INPUT CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280G. • Measure the resistance between the BCM C2280G-7, circuit CPL44 (YE/OG), harness side and the luggage compartment lid/liftgate latch C4223-3, circuit CPL44 (YE/OG), harness side.  N0114643	**Yes** GO to C11 . **No** REPAIR circuit CPL44 (YE/OG) for an open. TEST the system for normal operation.

• **Is the resistance less than 5 ohms?**	
C11 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all BCM the connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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: The Courtesy Lamps Are Always On

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends a voltage signal to each door ajar switch (integrated into the door latch), which is routed to ground when the door is closed (the door ajar switch is closed when the door is closed). When the door is opened, the signal to ground is interrupted, indicating an open door to the BCM . When the BCM determines a door is open, the battery saver relay energizes (if not already energized) to supply voltage to the interior lamps and then the BCM provides ground to the courtesy lamps.

DTC Description	Fault Trigger Conditions
• B1175:92 - Driver Door Ajar Switch: Performance Or Incorrect Operation	An on-demand DTC that sets when the BCM detects an open from the LH front door ajar circuit.
• B1176:92 - Passenger Door Ajar Switch: Performance Or Incorrect Operation	An on-demand DTC that sets when the BCM detects an open from the RH front door ajar circuit.
• B11E9:92 - Left Rear Door Ajar Switch: Performance Or Incorrect Operation	An on-demand DTC that sets when the BCM detects an open from the LH rear door ajar circuit.
• B11EA:92 - Right Rear Door Ajar Switch: Performance Or Incorrect Operation	An on-demand DTC that sets when the BCM detects an open from the RH rear door ajar circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Door latch
- BCM

PINPOINT TEST D: THE COURTESY LAMPS ARE ALWAYS ON

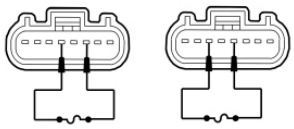
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>D1 CHECK THE DOOR AJAR PIDs</td><td></td></tr>
<tr><td>• Ignition ON.
• Close all the doors.
• Enter the following diagnostic mode on the scan tool: BCM DataLogger.
• Monitor the BCM door ajar switch PIDs while opening and closing all the doors.
• Do all the door ajar switch PID values agree with the door positions?</td><td>Yes
GO to D5 .

No
GO to D2 .</td></tr>
<tr><td>D2 BYPASS THE SUSPECT DOOR LATCH</td><td></td></tr>
<tr><td>• Ignition OFF.
• Disconnect: Suspect Door Latch .
• Ignition ON.
• Connect a fused jumper wire between the suspect door latch pins, harness side as follows:

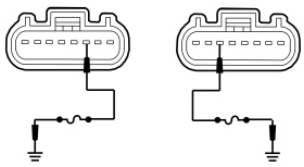
<table><tr><th>Suspect Door Latch</th><th>Connector-Pin
Circuit</th><th>Connector-Pin
Circuit</th></tr><tr><td>LH front</td><td>C525-3
CPL26 (GN/VT)</td><td>C525-5
GD143 (BK/VT)</td></tr><tr><td>RH front</td><td>C609-6
CPL31 (WH)</td><td>C609-4
GD145 (BK/BU)</td></tr><tr><td>LH rear</td><td>C705-3
CPL36 (GN)</td><td>C705-5
GD143 (BK/VT)</td></tr><tr><td>RH rear</td><td>C805-6
CPL39 (YE)</td><td>C805-4
GD145 (BK/BU)</td></tr></table></td><td>Yes
REMOVE the jumper wire. INSTALL a new door latch for the one in question. REFER to Section 501-14 . TEST the system for normal operation.

No
REMOVE the jumper wire. GO to D3 .</td></tr>
</table>

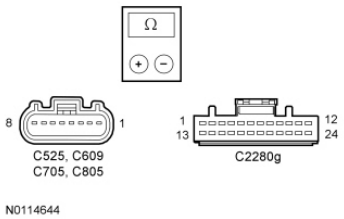


N0114641

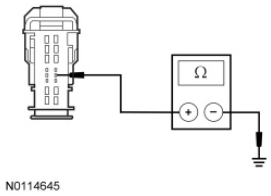
- Monitor the suspect BCM door ajar switch PID.
- **Does the PID indicate the suspect door is closed?**

D3 BYPASS THE DOOR LATCH GROUND CIRCUIT	
• Connect a fused jumper wire between the suspect door latch, harness side and ground as follows: **Suspect Door Latch** / **Connector-Pin** / **Circuit** LH front / C525-3 / CPL26 (GN/VT) RH front / C609-6 / CPL31 (WH) LH rear / C705-3 / CPL36 (GN) RH rear / C805-6 / CPL39 (YE)  N0114642 • Monitor the suspect BCM door ajar switch PID. • **Does the PID indicate the suspect door is closed?**	**Yes** REMOVE the jumper wire. REPAIR the door latch ground circuit in question for an open. TEST the system for normal operation. **No** REMOVE the jumper wire. GO to D4 .
D4 CHECK THE DOOR AJAR SWITCH INPUT CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280G. • Measure the resistance between the suspect door ajar switch, harness side and the BCM , harness side as follows: **Circuit**	**Yes** GO to D6 . **No** REPAIR the door ajar input circuit in question for an open. TEST the system for normal operation.

Suspect Door Ajar Latch Connector-Pin	BCM Connector-Pin	
LH front	C2280G-10	CPL26 (GN/VT)
RH front	C2280G-22	CPL31 (WH)
LH rear	C2280G-4	CPL36 (GN)
RH rear	C2280G-3	CPL39 (YE)



- **Is the resistance less than 5 ohms?**

D5 CHECK THE COURTESY LAMP GROUND CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280C. • Measure the resistance between the BCM C2280C-5, circuit CLN03 (YE/GY), harness side and ground.  • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to D6 . **No** REPAIR circuit CLN03 (YE/GY) for an open. TEST the system for normal operation.
D6 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ pushed-out pins • Connect all the BCM connectors and make sure they seat correctly. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . 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 E: The Luggage Compartment/Cargo Lamp Is Always On

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Normal Operation

The Body Control Module (BCM) sends a voltage signal to the luggage compartment lid/liftgate ajar switch (integrated into the latch) to monitor the ajar switch status. The switch is normally closed when the luggage compartment lid/liftgate is closed, and open when the luggage compartment lid/liftgate is open. The ajar switch also controls the ground side of the luggage compartment lamp. The luggage compartment ajar switch completes the path to ground for the luggage compartment/cargo lamp when the luggage compartment lid/liftgate is open.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Luggage compartment lid/liftgate latch

PINPOINT TEST E: THE LUGGAGE COMPARTMENT/CARGO 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
E1 CHECK THE LUGGAGE COMPARTMENT LID/LIFTGATE AJAR PID	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM luggage compartment lid/liftgate ajar PID while opening and closing the luggage compartment lid/liftgate. • **Does the PID agree with the luggage compartment lid/liftgate positions?**	**Yes** GO to E2 . **No** GO to Pinpoint Test C .
E2 CHECK THE LUGGAGE COMPARTMENT LID/LIFTGATE LATCH	
• Ignition OFF. • Disconnect: Luggage Compartment Lid/Liftgate Latch C4223. • Ignition ON. • **Does the luggage compartment/cargo lamp continue to illuminate?**	**Yes** REPAIR circuit CLN13 (WH/BU) for a short to ground. TEST the system for normal operation. **No** INSTALL a new luggage compartment lid/liftgate latch. REFER to Section 501-14 . TEST the system for normal operation.

Pinpoint Test F: One Or More Demand Lamps Are Inoperative

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Normal Operation

The Body Control Module (BCM) supplies voltage to the interior lamps when the battery saver feature is not active. This voltage supply is shared with the courtesy lamps. The interior lamps have a dedicated ground circuit that is used for the map lamps to function independently of the courtesy lamp operation.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Interior/map lamps

PINPOINT TEST F: ONE OR MORE DEMAND 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.**

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>F1 CHECK THE COURTESY LAMP OPERATION</td><td></td></tr>
<tr><td>NOTE: For vehicles equipped with a moonroof, make sure the interior lamp switches are in the DOOR position before carrying out this step.

• Check the operation of the courtesy lamps with any door open.
• Do the courtesy lamps operate correctly?</td><td>Yes
GO to F2 .

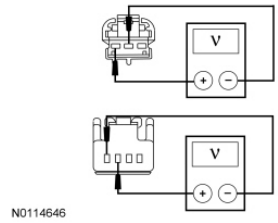
No
GO to Pinpoint Test B .</td></tr>
<tr><td>F2 DETERMINE IF THE FRONT AND REAR DEMAND LAMPS ARE OPERATIVE</td><td></td></tr>
<tr><td>• Operate the map lamp function from the front and rear interior lamps.
• Is the map lamp function inoperative from both lamps?</td><td>Yes
REPAIR circuit GD143 (BK/VT) for an open. TEST the system for normal operation.

No
GO to F3 .</td></tr>
<tr><td>F3 CHECK INTERIOR LAMP GROUND CIRCUIT FOR AN OPEN</td><td></td></tr>
<tr><td>• Ignition OFF.
• Disconnect: Inoperative Interior Lamp.
• Ignition ON.
• Measure the voltage between the inoperative interior lamp pins, harness side as follows:

<table><tr><th>Inoperative Lamp</th><th>Connector-Pin
Circuit</th><th>Connector-Pin
Circuit</th></tr><tr><td>Front (with moonroof)</td><td>C926-3</td><td>C926-4</td></tr></table></td><td>Yes
INSTALL a new interior lamp in question. TEST the system for normal operation.

No
REPAIR circuit GD143 (BK/VT) for an open. TEST the system for normal operation.</td></tr>
</table>

	CLN01 (GN/VT)	GD143 (BK/VT)
Front (without moonroof)	C901-3 CLN01 (GN/VT)	C901-2 GD143 (BK/VT)
Rear	C932-3 CLN01 (GN/VT)	C932-2 GD143 (BK/VT)



- **Is the voltage greater than 10 volts?**

Pinpoint Test G: The Battery Saver Does Not Deactivate After Time-out

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Normal Operation

The Body Control Module (BCM) provides a battery saver function that automatically shuts off of the courtesy lamps after 10 minutes and the demand lamps (map lamps and luggage compartment/cargo lamp) after 30 minutes have elapsed in order to save battery power.

If the courtesy lamps remain on after the battery saver feature activates (10 minutes), GO to Pinpoint Test D .

Refer to Interior Lighting , Battery Saver for specific information regarding the conditions which the battery saver activates.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals, or connectors
- BCM

PINPOINT TEST G: THE BATTERY SAVER DOES NOT DEACTIVATE AFTER TIME-OUT

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
G1 CHECK THE INTERIOR LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: BCM C2280C. • Ignition ON.	**Yes** REPAIR circuit CLN01 (GN/VT) for a short to voltage. TEST the system for normal operation.

• Turn any map lamp on. • **Does the map lamp turn on?**	**No** GO to G2 .
G2 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 H: The Ambient Lighting Is Inoperative

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Normal Operation

When the ignition is in any state other than OFF, the Body Control Module (BCM) supplies voltage to the ambient lighting module and the ambient lighting switch. The ambient lighting module supplies voltage and ground to the ambient lighting LEDs. The ambient lighting switch cycles through the 7 color combinations or turns the ambient lighting feature off.

When the ambient lighting switch is pressed, voltage is routed to the ambient lighting module, indicating a request for the module to cycle the ambient lighting to the next setting.

The ambient lighting switch is a momentary contact switch.

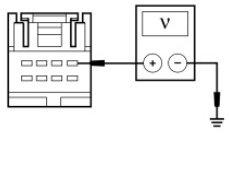
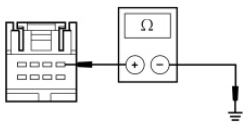
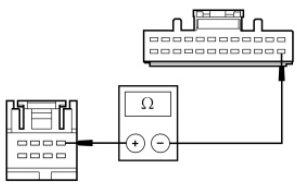
- DTC B12F1:11 (Ambient Lighting Zone 1 Output: Circuit Short To Ground) - a continuous and on-demand DTC that sets when the BCM detects a short to ground from the ambient lighting module voltage supply circuit.
- DTC B12F1:15 (Ambient Lighting Zone 1 Output: Circuit Short To Battery Or Open) - a continuous and on-demand that sets when the BCM detects an open from the ambient lighting module voltage supply circuit.

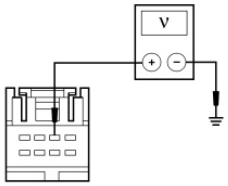
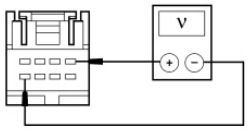
This pinpoint test is intended to diagnose the following:

- Wiring, terminals, or connectors
- Ambient lighting switch
- Ambient lighting harness
- Ambient lighting module
- BCM

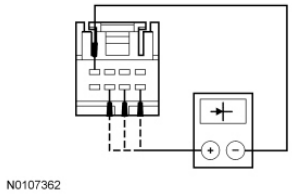
PINPOINT TEST H: THE AMBIENT LIGHTING IS INOPERATIVE

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

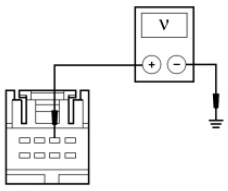
Test Step	Result / Action to Take
H1 CHECK FOR VOLTAGE TO THE AMBIENT LIGHTING MODULE	
• Ignition OFF. • Disconnect: Ambient Lighting Module C3347. • Ignition ON. • Measure the voltage between the ambient lighting module C3347-1, circuit CBX07 (GN/RD), harness side and ground.  N0107358 • **Is the voltage greater than 10 volts?**	**Yes** GO to H4 . **No** GO to H2 .
H2 CHECK THE AMBIENT LIGHTING MODULE VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280E. • Measure the resistance between the ambient lighting module C3347-1, circuit CBX07 (GN/RD), harness side and ground.  N0114651 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to H3 . **No** REPAIR circuit CLN02 (VT/BN) for a short to ground. CYCLE the ignition ON and then OFF. CLEAR the DTCs. TEST the system for normal operation.
H3 CHECK THE AMBIENT LIGHTING MODULE VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Measure the resistance between the ambient lighting module C3347-1, circuit CBX07 (GN/RD), harness side and the BCM C2280E-24, circuit CLN02 (VT/BN), harness side.  N0114647	**Yes** GO to H11 . **No** REPAIR circuit CBX07 (GN/RD) or circuit CLN02 (VT/BN) for an open. TEST the system for normal operation.

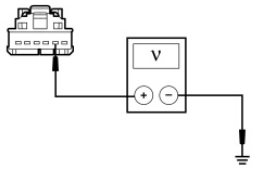
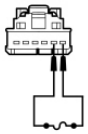
• **Is the resistance less than 5 ohms?**	
H4 CHECK THE AMBIENT LIGHTING SWITCH OUTPUT CIRCUIT	
• While pressing and releasing the ambient lighting switch, measure the voltage between the ambient lighting module C3347-2, circuit CLN54 (BN/YE), harness side and ground.  N0107360 • **Is the voltage greater than 10 volts with the switch pressed and 0 volts with the switch released?**	**Yes** GO to H5 . **No** If voltage is always present, GO to H7 . If no voltage is present, GO to H8 .
H5 CHECK THE AMBIENT LIGHTING MODULE GROUND CIRCUIT FOR AN OPEN	
• Measure the voltage between the ambient lighting module C3347-1, circuit CBX07 (GN/RD), harness side and the ambient lighting module C3347-8, circuit GD908 (BK), harness side.  N0107361 • **Is the voltage greater than 10 volts?**	**Yes** GO to H6 . **No** REPAIR circuit GD908 (BK) or circuit GD115 (BK/GY) for an open. TEST the system for normal operation.
H6 CHECK THE AMBIENT LIGHTING HARNESS	
• Ignition OFF. • Check any of the diode circuits between the ambient lighting module, harness side as follows: **Connector-Pin Circuit** / **Connector-Pin Circuit** C3347-5 CLN45 (GN) / C3347-4 RLN44 (BN)	**Yes** GO to H10 . **No** REPAIR or INSTALL a new ambient lighting harness. TEST the system for normal operation.

C3347-6 CLN46 (BU)	C3347-4 RLN44 (BN)
C3347-7 CLN44 (OG)	C3347-4 RLN44 (BN)



- **Does the meter indicate the circuit is good?**

H7 CHECK THE AMBIENT LIGHTING SWITCH OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: Ambient Lighting Switch C2401. • Ignition ON. • Measure the voltage between the ambient lighting module C3347-2, circuit CLN54 (BN/YE), harness side and ground.  • **Is any voltage present?**	**Yes** REPAIR circuit CLN54 (BN/YE) or circuit CLN60 (WH/BN) for a short to voltage. TEST the system for normal operation. **No** INSTALL a new ambient lighting switch. REFER to Ambient Lighting Switch in this section. TEST the system for normal operation.
H8 CHECK FOR VOLTAGE TO THE AMBIENT LIGHTING SWITCH	
• Ignition OFF. • Connect: Ambient Lighting Module C3347. • Disconnect: Ambient Lighting Switch C2401. • Ignition ON. • Measure the voltage between the ambient lighting switch C2401-2, circuit CLN02 (VT/BN), harness side and ground.	**Yes** GO to H9 . **No** REPAIR circuit CLN02 (VT/BN) for an open. TEST the system for normal operation.

 N0114648 • **Is the voltage greater than 10 volts?**	
H9 BYPASS THE AMBIENT LIGHTING SWITCH	
• Connect and remove a fused jumper wire between the ambient lighting switch C2401-2, circuit CLN02 (VT/BN), harness side and the ambient lighting switch C2401-1, circuit CLN60 (WH/BN), harness side.  N0114649 • **Do the ambient LEDs illuminate and cycle through a color change each time the jumper wire is connected and removed?**	**Yes** REMOVE the jumper wire. INSTALL a new ambient lighting switch. REFER to Ambient Lighting Switch in this section. TEST the system for normal operation. **No** REMOVE the jumper wire. REPAIR circuit CLN54 (BN/YE) or circuit CLN60 (WH/BN) for an open. TEST the system for normal operation.
H10 CHECK FOR CORRECT AMBIENT LIGHTING MODULE OPERATION	
• Disconnect the ambient lighting module connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the ambient lighting module connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ambient lighting module. REFER to Ambient Lighting Module in this section. 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.
H11 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 I: The Ambient Lighting Does Not Cycle Through All Color Variations

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Normal Operation

When the ignition is in any state other than OFF, the Body Control Module (BCM) supplies voltage to the ambient lighting module and the ambient lighting switch. The ambient lighting module supplies voltage and ground to the ambient lighting LEDs. The ambient lighting switch cycles through the 7 color combinations or turns the ambient lighting feature off.

When the ambient lighting switch is pressed, voltage is routed to the ambient lighting module, indicating a request for the module to cycle the ambient lighting to the next setting.

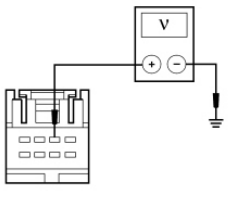
The ambient lighting switch is a momentary contact switch.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Ambient lighting switch
- Ambient lighting harness
- Ambient lighting module

PINPOINT TEST I: THE AMBIENT LIGHTING DOES NOT CYCLE THROUGH ALL COLOR VARIATIONS

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
I1 CHECK THE AMBIENT LIGHTING SWITCH OUTPUT CIRCUIT	
• Ignition OFF. • Disconnect: Ambient Lighting Module C3347. • Ignition ON. • While pressing and releasing the ambient lighting switch, measure the voltage between the ambient lighting module C3347-2, circuit CLN54 (BN/YE), harness side and ground.  N0107360 • **Is the voltage greater than 10 volts with the switch pressed and 0 volts with the switch released?**	**Yes** GO to I2 . **No** If voltage is always present, GO to I3 . If no voltage is present, GO to I4 .
I2 CHECK THE AMBIENT LIGHTING HARNESS	

<table>
<tr><td>
• Ignition OFF.
• Check the diode circuits between the ambient lighting module, harness side as follows:

<table>
<tr><th>Connector-Pin

Circuit</th><th>Connector-Pin

Circuit</th></tr>
<tr><td>C3347-5

CLN45 (GN)</td><td>C3347-4

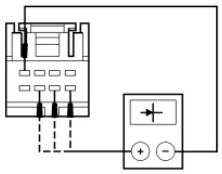
RLN44 (BN)</td></tr>
<tr><td>C3347-6

CLN46 (BU)</td><td>C3347-4

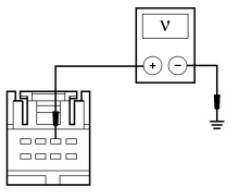
RLN44 (BN)</td></tr>
<tr><td>C3347-7

CLN44 (OG)</td><td>C3347-4

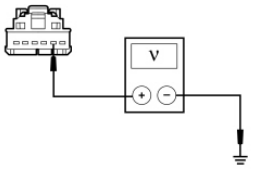
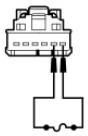
RLN44 (BN)</td></tr>
</table>

 
N0107362
• Does the meter indicate good for each circuit check?
</td><td>
Yes
GO to I6 .

No
REPAIR or INSTALL a new ambient lighting harness. TEST the system for normal operation.
</td></tr>
<tr><td>I3 CHECK THE AMBIENT LIGHTING SWITCH OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE</td><td></td></tr>
<tr><td>
• Ignition OFF.
• Disconnect: Ambient Lighting Switch C2401.
• Ignition ON.
• Measure the voltage between the ambient lighting module C3347-2, circuit CLN60 (WH/BN), harness side and ground.


N0107360
• Is any voltage present?
</td><td>
Yes
REPAIR circuit CLN54 (BN/YE) or circuit CLN60 (WH/BN) for a short to voltage. TEST the system for normal operation.

No
INSTALL a new ambient lighting switch. REFER to Ambient Lighting Switch in this section. TEST the system for normal operation.
</td></tr>
<tr><td>I4 CHECK FOR VOLTAGE TO AMBIENT LIGHTING SWITCH</td><td></td></tr>
</table>

• Ignition OFF. • Connect: Ambient Lighting Module C3347. • Disconnect: Ambient Lighting Switch C2401. • Ignition ON. • Measure the voltage between the ambient lighting switch C2401-2, circuit CLN02 (VT/BN), harness side and ground.  N0114648 • **Is the voltage greater than 10 volts?**	**Yes** GO to I5 . **No** REPAIR circuit CLN02 (VT/BN) for an open. TEST the system for normal operation.
I5 BYPASS THE AMBIENT LIGHTING SWITCH	
• Connect and remove a fused jumper wire between the ambient lighting switch C2401-2, circuit CLN02 (VT/BN), harness side and the ambient lighting switch C2401-1, circuit CLN60 (WH/BN), harness side.  N0114649 • **Do the ambient LEDs illuminate and cycle through a color change each time the jumper wire is connected and removed?**	**Yes** REMOVE the jumper wire. INSTALL a new ambient lighting switch. REFER to Ambient Lighting Switch in this section. TEST the system for normal operation. **No** REMOVE the jumper wire. REPAIR circuit CLN54 (BN/YE) or circuit CLN60 (WH/BN) for an open. TEST the system for normal operation.
I6 CHECK FOR CORRECT AMBIENT LIGHTING MODULE OPERATION	
• Disconnect the ambient lighting module connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the ambient lighting module connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ambient lighting module. REFER to Ambient Lighting Module in this section. 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 J: The Ambient Lighting Is Always On

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

Normal Operation

When the ignition is in any state other than OFF, the Body Control Module (BCM) supplies voltage to the ambient lighting module and the ambient lighting switch.

The ambient lighting also has its own illuminated entry/exit strategy. For additional information regarding this strategy, refer to Interior Lighting , Illuminated Entry/Exit.

- DTC B12F1:15 (Ambient Lighting Zone 1 Output: Circuit Short To Battery Or Open) - a continus and on-demand DTC that sets when the BCM detects a short to voltage from the ambient lighting module voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals, or connectors
- BCM

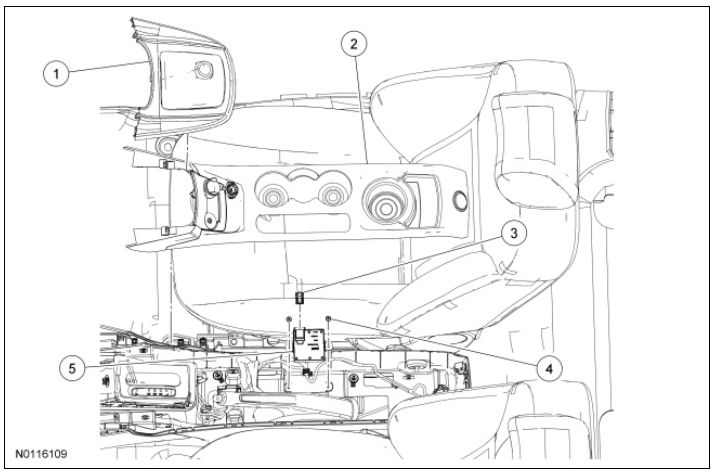
PINPOINT TEST J: THE AMBIENT LIGHTING IS ALWAYS ON

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

NOTE: Under some conditions, the ambient lighting system is active for up to 10 minutes after the ignition is changed to OFF or a door is opened. Make sure the battery saver feature operates correctly before continuing diagnostics.

Test Step	Result / Action to Take
J1 CHECK THE BCM AMBIENT LIGHTING SYSTEM OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: BCM C2280E. • Ignition ON. • **Does the ambient lighting continue to illuminate?**	**Yes** REPAIR circuit CLN54 (BN/YE) or circuit CLN60 (WH/BN) for a short to voltage. CLEAR the DTCs. TEST the system for normal operation. **No** GO to J2 .
J2 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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.

Ambient Lighting Module



Item	Part Number	Description
1	-	Lower instrument panel finish panel
2	83B01	Floor console finish panel
3	-	Ambient lighting module electrical connector (part of 14K006)
4	W790200	Ambient lighting module screws (2 required)
5	13C788	Ambient lighting module

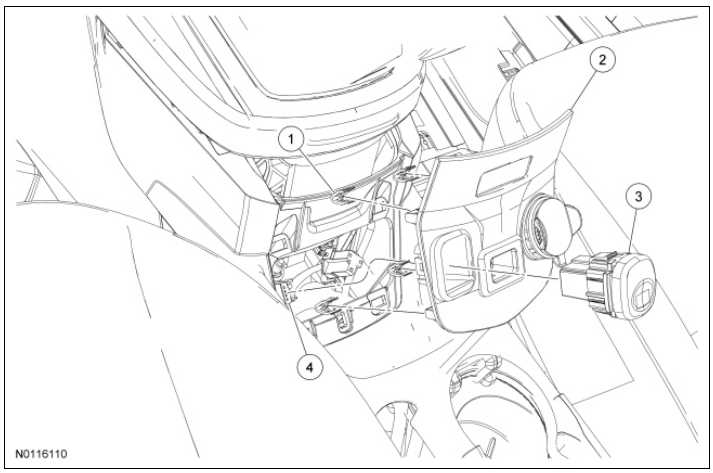
Removal and Installation

1. Remove the lower instrument panel finish panel. For additional information, refer to Section 501-12 .

2. Remove the floor console finish panel for access to the ambient lighting module. For additional information, refer to the floor console exploded view in Section 501-12 .
   - Lift upward on the rear of the floor console finish panel to release the floor console finish panel clips.
   - If equipped, disconnect the electrical connector.
   - Slide the park brake lever boot and the floor console finish panel over the park brake lever.

3. Remove the ambient lighting module.
   - Remove the 2 screws.
   - Disconnect the electrical connector.
4. To install, reverse the removal procedure.

Ambient Lighting Switch



Item	Part Number	Description
1	W714972-S1	Retaining clip (4 required)
2	15K12A	Media bezel
3	13D806A	Ambient lighting switch
4	-	Ambient lighting switch electrical connector (part of 14E078)

Removal and Installation

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Communications Network

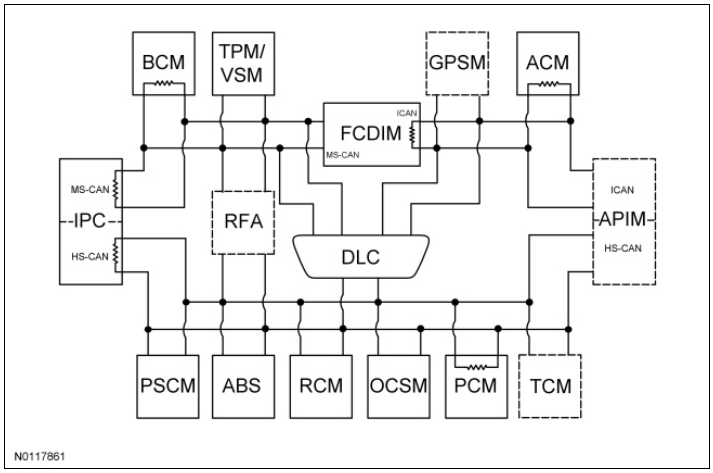
Multiplexing is a method of sending 2 or more signals simultaneously over a single circuit. Multiplexing allows 2 or more electronic modules (nodes) to communicate simultaneously over a twisted-wire pair [data (+) and data (-)] network. The information or messages that can be communicated on these wires 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 vehicle has 2 module communication networks connected to the Data Link Connector (DLC) and communicate with the scan tool. The communication networks are:

- High Speed Controller Area Network (HS-CAN)
- Medium Speed Controller Area Network (MS-CAN)

The Infotainment Controller Area Network (I-CAN) is connected to the DLC , but the I-CAN modules communicate with the scan tool over the MS-CAN . The Front Control/Display Interface Module (FCDIM) is used as a gateway module for the messages to transfer between the scan tool and the modules on the I-CAN .

Network Topology



Module Name	Network Type	Termination Module
ABS module	HS-CAN	No
Accessory Protocol Interface Module (APIM) (if equipped)	HS-CAN / I-CAN	No/No
Audio Control Module (ACM)	I-CAN	Yes
Body Control Module (BCM)	MS-CAN	Yes
Front Control/Display Interface Module (FCDIM) (MS-CAN / I-CAN gateway module)	MS-CAN / I-CAN	No/Yes
Global Positioning System Module (GPSM) (if equipped)	I-CAN	No
Instrument Panel Cluster (IPC) (HS-CAN / MS-CAN gateway module)	HS-CAN / MS-CAN	Yes/Yes
Occupant Classification System Module (OCSM)	HS-CAN	No
PCM	HS-CAN	Yes

Power Steering Control Module (PSCM)	HS-CAN	No
Remote Function Actuator (RFA) module (if equipped)	HS-CAN / MS-CAN	No/No
Restraints Control Module (RCM)	HS-CAN	No
Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM)	MS-CAN	No
Transmission Control Module (TCM) (if equipped)	HS-CAN	No

Network Termination

The CAN uses a network termination circuit to improve communication reliability. The network termination of the CAN bus occurs inside the termination modules 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, or total resistance is 60 ohms.

Network termination improves bus message reliability by stabilizing bus voltage, and eliminating electrical interference.

Gateway Module

The IPC is the gateway module, translating HS-CAN to MS-CAN and vice versa. The FCDIM is the gateway module, translating MS-CAN to I-CAN and vice versa, allowing a message to be distributed throughout the three networks. The IPC and the FCDIM are the only modules on this vehicle that have 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 NUD105-R025D or equivalent

Principles of Operation

The High Speed Controller Area Network (HS-CAN) operates at a maximum data transfer speed of 500 Kbps and is designed for real time powertrain information transfer and control. Modules on the HS-CAN communicate using bussed messages. The HS-CAN uses an unshielded twisted pair cable, data bus (+) and data bus (-) circuits. In addition to scan tool communication, the HS-CAN allows sharing of information between all modules on the network.

The Medium Speed Controller Area Network (MS-CAN) operates at a maximum data transfer speed of 125 Kbps for bus messages and is designed for general information transfer. Modules on the MS-CAN communicate using bussed messages. The MS-CAN uses an unshielded twisted pair cable, data bus (+) and data bus (-) circuits. In addition to scan tool communication, the MS-CAN allows sharing of information between all modules on the network.

The Infotainment Controller Area Network (I-CAN) operates at a maximum data transfer speed of 500 Kbps and is designed for real time audio and multimedia information transfer and control. Modules on the I-CAN communicate using bussed messages. The I-CAN uses an unshielded twisted pair cable, data bus (+) and data bus (-) circuits. The I-CAN allows sharing of information between all modules on the network. The I-CAN is connected to the Data Link Connector (DLC), but the I-CAN modules communicate with the scan tool over the MS-CAN . The Front Control/Display Interface Module (FCDIM) is used as a gateway module for the messages to transfer between the scan tool and the modules on the I-CAN .

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 CAN settings. The traces are for both data (+) and data (-) taken simultaneously (2-channel) at a 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 (20Î¼s) per division (horizontal axis). Readings taken with a different oscilloscope vary from those shown. Compare any suspect readings to a known good vehicle.

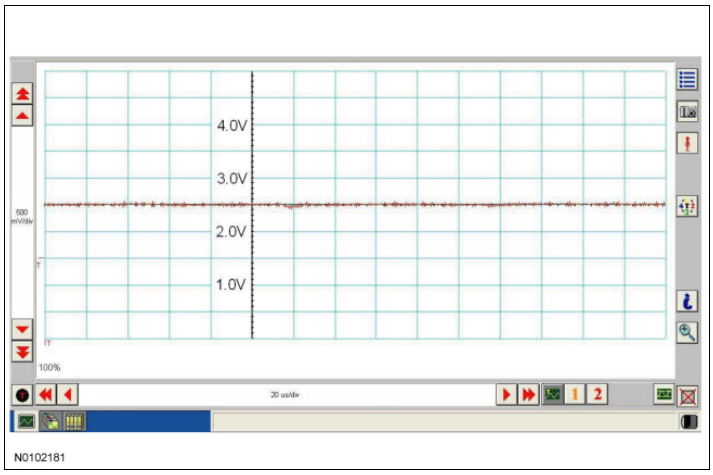
Normal CAN Operation



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.

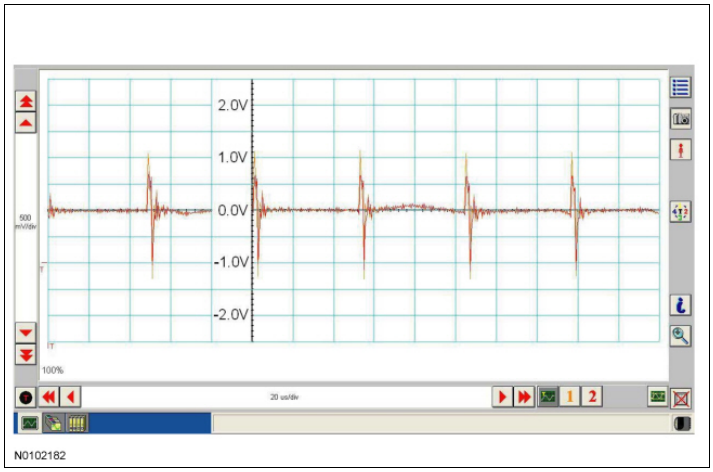
Successful communication of a message can usually be identified by the slight spike at the end of a message transmission. Any signals that are significantly different than the normal CAN waveform may cause network DTCs (U-codes) to set or may cause a complete network outage.

CAN Circuits Shorted Together



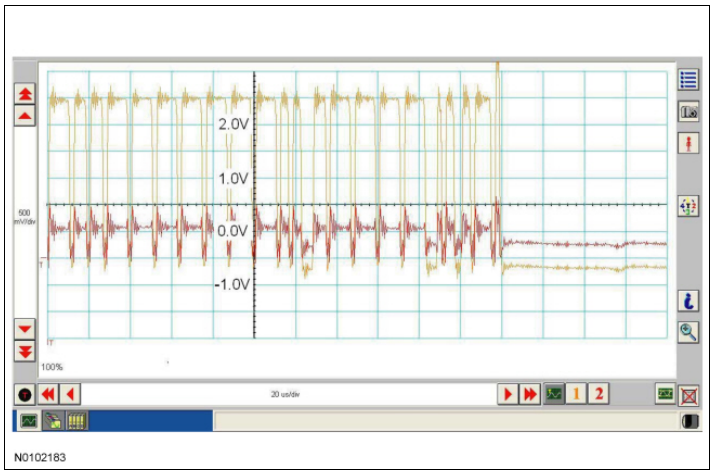
In the event the data (+) and data (-) circuits become shorted together, the signal stays at base voltage (2.5V) continuously and all communication capabilities are lost.

CAN (+) Circuit Shorted To Ground



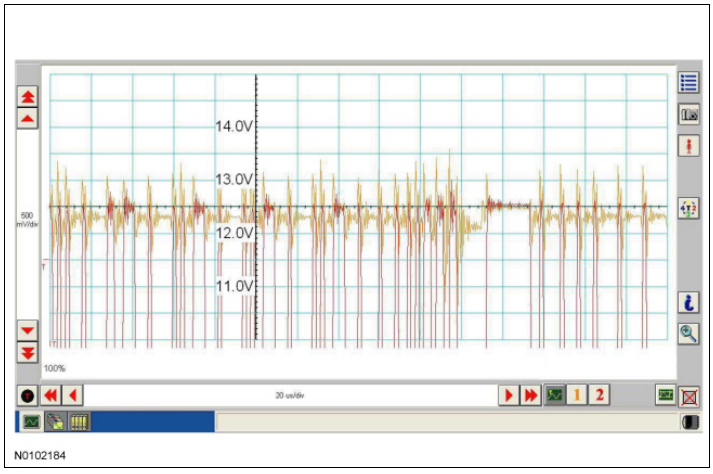
In the event the data (+) circuit becomes shorted to ground, both the data (+) and data (-) circuits are pulled low (0V) and all communication capabilities are lost.

CAN (-) Circuit Shorted To Ground



In the event 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.

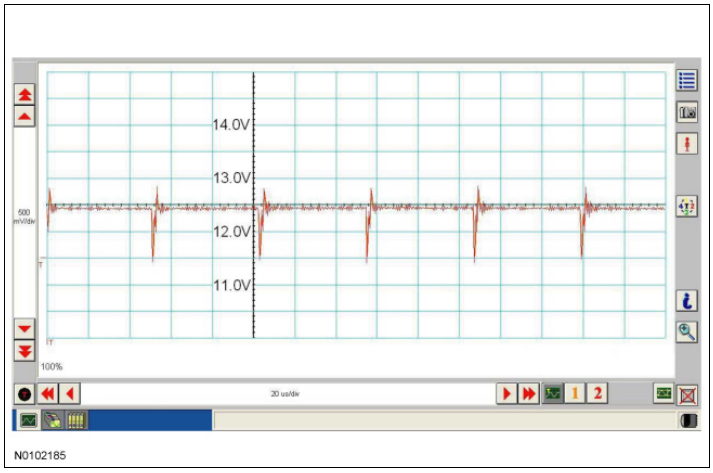
CAN (+) Circuit Shorted To Battery Voltage



In the event the data (+) circuit becomes shorted to battery voltage, the data (+) circuit is pulled high (12V)

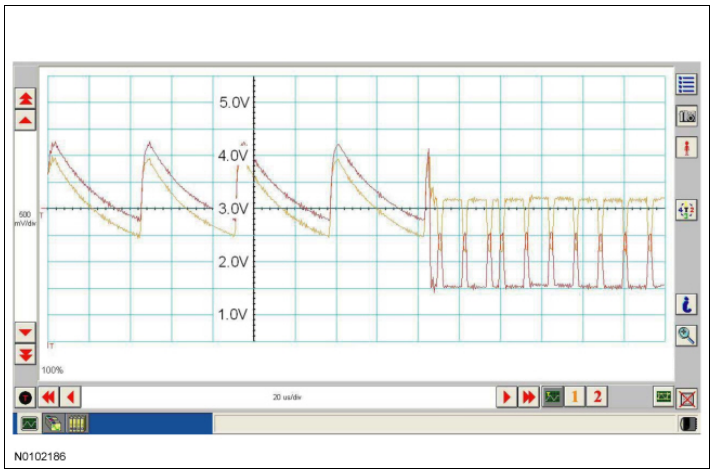
and the data (-) circuit falls to abnormally high voltage (above 5V) during communication and reaches battery voltage (12V) for peak voltage. Communication may continue but at a degraded level.

CAN (-) Circuit Shorted To Battery Voltage



In the event 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 disrupt 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 on the CAN utilize simultaneous communication of 2 or more messages on the same network circuits. The following chart summarizes the messages sent and received on the network.

CAN Module Communication Message Chart

NOTE: This chart describes the specific HS-CAN and MS-CAN messages broadcast by each module, and the module(s) that receive the message.

NOTE: For the I-CAN , message mapping is not essential to diagnostics as the symptoms arising from a message error are all related to the audio system. For audio system concerns, refer to Section 415-00 .

