Workshop Manual

2002

Ranger

2002 Ranger
Workshop Manual

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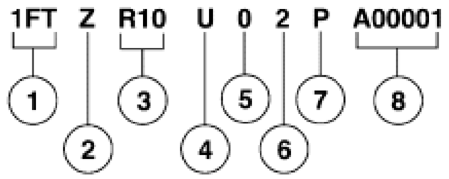
SECTION 100-01:
Identification Codes

DESCRIPTION AND OPERATION

Identification Codes

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 number is also found on the vehicle certification (VC) label.

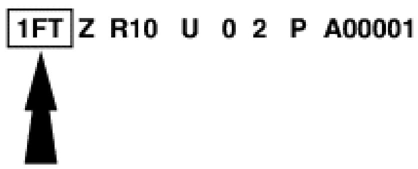


A0037033

Item	Description
1	World manufacturer identifier (WMI)
2	Brake type and gross vehicle weight rating (GVWR) 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

Vehicle Identification Number

World Manufacturer Identifier (WMI)



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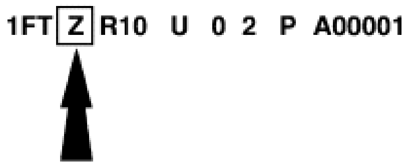
The first three vehicle identification number (VIN) positions are the world manufacturer identifier (WMI).

- 1FT — Ford Motor Company, USA, truck, completed vehicle.
- 1FD — Ford Motor Company, USA, incomplete vehicle.

Brake, Restraint Type and Gross Vehicle Weight Rating (GVWR)

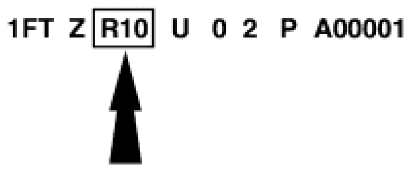


A0037035

The fourth VIN position is the vehicle brake type and gross vehicle weight rating (GVWR) code (all vehicles use hydraulic brakes).

- Z — 5,001 - 6,000 pounds GVWR with second generation air bags.
- Y — 4,001 - 5,000 pounds GVWR with second generation air bags.

Vehicle Line, Series and Body Type

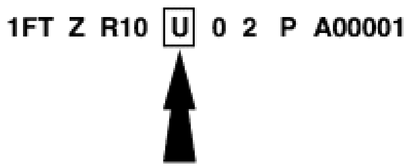


A0037036

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

- R08 — 4x2, Regular cab (electric).
- R10 — 4x2, Regular cab.
- R11 — 4x4, Regular cab.
- R14 — 4x2, SuperCab (two-door).
- R15 — 4x4, SuperCab (two-door).
- R44 — 4x2, SuperCab (four-door)
- R45 — 4x4, SuperCab (four-door)

Engine Code

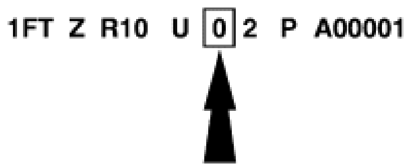


A0037037

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

- D — 2.3L, EFI, four cylinder, gas.
- U — 3.0L, V6, gas.
- E — 4.0L, SOHC, V6, gas.
- 1 — 336V-75 HP electric (nickel metal hydride).
- 7 — 336V-75 HP electric (lead acid).

Check Digit



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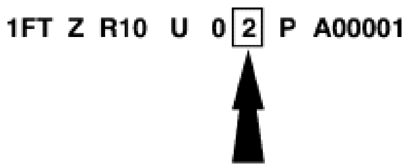
The ninth VIN position is a government-assigned, computer-generated check digit.

Model Year

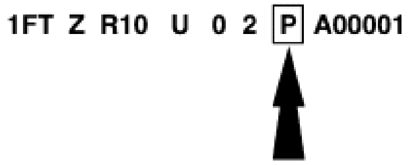


A0037039

The tenth VIN position is the model year code.

- 2 — 2002.

Assembly Plant

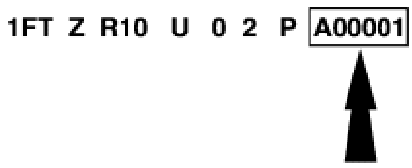


A0037040

The eleventh VIN position is the assembly plant code.

- P — Twin Cities (St. Paul, Minnesota).
- T — Edison (Edison, New Jersey).

Production Sequence Number

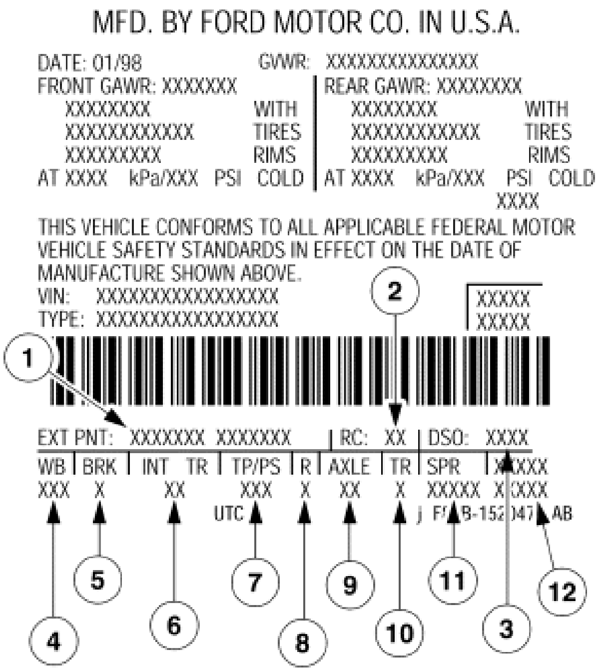


A0037041

The last six VIN positions are an alphanumeric code for the vehicle build sequence. This is also the vehicle serial and warranty number.

- A00001-E99999.

Vehicle Certification (VC) Label



A0008272

Item	Description
1	Exterior paint code
2	Region code
3	Domestic special order code
4	Wheelbase code
5	Brake code
6	Interior trim code
7	Tape/paint pinstripe code
8	Radio code
9	Axle code
10	Transmission code
11	Spring code
12	Calibration numbering

The upper portion of the vehicle certification (VC) label contains the manufacturer name, the month and year of manufacture, the certification statement, and the VIN. It also includes gross vehicle weight ratings (GVWR).

Vehicle Certification (VC) Label — Incomplete Vehicle (Typical)

A0008275

Paint Code

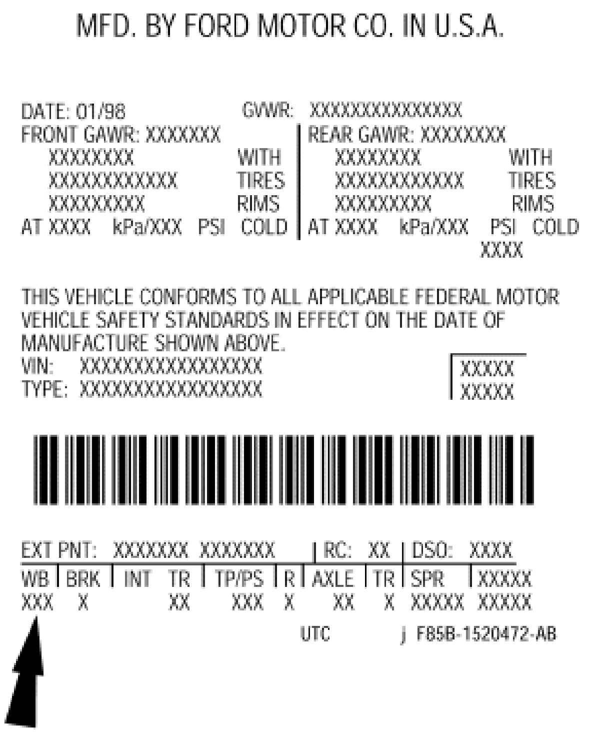
A0018017

Exterior paint codes may be listed as a two-part code. The first set of letters/numbers identify the vehicle primary body color. The second set of letters/number (if applicable) identify a two-tone or accent body color.

- B2 — Harvest Gold.
- E4 — Vermilion.
- FL — Toreador Red.
- LL — Wedgewood Blue.
- TS — Silver Frost.
- LZ — Bright Island Blue.
- PX — Dark Highland Green.
- UA — Ebony.
- YZ — Oxford White.
- BZ — Chrome Yellow.

- S1—Sonic Blue.

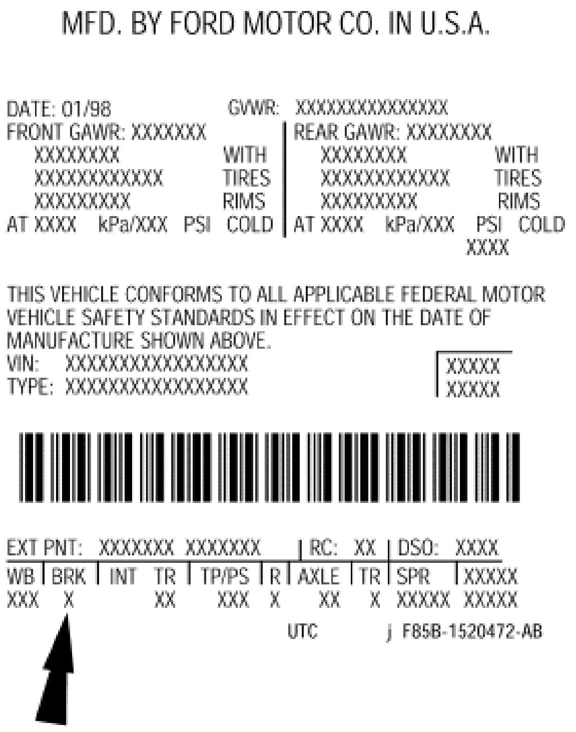
Wheelbase



A0018018

- 112 — 112-inch wheelbase.
- 118 — 118-inch wheelbase.
- 126 — 126-inch wheelbase.

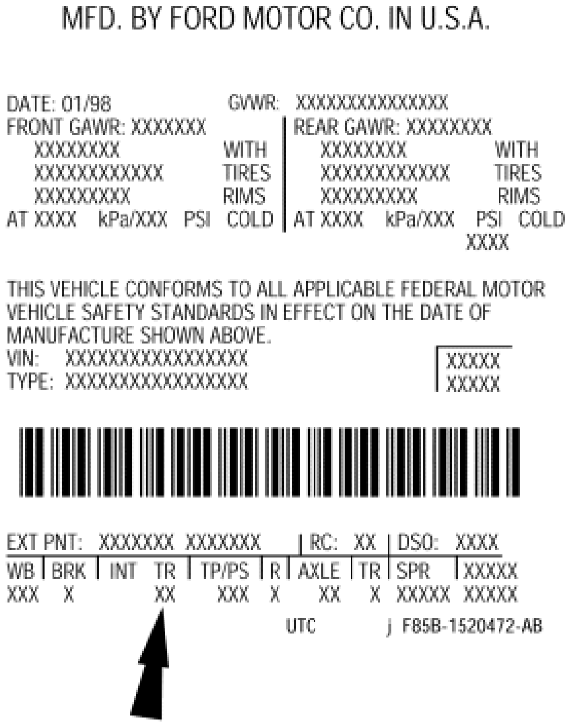
Brake Type



A0018019

- B — Four-wheel anti-lock brake system (ABS).

Interior Trim



A0018020

Interior trim codes are listed as a two-part code. The first code listed, identifies the trim level. The second code listed, identifies the interior trim color.

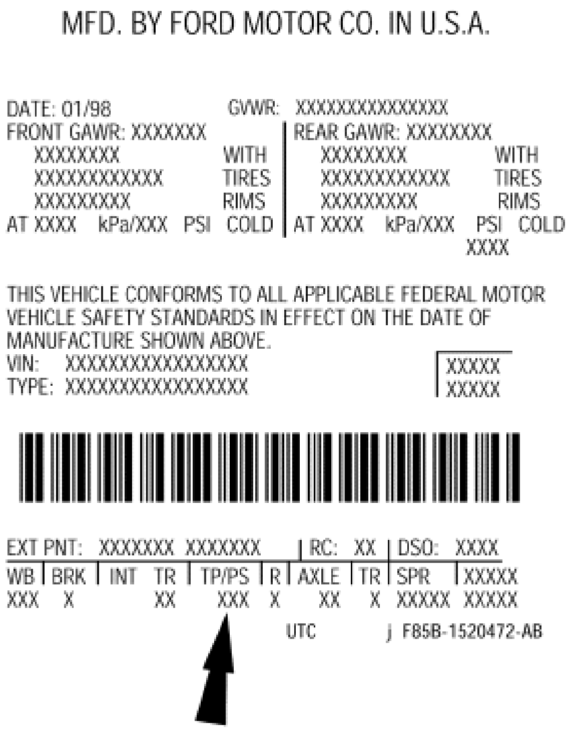
Interior Trim Type

- H — Simulated Split Vinyl Bench Seat.
- E — Cirrus Cloth 60/40 Split Bench Seat.
- G — Triad Luxury Sport Bucket Seats.
- F — Cloth/Vinyl 60/40 Split Bench Seat.
- S — Triangle Insert Sport Bucket Seats.
- T—Diamond II Cloth 60/40 Split Bench Seat.

Interior Trim Color

- T — Dark Graphite.
- X — Medium Prairie Tan.
- B — Ebony.

Tape/Paint Stripe



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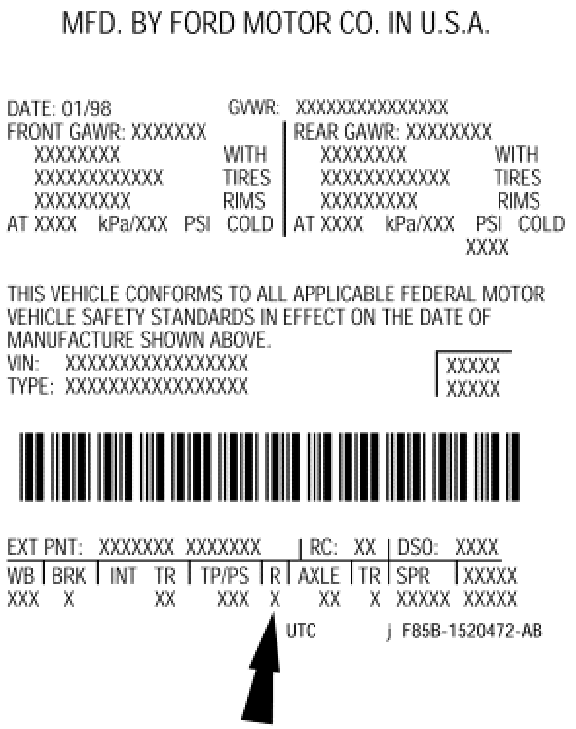
Tape and paint stripe codes do not apply.

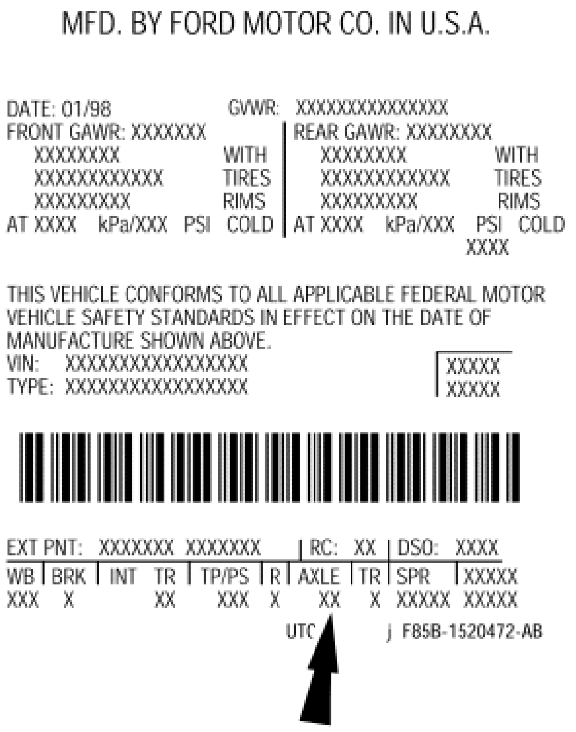
Radio Type



A0018022

- 7 — AM/FM stereo with clock.
- Z — AM/FM stereo with single compact disc (CD) player.
- K — AM/FM stereo (dual media) cassette with compact disc (CD) player.
- 1 — AM/FM stereo with six disc compact disc (CD) changer.
- P—AM/FM stereo with compact disc (CD player (MP3).
- W—AM/FM stereo with compact disc (CD) player and cassette.
- Y — Delete radio.

Axle Code

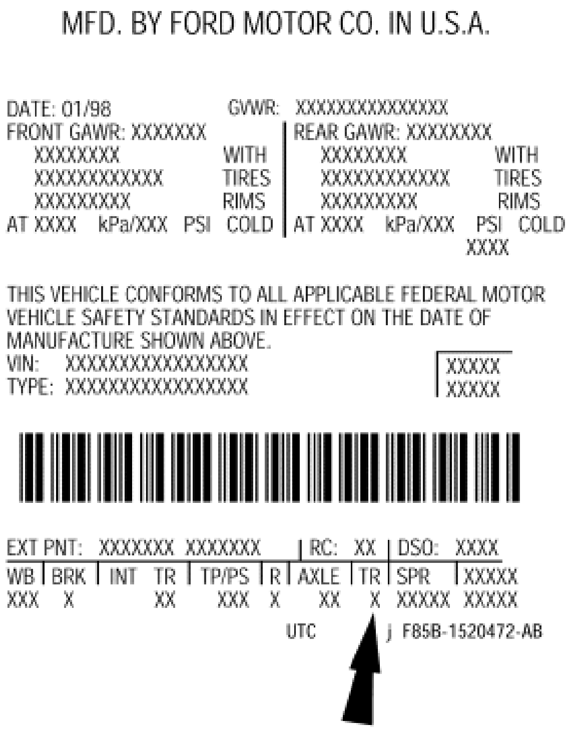


A0018023

The following lists the gear ratios on axles.

- 86 — 3.73 non-limited slip.
- 87 — 4.10 non-limited slip.
- 89 — 4.56 non-limited slip.
- F6 — 3.73 limited slip.
- 95 — 3.55 non-limited slip.
- R5 — 3.55 limited slip.
- 96 — 3.73 non-limited slip.
- 97 — 4.10 non-limited slip.
- R6 — 3.73 limited slip.
- R7 — 4.10 limited slip.
- KA — Electric vehicle (no ratio).

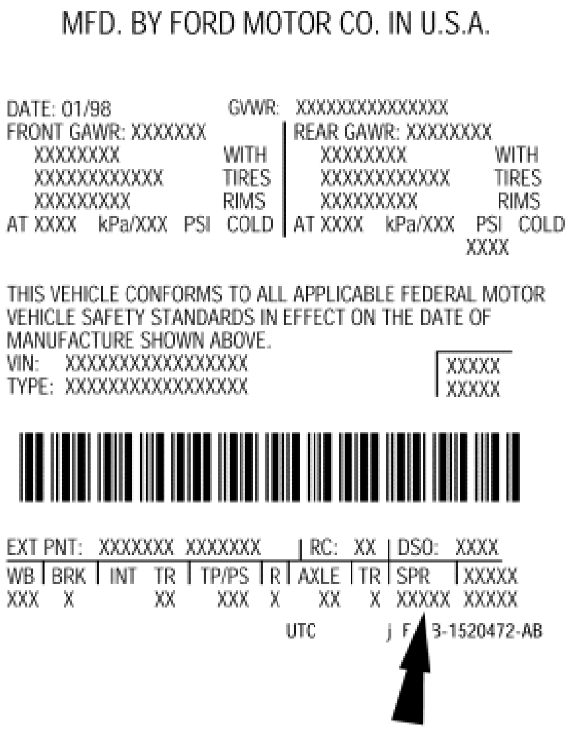
Transmission Type



A0018024

- D — Five-speed automatic (A5LD/5R55E).
- M — Five-speed manual (M5R1).
- J — Five-speed manual.
- H — Single speed (electric).

Spring Codes



A0018025

Spring codes are listed as a two-part code. The first character identifies the front spring/torsion bar code. The second character identifies the rear spring code.

Front Spring Codes

- Base part number — 5310 (RH/LH)
- A — 4x2.
- C — 4x2.
- D — 4x2.
- E — 4x2.
- J — 4x2.
- 2 — 4x2.
- 3 — 4x2.
- 5 — 4x2.

Front Torsion Bar Codes

- Base part number — 5B326 (RH)
- Base part number — 5B327 (LH)
- B — 4x4, 4x2.
- F — 4x4, 4x2.
- 1 — 4x4, 4x2.

Rear Spring Codes

- Base part number — 5560
- 3.
- 7.

- C.
- K.
- N.

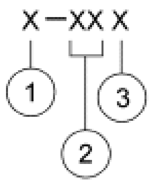
Powertrain Calibration Information

A0010077

NOTE: Powertrain calibration information is limited to a maximum of five characters per line on the vehicle certification label. Because of this, calibration identification consisting of more than five characters will wrap to the second line on the vehicle certification (VC) label.

Powertrain calibration information is printed in the lower right corner of the vehicle certification label. Only the base calibration information is printed. Revision levels will not appear, however, this information can be found in On Line Automotive Service Information System (OASIS). For the current model year, Ford Motor Company is using three different protocols which describe powertrain base calibration. These protocols are designed to provide worldwide standardization for vehicle calibration. If the electronic calibration strategy has been used since 1998 and carried into the current model year, Protocol 1 will be used. Refer to Protocol 1 below. If the electronic calibration strategy has been used since 1999 and is carried into the current model year, Protocol 2 will be used. Refer to Protocol 2 below. Electronic calibration strategies introduced in the 2000 or 2001 model year will use Protocol 3. Refer to Protocol 3 below.

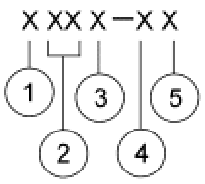
Protocol 1



A0008982

Item	Description
1	Model year (model year in which calibration strategy was first introduced)
2	Engine code
3	Engine revision level

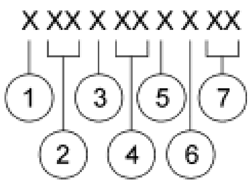
Protocol 2



A0008983

Item	Description
1	Model year (model year in which calibration strategy was first introduced)
2	Engine code
3	Transmission code
4	Emission standard (designates the specific country emission standard)
5	Design level (design level assigned to the engine)

Protocol 3



A0008984

Item	Description
1	Model year (model year in which calibration strategy was first introduced)
2	Vehicle code
3	Transmission code
4	Unique calibration (designates different hardware to similar vehicles). Example: tires, drive ratios, etc.
5	Fleet code (describes fleet to which the vehicle belongs). Example: 6 - evaporative emissions
6	Certification region (lead region where multiple regions are included in one calibration). Example: A - U.S. federal
7	Revision level (will advance as revisions occur). Not printed on label

Protocol 3

The following offers a more detailed explanation of the coding strategy for Protocol 3.

Model Year

- 0 — 2000.
- 1 — 2001.
- 2 — 2002.

Vehicle Line

- R3 — Ranger.

Transmission

- 1 — Automatic transmission.
- 2 — Manual transmission.

Unique Calibration

The Emissions/CAFE/CO2 Compliance Department is responsible for assigning these calibration numbers. Unique calibration identifications are assigned to cover similar vehicles to differentiate tires, drive configurations, final drive ratios and other certification-significant factors.

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

Fleet Code

- 0 — Certification (U.S. 4K, final sale in an export market).
- 1 — HDGE/Dyno.
- 2 — Fast AMA U.S.
- 3 — ADP U.S.
- 4 — Not assigned.
- 5 — Not assigned.
- 6 — Evaporative emissions.
- 7 — MACAA.
- 8 — On-board diagnostics (OBD).
- 9 — Not assigned.

Certification Region

- Lead region where multiple regions are included in one calibration.
- 5 — U.S. fifty states.
- A — U.S. Federal (including altitude, may include Canada or Mexico).
- B — U.S. California standard (includes U.S. green states).
- C — Canada.
- D — China.
- E — European Community (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Luxembourg, Netherlands, 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.
- H — Hong Kong.
- J — Japan.
- K — Korea.
- L — Malaysia.
- M — Mexico.
- N — New Zealand.
- P — Australia.
- Q — South America (Brazil).
- S — Singapore.
- T — Taiwan.
- U — South America (unleaded fuel).
- V — Vietnam.
- X — Rest of World (ROW).
- Y — Military.
- Z — Israel.

Revision Level

Revision levels will advance as revisions occur (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 — On-board diagnostics (OBD) intermediate level (pre-05).

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GROUP 08: Manual Transmission, Clutch and Transfer Case

SECTION 100-02:
Jacking and Lifting

DESCRIPTION AND OPERATION

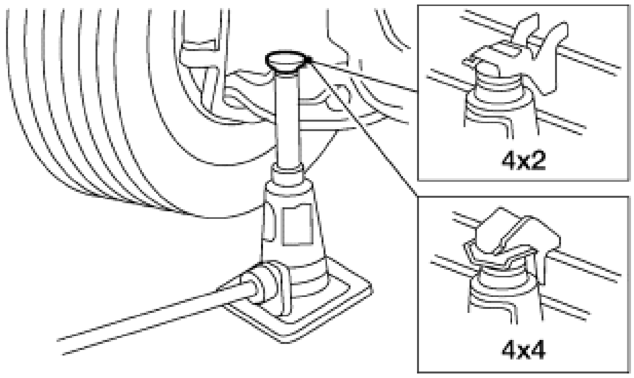
Jacking

WARNING: Do not run the engine when jacking the vehicle. The wheels contacting the ground could cause the vehicle to move.

WARNING: Make sure the jack and jack stands are properly located to prevent the vehicle from falling.

WARNING: Wheel chocks should be used to prevent the vehicle from rolling and falling off the jack.

Jacking Points — Front



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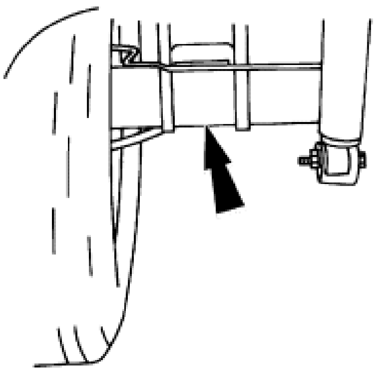
The jacking point is a tab that extends from the front suspension lower control arm.

Jacking Points — Rear


Y5044-A

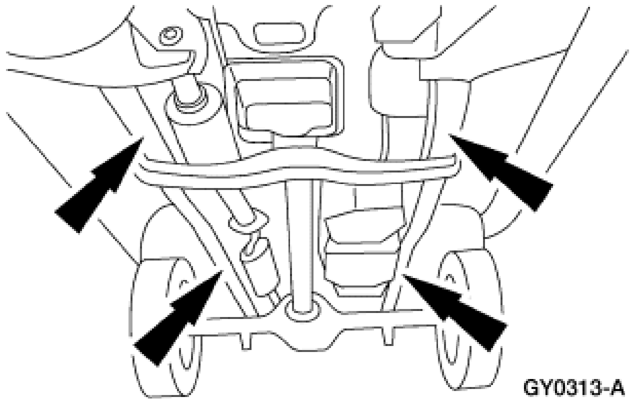
The rear jacking points are located on the rear axle (4001).

Lifting

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

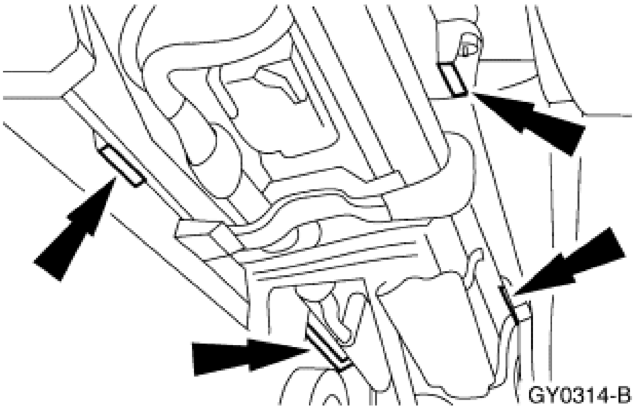
CAUTION: Never use a halfshaft or the differential housing as a lifting point.

Lifting Points — 4x2



Locate the front hoist adapters and rear hoist adapters on the frame of the vehicle as indicated.

Lifting Points — 4x4



Locate the front hoist adapters on the frame bracket and the rear hoist adapters on the vehicle frame as indicated.

SECTION 100-04:
Noise, Vibration and Harshness

DESCRIPTION AND OPERATION

DIAGNOSIS AND TESTING

GENERAL PROCEDURES

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. Noise, vibration and harshness (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 concerns.

Acceptable Noise, Vibration and Harshness

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. For example, Traction-Lok® differentials produce a slight noise on slow turns after extended highway driving. This is acceptable and has no detrimental effect on the locking axle function. As a technician, it is very important to be familiar with vehicle features and know how they relate to NVH concerns 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.

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 noise, vibration and harshness concerns requires:

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

Glossary of Terms

Acceleration — Light

An increase in speed at less than 1/2 throttle.

Acceleration — Medium

An increase in speed at 1/2 to nearly full throttle, such as 0-97 km/h (0-60 mph) in approximately 30 seconds.

Acceleration — Heavy

An increase in speed at 1/2 to full throttle, such as 0-97 km/h (0-60 mph) in approximately 20 seconds.

Ambient Temperature

The surrounding or prevailing temperature.

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.

Backlash

Gear teeth clearance.

Boom

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

Bound Up

An overstressed isolation (rubber) mount that transmits vibration/noise instead of absorbing it.

Brakes Applied

When the service brakes are applied with enough force to hold the vehicle against movement with the transmission in gear.

Buffet/Buffeting

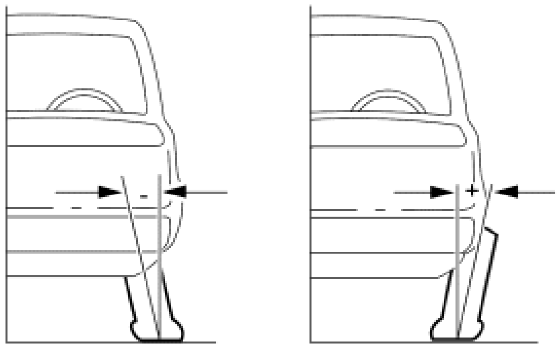
Strong noise fluctuations (less than 1000 Hz) caused by gusting winds. An example would be wind gusts against the side glass.

Buzz

A low-pitched sound (200-5000 Hz) like that from a bee. Often a metallic or hard plastic humming sound. Also describes a high frequency (200-800 Hz) vibration. Vibration feels similar to an electric razor.

Camber

The angle of the wheel in relation to the true vertical as measured looking from the front of the vehicle. Camber is positive when the wheel angle is offset so that the top of the wheel is positioned away from the vehicle.



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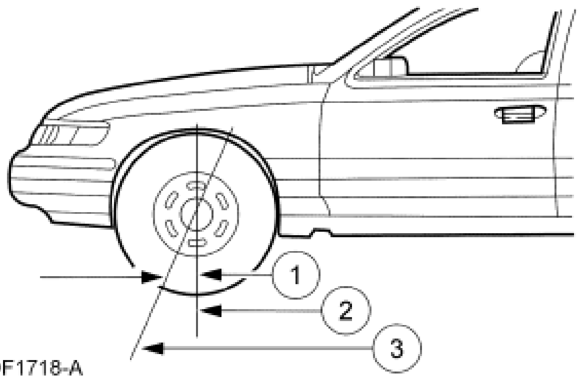
Caster

The angle of the steering knuckle in relation to the true vertical as measured looking from the side of the vehicle.



DF1718-A

Item	Description
1	Positive caster
2	True vertical
3	Steering axis

Chatter

A pronounced series of rapidly repeating rattling or clicking sounds.

Chirp

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

Chuckle

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

Click

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

Clonk

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

Clunk/Driveline Clunk

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

Coast/Deceleration

Releasing the accelerator pedal at cruise, allowing the engine to reduce vehicle speed without applying the brakes.

Coast/Neutral Coast

Placing the transmission range selector in NEUTRAL (N) or depressing the clutch pedal while at cruise.

Constant Velocity (CV) Joint

A joint used to absorb vibrations caused by driving power being transmitted at an angle.

Controlled Rear Suspension Height

The height at which a designated vehicle element must be when driveline angle measurements are made.

Coupling Shaft

The shaft between the transfer case and the front drive axle or, in a 2-piece rear driveshaft, the front section.

CPS

Cycles per second. Same as hertz (Hz).

Cracks

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

Creak

A metallic squeak.