Broadcast Message	Originating Module	Network Type	Receiving Module(s)
ABS flag data	ABS module	HS-CAN	• IPC • PCM • TCM
ABS info	ABS module	HS-CAN	• IPC • TCM
ABS info2	ABS module	HS-CAN	• RFA • PCM • TCM
ABS_Request	ABS module	HS-CAN	• IPC • PCM • RCM • TCM
ABS vehicle reference speed (gateway)	IPC	MS-CAN	• BCM
Accelerometer data	ABS module	HS-CAN	• TCM
Accelerometer data (gateway)	IPC	MS-CAN	• FCDIM
Air/fuel freeze frame data	PCM	HS-CAN	• TCM
Body information 4	IPC	HS-CAN	• ABS module • PCM
Body system data (gateway)	BCM	MS-CAN	• FCDIM • IPC • RFA module
Charging system current data	PCM	HS-CAN	• IPC
Charging system data	PCM	HS-CAN	• IPC
Chime request data	FCDIM	MS-CAN	

			• IPC
Date/time adjust request	FCDIM	MS-CAN	• IPC
Date/time data	IPC	MS-CAN	• FCDIM
Display data	IPC	MS-CAN	• FCDIM
Display parameters	FCDIM	MS-CAN	• IPC • BCM
Driver information data (gateway)	IPC	MS-CAN	• BCM • FCDIM • TPMS
Engine idle speed data	PCM	HS-CAN	• ABS module • IPC
Engine torque data 1 (gateway)	IPC	MS-CAN	• BCM • RFA module • TPMS
Engine torque data 3	PCM	HS-CAN	• TCM
Engine torque data flags	PCM	HS-CAN	• ABS module • TCM
Engine torque status	PCM	HS-CAN	• ABS module • IPC • TCM
IPC information 1	IPC	HS-CAN	• PCM • TCM
IPC information 3	IPC	HS-CAN	• ABS module • PCM
IPC PATS status	IPC	HS-CAN	• PCM
IPC status data	IPC	MS-CAN	• BCM • FCDIM • RFA module
Illumination data	BCM	MS-CAN	• FCDIM • IPC

Light and chime request	BCM	MS-CAN	• FCDIM • IPC • TPMS
OCS data	OCSM	HS-CAN	• RCM
OCS serial data	OCSM	HS-CAN	• RCM
PCM PATS status	PCM	HS-CAN	• IPC
Pedal data	IPC	HS-CAN	• ABS module • PCM
PEPS data	RFA module	MS-CAN	• IPC • BCM
PEPS status	RFA module	MS-CAN	• IPC
Power mode data	IPC	HS-CAN	• ABS module • PCM • PSCM
Power mode status	IPC	MS-CAN	• BCM • FCDIM • RFA module
Powertrain data 1	PCM	HS-CAN	• ABS module • IPC • RCM • TCM
RCM event	RCM	HS-CAN	• IPC • PCM
RCM event (gateway)	IPC	MS-CAN	• BCM
RCM serial number	RCM	HS-CAN	• ABS module • OCSM
RCM status	RCM	HS-CAN	• APIM • IPC • OCSM
Restraints data	IPC	HS-CAN	• RCM
Speed control status	PCM	HS-CAN	• IPC

			• TCM
Speed control switch data (gateway)	IPC	HS-CAN	• PCM
Steering wheel angle sensor data	PSCM	HS-CAN	• ABS module • PCM
Torque data 1	PCM	HS-CAN	• ABS module • IPC • RCM • TCM
TPMS status	TPMS	MS-CAN	• IPC
Transmission configuration	PCM	HS-CAN	• ABS module • TCM
Transmission data	TCM	HS-CAN	• IPC • PCM
Transmission data 3	TCM	HS-CAN	• ABS module • IPC • OCSM • PCM
Transmission data 4	TCM	HS-CAN	• IPC • PCM
Transmission gear data 2	PCM	HS-CAN	• ABS module
Transmission input data 1	TCM	HS-CAN	• PCM
Transmission input data 2	TCM	HS-CAN	• ABS module • IPC • PCM
Vehicle age	IPC	MS-CAN	• BCM • FCDIM
Vehicle age	IPC	HS-CAN	• PCM • TCM
Vehicle configuration data	IPC	MS-CAN	• BCM • FCDIM

			• RFA module
Vehicle configuration data (gateway)	IPC	HS-CAN	• ABS module • PCM • PSCM • RCM
Vehicle speed data	PCM	HS-CAN	• ABS module • IPC • PSCM • RCM • TCM
Vehicle speed data (gateway)	IPC	MS-CAN	• BCM • FCDIM • HVAC module • RFA module • TPMS
Wheel speed data	ABS module	HS-CAN	• PCM • TCM
Wheel speed data (gateway)	IPC	MS-CAN	• FCDIM

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
• Battery Junction Box (BJB) fuse(s): ♦ 1 (40A) (ABS module) ♦ 2 (50A) (Transmission Control Module (TCM)) ♦ 9 (20A) (ABS module) ♦ 16 (15A) (PCM) ♦ 27 (7.5A) (PCM, TCM) • Central Junction Box (CJB) fuse(s): ♦ 1 (15A) (Remote Function Actuator (RFA) module)

- 3 (7.5A) (Instrument Panel Cluster (IPC))
- 4 (7.5A) (Occupant Classification System Module (OCSM))
- 5 (15A) (no power to scan tool)
- 7 (7.5A) (Front Control/Display Interface Module (FCDIM))
- 9 (20A) (RFA module)
- 10 (15A) (Audio Control Module (ACM), Accessory Protocol Interface Module (APIM), Global Positioning System Module (GPSM) vehicles built after 1/14/2011)
- 12 (20A) (Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM))
- 14 (20A) (RFA module)
- 16 (15A) (Global Positioning System Module (GPSM) vehicles built up to 1/14/2011)
- 19 (7.5A) (ACM , IPC)
- 20 (10A) (Restraints Control Module (RCM))
- 21 (10A) (Body Control Module (BCM), IPC , Power Steering Control Module (PSCM))
- 22 (7.5A) (ABS module, PCM)
- 23 (10A) (TCM , TPM / VSM)
- 26 (7.5A) (TPM / VSM)

- Data Link Connector (DLC)
- Wiring, terminals or connectors

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 R , 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).
- 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, repair procedures such as module reprogramming often set network DTCs. Replacing a module to resolve a network DTC is unlikely to correct the concern. To prevent repeat network DTC concerns, inspect all network wiring, especially connectors. Test the vehicle battery, refer to Section 414-01 .

Communication Network DTC Chart

DTC	Description	Source	Action
U0001:00	High Speed Controller Area Network (HS-CAN) Communication Bus: no subtype information	RFA	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0001:88	High Speed Controller Area Network (HS-CAN) Communication Bus	• ABS module • PSCM • PCM	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0002:81	High Speed Controller Area Network (HS-CAN) Communication Bus Performance	PCM	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0010:00	Medium Speed Controller Area Network (MS-CAN) Communication Bus: no subtype information	RFA	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0010:88	Medium Speed Controller Area Network (MS-CAN) Communication Bus	• BCM • FCDIM	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to

			Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0028:00	Vehicle Communication Bus A	TCM	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0028:08	Vehicle Communication Bus A: Bus Signal/Message Failures	RCM	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0028:88	Vehicle Communication Bus A: Bus Off	RCM	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0073:00	Control Module Communication Bus "A" Off	TCM	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U0074:88	Infotainment Controller Area Network (I-CAN) Communication Bus	FCDIM	The module could not communicate on the network at a point in time. The fault is not currently present (the module had to communicate with the scan tool to report this DTC). CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.
U3000:88	Control Module: Bus Off	APIM	The module could not communicate on the network at a point in time. The fault is currently not present since the module is currently communicating with the scan tool reporting this DTC. CLEAR the DTC. REPEAT the network test with the scan tool. VERIFY the integrity of the connectors and wiring Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

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 23 , Electronic Engine Controls 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:

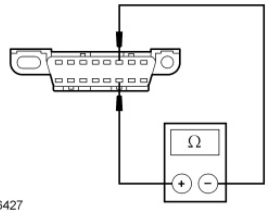
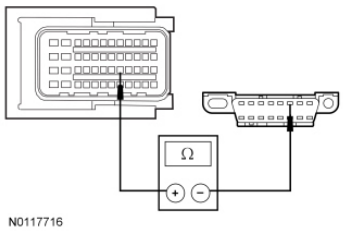
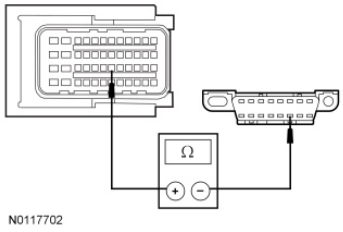
- Wiring, terminals or connectors
- PCM

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 .

Test Step	Result / Action to Take
A1 VERIFY WHETHER OTHER HS-CAN MODULES PASS THE NETWORK TEST	
• Enter the following diagnostic mode on the scan tool: Network Test. • In the left hand pane of the IDS network test display screen, verify whether any HS-CAN modules passed the network test. • **Is the text "pass" or a DTC listed next to any of the following modules (if equipped): ABS module, Accessory Protocol Interface Module (APIM), Instrument Panel Cluster (IPC), Occupant Classification System Module (OCSM), Power Steering Control Module (PSCM), PCM, Remote Function Actuator (RFA), Restraints Control Module (RCM) orTransmission Control Module (TCM)?**	**Yes** If "pass" or a DTC was listed next to the PCM, a network fault is not currently present. GO to Pinpoint Test r to diagnose an intermittent HS-CAN fault condition. If "pass" or a DTC was listed next to one or more modules other than the PCM, GO to A2 . **No** No modules are currently communicating on the HS-CAN . GO to Pinpoint Test q to diagnose no HS-CAN communication.
A2 PC/ED MANUAL PINPOINT TEST QA VERIFICATION CHECK	
• Verify that pinpoint test QA has been carried out. • **Has pinpoint test QA been carried out?**	**Yes** GO to A3 . **No** REFER to the Powertrain

	Control/Emissions Diagnosis (PC/ED) manual, Section 5, pinpoint test QA to diagnose no communication with the PCM.
A3 CHECK THE HS-CAN TERMINATION RESISTANCE	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the Data Link Connector (DLC) C251-6, circuit VDB04 (WH/BU), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  • **Is the resistance between 54 and 66 ohms?**	**Yes** CONNECT the negative battery cable. GO to A5 . **No** GO to A4 .
A4 CHECK THE HS-CAN CIRCUITS BETWEEN THE PCM AND THE DLC FOR AN OPEN	
• Disconnect: PCM C175B. • Measure the resistance between the PCM C175B-20, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.  • Measure the resistance between the PCM C175B-19, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to A5 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
A5 CHECK FOR CORRECT PCM OPERATION	

• Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM 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 PCM. REFER to Section 303-14 . 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. CLEAR the DTCs. REPEAT the network test with the scan tool.

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:

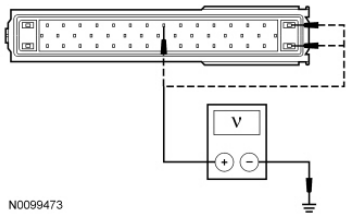
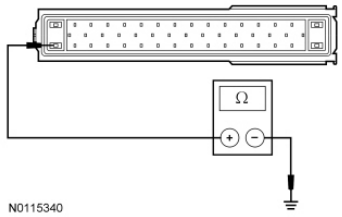
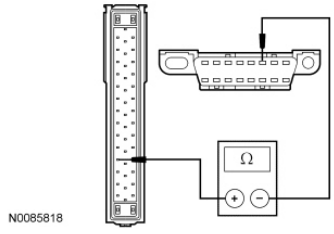
- Fuse
- Wiring, terminals or connectors
- ABS module

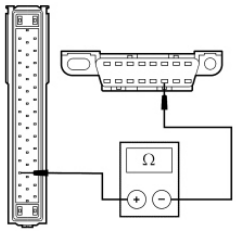
PINPOINT TEST B: THE ABS MODULE DOES NOT RESPOND TO THE SCAN TOOL

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
B1 CHECK THE ABS MODULE VOLTAGE SUPPLY CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: ABS Module C135. • Ignition ON. • Measure the voltage between the ABS module C135-1, circuit SBB01 (RD), C135-8, circuit CBP22 (GN/WH) and C135-32, circuit SBB28 (GN/RD), harness side and ground.	**Yes** GO to B2 . **No** VERIFY the Battery Junction Box (BJB) fuses 1 (40A), 9 (20A) and Central Junction Box (CJB) fuse 22 (7.5A) are OK. If OK, REPAIR the circuit in question. If not OK, REFER to the

 • **Are the voltages greater than 10 volts?**	Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the network test with the scan tool.
B2 CHECK THE ABS MODULE GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the ABS module C135-47, circuit GD123 (BK/GY), harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** GO to B3 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.
B3 CHECK THE HS-CAN CIRCUITS BETWEEN THE ABS MODULE AND THE DLC FOR AN OPEN	
• Measure the resistance between the ABS module C135-12, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.  • Measure the resistance between the ABS module C135-13, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.	**Yes** CONNECT the negative battery cable. GO to B4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 • **Are the resistances less than 5 ohms?**	
B4 CHECK FOR CORRECT ABS MODULE OPERATION	
• Disconnect the ABS module connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the ABS module connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ABS module. REFER to Section 206-09 . 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. CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test C: The Instrument Panel Cluster (IPC) 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 Panel Cluster (IPC) communicates with the scan tool and other network modules on the High Speed Controller Area Network (HS-CAN). The IPC does not communicate with the scan tool on the Medium Speed Controller Area Network (MS-CAN).

This pinpoint test is intended to diagnose the following:

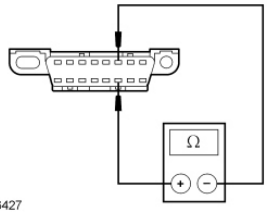
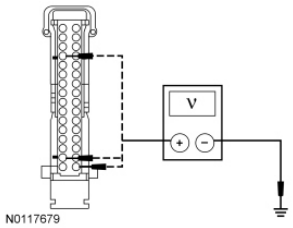
- Fuse(s)
- Wiring, terminals or connectors
- IPC

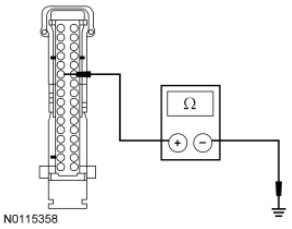
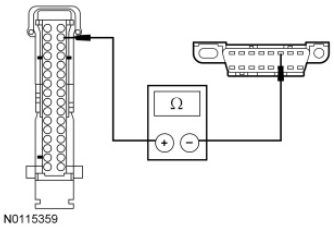
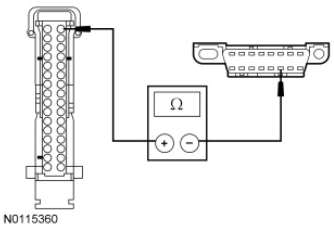
PINPOINT TEST C: THE IPC DOES NOT RESPOND TO THE SCAN TOOL

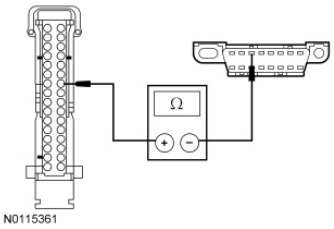
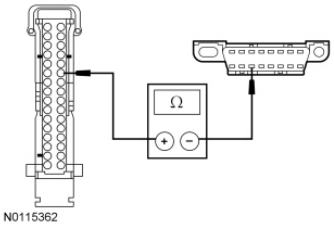
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

NOTE: Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 413-01 .

Test Step	Result / Action to Take

C1 CHECK THE HS-CAN TERMINATION RESISTANCE	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Disconnect the scan tool cable from the Data Link Connector (DLC). • Measure the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  • **Is the resistance between 54 and 66 ohms?**	**Yes** CONNECT the negative battery cable. GO to C2 . **No** GO to C4 .
C2 CHECK THE IPC VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: IPC C220. • Ignition ON. • Measure the voltage between the IPC , harness side and ground as follows: **Connector-Pin** / **Circuit** C220-4 — CBP21 (BU/GY) C220-15 — CBP19 (BN/WH) C220-32 — SBP03 (BU/RD)  • **Are the voltages greater than 10 volts?**	**Yes** GO to C3 . **No** VERIFY the Central Junction Box (CJB) fuse 3 (7.5A), 19 (7.5A) and 21 (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. CLEAR the DTCs. REPEAT the network test with the scan tool.
C3 CHECK THE IPC GROUND CIRCUIT FOR AN OPEN	

• Disconnect: Negative Battery Cable. • Measure the resistance between IPC C220-6, circuit GD115 (BK/GY) harness side and ground.  N0115358 • **Is the resistance less than 5 ohms?**	**Yes** GO to C4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
C4 CHECK THE HS-CAN CIRCUITS BETWEEN THE IPC AND THE DLC FOR AN OPEN	
• Measure the resistance between the IPC C220-18, circuit VDB04 (WH/BU), harness side and the Data Link Connector (DLC) C251-6, circuit VDB04 (WH/BU), harness side.  N0115359 • Measure the resistance between the IPC C220-17, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0115360 • **Are the resistances less than 5 ohms?**	**Yes** GO to C5 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
C5 CHECK THE MS-CAN CIRCUITS BETWEEN THE IPC AND THE DLC FOR AN OPEN	

• Measure the resistance between the IPC C220-23, circuit VDB06 (GY/OG), harness side and the Data Link Connector (DLC) C251-3, circuit VDB06 (GY/OG), harness side.  N0115361 • Measure the resistance between the IPC C220-22, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0115362 • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to C6 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
C6 CHECK FOR CORRECT IPC OPERATION	
• Disconnect all the IPC connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the IPC 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 IPC . REFER to Section 413-01 . 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 D: The Occupant Classification System Module (OCSM) 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 Occupant Classification System Module (OCSM) 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
- OCSM

PINPOINT TEST D: THE OCSM DOES NOT RESPOND TO THE SCAN TOOL

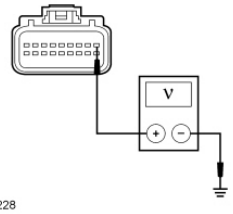
⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

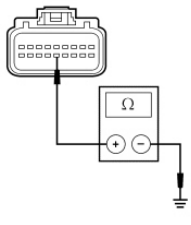
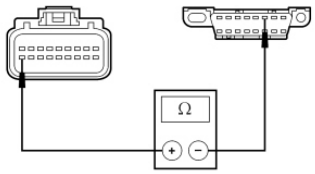
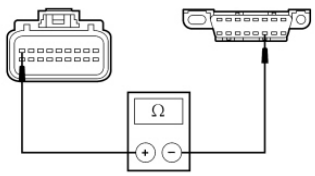
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

NOTE: 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
D1 CHECK THE OCSM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Ignition OFF. • Depower the SRS . Refer to Section 501-20B . • Disconnect: OCSM C3159. • Deactivate the SRS . Refer to Section 501-20B . • Repower the SRS . Refer to Section 501-20B . • Ignition ON. • Measure the voltage between the OCSM C3159-1, circuit CBP04 (VT), harness side and ground.  N0060228 • **Is the voltage greater than 10 volts?**	**Yes** GO to D2 . **No** VERIFY the Central Junction Box (CJB) fuse 4 (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. REACTIVATE the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan tool.
D2 CHECK THE OCSM GROUND CIRCUIT FOR AN OPEN	

• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the OCSM C3159-14, circuit GD145 (BK/BU), harness side and ground.  N0060229 • **Is the resistance less than 5 ohms?**	**Yes** GO to D3 . **No** REPAIR the circuit. REACTIVATE the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan tool.
D3 CHECK THE HS-CAN CIRCUITS BETWEEN THE OCSM AND THE DATA LINK CONNECTOR (DLC) FOR AN OPEN	
• Measure the resistance between the OCSM C3159-18, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.  N0026670 • Measure the resistance between the OCSM C3159-9, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0026671 • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to D4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
D4 CHECK FOR CORRECT OCSM OPERATION	
• Disconnect the OCSM connector. • Check for: ♦ corrosion	**Yes** INSTALL a new OCSM . REACTIVATE the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan

♦ damaged pins ♦ pushed-out pins	tool.
• Connect the OCSM connector and make sure it seats correctly. • Verify the concern is still present. • **Is the concern still present?**	**No** 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 Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test E: 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 High Speed Controller Area Network (HS-CAN).

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- RCM

PINPOINT TEST E: THE RCM DOES NOT RESPOND TO THE SCAN TOOL

⚠ WARNING: Never disassemble or tamper with seat belt deployable components, including pretensioners, load limiters and inflators. Never back probe deployable device electrical connectors. Tampering or back probing may cause an accidental deployment and result in personal injury or death.

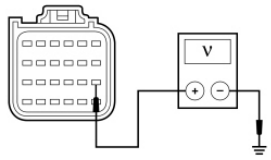
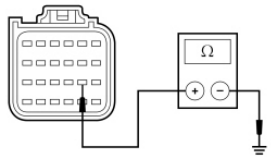
⚠ WARNING: Never probe the electrical connectors on air bag, Safety CanopyÂ® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

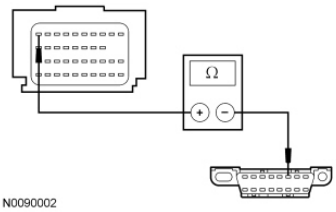
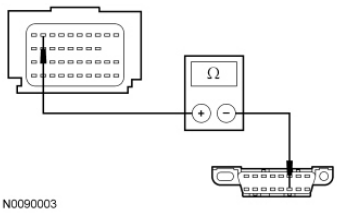
NOTE: The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

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
E1 CHECK THE RCM CONNECTION	
• Ignition OFF.	**Yes** GO to E2 .

• Depower the SRS . Refer to Section 501-20B . • Disconnect: RCM C310A. • Disconnect: RCM C310B. • **Are RCM C310A pins 13 and 14 and RCM C310B pins 9 and 10 OK?**	**No** REPAIR the RCM connector pins as necessary. REPOWER the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan tool.
E2 CHECK THE RCM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Deactivate the SRS . Refer to Section 501-20B . • Repower the SRS . Refer to Section 501-20B . • Ignition ON. • Measure the voltage between the RCM C310A-13, circuit CBP20 (YE/VT), harness side and ground.  N0117680 • **Is the voltage greater than 10 volts?**	**Yes** GO to E3 . **No** VERIFY the Central Junction Box (CJB) fuse 20 (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. REACTIVATE the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan tool.
E3 CHECK THE RCM CASE GROUND	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the RCM C310A-14, circuit GD174 (BK/WH), harness side and ground.  N0117681 • **Is the resistance less than 5 ohms?**	**Yes** GO to E4 . **No** REPAIR the circuit. REACTIVATE the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan tool.
E4 CHECK THE HS-CAN CIRCUITS BETWEEN THE RCM AND THE DLC FOR AN OPEN	

• Measure the resistance between the RCM C310B-10, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.  N0090002 • Measure the resistance between the RCM C310B-9, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0090003 • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to E5 . **No** REPAIR the circuit in question. REACTIVATE the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan tool.
E5 CHECK FOR CORRECT RCM OPERATION	
• Disconnect all the RCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the RCM 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 RCM . REACTIVATE the SRS . REFER to Section 501-20B . 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. REACTIVATE the SRS . REFER to Section 501-20B . CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test F: The Accessory Protocol Interface Module (APIM) 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 130 , Audio System/Navigation for schematic and connector information.

Normal Operation

TheAccessory Protocol Interface Module (APIM) communicates with the scan tool and other network modules on the High Speed Controller Area Network (HS-CAN). The APIM does not communicate with the scan tool on the Infotainment Controller Area Network (I-CAN).

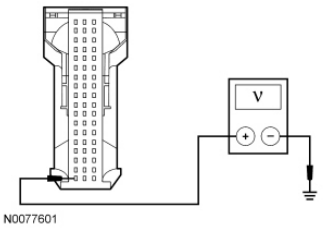
This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- APIM

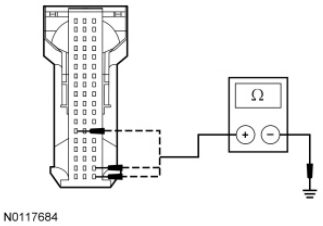
PINPOINT TEST F: THE APIM DOES NOT RESPOND TO THE SCAN TOOL

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
F1 CHECK THE APIM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: APIM C2383. • Ignition ON. • Measure the voltage between the APIM C2383-1, circuit SBP10 (YE/RD), harness side and ground.  • **Is the voltage greater than 10 volts?**	**Yes** GO to F2 . **No** VERIFY the Central Junction Box (CJB) fuse 10 (15A) 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. CLEAR the DTCs. REPEAT the network test with the scan tool.
F2 CHECK THE APIM GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the voltage between the APIM , harness side and ground as follows:	**Yes** GO to F3 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

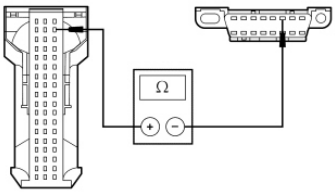
Connector-Pin	Circuit
C2383-6	GD111 (BK/BU)
C2383-37	GD111 (BK/BU)
C2383-38	GD111 (BK/BU)



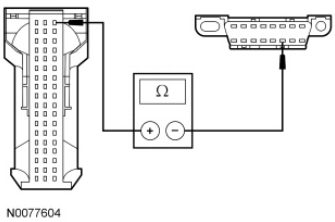
- **Are the resistances less than 5 ohms?**

F3 CHECK THE HS-CAN CIRCUITS BETWEEN THE APIM AND THE DLC FOR AN OPEN

- Measure the resistance between the APIM C2383-53, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.



- Measure the resistance between the APIM C2383-54, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.



- **Are the resistances less than 5 ohms?**

Yes
GO to F4 .

No
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

F4 CHECK FOR CORRECT APIM OPERATION

- Disconnect the APIM connector.
- Check for:
  - ♦ corrosion

Yes
INSTALL a new APIM . REFER to Section 415-00 . CLEAR the DTCs. REPEAT the network test with the scan tool.

♦ damaged pins ♦ pushed-out pins • Connect the APIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**No** 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 network test with the scan tool.

Pinpoint Test G: The Remote Function Actuator (RFA) 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 110 , Power Door Locks for schematic and connector information.

Normal Operation

The Remote Function Actuator (RFA) module communicates with the scan tool and some network modules on the Medium Speed Controller Area Network (MS-CAN), and communicates with other network modules only on the High Speed Controller Area Network (HS-CAN).

This pinpoint test is intended to diagnose the following:

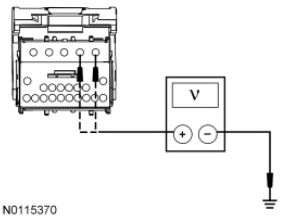
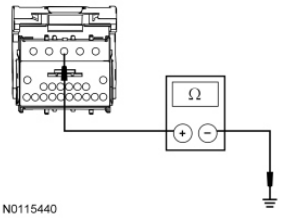
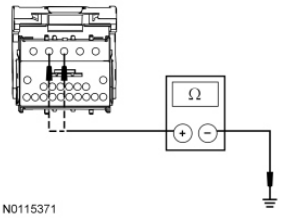
- Fuse
- Wiring, terminals or connectors
- RFA module

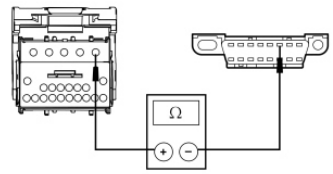
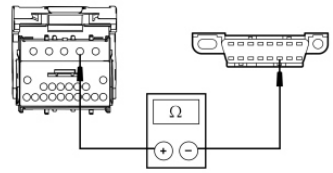
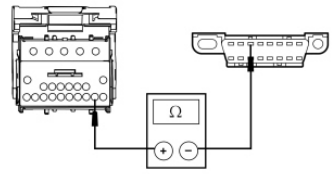
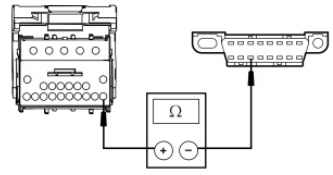
PINPOINT TEST G: THE RFA MODULE DOES NOT RESPOND TO THE SCAN TOOL

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
G1 CHECK THE RFA MODULE VOLTAGE SUPPLY CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: RFA module C3503A.. • Measure the voltage between the RFA module C3503A-1, circuit SBP09 (RD), harness side and ground; and C3503A-2, circuit SBP14 (BN/RD), harness side and ground.	**Yes** GO to G2 . **No** VERIFY the Central Junction Box (CJB) fuses 9 (20A) and 14 (20A) 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 circuit short. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0115370 • **Are the voltages greater than 10 volts?**	
G2 CHECK THE RFA MODULE GROUND CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the RFA module C3503A-3, circuit GD145 (BK/BU), harness side and ground.  N0115440 • Disconnect: RFA module C3503D. • Measure the resistance between the RFA module C3503D-3, circuit GD145 (BK/BU), harness side and ground; and RFA module C3503D-4, circuit GD145 (BK/BU) harness side and ground.  N0115371 • **Are the resistances less than 5 ohms?**	**Yes** GO to G3 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
G3 CHECK THE HS-CAN CIRCUITS BETWEEN THE RFA MODULE AND THE DLC FOR AN OPEN	
• Measure the resistance between the RFA module C3503B-1, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.	**Yes** GO to G4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0115373 • Measure the resistance between the RFA module C3503B-2, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0115374 • **Are the resistances less than 5 ohms?**	
G4 CHECK THE MS-CAN CIRCUITS BETWEEN THE RFA MODULE AND THE DLC FOR AN OPEN	
• Measure the resistance between the RFA module C3503B-15, circuit VDB06 (GY/OG), harness side and the DLC C251-3, circuit VDB06 (GY/OG), harness side.  N0115376 • Measure the resistance between the RFA module C3503B-14, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0115375 • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to G5 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
G5 CHECK FOR CORRECT RFA MODULE OPERATION	

• Disconnect the RFA module connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the RFA module connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new RFA module. REFER to Section 419-10 . 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. CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test H: The Front Control/Display Interface Module (FCDIM) 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 130 , Audio System/Navigation for schematic and connector information.

Normal Operation

The Front Control/Display Interface Module (FCDIM) communicates with the scan tool through the Medium Speed Controller Area Network (MS-CAN) and with other modules through the Infotainment Controller Area Network (I-CAN).

This pinpoint test is intended to diagnose the following:

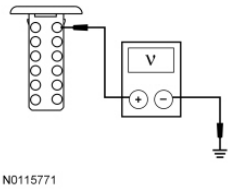
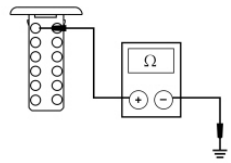
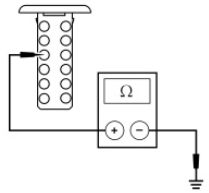
- Fuse
- Wiring, terminals or connectors
- FCDIM

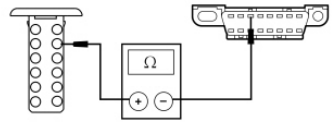
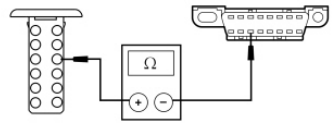
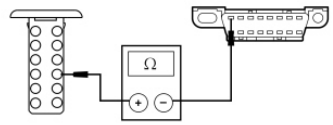
PINPOINT TEST H: THE FCDIM DOES NOT RESPOND TO THE SCAN TOOL

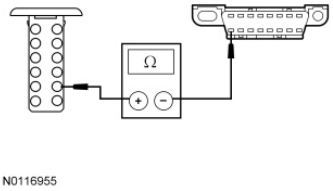
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

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
H1 CHECK THE FCDIM VOLTAGE SUPPLY CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: FCDIM C2123. • Ignition ON. • Measure the voltage between the FCDIM C2123-1, circuit SBP07 (WH/RD), harness side and ground.	**Yes** GO to H2 . **No** VERIFY the Central Junction Box (CJB) fuse 7 (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. CLEAR the

 N0115771 • **Are the voltages greater than 10 volts?**	DTCs. REPEAT the network test with the scan tool.
H2 CHECK THE FCDIM GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • For vehicles built up to 1/14/2011, measure the resistance between the FCDIM C2123-7, circuit GD115 (BK/GY), harness side and ground.  N0117689 • For vehicles built after 1/14/2011, measure the resistance between the FCDIM C2123-9, circuit GD115 (BK/GY), harness side and ground.  N0133863 • **Is the resistance less than 5 ohms?**	**Yes** GO to H3 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.
H3 CHECK THE MS-CAN CIRCUITS BETWEEN THE FCDIM AND THE DLC FOR AN OPEN	
• Measure the resistance between the FCDIM C2123-2, circuit VDB06 (GY/OG), harness side and the DLC C251-3, circuit VDB06 (GY/OG), harness side.	**Yes** GO to H4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0117690 • Measure the resistance between the FCDIM C2123-3, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0117691 • **Are the resistances less than 5 ohms?**	
H4 CHECK THE I-CAN CIRCUITS BETWEEN THE FCDIM AND THE DLC FOR AN OPEN	
• Measure the resistance between the FCDIM C2123-4, circuit VDB06 (GY/OG), harness side and the DLC C251-1, circuit VDB06 (GY/OG), harness side.  N0116954 • Measure the resistance between the FCDIM C2123-5, circuit VDB07 (VT/OG), harness side and the DLC C251-9, circuit VDB07 (VT/OG), harness side.	**Yes** CONNECT the negative battery cable. GO to H5 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0116955 • **Are the resistances less than 5 ohms?**	
H5 CHECK FOR CORRECT FCDIM OPERATION	
• Disconnect the FCDIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the FCDIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new FCDIM . REFER to Section 415-00 . 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. CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test I: The Power Steering Control Module (PSCM) 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 43 , Power Steering Controls for schematic and connector information.

Normal Operation

The PSCM communicates with the scan tool through the High Speed Controller Area Network (HS-CAN).

This pinpoint test is intended to diagnose the following:

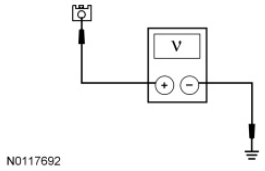
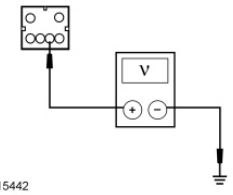
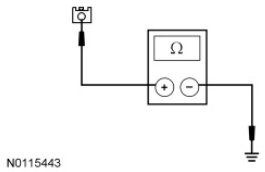
- Fuse
- Wiring, terminals or connectors
- PSCM

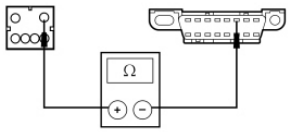
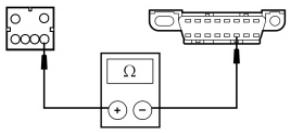
PINPOINT TEST I: THE PSCM DOES NOT RESPOND TO THE SCAN TOOL

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
I1 CHECK THE PSCM VOLTAGE SUPPLY CIRCUITS FOR AN OPEN	

• Ignition OFF. • Disconnect: PSCM C2368A and C2368B. • Ignition ON. • Measure the voltage between the PSCM C2368A-1, circuit SBF02 (YE/RD) harness side and ground.  • Measure the voltage between the PSCM C2368B-5, circuit CBP21 (BU/GY) harness side and ground.  • **Is the voltage greater than 10 volts?**	**Yes** GO to I2 . **No** VERIFY theBattery Junction Box (BJB) fuse mega 2 (60A) and Central Junction Box (CJB) fuse 21 (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. CLEAR the DTCs. REPEAT the network test with the scan tool.
I2 CHECK THE PSCM GROUND CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Disconnect: PSCM C2368C. • Measure the resistance between the PSCM 2368C-1, circuit GD120 (BK/GN), harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** GO to I3 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.
I3 CHECK THE HS-CAN CIRCUITS BETWEEN THE PSCM AND THE DLC FOR AN OPEN	

• Measure the resistance between the PSCM C2368B-2, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.  N0115444 • Measure the resistance between the PSCM C2368B-6, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0115445 • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to I4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
I4 CHECK FOR CORRECT PSCM OPERATION	
• Disconnect the PSCM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the PSCM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new PSCM . REFER to Section 211-02 . 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. CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test J: The Body Control Module (BCM) Does Not Respond To The Scan Tool

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

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Normal Operation

The Body Control Module (BCM) communicates with the scan tool through the Medium Speed Controller Area Network (MS-CAN).

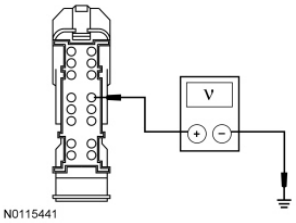
This pinpoint test is intended to diagnose the following:

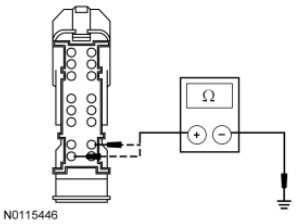
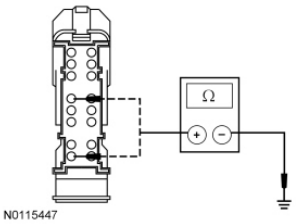
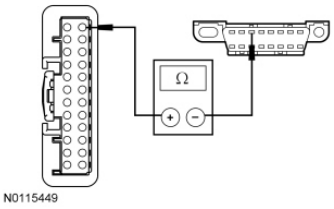
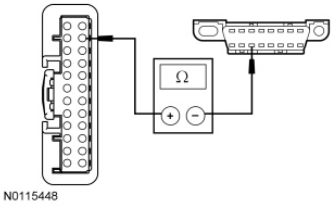
- Fuse
- Wiring, terminals or connectors
- BCM

PINPOINT TEST J: THE BCM 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
J1 CHECK THE BCM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280B. • Ignition ON. • Measure the voltage between the BCM C2280B-4, circuit CBP21 (BU/GY) harness side and ground.  N0115441 • **Is the voltage greater than 10 volts?**	**Yes** GO to J2 . **No** VERIFY the Central Junction Box (CJB) fuse 21 (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. CLEAR the DTCs. REPEAT the network test with the scan tool.
J2 CHECK THE BCM GROUND CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the BCM C2280B-7, circuit GD115 (BK/GY), harness side and ground; and C2280B-16, circuit GD115 (BK/GY), harness side and ground.	**Yes** GO to J3 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0115446 • Disconnect: BCM C2280A. • Measure the resistance between the BCM C2280A-12, circuit GD133 (BK), harness side and ground; and C2280A-16, circuit GD115 (BK/BU), harness side and ground.  N0115447 • **Are the resistances less than 5 ohms?**	
J3 CHECK THE MS-CAN CIRCUITS BETWEEN THE BCM AND THE DLC FOR AN OPEN	
• Disconnect: BCM C2280F. • Measure the resistance between the BCM C2280F-24, circuit VDB06 (GY/OG), harness side and the DLC C251-3, circuit VDB06 (GY/OG), harness side.  N0115449 • Measure the resistance between the BCM C2280F-23, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0115448	**Yes** CONNECT the negative battery cable. GO to J4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

• **Are the resistances less than 5 ohms?**	
J4 CHECK FOR CORRECT BCM OPERATION	
• Disconnect the BCM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the BCM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new BCM . REFER to Section 419-10 . 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. CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test K: The Audio Control Module (ACM) 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 130 , Audio System/Navigation for schematic and connector information.

Normal Operation

The Audio Control Module (ACM) communicates with the scan tool through the MS-CAN . The FCDIM is used as a gateway module.

This pinpoint test is intended to diagnose the following:

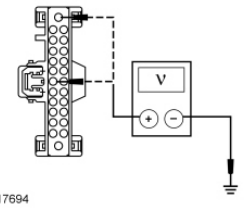
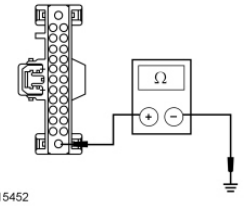
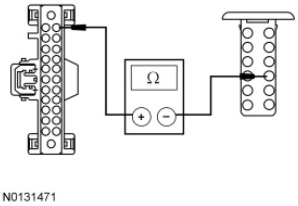
- Fuse
- Wiring, terminals or connectors
- ACM

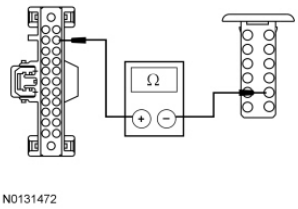
PINPOINT TEST K: THE ACM DOES NOT RESPOND TO THE SCAN TOOL

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
K1 CHECK THE ACM VOLTAGE SUPPLY CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: ACM C240A. • Ignition ON. • Measure the voltage between the ACM C240A-1, circuit SBP10 (YE/RD), harness side and ground; and for vehicles	**Yes** GO to K2 . **No** For vehicles built up to 1/14/2011 VERIFY the Central Junction Box

built up to 1/14/2011, measure the voltage between the ACM C240A-7, circuit CBP19 (BN/WH), harness side and ground.  N0117694 • **Is the voltage greater than 10 volts?**	(CJB) fuses 10 (15A) and 19 (7.5A) are OK. For vehicles built after 1/14/2011 VERIFY the Central Junction Box (CJB) fuses 10 (15A) 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. CLEAR the DTCs. REPEAT the network test with the scan tool.
K2 CHECK THE ACM GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the ACM C240A-13, circuit GD111 (BK/BU), harness side and ground.  N0115452 • **Is the resistance less than 5 ohms?**	**Yes** GO to K3 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.
K3 CHECK THE I-CAN CIRCUITS BETWEEN THE ACM AND THE FCDIM FOR AN OPEN	
• Disconnect: FCDIM C2123. • Measure the resistance between the ACM C240A-14, circuit VDB06 (GY/OG), harness side and the FCDIM C2123-4, circuit VDB06 (GY/OG), harness side.  N0131471 • Measure the resistance between the ACM C240A-15, circuit VDB07 (VT/OG), harness side and the FCDIM C2123-5, circuit VDB07 (VT/OG), harness side.	**Yes** CONNECT the negative battery cable. GO to K4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0131472 • **Are the resistances less than 5 ohms?**	
K4 CHECK FOR CORRECT ACM OPERATION	
• Disconnect all the ACM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM 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 ACM . REFER to Section 415-00 . CLEAR the DTCs. REPEAT the network test with the scan tool. 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. CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test L: The Global Positioning System Module (GPSM) 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 130 , Audio System/Navigation for schematic and connector information.

Normal Operation

The Global Positioning System Module (GPSM) communicates with the scan tool through the MS-CAN . The FCDIM is used as a gateway module.

This pinpoint test is intended to diagnose the following:

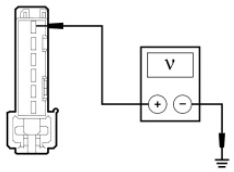
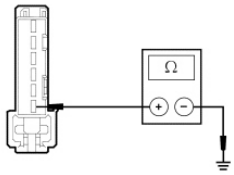
- Fuse
- Wiring, terminals or connectors
- GPSM

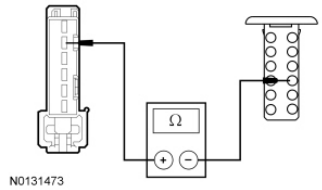
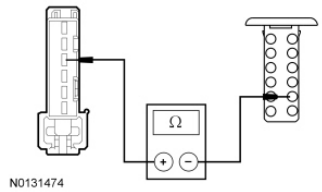
PINPOINT TEST L: THE GPSM DOES NOT RESPOND TO THE SCAN TOOL

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

L1 CHECK THE GPSM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: GPSM C2398. • Ignition ON. • Measure the voltage between the GPSM C2398-1, circuit SBP16 (VT/RD) (vehicles built up to 1/14/2011) circuit SBP10 (YE-RD) (vehicles built after 1/14/2011), harness side and ground.  N0094349 • **Is the voltage greater than 10 volts?**	**Yes** GO to L2 . **No** For vehicles built up to 1/14/2011 VERIFY the Central Junction Box (CJB) fuse 16 (15A) is OK. For vehicles built after 1/14/2011 VERIFY the Central Junction Box (CJB) fuse 10 (15A) 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. CLEAR the DTCs. REPEAT the network test with the scan tool.
L2 CHECK THE GPSM GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the GPSM C2398-6, circuit GD111 (BK/BU), harness side and ground.  N0094350 • **Is the resistance less than 5 ohms?**	**Yes** GO to L3 . **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.
L3 CHECK THE I-CAN CIRCUITS BETWEEN THE GPSM AND THE DLC FOR AN OPEN	
• Disconnect: FCDIM C2123. • Measure the resistance between the GPSM C2398-2, circuit VDB06 (GY/OG), harness side and the FCDIM C2123-4, circuit VDB06 (GY/OG), harness side.	**Yes** CONNECT the negative battery cable. GO to L4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 • Measure the resistance between the GPSM C2398-3, circuit VDB07 (VT/OG), harness side and the FCDIM C2123-5, circuit VDB07 (VT/OG), harness side.  • **Are the resistances less than 5 ohms?**	
L4 CHECK FOR CORRECT GPSM OPERATION	
• Disconnect the GPSM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the GPSM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new GPSM . REFER to Section 415-00 . 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. CLEAR the DTCs. REPEAT the network test with the scan tool.

Pinpoint Test M: The Transmission Control Module (TCM) 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 29 , Transmission Controls for schematic and connector information.

Normal Operation

TheTransmission Control Module (TCM) communicates with the scan tool through the High Speed Controller Area Network (HS-CAN).

This pinpoint test is intended to diagnose the following:

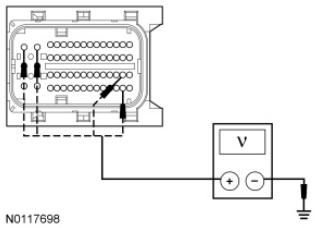
- Fuse
- Wiring, terminals or connectors
- TCM

PINPOINT TEST M: THE TCM 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 .

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>M1 CHECK THE TCM VOLTAGE SUPPLY CIRCUITS FOR AN OPEN</td><td></td></tr>
<tr><td>• Disconnect: TCM C1750A.
• Ignition ON.
• Measure the voltage between the TCM , harness side and ground as follows:

<table><tr><th>Connector-Pin</th><th>Circuit</th></tr><tr><td>C1750A-1</td><td>SBB02 (YE/RD)</td></tr><tr><td>C1750A-2</td><td>SBB02 (YE/RD)</td></tr><tr><td>C1750A-18</td><td>SBB27 (BU/RD)</td></tr><tr><td>C1750A-31</td><td>CBP23 (BN/YE)</td></tr></table>
 

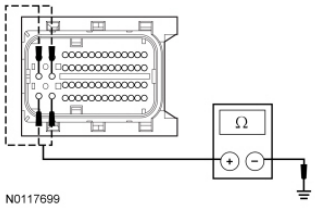
• Are the voltages greater than 10 volts?</td><td>Yes
GO to M2 .

No
VERIFY the Battery Junction Box (BJB) fuses 2 (50A), 27 (7.5A) and Central Junction Box (CJB) fuse 23 (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 circuit short. CLEAR the DTCs. REPEAT the network test with the scan tool.</td></tr>
<tr><td>M2 CHECK THE TCM GROUND CIRCUIT FOR AN OPEN</td><td></td></tr>
<tr><td>• Ignition OFF.
• Disconnect: Negative Battery Cable.
• Measure the resistance between the TCM , harness side and ground as follows:

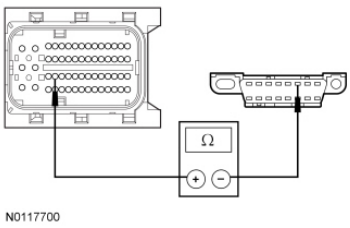
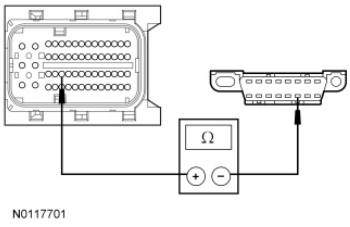
<table><tr><th>Connector-Pin</th><th>Circuit</th></tr><tr><td>C1750A-3</td><td>GD187 (BK/GN)</td></tr><tr><td>C1750A-4</td><td>GD187 (BK/GN)</td></tr></table></td><td>Yes
GO to M3 .

No
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.</td></tr>
</table>

C1750A-5	GD187 (BK/GN)
C1750A-6	GD187 (BK/GN)



- **Are the resistances less than 5 ohms?**

M3 CHECK THE HS-CAN CIRCUITS BETWEEN THE TCM AND THE DLC FOR AN OPEN	
• Measure the resistance between the TCM C1750A-34, circuit VDB04 (WH/BU), harness side and the Data Link Connector (DLC) C251-6, circuit VDB04 (WH/BU), harness side.  • Measure the resistance between the TCM C1750A-35, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to M4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
M4 CHECK FOR CORRECT TCM OPERATION	
• Disconnect both the TCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins	**Yes** INSTALL a new TCM . REFER to Section 307-11 . CLEAR the DTCs. REPEAT the network test with the scan tool. **No** The system is operating correctly at this time.

• Connect the TCM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	The concern may have been caused by a loose or corroded connector.

Pinpoint Test N: The Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) 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 118 , Tire Pressure Monitor System for schematic and connector information.

Normal Operation

The Tire Pressure Monitor (TPM)/Vehicle Security Module (VSM) communicates with the scan tool through the Medium Speed Controller Area Network (MS-CAN).

This pinpoint test is intended to diagnose the following:

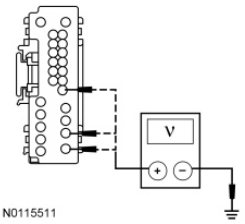
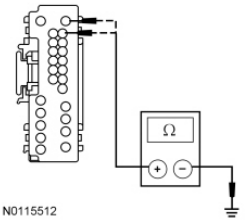
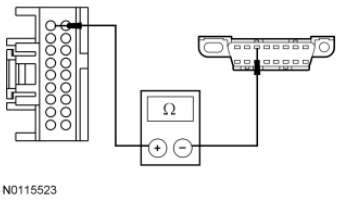
- Fuse
- Wiring, terminals or connectors
- TPM / VSM

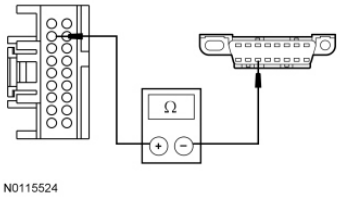
PINPOINT TEST N: THE TPM / VSM DOES NOT RESPOND TO THE SCAN TOOL

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
N1 CHECK THE TPM / VSM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: TPM / VSM C4321A. • Ignition ON. • Measure the voltage between the TPM / VSM , harness side and ground as follows: **Connector-Pin** / **Circuit** C4321A-20 / CBP26 (BU/WH) C4321A-23 / CBP23 (BN/YE) C4321A-24 / SBP12 (GN/RD)	**Yes** GO to N2 . **No** VERIFY the Central Junction Box (CJB) fuses 12 (20A), 23 (10A) and 26 (7.5A) 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 circuit short. CLEAR the DTCs. REPEAT the network test with the scan tool.

 • **Is the voltage greater than 10 volts?**	
N2 CHECK THE TPM / VSM GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the TPM / VSM C4321A-13, circuit GD143 (BK/VT), harness side and ground; and TPM / VSM C4321A-14, circuit GD143 (BK/VT), harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** GO to N3 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
N3 CHECK THE MS-CAN CIRCUITS BETWEEN THE TPM / VSM AND THE DLC FOR AN OPEN	
• Measure the resistance between the TPM / VSM C4321B-1, circuit VDB06 (GY/OG), harness side and the Data Link Connector (DLC) C251-3, circuit VDB06 (GY/OG), harness side.  • Measure the resistance between the TPM / VSM C4321B-2, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.	**Yes** CONNECT the negative battery cable. GO to N4 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0115524 • **Are the resistances less than 5 ohms?**	
N4 CHECK FOR CORRECT TPM / VSM OPERATION	
• Disconnect the TPM / VSM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the TPM / VSM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new TPM / VSM . REFER to Section 204-04 . 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 O: No Medium Speed Controller Area Network (MS-CAN) Communication, All Modules Are Not Responding

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Normal Operation

The Medium Speed Controller Area Network (MS-CAN) uses an unshielded twisted-pair cable.

This pinpoint test is intended to diagnose the following:

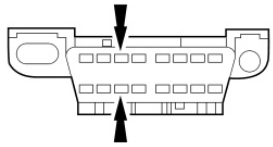
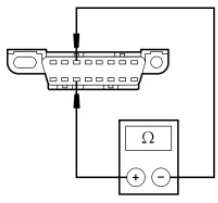
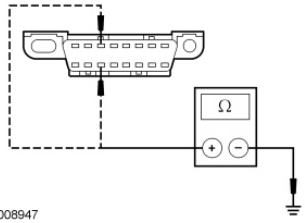
- Wiring, terminals or connectors
- Body Control Module (BCM)
- Front Control/Display Interface Module (FCDIM)
- Instrument Panel Cluster (IPC)
- Remote Function Actuator (RFA) module (if equipped)
- Tire Pressure Monitoring System (TPMS)

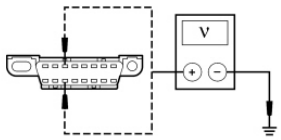
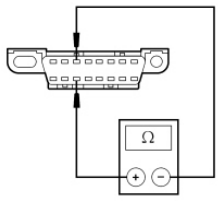
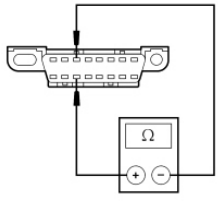
PINPOINT TEST O: NO MS-CAN COMMUNICATION, ALL MODULES ARE NOT RESPONDING

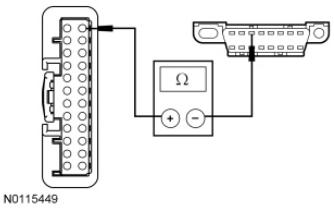
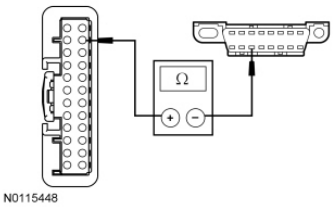
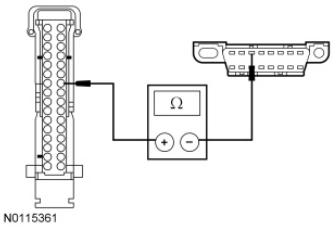
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

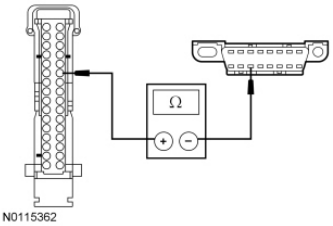
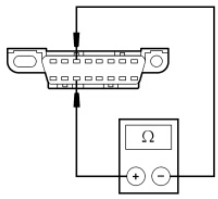
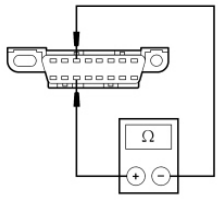
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

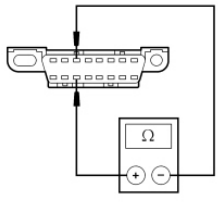
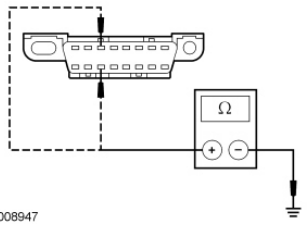
NOTE: Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
O1 CHECK THE DLC PINS FOR DAMAGE	
• Ignition OFF. • Disconnect the scan tool cable from the Data Link Connector (DLC). • Inspect DLC pins 3 and 11 for damage.  N0053178 • **Are DLC pins 3 and 11 OK?**	**Yes** GO to O2 . **No** REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.
O2 CHECK THE MS-CAN TERMINATION RESISTANCE	
• Disconnect: Negative Battery Cable. • Measure the resistance between the DLC C251-3, circuit VDB06 (GY/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0050701 • **Is the resistance between 54 and 66 ohms?**	**Yes** GO to O3 . **No** GO to O5 .
O3 CHECK THE MS-CAN (+) AND MS-CAN (-) CIRCUITS FOR A SHORT TO GROUND	
• Measure the resistance between the DLC C251-3, circuit VDB06 (GY/OG), harness side and ground; and between DLC C251-11, circuit VDB07 (VT/OG), harness side and ground.  N0008947 • **Are the resistances greater than 1,000 ohms?**	**Yes** GO to O4 . **No** GO to O12 .

O4 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO VOLTAGE	
• Connect the negative battery cable. • Ignition ON. • Measure the voltage between the DLC C251-3, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-11, circuit VDB07 (VT/OG), harness side and ground.  N0050702 • **Are the voltages greater than 6 volts?**	**Yes** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool. **No** GO to O13 .
O5 CHECK THE MS-CAN TERMINATION RESISTOR	
• Measure the resistance between the DLC C251-3, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0050701 • **Is the resistance between 108 and 132 ohms?**	**Yes** GO to O6 . **No** GO to O9 .
O6 CHECK THE MS-CAN TERMINATION RESISTOR WITH THE BCM DISCONNECTED	
• Disconnect: BCM C2280F (Black Hardshell). • Measure the resistance between the DLC C251-3, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0050701 • **Is the resistance between 108 and 132 ohms?**	**Yes** GO to O7 . **No** GO to O8 .

O7 CHECK THE MS-CAN CIRCUITS BETWEEN THE BCM AND THE DLC FOR AN OPEN	
• Measure the resistance between the BCM C2280F-24, circuit VDB06 (GY/OG), harness side and the DLC C251-3, circuit VDB06 (GY/OG), harness side.  N0115449 • Measure the resistance between the BCM C2280F-23, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0115448 • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to O13 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
O8 CHECK THE MS-CAN CIRCUITS BETWEEN THE IPC AND THE DLC FOR AN OPEN	
• Disconnect: Instrument Panel Cluster (IPC) C220. • Measure the resistance between the IPC C220-23, circuit VDB06 (GY/OG), harness side and the DLC C251-3, circuit VDB06 (GY/OG), harness side.  N0115361 • Measure the resistance between the IPC C220-22, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.	**Yes** CONNECT the negative battery cable. GO to O15 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0115362 • **Are the resistances less than 5 ohms?**	
O9 CHECK THE MS-CAN (+) AND MS-CAN (-) CIRCUITS FOR A SHORT TOGETHER	
• Measure the resistance between DLC C251-3, circuit VDB06 (GY/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG) the harness side.  N0050701 • **Is the resistance less than 5 ohms?**	**Yes** GO to O11 . **No** GO to O10 .
O10 CHECK THE MS-CAN CIRCUITS BETWEEN THE BCM AND THE DLC FOR AN OPEN	
• Measure the resistance between DLC C251-3, circuit VDB06 (GY/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG) the harness side.  N0050701 • **Is the resistance greater than 10,000 ohms?**	**Yes** REPAIR the DLC or REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool. **No** A capacitor internal to a module may still be draining, causing irregular resistance readings. WAIT 5 minutes. REPEAT the pinpoint test.
O11 CHECK THE MS-CAN (+) AND MS-CAN (-) CIRCUITS FOR A SHORT TOGETHER	
NOTE: Skip to the end of this test step once the suspect module has been identified. • While measuring the resistance between the DLC C251-3, circuit VDB06 (GY/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side; disconnect the following modules one at a time until the resistance is greater than 5 ohms. ♦ BCM 2280F	**Yes** CONNECT the negative battery cable. For the BCM , GO to O18 . For the FCDIM , GO to O19 . For the IPC , GO to O20 . For the RFA module, GO to O21 . For the TPM / VSM , GO to O22 . **No** REPAIR circuits VDB06 (GY/OG)

♦ FCDIM C2123 ♦ IPC C220 ♦ RFA module C3503B (if equipped) ♦ TPM / VSM C4321B  N0050701 • **Did the resistance change to greater than 5 ohms with one of the modules disconnected?**	and VDB07 (VT/OG) for a short together. CLEAR the DTCs. REPEAT the network test with the scan tool.
O12 CHECK THE MS-CAN (+) AND MS-CAN (-) CIRCUITS FOR A SHORT TO GROUND WITH THE MODULES DISCONNECTED	
NOTE: Skip to the end of this test step once the suspect module has been identified. • While measure the resistance between the DLC C251-3, circuit VDB06 (GY/OG), harness side ground; and the DLC C251-11, circuit VDB07 (VT/OG), harness side and ground; disconnect the following modules one at a time until the resistance to ground is greater than 10,000 ohms. ♦ BCM 2280F ♦ FCDIM C2123 ♦ IPC C220 ♦ RFA module (if equipped) ♦ TPM / VSM C4321B  N0008947 • **Did the resistance change to greater than 1000 ohms with one of the modules disconnected?**	**Yes** CONNECT the negative battery cable. For the BCM , GO to O18 . For the FCDIM , GO to O19 . For the IPC , GO to O20 . For the RFA module, GO to O21 . For the TPM / VSM , GO to O22 . **No** REPAIR the suspect circuit for a short to ground. CLEAR the DTCs. REPEAT the network test with the scan tool.
O13 CHECK FOR RESTORED COMMUNICATION WITH THE IPC AND BCM DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuses 3 (7.5A), 19 (7.5) and 21 (10A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test.	**Yes** INSTALL the removed fuses. GO to O14 . **No** If the vehicle is equipped with RFA module, INSTALL the removed fuses. GO to O15 .

• **Do all other modules pass the network test?**	If the vehicle is not equipped with RFA module, INSTALL the removed fuses. GO to O16
O14 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE BCM DISCONNECTED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: BCM C2280F. • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other MS-CAN modules pass the network test?**	**Yes** CONNECT the module. GO to Pinpoint Test J . **No** CONNECT the module. GO to Pinpoint Test C .
O15 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE RFA MODULE DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuses 1 (15A), 9 (20A) and 14 (20A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuses. GO to Pinpoint Test G . **No** INSTALL the removed fuses.GO to O16
O16 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE TPM / VSM DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuses 23 (10A), 26 (7.5A) and 12 (20A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuses. GO to Pinpoint Test N . **No** INSTALL the removed fuses. GO to O17 .
O17 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE FCDIM DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuse 7 (7.5A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test.	**Yes** INSTALL the removed fuse. GO to Pinpoint Test H . **No** INSTALL the removed fuse. The MS-CAN tests within specification. Verify the correct operation of the scan tool on a known good vehicle.

• **Do all other modules pass the network test?**	
O18 CHECK THE BCM FOR CORRECT OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . REFER to Section 419-10 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
O19 CHECK THE FCDIM FOR CORRECT OPERATION	
• Disconnect the FCDIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the FCDIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new FCDIM . REFER to Section 415-00 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
O20 CHECK THE IPC FOR CORRECT OPERATION	
• Disconnect the IPC connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the IPC connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
O21 CHECK THE RFA FOR CORRECT OPERATION	
• Disconnect all the RFA connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the RFA connectors and make sure they seat correctly.	**Yes** INSTALL a new RFA . REFER to Section 419-10 . CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool. **No** The system is operating correctly at

• Operate the system and verify the concern is still present. • **Is the concern still present?**	this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
O22 CHECK THE TPM / VSM FOR CORRECT OPERATION	
• Disconnect the TPM / VSM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the TPM / VSM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new TPM / VSM . REFER to Tire Pressure Monitoring System (TPMS) Module â 4-Door or Tire Pressure Monitoring System (TPMS) Module â 5-Door in Section 204-04 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.

Pinpoint Test P: 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 23 , Electronic Engine Controls for schematic and connector information.

Normal Operation

The High Speed Controller Area Network (HS-CAN) uses an unshielded twisted-pair cable.

This pinpoint test is intended to diagnose the following:

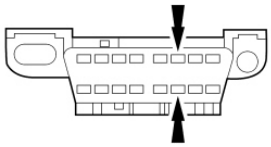
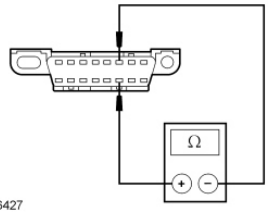
- Wiring, terminals or connectors
- ABS module
- Accessory Protocol Interface Module (APIM) (if equipped)
- Instrument Panel Cluster (IPC)
- Restraints Control Module (RCM)
- Occupant Classification System Module (OCSM)
- PCM
- Power Steering Control Module (PSCM)
- Remote Function Actuator (RFA) module (if equipped)
- Transmission Control Module (TCM) (if equipped)

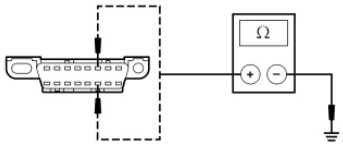
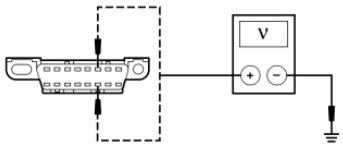
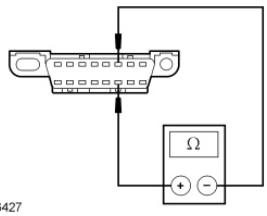
PINPOINT TEST P: NO HS-CAN COMMUNICATION, ALL MODULES ARE NOT RESPONDING

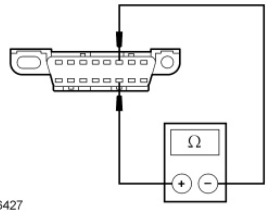
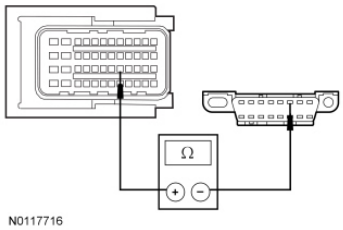
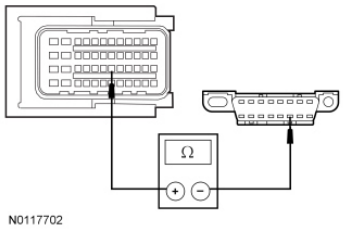
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

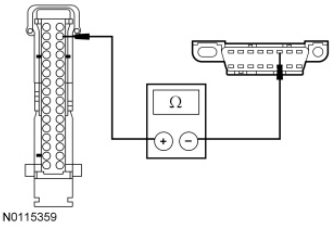
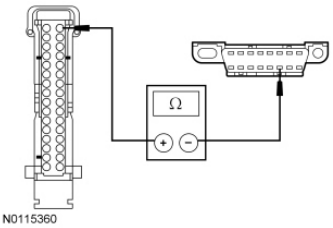
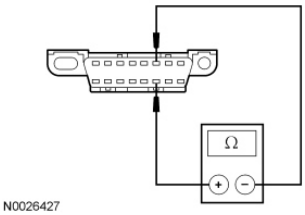
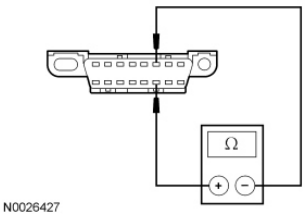
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

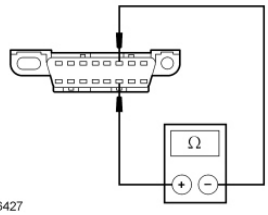
NOTE: Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

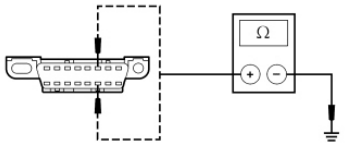
Test Step	Result / Action to Take
P1 CHECK THE DLC PINS FOR DAMAGE	
• Ignition OFF. • Disconnect the scan tool cable from the Data Link Connector (DLC). • Inspect DLC pins 6 and 14 for damage.  A0093867 • **Are DLC pins 6 and 14 OK?**	**Yes** GO to P2 . **No** REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.
P2 CHECK THE HS-CAN TERMINATION RESISTANCE	
• Disconnect: Negative Battery Cable. • Measure the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0026427 • **Is the resistance between 54 and 66 ohms?**	**Yes** GO to P3 . **No** GO to P5 .
P3 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND	
• Measure the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and ground; and between the DLC C251-14, circuit VDB05 (WH), harness side and ground.	**Yes** GO to P4 . **No** GO to P12 .

 N0002963 • **Are the resistances greater than 1,000 ohms?**	
P4 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO VOLTAGE	
• Connect the negative battery cable. • Ignition ON. • Measure the voltage between the DLC C251-6, circuit VDB04 (WH/BU), harness side and ground; and between the DLC C251-14, circuit VDB05 (WH), harness side and ground.  N0002964 • **Are the voltages greater than 6 volts?**	**Yes** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool. **No** GO to P13 .
P5 CHECK THE HS-CAN TERMINATION RESISTOR	
• Measure the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0026427 • **Is the resistance between 108 and 132 ohms?**	**Yes** GO to P6 . **No** GO to P9 .
P6 CHECK THE HS-CAN TERMINATION RESISTOR WITH THE PCM DISCONNECTED	
• Disconnect: PCM C175B. • Measure the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.	**Yes** GO to P7 . **No** GO to P8 .

 N0026427 • **Is the resistance between 108 and 132 ohms?**	
P7 CHECK THE HS-CAN CIRCUITS BETWEEN THE PCM AND THE DLC FOR AN OPEN	
• Measure the resistance between the PCM C175B-20, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.  N0117716 • Measure the resistance between the PCM C175B-19, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0117702 • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to P27 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
P8 CHECK THE HS-CAN CIRCUITS BETWEEN THE IPC AND THE DLC FOR AN OPEN	
• Disconnect: Instrument Panel Cluster (IPC) C220. • Measure the resistance between the IPC C220-18, circuit VDB04 (WH/BU), harness side and the DLC C251-6, circuit VDB04 (WH/BU), harness side.	**Yes** CONNECT the negative battery cable. GO to P24 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0115359 • Measure the resistance between the IPC C220-17, circuit VDB05 (WH), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0115360 • **Are the resistances less than 5 ohms?**	
P9 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TOGETHER	
• Measure the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0026427 • **Is the resistance less than 5 ohms?**	**Yes** GO to P11 . **No** GO to P10 .
P10 CHECK THE HS-CAN CIRCUITS BETWEEN THE PCM AND THE DLC FOR AN OPEN	
• Measure the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and the DLC C251-14, circuit VDB05 (WH), harness side.  N0026427 • **Is the resistance greater than 10,000 ohms?**	**Yes** REPAIR the DLC or the circuit. CLEAR the DTCs. REPEAT the network test with the scan tool. **No** A capacitor internal to a module may still be draining, causing irregular resistance readings. WAIT 5 minutes. REPEAT the pinpoint test.

P11 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TOGETHER	
NOTE: Skip to the end of this test step once the suspect module has been identified. • While measuring the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and the DLC C251-14, circuit VDB05 (WH), harness side; disconnect the following modules one at a time until the resistance is greater than 5 ohms. ♦ APIM C2383 (if equipped) ♦ ABS module C135 ♦ IPC C220 ♦ OCSM C3159 ♦ PSCM C2368 ♦ PCM C175B ♦ RCM C310B ♦ RFA module (if equipped) ♦ TCM C1750A (if equipped)  N0026427 • **Did the resistance change to greater than 5 ohms with one of the modules disconnected?**	**Yes** CONNECT the negative battery cable. For the APIM , GO to P22 . For the ABS module, GO to P23 . For the IPC , GO to P24 . For the OCSM , GO to P25 . For the PSCM , GO to P26 . For the PCM, GO to P27 . For the RCM , GO to P28 . For the RFA , GO to P29 . For the TCM , GO to P30 . **No** REPAIR circuits VDB04 (WH/BU) and VDB05 (WH) for being shorted together. CLEAR the DTCs. REPEAT the network test with the scan tool.
P12 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND WITH THE MODULES DISCONNECTED	
NOTE: Skip to the end of this test step once the suspect module has been identified. • While measuring the resistance between the DLC C251-6, circuit VDB04 (WH/BU), harness side and ground; and between the DLC C251-14, circuit VDB05 (WH), harness side and ground; disconnect the following modules one at a time until the resistance to ground is greater than 1000 ohms. ♦ APIM C2383 (if equipped) ♦ ABS module C135 ♦ IPC C220 ♦ OCSM C3159 ♦ PSCM C2368 ♦ PCM C175B ♦ RCM C310B ♦ RFA module (if equipped) ♦ TCM C1750A (if equipped)	**Yes** CONNECT the negative battery cable. For the APIM , GO to P22 . For the ABS module, GO to P23 . For the IPC , GO to P24 . For the OCSM , GO to P25 . For the PSCM , GO to P26 . For the PCM, GO to P27 . For the RCM , GO to P28 . For the RFA , GO to P29 . For the TCM , GO to P30 . **No** REPAIR the suspect circuit for a short to ground. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0002963 • **Did the resistance change to greater than 1000 ohms with one of the modules disconnected?**	
P13 CHECK FOR RESTORED COMMUNICATION WITH THE PCM AND ABS MODULE DISABLED	
NOTE: Establish an Integrated Diagnostic System (IDS) session prior to disabling the PCM in this test step. If the PCM has failed communication during multiple attempts to identify the vehicle, first manually identify the vehicle by entering a PCM part number, calibration number or tear tag when prompted by IDS . **NOTE:** When a vehicle is manually identified by a PCM part number, calibration number or tear tag, the IDS will not automatically run a network test. The network test must be manually selected and run. **NOTE:** When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: Battery Junction Box (BJB) Fuses 1 (40A), 9 (20A), 16 (15A), 27 (7.5A) and CJB Fuse 22 (7.5A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuses. GO to P14 . **No** INSTALL the removed fuses. GO to P15 .
P14 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE ABS MODULE DISCONNECTED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: ABS module C135. • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other HS-CAN modules pass the network test?**	**Yes** CONNECT the module. GO to Pinpoint Test B . **No** CONNECT the module. GO to Pinpoint Test A .
P15 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE PSCM DISABLED	
NOTE: When re-running the network test, close the	**Yes** INSTALL the removed fuse. GO to

network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuse 21 (10A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other HS-CAN modules pass the network test?**	Pinpoint Test I . **No** If the vehicle is equipped with RFA module, INSTALL the removed fuse. GO to P16 . If the vehicle is not equipped with RFA module, INSTALL the removed fuse. GO to P17
P16 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE RFA MODULE DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuses 1 (15A), 9 (20A) and 14 (20A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuses. GO to Pinpoint Test G . **No** GO to P17
P17 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE RCM DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuse 20 (10A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuse. GO to Pinpoint Test E . **No** If the vehicle is equipped with an APIM , INSTALL the removed fuse. GO to P18 . If the vehicle is not equipped with an APIM , INSTALL the removed fuse. GO to P19 .
P18 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE APIM DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuse 10 (15A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuse. GO to Pinpoint Test F . **No** INSTALL the removed fuse. GO to P19 .
P19 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE IPC DISABLED	

NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuses 3 (7.5A), 19 (7.5A) and 21 (10A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuses. GO to Pinpoint Test C . **No** If the vehicle is equipped with an automatic transmission, INSTALL the removed fuses. GO to P20 . If the vehicle is not equipped with an automatic transmission, INSTALL the removed fuses. GO to P21
P20 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE TCM DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: BJB Fuses 2 (50A), 27 (7.5A) and CJB Fuse 23 (10A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuses. GO to Pinpoint Test M . **No** INSTALL the removed fuses. GO to P21 .
P21 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE OCSM DISABLED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect: CJB Fuse 4 (7.5A). • Enter the following diagnostic mode on the scan tool: Network Test. • Repeat the network test. • **Do all other modules pass the network test?**	**Yes** INSTALL the removed fuse. GO to Pinpoint Test D . **No** INSTALL the removed fuse. The HS-CAN tests within specification. Verify the correct operation of the scan tool on a known good vehicle.
P22 CHECK THE APIM FOR CORRECT OPERATION	
• Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the APIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new APIM . REFER to Section 415-00 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
P23 CHECK THE ABS MODULE FOR CORRECT OPERATION	

• Disconnect the ABS module connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the ABS module connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new ABS module. REFER to Section 419-10 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
P24 CHECK THE IPC FOR CORRECT OPERATION	
• Disconnect the IPC connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the IPC connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
P25 CHECK THE OCSM FOR CORRECT OPERATION	
• Disconnect the OCSM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the OCSM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new OCSM . REFER to Section 501-20B . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
P26 CHECK THE PSCM FOR CORRECT OPERATION	
• Disconnect the PSCM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the PSCM connector and make sure it seats correctly. • Operate the system and verify the concern is still present.	**Yes** INSTALL a new PSCM . REFER to Section 211-04 . CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool. **No** The system is operating correctly at this time. The concern may have

• **Is the concern still present?**	been caused by a loose or corroded connector. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
P27 CHECK THE PCM FOR CORRECT OPERATION	
• Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM 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 PCM. REFER to Section 303-14 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
P28 CHECK THE RCM FOR CORRECT OPERATION	
• Disconnect all the RCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the RCM 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 RCM . REFER to Section 501-20B . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
P29 CHECK THE RFA MODULE FOR CORRECT OPERATION	
• Disconnect all the RFA module connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the RFA 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 RFA module. REFER to Section 419-10 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
P30 CHECK THE TCM FOR CORRECT OPERATION	
• Disconnect all the TCM connectors.	**Yes** INSTALL a new TCM . REFER to

• Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the TCM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	Section 307-11 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.

Pinpoint Test Q: No Infotainment Controller Area Network (I-CAN) Communication, All Modules Are Not Responding

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Normal Operation

The Infotainment Controller Area Network (I-CAN) uses an unshielded twisted-pair cable. The I-CAN is connected to the Data Link Connector (DLC), but the I-CAN modules communicate with the scan tool over the Medium Speed Controller Area Network (MS-CAN). The Front Control/Display Interface Module (FCDIM) is used as a gateway module for the messages to transfer between the scan tool and the modules on the I-CAN .

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Accessory Protocol Interface Module (APIM) (if equipped)
- Audio Control Module (ACM)
- FCDIM
- Global Positioning System Module (GPSM) (if equipped)

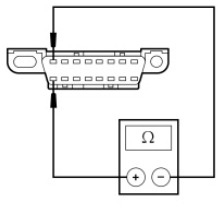
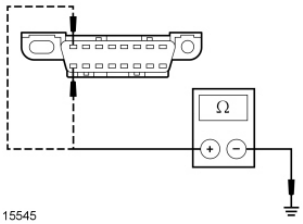
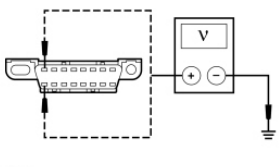
PINPOINT TEST Q: NO I-CAN COMMUNICATION, ALL MODULES ARE NOT RESPONDING

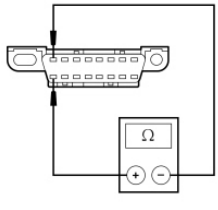
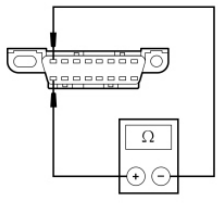
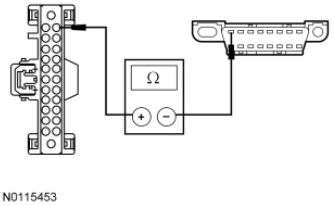
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

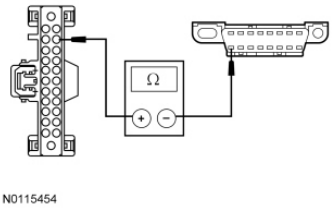
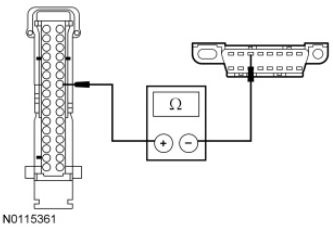
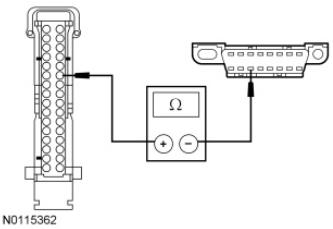
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

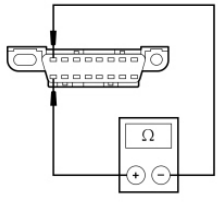
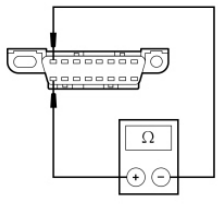
NOTE: Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

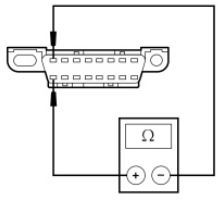
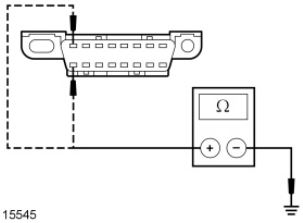
Test Step	Result / Action to Take
Q1 CHECK THE I-CAN TERMINATION RESISTANCE	

• Disconnect: Negative Battery Cable. • Measure the resistance between the DLC C251-1, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-9, circuit VDB07 (VT/OG), harness side.  N0115546 • **Is the resistance between 54 and 66 ohms?**	**Yes** GO to Q2 . **No** GO to Q4 .
Q2 CHECK THE I-CAN (+) AND I-CAN (-) CIRCUITS FOR A SHORT TO GROUND	
• Measure the resistance between the DLC C251-1, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-9, circuit VDB07 (VT/OG), harness side and ground.  N0115545 • **Are the resistances greater than 1,000 ohms?**	**Yes** GO to Q3 . **No** GO to Q11 .
Q3 CHECK THE I-CAN (+) AND I-CAN (-) CIRCUITS FOR A SHORT TO VOLTAGE	
• Connect the negative battery cable. • Ignition ON. • Measure the voltage between the DLC C251-1, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-9, circuit VDB07 (VT/OG), harness side and ground.  N0115547 • **Are the voltages greater than 6 volts?**	**Yes** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool. **No** GO to Q12 .

Q4 CHECK THE I-CAN TERMINATION RESISTOR	
• Measure the resistance between the DLC C251-1, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-9, circuit VDB07 (VT/OG), harness side.  N0115546 • **Is the resistance between 108 and 132 ohms?**	**Yes** GO to Q5 . **No** GO to Q8 .
Q5 CHECK THE I-CAN TERMINATION RESISTOR WITH THE ACM DISCONNECTED	
• Disconnect: ACM C240A. • Measure the resistance between the DLC C251-1, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-9, circuit VDB07 (VT/OG), harness side.  N0115546 • **Is the resistance between 108 and 132 ohms?**	**Yes** GO to Q6 . **No** GO to Q7 .
Q6 CHECK THE I-CAN CIRCUITS BETWEEN THE ACM AND THE DLC FOR AN OPEN	
• Measure the resistance between the ACM C240A-14, circuit VDB06 (GY/OG), harness side and the DLC C251-1, circuit VDB06 (GY/OG), harness side.  N0115453	**Yes** CONNECT the negative battery cable. GO to Q14 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.

• Measure the resistance between the ACM C240A-15, circuit VDB07 (VT/OG), harness side and the DLC C251-9, circuit VDB07 (VT/OG), harness side.  N0115454 • **Are the resistances less than 5 ohms?**	
Q7 CHECK THE I-CAN CIRCUITS BETWEEN THE FCDIM AND THE DLC FOR AN OPEN	
• Disconnect: Front Control/Display Interface Module (FCDIM) C2123. • Measure the resistance between the FCDIM C2123-4, circuit VDB06 (GY/OG), harness side and the DLC C251-3, circuit VDB06 (GY/OG), harness side.  N0115361 • Measure the resistance between the FCDIM C2123-5, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.  N0115362 • **Are the resistances less than 5 ohms?**	**Yes** CONNECT the negative battery cable. GO to Q15 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
Q8 CHECK THE I-CAN (+) AND I-CAN (-) CIRCUITS FOR A SHORT TOGETHER	

• Measure the resistance between the DLC C251-1, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-9, circuit VDB07 (VT/OG), the harness side.  N0115546 • **Is the resistance less than 5 ohms?**	**Yes** GO to Q10 . **No** GO to Q9 .
Q9 CHECK THE I-CAN CIRCUITS BETWEEN THE ACM AND THE DLC FOR AN OPEN	
• Measure the resistance between the DLC C251-1, circuit VDB06 (GY/OG), harness side and ground; and between the DLC C251-9, circuit VDB07 (VT/OG), the harness side.  N0115546 • **Is the resistance greater than 10,000 ohms?**	**Yes** REPAIR the DLC or the circuit. CLEAR the DTCs. REPEAT the network test with the scan tool. **No** A capacitor internal to a module may still be draining, causing irregular resistance readings. WAIT 5 minutes. REPEAT the pinpoint test.
Q10 CHECK THE I-CAN (+) AND I-CAN (-) CIRCUITS FOR A SHORT TOGETHER	
NOTE: Skip to the end of this test step once the suspect module has been identified. • While measuring the resistance between the DLC C251-3, circuit VDB06 (GY/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side; disconnect the following modules one at a time until the resistance is greater than 5 ohms. ♦ APIM C2383 (if equipped) ♦ ACM C240A ♦ FCDIM C2123 ♦ GPSM C2398 (if equipped)	**Yes** CONNECT the negative battery cable. For the APIM , GO to Q13 . For the ACM , GO to Q14 . For the FCDIM , GO to Q15 . For the GPSM , GO to Q16 . **No** REPAIR the circuits VDB06 (GY/OG) and VDB07 (VT/OG) for a short together. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0115546 • **Did the resistance change to greater than 5 ohms with one of the modules disconnected?**	
Q11 CHECK THE I-CAN (+) AND I-CAN (-) CIRCUITS FOR A SHORT TO GROUND WITH THE MODULES DISCONNECTED	
NOTE: Skip to the end of this test step once the suspect module has been identified. • While measuring the resistance between the DLC C251-1, circuit VDB06 (GY/OG), harness side ground; and the DLC C251-9, circuit VDB07 (VT/OG), harness side and ground; disconnect the following modules one at a time until the resistance to ground is greater than 1000 ohms. ♦ APIM C2383 (if equipped) ♦ ACM C240A ♦ FCDIM C2123 ♦ GPSM C2398 (if equipped)  N0115545 • **Did the resistance change to greater than 1000 ohms with one of the modules disconnected?**	**Yes** CONNECT the negative battery cable. For the APIM , GO to Q13 . For the ACM , GO to Q14 . For the FCDIM , GO to Q15 . For the GPSM , GO to Q16 . **No** REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.
Q12 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE ACM , APIM AND GPSM DISCONNECTED	
NOTE: When re-running the network test, close the network test application first or the screen display reverts back to the previously run network test results. • Disconnect modules one at a time until other HS-CAN modules pass the network test. Skip to the end once network operation is restored. • Disconnect: The ACM C240A. • Enter the following diagnostic mode on the scan tool: Network Test. • Disconnect: The APIM C2383 (if equipped). • Enter the following diagnostic mode on the scan	**Yes** CONNECT the module. For restored communication with the ACM disconnected, GO to Pinpoint Test K . For restored communication with the APIM disconnected, GO to Pinpoint Test F . For restored communication with the GPSM disconnected, GO to Pinpoint Test L . **No** CONNECT the modules. The I-CAN tests within specification. Verify the correct operation of the scan tool on a known good vehicle.

tool: Network Test. • Disconnect: The GPSM C2398 (if equipped). • Enter the following diagnostic mode on the scan tool: Network Test. • **Do all other modules pass the network test?**	
Q13 CHECK THE APIM FOR CORRECT OPERATION	
• Disconnect the APIM connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the APIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new APIM . REFER to Section 415-00 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
Q14 CHECK THE ACM FOR CORRECT OPERATION	
• Disconnect all the ACM connectors . • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the ACM 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 ACM . REFER to Section 415-00 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
Q15 CHECK THE FCDIM FOR CORRECT OPERATION	
• Disconnect the FCDIM connectors . • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the FCDIM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new FCDIM . REFER to Section 415-00 . CLEAR the DTCs. CONNECT all modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.
Q16 CHECK THE GPSM FOR CORRECT OPERATION	
• Disconnect the GPSM connector. • Check for:	**Yes** INSTALL a new GPSM . REFER to Section 415-00 . CLEAR the DTCs. CONNECT all

♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the GPSM connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	modules. 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. CLEAR the DTCs. CONNECT all modules. REPEAT the network test with the scan tool.

Pinpoint Test R: 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 Medium Speed Controller Area Network (MS-CAN) and the Infotainment Controller Area Network (I-CAN).

A loss of ground or poor ground at the DLC may result in HS-CAN , MS-CAN or I-CAN faults while the scan tool is connected.

This pinpoint test is intended to diagnose the following:

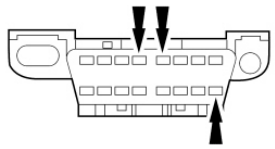
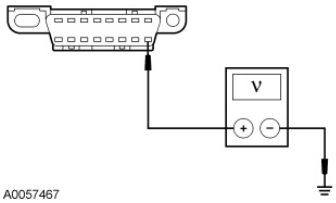
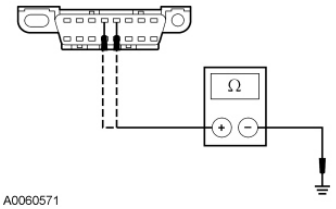
- Fuse
- Wiring, terminals or connectors
- Scan tool
- DLC

PINPOINT TEST R: 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
R1 CHECK THE DLC PINS FOR DAMAGE	
• Ignition OFF. • Disconnect the scan tool cable from the DLC . • Inspect DLC pins 4, 5 and 16 for damage.	**Yes** GO to R2 . **No** REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.