Cruise

Constant speed on level ground; neither accelerating nor decelerating.

Cycle

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

Decibel

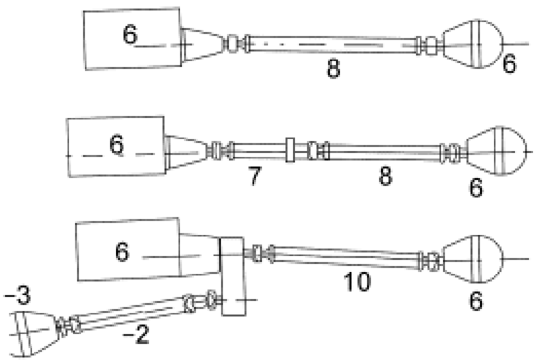
A unit of measurement, referring to sound pressure level, abbreviated dB.

Drive Engine Run-Up (DERU) Test

The operation of the engine through the normal rpm range with the vehicle standing still, the brakes applied and the transmission engaged. This test is used for noise and vibration checks.

Driveline Angles

The differences of alignment between the transmission output shaft, the driveshaft and the rear axle pinion centerline.



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Driveshaft

The shaft that transmits power to the rear axle input shaft (pinion shaft). In a 2-piece driveshaft, it is the rearmost shaft.

Drivetrain

All power transmitting components from the engine to the wheels; includes the clutch or torque converter, the transmission, the transfer case, the driveshaft and the front or rear drive axle.

Drivetrain Damper

A weight attached to the engine, the transmission, the transfer case or the axle. It is tuned by weight and placement to absorb vibration.

Drone

A low frequency (100-200 Hz) steady sound, like a freezer compressor. Also described as a moan.

Drumming

A cycling, low-frequency (20-100 Hz), rhythmic noise often accompanied by a sensation of pressure on the ear drums. Also described as a low rumble, boom or rolling thunder.

Dynamic Balance

The equal distribution of weight on each side of the centerline, so that when the wheel and tire assembly spins, there is no tendency for the assembly to move from side-to-side (wobble). Dynamically unbalanced wheel and tire assemblies can cause wheel shimmy.

Engine Imbalance

A condition in which an engine's center mass is not concentric to the rotation center, causing excessive motion.

Engine Misfire

When combustion in one or more cylinders does not occur or occurs at the wrong time.

Engine Shake

An exaggerated engine movement or vibration that directly increases in frequency as the engine speed increases. It is caused by non-equal distribution of mass in the rotating or reciprocating components.

Flexible Coupling

A flexible joint.

Float

A drive mode on the dividing line between cruise and coast where the throttle setting matches the engine speed with the road speed.

Flutter

Mid to high (100-2000 Hz) 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.

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.

Hiss

Steady high frequency (200-800 Hz) noise. Vacuum leak sound.

Hoot

A steady low frequency tone (50-500 Hz), sounds like blowing over a long neck bottle.

Howl

A mid-range frequency (200-800 Hz) noise between drumming and whine. Also described as a hum.

Hum

Mid-frequency (200-800 Hz) steady sound, like a small fan motor. Also described as a howl.

Hz

Hertz; a frequency measured in cycles per second.

Imbalance

Out of balance; heavier on one side than the other. In a rotating component, imbalance often causes vibration.

Inboard

Toward the centerline of the vehicle.

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.

Isolate

To separate the influence of one component to another.

Knock

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

Moan

A constant, low-frequency (100-200 Hz) tone. Also described as a hum.

Neutral Engine Run-Up (NERU) Test

The operation of the engine through the normal rpm range with the vehicle standing still and the transmission disengaged. This test is used to identify engine related vibrations.

Neutralize/Normalize

To return to an unstressed position. Used to describe mounts. Also refer to bound up.

Outboard

Away from the centerline of the vehicle.

Ping

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

Pinion Shaft

The input shaft in a driving axle that is usually a part of the smaller driving or input hypoid gear of a ring and pinion gearset.

Pitch

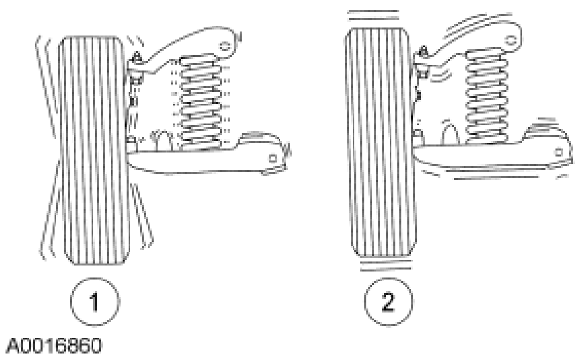
The physical quality of sound that relates to its frequency. Pitch increases as frequency increases and vice versa.

Pumping Feel

A slow, pulsing movement.

Radial/Lateral

Radial is in the plane of rotation; lateral is at 90 degrees to the plane of rotation.



Item	Description
1	Lateral runout
2	Radial runout

Rattle

A random and momentary or short duration noise.

Ring Gear

The large, circular, driven gear in a ring and pinion gearset.

Road Test

The operation of the vehicle under conditions intended to produce the concern under investigation.

Roughness

A medium-frequency vibration. A slightly higher frequency (20 to 50 Hz) than a shake. This type of vibration is usually related to drivetrain components.

Runout

Lateral runout means measuring the movement or "wobble" of a wheel or tire at the sidewall. Radial runout means measuring the out-of-round at the tread surface.

Rustling

Intermittent sound of varying frequency (100-2000 Hz), sounds similar to shuffling through leaves.

Shake

A low-frequency vibration (5-20 Hz), 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.

Slip Yoke/Slip Spline

The driveshaft coupling that allows length changes to occur while the suspension articulates and while the driveshaft rotates.

Squeak

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

Squeal

A long-duration, high-pitched noise.

Static Balance

The equal distribution of weight around the wheel. Statically unbalanced wheel and tire assemblies can cause a bouncing action called wheel tramp. This condition will eventually cause uneven tire wear.

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).

TIR

The acronym for total indicated runout is TIR.

Tire Deflection

The change in tire diameter in the area where the tire contacts the ground.

Tire Flat Spots

A condition commonly caused by letting the vehicle stand while the tires cool off. This condition can be corrected by driving the vehicle until the tires are warm. Also, irregular tire wear patterns in the tire tread resulting from wheel-locked skids.

Tire Force Vibration

A tire vibration caused by variations in the construction of the tire that is noticeable when the tire rotates against the pavement. This condition can be present on perfectly round tires because of variations in the inner tire construction. This condition can occur at wheel rotation frequency or twice rotation frequency.

Transient

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

Two-Plane Balance

Radial and lateral balance.

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 (above 500 Hz) with a very narrow frequency band. Examples of whistle noises are a turbocharger or airflow around an antenna.

Wind Noise

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

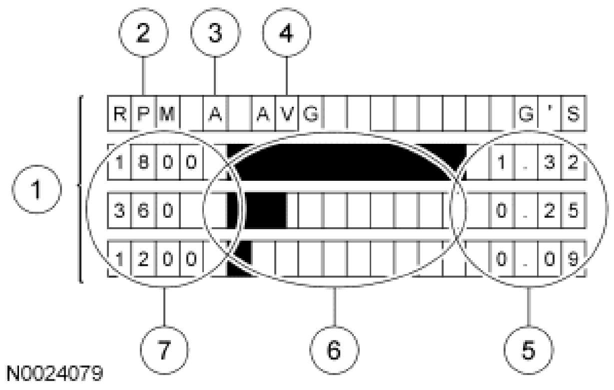
WOT

The acronym for wide open throttle is WOT.

Tools and Techniques

Vibration Analyzer (EVA)

The 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	EVA screen

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

The EVA allows for a systematic collection of information that is necessary to accurately diagnose and repair NVH problems. 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.
    - Frequencies should be read in the "average" mode.
    - Frequencies have a range of plus or minus 2. A reading of 10 Hz can be displayed as an 8 Hz through 12 Hz.
    - Frequencies with a 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.
    - Example: A vibration is felt in the seat. Place the sensor on the console. Record the readings. Place the vibration sensor on the rear axle. Compare the readings. If the frequencies are the same, the axle is the problem component.
    - If the 2 readings are not the same frequency, then diagnose the frequency with the most significant amplitude (Gs) first.

NVH Analyzer (Vetronix)

The MTS 4000 and the MTS 4100 NVH analyzers are tools to aid in the identification and isolation of a noise, vibration or harshness concern in a vehicle. They measures noise and vibration data and compare it with data obtained from the vehicle's powertrain control module (PCM) in order to provide possible sources. The MTS 4000 and the 4100 have the following characteristics:

- Interfaces 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 MTS 4000 and the 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's computer system about the operation of the vehicle. Then it does a frequency analysis on the accelerometer information and compares the vibration frequencies with the frequencies associated with various rotating components within the vehicle. The data can be presented in 4 different display modes: principle component, bar chart, frequency spectrum or waterfall. All display mode formats contain the same common elements, such as amplitude.

The second is for noise diagnosis. This mode measures noise from 1 or 2 microphones simultaneously. All noise measurements are in db's. All frequency bands used for noise measurements are the same as for the vibration measurements, up to 1000 Hz.

The third is driveshaft balancing. Driveshaft balancing is done using 1 or 2 accelerometers and a photo-tachometer. The accelerometers measure the vibrations at both ends of the driveshaft, while the photo-tachometer measures the rotation speed and position reference.

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

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 concern:

- 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 concern.
    - A EVA or equivalent tool capable of measuring vibration frequency and engine rpm will be needed.
- Provide pictures of diagnostic procedures to aid in testing components.

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.

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.

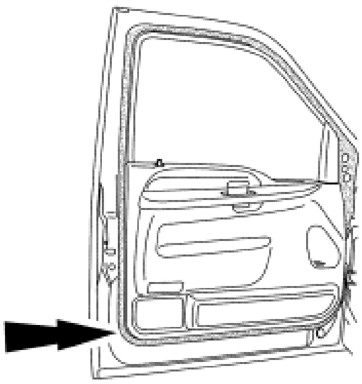
Squeak and Rattle Repair Kit

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

Tracing Powder

Tracing powder is used to check both the uniformity of contact and the tension of a seal against its sealing surface. These tests are usually done when a suspected air leak/noise appears to originate from the seal area or during the alignment and adjustment of a component to a weatherstrip. Tracing powder can be ordered from Crest Industries as ATR Leak Trace. Carry out the tracing powder test as follows:



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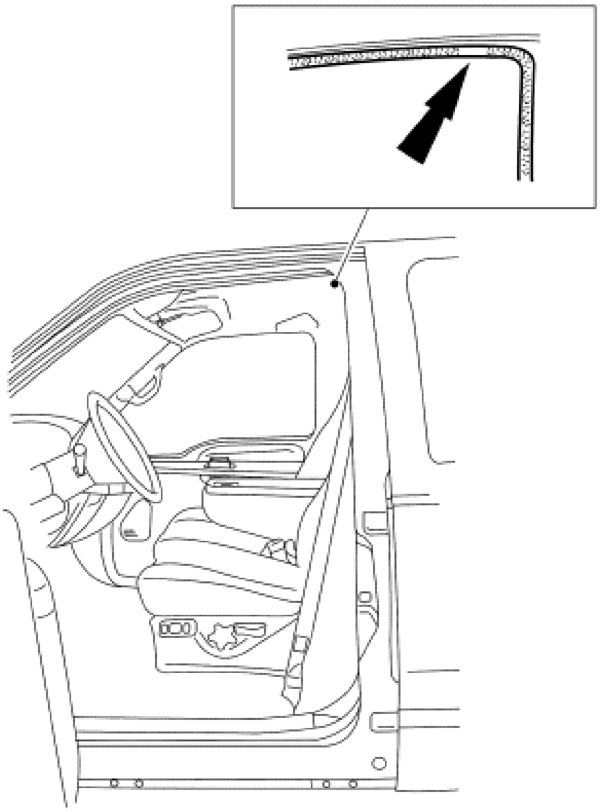
a. Clean the weatherstrip.
b. Spray the tracing powder on the mating surface only.
c. Close the door completely. Do not slam the door.
d. Open the door. An imprint is made where the weatherstrip contacted the mating surface seal. Gaps or a faint imprint will show where there is poor contact with the weatherstrip.



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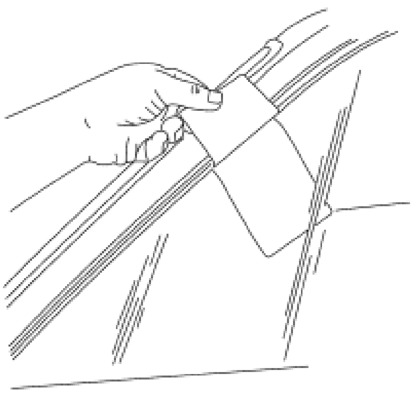
Index Card

Place an index card or a piece of paper between the weatherstrip and the sealing surface, then close the door. Slowly withdraw the index card or paper after the door is closed and check the amount of pressure on the weatherstrip. There should be a medium amount of resistance as it is withdrawn. Continue around the entire seal area. If there is little or no resistance, this indicates insufficient contact to form a good seal. At these points, the door, the glass or the weatherstrip is out of alignment.



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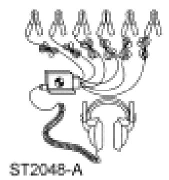
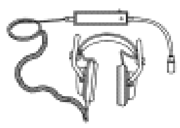
Noise, Vibration and Harshness (NVH)

Special Tool(s)	
 ST2048-A	ChassisEAR 107-R2102 or equivalent
 ST2311-A	Vibration Analyzer 100-F027 (014-00344) or equivalent
 ST2312-A	EngineEAR 107-R2100 or equivalent
 ST2314-A	Ultrasonic Leak Detector 134-R0135 or equivalent

Material	
Item	**Specification**
Threadlock and Sealer E0AZ-19554-AA	WSK-M2G351-A5

To assist the service advisor and the technician, a Write-up Job Aid and an NVH Diagnostic Guide are included with this material. The Write-up Job Aid serves as a place to record all important symptom information. The NVH Diagnostic Guide serves as a place to record information reported on the Write-up Job Aid as well as data from the testing to be carried out.

To begin a successful diagnosis, fill out the NVH Diagnostic Guide, record the reported findings, then proceed to each of the numbered process steps to complete the diagnosis.

"WRITE-UP" JOB AID

REPAIR ORDER # ______________________

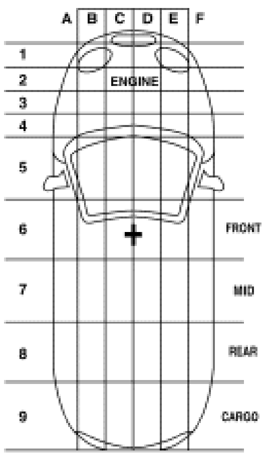
CUSTOMER CONCERN # ______________________

SPECIFIC SENSE IDENTIFICATION AND LOCATION ON VEHICLE OF CUSTOMER SYMPTOM(S)

INSTRUCTIONS: Check below sense affected and location of concern on the generic vehicle illustration (darken the vehicle area). Plus circle appropriate responses to the right.

NOTE: Shaded backgrounds indicate caution areas. Selection of two or more caution areas "flag" difficult repairs. In general, shaded areas are the more difficult to verify and repair, and require all applicable columns to be completed.

SEE YES ☐	FEEL YES ☐
HEAR YES ☐	SMELL YES ☐



VEHICLE SYMPTOM AREA	HOW OFTEN?	VEHICLE OPERATING MODE	VEHICLE CONDITIONS	VEHICLE SPEED(mph)	WHEN VEHICLE IS?	AMBIENT CONDITION
Front of Vehicle	Always	Start Up	Accessories On	0	Turning Left	_____ Below Zero
Engine Compartment	Daily A.M. P.M.	Idle	(define below)	1-9	Turning Right	Below Freezing (0 -19)
Dash	Conditional	Gear Selection	Windows Open	10-19	Over Bumps	Below Freezing (20 -32)
Steering Wheel	Weekly	Accel Light	4x4	20-29	Up Hills	33 -49
Accelerator Pedal	Monthly	Accel Moderate	Hauling	30-39	Down Hills	50 -69
Brake Pedal	Intermittent	Accel Heavy	Towing	40-49	Shifting	70 -89
Clutch Pedal	Unknown	Steady Speed	Snow Plowing	50-59	Parked	90 +
Seat		Deceleration	Other	60-69	In Traffic	Sunny
Rear of Vehicle		Neutral	(define below)	70+		Dry
Top of Vehicle		Reverse		ENGINE		Windy
Floor Pan		Stopping/Braking		TEMP		Wet/Humid
Under Vehicle				Cold		Rain
Other (define below)				Normal		Snow
				Hot		Ice

DEALER VERIFICATION

	YES	NO
SERVICE ADVISOR	☐	☐
SHOP FOREMAN	☐	☐
SERVICE MANAGER	☐	☐
QC MANAGER	☐	☐
TECHNICIAN	☐	☐
VERIFIED WITH CUSTOMER	☐	☐

WHAT THE CUSTOMER SAID

____

____

____

____

____

____

____

____

OASIS SYMPTOM CODE(S)

VIN NUMBER

A0017007

NVH DIAGNOSTIC GUIDE

Dealer: ______________________________ Date: __________

P.A. Code: __________ Order No. ______________ Technician: ____________________

Owner's Name: ______________________ Address: ____________________________

Phone No. Home: ___________________________ Work: ________________________

Vehicle Make: ____________ Model: ____________________________ Year: _______

VIN: _______________ Mileage: ________ Engine: _________ Trans: ________ Axle: ____

OWNER'S DESCRIPTION OF COMPLAINT:

Did Condition Exist When Vehicle Was New? Yes / No (circle one)

How Did Condition Begin? Gradually ☐ Suddenly ☐

At What Mileage Did It Occur Or Begin Occuring? ____________________________

Which Driving Conditions Affect The Vehicle?

Light Accel ☐ Closed Throttle Decel ☐ Brakes Applied/Released ☐

Medium Accel ☐ Coast (Float) ☐ Driving The Vehicle: Straight ☐

Heavy Accel ☐ Constant Speed ☐ Cornering ☐

Is Vibration Noticed? If So, Where:

Seat ☐ Steering Wheel ☐ Instrument Panel ☐ Floor ☐ Body Panels ☐ Ft/Rr of Vehicle ☐

Is There Sound Or Sensation Of Sound? Yes / No (circle one)

If So, Describe The Sound :

Boom ☐ Hum ☐ Whine ☐ Growl ☐ Other: ____________

Drone ☐ Tip-In-Moan ☐ Squeak ☐ Rattle ☐

PREDRIVE CHECKS

Tire Condition/Pressure: ____________________________________

Vehicle Body Damage? ______________________________________

Other: ____

ROAD TEST:

Vibration/Noise Occurs:

Vehicle Speed ________ Accel __________ Vibration Frequency ________ Hz/RPM

Gear Range __________ Decel/Coast _______ Engine Speed ___________ RPM

ENGINE RUN-UP TESTS

Neutral Engine Run-Up (NERU) Yes / No Engine RPM _____ Vibration/Frequency _____ Hz/RPM

Drive Engine Run-Up (DERU) Yes / No Engine RPM _____ Vibration/Frequency _____ Hz/RPM

Drivetrain Run-Up (DTRU) Yes / No Engine RPM _____ Vibration/Frequency _____ Hz/RPM

Indicate Suspected Area of Concern:

Tire/Wheel/Brakes ☐ Engine/Accessory ☐ Rear ☐

Driveline/Axle ☐ Susp/Steering ☐ Right ☐

Body ☐ Front ☐ Left ☐

Other ____

Equipment Used:

Reed Tachometer ☐ Electronic Noise Detector ☐ Tape ☐

Engine Tachometer ☐ Ultrasonic Leak Detector ☐ Other ____________

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WHEEL / TIRE / BRAKES CHECK:

Balance Check Yes / No

Maximum Runout Allowed:

Wheel:	Radial ________	Lateral ________
Tire:	Radial ________	Lateral ________

Measured Runout:

Tire/Wheel	Radial:	LF ________	LR ________	RF ________	RR ________
	Lateral:	LF ________	LR ________	RF ________	RR ________
Wheel Only	Radial:	LF ________	LR ________	RF ________	RR ________
	Lateral:	LF ________	LR ________	RF ________	RR ________

SUSPENSION INSPECTION:

Can Cause: Shimmy ☐ Clunk ☐ Squeak ☐ Harshness ☐

Suspension Bushings: Loose ☐ Worn ☐ Missing ☐ OK ☐

Front Upper Control Arm ☐ Stabilizer (sway bar) ☐ Rear Lower Control Arm ☐

Front Lower Control Arm ☐ Rear Upper Control Arm ☐ Rear Upper Control Arm ☐

Other ________________________________

Suspension/Steering Components: Loose Worn Missing OK

Ball Joints ☐ Idler Arm ☐ Pitman Arm ☐

Shock Absorbers F/R ☐ Center Link ☐ Steering Gear ☐

Springs F/R ☐ Tie Rod Ends/Sleeve ☐ Steering Coupler ☐

DRIVESHAFT CONDITION: Noise ☐ Vibration ☐

Balance Weights Missing/Other Visual Defects? Yes / No

Maximum Allowable Runout: ________________________________

Actual Runout: Front ________ Middle ________ Rear ________

Two-Piece Driveshaft Runout: Front ________ Rear ________

Middle Support Bearing: Loose ☐ Damaged ☐ Worn ☐ Other ________

Suspect Driveshaft Balanced? Yes / No

Pinion Angle: Engine Height: Specification ________ Actual ________

Pinion Angle: Specification ________ Actual ________

Driveline Angle - Truck: Specification ________ Actual ________

ENGINE/ACCESSORY CHECK:

Visual Inspection for Damage or Grounded Condition:

Powertrain Mounts ☐ Fuel Lines ☐ A/C Lines ☐ Power Steering/Cooler Lines ☐

Air Intake ☐ Accessories ☐ Exhaust ☐ Radiator/Condensor ☐

BODY (NOISE/RATTLE)

Indicate Suspected Area of Concern: Doors ☐ Windows ☐ Dash Panel ☐ Other ________

Tests Used to Isolate NVH Concern: Vacuum/Leak Detector ☐ Ultrasonic Leak Detector ☐ Tracing Powder ☐

Electronic Noise Detector ☐ Other ________________________________

ROAD/ENGINE RUN-UP TESTS: Improved? Yes / No Vehicle Acceptable? Yes / No

Comments: ________________________________

A0008914

1: Customer Interview

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

- When was it first noticed?
- Did it appear suddenly or gradually?
- Did any abnormal occurrence coincide with or proceed 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 NVH Diagnostic Guide. It is important to know the specific concern 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.
- 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).
- 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.
- 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 an accurate tachometer to the engine, even if the vehicle has a tachometer. Use a tachometer that has clearly defined increments of less than 50 rpm. This ensures 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 concern. 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 concern. 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 concern, especially when a road test with the customer is not possible.
- The Heavy Acceleration Test helps to determine if the concern is torque-related.
- The Neutral Coast Down Speed Test helps to determine if the concern is vehicle speed-related.
- The Downshift Speed Test helps to determine if the concern 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 concern.
- 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 Run-up Test and the Engine Load Test. These tests help to determine if the concern is engine speed-related.
- The Neutral Run-up Test is used as a follow-up test to the Downshift Speed Test when the concern occurs at idle.
- The Engine Load Test helps to identify vibration/noise sensitive to engine load or torque. It also helps to reproduce engine speed-related concerns that cannot be duplicated when carrying out the Neutral Run-up Test or the Neutral Coast Down Test.
- The Engine Accessory Test helps to locate faulty belts and accessories that cause engine speed-related concerns.
- The Vehicle Cold Soak Procedure helps to identify concerns 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 concern 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 concern is coming.

Attempt to identify the source of the concern.

Proceed as necessary.

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 concern is torque related if duplicated while carrying out this test.

Proceed as necessary.

Neutral Coast Down Speed Test

To carry out this test, proceed as follows:

Drive at a higher rate of speed than where the concern occurred when carrying out the Slow Acceleration Test.

Place the transmission in NEUTRAL and coast down past the speed where the concern occurs.

The concern is vehicle speed-related if duplicated while carrying out this test. This eliminates the engine and the torque converter as sources.

If the concern was not duplicated while carrying out this test, carry out the Downshift Speed Test to verify if the concern is engine speed related.

Proceed as necessary.

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 concern occurs.

The concern 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.

Proceed as necessary.

Steering Input Test

To carry out this test, proceed as follows:

Drive at the speed where the concern occurs, while making sweeping turns in both directions.

If the concern goes away or gets worse, the wheel bearings, hubs, U-joints (contained in the axles of 4WD applications), and tire tread wear are all possible sources.

Proceed as necessary.

Brake Test

To carry out this test, proceed as follows:

Warm the brakes by slowing the vehicle a few times from 80-32 km/h (50-20 mph) using light braking applications. At highway speeds of 89-97 km/h (50-60 mph), apply the brake using a light pedal force.

Accelerate to 89-97 km/h (55-60 mph).

Lightly apply the brakes and slow the vehicle to 30 km/h (20 mph).

A brake vibration noise can be felt in the steering wheel, seat or brake pedal. A brake noise can be heard upon brake application and diminish when the brake is released.

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.

Proceed as necessary.

Neutral Engine Run-Up (NERU) Test

To carry out this test, proceed as follows:

Install a tachometer.

Increase the engine rpm up from an idle to approximately 4000 rpm while in PARK on front wheel drive vehicles with automatic transmissions, or NEUTRAL for all other vehicles. Note the engine rpm and, if possible, determine the vibration frequency.

Attempt to identify what part of the vehicle the concern is coming from.

Attempt to identify the source of the concern.

Proceed as necessary.

Drive Engine Run-Up (DERU) Load Test

To carry out this test, proceed as follows:

WARNING: Block the front and rear wheels, and apply the parking brake and the service brake, or injury to personnel can result.

CAUTION: Do not carry out the Engine Load Test for more than five seconds or damage to the transmission or transaxle can result.

Block the front and rear wheels.

Apply the parking brake and the service brake.

Install a tachometer.

Shift the transmission into DRIVE, and increase and decrease the engine rpm between an idle to approximately 2000 rpm. Note the engine rpm and, if possible, determine the vibration frequency.

Repeat the test in REVERSE.

If the vibration/noise is duplicated when carrying out this test, inspect the engine and transmission or transaxle mounts.

If the concern is definitely engine speed-related, carry out the Engine Accessory Test to narrow down the source.

Proceed as necessary.

Engine Accessory Test

To carry out this test, proceed as follows:

WARNING: Block the front and rear wheels, and apply the parking brake and the service brake, or injury to personnel can result.

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

NOTE: A serpentine drive belt decreases the usefulness of this test. In these cases, use a vibration analyzer (VA), to pinpoint accessory vibrations. An electronic listening device, such as an EngineEAR, will also help to identify noises from specific accessories.

Remove the accessory drive belts.

Increase the engine rpm to where the concern occurs.

If the vibration/noise is duplicated when carrying out this test, the belts and accessories are not sources.

If the vibration/noise was not duplicated when carrying out this test, install each accessory belt, one at a time, to locate the source.

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 three minutes.

Park the vehicle where testing will occur. The vehicle must remain at or below the concern 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, anti-lock brake system (ABS) and air suspension system noises.

Start the engine.

CAUTION: Never probe moving parts.

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.

Refer to Idle Noise/Vibration in the Symptom Chart to assist with the diagnosis.

6: Check OASIS/TSBs/Repair History

After verifying the customer concern, check for OASIS reports, TSBs and the vehicle repair history for related concerns. If information relating to a diagnosis/repair is found, carry out the procedure(s) specified in that information.

If no information is available from these sources, carry out the vehicle preliminary inspection to eliminate any obvious faults.

7: Diagnostic Procedure

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

Verify the "symptom".

- Determine which "system(s)" can cause the "symptom".
  - If a vibration concern is vehicle speed related, the tire and wheel rpm/frequency or driveshaft frequency should be calculated.
  - If a vibration concern is engine speed related, the engine, engine accessory or engine firing frequencies should be calculated.
- After determining the "system", use the diagnostic tools to identify the worn or damaged "components".
- After identifying the "components", try to find the "cause" of the failure.

Once the concern is narrowed down to a symptom/condition, proceed to NVH Condition and Symptom Categories.

NVH Condition and Symptom Categories

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

- Identify the operating condition that the vehicle is exhibiting.
- Match the operating condition to the symptom.
- Verify the symptom.
- Identify which category or system could cause the symptom.
- Refer to the diagnostic symptom chart that is referred to.

Operating Condition—Vehicle is Not Moving

- Static operation
  - Noise occurs during component/system functioning. GO to Symptom Chart - Squeak and Rattle.
- While cranking
  - Grinding or whine, differential ring gear or starter motor pinion noise. GO to Symptom Chart - Engine Noise/Vibration.
  - Rattle. Exhaust hanger, exhaust heat shield or A/C line noise. GO to Symptom Chart - Squeak and Rattle.
  - Vibration. Acceptable condition.
- At idle
  - Idle noise. GO to Symptom Chart - Idle Noise/Vibration.
  - Idle vibration or shake. GO to Symptom Chart - Idle Noise/Vibration.
- During Gear Selection

Vehicle parked on a steep incline. Acceptable noise.

Vehicle parked on a flat surface. GO to Symptom Chart - Driveline Noise/Vibration.

Vehicle with a manual transmission. GO to Symptom Chart - Transmission (Manual) and Transfer Case Noise/Vibration.

Operating Condition—Vehicle is Moving

Depends more on how the vehicle is operated

Speed related

Related to vehicle speed

Pitch increases with vehicle speed. GO to Symptom Chart - Tire Noise/Vibration.

Noise occurs at specific vehicle speed. A high-pitched noise (whine). GO to Symptom Chart - Driveline Noise/Vibration.

Loudness proportional to vehicle speed. Low-frequency noise at high speeds, noise and loudness increase with speed. GO to Symptom Chart - Driveline Noise/Vibration.

A low-pitched noise (drumming). GO to Symptom Chart - Engine Noise/Vibration.

Vibration occurs at a particular speed (mph) regardless of acceleration or deceleration. GO to Symptom Chart - Tire Noise/Vibration.

Noise varies with wind/vehicle speed and direction. GO to Symptom Chart - Air Leak and Wind Noise.

Related to engine speed.

Noise varies with engine rpm. GO to Symptom Chart - Engine Noise/Vibration.

Vibration occurs at a particular speed (mph) regardless of engine speed (rpm).

Acceleration

Wide open throttle (WOT)

Engine induced contact between components. Inspect and repair as necessary.

Noise is continuous throughout WOT. Exhaust system or engine ground out. GO to Symptom Chart - Engine Noise/Vibration.

Light/moderate acceleration

Tip-in moan. Engine/exhaust noise. GO to Symptom Chart - Engine Noise/Vibration.

Knock-type noise. GO to Symptom Chart - Engine Noise/Vibration.

Driveline shudder. GO to Symptom Chart - Driveline Noise/Vibration.

Engine vibration. GO to Symptom Chart - Engine Noise/Vibration.

Turning noise. GO to Symptom Chart - Steering Noise/Vibration.

Braking

- Clicking sound is signaling ABS is active. Acceptable ABS sound.
- A continuous grinding/squeal. GO to Symptom Chart - Brake Noise/Vibration.
- Brake vibration/shudder. GO to Symptom Chart - Brake Noise/Vibration.

Clutching

- A noise occurring during clutch operation. GO to Symptom Chart - Transmission (Manual) and Transfer Case Noise/Vibration.
- Vibration. GO to Symptom Chart - Transmission (Manual) and Transfer Case Noise/Vibration.

Shifting

- Noise or vibration condition related to the transmission (automatic). GO to Symptom Chart - Transmission (Automatic) Noise/Vibration.
- Noise or vibration related to the transmission (manual). GO to Symptom Chart - Transmission (Manual) and Transfer Case Noise/Vibration.

Engaged in four-wheel drive. GO to Symptom Chart - Transmission (Manual) and Transfer Case Noise/Vibration.

Cruising speeds

- Accelerator pedal vibration. GO to Symptom Chart - Engine Noise/Vibration.
- Driveline vibration. GO to Symptom Chart - Driveline Noise/Vibration.
- A shimmy or shake. GO to Symptom Chart - Tire Noise/Vibration.

Driving at low/medium speeds

- A wobble or shudder. GO to Symptom Chart - Tire Noise/Vibration.

Depends more on where the vehicle is operated

Bump/pothole, rough road or smooth road. GO to Symptom Chart - Suspension Noise/Vibration.

- Noise is random or intermittent occurring from road irregularities. GO to Symptom Chart - Squeak and Rattle.
- Noise or vibration changes from one road surface to another. Normal sound changes.