 N0050767 • **Are DLC pins 4, 5 and 16 OK?**	
R2 CHECK THE DLC VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Measure the voltage between the DLC C251-16, circuit SBP05 (GY/RD), harness side and ground.  A0057467 • **Is the voltage greater than 10 volts?**	**Yes** GO to R3 . **No** VERIFY the Central Junction Box (CJB) fuse 5 (15A) 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. REPEAT the network test with the scan tool.
R3 CHECK THE DLC GROUND CIRCUITS FOR AN OPEN	
• Disconnect: Negative Battery Cable. • Measure the resistance between the DLC C251-4, circuit GD115 (BK/GY), harness side and ground; and between the DLC C251-5, circuit GD115 (BK/GY), harness side and ground.  A0060571 • **Are the resistances less than 5 ohms?**	**Yes** REPAIR the scan tool. CONNECT the negative battery cable. REPEAT the network test with the scan tool. **No** REPAIR the circuit in question. REPEAT the network test with the scan tool.

Module Configuration

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

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 for the scan tool to identify the vehicle and obtain 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.

Accessory Protocol Interface Module (APIM) Programming

Accessory Protocol Interface Module (APIM) programming is a process that updates the APIM Consumer Interface Processor (CIP) and Vehicle Interface Processor (VIP) software. The VIP programming updates the calibration files in the portion of the APIM that interfaces with the Controller Area Network (CAN). The CIP programming updates calibration files in the portion of the APIM that interfaces with mobile phones and other customer devices.

APIM programming uses the Vehicle Communication Module (VCM) to read and program the VIP software through the Data Link Connector (DLC). A web-based On-Line Automotive Service Information System (OASIS) application is used to read the CIP software via a Universal Serial Bus (USB) cable between the scan tool and the vehicle's USB port. Both the VCM and the OASIS application must be running on the scan tool during APIM programming. To carry out APIM programming, refer to Accessory Protocol Interface Module (APIM) Programming in this section.

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 speed 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 does not reflect customer preference items that have been changed from the default state. These items need to be changed using programmable parameters after the module is configured.

NOTE: It is not necessary to obtain As-Built data unless directed to do so by the scan tool. This data may be accessed from the technician service publication web site.

The following chart lists As-Built data addresses and describes specific module configuration information:

Module Configuration and Parameter Chart

Module	Requires PMI	Reprogram/Flash Capable	Requires Adaptive Learning or Calibration	Available Programmable Parameters
ABS module	Yes	Yes	Yes	Tire size
Accessory Protocol Interface Module (APIM)	Yes	Yes	No	None
Audio Front Control Module (ACM)	Yes	Yes	No	None
Body Control Module (BCM)	Yes	Yes	No	• Language • Speech Control Language • Tire Circumference • Tire Dimension
Front Control/Display Interface Module (FCDIM)	No	Yes	No	None
Global Positioning System Module (GPSM)	No	No	No	None
Instrument Panel Cluster (IPC)	Yes	Yes	No	• Language • Speech Control Language • Tire Circumference • Tire Dimension
Occupant Classification System Module (OCSM)	No	Yes	• Seat weight sensor re-zero	None
PCM	Yes	Yes	• Adaptive airflow • Idle speed • Refueling event • Fuel trim	None
Power Steering Control Module (PSCM)	No	Yes	No	None
Remote Function Actuator (RFA)	No	Yes	No	None
Restraints Control Module (RCM)	Yes	Yes	• Seat weight sensor re-zero	None
	Yes	Yes	No	Tire placard pressure

Tire Pressure Monitor Module (TPM)				
Transmission Control Module (TCM)	No	No	Yes	None

Inspection and Verification

This section provides step-by-step module configuration procedures. Carry out the Programmable Module Installation (PMI) procedures in this section when directed here from another workshop manual section to carry out configuration or when DTCs from the list below are present:

DTC Chart

NOTE: Some modules on this vehicle utilize a 5-character DTC followed by a 2-character failure-type code. The failure-type code provides information about specific fault conditions such as opens, or shorts to ground. Continuous Memory DTCs have an additional 2-character DTC status code suffix to assist in determining DTC history.

DTC	Description	Source	Action
U0300	Internal Control Module Software Incompatibility	• RCM • PSCM	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U0300:4A	Internal Control Module Software Incompatibility	• PCM	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U2024:54	Control Module Cal-Config Data	• PCM	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U2050	No Application Present	• OCSM • TPM	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U2051	One or More Calibration Files Missing/Corrupt	• OCSM	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U2100:00	Initial Configuration Not Complete: No Sub Type Information	• ABS module • ACM • FCDIM • PSCM • RCM • RFA	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U2100:00	Initial Configuration Not Complete: No Sub Type Information	• APIM	CARRY OUT APIM programming. REFER to Accessory Protocol Interface Module (APIM) Programming in this section.
U2100:55	Initial Configuration Not Complete	• ABS module	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U2100:55	Initial Configuration Not Complete	• ABS module	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.

U2101:00	Control Module Configuration Incompatible: No Sub Type Information	• ABS module • ACM • BCM • FCDIM • IPC • PSCM	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U2101:00	Control Module Configuration Incompatible: No Sub Type Information	• APIM	CARRY OUT APIM programming. REFER to Accessory Protocol Interface Module (APIM) Programming in this section.
U3000:46	Control Module Calibration/Parameter Memory Failure	• RCM	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.
U3002:62	Vehicle Identification Number - signal compare failure	• PSCM • RCM	CARRY OUT PMI . REFER to Programmable Module Installation (PMI) in this section.

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

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.

Accessory Protocol Interface Module (APIM) Programming

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST3051-A	Universal Serial Bus (USB) Male-A to Male-A Cable CCMUSB2-AM-AM-10 or equivalent

Accessory Protocol Interface Module (APIM) Programming Using the Integrated Diagnostic System (IDS)

NOTE:

- If a new Accessory Protocol Interface Module (APIM) is being installed, install a new APIM before carrying out the following procedure. For additional information, refer to Section 415-00 .
- When carrying out the programming procedures, follow the scan tool on-screen directions.
- Make sure the battery is fully charged before carrying out the programming steps.
- A hardwired internet connection is strongly recommended when programming.
- If unable to complete programming because operation stops or errors are received, internet browser settings may need to be configured. From the on-line OASIS tab, select the "Service Tips" tab, then select "SYNC Software Programming" under "Job Aids".

NOTE:

- For APIM flash programming:
  - The scan tool and a USB male A to male A cable (CCMUSB2-AM-AM-10 or equivalent) are required.
  - The flash procedure deletes any paired phones that were in the SYNC® system.
  - The file for the flash needs to be downloaded from the online database. Allow for extra time for the file to download. The files are approximately 80 megabyte.

1. **NOTE:** The IDS program must be closed before attempting to program the APIM .

   Open a session for the vehicle from the technician service publication web site, and run On-Line Automotive Service Information System (OASIS) using "Read VIN and DTC's".

2. From the OASIS tab, select the "SYNC" button.

3. There are 3 available options for APIM programming:
   - Standard (latest version of current software and applications): Use this option to update the APIM to the latest software level.
   - Custom (show what's available, and let me choose): Use this option to show all the available options that can be programmed, or if a Technical Service Bulletin (TSB) directs for specific software version to be programmed.

- Module Replacement (restore software for newly installed hardware): Use this option when the APIM has been replaced.

4. After selecting 1 of the 3 options (Standard, Custom or Module Replacement), click the "Read SYNC" button to verify the current APIM , Vehicle Interface Processor (VIP) and Consumer Interface Processor (CIP) software levels.
    - The versions are compared to a online database. After the comparison, the available software is displayed.

5. **NOTE:** Do not disconnect the Vehicle Communication Module (VCM) or the USB cable during APIM programming.

   When carrying out the programming procedures, follow the scan tool on-screen directions.

   NOTE: If unable to complete programming because operation stops or errors are received, interned browser settings may need to be configured. From the on-line OASIS tab, select the "Service Tips" tab, then select "SYNC Software Programming" under "Job Aids".

   Select the "Program SYNC" button to begin the APIM programming process.

6. Follow the scan tool on-screen directions for APIM programming.
    - After programming is complete the scan tool displays "Programming has been completed successfully."

Torque Specifications

Description	Nm	lb-ft	lb-in
Anti-theft alarm horn - 4 door sedan	11	-	97
Anti-theft alarm horn - 5 door hatchback	24	18	-

Anti-Theft

The perimeter anti-theft alarm system consists of the following:

- Anti-theft alarm horn (inside the luggage compartment on the passenger side in 4-door sedans. Underneath the left rear D-pillar trim in 5-door hatchbacks.)
- Door ajar input
- Door lock control switch input
- Door disarm switch (part of the driver door latch)
- Hood switch (part of the hood latch)
- Liftgate/luggage compartment ajar input
- Remote Keyless Entry (RKE) transmitter
- Turn signals
- Body Control Module (BCM)
-

The perimeter alarm system protects the vehicle from unauthorized entry by sounding the horn and flashing the turn signals at regular intervals when the system is armed and any door, the hood, or liftgate/luggage compartment is opened without using the key in the driver door lock cylinder, the Remote Keyless Entry (RKE) transmitter, or the Intelligent Access (IA) feature.

Arming the Perimeter Alarm

The perimeter alarm is ready to arm any time when the ignition is off. Any of the following pre-arms the alarm system:

- pressing the LOCK button on a programmed RKE transmitter.
- pressing the door lock control switch to the LOCK position with the door open, then closing the door.
- turning the driver door lock cylinder to the LOCK position.

Once the system is pre-armed, there is a 11-second countdown before the perimeter alarm is armed. Each entry point to the vehicle (hood, door, or liftgate/luggage compartment) are armed separately and must be closed before that entry point begins the 11-second countdown to become armed. If all entry points (hood, doors, and liftgate/luggage compartment) are closed, the turn signals flash indicating all entry points are entering the 11-second countdown.

Disarming the Perimeter Alarm

The perimeter alarm can be disarmed by:

- pressing the UNLOCK button on a programmed RKE transmitter.
- pressing the liftgate/luggage compartment release button on a programmed RKE transmitter.
- turning the driver door lock cylinder to the unlock position.
- using a programmed key to transition the ignition to the RUN mode.
- unlock the driver door or all doors using the IA feature.

Intelligent Access (IA) Key Disable

For security reasons, when the perimeter alarm enters an armed state, theRemote Function Actuator (RFA) module searches the interior of the vehicle for any programmed IA keys. If the RFA module detects any programmed IA keys inside the vehicle when the perimeter alarm is armed, it disables the IA key. The RKE and the IA functions of that key still operate, but the RFA module ignores any start command associated with

that key. The disabled IA key is enabled when the perimeter alarm is disarmed by pressing the RKE unlock button on the IA key, using the IA feature to unlock the doors, or by using the mechanical key blade in the door lock cylinder to unlock the doors.

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 NUD105-R025D or equivalent

Principles of Operation

The Body Control Module (BCM) controls the operation of the perimeter alarm based on the following inputs:

- door ajar switches
- hood ajar
- driver door lock cylinder
- door lock control switch
- Passive Anti-Theft System (PATS) input
- and the Remote Keyless Entry (RKE) transmitters

On vehicles equipped with Intelligent Access (IA) the BCM receives the RKE transmitter and IA input from the Remote Function Actuator (RFA) module over the Medium Speed Controller Area Network (MS-CAN). If the perimeter alarm is armed, and the BCM receives an input indicating an unauthorized entry into the vehicle or the ignition is turned to the RUN position without a programmed PATS key, the BCM activates the perimeter alarm. When the perimeter alarm is activated, the anti-theft horn sounds and the turn signals flash in regular intervals. The traffic horn does not sound during a perimeter alarm event.

Battery Disconnect

If the battery is disconnected and then reconnected, the perimeter alarm remains in the same state (disarmed, pre-armed, armed, or activated) it was prior to the battery disconnect.

Alarm Event PIDs

The BCM has PIDs available that show what caused the last alarm events. The 5 BCM alarm event PIDs are ALARM_1 through 5. The cause for the most recent alarm activation is always listed in the first alarm event PID. These PIDs display what caused the alarm to activate and can be a very useful tool when trying to identify the cause of a false alarm activation.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
• Wiring, terminals or connectors • Hood switch

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 .
   - cefer 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 BCM .

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

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B10B1:92	Cabin Set/Reset Switch: Performance or Incorrect Operation	GO to Pinpoint Test A .
P254F:00	Engine Hood Switch Circuit/Open: No Sub Type Information	GO to Pinpoint Test C .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

Symptom Chart

ConditionPossible SourcesAction

- The alarm system does not arm/disarm from the driver door lock cylinder

- Wiring, terminals or connectors
- Driver door set/reset switch (part of the door latch)
- Body Control Module (BCM)

- GO to Pinpoint Test A

- The alarm system does not activate from an unauthorized entry at the hood

- Wiring, terminals or connectors
- Hood switch (part of the hood latch)
- BCM

- GO to Pinpoint Test B .

- The alarm system does not activate from an unauthorized entry at a door

- Door ajar input

- Refer to section Section 417-02 to diagnose the door ajar switch inputs.

- The alarm system does not activate from an unauthorized entry at the liftgate/luggage compartment

- Liftgate/luggage compartment ajar input

- Refer to section Section 417-02 to diagnose the liftgate/luggage compartment ajar switch inputs.

- The alarm system does not arm/no turn signal flash confirmation

- Door ajar input
- Hood ajar input
- Liftgate/luggage compartment ajar input
- Turn signals
- Remote Keyless Entry (RKE) transmitter concern
- BCM

- GO to Pinpoint Test D .

- No horn output during alarm activation

- Wiring, terminals or connectors
- Anti-theft alarm horn
- BCM

- GO to Pinpoint Test E .

- The anti-theft alarm horn is always on

- Wiring, terminals or connectors
- BCM

- GO to Pinpoint Test F .

- No turn signal flash during alarm activation

- Turn signals

- REFER to Section 417-01 to diagnose the turn signals.

- False alarm activation

- Door ajar input
- Hood ajar input
- Liftgate/luggage compartment ajar input
- A valid Passive Anti-Theft System (PATS) key read is **NOT** received when the ignition is turned to RUN

- An intermittent fault exists. MONITOR the BCM alarm event PIDs ALARM_1 through 5 to identify and isolate the cause of the last alarm activations.

Pinpoint Tests

Pinpoint Test A: The Alarm System Does Not Arm/Disarm From The Driver Door Lock Cylinder

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

Normal Operation

The Body Control Module (BCM) monitors the driver door lock through the set/reset switch (part of the driver door latch) and the set and reset input circuits. When a key in the door lock cylinder is turned to the LOCK position it grounds the set circuit signaling the BCM to arm the alarm. When a key in the door lock cylinder is turned to the UNLOCK position it grounds the reset circuit signaling the BCM to disarm the alarm. The driver door latch uses a dedicated ground circuit for the door ajar and set/reset switches.

- B10B1:92 (Cabin Set/Reset Switch: Performance or Incorrect Operation) - a continuous and on-demand DTC that sets when the BCM detects a short to ground on the driver door lock cylinder set or reset input circuits.

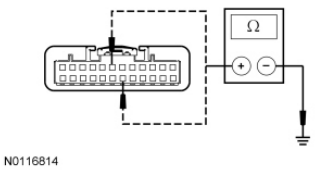
This pinpoint test is intended to diagnose the following:

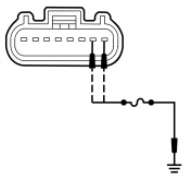
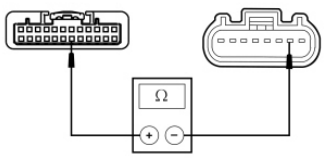
- Wiring, terminals or connectors

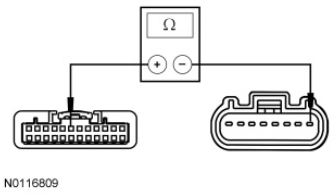
- Door set/reset switch (part of the driver door latch)
- BCM

PINPOINT TEST A: THE ALARM SYSTEM DOES NOT ARM/DISARM FROM THE DRIVER DOOR LOCK CYLINDER

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
A1 CHECK THE RECORDED BCM DTCs FROM THE SELF-TEST	
• Check the recorded results from the BCM self-test. • **Is DTC B10B1:92 present?**	**Yes** GO to A2 . **No** GO to A4 .
A2 CHECK THE DRIVER DOOR LATCH FOR A SHORT TO GROUND	
• Disconnect: Driver Door Latch C525. • Clear the BCM DTCs. • Repeat the BCM self-test. • **Is DTC B10B1:92 still present?**	**Yes** GO to A3 . **No** INSTALL a new driver door latch. REFER to Section 501-14 . TEST the system for normal operation.
A3 CHECK THE SET/RESET CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280G. • Measure the resistance between the BCM C2280G-6, circuit CPL29 (YE/GY), harness side and ground, and between the BCM C2280G-19, circuit CPL28 (VT/BN), harness side and ground  N0116814 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to A7 . **No** REPAIR the circuit in question for a short to ground. CLEAR the DTCs. TEST the system for normal operation.
A4 CHECK THE COURTESY LAMP OPERATION	
• Open and close the driver door while checking the courtesy lamp operation. • **Do the courtesy lamps operate correctly?**	**Yes** GO to A5 . **No**

	REFER to Section 417-02 to diagnose the driver door ajar input concern.
A5 CHECK THE DRIVER DOOR LATCH	
• Disconnect: Driver Door Latch C525. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM PID (KCS_DRVR) while connecting and disconnecting a fused jumper wire between the driver door latch C525-1 CPL29 (YE/GY), harness side and ground, and between the driver door latch C525-2 CPL28 (VT/BN), harness side and ground  N0116807 • **Does the PID indicate LOCK and UNLOCK when the jumper wire is connected?**	**Yes** INSTALL a new driver door latch. REFER to Section 501-14 . TEST the system for normal operation. **No** GO to A6 .
A6 CHECK THE SET/RESET CIRCUITS FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280G. • If the PID did not indicate UNLOCK, measure the resistance between the BCM C2280G-19, circuit CPL28 (VT/BN), harness side and the driver door latch C525-2, circuit CPL28 (VT/BN), harness side.  N0116808 • If the PID did not indicate LOCK, measure the resistance between the BCM C2280G-6, circuit CPL29 (YE/GY), harness side and the driver door latch C525-1, circuit CPL29 (YE/GY), harness side.	**Yes** GO to A7 . **No** REPAIR the circuit in question for an open. TEST the system for normal operation.

 N0116809 • **Is the resistance less than 5 ohms?**	
A7 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 B: The Alarm System Does Not Activate From An Unauthorized Entry At The Hood

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

Normal Operation

When the alarm system is armed, the Body Control Module (BCM) monitors the hood ajar switch. If the hood is opened while the alarm is armed, the hood ajar switch removes ground from the signal circuit. This signals the BCM that an unauthorized intrusion to the engine compartment has occurred and the alarm is activated.

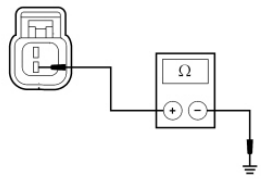
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Hood switch (part of the hood latch)
- BCM

PINPOINT TEST B: THE ALARM SYSTEM DOES NOT ACTIVATE FROM AN UNAUTHORIZED ENTRY AT THE HOOD

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
B1 RETRIEVE THE RECORDED DTCs IN THE BCM	
NOTE: DTC P254F:00 sets if the hood is open. Make sure the hood is closed prior to running	**Yes** GO to Pinpoint Test C .

the self-test. • Retrieve the recorded DTCs from the BCM self-test. • **Is DTC P254F:00 present?**	**No** GO to B2 .
B2 CHECK THE HOOD SWITCH (HOOD_SW) PID	
• Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM PID (HOOD_SW) while disconnecting the hood switch. • Disconnect: Hood Switch C127. • **Does the BCM PID read AJAR when the switch is disconnected?**	**Yes** INSTALL a new hood latch. REFER to Section 501-14 . TEST the system for normal operation. **No** GO to B3 .
B3 CHECK THE HOOD SWITCH INPUT CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280D. • Measure the resistance between the hood switch C127-2, circuit CPL25 (BU/OG), harness side and ground.  N0058785 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to B4 . **No** REPAIR circuit CPL25 (BU/OG) for a short to ground. TEST the system for normal operation.
B4 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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: DTC P254F:00

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

When the alarm system is armed, the Body Control Module (BCM) monitors the hood ajar switch. If the hood is opened while the alarm is armed, the hood ajar switch removes ground from the signal circuit. This signals the BCM that an unauthorized intrusion to the engine compartment has occurred and the perimeter alarm is activated.

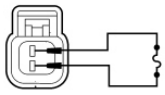
- DTC P254F:00 (Engine Hood Switch Circuit / Open: No Sub Type Information) - an on-demand DTC that sets when the BCM detects an open in the hood switch circuit during the self-test. This DTC sets if the hood is open during a self-test

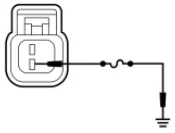
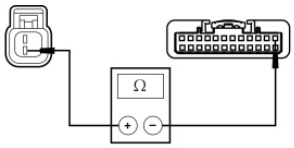
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Hood switch
- BCM

PINPOINT TEST C: DTC P254F:00

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
C1 CHECK THE HOOD SWITCH	
• Disconnect: Hood Switch C127. • Connect a fused jumper wire between the hood switch C127-2, circuit CPL25 (BU/OG), harness side and the hood switch C127-1, circuit GD187 (BK/GN), harness side.  N0058786 • Clear the BCM DTCs. • Repeat the BCM self-test. • **Is the BCM DTC P254F:00 retrieved?**	**Yes** REMOVE the jumper wire. GO to C2 . **No** REMOVE the jumper wire. INSTALL a new hood latch. REFER to Section 501-14 . TEST the system for normal operation.
C2 CHECK THE HOOD SWITCH GROUND CIRCUIT	
• Connect a fused jumper wire between the hood switch C127-2, circuit CPL25 (BU/OG), harness side and ground.	**Yes** GO to C3 . **No** REPAIR circuit GD187 (BK/GN) for an open. TEST the system for normal operation.

 N0116813 • Clear the BCM DTCs. • Repeat the BCM self-test. • **Is the BCM DTC P254F:00 retrieved?**	
C3 CHECK THE HOOD SWITCH SIGNAL CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: BCM C2280D. • Measure the resistance between the hood switch C127-2, circuit CPL25 (BU/OG), harness side and the BCM C2280D-12, circuit CPL25 (BU/OG), harness side.  N0116810 • **Is the resistance less than 5 ohms?**	**Yes** GO to C4 . **No** REPAIR circuit CPL25 (BU/OG) for an open. CLEAR the DTCs. REPEAT the self-test.
C4 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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: The Alarm System Does Not Arm/No Turn Signal Flash Confirmation

Normal Operation

The Body Control Module (BCM) controls the perimeter alarm system and based on inputs either arms, disarms or activates the alarm. When the alarm is activated, the BCM sounds the anti-theft horn and flashes the turn signals at regular intervals. The BCM receives inputs for the door lock status, hood ajar, door ajar and the liftgate/luggage compartment lid ajar. The BCM also receives signals from the Remote Keyless Entry (RKE) transmitters.

For the perimeter alarm to arm and provide a flash of the turn signals, the following conditions must be met:

- ignition must be off
- the hood closed
- all doors closed
- the liftgate/luggage compartment closed
- an electronic lock command received from a Remote Keyless Entry (RKE) transmitter, driver door lock cylinder, or door lock control switch (front door opened and then shut after lock is pressed).
- An Intelligent Access (IA) lock command received (if equipped with IA)

Once all the conditions are met, the alarm system enters a pre-arm phase and begins a 11-second countdown. The perimeter alarm arms after 11 seconds have passed and no unlock command is received or any hood, door or liftgate/luggage compartment is opened.

The perimeter alarm is triggered when any door, the hood, or the liftgate/luggage compartment is opened without first receiving an electronic unlock command from a RKE transmitter, the driver door lock cylinder, or an IA unlock. The perimeter alarm also activates if the ignition is turned to RUN without a valid Passive Anti-Theft System (PATS) key read received.

This pinpoint test is intended to diagnose the following:

- Door ajar input
- Hood ajar input
- Liftgate/luggage compartment ajar input
- Turn signals
- RKE transmitter concern
- BCM

PINPOINT TEST D: THE ALARM SYSTEM DOES NOT ARM/NO TURN SIGNAL FLASH CONFIRMATION

Test Step	Result / Action to Take
D1 RETRIEVE THE RECORDED DTCs IN THE BCM	
• Retrieve the recorded DTCs from the BCM self-test. • **Is DTC P254F:00 present?**	**Yes** GO to Pinpoint Test C . **No** GO to D2 .
D2 CHECK THE COURTESY LAMP OPERATION	
• Open and close all the doors and liftgate/luggage compartment while checking the courtesy lamp operation. • **Do the courtesy lamps operate correctly?**	**Yes** GO to D3 . **No** REFER to Section 417-02 to diagnose the ajar inputs.
D3 VERIFY THE HAZARD LAMP OPERATION	
• Place the hazard switch in the ON position. • **Do the hazard lamps operate correctly?**	**Yes** GO to D4 . **No** REFER to Section 417-01 to diagnose the hazard lamps.

D4 CHECK THE RKE TRANSMITTER FUNCTION	
• Using the RKE transmitter, lock and unlock the doors. • **Do the RKE transmitter functions operate correctly?**	**Yes** GO to D5 . **No** REFER to Section 501-14 to diagnose the RKE function.
D5 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 E: No Horn Output During Alarm Activation

Normal Operation

The Body Control Module (BCM) receives voltage for the anti-theft alarm horn from the Battery Junction Box (BJB) fuse 6 (30A). When the perimeter alarm is activated, the BCM cycles voltage on and off to the anti-theft horn causing the horn output to cycle in conjunction with the turn signals flashing. The horn is case grounded.

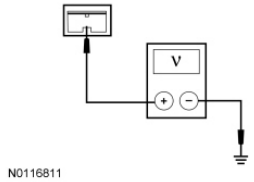
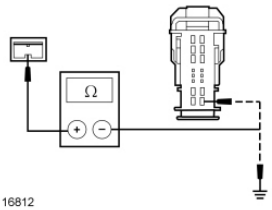
NOTE: The traffic horn does not sound during a perimeter alarm event.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Anti-theft alarm horn
- BCM

PINPOINT TEST E: NO HORN OUTPUT DURING ALARM ACTIVATION

Test Step	Result / Action to Take
E1 CHECK THE POWER DOOR LOCK OPERATION	
• Press the door lock control switch twice. • **Do the doors lock and unlock?**	**Yes** GO to E2 . **No** REFER to Section 501-14 to diagnose the power door locks.
E2 CHECK FOR VOLTAGE TO THE ANTI-THEFT HORN	

• Disconnect: Anti-Theft Alarm Horn C4380. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Measure the voltage between the anti-theft alarm horn C4380-1, circuit CRT02 (GY/VT), harness side and ground while active commanding the BCM PID (ANTITHFT_HRN) on.  N0116811 • **Is the voltage momentarily greater than 10 volts?**	**Yes** INSTALL a new anti-theft alarm horn. REFER to Anti-Theft Alarm Horn - 4-Door Sedan or Anti-Theft Alarm Horn - 5-Door Hatchback in this section. TEST the system for normal operation. **No** GO to E3 .
E3 CHECK THE ANTI-THEFT HORN OUTPUT CIRCUIT FOR AN OPEN OR SHORT TO GROUND	
• Ignition OFF. • Disconnect: BCM C2280C. • Measure the resistance between the anti-theft alarm horn C4380-1, circuit CRT02 (GY/VT), harness side and the BCM C2280C-8, circuit CRT02 (GY/VT), harness side; and between the anti-theft alarm horn C4380-1, circuit CRT02 (GY/VT), harness side and ground.  N0116812 • **Is the resistance less than 5 ohms between the anti-theft alarm horn and the BCM , and greater than 10,000 ohms between the anti-theft alarm horn and ground?**	**Yes** GO to E4 . **No** REPAIR circuit CRT02 (GY/VT) for an open or short to ground. TEST the system for normal operation.
E4 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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 F: The Anti-Theft Alarm Horn Is Always On

Normal Operation

The Body Control Module (BCM) receives voltage for the anti-theft alarm horn from the Battery Junction Box (BJB) fuse 6 (30A). When the perimeter alarm is activated, the BCM cycles voltage on and off to the horn causing the anti-theft horn output to cycle in conjunction with the turn signals flashing. The horn is case grounded.

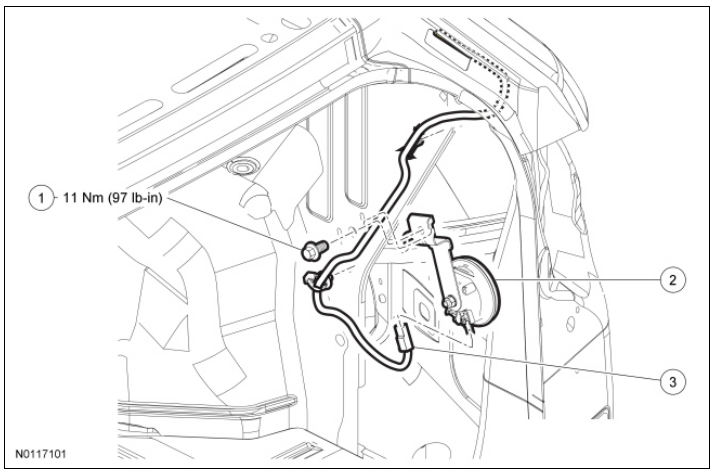
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- BCM

PINPOINT TEST F: THE ANTI-THEFT ALARM HORN IS ALWAYS ON

Test Step	Result / Action to Take
F1 ISOLATE THE SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: BCM C2280C. • Ignition ON. • **Does the anti-theft alarm horn continue to sound?**	**Yes** REPAIR circuit CRT02 (GY/VT) for a short to voltage. TEST the system for normal operation. **No** GO to F2 .
F2 CHECK FOR CORRECT BCM OPERATION	
• Disconnect all the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the BCM 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 BCM . 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.

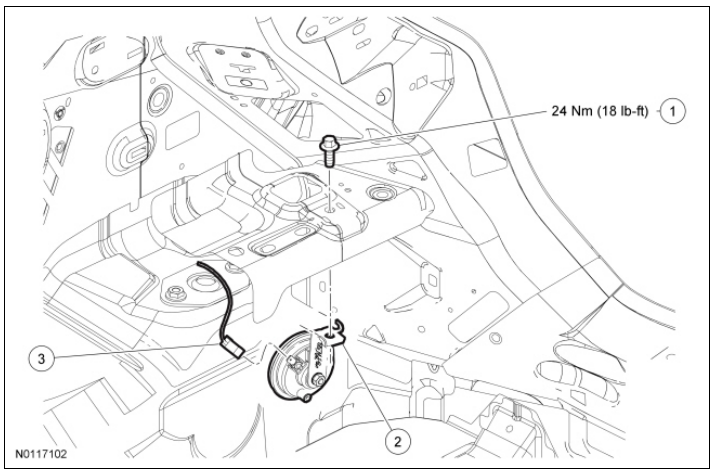
Anti-Theft Alarm Horn - 4-Door Sedan



Item	Part Number	Description
1	W702498	Anti-theft alarm horn bolt
2	13832	Anti-theft alarm horn
3	-	Anti-theft alarm horn electrical connector (part of 14A005)

1. Remove the RH luggage compartment trim panel for access.

Anti-Theft Alarm Horn - 5-Door Hatchback



Item	Part Number	Description
1	W702498	Anti-theft alarm horn bolt
2	13832	Anti-theft alarm horn
3	-	Anti-theft alarm horn electrical connector (part of 14A005)

1. Remove the LH quarter trim panel for access. For additional information, refer to Section 501-05 .

Anti-Theft

Passive Anti-Theft System (PATS) Without Intelligent Access (IA)

Passive Anti-Theft System (PATS) consists of the following components:

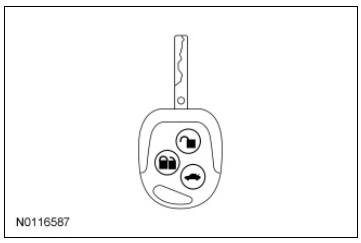
- Anti-theft indicator
- Integrated Keyhead Transmitter (IKT)
- PATS transceiver (located next to the ignition lock cylinder)
- Instrument Panel Cluster (IPC)
- PCM

PATS protects the vehicle from theft by preventing the engine from starting unless a programmed IKT is used.

Passive Anti-Theft System (PATS) Operation

PATS prevents the engine from starting by disabling the starter relay and fuel injector operation. If an unprogrammed key is used or if there is a PATS system concern, the anti-theft indicator in the IPC flashes rapidly and the engine will not start. PATS cannot disable an already running engine.

Passive Anti-Theft System (PATS) Keys



The vehicle comes equipped from the factory with two programmed IKTs . The IKT incorporates both the PATS and Remote Keyless Entry (RKE) transmitter functions in a single device. The key programming is a two step procedure. PATS information is programmed into the IPC and then the RKE transmitter is programmed into the BCM . The IPC accepts the programming of an unlimited number of keys, and the BCM accepts the programming of up to 8 keys. Refer to Key Programming Using Diagnostic Equipment in this section for PATS programming, and then refer to Remote Keyless Entry (RKE) Transmitter Programming in Section 501-14 to program the RKE transmitter.

Passive Anti-Theft System (PATS) With Intelligent Access (IA)

The Passive Anti-Theft System (PATS) consists of the following components:

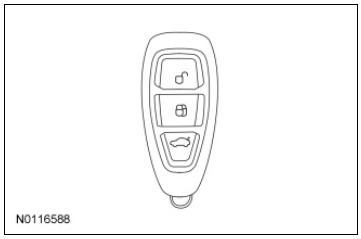
- IA key
- Front passive start antenna (located in the front of the floor console just below the HVAC controls)
- Center passive start antenna (located on the bottom of the rear of the floor console)
- Rear passive start antenna (located behind the rear seat bottom cushion)
- PATS /backup transceiver (located in the steering column)

- Remote Functions Receiver (RFR) module (located on the top of the headliner in the front)
- Remote Function Actuator (RFA) module
- PCM

Intelligent Access (IA) Passive Anti-Theft System (PATS) Operation

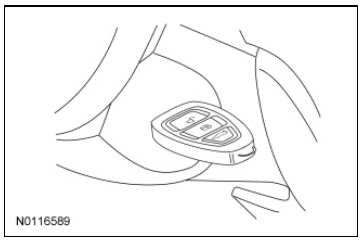
The IA PATS prevents the ignition from transitioning out of the off mode unless a programmed IA key is detected inside the vehicle. If no programmed key is detected inside the vehicle when the START/STOP button is pressed, KEY NOT DETECTED is displayed in the Front Control/Display Interface Module (FCDIM). PATS cannot turn the ignition off or disable an already running engine.

Intelligent Access (IA) Keys



The vehicle is equipped with 2 IA keys. The IA key incorporates both the PATS and the RKE transmitter functions in a single device. The IA key must be located inside the vehicle for vehicle starting. During key programming procedures, the PATS and RKE transmitter of an IA key are both programmed into the RFA module. The RFA module accepts programming of up to 8 IA keys. Refer to Key Programming Using Diagnostic Equipment in this section for key programming information.

PATS /Backup Transceiver



The PATS /backup transceiver is located in the steering column in the same location as a vehicle equipped without IA . If the vehicle does not start normally, place the IA key next to the steering column shroud and attempt to start the vehicle.

Intelligent Access (IA) with Push Button Start Ignition Modes

The IA feature does not require a conventional key to enter or start the vehicle. Once inside the vehicle, the operator activates one of the ignition modes using the brake pedal (automatic transaxle) or clutch pedal (manual transaxle) and the push button start (START/STOP) switch, as follows:

Intelligent Access (IA) with Push Button Start Ignition Modes

Ignition Entry Condition	Desired Ignition Modes	Action
Ignition off	On (engine off)	

		Press the START/STOP switch without pressing the brake or clutch pedal.
Any ignition mode	Start	Press and hold the brake or clutch pedal and then push the START/STOP switch.
On (engine off)	Ignition off	Push the START/STOP switch.
On (engine running and vehicle in motion)	Ignition off	Press and hold the START/STOP switch for approximately 1 second.

Anti-Theft - Without Intelligent Access (IA)

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
	Flex Probe Kit NUD105-R025D or equivalent

Principles of Operation

Passive Anti-Theft System (PATS) Operation

The Passive Anti-Theft System (PATS) is controlled by the Instrument Panel Cluster (IPC). There are two main checks that PATS performs before allowing the engine to start. If either of these checks fail, PATS does not allow the engine to start and the anti-theft indicator in the IPC flashes rapidly. These two checks are the IPC verifying the PCM ID to make sure it matches the PCM ID stored in memory and to verify that a programmed key was used to turn the ignition to the RUN or START position.

The first check is initiated when the ignition is turned to the RUN or START position. Once the IPC determines the ignition has been turned to the RUN or START position, it generates a challenge message. It sends this challenge message to the PATS transceiver on the transmit (TX) circuit. The transceiver in turn reads the key and generates a response message that is sent back to the IPC on the receive (RX) circuit. The engine does not start if the message received from the transceiver does not match a key stored in the IPC memory.

Once the IPC determines a programmed key was used to turn the ignition to RUN or START, the IPC sends the PCM a challenge message over the High Speed Controller Area Network (HS-CAN). When the PCM receives the challenge message, it generates a response and sends it back to the IPC . The engine does not start if the response from the PCM does not match the response in the IPC memory.

If both the key verification and PCM ID pass, PATS is enabled the engine is allowed to start. PATS cannot disable an engine that has already been started.

Spare Key Programming

The customer spare key programming allows spare keys to be programmed (up to a maximum of 8) to the IPC without having to use a scan tool. Two programmed keys are required to carry out the procedure. Refer to Key Programming - Program a Key Using Two Programmed Keys in this section for the customer spare key programming procedure.

Passive Anti-Theft System (PATS) PIDs

The Passive Anti-Theft System (PATS) PIDS are a useful tool when diagnosing a PATS concerns.

IPC PATS PID	PID Description	PID reading required for PATS to be enabled
MASRKEY	Determines if the key in the ignition lock cylinder is a programmed key.	Present
MIN_KEYS	Minimum number of programmed keys required. This PID always reads 2.	-
N_KEYCODE	Number of keys currently programmed into the Instrument Panel Cluster (IPC).	2 to 8
PATSENABL	Indicates if PATS will allow the engine to start.	Enabled
PCM_ID	Indicates if there is a PCM ID currently stored into the IPC .	Stored
PCM_VFY	Indicates if the PCM ID received by the IPC matches the PCM ID stored in the IPC memory.	Yes

Inspection and Verification

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

Visual Inspection Chart

Mechanical	Electrical
• Large metallic objects or electronic devices on the key ring that can be used to purchase gasoline or similar items • PATS key • Use of a non- PATS key or incorrect PATS key • More than one PATS key on key ring • Aftermarket remote start system installed	• Central Junction Box (CJB) fuse 21 (10A) • Wiring, terminals or connectors • PCM

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 Instrument Panel Cluster (IPC) and PCM.

9. If the DTCs retrieved are related to the concern, go to the IPC DTC Chart or the PCM DTC Chart. For all other IPC DTCs, refer to Section 413-01 . For all other PCM DTCs, refer to Section 303-14 .

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

DTC Charts

Instrument Panel Cluster (IPC) DTC Chart

DTC	Description	Action
B10D5:94	PATS Antenna: Unexpected Operation	The IPC received an incomplete or corrupt response from the transceiver. INSTALL a new transceiver, REFER to Passive Anti-Theft System (PATS) Transceiver in this section.
B10D7:05	PATS Key: System Programming Failure	GO to Pinpoint Test A .
B10D7:51	PATS Key: Not Programmed	There is an unprogrammed PATS key. PROGRAM the PATS key. REFER to Key Programming - Program a Key Using Two Programmed Keys or Key Programming Using Diagnostic Equipment in this section.
B10D7:81	PATS Key: Invalid Serial Data Received	GO to Pinpoint Test B .
B10D7:87	PATS Key: Missing Message	GO to Pinpoint Test C .
B10D7:94	PATS Key: Unexpected Operation	GO to Pinpoint Test B .
B10D8:00	PATS Key Less Than Minimum Programmed: No Sub Type Information	Less than 2 keys are programmed into the IPC . CYCLE the customer's second key in the ignition to program (when less than 2 keys are programmed, the IPC automatically programs the first 2 keys that are cycled in the ignition).

B10DA:51	PATS Target Identifier: Not Programmed	There is no PCM ID stored in the IPC . CARRY OUT a parameter reset. REFER to Passive Anti-Theft System (PATS) Parameter Reset in this section. CLEAR the DTCs. REPEAT the self-test.
B10DA:62	PATS Target Identifier: Signal Compare Failure	The PCM ID received by the IPC does not match the ID stored in the IPC memory. CARRY OUT a parameter reset. REFER to Passive Anti-Theft System (PATS) Parameter Reset in this section. CLEAR the DTCs. REPEAT the self-test.
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

PCM DTC Chart

DTC	Description	Action
U0167:00	Lost Communication With Vehicle Immobilizer Control Module: No Sub Type Information	GO to Pinpoint Test D .
U0426:00	Invalid Data Received From Vehicle Immobilizer Control Module: No Sub Type Information	GO to Pinpoint Test D .
All other DTCs	-	REFER to Section 303-14 .

Symptom Chart

Pinpoint Tests

Pinpoint Test A: DTC B10D7:05

Normal Operation

When the Instrument Panel Cluster (IPC) enters a key programming state, it activates the transceiver to read the key in the ignition. The key is programmed into the IPC memory if a valid Passive Anti-Theft System (PATS) key is used and there are no concerns with the PATS .

- DTC B10D7:05 (PATS Key: System Programming Failure) - a continuous DTC that sets when a PATS key is unsuccessfully programmed into the IPC .

This pinpoint test is intended to diagnose the following:

- PATS key

PINPOINT TEST A: DTC B10D7:05

• Check the recorded results from the IPC self-test. • **Is DTC B10D5:94, B10D7:81, B10D7:87, or B10D7:94 retrieved?**	**Yes** REFER to the IPC DTC Chart in this section. RESOLVE these DTCs first. **No** GO to A2 .
A2 CHECK THE PATS KEY	
• Verify the correct PATS keys are used with the vehicle. Compare the key with the one shown in Anti-Theft in the Description and Operation portion of this section. • **Are the correct keys being used?**	**Yes** ATTEMPT to program the key again. If key programming fails, DISCARD the damaged key and PROGRAM a new key. REFER to Key Programming - Program a Key Using Two Programmed Keys or Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. **No** OBTAIN the correct key(s) for the vehicle. PROGRAM the new key(s). REFER to Key Programming - Program a Key Using Two Programmed Keys or Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test B: DTC B10D7:81 or B10D7:94

Normal Operation

When the ignition is turned to the RUN or START position, the Instrument Panel Cluster (IPC) activates the transceiver to read the key in the ignition. If the IPC does not receive a PATS key code or if the code is invalid, PATS is disabled and the engine does not start.

- DTC B10D7:81 (PATS Key: Invalid Serial Data Received) - a continuous and on-demand DTC that sets when there is a partial or corrupt PATS key read.
- DTC B10D7:94 (PATS Key: Unexpected Operation) - a continuous and on-demand DTC that sets when there is no PATS key read. This DTC sets if a non- PATS key is used to turn the ignition on.

This pinpoint test is intended to diagnose the foing:

- PATS key
- PATS transceiver

PINPOINT TEST B: DTC B10D7:81 OR B10D7:94

NOTE: Large metallic objects or 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 vehicle starting concerns 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.