Noise or vibration associated with a hard/firm ride. GO to Symptom Chart - Suspension Noise/Vibration.

Symptom Charts

Symptom Chart — Air Leak and Wind Noise		
Condition	**Possible Sources**	**Action**
Air leak around door perimeter	Loose fit seal.	PINCH the seal carrier to improve retention on the seal flange.
	Seal installed incorrectly.	REINSTALL the seal.
	Door misaligned.	REALIGN the door. CHECK door gaps and fit in the door opening and ADJUST as necessary.
	Scuff plate installed incorrectly.	REINSTALL the scuff plate.
	Seal or seal push pins damaged.	INSTALL a new seal.
Air leak around glass run	Door glass misaligned.	ADJUST the door glass.
	Glass run installed incorrectly.	ADJUST the glass run. INSERT foam in the glass run carrier.
	Leak path behind glass run.	INSTALL foam rope behind the glass run.
	Glass run channel spread wide.	PINCH the glass run channel to reduce the size of the opening.
	Blow-out clip bent or contacting door glass.	ADJUST the blow-out clip or INSTALL a new glass run/blow-out clip molding assembly.
	Glass run damaged.	INSTALL a new glass run.
Air leak at inner belt line	Belt line seal installed incorrectly on flange.	ADJUST the seal. (Do not bend the flange.)
	Belt line seal integrated with door trim installed incorrectly (no glass contact).	REINSTALL the door trim.
	No contact with side glass.	ADJUST the door glass.
	No contact with glass runs at both ends of belt line seal.	ADJUST the belt line seal or ADD foam at the seal ends.
	Belt line seal damaged.	INSTALL a new seal.
Air leak at outer belt line	Belt line seal installed incorrectly on flange (no glass contact).	ADJUST the seal.
	Belt line seal does not contact the glass.	ADJUST the door glass.
	No contact with glass runs at both ends of belt line	ADJUST the belt line seal/ADD foam at the seal ends.

	seal.	
	Belt line seal damaged.	INSTALL a new seal.
Draft at inner door handle/speaker opening	Hole in watershield.	SEAL the hole with a suitable tape.
	Watershield misaligned.	REALIGN the watershield. INSTALL a new watershield if the pressure sensitive adhesive fails.
	Exterior door handle seal misaligned/damaged.	REALIGN or INSTALL a new seal as necessary.
Wind noise from side view mirror	Outside mirror housing misaligned.	REALIGN with the edges shingled correctly and no gaps.
	Mirror sail gasket folded/misaligned.	REINSTALL with the gasket unfolded and aligned correctly.
	Mirror housing trim cap installed incorrectly.	REINSTALL with the edges shingled to the air flow.
	Air leak through mirror housing hinge.	Fully ENGAGE the mirror into its operating position/USE foam to block the air path through the hinge.
	Inner sail trim installed incorrectly.	REINSTALL the sail trim/ADJUST the door trim.
	Inner sail gasket/barrier installed incorrectly.	REINSTALL the trim cover with the gasket/barrier aligned correctly.
	Air path through wiring bundle/fastener access holes.	BLOCK the air path(s) with foam/tape.
	Exposed fastener access hole on mirror housing/sail.	INSTALL a new cap if it is missing.
Air leak around perimeter of fixed glass	Gaps in the sealant bead.	APPLY approved sealant.
	Air traveling up windshield molding along A-pillar.	INSTALL foam rope the full length of the A-pillar.
	Windshield/backlite misaligned or not installed correctly.	REINSTALL the windshield/backlite.
	Rear hood seal at base of windshield misaligned/damaged.	REALIGN or INSTALL a new seal as necessary.
Air leak at cowl	Cowl gasket misaligned/damaged.	REALIGN or INSTALL a new seal as necessary.
Air leak around liftgate perimeter	Loose fit seal.	PINCH the seal carrier to improve retention on the seal flange or INSERT foam in the carrier.
	Seal misaligned.	REINSTALL the seal.
	Liftgate misaligned.	REALIGN the liftgate. CHECK the liftgate fit in the body opening and ADJUST as necessary.
	Scuff plate misaligned.	REINSTALL the scuff plate.

	Seal or seal push pins damaged.	INSTALL a new seal.
Air leak around the liftgate flip window perimeter	Loose fit seal.	PINCH the seal carrier to improve the retention to the seal flange.
	Seal misaligned.	REINSTALL the seal.
	Glass misaligned.	REALIGN the glass.
	Seal damaged.	INSTALL a new seal.
Wind noise from antenna	Shape of antenna.	INSTALL an antenna boot or a spiral antenna.
	Air leak around antenna cable access hole.	INSPECT the antenna access hole grommet. REPAIR as necessary.
Air leak from closed roof opening panel	Seal installed incorrectly.	REINSTALL the seal.
	Roof opening panel glass/door misaligned.	REALIGN the roof opening panel glass/door.
	Roof opening panel damaged.	INSTALL a new roof opening panel.
Buffeting from an open roof opening panel	Wind deflector inoperative/damaged.	REPAIR or INSTALL a new wind deflector as necessary.
	Wind deflector height incorrect.	ADJUST the wind deflector higher.
Wind noise created by airflow over or behind body panels	Fender splash shield misaligned.	REALIGN the fender splash shield.
	Body panel misaligned (exposed edge).	REALIGN the appropriate body panel.
	Hood misaligned (front margin).	CHECK hood gaps and fit. ADJUST the hood as necessary.
	Front grille edge noise.	APPLY foam in the hollow areas behind the louvers.
Wind noise created by grille opening panel	Grille relationship to leading edge on hood.	ADJUST the grille opening panel forward to eliminate wind noise.
	Sharp edges due to material imperfections.	REMOVE the sharp edges (no damage to visible surface).
Wind noise from air extractor	Air extractor housing seated incorrectly.	REINSTALL the air extractor housing.
	Air extractor housing or flaps damaged.	INSTALL a new air extractor.
Air leak at top of A-pillar — vehicles with a convertible top	Seal at windshield header installed incorrectly.	REINSTALL the seal.
	Seal pinched.	FILL the seal with foam to reshape it.
	Gap between side rail and	ADJUST the J-hook/vinyl top.

	header seal at A-pillar.	
Air leak at rear quarter glass (division bar) — vehicles with a convertible top	No contact between front side glass and quarter glass division bar.	ADJUST the front side glass regulator and the rear quarter glass regulator.
Air leak or wind noise from top of side glass — vehicles with a convertible top	Gap between side rail and vinyl top.	ADD additional foam tape to seal between the side rail and the vinyl top.
	Seal at windshield header installed incorrectly.	REINSTALL the seal.
	Seal damaged between side rail and vinyl top.	INSTALL a new seal.
	Vinyl top damaged.	INSPECT the vinyl top. INSTALL a new vinyl top as necessary.
Air leak or wind noise at windshield header — vehicles with a convertible top	Vinyl top not flush with header.	ADJUST the J-hook to lower the top to achieve a flush condition.
	Seal at windshield header installed incorrectly.	REINSTALL the seal.
	Header seal not flush with header.	REINSTALL the seal.
Convertible top flapping with the top up	Vinyl top contacting interior headliner.	Working from front to back, INSTALL a 6.35 mm (0.25 in) foam sheet between the headliner and the vinyl top at the suspected area. Allow a clearance of 50 mm (2 in) - 75 mm (3 in) away from the roof bows and the side rails.
Noise from roof rack	Roof rack rails or crossbars loose.	TIGHTEN the fasteners.
	Roof rack fasteners missing.	INSTALL the approved fasteners.
	Roof rack crossbars installed backward.	REINSTALL the crossbars.
	Roof rack rub strips partially lifting from roof.	REAPPLY adhesive or fasteners or INSTALL new rub strips as necessary.
	Roof rack gaskets loose or misaligned.	REINSTALL the gasket.
Wind noise from bug shield/exterior windshield sun visor	Turbulence created by location and shape.	REMOVE per customer direction if it is a dealer installed option.

Symptom Chart—Brake Noise/Vibration

Condition	Possible Sources	Action
Rattling noise	Caliper mounting bolts loose.	CHECK the caliper bolts. TIGHTEN to specifications. REFER to Section 206-

		03.
	Damaged or worn caliper pins or retainers.	CHECK the caliper pins and retainers for lubrication and correct fit. LUBRICATE or INSTALL new components as necessary. REFER to Section 206-03.
	Missing or damaged anti-rattle clips or springs.	CHECK the brake pads for missing clips or broken springs. INSTALL new components as necessary. REFER to Section 206-03.
	Loose brake disc shield.	TIGHTEN the brake disc shield bolts to specification. REFER to Section 206-03.
Clicking noise—with brakes applied with ABS brakes	ABS hydraulic control unit.	Acceptable condition.
Squealing noise—occurs on first (morning) brake application	Disc brake pads.	Acceptable condition. Caused by humidity and low disc brake pad temperature.
Squealing noise—a continuous squeal	Disc brake pads or linings worn below minimum thickness.	INSTALL new disc brake pads. REFER to Section 206-03.
Squealing noise—an intermittent squeal brought on by cold, heat, water, mud or snow	Disc brake pad.	Acceptable condition.
Groaning noise—occurs at low speeds with brake lightly applied (creeping)	Disc brake pads.	Acceptable condition.
Grinding noise—continuous	Disc brake pads or linings worn below minimum thickness.	INSPECT the disc brake pads, brake discs/drums and attaching hardware for damage. REPAIR or INSTALL new components as necessary. REFER to Section 206-03 for front disc brakes and Section 206-02 for rear drum brakes.
Moaning noise	Brake linings contaminated with grease or oil.	INSPECT the brake pads and shoes for contamination. REPAIR or INSTALL new components as necessary. REFER to Section 206-03 for front disc brakes, Section 206-02 for rear drum brakes.
Brake vibration/shudder—occurs when brakes are applied	Uneven disc or drum wear. Uneven disc brake pad or lining transfer. Suspension components.	GO to Pinpoint Test A.
Brake vibration/shudder—occurs when the brake pedal is released	Brake drag.	INSPECT the disc brake pads or linings for premature wear. REPAIR or INSTALL a new caliper or wheel cylinder as necessary. REFER to Section 206-

		03for front disc brakes and Section 206-02for rear drum brakes.

Symptom Chart—Driveline Noise/Vibration		
Condition	**Possible Sources**	**Action**
Axle howling or whine—front or rear axle	Axle lubricant low.	CHECK the lubricant level. FILL the axle to specification.
	Axle housing damage.	INSPECT the axle housing for damage. REPAIR or INSTALL a new axle as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
	Damaged or worn wheel bearings or axle bearings.	CHECK for abnormal wheel bearing play or roughness. REFER to Wheel Bearing Check in this section. ADJUST or INSTALL new wheel bearings as necessary.
	Damaged or worn differential ring and pinion.	INSPECT the ring and pinion ring for abnormal wear patterns or broken teeth. INSTALL a new ring and pinion as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
	Damaged or worn differential side or pinion bearings.	CHECK for abnormal bearing play or roughness. INSTALL new bearings as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
	Damaged or worn differential side gears and pinion gears.	DISASSEMBLE the differential carrier. INSPECT the side and pinion gears for abnormal wear patterns or broken teeth. INSTALL new gears as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
Driveline clunk—loud clunk when shifting from reverse to drive	Incorrect axle lubricant level.	CHECK the lubricant level. FILL the axle to specification.
	Excessive backlash in the axle or transmission.	CARRY OUT a total backlash check. REFER to Section 205-00.
	Damaged or worn pinion	CHECK for abnormal bearing play or roughness. INSTALL new bearings

	bearings.	as necessary
	Damaged or worn universal joints (U-joints).	INSPECT the U-joints for wear or damage. INSTALL new U-joints as necessary. REFER to Section 205-01.
	Loose suspension components.	INSPECT the suspension for damage or wear. REPAIR or INSTALL new components as necessary.
	Broken powertrain mounts.	INSPECT the powertrain mounts. Refer to the appropriate section in Group 303 for the procedure. INSTALL new mounts as necessary.
	Idle speed too high.	CHECK for the correct idle speed.
Driveline clunk—occurs as the vehicle starts to move forward following a stop	Worn or galled driveshaft slip-yoke splines.	CLEAN and INSPECT the splines of the yoke for a worn or galled condition. INSTALL a new yoke as necessary. REFER to Section 205-01.
	Worn or galled driveshaft and coupling shaft splines.	CLEAN and INSPECT the splines of the driveshaft and coupling shaft for a worn or galled condition. INSTALL a new driveshaft assembly as necessary. REFER to Section 205-01.
	Loose rear leaf spring U-bolts.	CHECK the U-bolts for loose nuts. TIGHTEN to specification. REFER to Section 204-02.
Driveline clunk (FWD vehicles)—occurs during acceleration or from cruise to coast/deceleration	Damaged or worn inboard constant velocity (CV) joint.	INSPECT the inboard CV joint and boot. REPAIR or INSTALL a new CV joint as necessary.
Driveline clunk (4WD vehicles)—occurs during shift-on-the-fly engagement	Clutch relay. Shift motor. Transfer case. GEM.	CHECK the 4WD engagement system. REPAIR or INSTALL new components as necessary. REFER to Section 308-07A and Section 308-07B.
Clicking, popping or grinding—occurs while vehicle is turning	Inadequate or contaminated lubrication in the (CV) joints.	CHECK the CV boots and joints for wear or damage. REPAIR or INSTALL new components as necessary. REFER to Section 205-04.
	Another component contacting the halfshaft	CHECK the halfshafts and the area around the halfshafts. REPAIR as necessary.
	Brake components.	INSPECT the front brakes for wear or damage. REPAIR as necessary.

		REFER to Section 206-03.
	Steering components.	INSPECT the drag link, inner and outer tie-rods or idler arm for wear or damage. REPAIR as necessary. REFER to Section 211-02.
	Suspension components.	INSPECT the upper and lower ball joints for wear or damage. REPAIR as necessary. REFER to Section 204-01A for 2-wheel drive vehicles orSection 204-01B for 4-wheel drive vehicles.
	Damaged or worn wheel bearings	CHECK for abnormal wheel bearing play or roughness. Refer to Wheel Bearing Check in this section. ADJUST or INSTALL new wheel bearings as necessary.
Clicking or snapping—occurs when accelerating around a corner	Damaged or worn outboard CV joint.	INSPECT the outboard CV joint and boot. REPAIR or INSTALL a new CV joint as necessary. REFER to Section 205-04.
High pitched chattering—noise from the rear axle when the vehicle is turning	Incorrect or contaminated lubricant.	CHECK the vehicle by driving in tight circles (5 clockwise, 5 counterclockwise). FLUSH and REFILL with the specified rear axle lubricant and friction modifier as necessary.
	Damaged or worn differential (differential side gears and pinion gears).	DISASSEMBLE the differential assembly. INSPECT the differential case, pin and gears for wear or damage. REPAIR or INSTALL a new differential as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
Buzz—buzzing noise is the same at cruise or coast/deceleration	Damaged or worn tires.	CHECK for abnormal tire wear or damage. INSTALL a new tire as necessary. REFER to Section 204-04.
	Incorrect driveline angles.	CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00.
Rumble or boom—noise occurs at coast/deceleration, usually driveshaft speed related and noticeable over a wide range of speeds	Driveshaft is out-of-balance.	CHECK the driveshaft for damage, missing balance weights or undercoating. CHECK the driveshaft balance. CARRY OUT a driveline vibration test. REFER to Section 205-00.
	U-joints binding or seized.	ROTATE the driveshaft and CHECK for rough operation or seized U-joints. INSTALL new U-joints as

		necessary. REFER to Section 205-01.
	Excessive pinion flange runout.	CARRY OUT a runout check. REPAIR as necessary. REFER to Section 205-00.
Grunting—normally associated with a shudder experienced during acceleration from a dead stop	Driveshaft slip yoke binding.	CLEAN and LUBRICATE the male and female splines.
	Loose rear spring U-bolts.	INSPECT the rear suspension. TIGHTEN the U-bolt nuts to specification. REFER to Section 204-02.
Howl—can occur at various speeds and driving conditions. Affected by acceleration and deceleration	Incorrect ring and pinion contact, incorrect bearing preload or gear damage.	CHECK the ring and pinion and bearings for damage. INSPECT the ring and pinion wear pattern. REFER to Checking Tooth Contact Pattern and Condition of the Ring and Pinion component test in this section. ADJUST or INSTALL new components as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
Chuckle—heard at coast/deceleration. Also described as a knock	Incorrect ring and pinion contact or by damaged teeth on the coast side of the ring and pinion.	CHECK the ring and pinion for damage. INSPECT the ring and pinion wear pattern. REFER to Checking Tooth Contact Pattern and Condition of the Ring and Pinion component test in this section. ADJUST or INSTALL new components as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
Knock—noise occurs at various speeds. Not affected by acceleration or deceleration	Gear tooth damage to the drive side of the ring and pinion.	CHECK the differential case and ring and pinion for damage. INSTALL new components as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
	Excessive axle shaft end play. (Vehicles with integral axles).	CHECK the axle end play using a dial indicator. INSTALL a new axle shaft or side gears as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
Scraping noise—a continuous low pitched noise starting at low	Worn or damaged pinion	CHECK the pinion bearings. INSTALL new pinion bearings as necessary.

speeds	bearings.	REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
Driveline shudder—occurs during acceleration from a slow speed or stop	Rear drive axle assembly mispositioned.	CHECK the axle mounts and the rear suspension for damage or wear. REPAIR as necessary.
	Loose rear spring U-bolts	INSPECT the U-bolts. TIGHTEN the U-bolt nuts to specification. REFER to Section 204-02.
	Incorrect or high CV joint operating angle.	CHECK vehicle ride height is within limits. REPAIR as necessary.
	Damaged or worn front suspension components.	CHECK for a loose stabilizer bar, damaged or loose strut/strut bushings or loose or worn ball joints. INSPECT the steering linkage for wear or damage. REPAIR or INSTALL new components as necessary.
	Driveline angles out of specification.	CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00.
	U-joints binding or seized.	ROTATE the driveshaft and CHECK for rough operation or seized U-joints. INSTALL new U-joints as necessary. REFER to Section 205-01.
	Binding, damaged or galled splines on the driveshaft slip-yoke	CLEAN and INSPECT the splines of the slip-yoke, driveshaft and coupling shaft for a worn, damaged or galled condition. INSTALL a new slip-yoke or driveshaft assembly as necessary. REPAIR as necessary. REFER to Section 205-01.
Driveline vibration—occurs at cruising speeds	U-joints are worn.	CHECK for wear or incorrect seating. INSTALL new U-joints as necessary. REFER to Section 205-01.
	Worn or damaged driveshaft center bearing support.	CHECK the insulator for damage or wear. ROTATE the driveshaft and CHECK for rough operation. INSTALL a new center bearing support as necessary. REFER to Section 205-01.
	Loose axle pinion flange bolts	INSPECT the axle pinion flange. TIGHTEN the pinion flange bolts to specification. REFER to Section 205-01.
	Excessive axle	CARRY OUT a Runout Check.

	pinion flange runout.	REPAIR as necessary. REFER to Section 205-01.
	Driveshaft is out-of-balance.	CHECK the driveshaft for damage, missing balance weights or undercoating. CHECK driveshaft balance. CARRY OUT a driveline vibration test. REFER to Section 205-00. REPAIR as necessary.
	Binding or damaged splines on the driveshaft slip-yoke	CLEAN and INSPECT the splines of the slip-yoke, driveshaft and coupling shaft for wear or damage. INSTALL a new slip-yoke or driveshaft assembly as necessary. REFER to Section 205-01. REPAIR as necessary.
	Driveshaft runout.	CARRY OUT a Runout Check. REFER to Section 205-00. REPAIR as necessary.
	Incorrect lateral and radial tire/wheel runout.	INSPECT the tire and wheels. MEASURE tire runouts. REPAIR or INSTALL new components as necessary. REFER to Section 204-04.
	Driveline angles out of specification.	CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00.
	Incorrectly seated CV joint in the front wheel hub.	CHECK the outer CV joint for correct seating into the hub. REPAIR as necessary. REFER to Section 205-04.
Thump or clunk noise and vibration—occurs on light acceleration from or coming to a stop with light to moderate braking. (4x4 Supercab vehicles)	Driveshaft.	GO to Component Tests in this section.
NOTE: It is normal for a 4-cylinder engine to have a nominal level of powertrain boom, vibration or rough idle. Compare the concern vehicle to a similar Ranger vehicle to determine if the level of boom, vibration or rough idle is normal before proceeding with any repairs. Engine — boom/vibration at 1800-2200 rpm — rough idle — 2.3L engine	Exhaust system tuning, powertrain and exhaust neutralization.	CARRY OUT Neutralize Powertrain and Exhaust — Automatic Transmission or Neutralize Powertrain and Exhaust — Manual Transmission component test.

Symptom Chart — Engine Noise/Vibration

Condition	Possible Sources	Action

Grinding noise—occurs during engine cranking	Incorrect starter motor mounting.	INSPECT the starter motor for correct mounting. REPAIR as necessary. Refer to the appropriate section in Group 303 for the procedure.
	Starter motor.	CHECK the starter motor. REPAIR or INSTALL a new starter motor as necessary. REFER to Section 303-06.
	Incorrect starter motor drive engagement.	INSPECT the starter motor drive and flexplate/flywheel for wear or damage. INSTALL a new starter motor drive or flexplate/flywheel as necessary. REFER to Section 303-06.
Engine ticking noise	Fuel injector. Fuel line. Oil pump. Valve lifter. Belt tensioner. Water pump. Obstruction of cooling fan.	GO to Pinpoint Test B.
Engine drumming noise—normally accompanied by vibration	Powertrain mount.	CARRY OUT Powertrain/Drivetrain Mount Neutralizing in this section.
	Damaged or misaligned exhaust system.	INSPECT the exhaust system for loose or broken clamps and brackets. CARRY OUT Exhaust System Neutralizing in this section.
Whistling noise—normally accompanied with poor idle condition	Air intake system.	CHECK the air intake ducts, air cleaner, throttle body and vacuum hoses for leaks and correct fit. REPAIR or ADJUST as necessary. REFER to Section 303-12.
Clunking noise	Water pump has excessive end play or imbalance.	CHECK the water pump for excessive end play. INSPECT the water pump with the drive belt off for imbalance. INSTALL a new water pump as necessary. REFER to Section 303-03.
	Generator has excessive end play.	CHECK the generator for excessive end play. REPAIR or INSTALL a new generator. REFER to Section 414-02.
Pinging noise	Exhaust system leak.	INSPECT the exhaust system for leaks. REPAIR as necessary.
	Gasoline octane too low.	VERIFY with customer the type of gasoline used. CORRECT as necessary.
	Knock sensor operation.	CHECK the knock sensor. INSTALL a new

		knock sensor as necessary. REFER to Section 303-14.
	Incorrect spark timing.	CHECK the spark timing. REPAIR as necessary.
	High operating temperature.	INSPECT cooling system for leaks. CHECK the coolant level. REFILL as necessary. CHECK the coolant for the correct mix ratio. DRAIN and REFILL as needed. CHECK engine operating temperature is within specifications. REPAIR as necessary.
	Foul-out spark plug.	CHECK the spark plugs. REPAIR or INSTALL new spark plugs as necessary.
	Catalytic converter.	Acceptable noise.
Knocking noise—light knocking noise, also described as piston slap. Noise is most noticeable when engine is cold with light to medium acceleration. Noise disappears as engine warms	Excessive clearance between the piston and the cylinder wall.	Engine cold and at high idle. Using an EngineEAR, pull a spark plug or fuel injector connector until the noise goes away. CARRY OUT a cylinder bore clearance to piston check. INSTALL a new piston. Refer to the appropriate section in Group 303 for the procedure.
Knocking noise—light double knock or sharp rap sound. Occurs mostly with warm engine at idle or low speeds in DRIVE. Increases in relation to engine load. Associated with poor lubrication history	Excessive clearance between the piston and the piston pin.	INSTALL a new piston or piston pin. Refer to the appropriate section in Group 303 for the procedure.
Knocking noise—light knocking noise is most noticeable when engine is warm. Noise tends to decrease when vehicle is coasting or in neutral	Excessive clearance between the connecting rod bearings and the crankshaft.	Engine warm and at idle. Using an EngineEAR, PULL a spark plug or fuel injector connector until the noise goes away. INSTALL new bearings. Refer to the appropriate section in Group 303 for the procedure.
Knocking—deep knocking noise. Noise is most noticeable when engine is warm, at lower rpm and under a light load and then at float	Worn or damaged crankshaft main bearings.	CARRY OUT Drive Engine Run-Up (DERU) Test. CHECK for noise with vehicle at operating temperature, during medium to heavy acceleration. CHECK at idle with injector disconnected, noise does not change. INSTALL new main bearings. Refer to the appropriate section in Group 303 for the procedure.
Knocking noise—occurs mostly with warm engine at light/medium acceleration	Spark plugs.	CHECK the spark plug for damage or wear. INSTALL new spark plugs as necessary.

	Carbon accumulation in combustion chamber.	REMOVE carbon from combustion chamber.
Whine or moaning noise	Air intake system.	CHECK the air cleaner and ducts for correct fit. INSPECT the air intake system for leaks or damage. REPAIR as necessary.
	Generator electrical field or bearings.	CARRY OUT generator load test. REPAIR or INSTALL a new generator as necessary. REFER to Section 414-02.
Drone type noise	Exhaust system.	CARRY OUT the Exhaust System Neutralizing in this section. REPAIR as necessary.
	A/C compressor.	CHECK for noise with vehicle at constant speeds. CYCLE the compressor on and off and listen for a change in pitch. REPAIR as necessary. REFER to Section 412-03.
	Powertrain mounts.	CARRY OUT the Powertrain/Drivetrain Mount Neutralizing in this section.
Sputter type noise — noise worse when cold, lessens or disappears when vehicle is at operating temperature	Damaged or worn exhaust system components.	INSPECT the exhaust system for leaks or damage. REPAIR as necessary. REFER to Section 309-00.
Rattling noise—noise from the upper engine (valve train). Worse when engine is cold	Low oil level.	CHECK oil level. FILL as necessary.
	Thin or diluted oil.	INSPECT the oil for contamination. If oil is contaminated, CHECK for the source. REPAIR as necessary. CHANGE the oil and filter.
	Low oil pressure.	CARRY OUT an oil pressure test. If not within specifications, REPAIR as necessary. REFER to Section 303-00.
	Worn rocker arms/fulcrums or followers.	CARRY OUT a valve train analysis. INSTALL new valve train components as necessary. Refer to the appropriate section in Group 303 for the procedure.
	Worn valve guides.	CARRY OUT a valve train analysis. INSTALL new valve guides as necessary. Refer to the appropriate section in Group 303 for the procedure.
	Excessive runout of valve seats on the valve face.	CARRY OUT a valve seat runout test. INSPECT the valve face and seat. INSTALL new valves as necessary. Refer to the appropriate section in Group 303 for the procedure.

Rattling noise—from the bottom of the vehicle	Loose muffler shields or catalytic converter shields.	CHECK the exhaust system for loose shields. REPAIR as necessary.
Thumping noise—from the bottom of the vehicle, worse at acceleration	Exhaust pipe/muffler grounded to chassis.	CHECK the exhaust system to chassis clearance. CHECK the exhaust system hangers for damage. REPAIR as necessary. REFER to Section 309-00.
Whoosh—occurs during light vehicle acceleration. Heard inside the vehicle	Throttling late, creating turbulence transmitted through the plastic manifold.	CHECK for leaks or missing seal in the dash panel.
Engine vibration—increases intensity as engine rpm is increased	Engine out-of-balance.	CARRY OUT Neutral Engine Run-Up (NERU) Test. ROTATE the torque converter, 120° for 3 bolt and 180° for 4 bolt. INSPECT the torque converter pilot outer diameter to crankshaft pilot inner diameter. REPAIR as necessary. REFER to Section 307-01.
Engine vibration—is felt with increases and decreases in engine rpm	Strain on exhaust mounts.	CARRY OUT the Exhaust System Neutralizing procedure in this section. REPAIR as necessary.
	Damaged or worn powertrain/drivetrain mounts	CHECK the powertrain/drivetrain mounts for damage. Refer to the appropriate section in Group 303 for the procedure. REPAIR as necessary.
	Engine or transmission grounded to chassis.	INSPECT the powertrain/drivetrain for correct clearances. REPAIR as necessary.
Engine vibration—vibration felt at all times	Excessive engine pulley runout.	CARRY OUT Engine Accessory Test. INSTALL a new engine pulley as necessary. Refer to the appropriate section in Group 303 for the procedure.
	Damaged or worn accessory component.	CARRY OUT Engine Accessory Test. REPAIR or INSTALL a new component as necessary.
Accelerator pedal vibration—felt through the pedal as a buzz	Throttle cable loose or misrouted.	INSPECT the throttle cable. REPAIR as necessary. REFER to Section 310-02.
Engine vibration—mostly at coast/neutral coast. Condition improves with vehicle accelerating	Combustion instability.	CHECK the ignition system. INSTALL new components as necessary.
Engine vibration or shudder—occurs with light to medium acceleration above 56 km/h (35 mph)	Worn or damaged spark plugs.	INSPECT the spark plugs for cracks, high resistance or broken insulator. INSTALL a new spark plug(s) as necessary.
	Plugged fuel injector.	REPAIR or INSTALL a new injector as necessary.
	Damaged spark plug	INSPECT the spark plug wires for damage.

	wire.	INSTALL a new spark plug wire(s) as necessary.
	Contaminated fuel.	INSPECT the fuel for contamination. DRAIN the fuel system and refill.
	Worn or damaged torque converter.	CHECK the torque converter. INSTALL a new torque converter as necessary. REFER to Section 307-01.