NOTE: Aftermarket or dealer-installed remote start systems may adversely affect the PATS operation. Disconnect these systems before diagnosing any PATS concerns.

Test Step	Result / Action to Take
B1 CHECK THE PATS KEYS	
• Verify the correct PATS keys are used with the vehicle. Compare the keys with the one shown in Anti-Theft in the Description and Operation portion of this section. • **Are the correct keys being used?**	**Yes** GO to B2 . **No** OBTAIN the correct key(s) for the vehicle. PROGRAM the new key(s). REFER to Key Programming - Program a Key Using Two Prrammed Keys or Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.
B2 ISOLATE THE PATS KEYS	
• **NOTE:** Follow this procedure using both PATS keys (using one at a time). • Place a PATS key in the ignition and turn to the RUN position. • Enter the following diagnostic mode on the scan tool: Clear IPC Continuous DTCs. • Cycle the ignition from RUN to OFF and then back to the RUN position. • Enter the following diagnostic mode on the scan tool: BCM Self-Test. • **Is DTC B10D7:81 or B10D7:94 retrieved for both keys?**	**Yes** INSTALL a new PATS transceiver. REFER to Passive Anti-Theft System (PATS) Transceiver in this section. CLEAR the DTCs. REPEAT the self-test. **No** DISCARD the key in question and PROGRAM a new key. REFER to Key Programming - Program a Key Using Two Programmed Keys or Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test C: DTC B10D7:87

Refer to Wiring Diagrams Cell 112 , Passive Anti-Theft System for schematic and connector information.

Normal Operation

The Central Junction Box (CJB) fuse 21 (10A) supplies voltage to the Passiventi-Theft System (PATS) transceiver. When the ignition is turned to the RUN or START position, the Instrument Panel Cluster (IPC) initiates the key interrogation sequence. The IPC starts the interrogation sequence by generating a signal and sending that signal to the transceiver on the transmit (TX) circuit. When the transceiver receives the signal from the IPC , it reads the PATS key and generates a challenge response to the IPC signal on the receive (RX) circuit.

- DTC B10D7:87 (PATS Key: Missing Message) - a continuous and on-demand DTC that sets when the IPC does not receive a response from the PATS transceiver.

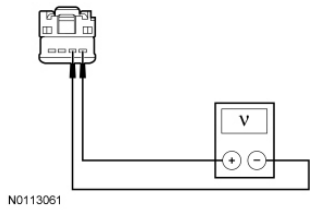
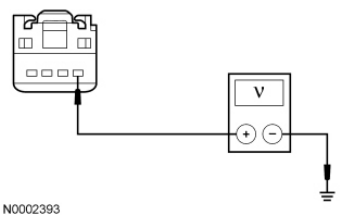
This pinpoint test is intended to diagnose the following:

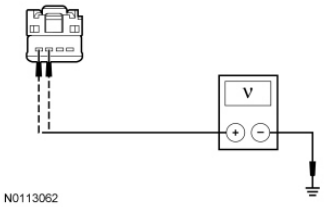
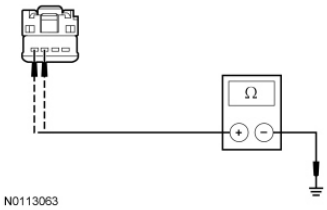
- Fuse

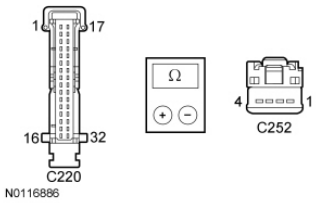
- Wiring, terminals or connectors
- PATS transceiver
- IPC

PINPOINT TEST C: DTC B10D7:87

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
C1 CHECK FOR VOLTAGE TO THE PATS TRANSCEIVER	
• Disconnect: PATS Transceiver C252. • Ignition ON. • Measure the voltage between the PATS transceiver C252-1, circuit CBP13 (GY/BN), harness side and the PATS transceiver C252-2, circuit GD115 (BK/GY).  N0113061 • **Is the voltage greater than 10 volts?**	**Yes** GO to C3 . **No** GO to C2 .
C2 CHECK THE PATS TRANSCEIVER VOLTAGE SUPPLY CIRCUIT	
• Measure the voltage between the PATS transceiver C252-1, circuit CBP13 (GY/BN), harness side and ground.  N0002393 • **Is the voltage greater than 10 volts?**	**Yes** REPAIR circuit GD115 (BK/GY) for an open. CLEAR the DTCs. REPEAT the self-test. **No** VERIFY the CJB fuse 21 (10A) is OK. If OK, REPAIR circuit CBP13 (GY/BN) for an open. If not OK, REFER to the Wiring Diagrams mannual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test.
C3 CHECK THE PATS TRANSCEIVER CIRCUITS FOR A SHORT TO VOLTAGE	

• Ignition OFF. • Disconnect: IPC C220. • Ignition ON. • Measure the voltage between the PATS transceiver C252-3, circuit VRT24 (YE/OG), harness side and ground; and between the PATS transceiver C252-4, circuit VRT23 (VT/GY), harness side and ground.  N0113062 • **Is any voltage present?**	**Yes** REPAIR the circuit in question for a short to voltage. CLEAR the DTCs. REPEAT the self-test. **No** GO to C4 .
C4 CHECK THE PATS TRANSCEIVER CIRCUITS FOR A SHORT TO GROUND	
• Ignition OFF. • Measure the resistance between the PATS transceiver C252-3, circuit VRT24 (YE/OG), harness side and ground; and between the PATS transceiver C252-4, circuit VRT23 (VT/GY), harness side and ground.  N0113063 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to C5 . **No** REPAIR the circuit in question for a short to ground. CLEAR the DTCs. REPEAT the self-test.
C5 CHECK THE PATS TRANSCEIVER CIRCUITS FOR AN OPEN	
• Measure the resistance between the IPC , harness side and the PATS transceiver, harness side as follows: **IPC Connector-Pin** / **Circuit** / **PATS Transceiver Connector-Pin** C220-5 / VRT24 (YE/OG) / C252-3 C220-3 / VRT23 (VT/GY) / C252-4	**Yes** INSTALL a new PATS transceiver. REFER to Passive Anti-Theft System (PATS) Transceiver in this section. CLEAR the DTCs. REPEAT the self-test. If DTC B10D7:87 is retrieved again, GO to C6 . **No** REPAIR the circuit in question for an open. CLEAR the DTCs. REPEAT the self-test.

 • **Are the resistances less than 5 ohms?**	
C6 CHECK FOR CORRECT IPC OPERATION	
• Disconnect the IPC connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the IPC connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . 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: DTC U0167:00 or U0426:00

Normal Operation

When the ignition is turned to the RUN or START position, the Instrument Panel Cluster (IPC) and the PCM send each other their ID over the High Speed Controller Area Network (HS-CAN). Each module then checks the ID it receives and compares with the ID stored in memory. If the IDs are missing or invalid, Passive Anti-Theft System (PATS) is disabled and does not allow the engine to start.

- DTC U0167:00 (Lost Communication With Vehicle Immobilizer Control Module: No Sub Type Information) - a continuous DTC that sets when the PCM does not receive any PATS data from the IPC over the HS-CAN . The target ID is only sent once per key cycle and within milliseconds of the ignition being turned to the RUN or START position.
- DTC U0426:00 (Invalid Data Received From Vehicle Immobilizer Control Module: No Sub Type Information) - a continuous DTC that sets when the PCM does not receive the expecterget ID from the IPC over the HS-CAN . The target ID is only sent once per key cycle and within milliseconds of the ignition being turned to the RUN or START position. This DTC also sets if a new PCM has been installed and the PATS Parameter Reset procedure has not been carried out.

This pinpoint test is intended to diagnose the following:

- HS-CAN concern
- Low battery state of charge
- IPC

PINPOINT TEST D: DTC U0167:00 OR U0426:00

Test Step	Result / Action to Take
D1 CHECK THE IPC DTCs FROM THE SELF-TEST	

• Check the recorded results from the IPC self-test. • **Are any IPC DTCs retrieved?**	**Yes** REFER to the IPC DTC Chart in this section. **No** GO to D2 .
D2 CHECK THE BATTERY STATE OF CHARGE	
NOTE: It might be necessary to check battery voltage while cranking the engine to make sure battery voltage is not dropping and causing the concern. • Carry out the Battery Condition Test In Section 414-01 . • **Did the battery pass the Battery Condition Test?**	**Yes** GO to D3 . **No** RECHARGE or REPLACE the battery. REFER to Section 414-01 .
D3 CHECK FOR COMMUNICATION WITH THE IPC	
• Enter the following diagnostic mode on the scan tool: Network Test. • **Does the IPC respond to the scan tool?**	**Yes** GO to D4 . **No** REFER to Section 418-00 .
D4 RECHECK THE PCM DTCs FROM THE SELF-TEST	
• Enter the following diagnostic mode on the scan tool: Clear PCM Continuous DTCs. • Cycle the ignition from RUN to OFF and then back to the RUN position. • Enter the following diagnostic mode on the scan tool: PCM Self-Test. • **Is DTC U0167:87 or U0426:81 retrieved?**	**Yes** GO to D5 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
D5 CHECK FOR CORRECT IPC OPERATION	
• Disconnect the IPC connector. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the IPC connector and make sure it seats correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . 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 E: The Engine Does Not Start

Normal Operation

The Passive Anti-Theft System (PATS) disables the engine from starting by disabling the fuel injectors and starter. When the ignition is turned to the RUN or START position, the PATS reads the PATS key and checks the PCM ID. If an unprogrammed PATS key is used or an invalid PCM ID is received, the PATS disables the engine. If there is a PATS concern that caused the engine to be disabled, the anti-theft indicator flashes in the Instrument Panel Cluster (IPC).

This pinpoint test is intended to diagnose the following:

- Driveability concern
- PATS concern
- Starting system concern

PINPOINT TEST E: THE ENGINE DOES NOT START

Test Step	Result / Action to Take
E1 CHECK FOR COMMUNICATION WITH THE PCM AND THE IPC	
• Carry out the network test using the scan tool. • **Does the scan tool establish communication with the PCM and the IPC ?**	**Yes** GO to E2 . **No** REFER to Section 418-00 to diagnose the module that is not communicating with the scan tool.
E2 CHECK FOR PATS DTCs	
• Enter the following diagnostic mode on the scan tool: IPC Self-Test. • Enter the following diagnostic mode on the scan tool: PCM Self-Test. • **Are any PATS DTCs present?**	**Yes** REFER to the DTC Charts in this section. **No** The no-start condition is not caused by PATS . REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual to diagnose the cause of the no-start condition.

Anti-Theft - With Intelligent Access (IA)

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
	Flex Probe Kit NUD105-R025D or equivalent

Principles of Operation

Push Button Start Components

Passive Start Antennas

There are three passive start antennas. The passive start antennas are hardwired to the Remote Function Actuator (RFA) module and, when activated by the RFA module, they transmit a low frequency signal that activates an Intelligent Access (IA) key.

Passive Anti-Theft System (PATS)/Backup Transceiver

The PATS /backup transceiver is used as a backup device. If the vehicle fails to start conventionally, an IA key can be held in close proximity to the transceiver to allow the vehicle to start. The transceiver is wired to the RFA module and when activated it sends out a signal to activate an IA key. Once the key is activated, it sends a signal back to the transceiver which is then sent to the RFA module.

Remote Functions Receiver (RFR) Module

The Remote Functions Receiver (RFR) module is hardwired to the RFA module and is a receiving antenna that receives the high frequency signals from an IA key. It also receives the signals from an Remote Keyless Entry (RKE) command.

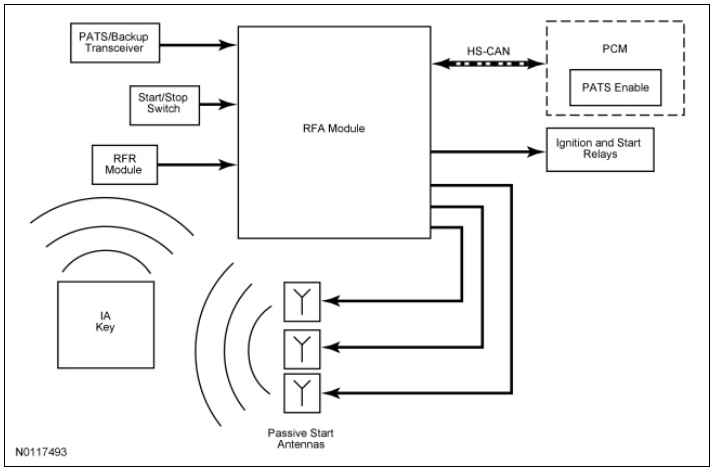
IA Key

The IA receives the low frequency signals from the passive start antennas. When the IA key is activated by one of the low frequency signals, it sends out a high frequency signal that is received by the RFR module. The IA key also contains a key blade that is used to enter the vehicle as a backup.

Start/Stop Switch

The start/stop switch is a momentary contact switch that is hardwired to the RFA module. When the switch is pressed, it signals the RFA module that there is a request to either switch the ignition on or start the engine.

Push Button Start Operation



The Passive Anti-Theft System (PATS) function is controlled by the RFA module and PCM.

When the start/stop switch is pressed, the RFA module initiates the key initialization sequence by activating the 3 interior IA passive start antennas. Each passive start antenna transmits a low frequency signal approximately 1 m (3 ft) radius of each antenna. If an IA key is within range of 1 of the 3 interior passive start antennas, the IA key is activated. Once the IA key is activated, it sends the PATS identification code to the Remote Functions Receiver (RFR) module via a high frequency signal. The RFR module interprets the high frequency signal from the IA key and sends the information to the RFA module over a dedicated network. If the RFA module determines that a programmed IA key is inside the vehicle, it allows the ignition to be transitioned out of off. When the ignition is turned on and the PCM initializes, the RFA module and the PCM exchange their IDs over the High Speed Controller Area Network (HS-CAN). If the RFA module receives a valid key code and the correct ID from the PCM, PATS is enabled and allows the engine to start. If PATS disables the engine from starting, the anti-theft indicator in the IPC flashes rapidly.

PATS and the RKE system share the operation of several components including the IA key and the RFR module. If there is a concern with either of these components, both PATS and the RKE system are affected. Refer to Section 501-14 for information on the RKE and IA features.

The RFA module also controls the ignition modes and in conjunction with the PCM controls the starting system. If there is a concern with starting system or the ignition modes, and PATS has been eliminated as the cause, refer to Section 303-06 for a starting system concern or Section 211-05 for the ignition modes.

Backup Starting

The vehicle can experience a PATS no start ff there is a failure of any passive start antenna, the battery in the IA key, or the RFR module. However, in the event of one of these failures, the IA key can be placed next to the PATS /backup transceiver (located in the steering column) to allow the vehicle to start. If a programmed IA key is near the steering column shroud when the PATS /backup transceiver is activated, it activates the IA key and the identification code is sent back to the RFA module.

Interior Passive Start Antenna Ranges

NOTE: Some brands/types of mobile phone or laptop computer chargers may cause interference that could lead to a PATS no-start if the IA key is within a few inches of the charger. If a concern is observed, move the

IA key away from the charger and attempt to start the vehicle.

There are 3 passive start antennas that are used solely for the purpose of starting the vehicle. They are located in the front of the floor console, in the rear of the floor console, and behind the rear lower seat cushion. When activated, each antenna sends out a low frequency signal with an approximate range of 1 m (3 ft). A programmed IA key must be in range of 1 of the 3 antennas for PATS to operate.

If an IA key is placed in the far outside edges of the interior, like above a sun visor or in a door map pocket, the vehicle might experience a no-start. If the IA key is located in one of these areas and there is a no-start condition, move the IA key out of the area and attempt to start the vehicle. If the key is outside the range of a passive start antenna, KEY NOT DETECTED is displayed in the Front Control/Display Interface Module (FCDIM).

Key Outside Vehicle Message

The KEY OUTSIDE VEHICLE message is displayed in the FCDIM when the engine has been started or the ignition is in the RUN mode and an IA key is no longer detected inside the vehicle. The RFA module activates all passive start antennas to search the inside of the vehicle for an IA key anytime a door or luggage compartment lid/liftgate is opened and then closed. This strategy prevents the IA key from being separated from an already running vehicle. If an IA key is no longer in the vehicle, the ignition remains in RUN and the engine continues to run. If the start/stop switch is pressed to turn the ignition off, the engine can be re-started without an IA key present inside the vehicle for approximately 10 seconds. After 10 seconds an IA key has to be present to start the engine or transition the ignition out of off. If the driver door is opened during the 10-second countdown, the fast restart feature is disabled, and an IA key is needed to start the engine again.

Passive Anti-Theft System (PATS) PIDs

The Passive Anti-Theft System (PATS) PIDS are a useful tool when diagnosing a PATS concerns.

RFA module PATS PID	PID Description	PID reading required for PATS to be enabled
MASTERKEY	Determines if the key inside the vehicle is a programmed key.	Present
MIN_KEYS	Minimum number of programmed keys required. This PID always reads 2.	-
PATSENABL	Indicates if PATS will allow the engine to start.	Enabled
PCM_ID	Indicates if there is a PCM ID currently stored into the Remote Function Actuator (RFA) module.	Stored
PCM_VFY	Indicates if the PCM ID received by the RFA module matches the PCM ID stored in the RFA module memory.	Yes

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Intelligent Access (IA) key • Large metallic objects or electronic devices on the key ring that can be used to purchase gasoline or similar items • Start/stop switch	• Central Junction Box (CJB) fuse 7 (7.5A) • Wiring, terminals or connectors • Mobile phone or laptop computer chargers

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 is in the ON mode.
     - 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.
   - 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, proceed with module self-test diagnostics.

8. Carry out the self-test diagnostics for the RFA module and 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

NOTE: Refer to Description and Operation, Intelligent Access (IA) with Push Button Start in this section to review the procedures for achieving the various ignition states.

Remote Function Actuator (RFA) Module DTC Chart

DTC	Description	Action
B102B:05	Passive Key: System Programming Failure	Less than 2 keys are programmed into the Remote Function Actuator (RFA) module. If other PATS DTCs are present, address them first. If DTC B102B:05 is the only DTC present, PROGRAM a minimum of 2 keys. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.
B10C7:1F	Interior Trunk Antenna: Circuit Intermittent	GO to Pinpoint Test K .
B10C8:1F	Interior Centre Antenna: Circuit Intermittent	GO to Pinpoint Test K .
B10C9:1F	Interior Front Antenna: Circuit Intermittent	GO to Pinpoint Test K .
B10D5:13	PATS Antenna: Circuit Open	The RFA module received an incomplete or corrupt response from the transceiver. INSTALL a new transceiver, REFER to Passive Anti-Theft System (PATS) Transceiver in this section.
B10D6:62	PATS Enable Status: Signal Compare Failure	GO to Pinpoint Test I .
B10D7:05	PATS Key: System Programming Failure	GO to Pinpoint Test F .
B10D7:51	PATS Key: Not Programmed	There is an unprogrammed PATS key. PROGRAM the PATS key. REFER to Key Programming Using Diagnostic Equipment in this section.
B10D7:81	PATS Key: Invalid Serial Data Received	GO to Pinpoint Test G .
B10D8:00	Passive Anti-Theft System (PATS) Key Less Than Minimum Programmed: No Sub Type Information	Less than 2 keys are programmed into the RFA module. If other PATS DTCs are present, address them first. If DTC B10D8:00 is the only DTC present, PROGRAM a minimum of 2 keys. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.
B10D9:87	PATS Transponder: Missing Message	GO to Pinpoint Test H .
B10DA:51	PATS Target Identifier: Not Programmed	There is no PCM ID stored in the RFA module. CARRY OUT a parameter reset of the RFA module and the PCM, then CYCLE the ignition and make an attempt to start the vehicle. REFER to Passive Anti-Theft System (PATS) Parameter Reset in this section. CLEAR the DTCs. REPEAT the self-test.
B10DA:62	PATS Target Identifier: Signal Compare Failure	There is an incorrect PCM ID stored in the RFA module. CARRY OUT a parameter reset of the RFA module and the PCM, then CYCLE the ignition and make an attempt to start the vehicle. REFER to Passive Anti-Theft System (PATS) Parameter Reset in this section. CLEAR the DTCs. REPEAT the self-test.
B10E6:11	PATS Power Supply: Circuit Short To Ground	GO to Pinpoint Test H .
B10E6:12		GO to Pinpoint Test H .

	PATS Power Supply: Circuit Short To Battery	
U0100:87	Lost Communication With ECM/PCM "A": Missing Message	GO to Pinpoint Test I .
U201F:00	External Receiver: No Sub Type Information	GO to Pinpoint Test J .
U201F:13	External Receiver: Circuit Open	GO to Pinpoint Test J .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

PCM DTC Chart

DTC	Description	Action
U0167:00	Lost Communication With Vehicle Immobilizer Control Module: No Sub Type Information	GO to Pinpoint Test N .
U0426:00	Invalid Data Received From Vehicle Immobilizer Control Module: No Sub Type Information	GO to Pinpoint Test N .
All other DTCs	-	REFER to Section 303-14 .

Symptom Chart

NOTE: Refer to Description and Operation, Intelligent Access (IA) with Push Button Start in this section to review the procedures for achieving the various ignition states.

Pinpoint Tests

Pinpoint Test F: DTC B10D7:05

Normal Operation

When the Remote Function Actuator (RFA) module enters a key programming state, it activates the Passive Anti-Theft System (PATS) transceiver to read the key placed next to it. The key is programmed into the RFA module memory if a valid Intelligent Access (IA) key is used and there are no concerns with the PATS .

- DTC B10D7:05 (PATS Key: System Programming Failure) - sets when a IA key is unsuccessfully programmed into the RFA module.

This pinpoint test is intended to diagnose the following:

- IA key
- PATS transceiver

PINPOINT TEST F: DTC B10D7:05

NOTE: At least 2 IA keys must be present prior to carrying out this pinpoint test.

Test Step	Result / Action to Take
RFA MODULE DTCs FROM THE SELF-TEST	
• Check the recorded results from the RFA module self-test. • **Are any RFA module DTCs retrieved?**	**Yes** REFER to the RFA DTC Chart in this section. **No** GO to F2 .
F2 CHECK THE IA KEYS	
• Verify the correct IA keys are used with the vehicle. Compare the IA keys with the one shown in Anti-Theft in the Description and Operation portion of this section. • **Are the correct keys being used?**	**Yes** ATTEMPT to program the key again, REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. If key programming fails, GO to F3 . **No** OBTAIN the correct key(s) for the vehicle. PROGRAM the new key(s). REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.
F3 CHECK BOTH IA KEYS	
• Program both of the IA keys. Refer to Key Programming Using Diagnostic Equipment in this section. • Press the START/STOP switch with each IA key in the vehicle at a time. • **Does the ignition turn on with only one key?**	**Yes** If only one key operates, REPLACE the key that did not program. PROGRAM the new key. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. **No** If both keys do not program, INSTALL a new PATS transceiver. REFER to Passive Anti-Theft System (PATS) Transceiver in this section. PROGRAM the keys. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test G: DTC B10D7:81

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

Normal Operation

When the START/STOP switch is pressed, the Remote Function Actuator (RFA) activates all 3 passive start antennas, which send out a low frequency signal. Each passive start antenna has an approximate range of 1 m (3 ft) and are placed in different locations to provide full coverage inside the vehicle. If an Intelligent Access (IA) key is within range of a passive start antenna, the low frequency signal activates the IA key. When the IA key is activated it sends a high frequency signal to the Remote Functions Receiver (RFR) module. The RFR module communicates with the RFA module. If the RFA module determines that a programmed IA key is in the vehicle, it allows the ignition to transition out of off or let the engine start.

NOTE: Some brands/types of mobile phone or laptop computer chargers may cause interference that could lead to a Passive Anti-Theft System (PATS) no-start if the IA key is within a few inches of the charger. If a concern is observed, move the IA key away from the charger and attempt to start the vehicle.

- DTC B10D7:81 (PATS Key: Invalid Serial Data Received) - sets when the RFA module receives a partial or corrupt IA key code.

This pinpoint test is intended to diagnose the following:

- Environmental interference
- IA key

PINPOINT TEST G: DTC B10D7:81

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
G1 CHECK THE IA KEYS	
• Verify the correct IA keys are used with the vehicle. Compare the keys with the one shown in Anti-Theft in the Description and Operation portion of this section. • **Are the correct keys being used?**	**Yes** GO to G2 . **No** OBTAIN the correct key(s) for the vehicle. PROGRAM the new key(s). REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.
G2 CHECK FOR ENVIRONMENTAL INTERFERENCE	
• Check for the use of any charger or other wireless device that can cause interference with the IA key. If any device is found, remove the device and attempt to start the engine. • **Does the engine start?**	**Yes** INFORM the customer of the cause of the concern and the normal operation of the vehicle. **No** DISCARD the key in question and PROGRAM a new key. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test H: DTC B10D9:87, B10E6:11, or B10E6:12

Refer to Wiring Diagrams Cell 112 , Passive Anti-Theft System for schematic and connector information.

Normal Operation

The Remote Function Actuator (RFA) module supplies voltage to the Passive Anti-Theft System (PATS) transceiver. If the RFA module does not passively detect an Intelligent Access (IA) key, it activates the PATS transceiver as a backup to try and detect a key. The RFA module also activates the PATS transceiver for key programming procedures. The RFA module starts the key interrogation sequence by supplying voltage to the transceiver. Once the transceiver is powered up, the RFA module generates a signal and sends that signal to the transceiver on the transmit (TX) circuit. When the transceiver receives the signal from the RFA module, it reads the PATS key and generates a challenge response to the RFA module signal and sends this response on the receive (RX) circuit.

- DTC B10D9:87 (PATS Transponder: Missing Message) - sets when the RFA module does not receive a response from the PATS transceiver.
- DTC B10E6:11 (PATS Power Supply: Circuit Short To Ground) - sets when the RFA module detects a short to ground on the PATS transceiver voltage supply circuit.
- DTC B10E6:12 (PATS Power Supply: Circuit Short To Battery) - sets when the RFA module detects a short to voltage on the PATS transceiver voltage circuit.

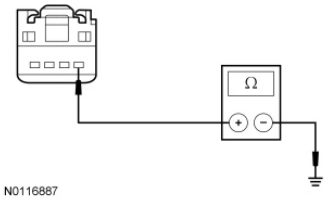
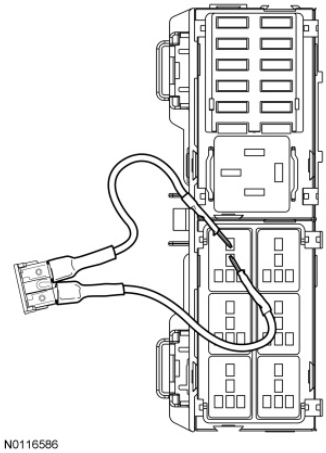
This pinpoint test is intended to diagnose the following:

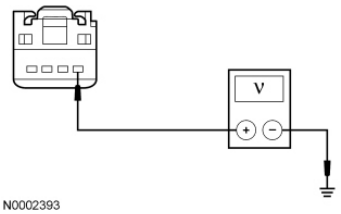
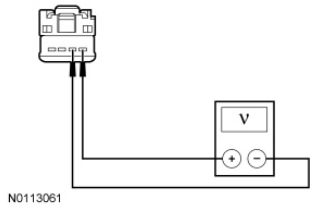
- Wiring, terminals or connectors
- PATS transceiver
- RFA module

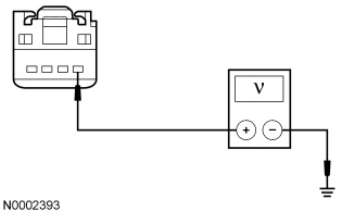
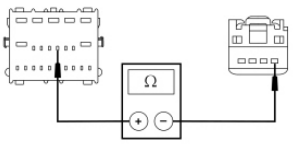
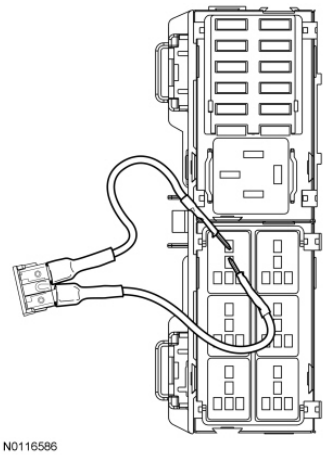
PINPOINT TEST H: DTC B10D9:87, B10E6:11, OR B10E6:12

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

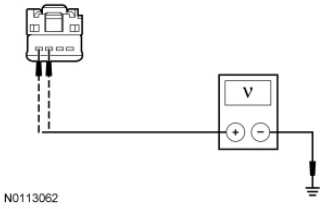
Test Step	Result / Action to Take
H1 RETRIEVE THE RECORDED RFA MODULE DTCs	
NOTE: If DTC B10E6:11 or B10E6:12 is present with B10D9:87, diagnose B10E6:11 or B10E6:12 first. • Check the recorded results from the RFA module self-test. • **Is DTC B10E6:11 or B10E6:12 present?**	**Yes** For DTC B10E6:11, GO to H2 . For DTC B10E6:12, GO to H4 . **No** For DTC B10D9:87, GO to H5 .
H2 CHECK THE PATS TRANSCEIVER FOR A SHORT TO GROUND	
• Disconnect: PATS Transceiver C252. • Enter the following diagnostic mode on the scan tool: Clear RFA Module DTCs. • Enter the following diagnostic mode on the scan tool: RFA Module Self-Test. • **Is DTC B10E6:11 present?**	**Yes** GO to H3 . **No** INSTALL a new PATS transceiver. REFER to Passive Anti-Theft System (PATS) Transceiver in this section. TEST the system for normal

	operation.
H3 CHECK THE PATS TRANSCEIVER VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: RFA Module C3503A. • Measure the resistance between the PATS transceiver C252-1, circuit CBP13 (GY/BN), harness side and ground.  N0116887 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to H11 . **No** REPAIR circuit CBP13 (GY/BN) for a short to ground. CLEAR the DTCs. REPEAT the self-test.
H4 CHECK THE PATS TRANSCEIVER VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: PATS Transceiver C252. • Disconnect: RFA Module C3503A. • Disconnect: Smart Keyless Entry Ignition Relay. • Connect a fused jumper wire between the smart keyless entry ignition relay pin 3, circuit SBP01 (RD), Central Junction Box (CJB) face side and the smart keyless entry ignition relay pin 5, circuit CDC32 (BN/YE), CJB face side.  N0116586 • Measure the voltage between the PATS transceiver C252-1, circuit CBP13 (GY/BN), harness side and ground.	**Yes** REPAIR circuit CBP13 (GY/BN) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. **No** GO to H11 .

 • **Is any voltage present?**	
H5 CHECK FOR VOLTAGE TO THE PATS TRANSCEIVER	
NOTE: The RFA module only supplies voltage to the PATS transceiver momentarily. It is important to monitor the meter while pressing the START/STOP switch. **NOTE:** Remove all IA keys from inside the vehicle. If the RFA module detects a key, it does not activate the PATS transceiver. • Disconnect: PATS Transceiver C252. • While pressing the START/STOP switch, measure the voltage between the PATS transceiver C252-1, circuit CBP13 (GY/BN), harness side and the PATS transceiver C252-2, circuit GD115 (BK/GY).  • **Is the voltage momentarily greater than 10 volts?**	**Yes** GO to H8 . **No** GO to H6 .
H6 CHECK THE PATS TRANSCEIVER VOLTAGE SUPPLY CIRCUIT	
NOTE: The RFA module only supplies voltage to the PATS transceiver momentarily. It is important to monitor the meter while pressing the START/STOP switch. **NOTE:** Remove all IA keys from inside the vehicle. If the RFA module detects a key, it does not activate the PATS transceiver. • While pressing the START/STOP switch, measure the voltage between the PATS transceiver C252-1, circuit CBP13 (GY/BN), harness side and ground.	**Yes** REPAIR circuit GD115 (BK/GY) for an open. CLEAR the DTCs. REPEAT the self-test. **No** GO to H7 .

 N0002393 • **Is the voltage momentarily greater than 10 volts?**	
H7 CHECK THE PATS TRANSCEIVER VOLTAGE SUPPLY CIRCUIT FOR AN OPEN	
• Disconnect: RFA Module C3503A. • Measure the resistance between the RFA module C3503A-10, circuit CBP13 (GY/BN), harness side and the PATS transceiver C252-1, circuit CBP13 (GY/BN), harness side  N0117084 • **Is the resistance less than 5 ohms?**	**Yes** GO to H11 . **No** REPAIR circuit CBP13 (GY/BN) for an open. CLEAR the DTCs. REPEAT the self-test.
H8 CHECK THE PATS TRANSCEIVER CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: Smart Keyless Entry Ignition Relay. • Disconnect: RFA Module C3503A. • Connect a fused jumper wire between the smart keyless entry ignition relay pin 3, circuit SBP01 (RD), Central Junction Box (CJB) face side and the smart keyless entry ignition relay pin 5, circuit CDC32 (BN/YE), CJB face side.  N0116586	**Yes** REMOVE the jumper wire. INSTALL the smart keyless entry ignition relay. REPAIR the circuit in question for a short to voltage. CLEAR the DTCs. REPEAT the self-test. **No** REMOVE the jumper wire. INSTALL the smart keyless entry ignition relay. GO to H9 .

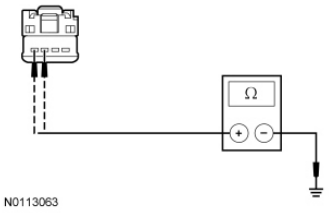
- Measure the voltage between the PATS transceiver C252-3, circuit VRT24 (YE/OG), harness side and ground; and between the PATS transceiver C252-4, circuit VRT23 (VT/GY), harness side and ground.



- **Is any voltage present?**

H9 CHECK THE PATS TRANSCEIVER CIRCUITS FOR A SHORT TO GROUND

- Measure the resistance between the PATS transceiver C252-3, circuit VRT24 (YE/OG), harness side and ground; and between the PATS transceiver C252-4, circuit VRT23 (VT/GY), harness side and ground.



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

Yes
GO to H10 .

No
REPAIR the circuit in question for a short to ground. CLEAR the DTCs. REPEAT the self-test.

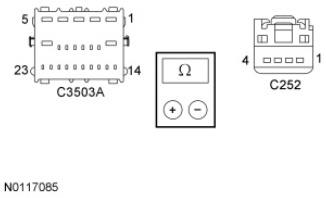
H10 CHECK THE PATS TRANSCEIVER CIRCUITS FOR AN OPEN

- Measure the resistance between the RFA module, harness side and the PATS transceiver, harness side as follows:

RFA Module Connector-Pin	Circuit	PATS Transceiver Connector-Pin
C3503A-11	VRT24 (YE/OG)	C252-3
C3503A-12	VRT23 (VT/GY)	C252-4

Yes
INSTALL a new PATS transceiver. REFER to Passive Anti-Theft System (PATS) Transceiver in this section. CLEAR the DTCs. REPEAT the self-test. If DTC B10D9:87 is retrieved again, GO to H11 .

No
REPAIR the circuit in question for an open. CLEAR the DTCs. REPEAT the self-test.

 N0117085 • **Are the resistances less than 5 ohms?**	
H11 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect all the RFA module connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the RFA 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 RFA module. 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 I: DTC B10D6:62 or U0100:87

Normal Operation

When the ignition is transitioned out of off, the Remote Function Actuator (RFA) module checks the PCM ID and compares It with the PCM ID that is stored in the RFA module memory. If the RFA module does not receive the PCM ID or the ID is invalid, Passive Anti-Theft System (PATS) is disabled and does not allow the engine to start.

- DTC B10D6:62 (PATS Enable Status: Signal Compare Failure) - sets when the RFA module does not receive the expected target ID from the PCM over the High Speed Controller Area Network (HS-CAN). The target ID is only sent one time per ignition cycle and is sent within milliseconds of the ignition being transitioned out of off.
- DTC U0100:87 (Lost Communication With ECM/PCM "A": Missing Message) - sets when the RFA module does not receive the target ID from the PCM over the HS-CAN . The target ID is only sent one time per ignition cycle and is sent within milliseconds of the ignition being transitioned out of off.

This pinpoint test is ined to diagnose the following:

- HS-CAN concern
- Low battery state of charge
- PCM

PINPOINT TEST I: DTC B10D6:62 OR U0100:87

Test Step	Result / Action to Take
I1 CHECK THE BATTERY STATE OF CHARGE	
	Yes GO to I2 .

NOTE: It might be necessary to check battery voltage while cranking the engine to make sure battery voltage is not dropping and causing the concern. • Carry out the Battery Condition Test in Section 414-01 . • **Did the battery pass the Battery Condition Test?**	**No** RECHARGE or REPLACE the battery REFER to Section 414-01 .
I2 RETRIEVE THE RFA MODULE DTCs FROM THE SELF-TEST	
• Check the recorded results from the RFA module self-test. • **Is DTC U0100:00 recorded?**	**Yes** REFER to the RFA module DTC Chart in Section 419-10 . **No** GO to I3 .
I3 RECHECK THE RFA MODULE DTCs FROM THE SELF-TEST	
• Enter the following diagnostic mode on the scan tool: Clear RFA Module Continuous DTCs. • Cycle the ignition from RUN to OFF and then back to RUN. • Enter the following diagnostic mode on the scan tool: RFA Module Self-Test. • **Is DTC B10D6:62 or U0100:87 retrieved?**	**Yes** GO to I4 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
I4 CHECK FOR CORRECT PCM OPERATION	
• Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM 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 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 caused by a loose or corroded connector.

Pinpoint Test J: DTC U201F:00 or U201F:13

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

Normal Operation

When the Intelligent Access (IA) key is activated by one of the low frequency passive start antennas, the transmitter in the IA key sends a radio signal to the Remote Functions Receiver (RFR) module. The RFR module then communicates the command to the Remote Function Actuator (RFA) module, and the RFA module either switches the ignition to the requested mode or starts the engine.

The RFR module receives voltage from Central Junction Box (CJB) fuse 7 (7.5A) and has a dedicated ground circuit. The RFR module sends all Remote Keyless Entry (RKE) and IA key information and requests to the RFA module through a dedicated single circuit network.

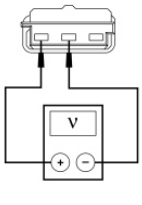
In the event of a failure with the RFR module, the vehicle experiences a no-start unless the IA key is placed near the Passive Anti-Theft System (PATS) transceiver.

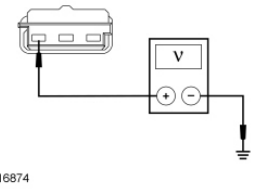
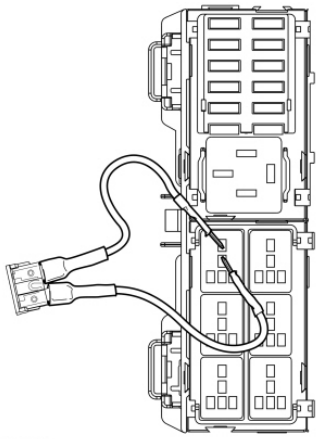
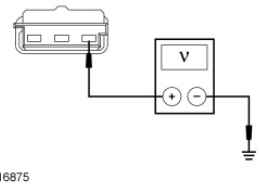
- DTC U201F:00 (External Receiver: No Sub Type Information) - sets when the RFA module has lost communication with the RFR module.
- DTC U201F:13 (External Receiver: Circuit Open) - sets when the RFA module has lost communication with the RFR module with an open communication circuit.

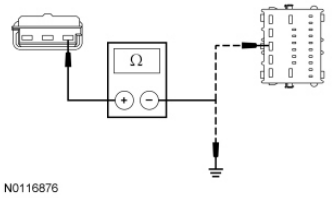
This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- < title="Remote Functions Receiver" class="popup" onmouseover="this.className='popupnounderline';" onmouseout="this.className='popup';">RFR module
- RFA module

PINPOINT TEST J: DTC U201F:00 OR U201F:13

Test Step	Result / Action to Take
J1 CHECK FOR VOLTAGE TO THE RFR MODULE	
• Disconnect: RFR Module C9026. • Measure the voltage between the RFR module C9026-3, circuit SBP07 (WH/RD), harness side and the RFR module C9026-2, circuit GD143 (BK/VT).  N0116873 • **Is the voltage greater than 10 volts?**	**Yes** GO to J3 . **No** GO to J2 .
J2 CHECK THE RFR MODULE VOLTAGE SUPPLY CIRCUIT	
• Measure the voltage between the RFR module C9026-3, circuit SBP07 (WH/RD), harness side and ground.	**Yes** REPAIR circuit GD143 (BK/VT) for an open. CLEAR the DTCs. REPEAT the self-test. **No** VERIFY CJB fuse 7 (7.5A) is OK. If OK, REPAIR circuit SBP07 (WH/RD) for an open. If not OK, REFER to the Wiring

 N0116874 • **Is the voltage greater than 10 volts?**	Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test.
J3 CHECK THE RFR MODULE COMMUNICATION CIRCUIT FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: RFA Module C3503B. • Disconnect: Smart Keyless Entry Ignition Relay. • Connect a fused jumper wire between the smart keyless entry ignition relay pin 3, circuit SBP01 (RD), Central Junction Box (CJB) face side and the smart keyless entry ignition relay pin 5, circuit CDC32 (BN/YE), CJB face side.  N0116586 • Measure the voltage between the RFR module C9026-1, circuit VDB10 (GY), harness side and ground.  N0116875 • **Is any voltage present?**	**Yes** REMOVE the jumper wire. INSTALL the smart keyless entry ignition relay. REPAIR circuit VDB10 (GY) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. **No** REMOVE the jumper wire. INSTALL the smart keyless entry ignition relay. GO to J4 .
J4 CHECK THE RFR MODULE COMMUNICATION CIRCUIT FOR AN OPEN OR SHORT TO GROUND	

• Measure the resistance between the RFR module C9026-1, circuit VDB10 (GY), harness side and the RFA module C3503B-3, circuit VDB10 (GY), harness side; and between the RFR module C9026-1, circuit VDB10 (GY), harness side and ground.  N0116876 • **Is the resistance less than 5 ohms between the RFR module and the RFA module; and greater than 10,000 ohms between the RFR module and ground?**	**Yes** INSTALL a new RFR module. REFER to Remote Functions Receiver (RFR) Module in this section. CLEAR the DTCs. REPEAT the self-test. If the concern is still present, GO to J5 . **No** REPAIR circuit VDB10 (GY) for an open or short to ground. CLEAR the DTCs. REPEAT the self-test.
J5 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect all the RFA module connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the RFA 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 RFA module. 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 K: The Vehicle Does Not Start With The Intelligent Access (IA) Key In Certain Areas Within The Vehicle

Refer to Wiring Diagrams Cell 112 , Passive Anti-Theft System for schematic and connector information.

Normal Operation

During each vehicle start sequence, when the START/STOP switch is pressed, the Remote Function Actuator (RFA) activates all 3 passive start antennas, which send out a low frequency signal. Each passive start antenna has an approximate range of 1 m (3 ft) and are placed in different locations to provide full coverage inside the vehicle. If an Intelligent Access (IA) key is within range of a passive start antenna, the low frequency signal activates the IA key. When the IA key is activated it sends a high frequency signal to the Remote Functions Receiver (RFR) module. The RFR module communicates with the RFA module. If the RFA module determines that a programmed IA key is in the vehicle, it allows the ignition to transition out of off or let the engine start.