Symptom Chart—Idle Noise/Vibration		
Condition	**Possible Sources**	**Action**
Idle air control (IAC) valve moan — occurs on throttle tip-out	IAC valve is contaminated with oil.	GO to Component Tests in this section.
Accessory drive belt chirp — occurs at idle or high idle, cold or hot. Most common occurrence is during humid weather	Accessory drive belt worn, or pulley is misaligned or loose.	INSPECT for loose or misaligned pulleys. CHECK the drive belt for wear or damage. INSTALL new pulley(s)/accessory drive component or drive belt, as necessary. REFER to Section 303-05.
Accessory drive bearing hoot — occurs at idle or high idle in cold temperatures of approximately +4°C (+40°F) or colder at first start of the day	Accessory drive idler or tensioner pulley bearing is experiencing stick/slip between ball bearings and bearing race.	GO to Pinpoint Test C.
Power steering moan — occurs at high idle and possibly at idle during the first cold start of the day in temperatures of approximately -18°C (0°F) or colder. Noise can even be a severe screech for less than one minute in very cold temperatures of approximately -29°C (-20°F) or colder	High fluid viscosity, or plugged reservoir screen in power steering reservoir starves pump causing cavitation.	GO to Pinpoint Test D.
Generator whine — during high electrical loads at idle or high idle, a high pitch whine or moan is emitted from the generator	Generator electrical field noise.	Using an EngineEAR, PROBE near the generator housing. LISTEN for changes in the noise level while changing electrical loads (such as rear defrost, headlamps, etc.). CARRY OUT a generator load test. If the system passes the load test, the noise is from the generator bearings, INSTALL new bearings. If the system fails the load test, INSTALL a new generator. REFER to Section 414-02.
Engine-driven cooling fan moan — occurs during the first start of	The viscous cooling fan clutch	GO to Pinpoint Test E.

the day. It is most objectionable near idle speeds up to 2000 rpm. The noise increases with rpm	engages until the fluid in the clutch reaches normal operating temperature, causing the fan to fully engage.	
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. Engine vibration excites the body resonances inducing interior noise.	GO to Pinpoint Test F.
Hissing noise — occurs during idle or high idle that is apparent with the hood open	Vacuum leak or idle air control (IAC) valve flow noise.	Use the Ultrasonic Leak Detector/EngineEAR to locate the source. Scan the air intake system from the inlet to each cylinder intake port. DISCARD the leaking parts, and INSTALL a new component.
	Vehicles with a plastic intake manifold.	Acceptable condition. Some plastic manifolds exhibit this noise, which is the effect of the plastic manifold.
Automatic transmission buzz or hiss	Incorrect driveline angles.	CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00.
	Worn or damaged main control solenoids or valves.	Using a transmission tester, activate the solenoids to duplicate sound. INSTALL new components as necessary. REFER to Section 307-01.
Manual transmission clutch throw-out bearing whine. A change in noise pitch or loudness while depressing the clutch pedal	Worn throw-out bearing.	INSTALL a new throw-out bearing. REFER to Section 308-03.
Heating, vacuum and air conditioning (HVAC) system chirp — most audible inside the vehicle. Listen for a change in noise pitch or loudness while changing the HVAC system blower speed	Damaged or worn HVAC blower bearing.	INSTALL a new blower motor. REFER to Section 412-02.
Air conditioning (A/C) clutch ticking — occurs when the compressor clutch engages	Acceptable noise. Incorrect air gap.	LISTEN to the clutch to determine if the noise occurs with clutch engagement. A small amount of noise is acceptable. If the noise is excessive, CHECK the A/C clutch air gap. INSPECT the A/C clutch

		for wear or damage. INSTALL a new clutch as necessary. REFER to Section 412-03.
Intermittent rattle, or scraping/rubbing noise	Loose exhaust heat shield(s).	INSPECT the exhaust system for loose parts using a glove or clamps to verify cause. REPAIR as necessary. REFER to Section 309-00.
	Wiring, hose or other part interfering with accessory drive belt or pulley.	INSPECT accessory drive system closely verifying there is adequate clearance to all rotating components. REPAIR as necessary.
Engine ticking or knocking noise — occurs during idle or high idle during the first cold start of the day	Piston noise or valve train noise (bled down lifter/lash adjuster).	GO to Pinpoint Test G.
A continuous, speed-dependent rattle from the engine — occurs during idle or high idle during the first cold start of the day and disappears as the engine warms up	Piston noise or valve train noise (bled down lifter/lash adjuster).	GO to Pinpoint Test G.
Idle vibration—a low-frequency vibration (5-20 Hz) or mild shake that is felt through the seat/floorpan	Cylinder misfire.	Using a scan tool, CHECK the ignition system. CARRY OUT a cylinder power test. REFER to Section 303-00.
	Engine or torque converter out of balance.	VERIFY the torque converter to crankshaft pilot clearance is correct, REPAIR as necessary. RE-INDEX the torque converter on the flex plate by 120° on a 3 bolt converter or 180° for a 4 bolt converter. REFER to Section 307-01. RETEST the vehicle.
Idle vibration—a high-frequency vibration (20-80 Hz) or buzz, that is felt through the steering wheel or seat	Exhaust system mounts bound up.	VERIFY concern occurs at engine firing frequency. CHECK that the exhaust system vibrates at the same frequency as the engine. ADD 9-14 km (20-30 lb.) to the tail pipe to test, CARRY OUT Exhaust System Neutralizing in this section.
	Body mounts loose.	INSPECT the body mounts. REPAIR as necessary
	Power steering lines grounded out.	INSPECT to make sure that the power steering lines are not contacting the chassis or each other. REPAIR as necessary.
NOTE: It is normal for a 4-cylinder engine to have a nominal level of powertrain boom, vibration or rough idle. Compare the	Exhaust system tuning, powertrain and exhaust	CARRY OUT Neutralize Powertrain and Exhaust — Automatic Transmission or Neutralize Powertrain and Exhaust —

concern vehicle to a similar Ranger vehicle to determine if the level of boom, vibration or rough idle is normal before proceeding with any repairs. Engine — boom/vibration at 1800-2200 rpm — rough idle — 2.3L engine	neutralization.	Manual Transmission component test.

Symptom Chart—Squeak and Rattle

Condition	Possible Sources	Action
Squeak—heard inside the vehicle when closing/opening the door	Insufficient lubrication on the door hinge or check strap.	LUBRICATE the hinge or check strap.
	Internal door components loose, rubbing or misaligned.	CHECK the inside of the door. TIGHTEN or ALIGN as necessary. USE the Rotunda Squeak and Rattle Kit to isolate any rubbing components.
Squeak—heard inside the vehicle when closing/opening the window	Worn or damaged glass run/channel.	REPAIR or INSTALL a new glass run/channel. REFER to Section 501-11.
Squeak—heard outside of vehicle when closing/opening the door	Exhaust shield rubbing against the chassis or exhaust pipe.	CHECK the exhaust system. REPAIR as necessary. REFER to Section 309-00.
Squeak—occurs with initial brake pedal application	Disc brake pads.	Under certain conditions, asbestos free pads can generate a squeak noise. This noise is normal and does not indicate a concern.
Squeak—a constant noise that occurs with brake pedal applications	Damaged or worn disc brake pads.	INSPECT the pads for oil, grease or brake fluid contamination. CHECK for glazed linings. A brake disc with hard spots will also cause a squeak type noise. REPAIR or INSTALL new pads as necessary. REFER to Section 206-03for front disc brakes.
Squeak—noise occurs over bumps or when turning	Worn control arm bushings.	INSPECT the control arm bushings. Spray with lubricant and CARRY OUT a "bounce test" to determine which bushing. REPAIR as necessary. REFER to Section 204-01A for 2-wheel drive vehicles or Section 204-01B for 4-wheel drive vehicles.
	Worn or damaged shock absorber/strut.	INSPECT the shock absorber for damage. CARRY OUT a "bounce test" to isolate the noise. INSTALL a new shock absorber/strut as necessary. REFER to Section 204-01A for 2-wheel drive vehicles and Section 204-01B for 4-wheel drive vehicles for the front shock absorber/strut or Section 204-02 for the rear

		shock absorber/strut.
Rattle—heard when closing/opening the door or window	Loose internal door mechanism, bracket or attachment.	REPEAT the motion or CARRY OUT a "tap test" to duplicate the noise. INSPECT the door for loose components. TIGHTEN loose components or USE the Rotunda Squeak and Rattle Kit to isolate any rattling components.
Squeak or rattle—heard inside the vehicle over rough roads/bumps	Misaligned glove compartment door/hinge.	ALIGN the glove compartment door.
	Instrument panel trim loose or misaligned.	INSPECT the instrument panel trim for missing or loose clips or screws. REPAIR as necessary.
	Loose interior component or trim.	CARRY OUT a "touch test". ELIMINATE the noise by pressing or pulling on interior trim and components. USE the Rotunda Squeak and Rattle Kit to isolate any rattling/squeaking components.
Squeak or rattle—noise with a vibration concern	Damaged or worn body mounts.	INSPECT the upper and lower absorbers and washers for damage or wear. CHECK the body mount brackets for damage. CHECK the nuts and bolts are tightened to specifications. TIGHTEN as necessary.
	Damaged or worn sub-frame mounts.	INSPECT the upper and lower absorbers for damage or wear. CHECK the sub-frame for damage. CHECK the nuts and bolts are tightened to specifications. TIGHTEN as necessary.

Symptom Chart—Steering Noise/Vibration

Condition	Possible Sources	Action
Steering grunt or shudder — occurs when turning into or out of a turn at low speeds (temperature sensitive)	Steering gear or power steering hoses.	GO to Steering Gear Grunt/Shudder Test component test in this section.
Steering System clonk—hydraulic knocking sound	Air in the steering hydraulic system.	CHECK for leaks in the system. PURGE the air from the system. REFER to Section 211-00.
Power steering pump moan — loud humming noise occurs when the steering wheel is rotated to the stop position. Produces a 120-600 Hz frequency that changes with rpm	Power steering hose grounded out to chassis.	INSPECT the power steering hoses. REPAIR as necessary.
	Aerated fluid.	CHECK for leaks in the system. PURGE the air from the system. REFER to Section 211-00.
	Steering gear isolators.	INSPECT the isolators for wear or

		damage. REPAIR as necessary.
	Low fluid.	CHECK the fluid level. REFILL as necessary.
	Power steering pump brackets loose or misaligned.	CHECK bolts, brackets and bracket alignment. TIGHTEN bolts to specification. REPAIR or INSTALL new brackets as necessary. REFER to Section 211-02.
Steering gear clunk — occurs only while cornering over a bump (can be temperature sensitive)	Steering gear.	INSPECT the steering gear for loose mounting bolts. TIGHTEN as necessary. REFER to Section 211-02.
Feedback (rattle, chuckle or knocking noise in the steering gear) — a condition where roughness is felt in the steering wheel when the vehicle is driven over rough surfaces	Column intermediate/flexible shaft joints damaged or worn.	INSTALL a new intermediate/flexible shaft. REFER to Section 211-04.
	Loose, damaged or worn tie-rod ends.	TIGHTEN the nuts to specification or INSTALL new tie-rod ends as necessary. REFER to Section 211-02.
	Steering gear insulators or mounting bolts loose or damaged.	TIGHTEN the bolts or INSTALL new bolts as necessary. REFER to Section 211-02.
	Steering column intermediate shaft bolts are loose.	TIGHTEN the bolts to specification. REFER to Section 211-04.
	Steering column damaged or worn.	REPAIR or INSTALL a new steering column as necessary. REFER to Section 211-04.
	Loose suspension bushings, bolts or ball joints.	INSPECT the suspension system. TIGHTEN or INSTALL new components as necessary. REFER to Section 204-01A for 2-wheel drive vehicles or Section 204-01B for 4-wheel drive vehicles.
Feedback (nibble at the steering wheel) — a condition where slight rotational movement is felt in the steering wheel when the vehicle is driven over rough or grooved surfaces	Lateral runout in the tire or wheel.	GO to Pinpoint Test H.
	Yoke spring in the steering gear.	CHECK TSBs for revised yoke spring for applicable vehicles.
Accessory drive belt	Loose or worn accessory	ADJUST or INSTALL a new

squeal/chirp—when rotating the steering wheel from stop to stop	drive belt.	accessory belt as necessary. REFER to Section 303-05.
Power steering gear hiss	Steering column intermediate/flexible shaft-to-steering gear is binding or misaligned.	REPAIR or INSTALL a new intermediate/flexible shaft as necessary. REFER to Section 211-04.
	Grounded or loose steering column boot at the dash panel.	REPAIR as necessary.
	Damaged or worn steering gear input shaft and valve.	REPAIR or INSTALL a new steering gear as necessary. REFER to Section 211-02.
Steering column rattle	Loose bolts or attaching brackets.	TIGHTEN the bolts to specifications. REFER to Section 211-04.
	Loose, worn or insufficiently lubricated column bearings.	LUBRICATE or INSTALL new steering column bearings as necessary. REFER to Section 211-04.
	Steering shaft insulators damaged or worn.	INSTALL new insulators. REFER to Section 211-04.
	Intermediate/flexible shaft compressed or extended.	INSPECT the rubber spider coupling for damage. INSTALL a new intermediate/flexible shaft. REFER to Section 211-04.
Steering column squeak or cracks	Insufficient lubricated steering shaft bushings.	LUBRICATE the steering shaft and shaft tube seals.
	Loose or misaligned steering column shrouds.	TIGHTEN or ALIGN the steering column shrouds.
	Steering wheel rubbing against steering column shrouds.	REPOSITION the steering column shrouds.
	Insufficient lubricated speed control slip ring.	LUBRICATE the speed control slip ring.
	Upper or lower bearing sleeve out of position.	REPOSITION the bearing sleeves.
Power steering pump noisy	Incorrect assembly of components. Imperfections on the outside diameter or end surface of the power steering pump rotor. Damaged or worn power steering pump rotor splines. A crack on the inner surface	REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.

	of the power steering pump cam. Interference between the power steering pump rotor and cam. Damaged or worn power steering pump rotor and pressure plates.	
Power steering pump swish noise	Power steering fluid flow into the bypass valve of the pump valve housing with fluid temperature below 54℃ (130℉).	Acceptable condition.
Power steering pump whine noise	Aerated fluid.	CHECK for a leak in the system. PURGE the air from the system. REFER to Section 211-00.
	Damaged power steering pump cam.	REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.
	Damaged valve cover O-ring seal.	REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.
Power steering pump clicking (mechanical) noise	Power steering pump rotor slippers too long, excessive rotor slipper-to-slot clearance or damaged or worn rotor assembly.	REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.
Power steering pump clatter noise	Damaged corners on the outside diameter or the power steering rotor or distorted rotor slipper ring.	REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.

Symptom Chart—Suspension Noise/Vibration		
Condition	**Possible Sources**	**Action**
Squeak or grunt—noise from the front suspension, occurs more in cold ambient temperatures. More noticeable over rough roads or when turning	Front stabilizer bar insulators.	Under these conditions, the noise is acceptable. CHECK TSBs for applicable vehicle.
Clunk—noise from the front suspension, occurs in and out of turns	Loose front struts or shocks.	INSPECT for loose nuts or bolts. TIGHTEN to specifications. REFER to Section 204-01A for 2-wheel drive vehicles or Section 204-01B for 4-wheel drive vehicles.
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 joints.	CARRY OUT a ball joint inspection. INSTALL new ball joints or control arms as necessary. REFER to Section 204-01A for 2-wheel drive vehicles or Section 204-01B for 4-wheel drive vehicles.
Click or pop (FWD vehicles)—noise occurs when vehicle is turning	Worn or damaged ball joints.	CARRY OUT a ball joint inspection. INSTALL new ball joints or control arms as necessary.
Click or snap—occurs when accelerating around a corner	Damaged or worn outboard CV joint.	INSPECT the outboard CV joint and boot. REPAIR or INSTALL a new CV joint as necessary. REFER to Section 205-04.
Front suspension noise—a squeak, creak or rattle noise. Occurs mostly over bumps or rough roads	Steering components. Loose or bent front struts or shock absorbers. Damaged spring or spring mounts. Damaged or worn control/radius arm bushings. Worn or damaged stabilizer bar bushings or links.	GO to Pinpoint Test H.
Rear suspension noise—a squeak, creak or rattle noise. Occurs mostly over bumps or rough roads	Loose or bent rear shock absorbers. Damaged spring or spring mounts. Damaged or worn control arm bushings. Worn or damaged stabilizer bar bushings or links.	GO to Pinpoint Test I.
Shudder—occurs during acceleration from a slow speed or stop	Rear drive axle assembly mispositioned.	CHECK the axle mounts and the rear suspension for damage or wear. REPAIR as necessary.
	Incorrect or high CV joint	CHECK vehicle ride height is within limits. REPAIR as necessary.

	operating angle.	
	Damaged or worn front suspension components.	CHECK for a loose stabilizer bar, damaged or loose strut/strut bushings or loose or worn ball joints. INSPECT the steering linkage for wear or damage. REPAIR or INSTALL new components as necessary.
Shimmy—most noticeable on coast/deceleration. Also hard steering condition	Excessive positive caster.	CHECK the caster alignment angle. CORRECT as necessary. REFER to Section 204-00.

Symptom Chart—Tire Noise/Vibration		
Condition	**Possible Sources**	**Action**
Tire noise—hum/moan at constant speeds	Abnormal wear patterns.	SPIN the tire and CHECK for tire wear. INSTALL a new tire as necessary. INSPECT for damaged/worn suspension components. CARRY OUT wheel alignment.
Tire noise—noise tone lowers as the vehicle speed is lowered	Out-of-balance tire.	BALANCE the tire and road test. INSTALL a new tire as necessary. REFER to Section 204-04.
Tire noise — ticking noise, changes with speed	Nail puncture or stone in tire tread.	INSPECT the tire. REPAIR as necessary.
Wheel and tire—vibration and noise concern is directly related to vehicle speed and is not affected by acceleration, coasting or decelerating	Damaged or worn tire.	GO to Pinpoint Test J.
Tire wobble or shudder — occurs at lower speeds	Damaged wheel bearings.	SPIN the tire and CHECK for abnormal wheel bearing play or roughness. ADJUST or INSTALL new wheel bearings as necessary. REFER to Section 204-01A for 2-wheel drive vehicles or Section 204-01B for 4-wheel drive vehicles.
	Damaged wheel.	INSPECT the wheel for damage. INSTALL a new wheel as necessary. REFER to Section 204-01A for 2-wheel drive vehicles or Section 204-01B for 4-wheel drive vehicles.
	Damaged or worn suspension components.	INSPECT the suspension components for wear or damage. REPAIR as necessary. REFER to Section 204-01A for 2-wheel drive vehicles or Section 204-01B for 4-wheel drive vehicles.
	Loose wheel nuts.	CHECK the wheel nuts. TIGHTEN to specification. REFER to Section 204-

		04.
	Damaged or uneven tire wear.	SPIN the tire and CHECK for abnormal tire wear or damage. INSTALL a new tire as necessary. REFER to Section 204-04.
Tire shimmy or shake—occurs at lower speeds	Wheel/tire out of balance.	BALANCE the wheel/tire assembly.
	Uneven tire wear.	CHECK for abnormal tire wear. INSTALL a new tire as necessary. REFER to Section 204-04.
	Excessive radial runout of wheel or tire.	CARRY OUT a radial runout test of the wheel and tire. INSTALL a new tire as necessary. REFER to Section 204-04.
	Worn or damaged wheel studs or elongated stud holes.	INSPECT the wheel studs and wheels. INSTALL new components as necessary. REFER to Section 204-01A for 2-wheel drive vehicles and Section 204-01B for 4-wheel drive vehicles for the front wheels or Section 204-02for the rear wheels.
	Excessive lateral runout of the wheel or tire.	CARRY OUT a lateral runout test of the wheel and tire. CHECK the wheel, tire and hub. REPAIR or INSTALL new components as necessary. REFER to Section 204-04.
	Foreign material between the brake disc and hub or in the brake disc fins.	CLEAN the mounting surfaces of the brake disc and hub. CHECK the brake disc fins for material.
High speed shake or shimmy—occurs at high speeds	Excessive wheel hub runout. Damaged or worn tires. Damaged or worn wheel bearings. Worn or damaged suspension or steering linkage components. Brake disc or drum imbalance.	GO to Pinpoint Test K.

Symptom Chart—Transmission (Manual) and Transfer Case Noise/Vibration		
Condition	**Possible Sources**	**Action**
Clutch rattling noise—occurs with clutch engaged, noise changes/disappears with clutch pedal depressed	Flywheel bolts, clutch housing bolts or clutch pressure plate bolts loose.	TIGHTEN the bolts to specifications. CHECK the bolts for damage.

Clutch squeaking noise—noise is heard when the clutch is operated. Vehicle moves slowly or creeps when the clutch is disengaged. Can also be difficult to shift into first and reverse gear	Pilot bearing seized or damaged.	INSTALL a new pilot bearing. REFER to Section 308-01.
Clutch squeaking noise—occurs with clutch pedal depressed/released	Worn clutch pedal shaft or bushings.	INSPECT the clutch pedal for wear or damage. REPAIR as necessary. REFER to Section 308-02.
Clutch whirring/rattle noise—occurs when clutch pedal is depressed	Worn, damaged or misaligned clutch release bearing.	INSTALL a new clutch release bearing. REFER to Section 308-02.
Clutch grating/grinding noise—occurs when clutch pedal is depressed	Clutch pressure plate fingers bent or worn.	INSPECT the clutch pressure plate release fingers. INSTALL a new pressure plate as necessary. REFER to Section 308-01.
	Contact surface of clutch release bearing worn or damaged.	INSTALL a new clutch release bearing. REFER to Section 308-02.
Clutch chatter—a small amount of noise when clutch pedal is released at initial take-off	Clutch engagement.	Acceptable operating condition.
Clutch chatter/grabs—in some cases a shudder is felt. Occurs with clutch pedal depressed/released	Damaged or worn powertrain/driveline mounts.	INSPECT the powertrain/drivetrain mounts. Refer to the appropriate section in Group 303 for the procedure. INSTALL new mounts as necessary. REFER to the appropriate workshop manual for the service procedures.
	Binding or dragging plunger of the clutch master cylinder or slave cylinder.	CHECK the master and slave cylinder operation. INSPECT the components for damage or wear. INSTALL a new master or slave cylinder as necessary. REFER to Section 308-02.
	Grease or oil on the clutch disc facing.	CHECK the input shaft seal and rear main oil seal. REPAIR as necessary. INSTALL a new clutch disc. REFER to Section 308-01.
	Clutch disc surface glazed or damaged.	INSPECT the clutch disc surface for a glazed, hardened or damage condition. CARRY OUT a disc check. INSTALL a new clutch disc as necessary. REFER to Section 308-01.
	Damaged or worn clutch pressure plate.	INSPECT the clutch pressure plate for wear or damage. INSTALL a new clutch pressure plate as

		necessary. REFER to Section 308-01.
	Flywheel surface damaged or glazed.	INSPECT the flywheel for damage or wear. CARRY OUT a flywheel runout check. INSTALL a new flywheel as necessary. REFER to Section 303-07A for 2.5L engines, Section 303-04B for 3.0L engines and Section 303-01C 4.0L engines.
Clutch chatter noise—noise when clutch pedal is released at initial take-off. Clutch is hard to engage and disengage	Pilot bearing worn, damaged or not correctly aligned in bore.	INSPECT the clutch pressure plate release fingers for uneven wear, clutch components burnt or a seized pilot bearing. INSTALL a new pilot bearing as necessary. REFER to Section 308-01.
Clutch vibration	Loose flywheel bolts. Damaged or loose clutch pressure plate. Excessive flywheel runout.	GO to Pinpoint Test L.
Transmission rattling/clattering noise—noise at idle or on light acceleration from a stop. Gear selection difficult	Gearshift lever joint worn or damaged.	INSTALL a new gearshift lever. REFER to Section 308-03.
	Gearshift lever loose.	TIGHTEN the bolts to specification. REFER to Section 308-03.
	Gearshift linkage rods worn or damaged.	CHECK the linkage bushings for wear. INSTALL new linkage rods as necessary.
Transmission rattling/clattering noise—occurs in neutral or in gear, at idle	Incorrect fluid level or fluid quality.	CHECK that the transmission is filled to the correct level and with the specified fluid. REFER to Section 308-03.
Transmission rattling/clattering noise—noise at idle in neutral	Worn or rough reverse idler gear.	CHECK the reverse idler gear. REPAIR as necessary. REFER to Section 308-03.
	Rough running engine, cylinder misfire.	CHECK the ignition system. CARRY OUT a cylinder power test. REFER to Section 303-00.
	Excessive backlash in gears	CHECK the gear backlash. ADJUST as necessary. REFER to Section 308-03.
	Worn countershaft gears.	REPAIR as necessary. REFER to Section 308-03.
Transmission whine—a mild whine at extreme speeds or high rpm	Rotating gears/geartrain.	Acceptable noise.

Transmission whine—a high pitched whine, also described as a squeal	Transmission gears are worn (high mileage vehicle).	Result of normal gear wear. REPAIR as necessary. REFER to Section 308-03.
	Mismatched gear sets.	INSPECT the gear sets for an uneven wear pattern on the face of the gear teeth. REPAIR as necessary. REFER to Section 308-03.
	Damaged or worn transmission bearing.	INSPECT the transmission bearings. INSTALL new bearings as necessary. REFER to Section 308-03.
Transmission growling/humming—noise occurs in the forward gears. The noise is more prominent when the gear is loaded. The problem gear can be located as the noise occurs in a specific gear position	Gear is cracked, chipped or rough.	INSPECT the transmission gears for damage or wear. INSTALL new gears as necessary. REFER to Section 308-03.
Transmission hissing—noise in neutral or in forward gears. As bearings wear or break up, the noise changes to a thumping noise	Damaged or worn bearings.	INSPECT the transmission bearings. INSTALL new bearings as necessary. REFER to Section 308-03.
Transmission knocking/thudding—noise at low speeds in forward gears	Bearings with damaged balls or rollers or with pitted and spalled races.	INSPECT the transmission bearings. INSTALL new bearings as necessary. REFER to Section 308-03.
Transmission rumble/growl—noise at higher speeds in forward gears, more pronounced in a coast/deceleration condition	Incorrect driveline angle.	CHECK the driveline angle. REPAIR as necessary. REFER to Section 205-00.
	Driveshaft out of balance or damaged.	CHECK the driveshaft for damage, missing balance weights or undercoating. Using the vibration analyzer (VA), CHECK the driveshaft balance. CARRY OUT a driveline vibration test. For additional information, REFER to Section 205-00. REPAIR as necessary.
Transmission rumble/growl—noise at all speeds in forward gears, more pronounced in a heavy acceleration condition	Damaged or worn transmission bearing or gears (high mileage vehicles).	CHECK transmission fluid for excessive metal particles. REPAIR as necessary. REFER to Section 308-03.
Transfer case whine—noise at all ranges	Incorrect fluid level or fluid quality.	CHECK that the transfer case is filled to the correct level and with the specified fluid. REFER to Section 308-07B.
	Worn oil pump.	DISASSEMBLE the transfer case. CHECK the oil pump for wear or

		damage. REPAIR as necessary.
	Under-inflated or oversized tires.	CONFIRM that the tires and wheels are correct for the vehicle. CHECK that the tire inflation pressures are correct.
Transfer case growl/rumble—noise at all ranges (A small amount of planetary noise can be heard when the transfer case is operated in low range.)	Damaged or worn bearings or planetary gear.	DISASSEMBLE the transfer case. CHECK the bearings or planetary gear for wear or damage. REPAIR as necessary. REFER to Section 308-07B.
Transfer case scraping/grating—noise at all ranges	Excessively stretched drive chain hitting the case.	DISASSEMBLE the transfer case. CHECK the drive chain for wear or damage. REPAIR as necessary. REFER to Section 308-07B.
Transfer case howl/hum—noise at all ranges or high range only	Worn or damaged sun (input) gear, clutch pack (intermediate) gear or output shaft gear.	DISASSEMBLE the transfer case. CHECK the gears for wear or damage. REPAIR as necessary. REFER to Section 308-07B.
Transfer case howl/hum—noise at low range only	Worn or damaged intermediate gear and sliding gears (clutch pack).	DISASSEMBLE the transfer case. CHECK the gears for wear or damage. REPAIR as necessary. REFER to Section 308-07B.
Transfer case vibration—vibration felt with vehicle in 4WD	Transfer case mounting. Driveshaft out of balance. Excessive pinion flange runout.	GO to Pinpoint Test M.

Symptom Chart—Transmission (Automatic) Noise/Vibration

Condition	Possible Sources	Action
Rattle—occurs at idle or at light acceleration from a stop	Damaged engine or transmission mounts.	CHECK the powertrain/drivetrain mounts for damage. Refer to the appropriate section in Group 303 for the procedure.
	A loose front pipe heat shield.	REPAIR or INSTALL a new heat shield as necessary.
	Loose inspection plate or dust cover plate.	CHECK for loose bolts. TIGHTEN to specifications. REFER to Section 307-01.
	Loose flexplate to converter nuts.	CHECK for loose nuts. TIGHTEN to specifications. REFER to Section 307-01.
Whine—pitch increases with vehicle speed. Starts in first	Damaged or worn low one-way clutch. Damaged or worn intermediate	INSPECT the transmission for wear or damage. REPAIR or INSTALL new components as necessary. REFER to Section 307-01.

and second gear, decreases or goes away at higher gears	one-way clutch. Friction elements. Damaged or worn planetary or sun gear.	
Whine—the pitch changes with engine speed	A worn or damaged accessory drive component.	CARRY OUT the Engine Accessory Test. REPAIR or INSTALL new components as necessary.
	Incorrect fluid level.	CHECK that the transmission is filled to the correct level. ADD fluid as necessary. REFER to Section 307-01.
	Partially blocked filter.	INSPECT the filter. CLEAN or INSTALL a new filter as necessary. REFER to Section 307-01.
	Worn or damaged torque converter.	CARRY OUT the torque converter service and replacement check. REFER to Section 307-01.
	Worn or damaged front pump.	INSPECT the front pump. INSTALL a new front pump as necessary. REFER to Section 307-01.
Whine—pitch changes with vehicle speed	Speedometer cable or gears.	REPAIR or INSTALL new cables or gears as necessary. REFER to Section 310-02.
Whine/moan type noise—pitch increases or changes with vehicle speed	Damaged engine or transmission mount.	CHECK the powertrain/drivetrain mounts for damage. Refer to the appropriate section in Group 303 for the procedure. REFER to Section 307-01.
	U-joints worn or damaged.	INSPECT the U-joints for wear or damage. INSTALL new U-joints as necessary. REFER to Section 205-01.
	Damaged or worn differential ring and pinion.	INSPECT the differential ring and pinion for damage. CARRY OUT the Checking Tooth Contact Pattern and Condition of the Ring and Pinion component test in this section. REPAIR or INSTALL a new differential ring and pinion as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.
	Planetary gears nicked or chipped.	CHECK the planetary gears for damage. INSTALL new components as necessary. REFER to Section 307-01.
Whistle—noise is high pitched,	Hydraulic pressure in the main control.	INSPECT the main control. REPAIR or INSTALL new components as

constant. Changes in pitch with throttle position		necessary. REFER to Section 307-01.
	Incorrect band/clutch apply pressure.	CARRY OUT the line pressure tests. REPAIR or INSTALL components as necessary. REFER to Section 307-01.
	Worn or damaged torque converter.	CARRY OUT the torque converter service and replacement check. REFER to Section 307-01.
Clunk—occurs when shifting from PARK to a drive or reverse position	Damaged powertrain mounts.	INSPECT the powertrain mounts for damage. INSTALL new mounts as necessary. REFER to Section 307-01.
	Damaged or worn pinion bearings.	CHECK for abnormal bearing play or roughness. INSTALL new bearings as necessary. REFER to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles, or Section 205-03 for front axles.
	Worn or galled driveshaft slip yoke splines.	CLEAN and INSPECT the splines of the yoke. INSTALL a new slip yoke as necessary. REFER to Section 205-01.
	Worn friction elements or excessive clutch pack end plate play.	INSPECT the transmission for wear. CHECK that all end play and clearances are within specification. REPAIR or INSTALL new components as necessary. REFER to Section 307-01.
Bump—occurs when shifting from PARK to a drive or reverse position. Similar to Clunk but with no sound	Initial gear engagement.	Acceptable condition.
Buzz or hiss	Incorrect driveline angles.	CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00.
	Worn or damaged main control solenoids or valves.	Using a transmission tester, ACTIVATE the solenoids to duplicate sound. INSTALL new components as necessary. REFER to Section 307-01.
Vibration—a high frequency (20-80 Hz) that is	Transmission cooler lines grounded out.	CHECK the transmission cooler lines. REPAIR as necessary.

felt through the seat or gear shifter. Changes with engine speed		
	Flexplate to torque converter nuts loose.	CHECK the flexplate nuts. TIGHTEN to specification. REFER to Section 307-01.
	Fluid filler tube grounded out.	CHECK the fluid filler tube. REPAIR as necessary.
	Shift cable incorrectly routed, grounded out or loose.	CHECK the shift cable. REPAIR as necessary. REFER to Section 307-05.
Shutter or chatter—occurs with light to medium acceleration from low speeds or a stop	Electrical inputs/outputs. Vehicle wiring harness. Incorrect inputs/outputs from the powertrain control module (PCM), digital transmission range (TR) sensor, brake pedal position (BPP) sensor, throttle position (TP) sensor, transmission speed sensor (TSS), output speed shaft (OSS) sensor or the torque converter clutch (TCC).	CARRY OUT a Torque Converter Clutch Operation Test. RUN on-board diagnostics or self-test. REFER to Section 307-01. CLEAR the DTCs, road test and rerun on-board diagnostics or self-test.

Pinpoint Tests

The pinpoint tests are a step-by-step diagnostic process designed to determine the cause of a condition. It may not always be necessary to follow a pinpoint test to its conclusion. Carry out only the steps necessary to correct the condition. Then, test the system for normal operation. Sometimes, it is necessary to remove various vehicle components to gain access to the component requiring testing. Reinstall all components after verifying system operation is normal.