There are certain areas inside the vehicle where the IA key may not be detected and the message center displays KEY NOT DETECTED. If the IA key is in the far outside edges of the interior (like in a door map pocket or above a sun visor) it might not be detected. Move the IA key to a different location and try to start the vehicle again.

NOTE: Some brands/types of mobile phone or laptop computer chargers may cause interference that could lead to a Passive Anti-Theft System (PATS) no-start if the IA key is within a few inches of the charger. If a concern is observed, move the IA key away from the charger and attempt to start the vehicle.

- DTC B10C7:1F (Interior Trunk Antenna: Circuit Intermittent) - a DTC that sets when an open or short is detected on one of the circuits to the rear passive start antenna.
- DTC B10C8:1F (Interior Centre Antenna: Circuit Intermittent) - a DTC that sets when an open or short is detected on one of the circuits to the center passive start antenna.
- DTC B10C9:1F (Interior Front Antenna: Circuit Intermittent) - a DTC that sets when an open or short is detected on one of the circuits to the front passive start antenna.

This pinpoint test is intended to diagnose the following:

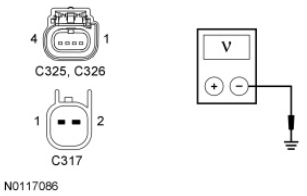
- Wiring, terminals or connectors
- Environmental interference
- Front passive start antenna
- Center passive start antenna
- Rear passive start antenna
- RFA module

PINPOINT TEST K: THE VEHICLE DOES NOT START WITH THE IA KEY IN CERTAIN AREAS WITHIN THE VEHICLE

Test Step	Result / Action to Take
K1 CHECK THE IA KEY LOCATION	
• Check the location of the IA key and if it is placed in the far corners of the interior of the vehicle, move the IA key out of these areas and attempt to start the vehicle. • **Does the vehicle start?**	**Yes** The system is OK. INFORM the customer of the normal vehicle operation. **No** GO to K2 .
K2 CHECK FOR ENVIRONMENTAL INTERFERENCE	
• Check for the use of any charger or other wireless device that can cause interference with the IA key. If any device is found, remove the device and attempt to start the engine. • **Does the engine start?**	**Yes** INFORM the customer of the cause of the concern and the normal operation of the vehicle. **No** GO to K3 .
K3 CHECK THE PASSIVE START ANTENNA CIRCUITS FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: RFA Module C3503E. • Disconnect: Suspect Passive Start Antenna. • Place an IA key next to the PATS /backup transceiver and press the START/STOP switch to switch the ignition to RUN.	**Yes** REPAIR the circuit in question for a short to voltage. CLEAR the DTCs. REPEAT the self-test. **No** GO to K4 .

- Measure the voltage between the suspect passive start antenna, harness side and ground as follows:

Suspect Passive Start Antenna Connector-Pin	Circuit
Front C325-1	VPK05 (BN/GN)
Front C325-2	RPK05 (YE/OG)
Center C326-1	VPK06 (GY/VT)
Center C326-2	RPK06 (BU/WH)
Rear C317-1	VPK08 (WH/OG)
Rear C317-2	RPK08 (BN/VT)



- **Is any voltage present?**

K4 CHECK THE PASSIVE START ANTENNA CIRCUITS FOR A SHORT TO GROUND

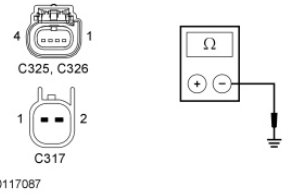
- Ignition OFF.
- Measure the resistance between the suspect passive start antenna, harness side and ground as follows:

Suspect Passive Start Antenna Connector-Pin	Circuit
Front C325-1	VPK05 (BN/GN)
Front C325-2	RPK05 (YE/OG)
Center C326-1	VPK06 (GY/VT)
Center C326-2	RPK06 (BU/WH)

Yes
GO to K5 .

No
REPAIR the circuit in question for a short to ground. CLEAR the DTCs. REPEAT the self-test.

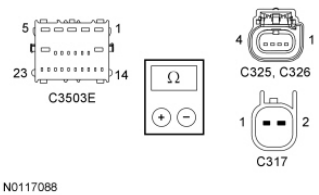
Rear C317-1	VPK08 (WH/OG)
Rear C317-2	RPK08 (BN/VT)



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

K5 CHECK THE ANTENNA CIRCUITS FOR AN OPEN	
• Measure the resistance between the RFA module C3503E, harness side and the suspect passive start antenna connector, harness side as follows:	**Yes** INSTALL a new passive start antenna. REFER to Passive Start Antenna - Front , Passive Start Antenna - Center or Passive Start Antenna - Rear in this section. CLEAR the DTCs. REPEAT the self-test. If the concern is still present, GO to K6 . **No** REPAIR the circuit in question for an open. CLEAR the DTCs. REPEAT the self-test.

RFA Module Connector-Pin	Suspect Passive Start Antenna Connector-Pin	Circuit
C3503E-9	Front C325-1	VPK05 (BN/GN)
C3503E-2	Front C325-2	RPK05 (YE/OG)
C3503E-17	Center C326-1	VPK06 (GY/VT)
C3503E-5	Center C326-2	RPK06 (BU/WH)
C3503E-11	Rear C317-1	VPK08 (WH/OG)
C3503E-4	Rear C317-2	RPK08 (BN/VT)



- **Are the resistances less than 5 ohms?**

K6 CHECK FOR CORRECT RFA MODULE OPERATION	

• Disconnect all the RFA module connectors. • Check for: ♦ corrosion ♦ damans ♦ pushed-out pins • Connect all the RFA 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 RFA module. 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 L: The Vehicle Does Not Start/Unable To Transition The Ignition Out Of OFF

Normal Operation

During each vehicle start sequence, when the START/STOP switch is pressed, the Remote Function Actuator (RFA) activates all 3 passive start antennas, which send out a low frequency signal. If an Intelligent Access (IA) key is within range of a passive start antenna, the low frequency signal activates the IA key. When the IA key is activated it sends a high frequency signal to theRemote Functions Receiver (RFR) module. The RFR module communicates with the RFA module. If the RFA module determines that a programmed IA key is in the vehicle, it allows the ignition to transition out of off or let the engine start.

The vehicle experiences a PATS no-start in the event there is a failure of any passive start antenna, the battery in the IA key, or the RFR module. However, in the event of one of these failures, the IA key can be placed next to the PATS transceiver (located in the steering column) to allow the vehicle to start. The PATS transceiver activates an IA key if it is placed in close proximity. The PATS transceiver is hardwired to the RFA module.

Once the RFA module determines that a programmed IA key is inside the vehicle and receives a request to start the engine, it communicates with the PCM over the High Speed Controller Area Network (HS-CAN). Once the RFA module and the PCM communicate, the RFA module checks the ID of the PCM and compares it with the module ID stored in its own memory. If the RFA module and PCM IDs match then the PATS enables the starter relay and fuel injectors and allows the engine to start.

The IA key disable feature prevents the engine from starting or the ignition from transitioning out of off if the IA key has been disabled. For more information on the IA key disable feature, refer to Section 419-01A .

This pinpoint test is intended to diagnose the following:

- Starting system concern
- Driveability concern
- PATS concern

PINPOINT TEST L: THE VEHICLE DOES NOT START/UNABLE TO TRANSITION THE IGNITION OUT OF OFF

Test Step	Result / Action to Take
L1 CHECK FOR KEY NOT DETECTED	
NOTE: Prior to performing any diagnostics press the unlock button on an IA key to make sure the IA key disable feature was causing the concern.	**Yes** GO to Pinpoint Test M . **No**

• Check the Front Control/Display Interface Module (FCDIM) while pressing the START/STOP switch. • **Is KEY NOT DETECTED displayed?**	GO to L2 .
L2 CHECK THE IPC OPERATION	
• Observe the Instrument Panel Cluster (IPC) operation while pressing the START/STOP switch. • **Do some of the indicators in the IPC illuminate?**	**Yes** GO to L3 . **No** GO to L4 .
L3 CHECK FOR RFA MODULE DTCs	
• Retrieve the RFA module continuous DTCs. • **Are any RFA module DTCs present?**	**Yes** REFER to DTC Charts in this section. **No** The no-start condition is not PATS -related. REFER to Section 303-06 to diagnose the cause of the no-start condition.
L4 CHECK FOR COMMUNICATION WITH THE SCAN TOOL	
• Refer to Inspection and Verification in Section 418-00 , and follow the procedure to establish a session with the vehicle. • **Does the scan tool establish communication with the vehicle?**	**Yes** REFER to Section 211-05 to diagnose no power in RUN. **No** REFER to Section 418-00 to diagnose no communication with the RFA module or the PCM.

Pinpoint Test M: KEY NOT DETECTED Is Displayed

Normal Operation

During each vehicle start sequence, if the Remote Function Actuator (RFA) module does not detect an Intelligent Access (IA) key inside the vehicle or the Passive Anti-Theft System (PATS)/backup transceiver does not receive an IA key identification code, the Front Control/Display Interface Module (FCDIM) displays the message KEY NOT DETECTED.

NOTE: Some brands/types of mobile phone or laptop computer chargers may cause interference that could lead to a Passive Anti-Theft System (PATS) no-start if the IA key is within a few inches of the charger. If a concern is observed, move the IA key away from the charger and attempt to start the vehicle.

This pinpoint test is intended to diagnose the following:

- Environmental interference
- IA key
- IA key battery
- IA key not programmed

PINPOINT TEST M: KEY NOT DETECTED IS DISPLAYED

Test Step	Result / Action to Take
M1 CHECK THE IA KEY LOCATION	
• Place the IA key in several locations within the vehicle and attempt to start the vehicle • **Does the vehicle start with the IA in certain areas only?**	**Yes** GO to Pinpoint Test K . **No** GO to M2 .
M2 CHECK FOR ENVIRONMENTAL INTERFERENCE	
• Check for the use of any charger or other wireless device that can cause interference with the IA key. If any device is found, remove the device and attempt to start the engine. • **Does the engine start?**	**Yes** INFORM the customer of the cause of the concern and the normal operation of the vehicle. **No** GO to M3 .
M3 CHECK THE IA KEY	
• Place the IA key next to the PATS transceiver and press the START/STOP switch. • **Is KEY NOT DETECTED displayed?**	**Yes** GO to M4 . **No** INSTALL a new IA key battery. DO NOT reprogram the IA key (damaged or dead batteries do not erase IA keys from memory). TEST the system for normal operation.
M4 CHECK THE IA KEY PROGRAMMING	
• Program the IA keys. REFER to Key Programming Using Diagnostic Equipment in this section. • **Does the IA key successfully program?**	**Yes** The concern was caused by an unprogrammed IA key. **No** DISCARD the key in question and PROGRAM a new key. REFER to Key Programming Using Diagnostic Equipment in this section. TEST the system for normal operation

Pinpoint Test N: DTC U0167:00 or U0426:00

Normal Operation

When the ignition is turned to the RUN or START mode, the Remote Function Actuator (RFA) module and the PCM send each other their ID over the High Speed Controller Area Network (HS-CAN). Each module then checks the ID it receives and compares with the ID stored in memory. If the IDs are missing or the IDs are invalid, Passive Anti-Theft System (PATS) is disabled and does not allow the engine to start.

- DTC U0167:00 (Lost Communication With Vehicle Immobilizer Control Module: No Sub Type Information) - a continuous DTC that sets when the PCM does not receiveny PATS data from the RFA module over the HS-CAN . The target ID is only sent once per key cycle and within milliseconds of the ignition being turned to the RUN or START mode.

- DTC U0426:00 (Invalid Data Received From Vehicle Immobilizer Control Module: No Sub Type Information) - a continuous DTC that sets when the PCM does not receive the expected target ID from the RFA module over the HS-CAN . The target ID is only sent once per key cycle and within milliseconds of the ignition being turned to the RUN or START mode. This DTC also sets if a new PCM has been installed and the PATS Parameter Reset procedure has not been carried out.

This pinpoint test is intended to diagnose the following:

- HS-CAN concern
- Low battery state of charge
- RFA module

PINPOINT TEST N: DTC U0167:00 OR U0426:00

Test Step	Result / Action to Take
N1 CHECK THE RFA MODULE DTCs FROM THE SELF-TEST	
• Check the recorded results from the RFA module self-test. • **Are any RFA module DTCs retrieved?**	**Yes** REFER to the RFA module DTC Chart in this section. **No** GO to N2 .
N2 CHECK THE BATTERY STATE OF CHARGE	
NOTE: It might be necessary to check battery voltage while cranking the engine to make sure battery voltage is not dropping and causing the concern. • Carry out the Battery Condition Test In Section 414-01 . • **Did the battery pass the Battery Condition Test?**	**Yes** GO to N3 . **No** RECHARGE or REPLACE the battery. REFER to Section 414-01 .
N3 CHECK FOR COMMUNICATION WITH THE RFA MODULE	
• Enter the following diagnostic mode on the scan tool: Network Test. • **Does the RFA module respond to the scan tool?**	**Yes** GO to N4 . **No** REFER to Section 418-00 .
N4 RECHECK THE PCM DTCs FROM THE SELF-TEST	
• Enter the following diagnostic mode on the scan tool: Clear PCM Continuous DTCs. • Cycle the ignition from RUN to OFF and then back to RUN. • Enter the following diagnostic mode on the scan tool: PCM Self-Test. • **Is DTC U0167:87 or U0426:81 retrieved?**	**Yes** GO to N5 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
N5 CHECK FOR CORRECT RFA MODULE OPERATION	

• Disconnect all the RFA module connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the RFA 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 RFA module. 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.

Passive Anti-Theft System (PATS) Parameter Reset

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Without Intelligent Access (IA)

1. Turn the key from the OFF position to the RUN 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 PATS security access.

3. **NOTE:** If the Instrument Panel Cluster (IPC) was replaced, program at least two keys to the IPC . After completing step 3, leave the scan tool connected and follow the Key Programming Using Diagnostic Equipment .

   From the scan tool, select "Parameter Reset" and follow the IDS on-screen instructions.

With Intelligent Access (IA)

NOTE: This procedure erases all keys from the Remote Function Actuator (RFA) module. Make sure at least two Intelligent Access (IA) keys are present before performing this procedure.

NOTE: To Enter PATS security access if the RFA module is replaced, start a vehicle session using a tear tag or PCM part number. Refer to Inspection and Verification in Section 418-00 to start a session. PATS security access can still be granted even with the ignition off.

1. From the scan tool, enter TOOLBOX. Select Body>Security>PATS Functions Functions and follow the Integrated Diagnostic System (IDS) on-screen instructions to Enter PATS security access.

2. From the scan tool, select "Parameter Reset" and follow the IDS on-screen instructions.

Key Programming Using Diagnostic Equipment

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Without Intelligent Access (IA)

NOTE: Program a minimum of 2 keys into the vehicle.

NOTE: This procedure only programs the Passive Anti-Theft System (PATS) portion of the key into the Instrument Panel Cluster (IPC). It does not program the Remote Keyless Entry (RKE) Transmitter Identification Code (TIC) into the Body Control Module (BCM).

1. Turn the key from OFF position to the RUN 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 PATS security access.
3. **NOTE:** A maximum of 8 keys can be programmed into the vehicle.

   From the scan tool menu, select the appropriate key programming procedure and follow the on-screen instructions to program the Passive Anti-Theft System (PATS) portion of the key(s).
4. Disconnect the scan tool.
5. Refer to Remote Keyless Entry (RKE) Transmitter Programming in Section 501-14 to program the RKE portion of the key.

With Intelligent Access (IA)

NOTE: Program a minimum of 2 keys into the vehicle.

NOTE: This procedure programs the Passive Anti-Theft System (PATS) and Remote Keyless Entry (RKE) portions of the key into the Remote Function Actuator (RFA) module.

NOTE: To Enter PATS security access if no programmed Intelligent Access (IA) keys are available, start a vehicle session using a tear tag or PCM part number. Refer to Inspection and Verification in Section 418-00 to start a session. PATS security access can still be granted even with the ignition off.

1. From the scan tool, enter TOOLBOX. Select Body>Security>PATS Functions Functions and follow the Integrated Diagnostic System (IDS) on-screen instructions to Enter PATS security access.

2. **NOTE:** A maximum of 8 keys can be programmed into the vehicle.

   From the scan tool menu, select the appropriate key programming procedure and follow the on-screen instructions to program the IA key(s).

Key Programming - Program a Key Using Two Programmed Keys

NOTE: This procedure is only for vehicles without Intelligent Access (IA). For vehicles with IA the keys can only be programmed using a scan tool.

NOTE: This procedure works only if 2 or more programmed keys are available. If 2 programmed keys are not available, refer to Key Programming Using Diagnostic Equipment in this section.

NOTE: This procedure only programs the Passive Anti-Theft System (PATS) portion of the key into the Instrument Panel Cluster (IPC). It does not program the Remote Keyless Entry (RKE) Transmitter Identification Code (TIC) into the Body Codule (BCM).

1. Insert the first programmed PATS key into the ignition and turn the key from the OFF position to the RUN position (maintain the key in the RUN position for approximately 3 seconds).

2. Turn the first key to the OFF position and remove the key from the ignition.

3. Within 10 seconds of turning the key to the OFF position, insert a second programmed PATS key into the ignition and turn the key from the OFF position to the RUN position (maintain the key in the RUN position for approximately 3 seconds).

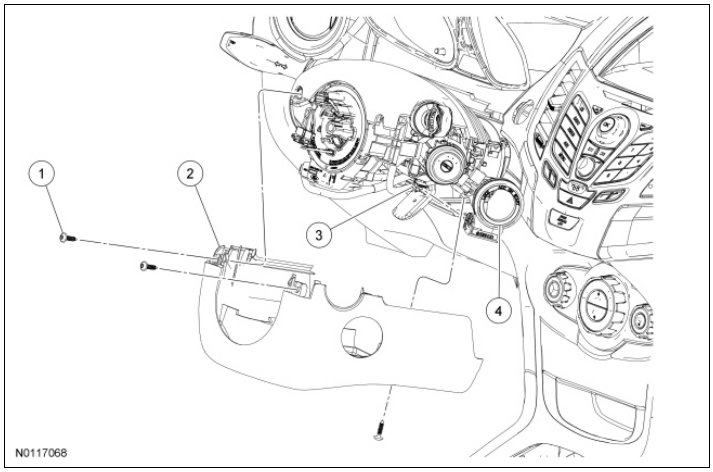
4. Turn the second key to the OFF position and remove the key from the ignition.

5. Within 10 seconds of turning the second key to the OFF position, insert the new, unprogrammed PATS key into the ignition and turn the key from the OFF position to the RUN position (maintain the key in the RUN position for approximately 3 seconds).

6. If it is desired to program additional key(s) (up to a total of 8 keys can be programmed), repeat Steps 1 - 5 for each additional key.

7. Refer to RKE Transmitter Programming in Section 501-14 to program the RKE portion of the key.

Passive Anti-Theft System (PATS) Transceiver



Item	Part Number	Description
1	W714630	Steering column shroud screws (3 required)
2	150101	Lower steering column shroud
3	-	Passive Anti-Theft System (PATS) transceiver electrical connector (part of 14401)
4	15607	PATS transceiver

Removal atallation

1. **NOTE:** Rotate the steering wheel for access to the lower steering column shroud screws.

   Remove the 3 screws and the lower steering column shroud.

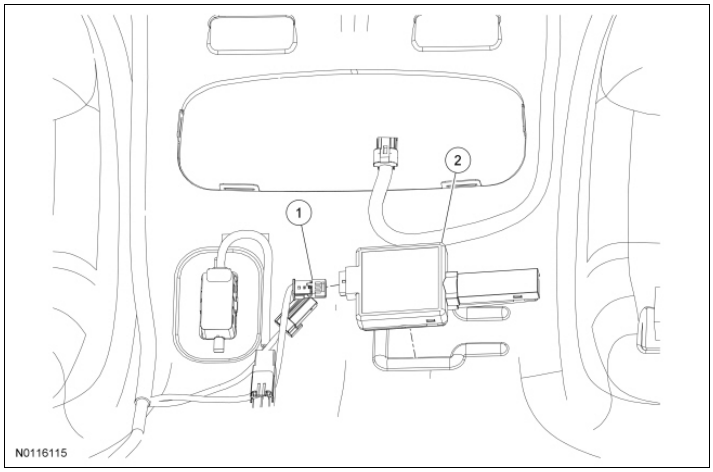
2. Disconnect the Passive Anti-Theft System (PATS) transceiver electrical connector.

3. Using a suitable tool (such as a dentist pick), release the 3 locking tabs and remove the PATS transceiver.

4. **NOTE:** Replacement of the PATS transceiver does not require the PATS keys to be programmed into the Instrument Cluster (IC) again.

   To install, reverse the removal procedure.

Remote Functions Receiver (RFR) Module

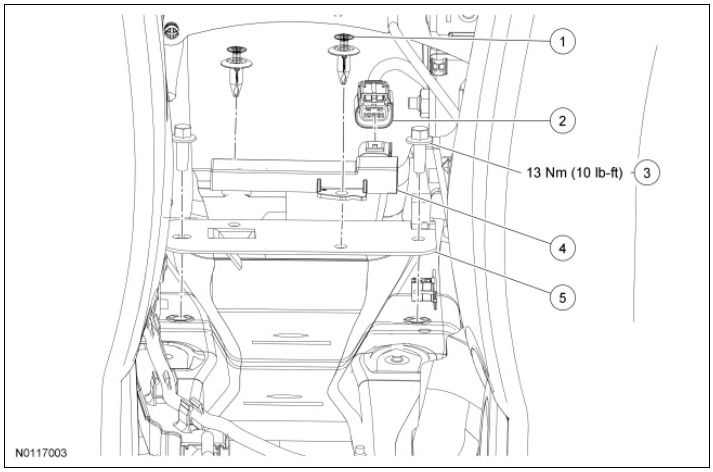


Item	Part Number	Description
1	-	RFR module electrical connector (part of 14334)
2	15K602	Remote Functions Receiver (RFR)

1. Remove the headliner. For additional information, refer to Section 501-05 .
2. Disconnect the Remote Functions Receiver (RFR) module electrical connector.
3. Using a suitable tool (such as a trim removal tool), gently pry the RFR module away from the headliner.
4. **NOTE:** The RFR module is secured to the headliner with 3M Duramix® 4747 Super Fast Adhesive at the assembly plant. When installing the RFR module, make sure to use 3M Duramix® 4747 Super Fast Adhesive to secure the RFR module to the headliner in approximately the same position and orientation on the headliner.

   To install, reverse the removal procedure.

Passive Start Antenna - Front

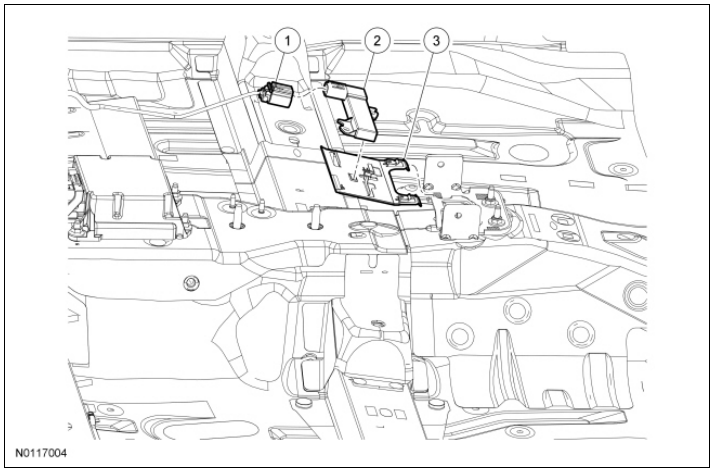


Item	Part Number	Description
1	16K262	Scrivet (2 required)
2	-	Front passive start antenna electrical connector (part of 14K024)
3	W505253	Front passive start antenna bracket bolt (2 required)
4	15603	Front passive start antenna
5	19H217	Front passive start antenna bracket

Removal and Installation

1. Remove the floor consopanel. For additional information, refer to the exploded view In Section 501-12 .
   - Lift upward on the rear of the floor console finish panel to release the floor console finish panel clips.
   - If equipped, disconnect the electrical connector.
   - Slide the park brake lever boot and the floor console finish panel over the park brake lever.
2. Pull the red lock tab outward and disconnect the front passive start antenna electrical connector.
3. Remove the 2 bolts and the front passive start antenna and bracket assembly.
   - To install, tighten to 13 Nm (10 lb-ft).
4. If required, remove the 2 scrivets and the front passive start antenna.
5. To install, reverse the removal procedure.

Passive Start Antenna - Center

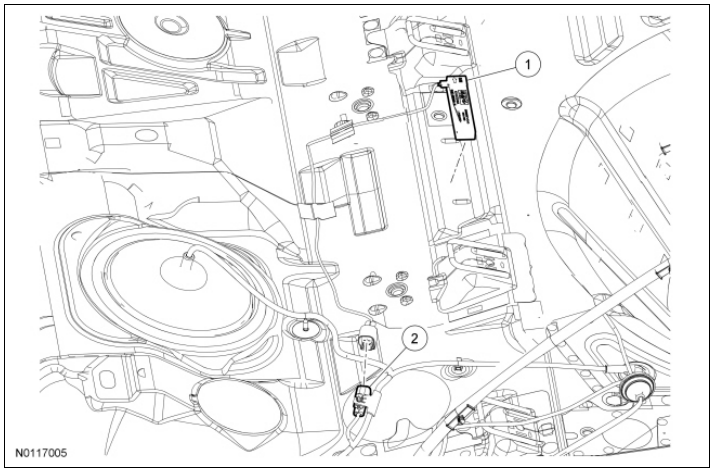


Item	Part Number	Description
1	-	Center passive start antenna electrical connector (part of 14A005)
2	15603	Center passive start antenna
3	W713358	Center passive start antenna bracket (part of 15603)

Removal and Installation

1. Remove the floor console. For additional information, refer to Section 501-12 .
2. Pull the red lock tab outward and disconnect the rear floor console passive start antenna electrical connector.
3. Unclip and remove the center passive start antenna and bracket assembly.
4. If required, remove the center passive start antenna from the center passive start antenna bracket.
5. To install, reverse the removal procedure.

Passive Start Antenna - Rear



Item	Part Number	Description
1	-	Rear passive start antenna
2	15603	Rear passive start antenna electrical connector (part of 14A005)

Removal and Installation

1. Remove the rear seat cushion. For additional information, refer to Section 501-10 .
2. Pull the carpet forward to uncover the rear passive start antenna.
3. Disconnect the rear passive start antenna electrical connector.
4. Using a suitable tool (such as a trim removal tool), pry the rear passive start antenna upward to release the antenna from the floorpan and remove the rear passive start antenna.
    - To install, remove the rear passive start antenna tapes backing and press the antenna to the rear floor.
5. To install, reverse the removal procedure.

Cruise Control

The cruise control system consists of the following components:

- Clutch pedal cruise control deactivator switch (manual transaxle only)
- Cruise control deactivator switch
- Cruise control indicator
- Cruise control switch
- Electronic Throttle Body (ETB)
- Instrument Panel Cluster (IPC)
- Stoplamp switch
- PCM

During normal driving, the vehicle speed may vary slightly from the set speed due to road conditions. The vehicle speed may vary or 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.

For manual transaxle vehicles, it is normal for the engine rpm to increase slightly and then drops off slowly when the clutch pedal is pressed during operation.

Cruise Control

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit NUD105-R025D or equivalent

Principles of Operation

The cruise control system is controlled by the PCM and the Instrument Panel Cluster (IPC). The cruise control system is designed to maintain a selected vehicle speed between 30 km/h (18 mph) and the maximum limited vehicle speed. The cruise control system is controlled by the steering wheel mounted switches (ON/OFF, SET+, SET-, and CAN/RES), brake pedal inputs and the clutch pedal cruise control deactivator switch (manual transaxle). The cruise control switches are hard-wired to the IPC . The IPC sends a High Speed Controller Area Network (HS-CAN) network message to the PCM to control the cruise control system.

The clockspring provides the electrical interface between the steering column wiring and the cruise control switches in the steering wheel.

The cruise control functions include:

- turning on the cruise control system.
- setting and maintaining the desired vehicle speed.
- accelerating the vehicle speed.
- coasting down to a lower speed.
- resuming the prior vehicle speed.
- turning off the cruise control system.

Pressing and releasing the 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. The cruise control indicator illuminates green to indicate the cruise control system is active.

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. Applying the brake pedal or clutch pedal (manual transaxle) puts the cruise control system into standby mode.

The CAN/RES switch has a dual function for cancelling or resuming the cruise control system. Pressing the CAN/RES switch, when the cruise control system is active moves the system into the standby mode (cancel function). The cruise control indicator turns off. Pressing the CAN/RES switch when the cruise control system is in the standby mode causes the vehicle to accelerate to the last set speed (resume function). The cruise control indicator illuminates to indicate the system is reactivated. Resume 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.

The stoplamp switch and the cruise control deactivator switch are electrical inputs controlling the cruise control system. The stoplamp switch is a normally open switch that is hard-wired to the PCM. When the brake pedal is applied, the switch closes and applies a voltage signal to the PCM, deactivating the cruise control. The cruise control deactivator switch is a normally closed switch that is hard-wired to the IPC . When the brake pedal is applied, the switch opens and removes the ground signal from the IPC . The IPC sends a HS-CAN network message to the PCM to signal that the brake pedal is applied. The PCM compares the inputs from the stoplamp switch and the cruise control deactivator switch. If a deviation occurs, the PCM sets a DTC and the cruise control system is deactivated.

The clutch pedal cruise control deactivator switch is used on vehicles equipped with a manual transaxle. When the clutch pedal is pressed with the cruise control system engaged, the normally open switch closes and provides a ground signal to the IPC . The IPC sends a HS-CAN network message to the PCM to deactivate the cruise control system and place it in standby mode.

The inputs to the PCM are:

- Digital Transmission Range (TR) sensor (automatic transaxle)
- Cruise control switch(es) (networked from the IPC)
- Clutch pedal cruise control deactivator switch (manual transaxle) (networked from the IPC)
- Cruise control deactivator switch (networked from the IPC)
- Stoplamp switch (hard-wired)

The outputs of the PCM are:

- Electronic Throttle Body (ETB) command
- Cruise control Indicator (networked from the IPC)

The vehicle speed is controlled by the PCM through ETB . Cruise control electronics are contained entirely within the PCM.

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 IPC to command the cruise control indicator to 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 deactivation and immediately returns the throttle to the idle position.

The cruise control system provides self-diagnostics. The cruise control system disables operation and sets a PCM or IPC DTC if it detects certain faults. The IPC does not indicate cruise control faults with an indicator. Fault codes are logged by the PCM or IPC .

Additionally, the following conditions cause the cruise control system to deactivate:

- Transmission gear selector in a position other than D or OD (automatic transaxle)
- Clutch pedal is pressed (manual transaxle)
- The 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 30 km/h (18 mph)
- Cruise control switch pressed or stuck longer than 2 minutes
- ABS fault

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
• Central Junction Box (CJB) fuse 18 (10A) • Wiring, terminals or connectors • Cruise control switch(es) • Clutch pedal cruise control deactivator switch (manual transaxle) • Cruise control deactivator switch • Stoplamp switch • Instrument Panel Cluster (IPC)

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 and IPC .

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
P0504	Brake Switch A / B Correlation	GO to Pinpoint Test B .
P0578	Cruise Control Multifunction Input A Circuit Stuck	The PCM compares the CAN signal from the different inputs of the cruise control switches and determines that one or more of the switches are stuck. DIAGNOSE all other Instrument Panel Cluster (IPC) and PCM DTCs first. If no other DTCs are present, CLEAR the DTC. Make sure no cruise control switches are pressed and REPEAT the self-test. If DTC P0578 sets again, INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation.
P0579	Cruise Control Multifunction Input A Circuit Range/Performance	The PCM internally monitors and compares the CAN signal message from the IPC of the cruise control switch inputs with the PCM cruise control internal state. If the PCM detects a discrepancy between the input message and the PCM then DTC P0597 sets in the PCM. DIAGNOSE all other IPC and PCM DTCs first. If no other DTCs are present, CLEAR the DTC. REPEAT the self-test. If DTC P0597 sets again, INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation.
P0833	Clutch Pedal Switch B Circuit	GO to Pinpoint Test E .
P162D	Internal Control Module Cruise Control Performance	The PCM internally monitors the disable inputs for cruise control. If a cruise control disable is requested and the cruise control output from the PCM is still being controlled then DTC P162D sets in the PCM. DIAGNOSE all other DTCs and symptoms first. If no other DTCs or symptoms are present, INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation.
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Charts in Section 303-14 .

Instrument Panel Cluster (IPC) DTC Chart

DTC	Description	Action
P0565:01	Cruise Control ON Signal: General Electrical Failure	GO to Pinpoint Test C .
P0566:01	Cruise Control OFF Signal: General Electrical Failure	GO to Pinpoint Test C .
P0567:01	Cruise Control RESUME Signal: General Electrical Failure	GO to Pinpoint Test C .
P0568:01	Cruise Control SET Signal: General Electrical Failure	GO to Pinpoint Test C .
P0569:01	Cruise Control COAST Signal: General Electrical Failure	GO to Pinpoint Test C .
P0579:01	Cruise Control Multifunction Input A Circuit Range/Performance: General Electrical Failure	GO to Pinpoint Test C .
P0581:13	Cruise Control Multi-Function Input A Circuit High: Open Circuit	GO to Pinpoint Test C .
P0704:01	Clutch Switch Input Circuit: General Electrical Failure	GO to Pinpoint Test A .
P1572:01	Brake Pedal Switch Circuit: General Electrical Failure	GO to Pinpoint Test B .
All other DTCs	-	REFER to the Section 413-01 .

Symptom Chart

Sytom Chart

Pinpoint Tests

Pinpoint Test A: The Cruise Control Is Inoperative

Refer to Wiring Diagrams Cell 31 , Cruise Control for schematic and connector information.

Normal Operation

The cruise control functionality is controlled through the cruise control switches that are hard-wired to the Instrument Panel Cluster (IPC) through a signal and return circuit.

There are 5 cruise control switches with each switch operating a specific function that uses different resistance values. The IPC sends out a reference voltage to the cruise control switches and monitors the voltage drop when a cruise control switch is pressed. The voltage drop varies depending upon the resistance of each switch, providing a specific indication to the IPC which switch is pressed. The IPC sends a network message over the High Speed Controller Area Network (HS-CAN) to the PCM relaying the switch status and requesting cruise control operation.

The stoplamp switch and cruise control deactivator switch signals are inputs to the PCM for the cruise control operation.

When the brake pedal is applied, the normally open stoplamp switch closes and applies a voltage signal to the PCM deactivating the cruise control, if engaged.

The cruise control deactivator switch is a normally closed switch that provides a ground signal to the IPC . When the brake pedal is applied, the switch opens and removes the ground signal to the IPC . The IPC sends a network message over the High Speed Controller Area Network (HS-CAN) to the PCM. This is a redundant signal to the PCM.

The PCM receives both signals and compares the inputs to confirm that the correct brake input sequence is received.

Vehicles equipped with a manual transaxle have an additional clutch pedal cruise control deactivator switch. The clutch pedal cruise control deactivator switch is a normally open switch with the clutch pedal not pressed. When the clutch pedal is applied, the clutch pedal cruise control deactivator switch moves to the closed position, which routes the ground signal to the IPC . The IPC sends a network message over the High Speed Controller Area Network (HS-CAN) to the PCM, deactivating the cruise control system.

- DTC P0704:01 (Clutch Switch Input Circuit: General Electrical Failure) - sets when the IPC detects a short to ground in the clutch pedal cruise control deactivator switch signal during the self-test.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Clockspring
- Digital Transmission Range (TR) sensor (automatic transaxle)
- Cruise control switch
- Cruise control deactivator switch
- Stoplamp switch
- Clutch pedal uise control deactivator switch (manual transaxle)
- IPC
- PCM
- ABS module

PINPOINT TEST A: THE CRUISE CONTROL IS INOPERATIVE

Test Step	Result / Action to Take
A1 CHECK FOR DTCs	
• Review the recorded DTCs from the PCM and IPC self-test. • **Are any DTCs recorded?**	**Yes** For DTC P0704, GO to A5 . Otherwise, REFER to DTC Charts in this section. **No** GO to A2 .
A2 CHECK FOR ABS MODULE DTCs	
• Review the recorded DTCs from the ABS module self-test. • **Are any DTCs recorded?**	**Yes** REFER to Section 206-09 . REPAIR all ABS module DTCs and RETEST the system. **No** GO to A3 .

<table>
<tr><td>A3 MONITOR THE BRAKE PEDAL PIDs</td><td></td></tr>
<tr><td>
• Enter the following diagnostic mode on the scan tool: PCM DataLogger.
• Monitor the PCM PIDs BOO1 (stoplamp switch) and BOO2 (cruise control deactivator switch) while applying and releasing the brake pedal as follows:
<table>
<tr><th>Brake Pedal Position</th><th>BOO1 PID</th><th>BOO2 PID</th></tr>
<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>
</table>
• Do the PID values agree with the brake pedal position?
</td><td>
Yes
For automatic transaxle, GO to A4 .

For manual transaxle, GO to A5 .

No
GO to Pinpoint Test B .
</td></tr>
<tr><td>A4 MONITOR THE PCM TRANSGEAR PID</td><td></td></tr>
<tr><td>
• Enter the following diagnostic mode on the scan tool: PCM DataLogger.
• Monitor the PCM PID (TRANSGEAR).
• Select DRIVE.
• Does the PID value agree with the TRANSGEAR selector lever position?
</td><td>
Yes
GO to A6 .

No
REFER to Section 307-11 to continue diagnosis of the digital TR sensor.
</td></tr>
<tr><td>A5 CHECK THE CLUTCH PEDAL CRUISE CONTROL DEACTIVATOR SWITCH PID</td><td></td></tr>
<tr><td>
• Enter the following diagnostic mode on the scan tool: PCM DataLogger.
• Monitor the PCM PID CPP_TOP while pressing and releasing the clutch pedal.
• Does the PID value read "YES" with the clutch pedal pressed and "NO" with the clutch pedal released?
</td><td>
Yes
GO to A6 .

No
If the CPP_TOP value always reads YES (pressed) GO to A7 .

If the CPP_TOP value always reads NO (released) GO to Pinpoint Test D .
</td></tr>
<tr><td>A6 CHECK THE CRUISE CONTROL SWITCH PID</td><td></td></tr>
<tr><td>
• Enter the following diagnostic mode on the scan tool: IPC DataLogger.
• Press each cruise control switch while monitoring the cruise control switch PID (CRUISE_SW).
</td><td>
Yes
GO to A8 .

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.
r>Otherwise, GO to Pinpoint Test C .
</td></tr>
</table>

Cruise Control Switch	CRUISE_SW PID Value
-	NONE Pressed
CAN/RES	CANCEL
ON	ON
OFF	OFF
SET +	SET +
SET -	SET-

- **Does the PID value agree with the switch position?**

A7 CHECK THE CLUTCH PEDAL SWITCH PID WITH THE CLUTCH PEDAL CRUISE CONTROL DEACTIVATOR SWITCH DISCONNECTED	
• Disconnect: Clutch Pedal Cruise Control Deactivator Switch C277. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor the PCM PID CPP_TOP. • **Does the PID value read NO?**	**Yes** INSTALL a new clutch pedal cruise control deactivator switch. REFER to Cruise Control Deactivator Switch in this section. TEST the system for normal operation. **No** REPAIR circuit CE904 (GN/VT) for a short to ground. TEST the system for normal operation.
A8 CHECK FOR CORRECT PCM OPERATION	
• Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM connectors and make sure they are seated correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**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 caused by a loose or corroded connector.

Pinpoint Test B: DTC P0504 OR DTC P1572:01

Refer to Wiring Diagrams Cell 31 , Cruise Control for schematic and connector information.

Normal Operation

The stoplamp switch and cruise control deactivator switch signals are inputs to the PCM for the cruise control operation.

When the brake pedal is applied, the normally open stoplamp switch closes and applies a voltage signal to the PCM deactivating the cruise control, if engaged.

The cruise control deactivator switch is a normally closed switch that provides a ground signal to the Instrument Panel Cluster (IPC). When the brake pedal is applied, the switch opens and removes the ground signal to the IPC . The IPC sends a network message over the High Speed Controller Area Network (HS-CAN) to the PCM. This is a redundant signal to the PCM.

The PCM receives both signals and compares the inputs to confirm that the correct brake input sequence is received.

- DTC P0504 (Brake Switch A / B Correlation) - 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 P1572:01 (Brake Pedal Switch Circuit: General Electrical Failure) - sets when the IPC detects an open in the cruise control deactivator switch signal during the self-test.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Stoplamp switch
- Cruise control deactivator switch
- PCM
- IPC
- Remote Function Actuator (RFA) Module (with Intelligent Access (IA))

PINPOINT TEST B: DTC P0504 OR DTC P1572:01

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

<table>
<tr><th>Test Step</th><th>Result / Action to Take</th></tr>
<tr><td>B1 CHECK THE OPERATION OF THE STOPLAMPS</td><td></td></tr>
<tr><td>• Ignition ON.
• Operate the stoplamps.
• Do the stoplamps operate correctly? ></td><td>Yes
GO to B2 .

No
REFER to Section 417-01 to continue diagnosis of the stoplamps.</td></tr>
<tr><td>B2 MONITOR THE BRAKE PEDAL PIDs</td><td></td></tr>
<tr><td>• Enter the following diagnostic mode on the scan tool: PCM DataLogger.
• Monitor the PCM PIDs (BOO1) (stoplamp switch) and (BOO2) (cruise control deactivator switch) while applying and releasing the brake pedal as follows:

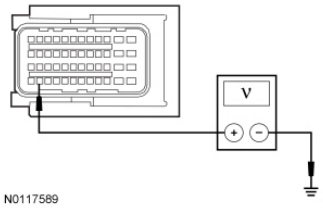
<table><tr><th>Brake Pedal Position</th><th>BOO1 PID</th><th>BOO2 PID</th></tr><tr><td>Released</td><td>Off</td><td>Off</td></tr><tr><td>Applied lightly</td><td>On</td><td>Off</td></tr></table></td><td>Yes
For DTC P0504 GO to B11 .

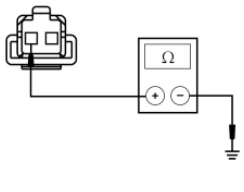
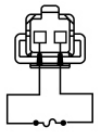
For P1572:01 GO to B10 .

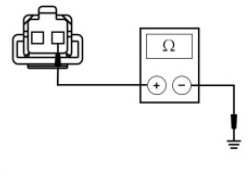
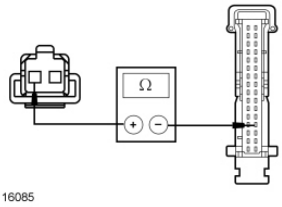
No
For an incorrect BOO1 PID value, GO to B3 .

If the BOO2 PID value always reads OFF, GO to B4 .