PINPOINT TEST A: BRAKE VIBRATION/SHUDDER

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 ROAD TEST THE VEHICLE—LIGHT BRAKING	
	Check that the wheel and tires are correct for the vehicle. Inspect the tires for abnormal wear patterns.
	Road test the vehicle. Warm the brakes by slowing the vehicle a few times from 80-32 km/h (50-20 mph) using light braking applications. At highway speeds of 89-97 km/h (55-60 mph), apply the brake using a 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** For vehicles with ABS, GO to A3 . For vehicles with standard brakes, GO to A4 . → **No** Vehicle is OK. VERIFY condition with customer. TEST the vehicle for normal operation.
A3 NORMAL ACTUATION OF THE ABS SYSTEM DIAGNOSIS	
	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 system. Pedal pulsation or steering wheel nibble (frequency is proportioned to the vehicle speed) indicates a concern with a brake or suspension component.
	Is the vibration/shudder vehicle speed sensitive? → **Yes** GO to A5. → **No** The brake system is operating correctly.
A4 APPLICATION OF THE PARKING BRAKE	
	NOTE: Begin at the front of the vehicle unless the vibration or shudder has been isolated to the rear. 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. For all other vehicles, 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 WHEEL BEARINGS	
	Check the front wheel bearings. Refer to Wheel Bearing Check in this section.
	Are the wheel bearings OK? → **Yes** GO to A6. → **No** INSPECT the wheel bearings. ADJUST or REPAIR as necessary. TEST the system for normal operation.
A6 CHECK THE FRONT SUSPENSION	
	Check the front suspension for: Broken or loose bolts. Damaged springs. Worn or damaged upper and lower control arm bushings. Loose or rough front bearings. Uneven tire wear.
	Are all the suspension components in satisfactory condition? → **Yes** GO to A7. → **No** REPAIR or INSTALL new components as necessary. TEST the system for normal operation.
A7 RESURFACE THE FRONT BRAKE DISCS	
	CAUTION: Do not use a bench lathe to machine brake discs. **NOTE:** Follow the manufacturer's instructions to machine the brake discs. After machining, make sure the brake disc meets the thickness specification. Resurface the front brake discs. Refer to Brake Disc Machining in this section. Road test the vehicle.
	Is the vibration/shudder present? → **Yes** GO to A8. → **No**

	Vehicle is OK.
A8 CHECK THE REAR SUSPENSION	
	Check the rear suspension for: Broken or loose bolts. Damaged or worn springs or spring bushings. Worn or damaged upper and lower control arm bushings. Worn or damaged trailing arms. Loose or rough rear bearings. Uneven tire wear.
	Are all the suspension components in satisfactory condition? → **Yes** GO to A9. → **No** REPAIR or INSTALL new components as necessary. TEST the system for normal operation.
A9 RESURFACE THE REAR BRAKE DISC OR DRUM	
	⚠ **CAUTION: Do not use a bench lathe to machine brake discs.** **NOTE:** Follow the manufacturers instructions to machine the brake discs. After machining, make sure the brake disc meets the thickness specification. Resurface the rear brake discs or drums. Refer to Brake Disc Machining in this section. Road test the vehicle.
	Is the vibration/shudder present? → **Yes** CHECK the front suspension for wear or damage. RESURFACE the front brake discs. TEST the system for normal operation. → **No** Vehicle is OK.

PINPOINT TEST B: ENGINE TICKING NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK FOR TICKING NOISE AT THE FUEL RAIL	
	Disconnect the first fuel line clip.

	Is the ticking noise gone? → **Yes** CHECK for TSB for applicable vehicle. REPAIR as necessary. TEST the system for normal operation. → **No** GO to B2.
B2 CHECK FOR TICKING NOISE AT THE FUEL INJECTOR	
	Using an EngineEAR, listen at the fuel injectors by placing a probe on each injector. To isolate the faulty injector, disconnect the injector electrical connector and listen for the noise.
	Is the fuel injector the source of the ticking noise? → **Yes** INSTALL a new fuel injector. REFER to Section 303-04A for 2.5L engines, Section 303-04B for 3.0L engines, or Section 303-04C for 4.0L engines. TEST the system for normal operation. → **No** GO to B3.
B3 CHECK THE BELT TENSIONER FOR TICKING NOISE	
	INSPECT the accessory drive. CHECK for the belt tensioner bottoming at end of travel or not at end of stroke.
	Using an EngineEAR, listen at the belt tensioner.
	Is the belt tensioner the source of the noise? → **Yes** INSTALL a new belt tensioner. TEST the system for normal operation. → **No** GO to B4.
B4 CHECK THE WATER PUMP FOR TICKING NOISE	
	Using an EngineEAR, listen at the water pump for ticking noise.
	Is the water pump the source of the noise? → **Yes** INSTALL a new water pump. REFER to Section 303-03. TEST the system for normal operation. → **No** GO to B5.
B5 CHECK FOR AN OBSTRUCTION OF THE COOLING FAN	

	Inspect the cooling fan for obstructions.
	Check the cooling fan and shroud for wear or damage.
	Was there an obstruction or does the cooling fan show signs of damage? → **Yes** REPAIR or INSTALL a new cooling fan. REFER to Section 303-03. TEST the system for normal operation. → **No** GO to B6.
B6 CHECK THE OIL PUMP FOR TICKING NOISE	
	CHECK the oil pump using EngineEARs and probe at the oil filter adapter to verify the oil pump as a source.
	Is the oil pump the source of the noise? → **Yes** INSTALL a new oil pump. Refer to the appropriate section in Group 303 for the procedure. TEST the system for normal operation. → **No** GO to B7.
B7 CHECK VALVE LIFTERS OR LASH ADJUSTERS FOR CORRECT OPERATION	
	Check valve lifter/lash adjuster for correct operation, using EngineEARs.
	Are the valve lifters/lash adjusters operating correctly? → **Yes** VERIFY customer concern. CONDUCT a diagnosis of other suspect components. → **No** INSTALL a new valve lifter/lash adjuster(s). TEST the system for normal operation.

PINPOINT TEST C: ACCESSORY DRIVE BEARING HOOT

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE ACCESSORY DRIVE IDLER AND TENSIONER PULLEY BEARINGS	
	Carry out the Vehicle Cold Soak Procedure in this section.
	
	Place an EngineEAR probe directly on the pulley center post or bolt to verify which bearing is making

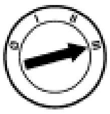
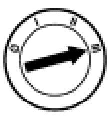
	the noise.
	
	Is either bearing making the noise? → **Yes** INSTALL a new pulley/idler. CARRY OUT the Vehicle Cold Soak Procedure and TEST the system for normal operation. → **No** CONDUCT a diagnosis on other suspect accessory drive components.

PINPOINT TEST D: POWER STEERING MOAN

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK THE POWER STEERING SYSTEM	
	Carry out the Vehicle Cold Soak Procedure in this section.
	
	Turn the steering wheel while the noise is occurring and listen for changes in sound pitch or loudness.
	
	Does the sound pitch or loudness change while turning the steering wheel? → **Yes** GO to D2. → **No** CONDUCT a diagnosis on other suspect accessory drive components.
D2 VERIFY THE SOURCE	
	
	Place an EngineEAR probe near the power steering pump/reservoir while the noise is occurring. While an assistant turns the steering wheel, listen for changes in sound pitch or loudness.

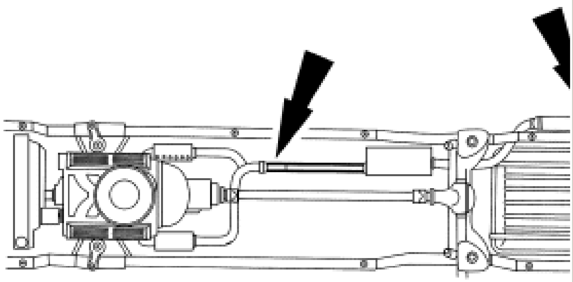
	
	Does the sound pitch or loudness change while turning the steering wheel? → **Yes** VERIFY that the supply tube to the pump is unobstructed. CHECK the fluid condition and level. DRAIN the fluid and REFILL. REFER to Section 211-02. CARRY OUT the Vehicle Cold Soak Procedure and TEST the system for normal operation. → **No** Normal system operation.

PINPOINT TEST E: ENGINE DRIVEN COOLING FAN MOAN

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE ENGINE DRIVEN COOLING FAN AFTER A COLD SOAK	
	Carry out the Vehicle Cold Soak Procedure in this section.
	
	Assess the airflow.
	Raise the engine speed to 1500 rpm while listening for the moan to increase in proportion to the airflow.
	
	Does the moan increase in proportion to the airflow? → **Yes** TEST the fan for normal operation. If the fan tests normal, GO to E2 . Otherwise, REPAIR as necessary. → **No** Normal system operation.
E2 CHECK THE ENGINE DRIVEN COOLING FAN AT NORMAL OPERATING TEMPERATURE	
	
	Run the engine to normal operating temperature while listening for the moan to stop.

	
	Does the moan stop? → **Yes** Normal clutch operation. → **No** INSTALL a new fan clutch. TEST the system for normal operation.

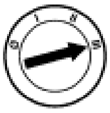
PINPOINT TEST F: DRUMMING NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE EXHAUST SYSTEM	
	
	Increase the engine rpm until the noise is the loudest. Note the engine rpm.
	
 DF1768-A	Add approximately 9 kg (20 lb) of weight to the exhaust system. First place the weight at the tail pipe and test, then at the front pipe.
	
	Increase the engine rpm and listen for the drumming noise. Note the engine rpm if the noise occurs.

	
	Using a vibration analyzer (VA), determine the amount of vibration that occurs with the drumming noise.
	Is the noise/vibration reduced or eliminated, or does the noise/vibration occur at a different rpm? → **Yes** CARRY OUT Exhaust System Neutralizing in this section. TEST the system for normal operation. → **No** GO to F2.
F2 POWERTRAIN/DRIVETRAIN MOUNT NEUTRALIZING	
	Carry out Powertrain/Drivetrain Mount Neutralizing in this section. Test the system for normal operation.
	Is the noise reduced or eliminated? → **Yes** Vehicle OK. TEST the system for normal operation. → **No** CONDUCT diagnosis of other suspect components.

PINPOINT TEST G: ENGINE TICKING, KNOCKING OR CONTINUOUS RATTLE

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK FOR NOISE AT THE VALVE COVERS AND THE FRONT COVERS (OHC ENGINES)	
	Carry out the Vehicle Cold Soak Procedure in this section.
	
	NOTE: For a short-duration ticking noise, multiple engine starts may be necessary. Using an EngineEAR, listen closely at the valve covers and the front covers (OHC engines) by placing the probe near the surface of the valve cover and then on the surface front cover.
	

	Is the noise source apparent? → **Yes** REMOVE the appropriate cover and INSPECT for loose, worn/broken components. REPAIR as necessary. TEST the system for normal operation. → **No** GO to G2.
G2 CHECK FOR NOISE AT THE CYLINDER BLOCK	
	
	Using an EngineEAR, listen closely at the cylinder block by placing a probe on or near each freeze plug.
	
	Is the noise source apparent? → **Yes** REPAIR or INSTALL new components as necessary. → **No** GO to G3.
G3 CHECK FOR NOISE WHILE DISCONNECTING EACH FUEL INJECTOR ELECTRICAL CONNECTOR, ONE AT A TIME	
	
	Disconnect each fuel injector electrical connector, one at a time, to decrease piston force and listen for the noise.
	
	Is the noise reduced or eliminated? → **Yes** INSTALL a new fuel injector. TEST the system for normal operation.

	→ **No** INSPECT accessory drive or the transmission as a possible source.

PINPOINT TEST H: FRONT SUSPENSION NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 ROAD TEST THE VEHICLE	
	Test drive the vehicle.
	NOTE: An assistant will be needed for this road test. During the road test, drive the vehicle over a rough road. Using ChassisEARs, determine from which area/component the noise is originating.
	Is there a squeak, creak or rattle noise? → **Yes** GO to H2. → **No** The suspension system is OK. CONDUCT a diagnosis on other suspect systems.
H2 INSPECT THE STEERING SYSTEM	
	WARNING: The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations. Raise and support the vehicle.
	Check the steering system for wear or damage. Carry out a steering linkage test. Refer Section 211-00.
	Inspect the tire wear pattern. Refer to Tire Wear Patterns chart in this section.
	Are the steering components worn or damaged? → **Yes** REPAIR the steering system. INSTALL new components as necessary. TEST the system for normal operation. → **No** GO to H3.
H3 FRONT SHOCK ABSORBER/STRUT CHECK	
	Check the front shock absorbers/strut mounts for loose bolts or nuts.
	Check the front shock absorbers/struts for wear or damage. Carry out a "bounce test".
	Are the front shock absorbers/struts loose or damaged?

	→ **Yes** TIGHTEN to specifications if loose. INSTALL new front shock absorbers/struts if damaged. TEST the system for normal operation. → **No** GO to H4.
H4 CHECK THE FRONT SPRINGS	
	Check the front spring and front spring mounts/brackets for wear or damage.
	Are the front springs or spring mounts/brackets worn or damaged? → **Yes** REPAIR or INSTALL new components as necessary. TEST the system for normal operation. → **No** GO to H5.
H5 CHECK THE CONTROL ARMS/RADIUS ARMS	
	Inspect the control arm/radius arm bushings for wear or damage.
	Inspect for twisted or bent control arm/radius arm.
	Are the control arm/radius arms damaged or worn? → **Yes** REPAIR or INSTALL new components as necessary. TEST the system for normal operation. → **No** GO to H6.
H6 CHECK THE STABILIZER BAR/TRACK BAR	
	Check the stabilizer bar/track bar bushings and links for damage or wear.
	Check the stabilizer bar/track bar for damage.
	Check for loose or damaged stabilizer bar isolators or brackets.
	Are the stabilizer bar/track bar components loose, worn or damaged? → **Yes** REPAIR or INSTALL new components as necessary. TEST the system for normal operation. → **No** Suspension system OK. CONDUCT diagnosis on other suspect systems.

PINPOINT TEST I: REAR SUSPENSION NOISE

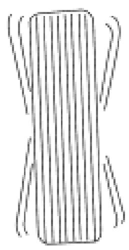
CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 ROAD TEST THE VEHICLE	

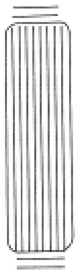
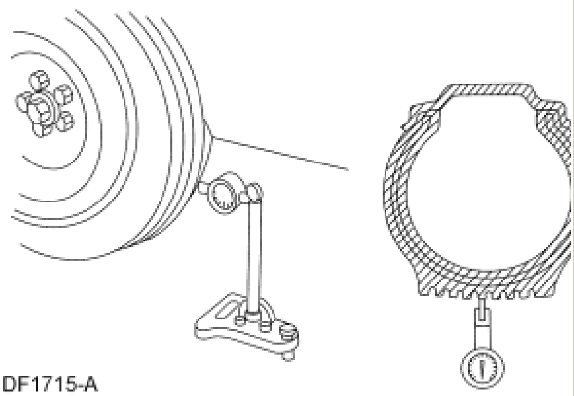
	Test drive the vehicle.
	NOTE: An assistant will be needed for this road test. During the road test, drive the vehicle over a rough road. Using ChassisEARs, determine from which area/component the noise is originating.
	Is there a squeak, creak or rattle noise? → **Yes** GO to I2. → **No** The suspension system is OK. CONDUCT a diagnosis on other suspect systems.
I2 REAR SHOCK ABSORBER/STRUT CHECK	
	WARNING: The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations. Raise and support the vehicle.
	Check the rear shock absorber/strut mounts for loose bolts or nuts.
	Check the rear shock absorbers/struts for damage. Carry out a "bounce test".
	Are the rear shock absorbers/struts loose or damaged? → **Yes** TIGHTEN to specifications if loose. INSTALL new rear shock absorbers/struts if damaged. TEST the system for normal operation. → **No** GO to I3.
I3 CHECK THE REAR SPRINGS	
	Check the rear springs and rear spring mounts/brackets for wear or damage.
	Are the rear springs or spring mounts/brackets worn or damaged? → **Yes** REPAIR or INSTALL new components as necessary. TEST the system for normal operation. → **No** GO to I4.
I4 CHECK THE CONTROL ARMS/TRAILING ARMS	
	Inspect the control arm/trailing arm bushings for wear or damage. Check for loose control arm/trailing arm bolts.
	Inspect for twisted or bent control arms/trailing arms.

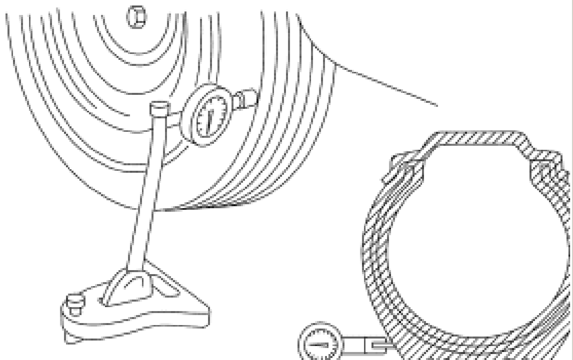
	Are the control arms/trailing arms loose, damaged or worn? → **Yes** REPAIR or INSTALL new components as necessary. TEST the system for normal operation. → **No** GO to I5.
I5 CHECK THE STABILIZER BAR/TRACK BAR	
	Check the stabilizer bar/track bar bushings and links for damage or wear.
	Check the stabilizer bar/track bar for damage.
	Check for loose or damaged stabilizer bar isolators or brackets.
	Are the stabilizer bar/track bar components loose, worn or damaged? → **Yes** REPAIR or INSTALL new components as necessary. Test the system for normal operation. → **No** Suspension system OK. CONDUCT diagnosis on other suspect systems.

PINPOINT TEST J: WHEEL AND TIRE

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 ROAD TEST THE VEHICLE	
	NOTE: Wheel or tire vibrations felt in the steering wheel are most likely related to the front wheel or tire. Vibration felt through the seat are most likely related to the rear wheel or tire. This may not always be true, but it can help to isolate the problem to the front or rear of the vehicle. Test drive the vehicle at different speed ranges.
	During the road test, if the vibration can be eliminated by placing the vehicle in neutral or is affected by the speed of the engine, the cause is not the wheels or tires.
	Is there a vibration and noise? → **Yes** GO to J2. → **No** The wheel and tires are OK. CONDUCT a diagnosis on other suspect systems.
J2 CHECK THE FRONT WHEEL BEARINGS	
	Check the front wheel bearings. Refer to Wheel Bearing Check in this section.

	Are the wheel bearings OK? → **Yes** GO to J3. → **No** INSPECT the wheel bearings. ADJUST or REPAIR as necessary. TEST the system for normal operation.
J3 INSPECT THE TIRES	
	Check the tires for missing weights.
	Check the wheels for damage.
	Inspect the tire wear pattern. Refer to the Tire Wear Patterns chart in this section.
	Do the tires have an abnormal wear pattern? → **Yes** CORRECT the condition that caused the abnormal wear. INSTALL new tire(s). TEST the system for normal operation. → **No** GO to J4.
J4 TIRE ROTATION DIAGNOSIS	
 DF1713-A	Spin the tires slowly and watch for signs of lateral runout.
	Spin the tires slowly and watch for signs of radial runout.

 DF1714-A	
	Are there signs of visual runout? → **Yes** GO to J5. → **No** CHECK the wheel and tire balance. CORRECT as necessary. TEST the system for normal operation.
J5 RADIAL RUNOUT CHECK ON THE TIRE	
 DF1715-A	Measure the radial runout of the wheel and tire assembly. A typical specification for total radial runout is 1.14 mm (0.045 in).
	Is the radial runout within specifications? → **Yes** GO to J8. → **No** GO to J6.
J6 RADIAL RUNOUT CHECK ON THE WHEEL	
	Measure the radial runout of the wheel. A typical specification for total radial runout is 1.14 mm (0.045 in).

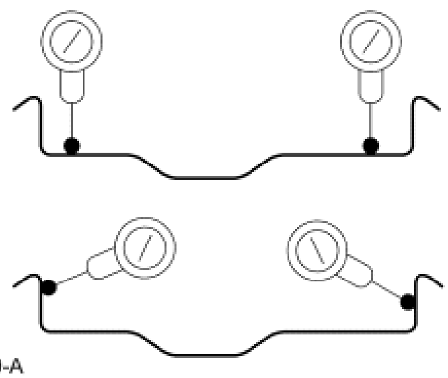
	Is the radial runout within specifications? → **Yes** INSTALL a new tire. TEST the system for normal operation. → **No** GO to J7.
J7 CHECK THE HUB/BRAKE DISC OR DRUM PILOT RUNOUT OR BOLT CIRCLE RUNOUT	
	Measure the pilot or bolt circle runout. A typical specification for radial runout is: Pilot runout— less than 0.15 mm (0.006 inch). Bolt circle runout— less than 0.38 mm (0.015 inch).
	Is the radial runout within specifications? → **Yes** INSTALL a new wheel. TEST the system for normal operation. → **No** REPAIR or INSTALL new components as necessary. REFER to Section 204-01A for 2-wheel drive vehicles and Section 204-01B for 4-wheel drive vehicles for the front wheels or Section 204-02 for the rear wheels.
J8 LATERAL RUNOUT CHECK ON THE TIRE	
 A0011804	Measure the lateral runout of the wheel and tire assembly. A typical specification for total lateral runout is 1.14 mm (0.045 inch).
	Is the lateral runout within specifications? → **Yes** Wheel and tires OK. CONDUCT diagnosis on other suspect systems. → **No** GO to J9.

J9 LATERAL RUNOUT CHECK ON THE WHEEL	
	Measure the lateral runout of the wheel. A typical specification for total radial runout is 1.14 mm (0.045 in).
	Is the lateral runout within specifications? → **Yes** INSTALL a new tire. TEST the system for normal operation. → **No** GO to J10.
J10 CHECK THE FLANGE FACE LATERAL RUNOUT	
	Measure the flange face lateral runout. A typical specification for lateral runout is: Hub/brake disc— less than 0.13 mm (0.005 inch). Axle shaft— less than 0.25 mm (0.010 inch).
	Is the lateral runout within specifications? → **Yes** INSTALL a new wheel. TEST the system for normal operation. → **No** REPAIR or INSTALL new components as necessary. REFER to Section 204-01A for 2-wheel drive vehicles and Section 204-01B for 4-wheel drive vehicles for the front wheels or Section 204-02 for the rear wheels.

PINPOINT TEST K: HIGH SPEED SHAKE OR SHIMMY

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK FOR FRONT WHEEL BEARING ROUGHNESS	
	Chock the rear wheels.
	Raise and support the front end of the vehicle so that the front wheel and tire assemblies can spin.
	Spin the front tires by hand. Refer to Wheel Bearing Check in this section.
	Do the wheel bearings feel rough? → **Yes** INSPECT the wheel bearings. REPAIR as necessary. TEST the system for normal operation.

	→ **No** GO to K2.
K2 CHECK THE END PLAY OF THE FRONT WHEEL BEARINGS	
	Check the end play of the front wheel bearings. Refer to Section 204-00.
	Is the end play OK? → **Yes** GO to K3. → **No** ADJUST or REPAIR as necessary. TEST the system for normal operation.
K3 MEASURE THE LATERAL RUNOUT AND THE RADIAL RUNOUT OF THE FRONT WHEELS ON THE VEHICLE	
	Measure the lateral runout and the radial runout of the front wheels on the vehicle. GO to Pinpoint Test J.
	Are the measurements within specifications? → **Yes** GO to K4. → **No** INSTALL new wheels as necessary and BALANCE the assembly. TEST the system for normal operation.
K4 MEASURE THE LATERAL RUNOUT OF THE FRONT TIRES ON THE VEHICLE	
	Measure the lateral runout of the front tires on the vehicle. GO to Pinpoint Test J.
	Is the runout within specifications? → **Yes** GO to K5. → **No** INSTALL new tires as necessary and BALANCE the assembly. TEST the system for normal operation.
K5 MEASURE THE RADIAL RUNOUT OF THE FRONT TIRES ON THE VEHICLE	
	Measure the radial runout of the front tires on the vehicle. GO to Pinpoint Test J.

	Is the runout within specifications? → **Yes** BALANCE the front wheel and tire assemblies. If any tire cannot be balanced, INSTALL a new tire. TEST the system for normal operation. → **No** GO to K6.
K6 MATCH MOUNT THE TIRE AND WHEEL ASSEMBLY	
	Mark the high runout location on the tire and also on the wheel. Break the assembly down and rotate the tire 180 degrees (halfway around) on the wheel. Inflate the tire and measure the radial runout.
	Is the runout within specifications? → **Yes** BALANCE the assembly. TEST the system for normal operation. → **No** If the high spot is not within 101.6 mm (4 inches) of the first high spot on the tire, GO to K7 .
K7 MEASURE THE WHEEL FLANGE RUNOUT	
 DG0199-A	Dismount the tire and mount the wheel on a wheel balancer. Measure the runout on both wheel flanges. Refer to Section 204-04.
	Is the runout within specifications? → **Yes** LOCATE and MARK the low spot on the wheel. INSTALL the tire, matching the high spot on the tire with the low spot on the wheel. BALANCE the assembly. TEST the system for normal operation. If the condition persists, GO to K8 . → **No** INSTALL a new wheel. CHECK the runout on the new wheel. If the new wheel is within limits, LOCATE and MARK the low spot.

	INSTALL the tire, matching the high spot on the tire with the low spot on the wheel. BALANCE the assembly. TEST the system for normal operation. If the condition persists, GO to K8 .
K8 CHECK FOR VIBRATION FROM THE FRONT OF THE VEHICLE	
WARNING: If only one drive wheel is allowed to rotate, speed must be limited to 55 km/h (34 mph) using the speedometer reading, since actual wheel speed will be twice that indicated on the speedometer. Exceeding a speed of 55 km/h (34 mph) or allowing the drive wheel to hang unsupported can result in tire disintegration or differential failure, which can cause serious personal injury and extensive vehicle damage.	
	Spin the front wheel and tire assemblies with a wheel balancer while the vehicle is raised on a hoist. Feel for vibration in the front fender or while seated in the vehicle.
	Is the vibration present? → **Yes** SUBSTITUTE known good wheel and tire assemblies as necessary. TEST the system for normal operation. → **No** GO to K9.
K9 CHECK FOR VIBRATION FROM THE REAR OF THE VEHICLE	
WARNING: If only one drive wheel is allowed to rotate, speed must be limited to 55 km/h (34 mph) using the speedometer reading, since actual wheel speed will be twice that indicated on the speedometer. Exceeding a speed of 55 km/h (34 mph) or allowing the drive wheel to hang unsupported can result in tire disintegration or differential failure, which can cause serious personal injury and extensive vehicle damage.	
	Chock the front wheels.
	Raise and support the rear end of the vehicle so that the rear wheel and tire assemblies can spin.
	Engage the drivetrain and carefully accelerate the drive wheels while checking for vibration.
	Is the vibration present? → **Yes** GO to K10. → **No** TEST the system for normal operation.
K10 CHECK THE DRIVETRAIN	
WARNING: If only one drive wheel is allowed to rotate, speed must be limited to 55 km/h (34 mph) using the speedometer reading, since actual wheel speed will be twice that indicated on the speedometer. Exceeding a speed of 55 km/h (34 mph) or allowing the drive wheel to hang unsupported can result in tire disintegration or differential failure, which can cause serious personal injury and extensive vehicle damage.	
	Remove the rear wheel and tire assemblies. Refer to Section 204-04.

	Secure the brake drums (if so equipped), by installing wheel hub bolt nuts, reversed.
	Carefully accelerate the drivetrain while checking for vibration.
	Is the vibration present? → **Yes** CHECK/TEST the drivetrain and driveline components. TEST the system for normal operation. → **No** SUBSTITUTE known good wheel and tire assemblies as necessary. TEST the system for normal operation.

PINPOINT TEST L: CLUTCH VIBRATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK ENGINE COMPONENTS FOR GROUNDING	
	NOTE: Make sure the clutch is the cause of the vibration concern. The vibration should occur during clutch operation. The clutch can also be difficult to engage or disengage. Eliminate all related systems before checking the clutch components. **NOTE:** Check the driveline angles and driveshaft runout before disassembling the clutch system. Refer to Section 205-00. Check the powertrain/drivetrain mounts, exhaust manifolds or other engine components for grounding on the chassis.
	Are any mounts or engine components grounded? → **Yes** REPAIR as necessary. TEST the system for normal operation. → **No** GO to L2.
L2 CHECK THE ACCESSORY DRIVE BELT	
	Remove the accessory drive belt.
	Does the vibration stop with the accessory drive belt removed? → **Yes** DIAGNOSE the accessory drive components. → **No** GO to L3.
L3 CHECK FOR LOOSE CLUTCH PRESSURE PLATE BOLTS	
	Check for loose clutch pressure plate bolts. Inspect the clutch pressure plate for damage or for material between the pressure plate and flywheel.

	Are there any loose bolts or damage? → **Yes** TIGHTEN the bolts to specifications or if damaged, INSTALL a new clutch pressure plate. REFER to Section 308-01. TEST the system for normal operation. → **No** GO to L4.
L4 CHECK THE CLUTCH DISC SPRINGS	
	Check for worn, broken or loose clutch disc springs.
	Are the clutch springs worn, broken or loose? → **Yes** INSTALL a new clutch disc. REFER to Section 308-01. TEST the system for normal operation. → **No** GO to L5.
L5 CHECK THE CLUTCH DISC SPLINES	
	Inspect the clutch disc splines for damage or wear.
	Is there damage or wear? → **Yes** INSTALL a new clutch disc. REFER to Section 308-01. TEST the system for normal operation. → **No** GO to L6.
L6 CHECK THE FLYWHEEL BOLTS	
	Check for loose flywheel bolts.
	Are the bolts loose? → **Yes** TIGHTEN the bolts to specifications. Refer to the appropriate section in Group 303 for the procedure. TEST the system for normal operation. → **No** GO to L7.
L7 CHECK THE FLYWHEEL SURFACE	
	Inspect the flywheel surface for wear or damage. Check the flywheel runout.

	Is there any damage or excessive wear? → **Yes** INSTALL a new flywheel. Refer to the appropriate section in Group 303 for the procedure. TEST the system for normal operation. → **No** Clutch system normal. CONDUCT a diagnosis on other suspect systems.

PINPOINT TEST M: TRANSFER CASE VIBRATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 INSPECT THE TRANSFER CASE	
	WARNING: The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations. Inspect the transfer case for loose or missing mounting bolts. Check for fluid seepage between the transfer case and the transmission.
	Are the mounting bolts missing or loose? → **Yes** TIGHTEN to specifications or INSTALL new bolts as necessary. TEST the system for normal operation. → **No** GO to M2.
M2 INSPECT THE REAR DRIVESHAFT	
	NOTE: Verify that the driveshaft and pinion flange index marks are aligned. Inspect the driveshaft for missing weights, damage or undercoating.
	Inspect the U-joints for freedom of movement.
	Check driveshaft runout and, if necessary, check the pinion flange runout. Refer to Section 205-00.
	Is the driveshaft or U-joints worn or damaged or misaligned? → **Yes** REPAIR or INSTALL a new driveshaft as necessary. TEST the system for normal operation. → **No** GO to M3.
M3 CHECK THE DRIVELINE ANGLES	
	Measure the rear driveshaft and pinion angles. Refer to Section 205-00.
	Measure the front driveshaft and pinion angles. Refer to Section 205-00.

	Are the driveline angles incorrect? → **Yes** REPAIR as necessary. TEST the system for normal operation. → **No** GO to M4.
M4 INSPECT THE FRONT DRIVESHAFT	
	NOTE: Verify that the driveshaft and pinion flange index marks are aligned. Inspect the front driveshaft for missing weights, damage or undercoating.
	Inspect the U-joints and slip yoke for freedom of movement.
	Check driveshaft runout and, if necessary, check the pinion flange runout.
	Is the driveshaft or U-joints worn or damaged? → **Yes** REPAIR or INSTALL a new driveshaft as necessary. TEST the system for normal operation. → **No** GO to M5.
M5 ROAD TEST WITH THE FRONT DRIVESHAFT ONLY	
	NOTE: Index mark the driveshaft to the pinion flange and to the output shaft before removal. Remove the rear driveshaft.
	Plug the transfer case with an output shaft seal plug.
	NOTE: Shift the transfer case into 4WD high so the vehicle is driven by the front driveshaft only. Test drive the vehicle.
	Is the vibration gone? → **Yes** INSTALL and BALANCE the rear driveshaft. TEST the system for normal operation. → **No** GO to M6.
M6 ROAD TEST WITH THE REAR DRIVESHAFT ONLY	
	NOTE: Index mark the front driveshaft to the pinion flange. Remove the front driveshaft.
	Test drive the vehicle.
	Is the vibration gone? → **Yes**

	INSTALL and BALANCE the front driveshaft. TEST the system for normal operation. → **No** GO to M7.
M7 TRANSFER CASE TAIL SHAFT INSPECTION	
	Inspect the splines of the output shaft for wear or damage.
	Inspect the splines of the driveshaft slip yoke for wear or damage.
	Are the splines worn or damaged? → **Yes** REPAIR or INSTALL new components as necessary. TEST the system for normal operation. → **No** The transfer case is OK. CONDUCT a diagnosis on other suspect systems.

Component Tests

Idle Air Control (IAC) Valve

Open the hood.

NOTE: Key symptom is elevated idle speed while noise is occurring.

NOTE: "Snapping" the throttle can induce the noise.

Verify the condition by operating the vehicle for a short time.

Inspect the IAC valve. If physical evidence of contamination exists, install a new IAC valve.

While the noise is occurring, either place an EngineEAR probe near the IAC valve and the inlet tube, or create a 6.35 mm (0.25 in)-12.7 mm (0.50 in) air gap between the inlet tube and the clean air tube. If the IAC valve is making the noise, install a new IAC valve.

Test the vehicle for normal operation.

Steering Gear Grunt/Shudder Test

Start and run the vehicle to operating temperature.

Set engine idle speed to 1200 rpm.

CAUTION: Do not hold the steering wheel against the stops for more than three to five seconds at a time. Damage to the power steering pump will occur.

Rotate the steering wheel to the RH stop, then turn the steering wheel 90 degrees back from that position. Turn the steering wheel slowly in a 15 degrees to 30 degrees arc.

Turn the steering wheel another 90 degrees. Turn the steering wheel slowly in a 15 degrees to 30 degrees arc.

Repeat the test with power steering fluid at different temperatures.

If a light grunt is heard or a low (50-200 Hz) shudder is present, this is a normal steering system condition.

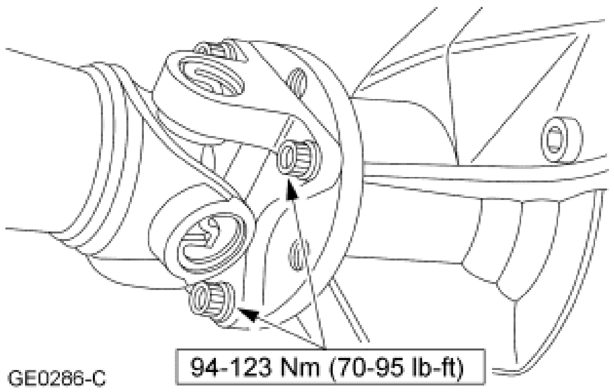
If a loud grunt is heard, or a strong shudder is felt, fill and purge the power steering system.

Driveshaft With a Thump or Clunk Condition

NOTE: Inspect the vehicle to see if the driveshaft and skid plate have been updated.

If the vehicle has not been updated, carry out the entire procedure.

If the vehicle has been updated with a 4.0 inch aluminum driveshaft, and the vehicle has a clunk on acceleration or when hitting a bump, only carry out the fuel tank relocation steps.



CAUTION: If new driveshaft bolts are not available, coat the threads of the original bolts with threadlock and sealer.

NOTE: Inspect the driveshaft. If the vehicle has a 4.0 inch aluminum driveshaft, do not install another driveshaft.

Remove the 3.5 inch steel rear driveshaft and install a 4.0 inch aluminum rear driveshaft. This will require a revised fuel tank skid plate, if equipped.

Index-mark the rear axle flange and transfer case flange to the yellow marks on the steel driveshaft. Remove the steel driveshaft. Using the index marks, align and install the new aluminum driveshaft.

Remove the fuel tank and the fuel tank skid plate. Refer to Section 310-01.

Remove the existing gusset.

Install a new gusset, a new nut plate and new bolts.

Item	Part Number	Description
1	2L54-5097-BA	Gusset
2	F87Z-5A074-AA	Nut plate
3	W705613-S436	Gusset-to- crossmember bolts
4	N803892-S60	Gusset-to-frame bolts

Torque the gusset-to-frame bolts to 90 Nm (66 lb-ft).

Hold the nut plate in place, then torque the gusset-to-crossmember bolts 40 Nm (30 lb-ft).

Install the fuel tank and the fuel tank skid plate. Refer to Section 310-01.

Verify the condition has been corrected.

Checking Tooth Contact Pattern and Condition of the Ring and Pinion

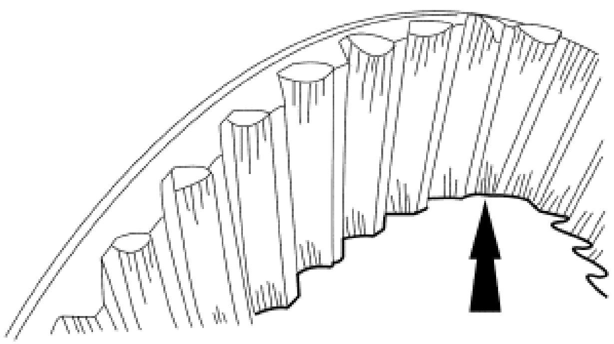
There are two basic types of conditions that will produce ring and pinion noise. The first type is a howl or chuckle produced by broken, cracked, chipped, scored or forcibly damaged gear teeth and is usually quite audible over the entire speed range. The second type of ring and pinion noise pertains to the mesh pattern of the gear pattern. This gear noise can be recognized as it produces a cycling pitch or whine. Ring and pinion noise tends to peak in a narrow speed range or ranges, and will tend to remain constant in pitch.

Raise and support the vehicle. For additional information, refer to Section 100-02.

Drain the axle lubricant. Refer to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.

Remove the carrier assembly or the axle housing cover depending on the axle type. Refer to Section 205-02A for Ford 7.5 rear axles, Section 205-02B for Ford 8.8 rear axles or Section 205-03 for front axles.

Inspect the gear set for scoring or damage.



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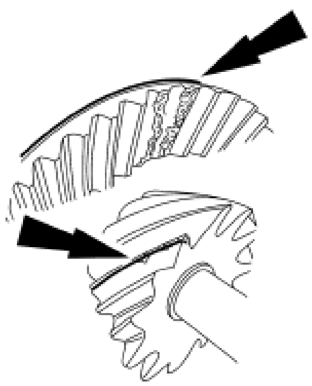

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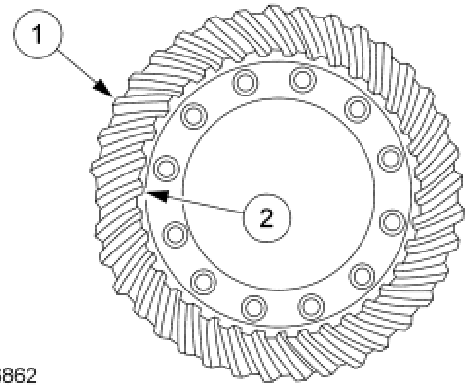
In the following steps, the movement of the contact pattern along the length is indicated as toward the" heel" or "toe" of the differential ring gear.



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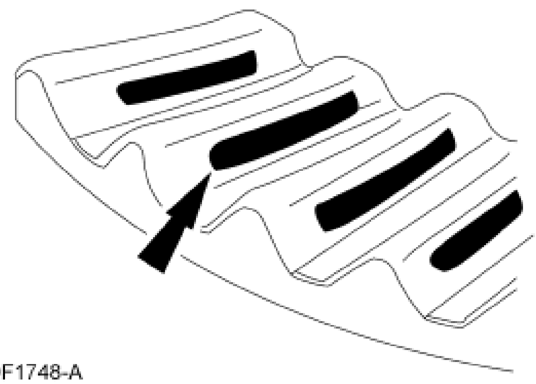
Item	Description
1	Heel
2	Toe

Apply a marking compound to a third of the gear teeth on the differential ring gear. Rotate the differential ring gear several complete turns in both directions until a good, clear tooth pattern is obtained. Inspect the contact patterns on the ring gear teeth.

A good contact pattern should be centered on the tooth. It can also be slightly toward the toe. There should always be some clearance between the contact pattern and the top of the tooth.

Tooth contact pattern shown on the drive side of the gear teeth.

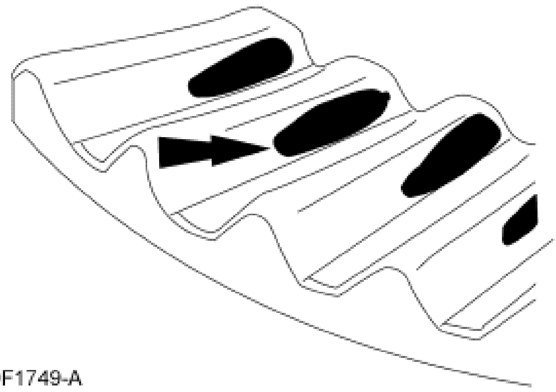

DF1748-A

A high, thick contact pattern that is worn more toward the toe.

Tooth contact pattern shown on the drive side of the gear teeth.

The high contact pattern indicates that the drive pinion is not installed deep enough into the carrier.

The differential ring gear backlash is correct, a thinner drive pinion shim is needed. A decrease will move the drive pinion toward the differential ring gear.

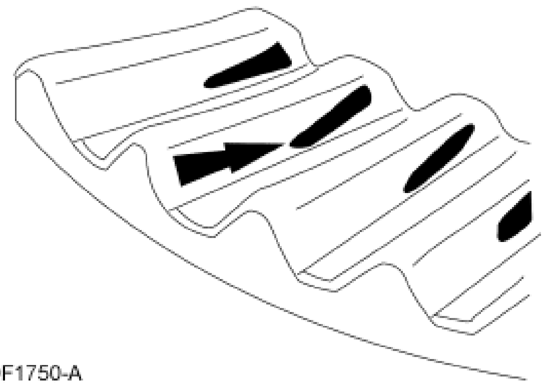


DF1749-A

A high, thin contact pattern that is worn toward the toe.

Tooth contact pattern shown on the drive side of the gear teeth.

The drive pinion depth is correct. Increase the differential ring gear backlash.



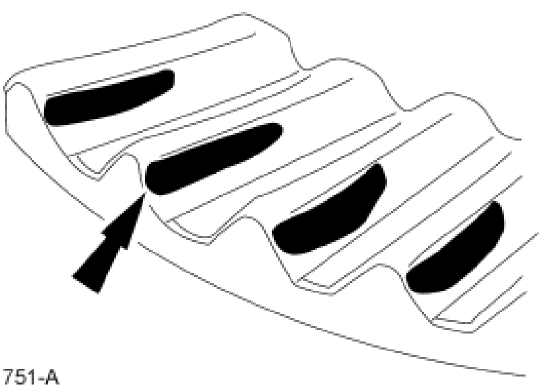
DF1750-A

A contact pattern that is worn in the center of the differential ring gear tooth toward the heel.

Tooth contact pattern shown on the drive side of the gear teeth.

The low contact pattern indicates that the drive pinion is installed too deep into the carrier.

The differential ring gear backlash is correct. A thicker drive pinion shim is needed.

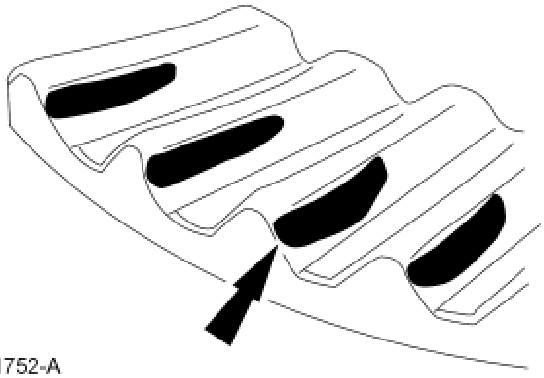


DF1751-A

A contact pattern that is worn at the top of the differential ring gear tooth toward the heel.

Tooth contact pattern shown on the drive side of the gear teeth.

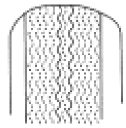
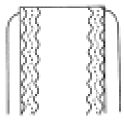
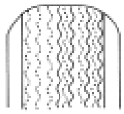
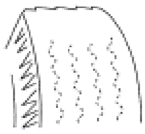
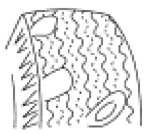
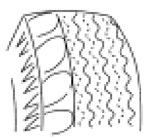
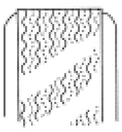
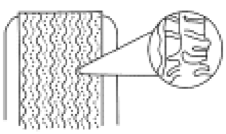
The pinion gear depth is correct. Decrease the differential ring gear backlash.



DF1752-A

Tire Wear Patterns and frequency calculations

Tire Wear Chart

TIRE WEAR	CONDITION	POSSIBLE CAUSES
	•Rapid wear at both shoulders.	•Tires underinflated. •Worn suspension components. •Excessive cornering speeds. •Lack of rotation.
	•Rapid wear at the center.	•Tires overinflated. •Lack of rotation. •Excessive toe on drive wheels. •Heavy acceleration on drive wheels.
	•Wear at one shoulder.	•Toe adjustment out of specification. •Camber out of specification. •Damaged strut. •Damaged lower control arm.
	•Feather edges.	•Toe adjustment out of specification. •Damaged or worn tie rods. •Damaged spindle or knuckle.
	•Bald spots or cupping.	•Unbalanced wheel. •Excessive radial runout. •Worn strut or shock absorber.
	•Tire scalloped.	•Toe adjustment out of specification. •Camber out of specification. •Worn or damaged suspension components.
	•Wear pattern - FWD vehicles.	•Excessive toe on non-drive wheels. •Lack of rotation.
	•Wear pattern - FWD vehicles. Edge of thread blocks worn.	•Excessive toe on non-drive wheels. •Lack of rotation.

DF1717-A

Wheel and tire NVH concerns are directly related to vehicle speed and are not generally affected by acceleration, coasting or decelerating. Also, out-of-balance wheel and tires can vibrate at more than one speed. A vibration that is affected by the engine rpm, or is eliminated by placing the transmission in NEUTRAL is not related to the tire and wheel. As a general rule, tire and wheel vibrations felt in the steering wheel are related to the front tire and wheel assemblies. Vibrations felt in the seat or floor are related to the rear tire and wheel assemblies. This can initially isolate a concern to the front or rear.

Careful attention must be paid to the tire and wheels. There are several symptoms that can be caused by damaged or worn tire and wheels. Carry out a careful visual inspection of the tires and wheel assemblies. Spin the tires slowly and watch for signs of lateral or radial runout. Refer to the tire wear chart to determine the tire wear conditions and actions.

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 and 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, divide the vehicle speed at which the vibration occurs by 16 km/h (10 mph). Multiply that number by 16 km/h (10 mph) tire rpm listed for that tire diameter in the chart. Then divide that number by 60. For example: a 40 mph vibration with 835 mm (33 in) tires. 40÷10 = 4. Multiply 4 by 105 = 420 rpm. Divide 420 rpm by 60 seconds = 7 Hz at 40 mph.

Tire Speed and Frequency Chart

Tire Diameter	**Tire RPM/Hz**	**Tire RPM/Hz**	**Tire RPM/Hz**	**Tire RPM/Hz**
mm (inch)	@ 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	1092/18	1274/21
508 (20)	173	865/14	1038/17	1211/20
533 (21)	165	825/14	990/16	1155/19
560 (22)	158	790/13	948/16	1106/18
585 (23)	151	755/13	906/15	1057/18
610 (24)	145	725/12	870/14	1015/17
635 (25)	139	695/12	834/14	973/16
660 (26)	134	670/11	804/13	938/16
685 (27)	129	645/11	774/13	903/15
710 (28)	124	620/10	744/12	868/14
735 (29)	119	595/10	714/12	833/14
760 (30)	115	575/10	690/11	805/13
785 (31)	111	555/9	666/11	777/13
810 (32)	108	540/9	648/11	756/13
835 (33)	105	525/9	630/10	735/12
864 (34)	102	510/8	612/10	714/12

Component Test

Neutralize Powertrain and Exhaust — Automatic Transmission

NOTE: It is normal for a 4-cylinder engine to have a nominal level of powertrain boom, vibration or rough idle. Compare the concern vehicle to a similar Ranger vehicle to determine if the level of boom, vibration or rough idle is normal before proceeding with any repairs.

Road test the vehicle to determine the condition.

For 2003 model year vehicles experiencing the ROUGH IDLE condition, continue with Step 2.

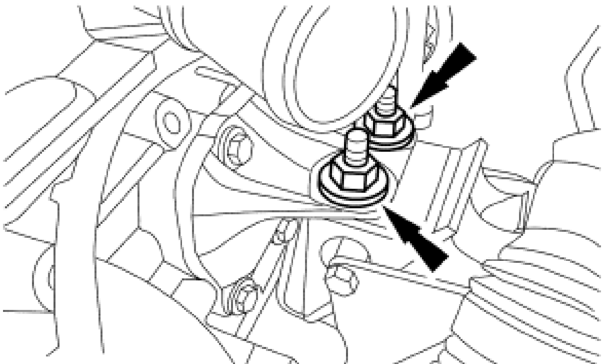
For 2002 and 2003 model year vehicles experiencing the RPM BOOM/VIBRATION condition, continue with Step 3.

For 2002 model year vehicles experiencing the ROUGH IDLE condition, continue with Step 4.

Reprogram the PCM to the latest level using WDS release 25.6 or higher, then continue this procedure with Step 4.

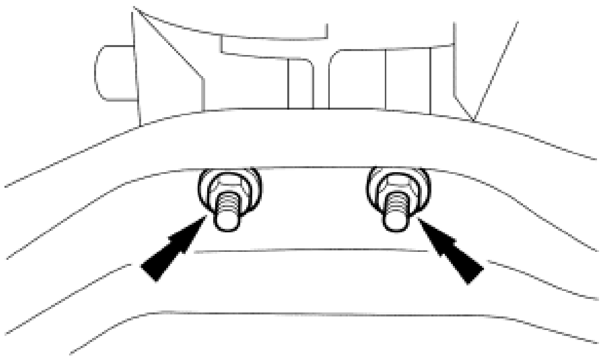
Install a new muffler and tailpipe assembly and new muffler front and rear isolators. For additional information, refer to Section 309-00.

Loosen the catalytic converter-to-muffler exhaust flange nuts.



N0018867

Loosen the 4 engine support insulator nuts.



N0018866

Loosen the 2 transmission extension housing-to-crossmember mount nuts.

Loosen the 2 exhaust manifold-to-catalytic converter nuts.

Start the engine.

Apply the park brake and the service brake, then place the transmission into DRIVE.

Raise the engine RPM until the powertrain moves or shifts under torque.

Place the transmission into REVERSE.

Raise the engine RPM until the powertrain moves or shifts under torque.

Repeat Steps 8-11.

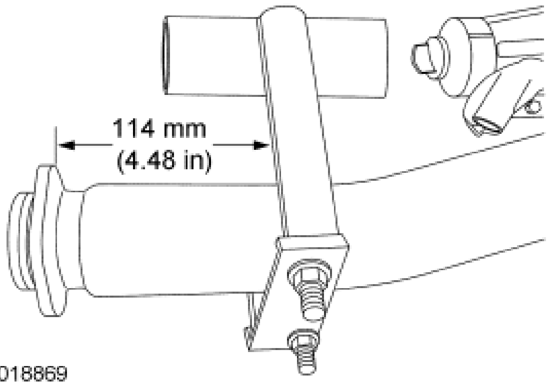
Place the transmission into PARK and turn the ignition switch to the OFF position.

NOTE: Support the catalytic converter and exhaust pipe with a jack stand while tightening.

Tighten the powertrain and exhaust system fasteners in the following sequence:

- Tighten the 2 LH engine insulator nuts to 102 Nm (75 lb-ft).
- Tighten the 2 RH engine insulator nuts to 102 Nm (75 lb-ft).
- Tighten the 2 transmission extension housing-to-crossmember mount nuts to 99 Nm (73 lb-ft).
- Tighten the 2 exhaust manifold-to-catalytic converter nuts to 40 Nm (30 lb-ft).
- Tighten the 2 catalytic converter-to-muffler exhaust flange nuts to 40 Nm (30 lb-ft).

Inspect the powertrain and exhaust system for contact with the body, frame, suspension components, dash panel, hoses, wire harnesses and other components.



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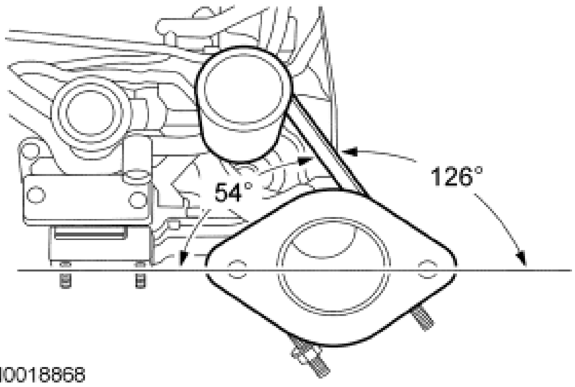


N0018868

Inspect and, if necessary, reposition the exhaust dampener.

The exhaust dampener, located in front of the catalytic converter-to-muffler exhaust flange, should be 114 mm (4.48 in) forward of the exhaust flange and at an angle of 54 degrees from horizontal or between 10:30 and 11:00 o'clock when viewed from the rear of the vehicle.

Tighten the exhaust dampener nuts to 47 Nm (35 lb-ft).

Start the engine and inspect for exhaust system leaks.

Road test the vehicle to confirm that the condition is improved.

Neutralize Powertrain and Exhaust — Manual Transmission

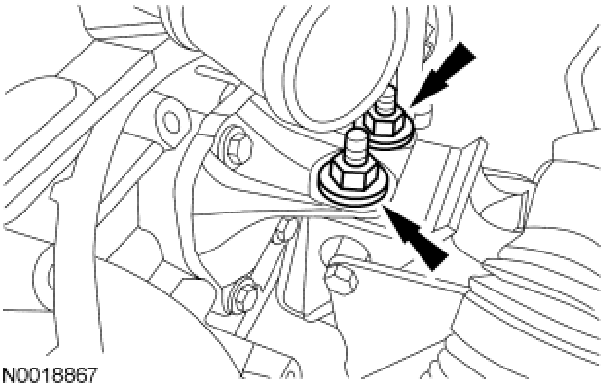
Road test the vehicle to determine the condition.

For vehicles experiencing the RPM BOOM/VIBRATION condition, continue with Step 2.

For vehicles experiencing the ROUGH IDLE condition, continue with Step 3.

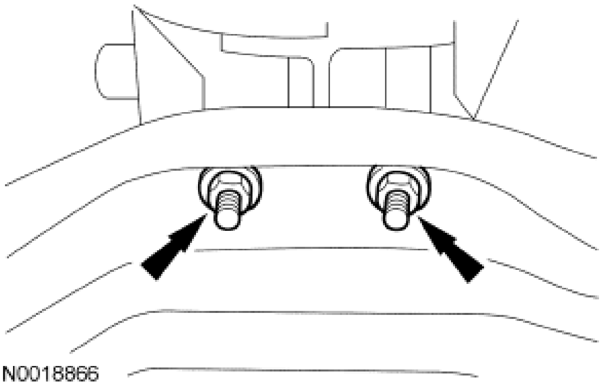
Install a new muffler and tailpipe assembly, and new muffler front and rear isolators. For additional information, refer to Section 309-00.

Loosen the catalytic converter-to-muffler exhaust flange nuts.



N0018867

Loosen the 4 engine support insulator nuts.



N0018866

Loosen the 2 transmission extension housing-to-crossmember mount nuts.

Loosen the 2 exhaust manifold-to-catalytic converter nuts.

Start the engine.

Apply the park brake and place the transmission into FIRST GEAR.

Raise the engine RPM and slowly release the clutch until the powertrain moves or shifts under torque.

Place the transmission into REVERSE.

Raise the engine RPM and slowly release the clutch until the powertrain moves or shifts under torque.

Repeat Steps 8-11.

Place the transmission into NEUTRAL and turn the ignition switch to the OFF position.

NOTE: Support the catalytic converter and exhaust pipe with a jack stand while tightening.

Tighten the powertrain and exhaust system fasteners in the following sequence:

Tighten the 2 LH engine insulator nuts to 102 Nm (75 lb-ft).

Tighten the 2 RH engine insulator nuts to 102 Nm (75 lb-ft).

Tighten the 2 transmission extension housing-to-crossmember mount nuts to 98 Nm (72 lb-ft).

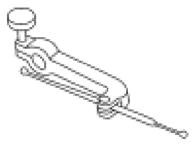
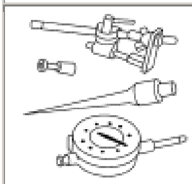
Tighten the 2 exhaust manifold-to-catalytic converter nuts to 40 Nm (30 lb-ft).

Tighten the 2 catalytic converter-to-muffler exhaust flange nuts to 40 Nm (30 lb-ft).

Start the engine and inspect for exhaust system leaks.

Road test the vehicle to confirm that the condition is improved.

Brake Disc Machining

Special Tool(s)	
 ST1348-A	Gauge, Clutch Housing 308-021 (T75L-4201-A)
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent

Material	
Item	**Specification**
Motorcraft Metal Surface Cleaner ZC-21	WSE-M5B392-A
High Temperature Nickel Anti-Seize Lubricant XL-2 (US); CXG-2-B (Canada); or equivalent	ESE-M12A4-A

WARNING: The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations.

CAUTION: Do not install brake discs that are less than the minimum thickness specified. Do not machine a brake disc below the minimum thickness specification.

Check wheel bearing end-play and correct as necessary.

NOTE: Begin at the front of the vehicle unless the vibration has been isolated to the rear.

Remove the tire and wheel assembly.

Remove the brake caliper and the brake caliper anchor plate. Refer to the appropriate section in Group 206 for the procedure.

Inspect the brake linings. Install new brake linings if below specification. For additional information, refer to the appropriate brake section.

Measure and record the brake disc thickness. Install a new brake disc if the thickness after machining will be at or below specification. The specification is molded into the brake disc.

Do not machine a new brake disc.

For vehicles with a 2-piece hub and brake disc assembly:

Match-mark before disassembly.

Remove the brake disc.

Clean the hub and brake disc mounting surfaces with metal surface cleaner.

Using a die grinder with a mild abrasive (Scotch Brite® type), remove any rust or corrosion from the hub and brake disc mounting surfaces.

Align the match-marks and reinstall the brake disc on the hub.

CAUTION: Do not use a bench lathe to machine brake discs.

NOTE: The depth of cut must be between 0.10 and 0.20 mm (0.004 and 0.008 inch). Lighter cuts will cause heat and wear. Heavier cuts will cause poor brake disc surface finish.

Using an on-car brake lathe, machine the brake discs. Follow the manufacturer's instructions. After machining, make sure the brake disc still meets the thickness specification.

Using the special tools, verify that the brake disc lateral runout is now within specification. For additional information, refer to Section 206-00.

Remove the special tool hub adapter.

Remove any remaining metal chips from the machining operation.

For vehicles with a 2-piece hub and brake disc assembly:

Remove the brake disc from the hub.

Remove any remaining metal chips from hub and brake disc mounting surfaces and from the ABS sensor.

Apply a liberal amount of lubricant to the hub flange, pilot area and to the brake disc-to-hub mounting surface.

Using the match marks, mount the brake disc on the hub.

Install the brake caliper anchor plate and the brake caliper.

Install the tire and wheel assembly.

Test the system for normal operation.

Powertrain/Drivetrain Mount Neutralizing

WARNING: The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations.

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

Loosen, but do not remove, the powertrain/drivetrain mount fasteners.

Lower the vehicle.

CAUTION: Do not twist or strain the powertrain/drivetrain mounts.

Move the vehicle in forward and reverse 0.6-1.2 meters (2-4 ft).

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

Tighten the powertrain/drivetrain mount fasteners.

Lower the vehicle.

Test the system for normal operation.

Exhaust System Neutralizing

WARNING: Exhaust gases contain carbon monoxide, which is harmful to health and potentially lethal. Repair exhaust system leaks immediately. Never operate the engine in an enclosed area.

WARNING: Exhaust system components are hot.

NOTE: Neutralize the exhaust system to relieve strain on mounts which can be sufficiently bound up to transmit vibration as if grounded.

WARNING: The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations.

CAUTION: Make sure the system is warmed up to normal operating temperature, as thermal expansion can be the cause of a strain problem.

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

Loosen all exhaust hanger attachments and reposition the hangers until they hang free and straight.

Loosen all exhaust flange joints.

Place a stand to support the muffler parallel to the vehicle frame with the muffler pipe bracket free of stress.

Tighten the muffler connection.

Tighten all the exhaust hanger clamps and flanges (tighten the exhaust manifold flange joint last).

- Verify there is adequate clearance to prevent grounding at any point in the system. Make sure that the catalytic converter and heat shield do not contact the frame rails.
- After neutralization, the rubber in the exhaust hangers should show some flexibility when movement is applied to the exhaust system.
- With the exhaust system installed securely and cooled, the rear hanger should be angled forward.

Lower the vehicle.

Test the exhaust system for normal operation.

Wheel Bearing Check

Special Tool(s)	
	Dial Indicator Gauge With Holding Fixture 100-D002 (D78P-4201-B) or equivalent

NOTE: Inspect the tires for cupping. A tire with cupping wear can duplicate a bearing noise.

Rear wheel drive (RWD) vehicles

Raise the vehicle until the tire is off the floor. For additional information, refer to Section 100-02.

NOTE: Make sure the wheel rotates freely and the brake pads are retracted sufficiently to allow movement of the tire and wheel assembly.

Grasp each front tire at the top and bottom and move the wheel inward and outward while lifting the weight of the tire off the front wheel bearing.

If the tire and wheel (hub) is loose on the wheel spindle:

Adjust the front wheel bearings. For additional information, refer to Section 204-01A.

Four wheel drive (4WD) vehicles

NOTE: An assistant will be needed for this procedure.

Position the vehicle on a hoist. For additional information, refer to Section 100-02.

Carry out the following steps:

Engage the transfer case to the 4H position.

With the vehicle in DRIVE, run the vehicle to 40 km (25 mph).

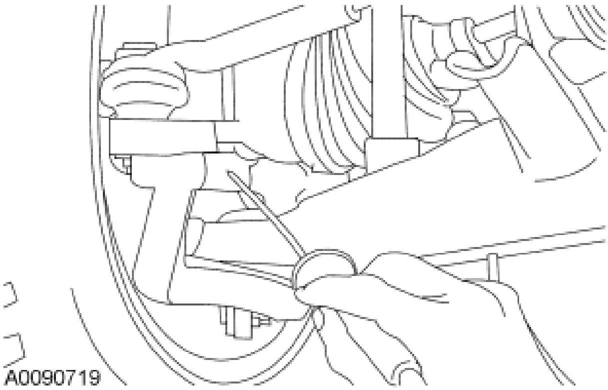
NOTE: If the vehicle is equipped with a limited slip front axle, both the wheels will be turning. Evaluate both wheels at this time. Then continue to Step 8.

Evaluate the front wheel that is turning.

Place the stethoscope on the knuckle near the wheel bearing.

Make a mental note of the sound.

Using the brakes, stop the wheels from turning.



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NOTE: If the vehicle is equipped with a limited slip front axle, do not hold the wheel. Evaluate both simultaneously. Go to Step 8.

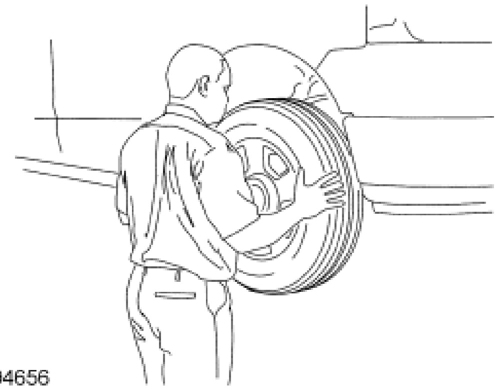
Evaluate the other front wheel.

While holding the previously evaluated wheel, run the vehicle to 40 km (25 mph). Release the wheel being held.

Place the stethoscope on the knuckle near the wheel bearing.

Make a mental note of the sound.

Using the brakes, stop the wheels from turning.



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Compare the results.

If one side sounds significantly louder than the other, go to Step 9.

If both sides sound equally loud, go to Step 9.

If both sides sound similar (not loud or noisy), wheel bearings are OK.

NOTE: Make sure the wheel rotates freely.

NOTE: Rotate the hublocks to the unlocked position.

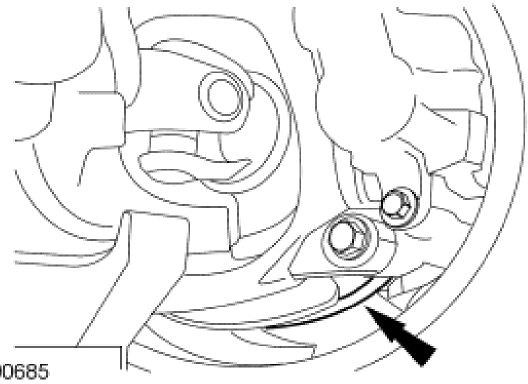
Carry out the following steps for the wheel bearing endplay setup:

Install the special tool to the knuckle.

Place the probe on the brake disc where the splash shield has a "V" opening.

Make sure the probe can move in a lateral direction.

Tighten the neck of the probe.



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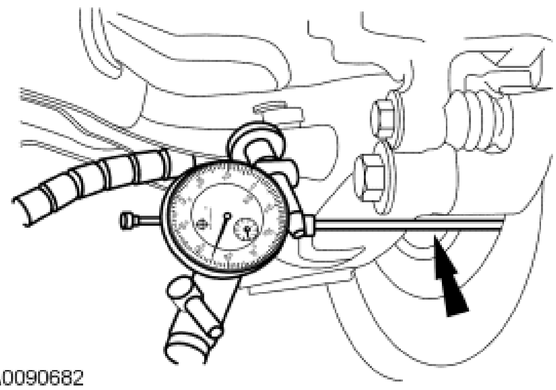

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Carry out the following steps for the wheel bearing endplay:

Push the wheel inward at the 6 o'clock position.