If the BOO2 PID value always reads ON, GO to B7 .</td></tr>
</table>

Applied firmly | On | On • **Do the PID values agree with the brake pedal position?**	
B3 CHECK THE STOPLAMP SWITCH CIRCUIT FOR AN OPEN	
• Ignition OFF. • Disconnect: PCM C175B. • Ignition ON. • While applying the brake pedal, measure the voltage between the PCM C175B-2, circuit CCA26 (BU/GY), harness side and ground.  • **Is the voltage greater than 10 volts with the brake pedal applied and 0 volts with the brake pedal released?**	**Yes** GO to B10 . **No** REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.
B4 MONITOR THE CRUISE CONTROL DEACTIVATOR SWITCH PID	
• Ignition OFF. • Disconnect: Cruise Control Deactivator Switch C278. • Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor the PCM PID (BOO2). • **Does the B002 PID read ON?**	**Yes** INSTALL a new cruise control deactivator switch. REFER to Cruise Control Deactivator Switch in this section. CLEAR the DTCs. TEST the system for normal operation. **No** If equipped with IA , GO to B5 . Otherwise, GO to B6
B5 THE RFA MODULE FOR A SHORT TO GROUND	
• Ignition OFF. • Disconnect: RFA Module C3503B. • Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor the PCM PID (BOO2). • **Does the B002 PID read ON?**	**Yes** INSTALL a new RFA Module. REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. **No** GO to B6 .
B6 CHECK THE CRUISE CONTROL DEACTIVATOR SIGNAL CIRCUIT FOR A SHORT TO GROUND	

• Ignition OFF. • Disconnect: IPC C220. • Measure the resistance between the cruise control deactivator switch C278-2, circuit CCA29 (GN/BU), harness side and ground.  N0116082 • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to B10 . **No** REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.
B7 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH FOR AN OPEN	
• Ignition OFF. • Disconnect: Cruise Control Deactivator Switch C278. • Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • CONNECT a fused jumper wire between the cruise control deactivator switch C278-2, circuit CCA29 (GN/BU), harness side and the cruise control deactivator switch C278-1, circuit GD187 (BK/GN), harness side, while monitoring the PCM PID (BOO2).  N0116083 • **Does the BOO2 PID read OFF?**	**Yes** REMOVE the jumper wire. INSTALL a new cruise control deactivator switch. REFER to Cruise Control Deactivator Switch in this section. CLEAR the DTCs. TEST the system for normal operation. **No** REMOVE the jumper wire. GO to B8 .
B8 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Measure the resistance between the cruise control deactivator switch C278-1, circuit GD187 (BK/GN), harness side and ground.	**Yes** GO to B9 . **No** REPAIR the circuit for an open. CLEAR the DTCs. TEST the system for normal operation.

 N0116084 • **Is the resistance less than 5 ohms?**	
B9 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH INPUT TO THE IPC FOR AN OPEN	
• Disconnect: IPC C220. • Measure the resistance between the cruise control deactivator switch C278-2, circuit CCA29 (GN/BU), harness side and the IPC C220-29, circuit CCA29 (GN/BU), harness side.  N0116085 • **Is the resistance less than 5 ohms?**	**Yes** GO to B10 . **No** REPAIR the circuit for an open. CLEAR the DTCs. TEST the system for normal operation.
B10 CHECK FOR CORRECT IPC OPERATION	
• Connect: All Disconnected Connectors. • Disconnect all the IPC connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the IPC 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 IPC . REFER to Section 413-01 . 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.
B11 CHECK FOR CORRECT PCM OPERATION	
• Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM connectors and make sure they are seated correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**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 caused by a loose or corroded connector.

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

There are 5 cruise control switches with each switch operating a specific function that uses different resistance values. The Instrument Panel Cluster (IPC) sends out a reference voltage to the cruise control switches and monitors the voltage drop when a cruise control switch is pressed. The voltage drop varies depending upon the resistance of each switch, providing a specific indication to the IPC which switch is pressed. The IPC sends a network message over the High Speed Controller Area Network (HS-CAN) to the PCM activating and controlling the cruise control system.

IPC DTCs

DTC Description	Fault Trigger Conditions
P0565:01 - Cruise Control ON Signal: General Electrical Failure	A DTC that sets after 1 minute if the IPC detects the ON switch is pressed and held or stuck.
P0566:01 - Cruise Control OFF Signal: General Electrical Failure	A DTC that sets after 1 minute if the IPC detects the OFF switch is pressed and held or stuck.
P0567:01 - Cruise Control RESUME Signal: General Electrical Failure	A DTC that sets after 1 minute if the IPC detects the CAN/RES switch is pressed and held or stuck.
P0568:01 - Cruise Control SET Signal: General Electrical Failure	A DTC that sets after 1 minute if the IPC detects the SET+ switch is pressed and held or stuck.
P0569:01 - Cruise Control COAST Signal: General Electrical Failure	A DTC that sets after 1 minute if the IPC detects the SET- switch is pressed and held or stuck.
P0579:01 - Cruise Control Multifunction Input A Circuit Range/Performance: General Electrical Failure	A continuous and on-demand DTC that sets if the IPC detects the cruise control switch input is in an unknown state for more than 1 second.
P0581:13 - Cruise Control Multi-Function Input A Circuit High: Open Circuit	A continuous and on-demand DTC that sets after 1 minute if the IPC detects an open in the cruise control switch circuits

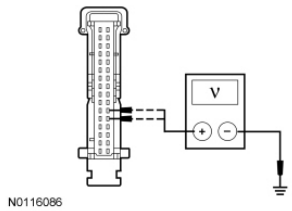
This pinpoint test is intended to diagnose the following:

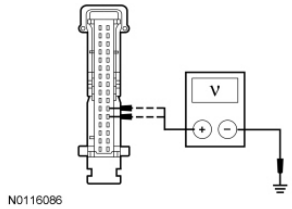
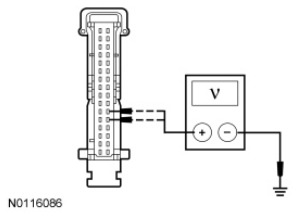
- Wiring, terminals or connectors
- Clockspring
- Cruise control switch
- IPC
- PCM

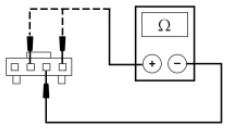
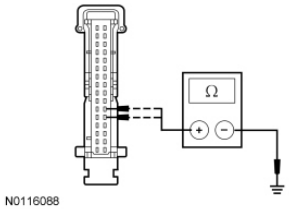
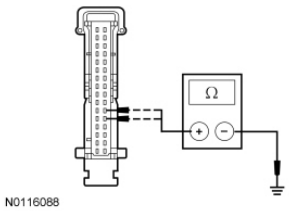
PINPOINT TEST C: THE CRUISE CONTROL SWITCHES DO NOT OPERATE CORRECTLY

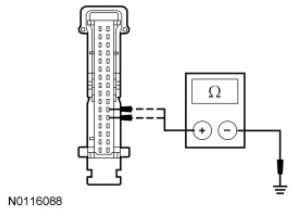
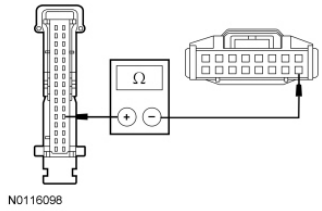
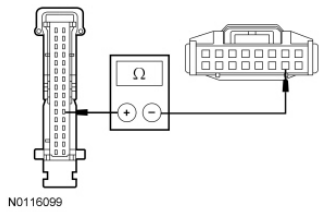
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

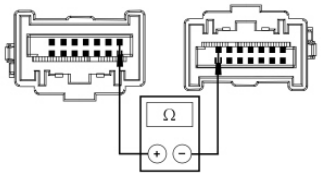
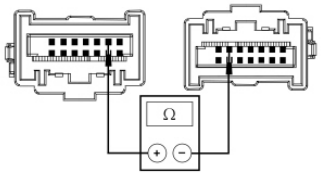
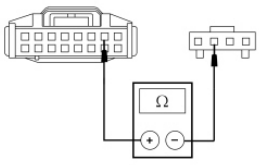
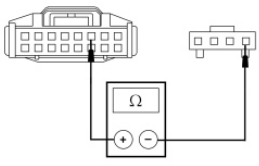
Test Step	Result / Action to Take

C1 CHECK THE CRUISE CONTROL SWITCH PID	
• Enter the following diagnostic mode on the scan tool: IPC DataLogger. • Press each cruise control switch while monitoring the cruise control switch PID (CRUISE_SW). **Cruise Control Switch / CRUISE_SW PID Value** - / NONE Pressed CAN/RE / CANCEL ON / ON OFF / OFF SET + / SET + SET - / SET- • **Does the PID value agree with the switch position?**	**Yes** GO to C12 . **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 C2 .
C2 CHECK THE CRUISE CONTROL SWITCH CIRCUITRY FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Disconnect: IPC C220. • Ignition ON. • Turn the parking lamps on. • Measure the voltage between the IPC C220-28, circuit VES10 (WH), harness side and ground; and between the IPC C220-27, circuit RES08 (GN/BN), harness side and ground.  N0116086 • **Is any voltage present?**	**Yes** TURN the parking lamps off. GO to C3 . **No** TURN the parking lamps off. GO to C6 .
C3 CHECK THE CRUISE CONTROL SWITCH CIRCUITRY FOR A SHORT TO VOLTAGE WITH THE CLOCKSPRING DISCONNECTED	
• Ignition OFF. • Disconnect: Clockspring C218B. • Ignition ON. • Turn the parking lamps on. • Measure the voltage between the IPC C220-28, circuit VES10 (WH), harness side and ground; and between the IPC C220-27, circuit RES08 (GN/BN), harness side	**Yes** REPAIR the circuit in question. CLEAR the DTCs. TEST the system for normal operation. **No** TURN the parking lamps off. GO to C4 .

and ground.  • **Is any voltage present?**	
C4 CHECK THE CLOCKSPRING FOR A SHORT TO VOLTAGE	
• Ignition OFF. • Connect: Clockspring C218B. • ⚠ **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.** • Remove the driver air bag module. Refer to Section 501-20B . • Disconnect: Clockspring C218C. • Connect the battery. • Ignition ON. • Turn the parking lamps on. • Measure the voltage between the IPC C220-28, circuit VES10 (WH), harness side and ground; and between the IPC C220-27, circuit RES08 (GN/BN), harness side and ground.  • **Is any voltage present?**	**Yes** INSTALL a new clockspring. INSTALL the driver air bag module. REFER to Section 501-20B . CLEAR the DTCs. TEST the system for normal operation. **No** GO to C5 .
C5 CHECK THE CRUISE CONTROL SWITCH CIRCUITRY FOR A SHORT TO THE ILLUMINATION CIRCUIT	
• Ignition OFF. • Disconnect: Cruise Control Switch C2999. • Measure the resistance between the cruise control switch C2999-2, harness side and the cruise control switch C2999-3 harness side; and between the cruise control switch C2999-4, harness side and the cruise	**Yes** INSTALL a new cruise control switch. REFER to Cruise Control Switch in this section. INSTALL the driver air bag module. REFER to Section 501-20B . CLEAR the DTCs. TEST the system for normal operation.

control switch C2999-3 harness side.  N0117590 • **Is the resistance greater than 10,000 ohms?**	**No** REPAIR the steering wheel harness or INSTALL a new steering wheel. REFER to Section 211-04 . INSTALL the driver air bag module. REFER to Section 501-20B . TEST the system for normal operation.
C6 CHECK THE CRUISE CONTROL SWITCH CIRCUITRY FOR A SHORT TO GROUND	
• Ignition OFF. • Remove the driver air bag module. Refer to Section 501-20B . • Disconnect: Cruise Control Switch C2999. • Measure the resistance between the IPC C220-28, circuit VES10 (WH), harness side and ground; and between the IPC C220-27, circuit RES08 (GN/BN), harness side and ground.  N0116088 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to C9 . **No** GO to C7 .
C7 CHECK THE CLOCKSPRING FOR A SHORT TO GROUND	
• Disconnect: Clockspring C218B. • Measure the resistance between the IPC C220-28, circuit VES10 (WH), harness side and ground; and between the IPC C220-27, circuit RES08 (GN/BN), harness side and ground.  N0116088 • **Are the resistances greater than 10,000 ohms?**	**Yes** GO to C8 . **No** REPAIR the circuit in question. INSTALL the driver air bag module. REFER to Section 501-20B . CLEAR the DTCs. TEST the system for normal operation.
C8 CHECK THE STEERING WHEEL HARNESS FOR A SHORT TO GROUND	

• Connect: Clockspring C218B. • Disconnect: Clockspring C218C. • Measure the resistance between the IPC C220-28, circuit VES10 (WH), harness side and ground; and between the IPC C220-27, circuit RES08 (GN/BN), harness side and ground.  • **Are the resistances greater than 10,000 ohms?**	**Yes** REPAIR the steering wheel harness or INSTALL a new steering wheel. REFER to Section 211-04 . INSTALL the driver air bag module. REFER to Section 501-20B . TEST the system for normal operation. **No** INSTALL a new clockspring. INSTALL the driver air bag module. REFER to Section 501-20B . CLEAR the DTCs. TEST the system for normal operation.
C9 CHECK THE CRUISE CONTROL SWITCH CIRCUITRY FOR AN OPEN	
• Disconnect: Clockspring C218B . • Measure the resistance between the IPC C220-28, circuit VES10 (WH), harness side and the clockspring C218B-9, circuit VES10 (WH), harness side.  • Measure the resistance between the IPC C220-27, circuit RES08 (GN/BN), harness side and the clockspring C218B-10, circuit RES08 (GN/BN), harness side.  • **Are the resistances less than 5 ohms?**	**Yes** GO to C10 . **No** REPAIR the circuit in question. CLEAR the DTCs. TEST the system for normal operation.
C10 CHECK THE CLOCKSPRING FOR AN OPEN	

• Disconnect: Clockspring C218C. • Measure the resistance between the clockspring C218B-9, component side and the C218C-2, component side.  N0116100 • Measure the resistance between the clockspring C218B-10, component side and the C218C-3, component side.  N0116101 • **Are the resistances less than 5 ohms?**	**Yes** GO to C11 . **No** INSTALL a new clockspring. INSTALL the driver air bag module. REFER to Section 501-20B . CLEAR the DTCs. TEST the system for normal operation.
C11 CHECK THE STEERING WHEEL HARNESS FOR AN OPEN	
• Measure the resistance between the clockspring C218C-2, harness side and the C2999-2, harness side.  N0117591 • Measure the resistance between the clockspring C218C-3, harness side and the C2999-4, harness side.  N0116103 • **Are the resistances less than 5 ohms?**	**Yes** INSTALL a new cruise control switch. REFER to Cruise Control Switch in this section. INSTALL the driver air bag module. REFER to Section 501-20B . CLEAR the DTCs. TEST the system for normal operation. **No** REPAIR the steering wheel harness or INSTALL a new steering wheel. REFER to Section 211-04 . INSTALL the driver air bag module. REFER to Section 501-20B . TEST the system for normal operation.

C12 CHECK FOR CORRECT IPC OPERATION	
• Connect: All Disconnected Connectors. • Disconnect all the IPC connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the IPC 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 IPC . REFER to Section 413-01 . INSTALL the driver air bag module. REFER to Section 501-20B . 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test D: The Cruise Control Does Not Disengage When The Clutch Pedal Is Pressed

Refer to Wiring Diagrams Cell 31 , Cruise Control for schematic and connector information.

Normal Operation

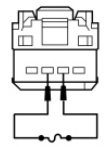
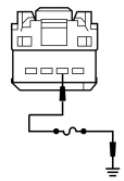
Vehicles equipped with a manual transaxle have an additional clutch pedal cruise control deactivator switch. The clutch pedal cruise control deactivator (top travel) switch is a normally open switch with the clutch pedal released. When the clutch pedal is pressed, the clutch pedal cruise control deactivator switch moves to the closed position, which routes the ground signal to the Instrument Panel Cluster (IPC). The IPC sends a network message over the High Speed Controller Area Network (HS-CAN) to the PCM, deactivating the cruise control system.

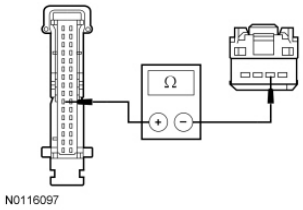
This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Clutch pedal cruise control deactivator switch
- IPC
- PCM

PINPOINT TEST D: THE CRUISE CONTROL DOES NOT DISENGAGE WHEN THE CLUTCH PEDAL IS PRESSED

Test Step	Result / Action to Take
D1 CHECK THE CLUTCH PEDAL CRUISE CONTROL DEACTIVATOR SWITCH PID	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor the PCM PID CPP_TOP while pressing and releasing the clutch pedal. • **Does the PID value read "YES" with the clutch pedal pressed and "NO" with the clutch pedal released?**	**Yes** GO to D6 . **No** GO to D2 .
D2 CHECK THE CLUTCH PEDAL CRUISE CONTROL DEACTIVATOR SWITCH	

• Ignition OFF. • Disconnect: Clutch Pedal Cruise Control Deactivator Switch C277. • Connect a fused jumper wire between the clutch pedal cruise control deactivator switch C277-2, circuit CE904 (GN/VT), harness side and the clutch pedal cruise control deactivator switch C277-3, circuit GD187 (BK/GN), harness side.  N0116095 • Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor the PCM PID CPP_TOP. • **Does the PID value read YES?**	**Yes** INSTALL a new clutch pedal cruise control deactivator switch. REFER to Cruise Control Deactivator Switch in this section. TEST the system for normal operation. **No** GO to D3 .
D3 CHECK THE CLUTCH PEDAL CRUISE CONTROL DEACTIVATOR SWITCH GROUND CIRCUIT FOR AN OPEN	
• Ignition OFF. • Connect a fused jumper wire between the clutch pedal cruise control deactivator switch C277-2, circuit CE904 (GN/VT), harness side and ground.  N0116096 • Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor the PCM PID CPP_TOP. • **Does the PID value read YES?**	**Yes** REPAIR circuit GD187 (BK/GN) for an open. TEST the system for normal operation. **No** GO to D4 .
D4 CHECK THE CLUTCH PEDAL CRUISE CONTROL DEACTIVATOR SWITCH SIGNAL CIRCUIT FOR AN OPEN	

• Disconnect: IPC C220. • Measure the resistance between the IPC C220-10, circuit CE904 (GN/VT), harness side and the clutch pedal cruise control deactivator switch C277-2, circuit CE904 (GN/VT), harness side.  • **Is the resistance less than 5 ohms?**	**Yes** GO to D5 . **No** REPAIR the circuit. TEST the system for normal operation.
D5 CHECK FOR CORRECT IPC OPERATION	
• Disconnect all the IPC connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the IPC connectors and make sure they are seated correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . 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.
D6 CHECK FOR CORRECT PCM OPERATION	
• Connect: All Disconnected Connectors. • Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM 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 PCM. REFER to Section 303-14 . **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test E: DTC P0833

Normal Operation

Vehicles equipped with a manual transaxle have an additional clutch pedal cruise control deactivator switch. The clutch pedal cruise control deactivator switch is a normally open switch with the clutch pedal released. When the clutch pedal is pressed, the clutch pedal cruise control deactivator switch moves to the closed position, which routes the ground signal to the Instrument Panel Cluster (IPC). The IPC sends a network message over the High Speed Controller Area Network (HS-CAN) to the PCM, deactivating the cruise control system.

- DTC P0833 (Clutch Pedal Switch B Circuit) - this is a logic based DTC that sets when the PCM receives the vehicle speed input, indicating vehicle movement and does not detect the switching input signal from the Clutch Pedal Position (CPP) switch or clutch pedal cruise control deactivator switch. This condition disables cruise control.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- PCM

PINPOINT TEST E: DTC P0833

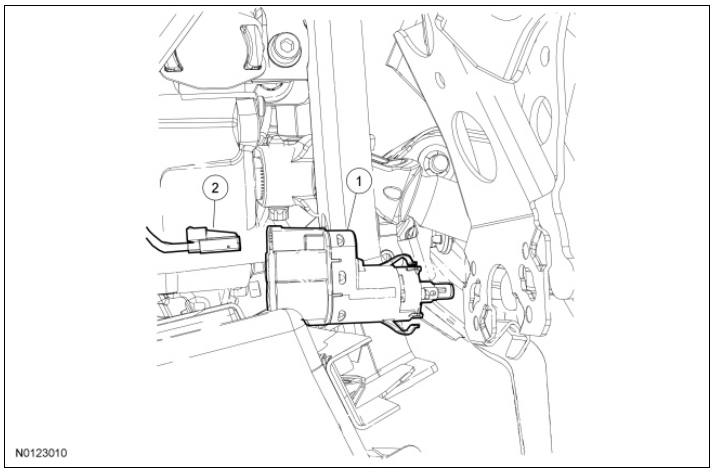
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

Test Step	Result / Action to Take
E1 CHECK THE CLUTCH PEDAL PIDs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: PCM DataLogger. • Monitor the PCM PID CPP_TOP and CPP_BOT while pressing and releasing the clutch pedal. • **Does the PID values agree with the clutch pedal position?**	**Yes** GO to E2 . **No** For an incorrect CPP_TOP PID GO to Pinpoint Test D . For an incorrect CPP_BOT PID Section 303-06 to diagnose the CPP switch.
E2 CHECK FOR CORRECT PCM OPERATION	
• Connect: All Disconnected Connectors. • Disconnect all the PCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect all the PCM 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 PCM. REFER to Section 303-14 . **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Cruise Control Deactivator Switch

NOTICE: **Do not press, pull or otherwise move the brake pedal while installing the stoplamp switch and cruise control deactivation switch. Install these switches 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 results in incorrect adjustment and damages the switches.**

NOTE: Brake pedal cruise control deactivator switch shown. Clutch pedal cruise control deactivator switch similar.



Item	Part Number	Description
1	7C534	Clutch pedal cruise control deactivator switch
1	9C872	Brake pedal cruise control deactivator switch
2	-	Cruise control deactivator switch electrical connector (part of 14K024)

1. Rotate the cruise control deactivator switch counterclockwise one-quarter turn to remove.

2. If equipped with an automatic transmission, perform the brake pedal switch adjustment. For additional information, refer to Section 206-09 .

Cruise Control Switch

Removal and Installation

1. The cruise control switch is part of the steering wheel controls. For additional information, refer to Section 415-00 .

Torque Specifications

Description	Nm	lb-in
Body Control Module (BCM) nuts	13	115
Remote Function Actuator (RFA) bracket bolts	10	89

Module Controlled Functions

Body Control Module (BCM)

The Body Control Module (BCM) is located under the glove compartment and controls the following:

- Rear window defrost
- Horn
- Battery saver
- Exterior lighting
- Interior lighting
- Ambient lighting
- Dimmable backlighting
- Power door lock system
- Luggage compartment/liftgate release
- Front and rear wipers
- Perimeter alarm
- Remote Keyless Entry (RKE) system (vehicles without Intelligent Access (IA))

Battery Saver

NOTE: Time-out is 10 seconds if the vehicle is in Factory mode or 0 seconds if the vehicle is in Transport mode.

To save battery voltage, the BCM automatically shuts off of the interior and exterior lamps after a time-out period.

For specific information of the battery saver feature for the interior lamps, refer to Section 417-02 .

For specific information of the battery saver feature for the exterior lamps, refer to Section 417-01 .

Remote Function Actuator (RFA) Module

The Remote Function Actuator (RFA) is located under the RH front seat and controls the following:

- Ignition switch modes
- Passive Anti-Theft System (PATS) (vehicles with Intelligent Access (IA))
- Remote Keyless Entry (RKE) system (vehicles with IA)

Refer to the appropriate section in this manual for system specific information and diagnostics.

Diagnostic Trouble Code (DTC) Chart

Each module has a comprehensive DTC chart listed in an appropriate section. Refer to the table below for the appropriate section:

Master DTC Index

ABS Module	REFER to Section 206-09 .
Audio Control Module (ACM)	REFER to Section 415-00 .
Accessory Protocol Interface Module (APIM)	REFER to Section 415-00 .
Body Control Module (BCM)	REFER to the Body Control Module (BCM) DTC Chart in this section.
Front Control/Display Interface Module (FCDIM)	REFER to Section 415-00 .
Global Positioning System Module (GPSM)	REFER to Section 415-00 .
Instrument Panel Cluster (IPC)	REFER to Section 413-01 .
Occupant Classification System (OCS) Module	REFER to Section 501-20B .
Power Steering Control Module (PSCM)	REFER to Section 211-00 .
PCM	REFER to Section 303-14 .
Remote Function Actuator (RFA) Module	REFER to the Remote Function Actuator (RFA) Module DTC Chart in this section.
Restraints Control Module (RCM)	REFER to Section 501-20B .
Transmission Control Module (TCM)	REFER to Section 307-11 .
Vehicle Security Module (VSM)	REFER to Section 204-04 .

Body Control Module (BCM)

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 NUD105-R025D or equivalent

Principles of Operation

The Body Control Module (BCM) controls various systems by monitoring inputs from switches, sensors and messages sent over the Medium Speed Controller Area Network (MS-CAN) from other modules. The BCM activates outputs based on the inputs received. For example, the BCM monitors the headlamp switch position, and based on this input, the BCM may provide voltage to the exterior lamps.

Field-Effect Transistor (FET) Protection

A Field-Effect Transistor (FET) is a type of transistor that, when used with module software, monitors and controls current flow on module outputs. The FET protection strategy prevents module damage in the event of excessive current flow.

The BCM utilizes a FET protective circuit strategy for many of its outputs (such as a turn lamp output circuit). Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down when a fault event is detected. A short circuit DTC sets when the fault event occurs.

The circuit remains off until the fault is corrected and the ignition state is cycled off and then back on, the module resets the FET protection and allows the circuit to function.

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical

• Wiring, terminals or connectors

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 is in the ON state.
     - The air bag warning indicator prove-out confirms ignition ON (other indicators may not prove ignition ON). If the ignition does not turn on, refer to Section 211-05 to diagnose no power in RUN.
   - 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 Body Control Module (BCM).

9. If the DTCs retrieved are related to the concern, go to the Body Control Module (BCM) DTC Chart.

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

DTC Charts

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B1007:92	High-Beam Headlamp Switch: Performance Or Incorrect Operation	REFER to Section 417-01 .
B1008:92	Wiper Mode Switch: Performance Or Incorrect Operation	REFER to Section 501-16 .
B1013:23		REFER to Section 501-11 .

	Heater Rear Defog Switch: Signal Stuck Low	
B1034:12	Left Front Seat Heater Element: Circuit Short To Battery	REFER to Section 501-10 .
B1034:14	Left Front Seat Heater Element: Circuit Short To Ground Or Open	REFER to Section 501-10 .
B1051:92	Front Washer Switch: Performance Or Incorrect Operation	REFER to Section 501-16 .
B1052:92	Rear Washer Switch: Performance Or Incorrect Operation	REFER to Section 501-16 .
B108F:23	Cabin Lock/Unlock Switch: Signal Stuck Low	REFER to Section 501-14 .
B1091:12	Courtesy Lamp Sense: Circuit Short To Battery	REFER to Section 417-02 .
B1092:12	Daytime Running Light Relay: Circuit Short To Battery	REFER to Section 417-01 .
B1092:14	Daytime Running Light Relay: Circuit Short To Ground Or Open	REFER to Section 417-01 .
B1098:11	Left Position Light: Circuit Short To Ground	REFER to Section 417-01 .
B1098:15	Left Position Light: Circuit Short To Battery Or Open	REFER to Section 417-01 .
B1099:11	Right Position Light: Circuit Short To Ground	REFER to Section 417-01 .
B1099:15	Right Position Light: Circuit Short To Battery Or Open	REFER to Section 417-01 .
B109A:12	High Beam Relay: Circuit Short To Battery	REFER to Section 417-01 .
B109A:14	High Beam Relay: Circuit Short To Ground Or Open	REFER to Section 417-01 .
B10A6:92	Main Light Switch: Performance Or Incorrect Operation	REFER to Section 417-01 .
B10A8:12	Low Beam Relay: Circuit Short To Battery	REFER to Section 417-01 .
B10A8:14	Low Beam Relay: Circuit Short To Ground Or Open	REFER to Section 417-01 .
B10B1:92	Cabin Set/Reset Switch: Performance Or Incorrect Operation	REFER to Section 419-01A .
B10F1:23	Key In Switch: Signal Stuck Low	REFER to Section 413-01 .
B1108:92	Driver Door Central Locking Motor: Performance Or Incorrect Operation	REFER to Section 501-14 .
B1118:11		REFER to Section 417-01 .

	Left Rear Sidemarker: Circuit Short To Ground	
B1118:15	Left Rear Sidemarker: Circuit Short To Battery Or Open	REFER to Section 417-01 .
B113E:23	External Boot/Trunk Release Switch: Signal Stuck Low	REFER to Section 501-14 .
B115A:23	Front Passenger Seat Heater: Signal Stuck Low	REFER to Section 501-10 .
B115B:23	Front Driver Seat Heater: Signal Stuck Low	REFER to Section 501-10 .
B1175:92	Drivers Door Ajar Switch: Performance Or Incorrect Operation	REFER to Section 417-02 .
B1176:92	Passenger Door Ajar Switch: Performance Or Incorrect Operation	REFER to Section 417-02 .
B1178:92	Boot/Trunk Ajar Switch: Performance Or Incorrect Operation	REFER to Section 417-02 .
B1187:92	Trunk Motor: Performance Or Incorrect Operation	REFER to Section 501-14 .
B11DC:92	Rear Wiper Mode Switch: Performance Or Incorrect Operation	REFER to Section 501-16 .
B11E9:92	Left Rear Door Ajar Switch: Performance Or Incorrect Operation	REFER to Section 417-02 .
B11EA:92	Right Rear Door Ajar Switch: Performance Or Incorrect Operation	REFER to Section 417-02 .
B12F1:11	Ambient Lighting Zone 1 Output: Circuit Short To Ground	REFER to Section 417-02 .
B12F1:15	Ambient Lighting Zone 1 Output: Circuit Short To Battery Or Open	REFER to Section 417-02 .
B132B:12	Left Stop/Turn Lamp: Circuit Short To Battery	REFER to Section 417-01 .
B132B:14	Left Stop/Turn Lamp: Circuit Short To Ground Or Open	REFER to Section 417-01 .
B132C:12	Right Stop/Turn Lamp: Circuit Short To Battery	REFER to Section 417-01 .
B132C:14	Right Stop/Turn Lamp: Circuit Short To Ground Or Open	REFER to Section 417-01 .
B134E:23	Switch Illumination Adjustment Control: Signal Stuck Low	REFER to Section 413-00 .
B1A84:41	Car Configuration Data: General Checksum Failure	CARRY OUT PMI on the BCM . REFER to Section 418-01 . CLEAR the DTCs. REPEAT the self-test. If DTC B1A84:41 is retrieved again, INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation.

B1A84:51	Car Configuration Data: Not Programmed	CARRY OUT PMI on the BCM . REFER to Section 418-01 . CLEAR the DTCs. REPEAT the self-test. If DTC B1A84:51 is retrieved again, INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation.
B1C45:24	Front Wiper Park Position Switch: Signal Stuck High	REFER to Section 501-16 .
B1C53:13	Front Wiper Intermittent Data: Circuit Open	REFER to Section 501-16 .
B1D06:11	Left Turn Indicator: Circuit Short To Ground	REFER to Section 417-01 .
B1D06:15	Left Turn Indicator: Circuit Short To Battery Or Open	REFER to Section 417-01 .
B1D07:11	Right Turn Indicator: Circuit Short To Ground	REFER to Section 417-01 .
B1D07:15	Right Turn Indicator: Circuit Short To Battery Or Open	REFER to Section 417-01 .
B1D14:11	Interior Lights Circuit "B": Circuit Short To Ground	REFER to Section 417-02 .
B1D35:23	Hazard Switch: Signal Stuck Low	REFER to Section 417-01 .
B1D36:92	Turn Indicator Switch: Performance Or Incorrect Operation	REFER to Section 417-01 .
C1137:24	Reverse Gear Switch: Signal Stuck High	REFER to Section 417-01 .
P062F:41	Internal Control Module EEPROM Error: General Checksum Failure	CARRY OUT Programmable Module Installation (PMI) on the BCM . REFER to Section 418-01 .
P062F:46	Internal Control Module EEPROM Error: Calibration/Parameter Memory Failure	CARRY OUT the Programmable Module Installation (PMI) Using the Integrated Diagnostic System (IDS) When the Original Module is NOT Available procedure. REFER to Section 418-01 . TEST the system for normal operation.
P1397:00	System Voltage Out Of Self Test Range: No Sub Type Information	GO to Pinpoint Test A .
P254F:00	Engine Hood Switch Circuit/Open: No Sub Type Information	REFER to Section 419-01A .
U0010:88	Medium Speed CAN Communication Bus: Bus Off	REFER to Section 418-00 .
U0121:00	Lost Communication With Anti-Lock Brake System (ABS) Control Module: No Sub Type Information	GO to Pinpoint Test B .
U0155:00	Lost Communication With Instrument Panel Cluster (IPC) Control Module: No Sub Type Information	GO to Pinpoint Test C .
U0167:00		GO to Pinpoint Test D .

	Lost Communication With Vehicle Immobilizer Control Module: No Sub Type Information	
U0257:00	Lost Communication With Front Controls/Display Interface Module: No Sub Type Information	GO to Pinpoint Test E .
U0415:68	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module: Event Information	RETRIEVE and REPAIR all non-network DTCs set in the ABS module. REFER to Section 206-09 or the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U2005:81	Vehicle Speed: Invalid Serial Data Received	A speed signal is detected during the self-test. DIAGNOSE any symptoms or other module DTCs that are present. CLEAR the DTCs. REPEAT the BCM self-test. If no other symptoms (inaccurate speedometer) or DTCs are present, INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation.
U2010:11	Switch Illumination: Circuit Short To Ground	REFER to Section 413-00 .
U2101:00	Control Module Configuration Incompatible: No Sub Type Information	CARRY OUT Programmable Module Installation (PMI) on the BCM . REFER to Section 418-01 .
U3000:44	Control Module: Data Memory Failure	CARRY OUT PMI on the BCM . REFER to Section 418-01 . CLEAR the DTCs. REPEAT the self-test. If DTC U3000:44 is retrieved again, INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation.
U3000:45	Control Module: Program Memory Failure	CARRY OUT PMI on the BCM . REFER to Section 418-01 . CLEAR the DTCs. REPEAT the self-test. If DTC U3000:45 is retrieved again, INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation.
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	GO to Pinpoint Test F .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	GO to Pinpoint Test G .

Symptom Chart

Symptom Chart

Pinpoint Tests

Pinpoint Test A: DTC P1397:00

Normal Operation

- DTC P1397:00 (System Voltage Out Of Self Test Range: No Sub Type Information) - an on-demand DTC that sets when the Body Control Module (BCM) detects voltage below 10 volts or above 15.5 volts from either voltage supply circuit to BCM C2280A-8 or BCM C2280A-14.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- High circuit resistance
- Charging system concern
- BCM

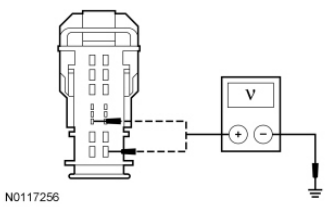
PINPOINT TEST A: DTC P1397:00

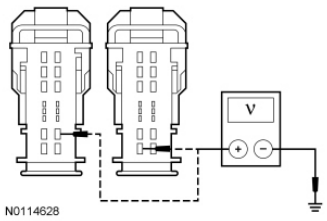
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

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

NOTE: DTC P1397:00 may be stored in the module memory due to previous battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
A1 CHECK FOR DTCs U3003:16 AND U3003:17	
• Check for recorded BCM DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 present?**	**Yes** For DTC U3003:16, GO to Pinpoint Test F . For DTC U3003:17, GO to Pinpoint Test G . **No** GO to A2 .
A2 RECHECK THE BCM DTCs	
• Ignition OFF. • Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM Module Self-Test. • Clear the DTCs. Repeat the BCM self-test. • **Is DTC P1397:00 still present?**	**Yes** GO to A3 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition, during battery charging or while jump starting the vehicle.
A3 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Enter the following diagnostic mode on the scan tool: PCM Self-Test. • Carry out the PCM KOEO self-test. • Retrieve the continuous memory DTCs from the PCM. • **Is DTC P0562, P0620, P0622, P0625, P0626 or P065B set in the PCM?**	**Yes** REFER to Section 414-00 . **No** GO to A4 .

A4 CHECK FOR DTCs B1317, B1318, B1676, P0563 OR U3003:17 SET IN OTHER MODULES	
• Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC B1317, B1318, B1676, P0563 (PCM) or U3003:17 set in any other module?**	**Yes** REFER to Section 414-00 to diagnose the charging system condition. **No** GO to A5 .
A5 CHECK THE BATTERY VOLTAGE	
• Turn off all interior/exterior lights and accessories. • Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage. • **Does the battery voltage rise to 15.5 volts or higher?**	**Yes** REFER to Section 414-00 to diagnose an overcharging condition. **No** GO to A6 .
A6 CHECK THE BATTERY CONDITION AND STATE OF CHARGE	
• Ignition OFF. • Check the battery condition and verify the battery is fully charged. Refer to Section 414-01 . • **Is the battery OK and fully charged?**	**Yes** GO to A7 . **No** REFER to Section 414-00 .
A7 CHECK THE BCM VOLTAGE PID	
• Ignition ON. • Measure and record the voltage at the battery. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM voltage PID. • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to A10 . **No** GO to A8 .
A8 CHECK THE BCM VOLTAGE SUPPLY	
• Ignition OFF. • Disconnect: BCM C2280A. • Ignition ON. • Measure the voltage between the BCM C2280A-8, circuit SBB06 (BN/RD), harness side and ground; and between the BCM C2280A-14, circuit SBB24 (VT/RD), harness side and ground.  • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to A9 . **No** REPAIR circuit SBB06 (BN/RD) or circuit SBB24 (VT/RD) as necessary for high resistance. CLEAR the DTC. REPEAT the self-test.

A9 CHECK THE BCM GROUND CIRCUIT FOR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: Negative Battery Cable . • Disconnect: BCM C2280B. • Measure the resistance between the BCM C2280A-16, circuit GD115 (BK/GY), harness side and ground; and between the BCM C2280B-7, circuit GD115 (BK/GY), harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** GO to A10 . **No** REPAIR circuit GD115 (BK/GY) for high resistance. CLEAR the DTC. REPEAT the self-test.
A10 CHECK FOR CORRECT BCM OPERATION	
• Disconnect the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the BCM 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 BCM . REFER to Body Control Module (BCM) in this section. 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 B: DTC U0121:00

Normal Operation

- DTC U0121:00 (Lost Communication With Anti-Lock Brake System (ABS) Control Module: No Sub Type Information) - sets in the Body Control Module (BCM) if data messages received from the ABS module are missing. For a complete list of all network messages, refer to Section 418-00 .

This pinpoint test is intended to diagnose the following:

- Communication network concern
- ABS module
- BCM

PINPOINT TEST B: DTC U0121:00

Test Step	Result / Action to Take
B1 VERIFY THE CUSTOMER CONCERN	

• Ignition ON. • Verify that there is an observable symptom present. • **Is an observable symptom present?**	**Yes** GO to B2 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
B2 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Network Test. • Carry out the network test. • **Does the ABS module pass the network test?**	**Yes** GO to B3 . **No** REFER to Section 418-00 , The ABS Module Does Not Respond To The Scan Tool.
B3 RETRIEVE THE RECORDED DTCs FROM THE BCM SELF-TEST	
• Check for recorded BCM DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test F . For DTC U3003:17, GO to Pinpoint Test G . **No** GO to B4 .
B4 CHECK FOR DTCs U3003:16 AND U3003:17 FROM THE ABS MODULE SELF-TEST	
• Retrieve the continuous memory DTCs from the ABS module. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** REFER to Section 206-09 . **No** GO to B5 .
B5 RECHECK THE BCM DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not have been carried out. • Clear the DTCs. Repeat the BCM self-test. • **Is DTC U0121:00 still present?**	**Yes** GO to B6 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
B6 CHECK FOR DTC U0121:00 or U0121 SET IN OTHER MODULES	
• Clear the DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules.	**Yes** INSTALL a new ABS module. REFER to Section 206-09 . CLEAR the DTCs. REPEAT the BCM self-test. **No** INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal

• **Is DTC U0121:00 or DTC U0121 set in any other module?**	operation.

Pinpoint Test C: DTC U0155:00

Normal Operation

- DTC U0155:00 (Lost Communication With Instrument Panel Cluster (IPC) Control Module: No Sub Type Information) - sets in the Body Control Module (BCM) if data messages received from the Instrument Panel Cluster (IPC) are missing. For a complete list of all network messages, refer to Section 418-00 .

This pinpoint test is intended to diagnose the following:

- Communication network concern
- IPC
- BCM

PINPOINT TEST C: DTC U0155:00

Test Step	Result / Action to Take
C1 VERIFY THE CUSTOMER CONCERN	
• Ignition ON. • Verify that there is an observable symptom present. • **Is an observable symptom present?**	**Yes** GO to C2 . **No** The system is operating correctly at this time. The DTC may have bn set due to high network traffic or an intermittent fault condition.
C2 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Network Test. • Carry out the network test. • **Does the IPC pass the network test?**	**Yes** GO to C3 . **No** REFER to Section 418-00 , The Instrument Panel Cluster (IPC) Does Not Respond To The Scan Tool.
C3 RETRIEVE THE RECORDED DTCs FROM THE BCM SELF-TEST	
• Check for recorded BCM DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test F . For DTC U3003:17, GO to Pinpoint Test G . **No** GO to C4 .
C4 CHECK FOR DTC U3006:16 FROM THE IPC SELF-TEST	

• Retrieve the continuous memory DTCs from the IPC . • **Is DTC U3006:16 recorded?**	**Yes** REFER to Section 413-01 . **No** GO to C5 .
C5 RECHECK THE BCM DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not have been carried out. • Clear the DTCs. Repeat the BCM self-test. • **Is DTC U0155:00 still present?**	**Yes** GO to C6 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
C6 CHECK FOR DTC U0155:00 or U0155 SET IN OTHER MODULES	
• Clear the DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC U0155:00 or DTC U0155 set in any other module?**	**Yes** INSTALL a new IPC . REFER to Section 413-01 . CLEAR the DTCs. REPEAT the BCM self-test. **No** INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation.

Pinpoint Test D: DTC U0167:00

Normal Operation

- DTC U0167:00 (Lost Communication With Vehicle Immobilizer Control Module: No Sub Type Information) - sets in the Body Control Module (BCM) if data messages received from the Remote Function Actuator (RFA) module are missing. For a complete list of all netwo messages, refer to Section 418-00 .

This pinpoint test is intended to diagnose the following:

- Communication network concern
- RFA module
- BCM

PINPOINT TEST D: DTC U0167:00

Test Step	Result / Action to Take
D1 VERIFY THE CUSTOMER CONCERN	
• Ignition ON. • Verify that there is an observable symptom present.	**Yes** GO to D2 . **No**

• **Is an observable symptom present?**	The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
D2 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Network Test. • Carry out the network test. • **Does the RFA module pass the network test?**	**Yes** GO to D3 . **No** REFER to Section 418-00 , The Remote Function Actuator (RFA) Module Does Not Respond To The Scan Tool.
D3 RETRIEVE THE RECORDED DTCs FROM THE BCM SELF-TEST	
• Check for recorded BCM DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test F . For DTC U3003:17, GO to Pinpoint Test G . **No** GO to D4 .
D4 CHECK FOR DTCs U3003:16 AND U3003:17 FROM THE RFA MODULE SELF-TEST	
• Retrieve the continuous memory DTCs from the RFA module. • **Is DTC U3003:16 or U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test O . For DTC U3003:17, GO to Pinpoint Test P . **No** GO to D5 .
D5 RECHECK THE BCM DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not have been carried out. • Clear the DTCs. Repeat the BCM self-test. • **Is DTC U0167:00 still present?**	**Yes** INSTALL a new RFA module. REFER to Remote Function Actuator (RFA) Module in this section. CLEAR the DTCs. REPEAT the BCM self-test. If the concern is still present after the repair, INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.