Set the dial indicator to zero.

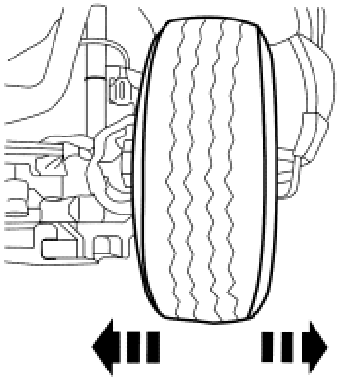
Pull the wheel outward at the 6 o'clock position.

Record the measurement.

Repeat this step 3 to 5 times.

If the wheel bearing endplay is greater than 0.13 mm (0.005 inch), install a new wheel bearing.

If the wheel bearing endplay is less than 0.13 mm (0.005 inch), the wheel bearing is within specification. Go to the next step.



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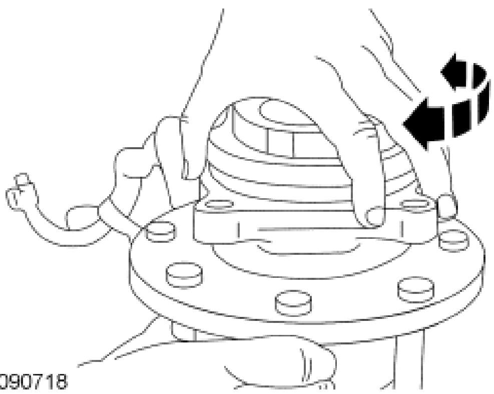
Remove the wheel hub. For additional information, refer to Section 204-01B.

Carry out the following steps for the wheel bearing roughness/noise inspection:

- With the wheel hub unit on a bench, rotate the outer flange of the wheel bearing while applying downward pressure.
  - If the wheel bearing rotates freely, without roughness, check the bearing for noise.
  - If the wheel bearing does not rotate freely, install a new bearing.
- Rotate the outer flange of the wheel bearing while applying downward pressure. Using a stethoscope, check the wheel bearing for noise.
  - If the wheel bearing rotates freely, without noise, the wheel bearing is OK. Conduct a diagnosis on other suspect components or systems.
  - If the wheel bearing does not rotate without noise, install a new bearing.



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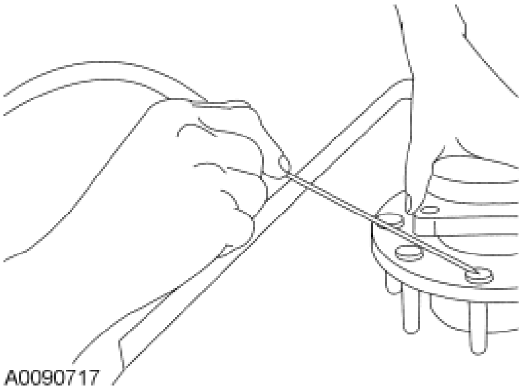


Install the wheel hub. For additional information, refer to Section 204-01B.

Test the system for normal operation.

SECTION 308-07A:
Four-Wheel Drive Systems

General Specifications

Item	Specification
Multi-Purpose Grease XG-4	ESR-M1C159-A

Torque Specifications

Description	Nm	lb-ft
Transfer case shift motor mounting bolts	20	15

Four-Wheel Drive Systems

The electronic-shift four-wheel drive system consists of the following components:

- Transfer case (For transfer case repair procedures, refer to Section 308-07B).
- Four wheel drive control module
- Mode select switch (MSS)
- Gearmotor encoder assembly

Four-Wheel Drive Systems — Mechanical Shift

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Principles of Operation

Mechanical Operation

In the 2WD mode, torque from the engine is transferred through the transmission to the transfer case, which in turn drives the output shaft that drives the rear axle.

The 2WD to 4WD HIGH shift is accomplished when the 2WD to 4WD HIGH shift fork moves the mode sleeve to engage the drive sprocket to the rear output shaft. The drive sprocket turns the chain which turns the front output shaft driven sprocket on the front output shaft and the front driveshaft.

The 4WD HIGH to 4WD LOW shift is accomplished when the 4WD HIGH to 4WD LOW shift fork moves the range sleeve to engage the planet carrier to the main shaft. Torque for the input shaft is then transmitted through the sun gear, which then turns the planets. The planets, which are now engaged to the output shaft, provide a gear reduction.

Neutral

With the shift selector in NEUTRAL, no power is transmitted to either the front or rear axles. All the planetary gears turn freely with the input shaft, and the chain sprocket floats freely on the output shaft.

2-Wheel Drive

When 2WD is selected, the range sleeve at the center of the front planet slides forward, putting the transfer case into the high speed range (direct drive). The input shaft and the rear output shaft are locked together. This results in direct drive, straight through to the rear driveshaft. In addition, the 4-wheel drive mode sleeve is disengaged so none of the 4-wheel drive components turn.

4-Wheel Drive — 4WD HIGH

In 4WD HIGH, the range sleeve remains in the same position as it was in 2WD. The action of the shift lever causes the mode sleeve to move rearward, locking the drive sprocket and chain to the rear output shaft. This causes both the front and rear wheels to be driven in the high range.

4-Wheel Drive — 4WD LOW

4WD LOW allows for maximum pulling capacity. Shifting into 4WD LOW causes the range sleeve to move rearward and engage the planetary gear to achieve gear reduction. The result is that the output shaft now turns more slowly than the input shaft. This action increases the pulling capacity available to the wheels.

Inspection and Verification

1. Visually inspect for obvious signs of mechanical and electrical system concerns.

Visual Inspection Chart

Mechanical	Electrical
• Axle shafts and universal joints • Driveshaft and universal joints • Shift linkage • Fluid leaks • Matching tire size	• Circuitry • Mode indication lamps

2. Carry out the mechanical shift functional test. Refer to Function Test — Mechanical Shift (Pinpoint Test A) in this section.

3. If the concern is still present after the mechanical shift function test, refer to the Symptom Chart.

Functional Test — Mechanical Shift

PINPOINT TEST A: MECHANICAL SHIFT FUNCTIONAL TEST

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK FOR 2WD INDICATED	
	1 With the vehicle stationary, make sure the transmission is in NEUTRAL with your foot on the brake pedal. For manual transmission, press and hold the clutch pedal.
2 	
	3 Shift the transfer case selector lever to 2WD.
	4 Observe both the 4WD and 4WD LOW indicators.
	• **Are both indicators off?** → **Yes** GO to A2.

	→ **No** GO to Section 413-01 to diagnose the instrument cluster.
A2 VERIFY SHIFT TO 4WD HIGH	
	1 With the vehicle stationary, shift the transmission to NEUTRAL.
	2 Shift the transfer case selector lever to the 4WD HIGH position.
	• **Did the transfer case selector lever shift to the 4WD HIGH position?** → **Yes** GO to A4. → **No** GO to A3.
A3 ATTEMPT TO MECHANICALLY ASSIST 4WD HIGH SHIFT	
	1 Allow the vehicle to roll forward.
	2 Shift the transfer case selector lever to the 4WD HIGH position.
	• **Did the transfer case selector lever shift to the 4WD HIGH position?** → **Yes** GO to A4. → **No** 4WD HIGH will not engage. REFER to the Symptom Chart.
A4 CHECK FOR MECHANICAL ENGAGEMENT OF 4WD HIGH	
	1 Drive the vehicle in tight turns on a hard surface.
	2 Check for the presence of driveline wind-up and tire scuff.
	• **Is driveline wind-up and tire scuff present?** → **Yes** GO to A5. → **No** 4WD HIGH did not mechanically engage. GO to Pinpoint Test B.
A5 CHECK THE 4WD INDICATOR	
	1 Observe the 4WD indicator.

	• **Is the 4WD indicator illuminated?** → **Yes** GO to A6. → **No** GO to Section 413-01 to diagnose the instrument cluster.
A6 VERIFY SHIFT TO 4WD LOW	
	1 Apply the brake.
	2 With the vehicle stationary, shift the transmission to NEUTRAL.
	3 Shift the transfer case selector lever to 4WD LOW.
	• **Did the transfer case selector lever shift to 4WD LOW?** → **Yes** GO to A8. → **No** GO to A7.
A7 ATTEMPT TO MECHANICALLY ASSIST 4WD LOW SHIFT	
	1 Allow the vehicle to roll forward.
	2 Shift the transfer case selector lever to the 4WD LOW position.
	• **Did the transfer case selector lever shift to the 4WD LOW position?** → **Yes** GO to A8. → **No** 4WD LOW will not engage. REFER to the Symptom Chart.
A8 CHECK FOR MECHANICAL ENGAGEMENT OF 4WD LOW	
	1 **NOTE:** Driveline wind-up and tire scuff is present in both 4WD HIGH and 4WD LOW. However, vehicle speed is severely limited in 4WD LOW. Execute tight turns on a hard surface.
	2 Check for the presence of driveline wind-up, tire scuff, and limited vehicle speed.
	• **Is driveline wind-up and tire scuff present?** → **Yes**

	GO to A9. → **No** 4WD LOW did not mechanically engage. REFER to the Symptom Chart.
A9 CHECK THE LOW RANGE INDICATOR	
	1 Observe the 4WD LOW indicator.
	• **Is the 4WD LOW indicator illuminated?** → **Yes** GO to A10. → **No** GO to Section 413-01 to diagnose the instrument cluster.
A10 CHECK THE SHIFT FROM 4WD LOW TO 2WD	
	1 With the vehicle stationary, shift the transfer case selector lever to the 2WD position.
	• **Did the transfer case selector lever shift to the 2WD position?** → **Yes** GO to A12. → **No** GO to A11.
A11 ATTEMPT TO MECHANICALLY ASSIST 4WD LOW DISENGAGEMENT	
	1 Allow the vehicle to roll forward to eliminate blockage or driveline wind-up.
	2 Shift the transfer case selector lever to the 2WD position.
	• **Did the transfer case selector lever shift to 2WD position?** → **Yes** GO to A12. → **No** 4WD LOW will not disengage. REFER to the Symptom Chart.
A12 VERIFY THE TRANSFER CASE MECHANICALLY DISENGAGED	
	1 Engage the parking brake.
	2 Rotate the front driveshaft.

	• **Does the front driveshaft rotate?** → **Yes** The 4WD system is operating correctly. INSTRUCT the customer on correct operation. → **No** The transfer case did not disengage. REPAIR the transfer case as necessary. REFER to Section 308-07B.

PINPOINT TEST B: 4WD WILL NOT ENGAGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 INSPECT THE DRIVESHAFT	
	1 Visually inspect the front driveshaft.
	• **Is the front driveshaft in place and correctly attached?** → **Yes** GO to B2. → **No** REPAIR the front driveshaft as necessary. REFER to Section 205-01.
B2 CHECK THE FRONT DRIVE AXLE OPERATION	
	1 Manually rotate the front driveshaft while observing the front tire rotation.
	• **Does either front tire turn?** → **Yes** GO to B3. → **No** REPAIR the front drive axle as necessary. REFER to Section 205-03.
B3 VERIFY TRANSFER CASE ENGAGEMENT	
	1 Shift the transfer case selector lever to 4WD HIGH.
	2 Engage the parking brake.
	3 Rotate the front driveshaft.
	• **Does the front driveshaft turn?** → **Yes**

	GO to B4. → **No** The 4WD system is operating correctly. INSTRUCT the customer on correct operation.
B4 CHECK THE SHIFT LINKAGE	
	1 Disconnect the transfer case shift linkage.
	2 **NOTE:** The transfer case has four detented shift positions. The full clockwise position is 2WD, the next position is 4WD HIGH, then NEUTRAL and the full counterclockwise position is 4WD LOW. Normal operation should not take more than 45 Nm (33 lb-ft) to manually shift the transfer case. Manually shift the transfer case into 4WD HIGH.
	3 Rotate the front driveshaft.
	• **Does the front driveshaft turn?** → **Yes** REPAIR the transfer case as necessary. REFER to Section 308-07B. → **No** ADJUST the transfer case shift linkage. REFER to Gearshift Linkage Adjustment in this section.

Symptom Chart — Mechanical Shift

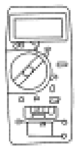
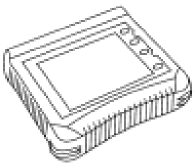
Symptom Chart — Mechanical Shift

Condition	Possible Sources	Action
• Transfer case makes noise	• Tire or wheel size.	• VERIFY all tires and wheels are the same size and tire pressure is correct.
	• Excessive tire tread wear.	• CHECK tire tread wear to see if there is more than 0.15 cm (0.06 inch) difference in tread wear between front and rear. EXCHANGE one front and one rear wheel. INFLATE tires to correct specifications.
	• Internal components.	• CYCLE the transmission through all gear positions with the transfer case in 2WD and 4WD HIGH. If there is noise in the NEUTRAL position or in some gears but not others, DIAGNOSE the transmission. If there is noise in all transmission gear positions,

		OPERATE the transfer case in all positions. If the noise is only present in 4WD HIGH, during acceleration, deceleration and float, DISASSEMBLE the transfer case; REFER to Section 308-07B. CHECK the internal components for damage. REPAIR as necessary. If the noise is only present in 4WD LOW, INSPECT the planet gears and range sleeve for damage. REPAIR as necessary.
• Transfer case jumps out of gear	• Shift linkage.	• CHECK shift linkage travel. ADJUST the shift linkage as necessary, REFER to Gearshift Linkage Adjustment in this section.
	• Front and rear driveshaft slip yokes.	• LUBRICATE and REPAIR the slip yoke as necessary.
	• Internal components.	• REPAIR the transfer case as necessary, REFER to Section 308-07B.
• Excessive driveline/torsional wind-up during straight-line operation	• Tire and wheel size mismatched.	• VERIFY all tires and wheels are a matching size and that inflation pressures are correct.
	• Mismatched axle ratios.	• VERIFY front and rear axle ratios are the same.

Four-Wheel Drive Systems — Electronic Shift

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Special Tool(s)	
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224 New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool

Principles of Operation

Transfer Case — Electronic Shift

The four-wheel drive electronic shift-on-the-fly feature electrically shifts the vehicle transfer case between 2WD, 4WD HIGH, and 4WD LOW. The system mode is selected by the operator through the mode select switch (MSS) on the instrument panel. The operator is informed which mode the system is in by two instrument cluster indicators: one for 4WD HIGH which appears as 4WD, and one for 4WD LOW, which appears as 4WD LOW. Shifts into 4WD HIGH can be made at any speed. When shifting into 4WD HIGH with the vehicle stationary, tooth blockage may occur preventing shift completion. When the vehicle is driven above 8 km/h (5 mph) the shift will complete. When shifting in or out of 4WD LOW, the four-wheel drive (4WD) control module requires that the vehicle speed be less than 5 km/h (3 mph), the brake pedal be applied, and the transmission be in NEUTRAL (automatic transmission) or the clutch pedal be depressed (manual transmission).

The gearmotor encoder assembly is mounted externally on the transfer case. It drives a rotary cam which moves the mode fork and range fork within the transfer case between the 4WD HIGH, 4WD LOW, and 2WD range positions.

The four-wheel drive (4WD) control module controls the gearmotor encoder assembly that shifts between 4WD HIGH, 4WD LOW, and 2WD modes.

System Function

Feature inputs:

- brake ON/OFF switch

- mode select switch (MSS)
- digital transmission range (TR) sensor
- vehicle speed signal transmitted from the powertrain control module (PCM)
- contact plate position inputs A, B, C, D

Feature outputs:

- 4WD LOW indicator (ground when activated, open circuit when deactivated)
- 4WD indicator (ground when activated, open circuit when deactivated)
- 4WD shift motor outputs

Shifts between 2WD and 4WD HIGH can be made at any speed. Listed below are the inputs and outputs needed by the 4WD control module to execute a change between any of these modes.

Feature inputs:

- vehicle speed signal
- mode select switch

Feature outputs:

- 4WD cluster indicator (ground when activated, open circuit when deactivated)

When shifting into or out of LOW range, the 4WD control module requires that the vehicle speed is less than 5 km/h (3 mph), the brake is applied, and the transmission is in NEUTRAL.

Feature inputs:

- mode select switch
- contact plate position inputs A, B, C, D
- vehicle speed signal
- brake ON/OFF switch input (battery voltage when brake is depressed, open circuit when not activated)
- digital TR sensor (ground when transmission is in NEUTRAL, open circuit otherwise)

Feature outputs:

- 4WD shift motor outputs
- 4WD LOW cluster indicator (ground when activated, open circuit when deactivated)

Inspection and Verification — Electronic Shift

1. Visually inspect the following for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical

• Axle shafts and universal joints
• Driveshaft and universal joints
• Fluid leaks
• Matching tire size
	• Battery junction box (BJB) fuse:
	  ▪ 1 (50A)
	  ▪ 3 (50A)
	  ▪ 13 (20A)
	  ▪ 30 (10A)
	• Central junction box (CJB) fuse:
	  ▪ 28 (7.5A) (manual transmission)
	  ▪ 10 (7.5A)
	  ▪ 11 (7.5A)
	  ▪ 5 (15A)
	• 4WD control module
	• Wiring harness
	• Mode select switch (MSS)
	• gearmotor encoder assembly
	• Connector(s)
	• Circuitry

2. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:

- check that the program card is correctly installed.
- check the connections to the vehicle.
- check the ignition switch position.

3. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.

4. Carry out the DATA LINK DIAGNOSTICS test. If the diagnostic tool responds with:

- CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to Section 418-00.
- NO RESP/NOT EQUIP for 4WD control module, GO to Pinpoint Test D.
- SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out the 4WD control module self-test.

5. If the DTCs retrieved are related to the concern, go to the 4WD Control Module Diagnostic Trouble Code (DTC) Index to continue diagnostics.

6. If no DTCs related to the concern are retrieved, carry out the Electronic Shift Function Test. Refer to Functional Test—Electronic Shift (Pinpoint Test C) in this section.

4WD Control Module Diagnostic Trouble Code (DTC) Index

NOTE: Before carrying out the on-demand self-test, switch the mode selection switch into the suspect 4WD mode (4H or 4L) to verify the customer's concern.

DTC	Description	Source	Action
B1342	ECU is Defective	4WD control module	CLEAR the DTCs. REPEAT the 4WD control module self-test. If DTC B1342 is retrieved, INSTALL a new 4WD control module. REFER to Four-Wheel Drive (4WD) Control Module in this section. CLEAR the DTCs. REPEAT the self-test.
B1355	Ignition Run Circuit Failure	4WD control module	GO to Pinpoint Test E.
B1483	Brake Pedal Input Circuit Failure	4WD control module	GO to Pinpoint Test F.
B1485	Brake Pedal Input Battery Short	4WD control module	GO to Pinpoint Test F.
B1555	Ignition Run/Start Circuit Failure	4WD control module	GO to Pinpoint Test E.
C1728	Transfer Case Unable to Transition Between 2WD HIGH and 4WD HIGH	4WD control module	GO to Pinpoint Test E.
C1729	Transfer Case Unable to Transition Between 4WD HIGH and 4WD LOW	4WD control module	GO to Pinpoint Test F.
P0500	Vehicle Speed Sensor (VSS) Malfunction	4WD control module	GO to Pinpoint Test F.
P1812	Transmission 4WD Mode Select Circuit Failure	4WD control module	GO to Pinpoint Test E.
P1815	Transmission 4WD Mode Select Short Circuit to Ground	4WD control module	GO to Pinpoint Test E.
P1816	Transmission Neutral Safety Switch Circuit Failure	4WD control module	GO to Pinpoint Test F.
P1819	Transmission Neutral Safety Switch Short Circuit to Ground	4WD control module	GO to Pinpoint Test F.
P1849	Transmission Transfer Case Contact Plate A Short Circuit to Ground	4WD control module	GO to Pinpoint Test E.
P1853	Transmission Transfer Case Contact Plate B Short Circuit to Ground	4WD control module	GO to Pinpoint Test E.

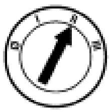
P1857	Transmission Transfer Case Contact Plate C Short Circuit to Ground	4WD control module	GO to Pinpoint Test E.
P1861	Transmission Transfer Case Contact Plate D Short Circuit to Ground	4WD control module	GO to Pinpoint Test E.
P1867	Transmission Transfer Case Contact Plate General Circuit Failure	4WD control module	GO to Pinpoint Test E.
P1891	Transmission Transfer Case Contact Plate Ground Return Open Circuit	4WD control module	GO to Pinpoint Test E.
—	For All Other DTCs	4WD control module	Section 419-10.

Functional Test — Electronic Shift

PINPOINT TEST C: ELECTRONIC SHIFT FUNCTIONAL TEST

CAUTION: The function test must be carried out on a hard surface in a vacant area without traffic.

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK INDICATOR PROVE-OUT	
1 	
	2 Start the vehicle while observing the four-wheel drive (4WD) indicators for prove-out.
	• **Did the indicators prove out?** → **Yes** GO to C3. → **No** GO to C2.
C2 CHECK FOUR-WHEEL DRIVE (4WD) CONTROL MODULE COMMUNICATION	
1	

	
	2 Connect the diagnostic tool.
	3 Retrieve 4WD control module self-test DTCs.
	• **Did the 4WD control module respond?** → **Yes** REPAIR the instrument cluster as necessary. REFER to Section 413-01. → **No** GO to Pinpoint Test D.
C3 CHECK FOR TWO-WHEEL DRIVE (2WD) INDICATED	
	1 Start the vehicle and allow to idle.
	2 Apply the brake pedal and hold.
	3 Shift the transmission to NEUTRAL.
	4 Turn the mode select switch (MSS) to 2WD while holding the shift conditions.
	5 Observe the 4WD and 4WD LOW indicators.
	• **Are both indicators off?** → **Yes** GO to C5. → **No** GO to C4.
C4 CHECK FOR THE PRESENCE OF FOUR-WHEEL DRIVE (4WD)	
	1 Shift the transmission to REVERSE and back the vehicle up 3 meters (10 feet) to relieve driveline windup.
	2 Drive the vehicle forward for 3 meters (10 feet) and stop.
	3 Press the brake pedal and hold.
	4 Shift the transmission to NEUTRAL. Hold the shift conditions for 20 seconds.
	5 Execute tight turns on a hard surface.
	6 Check for the presence of driveline windup and tire scuff.
	• **Is driveline windup and tire scuff present?**

	→ **Yes** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC is retrieved, REFER to Section 308-07B and REPAIR the transfer case as necessary. → **No** If the 4WD indicator is ON, REFER to the symptom chart in Section 413-01 to continue diagnosis. If the 4WD LOW indicator is ON, REFER to the symptom chart in Section 413-01 to continue diagnosis.
C5 VERIFY SHIFT TO 4WD HIGH	
	1 Turn the mode select switch (MSS) to 4X4 HIGH.
	2 Listen for gearmotor operation.
	3 Wait for 20 seconds after MSS is turned to 4X4 HIGH. (The system will use up to five cycles of shift attempts trying to engage 4WD HIGH.)
	• **Is the 4WD indicator ON?** → **Yes** GO to C7. → **No** GO to C6.
C6 ATTEMPT MECHANICAL ASSIST ENGAGEMENT	
	1 Drive the vehicle above 8 km/h (5 mph) for at least 20 seconds.
	2 Stop the vehicle.
	3 Observe the 4WD indicator.
	• **Is the 4WD indicator ON?** → **Yes** GO to C7. → **No** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test E.
C7 CHECK FOR MECHANICAL ENGAGEMENT OF 4WD HIGH	
	1 Drive the vehicle for two minutes above 16 km/h (10 mph).
	2 Execute tight turns on a hard surface.
	3 Check for the presence of driveline windup and tire scuff.

	• **Is driveline windup and tire scuff present?** → **Yes** GO to C8. → **No** 4WD HIGH did not mechanically engage. RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test E.
C8 CHECK FOR CORRECT INDICATOR OPERATION ON 4WD LOW ENGAGEMENT	
	1 While driving the vehicle forward above 8 km/h (5 mph), turn the MSS to 4X4 LOW while observing the indicators for five seconds.
	2 Turn the MSS to 4X4 HIGH.
	3 Stop the vehicle and apply the parking brake.
	4 Shift the transmission to PARK and release the brake pedal.
	• **Did the 4WD LOW indicator stay off?** → **Yes** GO to C9. → **No** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test F.
C9 CHECK THE LOW RANGE INDICATOR ON IN ERROR	
	1 Turn the MSS to 4X4 LOW.
	2 Apply and hold the brake pedal.
	• **Is the 4WD LOW indicator OFF?** → **Yes** GO to C10. → **No** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test F.
C10 CHECK THE LOW RANGE INDICATOR FOR ON IN 4X4 LOW	

	1 Apply and hold the brake pedal.
	2 Shift the transmission to NEUTRAL.
	3 Listen for gearmotor operation.
	4 Hold the shift conditions for 20 seconds. (The system will use up to five cycles of shift attempts trying to engage 4X4 LOW.)
	• **Is the 4WD LOW indicator ON?** → **Yes** GO to C12. → **No** GO to C11.
C11 ATTEMPT MECHANICAL ASSIST OF 4WD LOW ENGAGEMENT	
	1 **CAUTION: Make sure there is a clear area behind the vehicle before backing up.** Shift the transmission to REVERSE and back the vehicle up 3 meters (10 feet) to relieve driveline windup and stop.
	2 Drive the vehicle forward for 3 meters (10 feet) and stop.
	3 Apply the brake pedal and hold.
	4 Shift the transmission to NEUTRAL.
	5 Observe the 4WD LOW indicator.
	• **Is the 4WD LOW indicator ON?** → **Yes** GO to C12. → **No** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test F.
C12 CHECK FOR MECHANICAL ENGAGEMENT OF 4WD LOW	
	1 **NOTE:** Driveline windup and tire scuff is present in both 4WD HIGH and 4WD LOW. However, vehicle speed is severely limited in 4WD LOW. Execute tight turns on a hard surface.
	2 Check for the presence of driveline windup, tire scuff and reduced vehicle speed.

	• **Is driveline windup, tire scuff and reduced speed present?** → **Yes** GO to C13. → **No** 4X4 LOW did not mechanically engage. RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test F.
C13 CHECK FOR CORRECT INDICATOR OPERATION ON 4WD LOW DISENGAGEMENT	
	1 While driving the vehicle forward above 8 km/h (5 mph), turn the MSS to 4X4 HIGH while observing the indicators.
	2 Turn the MSS to 4X4 LOW.
	3 Stop the vehicle and apply the parking brake.
	4 Shift the transmission to PARK and release the brake pedal.
	• **Is the 4WD LOW indicator ON?** → **Yes** GO to C14. → **No** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test F.
C14 CHECK THE 4WD LOW INDICATOR	
	1 Turn the MSS to 4X4 HIGH.
	2 Apply and hold the brake pedal.
	• **Is the 4WD LOW indicator ON?** → **Yes** GO to C15. → **No** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test F.
C15 CHECK FOR 4WD LOW INDICATOR OFF IN 4WD HIGH	
	1 Press and hold the brake pedal.

	2 Shift the transmission to NEUTRAL.
	3 Listen for gearmotor operation.
	4 Hold the shift conditions for 20 seconds. (The system will use up to five cycles of shift attempts trying to engage 4WD HIGH.)
	• **Is the 4WD LOW indicator OFF?** → **Yes** GO to C17. → **No** GO to C16.
C16 ATTEMPT MECHANICAL ASSIST OF 4WD LOW DISENGAGEMENT	
	1 Drive the vehicle forward above 8 km/h (5 mph) for at least five seconds.
	2 Stop the vehicle.
	3 Apply the brake pedal and hold.
	4 Shift the transmission to NEUTRAL.
	5 Observe the 4WD LOW indicator.
	• **Is the 4WD LOW indicator OFF?** → **Yes** GO to C17. → **No** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test F.
C17 CHECK FOR MECHANICAL 4WD LOW DISENGAGEMENT AND 4WD HIGH ENGAGEMENT	
	1 Apply the brake.
	2 ⚠ **CAUTION: Make sure there is a clear area behind the vehicle before backing up.** Shift the transmission to REVERSE and back the vehicle up 3 meters (10 feet) to relieve driveline windup.
	3 Stop the vehicle.
	4 Drive the vehicle forward and execute tight turns on a hard surface.
	5 **NOTE:** Driveline windup and tire scuff is present in both 4WD HIGH and 4WD LOW. However, vehicle speed is severely limited in 4WD LOW.

	Verify the presence of driveline windup and tire scuff. Also verify the increased vehicle speed from when 4WD LOW was engaged.
	• **Did 4WD HIGH engage and the vehicle speed increase?** → **Yes** GO to C18. → **No** 4WD LOW is mechanically bound or locked. REPAIR the transfer case as necessary. REFER to Section 308-07B.
C18 CHECK THE 4WD HIGH TO 2WD SHIFT	
	1 Stop the vehicle.
	2 Turn the MSS to 2WD and wait 20 seconds.
	3 Listen for gearmotor operation.
	• **Is the 4WD indicator OFF?** → **Yes** GO to C20. → **No** GO to C19.
C19 ATTEMPT MECHANICAL ASSIST OF 4WD HIGH DISENGAGEMENT	
	1 Drive the vehicle forward above 8 km/h (5 mph) for at least 20 seconds.
	2 Stop the vehicle.
	3 Observe the 4WD indicator.
	• **Is the 4WD indicator OFF?** → **Yes** GO to C20. → **No** RETRIEVE 4WD control module self-test DTCs. If a self-test DTC related to the concern is retrieved, REFER to the 4WD Control Module Diagnostic Trouble Code (DTC) Index. If no DTC related to the concern is retrieved, GO to Pinpoint Test E.
C20 VERIFY THE TRANSFER CASE MECHANICALLY DISENGAGED	
	1 Apply the parking brake.
	2 Rotate the front driveshaft.

	- **Does the front driveshaft turn?** → **Yes** The transfer case is operating correctly. INSTRUCT the customer on correct system operation. → **No** The transfer case did not disengage from 4WD HIGH. REPAIR the transfer case as necessary. REFER to Section 308-07B.

Symptom Chart — Electronic Shift

Symptom Chart		
Condition	**Possible Sources**	**Action**

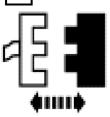
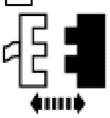
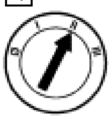
• No communication with the four-wheel drive (4WD) control module	• 4WD control module.
	• Central junction box (CJB).
	• CJB fuse:
	    ▪ 5 (15A).
	    ▪ 10 (7.5A).
	• Circuitry.
		• GO to Pinpoint Test D.

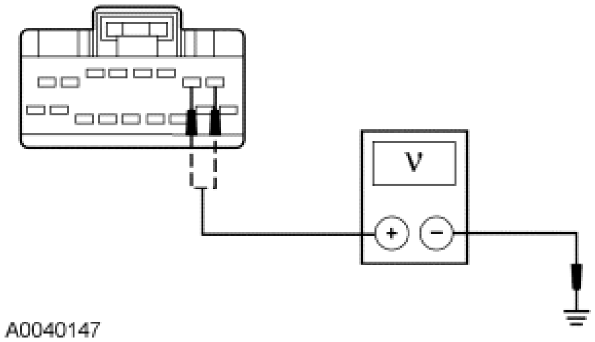
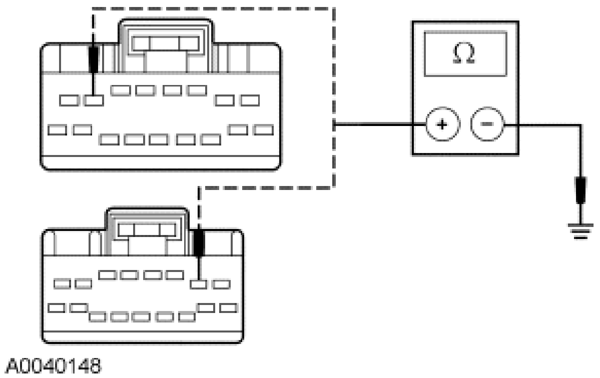
• **NOTE:** Before carrying out the on-demand self-test, switch the mode selection switch into the suspect 4WD mode (4H or 4L) to verify the customer's concern. The vehicle does not shift between 2WD and 4WD modes correctly	• Battery junction box (BJB) fuse 13 (20A). • Mode select switch (MSS). • Contact plate A, B, C, or D. • gearmotor encoder assembly. • Circuitry. • 4WD control module. • Transfer case mechanism.	• GO to Pinpoint Test F.
• **NOTE:** Before carrying out the on-demand self-test, switch the mode selection switch into the suspect 4WD mode (4H or 4L) to verify the customer's concern. The vehicle does not shift between 4WD HIGH and 4WD LOW modes correctly	• BJB fuse 13 (20A). • Mode select switch (MSS). • Neutral safety switch. • Brake pedal position (BPP) switch. • 4WD control module. • Transfer case. • Digital transmission range (TR) sensor.	• GO to Pinpoint Test F.