Pinpoint Test E: DTC U0257:00

Normal Operation

- DTC U0257:00 (Lost Communication With Front Controls/Display Interface Module: No Sub Type Information) - sets in the Body Control Module (BCM) if data messages received from the Front Control/Display Interface Module (FCDIM) are missing. For a complete list of all network messages, refer to Section 418-00 .

This pinpoint test is intended to diagnose the following:

- Communication network concern
- FCDIM
- BCM

PINPOINT TEST E: DTC U0257:00

Test Step	Result / Action to Take
E1 VERIFY THE CUSTOMER CONCERN	
• Ignition ON. • Verify that there is an observable symptom present. • **Is an observable symptom present?**	**Yes** GO to E2 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
E2 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Network Test. • Carry out the network test. • **Does the FCDIM pass the network test?**	**Yes** GO to E3 . **No** REFER to Section 418-00 , The Front Control/Display Interface Module (FCDIM) Does Not Respond To The Scan Tool.
E3 RETRIEVE THE RECORDED DTCs FROM THE BCM SELF-TEST	
• Check for recorded BCM DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test F . For DTC U3003:17, GO to Pinpoint Test G . **No** GO to E4 .
E4 CHECK FOR DTCs U3006:16 AND U3006:17 FROM THE FCDIM SELF-TEST	
• Retrieve the continuous memory DTCs from the FCDIM . • **Is DTC U3006:16 or DTC U3006:17 recorded?**	**Yes** REFER to Section 415-00 . **No** GO to E5 .
E5 RECHECK THE BCM DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not	**Yes** GO to E6 . **No**

have been carried out. • Clear the DTCs. Repeat the BCM self-test. • **Is DTC U0257:00 still present?**	The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
E6 CHECK FOR DTC U0257:00 OR U0257 SET IN OTHER MODULES	
• Clear the DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC U0257:00 or DTC U0257 set in any other module?**	**Yes** INSTALL a new FCDIM . REFER to Section 415-00 . CLEAR the DTCs. REPEAT the BCM self-test. **No** INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation.

Pinpoint Test F: DTC U3003:16

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

Normal Operation

- DTC U3003:16 (Battery Voltage: Circuit Voltage Below Threshold) - sets in the Body Control Module (BCM) when the BCM detects that battery voltage has dropped below 9 volts from the voltage supply circuit.

This pinpoint test is intended to diagnose the following:

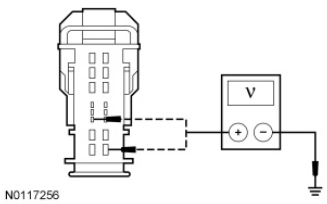
- Wiring, terminals or connectors
- High circuit resistance BCM

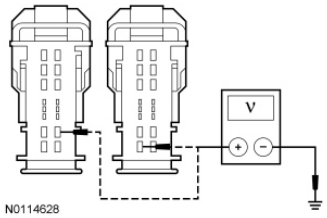
PINPOINT TEST F: DTC U3003:16

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 results in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
F1 RECHECK THE BCM DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM Self-Test. • Clear the DTCs. Repeat the BCM self-test. • **Is DTC U3003:16 still present?**	**Yes** GO to F2 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage

	condition.
F2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Enter the following diagnostic mode on the scan tool: PCM Self-Test. • Carry out the PCM KOEO self-test. • Retrieve the continuous memory DTCs from the PCM. • **Is DTC P0562, P0620, P0622, P0625, P0626 or P065B set in the PCM?**	**Yes** REFER to Section 414-00 . **No** GO to F3 .
F3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE	
• Ignition OFF. • Check the battery condition and verify the battery is fully charged. Refer to Section 414-01 . • **Is the battery OK and fully charged?**	**Yes** GO to F4 . **No** REFER to Section 414-00 .
F4 CHECK THE BCM VOLTAGE PID	
• Ignition ON. • Measure and record the voltage at the battery. • Enter the following diagnostic mode on the scan tool: BCM DataLogger. • Monitor the BCM voltage PID. • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to F7 . **No** GO to F5 .
F5 CHECK THE BCM VOLTAGE SUPPLY	
• Ignition OFF. • Disconnect: BCM C2280A. • Ignition ON. • Measure the voltage between the BCM C2280A-8, circuit SBB06 (BN/RD), harness side and ground; and between the BCM C2280A-14, circuit SBB24 (VT/RD), harness side and ground.  • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to F6 . **No** REPAIR circuit SBB06 (BN/RD) or circuit SBB24 (VT/RD) as necessary for high resistance. CLEAR the DTC. REPEAT the self-test.
F6 CHECK THE BCM GROUND CIRCUIT FOR HIGH RESISTANCE	

• Ignition OFF. • Disconnect: Negative Battery Cable. • Disconnect: BCM C2280D. • Measure the resistance between the BCM C2280A-16, circuit GD115 (BK/GY), harness side and ground; and between the BCM C2280B-7, circuit GD115 (BK/GY), harness side and ground.  • **Is the resistance less than 5 ohms?**	**Yes** GO to F7 . **No** REPAIR circuit GD115 (BK/GY) for high resistance. CLEAR the DTC. REPEAT the self-test.
F7 CHECK FOR CORRECT BCM OPERATION	
• Disconnect the BCM connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the BCM 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 BCM . REFER to Body Control Module (BCM) in this section. 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 G: DTC U3003:17

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

Normal Operation

- DTC U3003:17 (Battery Voltage: Circuit Voltage Above Threshold) - sets in the Body Control Module (BCM) when the BCM detects that battery voltage exceeds 15.9 volts on the voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Charging system concern
- BCM

PINPOINT TEST G: DTC U3003:17

NOTE: DTC U3003:17 may be stored in the module memory due to previous battery charging or vehicle jump starting events.

Test Step	Result / Action to Take

G1 CHECK FOR DTC B1317, B1676, P0563 (PCM) OR U3003:17 SET IN OTHER MODULES	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memoryTCs from all modules. • **Is DTC B1317, B1676, P0563 (PCM) or U3003:17 set in more than one module?**	**Yes** REFER to Section 414-00 to diagnose an overcharging condition. **No** GO to G2 .
G2 CHECK THE BATTERY VOLTAGE	
• Turn off all interior/exterior lights and accessories. • Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage. • **Does the battery voltage rise to 15.5 volts or higher?**	**Yes** REFER to Section 414-00 to diagnose an overcharging condition. **No** GO to G3 .
G3 RECHECK FOR DTC U3003:17	
• Turn the engine off. • Ignition ON. • Enter the following diagnostic mode on the scan tool: BCM Self-Test. • Clear the continuous memory DTCs. • Carry out the BCM self-test. • **Is DTC U3003:17 present?**	**Yes** INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.

Remote Function Actuator (RFA) Module

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 NUD105-R025D or equivalent

Principles of Operation

The Remote Function Actuator (RFA) module is only on vehicles equipped with the Intelligent Access (IA) feature. On vehicles equipped with this option, the RFA controls the IA and related entry/anti-theft systems (such as the power door locks and luggage compartment/liftgate release). The RFA module communicates on the High Speed Controller Area Network (HS-CAN) and the Medium Speed Controller Area Network (MS-CAN). The RFA module controls the following functions:

- IA feature
- Ignition states
- Passive Anti-Theft System (PATS)
- Remote Keyless Entry (RKE) system

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
• Wiring, terminals or connectors

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) 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 is in the ON state.
     - The air bag warning indicator prove-out confirms ignition ON (other indicators may NOT prove ignition is in the ON state). If ignition does not change to the ON state, refer to Section 211-05 to diagnose no power in RUN.
   - verify the scan tool operation with a known good vehicle.
   - refer to Section 418-00 , Inspection and Verification to establish a scan tool session.

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 Remote Function Actuator (RFA) module.

9. If the DTCs retrieved are related to the concern, go to the Remote Function Actuator (RFA) Module DTC Chart.

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

DTC Charts

Remote Function Actuator (RFA) Module DTC Chart

NOTE: Refer to Description and Operation, Intelligent Access (IA) with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states (ignition off, ignition on, ignition start) on vehicles with this feature.

DTC	Description	Action
B102B:05	Passive Key: System Programming Failure	REFER to Section 419-01B .
B108B:23	Start Button Circuit "A": Signal Stuck Low	REFER to Section 211-05 .
B108B:29	Start Button Circuit "A": Signal Invalid	REFER to Section 211-05 .
B108C:23	Start Button Circuit "B": Signal Stuck Low	REFER to Section 211-05 .
B10C6:1F		REFER to Section 501-14 .

	Exterior Trunk Antenna: Circuit Intermittent	
B10C7:1F	Interior Trunk Antenna: Circuit Intermittent	REFER to Section 419-01B .
B10C8:1F	Interior Centre Antenna: Circuit Intermittent	REFER to Section 419-01B .
B10C9:1F	Interior Front Antenna: Circuit Intermittent	REFER to Section 419-01B .
B10D1:24	Left Front Lock Button: Signal Stuck High	REFER to Section 501-14 .
B10D3:24	Right Front Lock Button: Signal Stuck High	REFER to Section 501-14 .
B10D5:13	PATS Antenna: Circuit Open	REFER to Section 419-01B .
B10D6:62	PATS Enable Status: Signal Compare Failure	REFER to Section 419-01B .
B10D7:05	PATS Key: System Programming Failure	REFER to Section 419-01B .
B10D7:51	PATS Key: Not Programmed	REFER to Section 419-01B .
B10D7:81	PATS Key: Invalid Serial Data Received	REFER to Section 419-01B .
B10D8:00	PATS Key Less Than Minimum Programmed: No Sub Type Information	REFER to Section 419-01B .
B10D9:87	PATS Transponder: Missing Message	REFER to Section 419-01B .
B10DA:51	PATS Target Identifier: Not Programmed	REFER to Section 419-01B .
B10DA:62	PATS Target Identifier: Signal Compare Failure	REFER to Section 419-01B .
B10E6:11	PATS Power Supply: Circuit Short To Ground	REFER to Section 419-01B .
B10E6:12	PATS Power Supply: Circuit Short To Battery	REFER to Section 419-01B .
B10E7:11	Ignition On Relay: Circuit Short To Ground	REFER to Section 211-05 .
B10E7:12	Ignition On Relay: Circuit Short To Battery	REFER to Section 211-05 .
B10E7:16	Ignition On Relay: Circuit Voltage Below Threshold	REFER to Section 211-05 .
B10E7:17	Ignition On Relay: Circuit Voltage Above Threshold	REFER to Section 211-05 .
B113E:24	External Boot/Trunk Release Switch: Signal Stuck High	REFER to Section 501-14 .
B11FD:1F	Left Front Exterior Antenna: Circuit Intermittent	REFER to Section 501-14 .
B1210:1F	Right Front Exterior Antenna: Circuit Intermittent	REFER to Section 501-14 .
P0560:16	System Voltage: Circuit Voltage	REFER to GO to Pinpoint Test H .

	Below Threshold	
P0560:17	System Voltage: Circuit Voltage Above Threshold	REFER to GO to Pinpoint Test I .
P0615:12	Starter Relay Circuit: Circuit Short To Battery	REFER to Section 303-06 .
P081C:62	Park Input Circuit: Signal Compare Failure	REFER to Section 413-01 .
P1571:62	Brake Switch: Signal Compare Failure	REFER to Section 303-06 .
P1708:62	Clutch Switch Circuit: Signal Compare Failure	REFER to Section 303-06 .
U0001:00	High Speed CAN Communication Bus: No Sub Type Information	REFER to Section 418-00 .
U0010:00	Medium Speed CAN communication Bus: No Sub Type Information	REFER to Section 418-00 .
U0100:00	Lost Communication With ECM/PCM "A": No Sub Type Information	REFER to GO to Pinpoint Test J .
U0100:87	Lost Communication With ECM/PCM "A": Missing Message	REFER to Section 419-01B .
U0101:00	Lost Communication with TCM: No Sub Type Information	REFER to GO to Pinpoint Test K .
U0121:00	Lost Communication With Anti-Lock Brake System (ABS) Control Module: No Sub Type Information	REFER to GO to Pinpoint Test L .
U0140:00	Lost Communication With Body Control Module: No Sub Type Information	REFER to GO to Pinpoint Test M .
U0155:00	Lost Communication With Instrument Panel Cluster (IPC) Control Module: No Sub Type Information	REFER to GO to Pinpoint Test N .
U0300:05	Internal Control Module Software Incompatibility: System Programming Failure	CARRY OUT Programmable Module Installation (PMI) on the RFA module. REFER to Section 418-01 .
U201B:54	Control Module Calibration Data #2: Missing Calibration	CARRY OUT Programmable Module Installation (PMI) on the RFA module. REFER to Section 418-01 .
U201F:00	External Receiver: No Sub Type Information	REFER to Section 419-01B .
U201F:13	External Receiver: Circuit Open	REFER to Section 419-01B .
U2100:00	Initial Configuration Not Complete: No Sub Type Information	CARRY OUT Programmable Module Installation (PMI) on the RFA module. REFER to Section 418-01 .
U2101:00	Control Module Configuration Incompatible: No Sub Type Information	CARRY OUT Programmable Module Installation (PMI) on the RFA module. REFER to Section 418-01 .
U3000:01	Control Module: General Electrical Failure	ADDRESS all other DTCs first. CLEAR the DTCs. REPEAT the self-test. If DTC U3000:01 is retrieved again,

		INSTALL a new RFA . REFER to Remote Function Actuator (RFA) Module in this section.
U3000:42	Control Module: General Memory Failure	ADDRESS all other DTCs first. CLEAR the DTCs. REPEAT the self-test. If DTC U3000:42 is retrieved again, INSTALL a new RFA . REFER to Remote Function Actuator (RFA) Module in this section.
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	REFER to GO to Pinpoint Test O .
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	REFER to GO to Pinpoint Test P .
U3003:62	Battery Voltage: Signal Compare Failure	REFER to GO to Pinpoint Test Q .
U3004:11	Accessory Power Relay: Circuit Short To Ground	REFER to Section 211-05 .
U3004:12	Accessory Power Relay: Circuit Short To Battery	REFER to Section 211-05 .
U300E:62	Ignition Input On: Signal Compare Failure	REFER to Section 211-05 .
U300F:62	Ignition Input Accessory: Signal Compare Failure	REFER to Section 211-05 .
U3010:62	Ignition Input Start: Signal Compare Failure	REFER to Section 211-05 .
U3011:62	Ignition Input Off: Signal Compare Failure	REFER to Section 211-05 .

Symptom Chart

Symptom Chart
NOTE: Refer to Description and Operation, Intelligent Access (IA) with Push Button Start in Section 419-01B to review the procedures for achieving the various ignition states (ignition off, ignition in accessory, ignition on, ignition start) on vehicles with this feature.

ConditionPossible SourcesAction

- No communication with the Remote Function Actuator (RFA) Module

- Fuse
- Wiring, terminals or connectors
- RFA module

- REFER to Section 418-00 , The Remote Function Actuator (RFA) Module Does Not Respond To The Scan Tool.

Pinpoint Tests

Pinpoint Test H: DTC P0560:16

Normal Operation

- DTC P0560:16 (System Voltage: Circuit Voltage Below Threshold) - sets in the Remote Function Actuator (RFA) module when the RFA module detects that battery voltage has dropped below 9 volts (for more than 10 seconds) from the voltage supply circuit.

This pinpoint test is intended to diagnose the following:

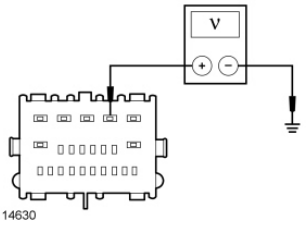
- Wiring, terminals or connectors
- High circuit resistance
- RFA module

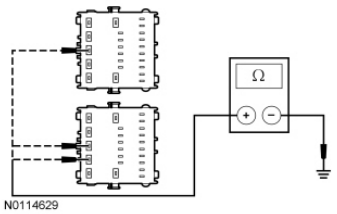
PINPOINT TEST H: DTC P0560:16

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 results in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
H1 RECHECK THE RFA MODULE DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: RFA Module Self-Test. • Clear the DTCs. Repeat the RFA module self-test. • **Is DTC P0560:16 still present?**	**Yes** GO to H2 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition.
H2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Enter the following diagnostic mode on the scan tool: PCM Self-Test. • Carry out the PCM KOEO self-test. • Retrieve the continuous memory DTCs from the PCM. • **Is DTC P0562, P0620, P0622, P0625, P0626 or P065B set in the PCM?**	**Yes** REFER to Section 414-00 . **No** GO to H3 .
H3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE	
• Ignition OFF. • Check the battery condition and verify the battery is fully charged. Refer to Section 414-01 . • **Is the battery OK and fully charged?**	**Yes** GO to H4 . **No** REFER to Section 414-00 .
H4 CHECK THE RFA MODULE VOLTAGE PID	
• Ignition ON.	**Yes** GO to H7 .

• Measure and record the voltage at the battery. • Enter the following diagnostic mode on the scan tool: RFA Module DataLogger. • Monitor the RFA module voltage PID (ECU_Pwr_Sup). • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**No** GO to H5 .
H5 CHECK THE RFA MODULE VOLTAGE SUPPLY	
• Ignition OFF. • Disconnect: RFA Module C3503a. • Ignition ON. • Measure the voltage between the RFA module C3503a-2, circuit SBP14 (BN/RD), harness side and ground.  • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to H6 . **No** REPAIR circuit SBP14 (BN/RD) for high resistance. CLEAR the DTC. REPEAT the self-test.
H6 CHECK THE RFA MODULE GROUND CIRCUIT FOR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Disconnect: RFA Module C3503d. • Measure the resistance between the RFA module and ground as follows: **Connector-Pin** / **Circuit** C3503a-3 / GD145 (BK/BU) C3503d-3 / GD145 (BK/BU) C3503d-4 / GD145 (BK/BU)	**Yes** GO to H7 . **No** REPAIR circuit GD145 (BK/BU) for high resistance. CLEAR the DTC. REPEAT the self-test.

 • **Are the resistances less than 5 ohms?**	
H7 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect the RFA module connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the RFA 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 RFA module. REFER to Remote Function Actuator (RFA) Module in this section. TEST the system for normal operation. If the **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test I: DTC P0560:17

Normal Operation

- DTC P0560:17 (System Voltage: Circuit Voltage Above Threshold) - sets in the Remote Function Actuator (RFA) module when the RFA module detects that battery voltage exceeds 16 volts from the voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Charging system concern
- RFA module

PINPOINT TEST I: DTC P0560:17

NOTE: DTC P0560:17 may be stored in the module memory due to previous battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
I1 CHECK FOR DTC B1317, B1676, P0563 (PCM) OR U3003:17 SET IN OTHEMODULES	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC B1317, B1676, P0563 (PCM) or U3003:17 set in more than one**	**Yes** REFER to Section 414-00 to diagnose an overcharging condition. **No** GO to I2 .

module?	
I2 CHECK THE BATTERY VOLTAGE	
• Turn off all interior/exterior lights and accessories. • Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage. • **Does the battery voltage rise to 16 volts or higher?**	**Yes** REFER to Section 414-00 to diagnose an overcharging condition. **No** GO to I3 .
I3 RECHECK FOR DTC P0560:17	
• Turn the engine off. • Ignition ON. • Enter the following diagnostic mode on the scan tool: RFA Module Self-Test. • Clear the continuous memory DTCs. • Carry out the RFA module self-test. • **Is DTC P0560:17 present?**	**Yes** INSTALL a new RFA module. REFER to Remote Function Actuator (RFA) Module in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.

Pinpoint Test J: DTC U0100:00

Normal Operation

- DTC U0100:00 (Lost Communication With ECM/PCM "A": No Sub Type Information) - sets in the Remote Function Actuator (RFA) module if data messages (engine speed) received from the PCM are missing. For a complete list of all network messages, refer to Section 418-00 .

This pinpoint test is intended to diagnose the following:

- Communication network concern
- PCM
- RFA module

PINPOINT TEST J: DTC U0100:00

Test Step	Result / Action to Take
J1 VERIFY THE SCAN TOOL CAN COMMUNICATE WITH THE PCM	
• Connect the scan tool. • Check that a vehicle session can be established using the scan tool. • **Can a vehicle session be established?**	**Yes** GO to J2 . **No** REFER to Section 418-00 , The PCM Does Not Respond To The Scan Tool.
J2 CHECK THE RFA MODULE CONTINUOUS MEMORY DTCs	
• Ignition ON.	**Yes** GO to J3 .

• Enter the following diagnostic mode on the scan tool: RFA Module Self-Test. • Clear the DTCs. Repeat the RFA module self-test. • **Is DTC U0100:00 retrieved again?**	**No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
J3 RETRIEVE THE RECORDED DTCs FROM THE RFA MODULE SELF-TEST	
• Check for recorded RFA module DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test O . For DTC U3003:17, GO to Pinpoint Test P . **No** GO to J4 .
J4 CHECK FOR DTC U0100:00 OR DTC U0100 SET IN OTHER MODULES	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC U0100:00 or DTC U0100 set in any other module?**	**Yes** INSTALL a new PCM. REFER to Section 303-14 . TEST the system for normal operation. **No** INSTALL a new RFA module. REFER to Remote Function Actuator (RFA) Module in this section. TEST the system for normal operation

Pinpoint Test K: DTC U0101:00

Normal Operation

- DTC U0101:00 (Lost Communication with TCM: No Sub Type Information) - sets in the Remote Function Actuator (RFA) module if data messages received from the Transmission Control Module (TCM) over the High Speed Controller Area Network (HS-CAN) are missing.

This pinpoint test is intended to diagnose the following:

- TCM
- RFA module

PINPOINT TEST K: DTC U0101:00

Test Step	Result / Action to Take
K1 VERIFY THE CUSTOMER CONCERN	
• Ignition ON. • Verify that there is an observable symptom present. • **Is an observable symptom present?**	**Yes** GO to K2 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.

K2 CHECK THE COMMUNICATION NETWORK	
• Enter the following diagnostic mode on the scan tool: Network Test. • Carry out the network test. • **Does the TCM pass the network test?**	**Yes** GO to K3 . **No** REFER to Section 418-00 .
K3 RETRIEVE THE RECORDED DTCs FROM THE RFA MODULE SELF-TEST	
• Check for recorded RFA module DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test O . For DTC U3003:17, GO to Pinpoint Test P . **No** GO to K4 .
K4 RECHECK THE RFA MODULE DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during the Programmable Module Installation (PMI) or the PMI may not have been carried out. • Clear the DTCs. Repeat the RFA module self-test. • **Is DTC U0101:00 still present?**	**Yes** GO to K5 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic.
K5 CHECK FOR DTC U0101:00 OR DTC U0101 SET IN OTHER MODULES	
• Clear all DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Enter the following diagnostic mode on the scan tool: Self-Test . • Retrieve the continuous memory DTCs from all modules. • **Is DTC U0101:00 or DTC U0101 set in any other module?**	**Yes** INSTALL a new TCM . REFER to Section 307-11 . CLEAR the DTCs. REPEAT the self-test. **No** INSTALL a new RFA module. REFER to Remote Function Actuator (RFA) Module in this section. TEST the system for normal operation.

Pinpoint Test L: DTC U0121:00

Normal Operation

- DTC U0121:00 (Lost Communication With Anti-Lock Brake System (ABS) Control Module: No Sub Type Information) - sets in the Remote Function Actuator (RFA) module if data messages received from the ABS module are missing. For a complete list of all network messages, refer to Section 418-00 .

This pinpoint test is intended to diagnose the following:

- Communication network concern
- ABS module
- RFA module

PINPOINT TEST L: DTC U0121:00

Test Step	Result / Action to Take
L1 VERIFY THE CUSTOMER CONCERN	
• Ignition ON. • Verify that there is an observable symptom present. **Is an observable symptom present?**	**Yes** GO to L2 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
L2 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Network Test. • Carry out the network test. • **Does the ABS module pass the network test?**	**Yes** GO to L3 . **No** REFER to Section 418-00 , The ABS Module Does Not Respond To The Scan Tool.
L3 RETRIEVE THE RECORDED DTCs FROM THE RFA MODULE SELF-TEST	
• Check for recorded RFA module DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test O . For DTC U3003:17, GO to Pinpoint Test P . **No** GO to L4
L4 CHECK FOR DTCs U3003:16 AND U3003:17 FROM THE ABS MODULE SELF-TEST	
• Retrieve the continuous memory DTCs from the ABS module. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** REFER to Section 206-09 . **No** GO to L5 .
L5 RECHECK THE RFA MODULE DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not have been carried out. • Clear the DTCs. Repeat the RFA module self-test. • **Is DTC U0121:00 still present?**	**Yes** GO to L6 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
L6 CHECK FOR DTC U0121:00 OR DTC U0121 SET IN OTHER MODULES	

• Clear the DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC U0121:00 OR DTC U0121 set in any other module?**	**Yes** INSTALL a new ABS module. REFER to Section 206-09 . CLEAR the DTCs. REPEAT the self-test. **No** INSTALL a new RFA module. REFER to Remote Function Actuator (RFA) Module in this section. TEST the system for normal operation.

Pinpoint Test M: DTC U0140:00

Normal Operation

- DTC U0140:00 (Lost Communication With Body Control Module: No Sub Type Information) - sets in the Remote Function Actuator (RFA) module if data messages received from the Body Control Module (BCM) are missing. For a complete list of all network messages, refer to Section 418-00 .

This pinpoint test is intended to diagnose the following:

- Communication network concern
- RFA module
- BCM

PINPOINT TEST M: DTC U0140:00

Test Step	Result / Action to Take
M1 VERIFY CUSTOMER CONCERN	
• Ignition ON. • Verify that there is an observable symptom present. • **Is an observable symptom present?**	**Yes** GO to M2 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
M2 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Network Test. • Carry out the network test. • **Does the BCM pass the network test?**	**Yes** GO to M3 . **No** REFER to Section 418-00 .
M3 RETRIEVE THE RECORDED DTCs FROM THE RFA MODULE SELF-TEST	
• Check for recorded RFA module DTCs from the self-test.	**Yes** For DTC U3003:16, GO to

• **Is DTC U3003:16 or DTC U3003:17 recorded?**	Pinpoint Test O . For DTC U3003:17, GO to Pinpoint Test P . **No** GO to M4 .
M4 CHECK FOR DTCs U3003:16 AND U3003:17 FROM THE BCM SELF-TEST	
• Retrieve the continuous memory DTCs from the BCM self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test F . For DTC U3003:17, GO to Pinpoint Test G . **No** GO to M5 .
M5 RECHECK THE RFA MODULE DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not have been carried out. • Clear the DTCs. Repeat the RFA module self-test. • **Is DTC U0140:00 still present?**	**Yes** GO to M6 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
M6 CHECK FOR DTC U0140:00 OR DTC U0140 OTHER MODULES	
• Clear all DTCs. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC U0140:00 or DTC U0140 set in any other module?**	**Yes** INSTALL a new BCM . REFER to Body Control Module (BCM) in this section. TEST the system for normal operation. **No** INSTALL a new RFA module. REFER to Remote Function Actuator (RFA) Module in this section. TEST the system for normal operation.

Pinpoint Test N: DTC U0155:00

Normal Operation

- DTC U0155:00 (Lost Communication With Instrument Panel Cluster (IPC) Control Module: No Sub Type Information) - sets in the Remote Function Actuator (RFA) module if data messages received from the Instrument Panel Cluster (IPC) are missing. For a complete list of all network messages, refer to Section 418-00 .

This pinpoint test is intended to diagnose the following:

- Communication network concern

- RFA module
- IPC

PINPOINT TEST N: DTC U0155:00

Test Step	Result / Action to Take
N1 VERIFY CUSTOMER CONCERN	
• Ignition ON. • Verify that there is an observable symptom present. • **Is an observable symptom present?**	**Yes** GO to N2 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
N2 CHECK THE COMMUNICATION NETWORK	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: Network Test. • Carry out the network test. • **Does the IPC pass the network test?**	**Yes** GO to N3 . **No** REFER to Section 418-00 , The IPC Does Not Respond To The Scan Tool.
N3 RETRIEVE THE RECORDED DTCs FROM THE RFA MODULE SELF-TEST	
• Check for recorded RFA module DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 recorded?**	**Yes** For DTC U3003:16, GO to Pinpoint Test O . For DTC U3003:17, GO to Pinpoint Test P . **No** GO to N4 .
N4 RECHECK THE RFA MODULE DTCs	
NOTE: If new modules were installed prior to the DTC being set, the module configuration may be incorrectly set during Programmable Module Installation (PMI) or the PMI may not have been carried out. • Clear the DTCs. Repeat the RFA module self-test. • **Is DTC U0155:00 still present?**	**Yes** GO to N5 . **No** The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
N5 CHECK FOR DTC U0155:00 OR DTC U0155 SET IN OTHER MODULES	
• Clear the DTCs. • Ignition OFF. • Ignition ON.	**Yes** INSTALL a new IPC . REFER to Section 413-01 .

• Wait 10 seconds. • Enter the following diagnostic mode on the scan tool: Self-Test . • Retrieve the continuous memory DTCs from all modules. • **Is DTC U0155:00 or DTC U0155 set in any other module?**	**No** INSTALL a new RFA module. REFER to Remote Function Actuator (RFA) Module in this section. TEST the system for normal operation.

Pinpoint Test O: DTC U3003:16

Normal Operation

- DTC U3003:16 (Battery Voltage: Circuit Voltage Below Threshold) - sets in the Remote Function Actuator (RFA) module when the RFA module detects that battery voltage has dropped below 9 volts (for more than 10 seconds) from the voltage supply circuit.

This pinpoint test is intended to diagnose the following:

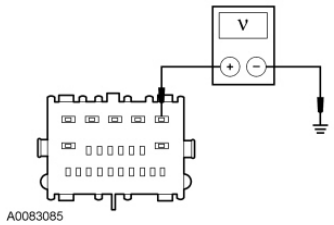
- Wiring, terminals or connectors
- High circuit resistance
- RFA module

PINPOINT TEST O: DTC U3003:16

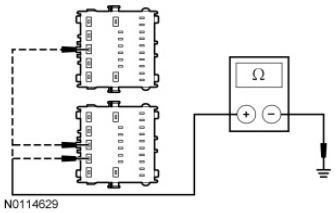
NOTICE: **Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

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

Test Step	Result / Action to Take
O1 RECHECK THE RFA MODULE DTCs	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: RFA Module Self-Test. • Clear the DTCs. Repeat the RFA module self-test. • **Is DTC U3003:16 still present?**	**Yes** GO to O2 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition.
O2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Enter the following diagnostic mode on the scan tool: PCM Self-Test. • Carry out the PCM KOEO self-test. • Retrieve the continuous memory DTCs from the PCM. • **Are any low or high voltage DTCs set in the PCM?**	**Yes** REFER to Section 414-00 . **No** GO to O3 .
O3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE	

• Ignition OFF. • Check the battery condition and verify the battery is fully charged. Refer to Section 414-01 . • **Is the battery OK and fully charged?**	**Yes** GO to O4 . **No** REFER to Section 414-00 .
O4 CHECK THE RFA MODULE VOLTAGE PID	
• Ignition ON. • Measure and record the voltage at the battery. • Enter the following diagnostic mode on the scan tool: RFA Module DataLogger. • Monitor the RFA module voltage PID (ECU_VPWR). • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to O7 . **No** GO to O5 .
O5 CHECK THE RFA MODULE VOLTAGE SUPPLY	
• Ignition OFF. • Disconnect: RFA Module C3503a. • Ignition ON. • Measure the voltage between the RFA module C3503a-1, circuit SBP09 (RD), harness side and ground.  • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to O6 . **No** REPAIR circuit SBP09 (RD) for high resistance. CLEAR the DTC. REPEAT the self-test.
O6 CHECK THE RFA MODULE GROUND CIRCUIT FOR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Disconnect: RFA Module C3503d. • Measure the resistance between the RFA module and ground as follows: **Connector-Pin** / **Circuit** C3503a-3 / GD145 (BK/BU) C3503d-3 / GD145 (BK/BU)	**Yes** GO to O7 . **No** REPAIR circuit GD145 (BK/BU) for high resistance. CLEAR the DTC. REPEAT the self-test.

C3503d-4	GD145 (BK/BU)



• **Are the resistances less than 5 ohms?**

O7 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect the RFA module connectors. • Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the RFA 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 RFA module. REFER to Remote Function Actuator (RFA) Module in this section. 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 P: DTC U3003:17

Normal Operation

- DTC U3003:17 (Battery Voltage: Circuit Voltage Above Threshold) - sets in the Remote Function Actuator (RFA) module when the RFA module detects that battery voltage exceeds 16 volts from the voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Charging system concern
- RFA module

PINPOINT TEST P: DTC U3003:17

NOTE: DTC U3003:17 may be stored in the module memory due to previous battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
P1 CHECFOR DTC B1317, B1676, P0563 (PCM) OR U3003:17 SET IN OTHER MODULES	
• Ignition ON. • Enter the following diagnostic mode on the	**Yes** REFER to Section 414-00 to diagnose an overcharging condition.

scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC B1317, B1676, P0563 (PCM) or U3003:17 set in more than one module?**	**No** GO to P2 .
P2 CHECK THE BATTERY VOLTAGE	
• Turn off all interior/exterior lights and accessories. • Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage. • **Does the battery voltage rise to 16 volts or higher?**	**Yes** REFER to Section 414-00 to diagnose an overcharging condition. **No** GO to P3 .
P3 RECHECK FOR DTC U3003:17	
• Turn the engine off. • Ignition ON. • Enter the following diagnostic mode on the scan tool: RFA Module Self-Test. • Clear the continuous memory DTCs. • Carry out the RFA module self-test. • **Is DTC U3003:17 present?**	**Yes** INSTALL a new RFA module. REFER to Remote Function Actuator (RFA) Module in this section. TEST the system for normal operation. **No** The system is operating correctly at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.

Pinpoint Test Q: DTC U3003:62

Normal Operation

- DTC U3003:62 (Battery Voltage: Signal Compare Failure) - a continuous and on-demand DTC that sets when the RFA module detects a difference of 2 volts between the voltage supply circuit and a message (voltage value) received from the PCM over the High Speed Controller Area Network (HS-CAN).

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- High circuit resistance
- Charging system concern
- RFA module

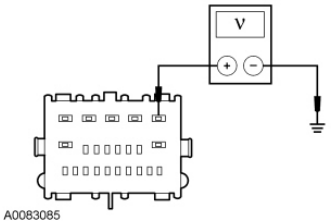
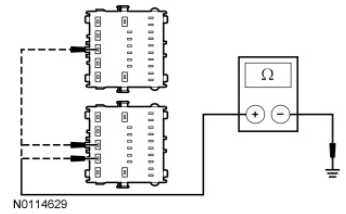
PINPOINT TEST Q: DTC U3003:62

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 results in false resistance readings. Refer to Section 414-01 .

NOTE: DTC U3003:62 may be stored in the module memory due to previous battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
Q1 CHECK FOR DTCs U3003:16 AND U3003:17	
• Check for recorded RFA module DTCs from the self-test. • **Is DTC U3003:16 or DTC U3003:17 present?**	**No** GO to Q2 . **No** For DTC U3003:16, GO to Pinpoint Test Q . For DTC U3003:17, GO to Pinpoint Test P .
Q2 RECHECK THE RFA MODULE DTCs	
• Ignition OFF. • Ignition ON. • Enter the following diagnostic mode on the scan tool: RFA Module Self-Test. • Clear the DTCs. Repeat the RFA Module self-test. • **Is DTC U3003:62 still present?**	**Yes** GO to Q3 . **No** The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition, during battery charging or while jump starting the vehicle.
Q3 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM	
• Enter the following diagnostic mode on the scan tool: PCM Self-Test. • Carry out the PCM KOEO self-test. • Retrieve the continuous memory DTCs from the PCM. • **Is DTC P0562, P0620, P0622, P0625, P0626 or P065B set in the PCM?**	**Yes** REFER to Section 414-00 . **No** GO to Q4 .
Q4 CHECK FOR DTCs B1317, B1318 B1676, P0563 OR U3003:62 SET IN OTHER MODULES	
• Enter the following diagnostic mode on the scan tool: Self-Test. • Retrieve the continuous memory DTCs from all modules. • **Is DTC B1317, B1676, P0563 (PCM) or U3003:17 set in more than one module?**	**Yes** REFER to Section 414-00 to diagnose the charging system condition. **No** GO to Q5 .
Q5 CHECK THE RFA MODULE VOLTAGE PID	
• Ignition ON. • Measure and record the voltage at the battery. • Enter the following diagnostic mode on the scan tool: RFA Module DataLogger. • Monitor the RFA module voltage PID (ECU_VPWR).	**Yes** REFER to Section 414-00 to diagnose the charging system condition. **No** GO to Q6 .

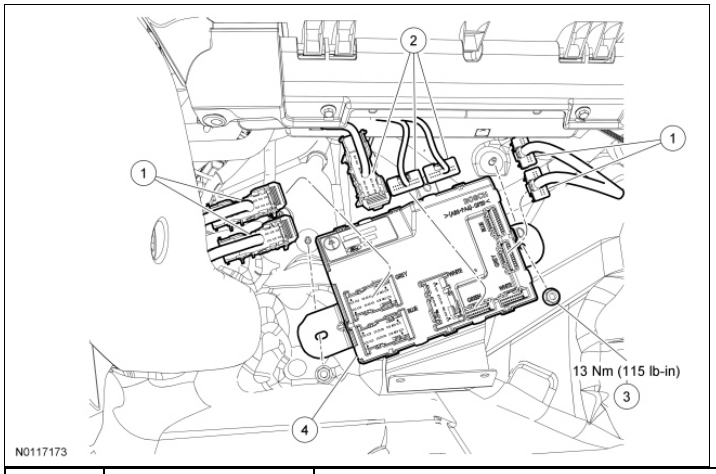
• **Is the voltage within .2 volts of the recorded battery voltage?**	
Q6 CHECK THE RFA MODULE VOLTAGE SUPPLY	
• Ignition OFF. • Disconnect: RFA Module C3503a . • Ignition ON. • Measure the voltage between the RFA module C3503a-1, circuit SBP09 (RD), harness side and ground.  • **Is the voltage within 0.2 volt of the recorded battery voltage?**	**Yes** GO to Q7 . **No** REPAIR circuit SBP09 (RD) for high resistance. CLEAR the DTC. REPEAT the self-test.
Q7 CHECK THE RFA MODULE GROUND CIRCUIT FOR HIGH RESISTANCE	
• Ignition OFF. • Disconnect: Negative Battery Cable. • Measure the resistance between the RFA module and ground as follows: **Connector-Pin / Circuit** C3503a-3 — GD145 (BK/BU) C3503d-3 — GD145 (BK/BU) C3503d-4 — GD145 (BK/BU)  • **Are the resistances less than 5 ohms?**	**Yes** GO to Q8 . **No** REPAIR circuit GD145 (BK/BU) for high resistance. CLEAR the DTC. REPEAT the self-test.
Q8 CHECK FOR CORRECT RFA MODULE OPERATION	
• Disconnect the RFA module connectors.	**Yes** INSTALL a new RFA module. REFER to Remote

• Check for: ♦ corrosion ♦ damaged pins ♦ pushed-out pins • Connect the RFA module connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	Function Actuator (RFA) Module in this section. 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.

Body Control Module (BCM)

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool



Item	Part Number	Description
1	-	Electrical connectors (part of 14A005)
2	-	Electrical connectors (part of 14K024)
3	W520412-S2	Body Control Module (BCM) nut (2 required)
4	15K600	BCM

Removal

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

NOTE: Prior to the replacement of the module, it is necessary to upload the module configuration information to a scan tool. This information must be downloaded into the new Body Control Module (BCM) after installation. For additional information, refer to Section 418-01 . A minimum of 2 devices are necessary to complete the configuration.

1. **NOTE:** This step is only necessary if the BCM is being replaced.

   Upload the module configuration information from the BCM into the scan tool. For additional information, refer to Section 418-01 .

2. Remove the RH dash closeout panel.

3. Disconnect the 7 electrical connectors.

4. Remove the 2 nuts and the BCM .

Installation

1. Position the BCM and install the 2 nuts.
    - Tighten to 13 Nm (115 lb-in).

2. **NOTE:** If the BCM is not being replaced, this is the last step that is necessary.

   Connect the 7 electrical connectors.

3. Install the RH dash closeout panel.

4. Download the BCM configuration information from the scan tool to the BCM . For additional information, refer to Section 418-01 .

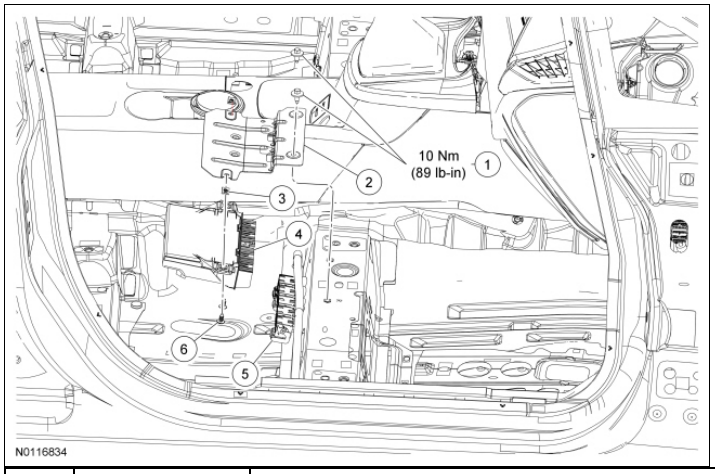
5. Carry out the BCM self-test to confirm all DTCs have been cleared.

6. For vehicles without IA , program all the RKE transmitters into the new BCM . For additional information, refer to Section 501-14 .

Remote Function Actuator (RFA) Module

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool



Item	Part Number	Description
1	W503922	Remote Function Actuator (RFA) bracket bolt (2 required)
2	-	RFA bracket
3	-	RFA module J-nut (2 required)
4	19G481	RFA module
5	-	RFA module electrical connectors (part of 14A005)
6	-	RFA module screw (2 required)

Removal and Installation

1. **NOTE:** The IA keys need to be programmed into the new RFA module during ignition off. For additional information, refer to Key Programming Using Diagnostic Equipment in Section 419-01B . After thn title="Intelligent Access" class="popup" onmouseover="this.className='popupnounderline';" onmouseout="this.className='popup';">IA keys have been programmed into the new RFA module, the ignition must be turned to the ON mode in order to reset the parameters in the new RFA module and the PCM. For additional information, refer to Passive Anti-Theft System (PATS) Parameter Reset in Section 419-01B .

   Remove the passenger seat. For additional information, refer to Section 501-10 .

2. Disconnect the 5 RFA module electrical connectors.

3. Remove the 2 bolts and the RFA module and bracket assembly.
   - To install, tighten to 10 Nm (89 lb-in).

4. To install, reverse the removal procedure.
    - Program the IA keys into the new RFA module. For additional information, refer to Key Programming Using Diagnostic Equipment in Section 419-01B .
    - Carry out a Passive Anti-Theft System (PATS) parameter reset. For additional information, refer to Passive Anti-Theft System (PATS) Parameter Reset in Section 419-01B .

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