	• Circuitry.	
• The 4WD indicator is always on—4WD system operates correctly	• Circuitry. • Instrument cluster. • 4WD control module.	• REFER to the symptom chart in Section 413-01to continue diagnosis.
• The 4WD LOW indicator is always on	• Powertrain control module (PCM). • Circuitry. • Instrument cluster. • 4WD control module.	• REFER to the symptom chart in Section 413-01to continue diagnosis.

Pinpoint Tests — Electronic Shift

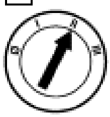
PINPOINT TEST D: NO COMMUNICATION WITH THE FOUR-WHEEL DRIVE (4WD) CONTROL MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK POWER TO 4WD CONTROL MODULE	
1 	
2  4WD Control Module C281a	
3  4WD Control Module C281b	
4 	
5	5 Measure the voltage between 4WD control module C281a, pin 1, circuit 931 (OG) and ground; and between 4WD control module C281a, pin 2, circuit 704

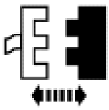
	(DG/LG) and ground.
	• **Are both voltage measurements greater than 10 volts?** → **Yes** GO to D2. → **No** REPAIR the power supply as necessary. TEST the system for normal operation.
D2 CHECK 4WD CONTROL MODULE GROUND CIRCUIT	
1 	
2 	2 Measure the resistance between 4WD control module C281a pin 7, circuit 57 (BK), harness side and ground; and between 4WD control module C281b pin 2, circuit 570 (BK/WH), harness side and ground.
	• **Are both resistances less than 5 ohms?** → **Yes** REFER to Section 418-00. → **No**

	REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST E: THE VEHICLE DOES NOT SHIFT BETWEEN 2WD AND 4WD MODES CORRECTLY

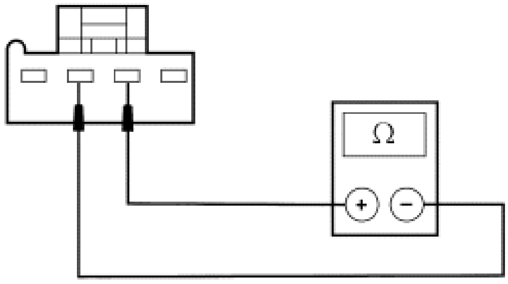
CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 REVIEW THE DIAGNOSTIC TROUBLE CODES (DTCS)	
	1 Using the recorded results from the 4WD control module self-test:
	• **Are any DTCs retrieved?** → **Yes** If DTC B1355 or DTC B1555 is retrieved, GO to E15 . If DTC P1812 or DTC P1815 is retrieved, GO to E2 . If DTC P1849, DTC P1853, DTC P1857, DTC P1861, DTC P1867 or DTC P1891 is retrieved, GO to E10 . → **No** GO to E2.
E2 CHECK THE MODE SELECT SWITCH (MSS) — MONITOR THE 4WD CONTROL MODULE PID 4WD_SW	
1 	
	2 Monitor the 4WD control module PID 4WD_SW while cycling the MSS through 2WD, 4WD HIGH and 4WD LOW.
	• **Do the 4WD control module PID values agree with the MSS positions?** → **Yes** GO to E4. → **No** GO to E3.
E3 CHECK THE MSS — ALL POSITIONS	
1	

2



MSS C284

3



A0018717

3 Measure the resistance between MSS C284 pin 2, component side and pin 3, component side. Refer to the following chart:

MSS Position	Resistance
2WD	3,705-4,095 Ohms
4WD HIGH	1,045-1,155 Ohms
4X4 LOW	342-378 Ohms

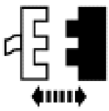
- **Are the resistances within the specified values?**

→ **Yes**
GO to E4.

→ **No**
INSTALL a new MSS. REFER to Mode Select Switch (MSS) in this section. CLEAR the DTCs. REPEAT the self-test.

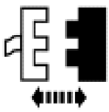
E4 CHECK CIRCUIT 435 (YE/BK) FOR A SHORT TO VOLTAGE

1

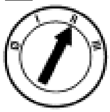
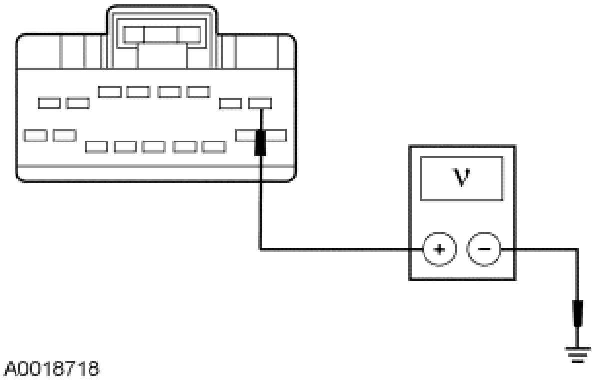
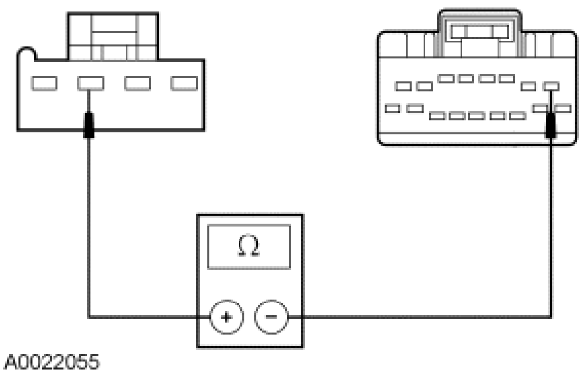


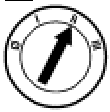
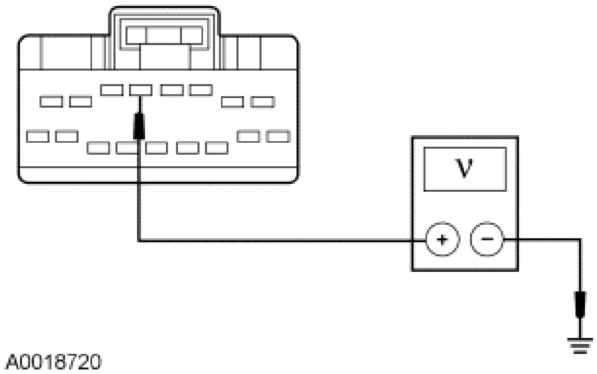
4WD Control Module C281a

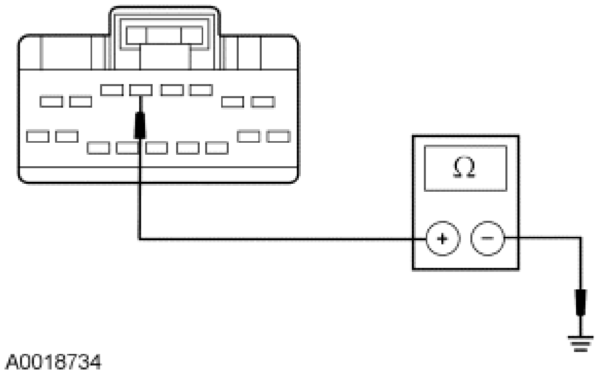
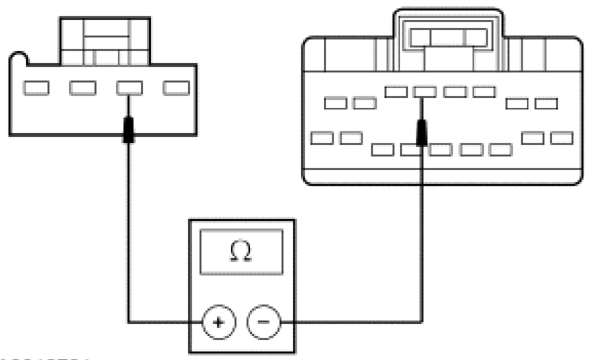
2

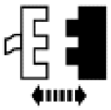


4WD Control Module C281b

3 	
4 	4 Measure the voltage between 4WD control module C281b pin 1, circuit 435 (YE/BK), harness side and ground.
	• **Is any voltage present?** → **Yes** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. → **No** GO to E5.
E5 CHECK CIRCUIT 435 (YE/BK) FOR AN OPEN	
1 	
2 	2 Measure the resistance between MSS C284 pin 3, circuit 435 (YE/BK), harness side and 4WD control module C281b, pin 1, circuit 435 (YE/BK), harness side.
	• **Is the resistance less than 5 ohms?**

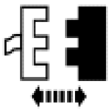
	→ **Yes** GO to E6. → **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.
E6 CHECK CIRCUIT 465 (WH/LB) FOR A SHORT TO VOLTAGE	
1 	
2  	2 Measure the voltage between 4WD control module C281a pin 5, circuit 465 (WH/LB), harness side and ground.
	• **Is any voltage present?** → **Yes** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. → **No** GO to E7.
E7 CHECK CIRCUIT 465 (WH/LB) FOR A SHORT TO GROUND	
1 	
2	2 Measure the resistance between 4WD control module C281a pin 5, circuit 465 (WH/LB), harness side and ground.

 	
	• **Is the resistance greater than 10,000 ohms?** → **Yes** GO to E8. → **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.
E8 CHECK CIRCUIT 465 (WH/LB) FOR AN OPEN	
1  	1 Measure the resistance between MSS C284 pin 2, circuit 465 (WH/LB), harness side and 4WD control module C281a pin 5, circuit 465 (WH/LB), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to E9. → **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.
E9 CHECK CIRCUIT 762 (YE/WH), CIRCUIT 763 (OG/WH), CIRCUIT 764 (BN/WH), CIRCUIT 770 (WH), AND CIRCUIT 771 (VT/YE) FOR A SHORT TO VOLTAGE	
1	



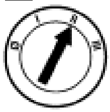
4WD Control Module C281a

2

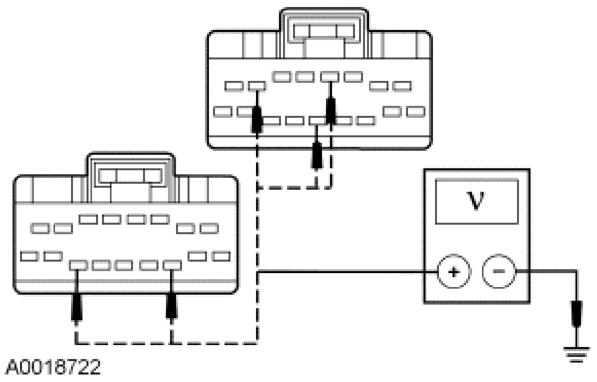


4WD Control Module C281b

3



4



4 Measure the voltage between the following circuits at the 4WD control module connector pins and ground.

Circuit	4WD Control Module Connector and Pins
762 (YE/WH)	C281b pin 4
763 (OG/WH)	C281b pin 13
764 (BN/WH)	C281b pin 7
770 (WH)	C281a pin 15
771 (VT/YE)	C281a pin 11

- **Is any voltage present?**

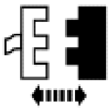
→ **Yes**
REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to E10.

E10 CHECK CIRCUIT 762 (YE/WH), CIRCUIT 763 (OG/WH), CIRCUIT 764 (BN/WH), CIRCUIT 770 (WH), AND CIRCUIT 771 (VT/YE) FOR A SHORT TO GROUND

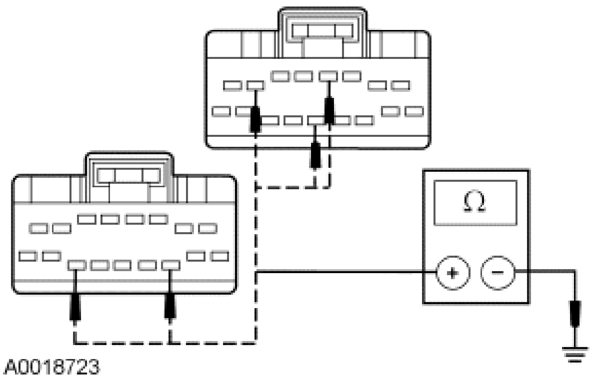
1

2



Gearmotor Encoder C350

3



3 Measure the resistance between the following circuits at the 4WD control module connector pins and ground.

Circuit	4WD Control Module Connector and Pins
762 (YE/WH)	C281b pin 4
763 (OG/WH)	C281b pin 13
764 (BN/WH)	C281b pin 7
770 (WH)	C281a pin 15
771 (VT/YE)	C281a pin 11

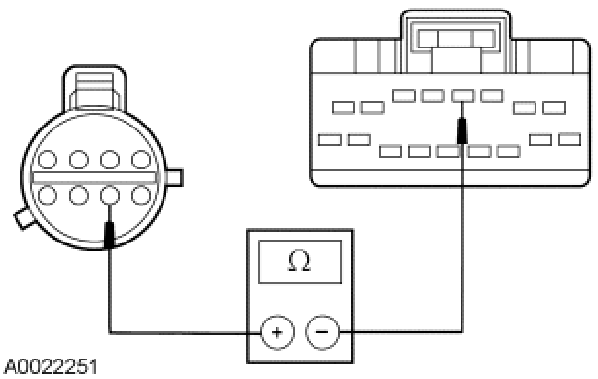
- **Are the resistances all over 10,000 ohms?**

→ **Yes**
GO to E11.

→ **No**
REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

E11 CHECK CIRCUIT 762 (YE/WH) FOR OPEN

1

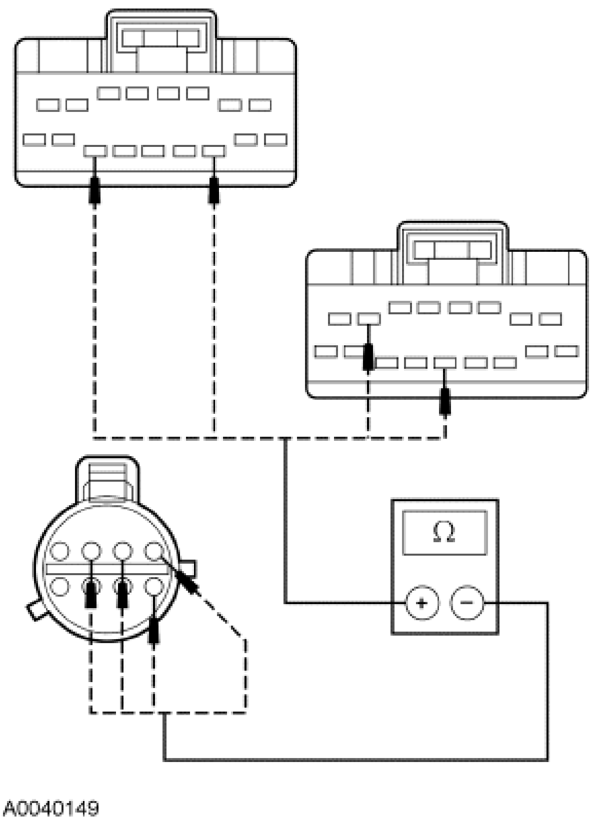


1 Measure the resistance between gearmotor encoder C350 pin 6, circuit 762 (YE/WH), harness side and 4WD control module C281b pin 4, circuit 762 (YE/WH), harness side.

	• **Is the resistance less than 5 ohms?** → **Yes** GO to E12. → **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

E12 CHECK CIRCUIT 763 (OG/WH), 764 (BN/WH), CIRCUIT 770 (WH), AND CIRCUIT 771 (VT/YE) FOR AN OPEN

1



1 Measure the resistance of the following circuits at the 4WD control module connector pins and gearmotor encoder connector pins shown.

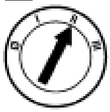
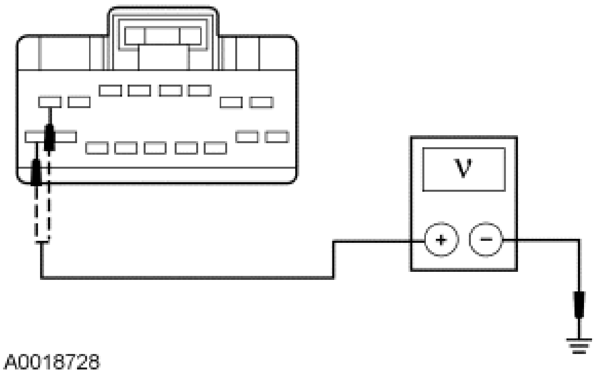
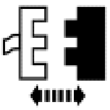
Circuit	4WD Control Module Connector and Pins	Gearmotor Encoder Connector and Pins
763 (OG/WH)	C281b pin 13	C350 pin 3
764 (BN/WH)	C281b pin 7	C350 pin 2
770 (WH)	C281a pin 15	C350 pin 1
771 (VT/YE)	C281a pin 11	C350 pin 5

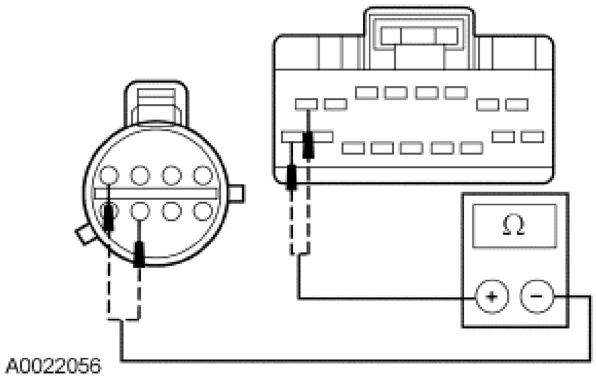
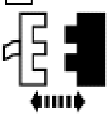
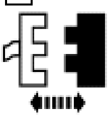
• **Are all the resistances less than 5 ohms?**

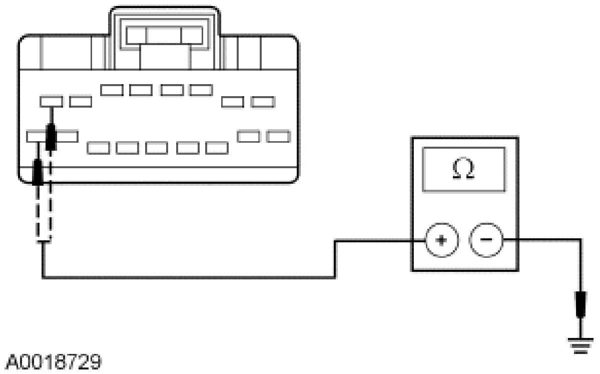
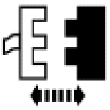
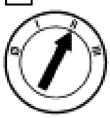
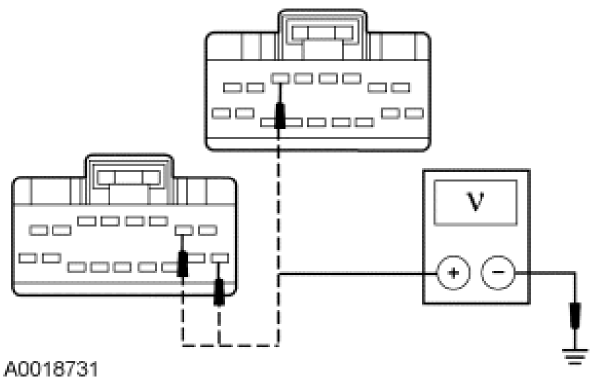
→ **Yes**
GO to E13.

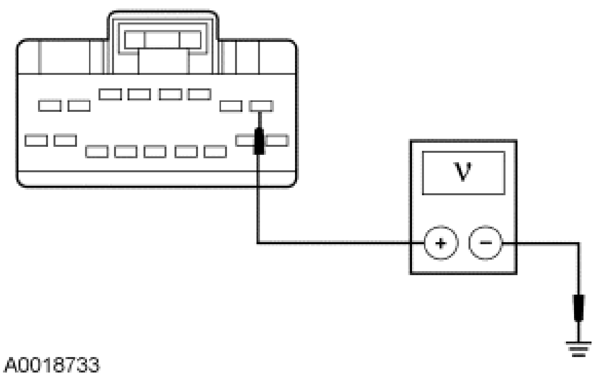
→ **No**
REPAIR the circuit or circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

E13 CHECK CIRCUIT 777 (YE) AND CIRCUIT 778 (OG) FOR A SHORT TO VOLTAGE

1 	
2  A0018728	2 Measure the voltage between 4WD control module C281a pin 17, circuit 777 (YE), harness side and ground; and between 4WD control module C281a pin 8, circuit 778 (OG), harness side and ground.
	• **Is any voltage present?** → **Yes** REPAIR the circuit(s). CLEAR the DTCs. REPEAT the self-test. → **No** GO to E14.
E14 CHECK CIRCUIT 777 (YE) AND CIRCUIT 778 (OG) FOR AN OPEN	
1 	
2  Gearmotor Encoder C350	
3	3 Measure the resistance between 4WD control module C281a pin 17, circuit 777 (YE), harness side and gearmotor encoder C350, pin 4, circuit 777 (YE), harness side; and measure the resistance between 4WD control module C281a pin 8, circuit 778 (OG), harness side and gearmotor encoder C350 pin 7, circuit 778 (OG), harness side.

	
	• **Are the resistances less than 5 ohms?** → **Yes** GO to E15. → **No** REPAIR the suspect circuit. CLEAR the DTCs. REPEAT the self-test.
E15 CHECK CIRCUIT 777 (YE) AND CIRCUIT 778 (OG) FOR A SHORT TO GROUND	
1 	
2  Gearmotor Encoder C350	
3  4WD Control Module C281a	
4	4 Measure the resistance between 4WD control module C281a pin 17, circuit 777 (YE), harness side and ground and between 4WD control module C281a pin 8, circuit 778 (OG), harness side and ground.

	
	• **Are the resistances more than 10,000 ohms?** → **Yes** GO to E16. → **No** REPAIR the suspect circuit. CLEAR the DTCs. REPEAT the self-test.
E16 CHECK CIRCUIT 640 (RD/YE), CIRCUIT 1003 (GY/YE) AND CIRCUIT 704 (DG/LG) FOR VOLTAGE	
1  4WD Control Module C281b	
2 	
3 	3 Measure the voltage between 4WD control module C281b pin 6, circuit 783 (GY), harness side and ground; and between 4WD control module C281a pin 9, circuit 1003 (GY/YE), harness side and ground; and between 4WD control module C281a pin 2, circuit 704 (DG/LG), harness side and ground.

	• **Are the voltages all over 10 volts?** → **Yes** GO to E17. → **No** REPAIR the supply circuit. CLEAR the DTCs. REPEAT the self-test.
E17 CHECK CIRCUIT 931 (OG) FOR VOLTAGE	
1  	1 Measure the voltage between 4WD control module C281a pin 1, circuit 931 (OG), harness side and ground.
	• **Is the voltage between 9 and 16 volts?** → **Yes** GO to E18. → **No** TEST the charging system. REFER to Section 414-00.
E18 CHECK FOR CORRECT 4WD CONTROL MODULE OPERATION	
	1 Disconnect all 4WD control module connectors (C281a, C281b) and the gearmotor encoder connector (C350).
	2 Check for: • corrosion • pushed-out pins
	3 Connect all 4WD control module connectors and the gearmotor encoder connector making sure they seat correctly.
	4 Operate the system and verify the concern is still present.

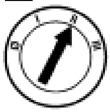
- **Is the concern still present?**

→ **Yes**
GO to E19.

→ **No**
The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

E19 CHECK THE CONTACT PLATE ENCODER SWITCH

1



2 Monitor mode select switch (MSS) PIDs 2WD and 4WD HIGH.

3 Monitor contact plate PIDs PLATE_A, PLATE_B, PLATE_C and PLATE_D.

4 Cycle the MSS to 2WD and 4WD HIGH two times.

5 **NOTE:** Contact plate PIDs can only be read for approximately two seconds. To continue reading PIDs, cycle the MSS again.

Compare the contact plate PID values for each shift position selected by the MSS.

Plate PID	MSS PID 2WD	MSS PID 4 HIGH
PLATE_A	CLOSED	OPEN
PLATE_B	OPEN	CLOSED
PLATE_C	CLOSED	CLOSED
PLATE_D	CLOSED	OPEN

- **Do the contact plate PID values agree with the MSS switch PIDs?**

→ **Yes**
GO to E20.

→ **No**
INSTALL a new gearmotor encoder assembly. REFER to Gearmotor Encoder Assembly in this section.

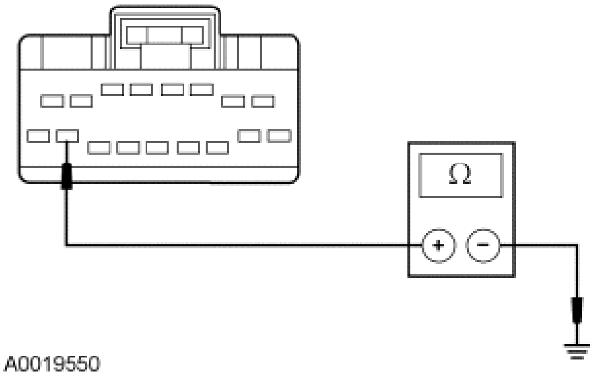
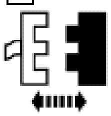
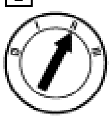
	CLEAR the DTCs. REPEAT the self-test. If still inoperative, INSTALL a new 4WD control module. REFER to Four-Wheel Drive (4WD) Control Module in this section.
E20 CHECK THE TRANSFER CASE	
1 	
	2 Release the parking brake.
	3 Using a wrench, manually shift the transfer case sector shaft to the full clockwise (2WD) direction while turning the rear driveshaft.
	4 Engage the parking brake.
	5 Rotate the front driveshaft.
	• **Does the front driveshaft turn?** → **Yes** GO to E21. → **No** REPAIR the transfer case. REFER to Section 308-07B. TEST the system for normal operation.
E21 CHECK THE SECTOR SHAFT TURNING EFFORT	
NOTE: The transfer case has three detented shift positions. The full clockwise position is 2WD, the next position is 4WD HIGH, and the full counterclockwise position is 4WD LOW. Normal operation should not take more than 45 Nm (33 lb-ft) to manually shift the transfer case.	
	1 Release the parking brake.
	2 Using a torque wrench, manually shift the transfer case sector shaft in a counterclockwise direction to the 4WD HIGH detent position while rotating the rear driveshaft.
	• **Did the torque required to shift exceed 45 Nm (33 lb-ft)?** → **Yes** REPAIR the transfer case as necessary. REFER to Section 308-07B. TEST the system for normal operation.

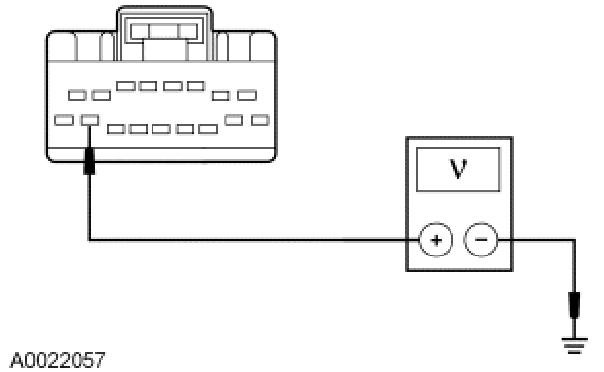
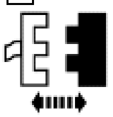
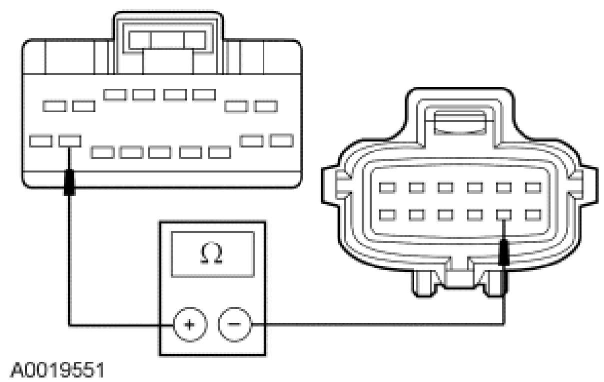
	→ **No** GO to E22.
E22 CHECK THE TRANSFER CASE SHIFT TO 4WD HIGH AND 4WD LOW	
	1 Apply the parking brake.
	2 Rotate the front driveshaft.
	• **Does the front driveshaft rotate?** → **Yes** REPAIR the transfer case as necessary. REFER to Section 308-07B. → **No** INSTALL a new gearmotor encoder assembly. REFER to Gearmotor Encoder Assembly in this section. CLEAR the DTCs. REPEAT the self-test. If still inoperative, INSTALL a new 4WD control module. REFER to Four-Wheel Drive (4WD) Control Module in this section.

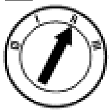
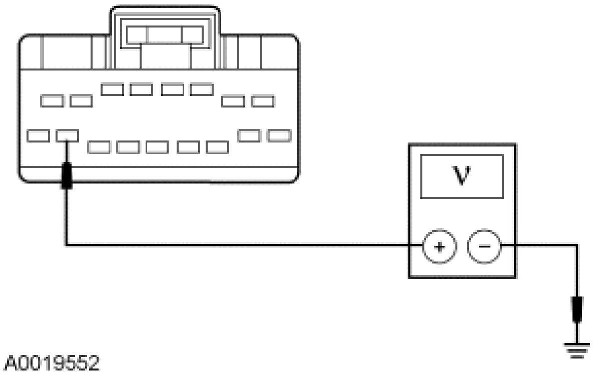
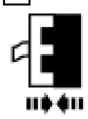
PINPOINT TEST F: THE VEHICLE DOES NOT SHIFT BETWEEN 4WD HIGH AND 4WD LOW MODES CORRECTLY

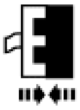
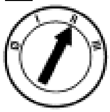
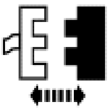
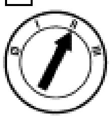
CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 REVIEW THE FOUR-WHEEL DRIVE (4WD) CONTROL MODULE DIAGNOSTIC TROUBLE CODES (DTCs)	
	1 Using the recorded results from the 4WD control module self-test:
	• **Are any DTCs retrieved?** → **Yes** If DTC P1816 is retrieved, GO to F3 . If DTC P1819 is retrieved, GO to F4 . If DTC B1483 or DTC B1485 is retrieved, GO to F8 . If DTC P0500 is retrieved, GO to F13 . If DTC C1729 is retrieved, GO to F24. → **No**

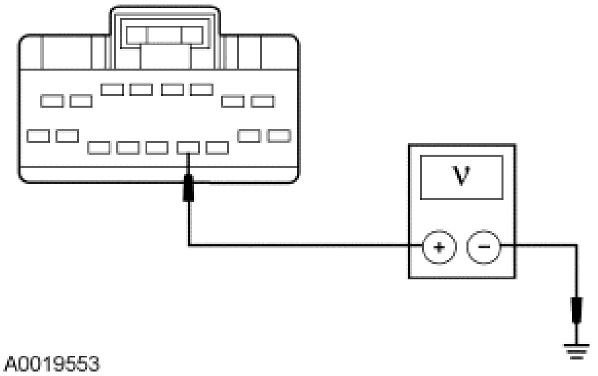
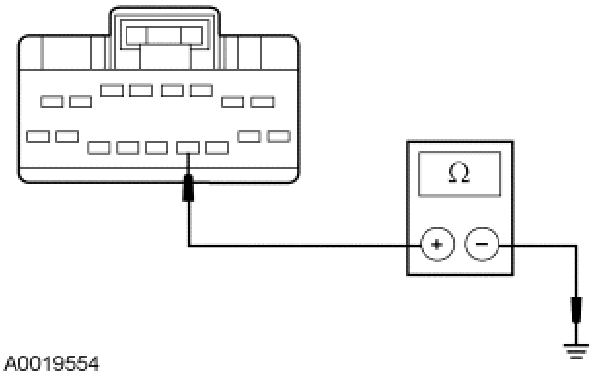
	GO to F2.
F2 VERIFY THE FUNCTION TEST HAS BEEN CARRIED OUT	
	1 Check the previous diagnostic procedure.
	• **Was the electronic shift function test carried out?** → **Yes** GO to F3. → **No** CARRY OUT the electronic shift function test. REFER to Functional Test — Electronic Shift (Pinpoint Test C) in this section.
F3 CHECK THE DIGITAL TRANSMISSION RANGE SENSOR PID NTRL_SW	
	1 Monitor 4WD control module PID NTRL_SW.
	2 Place the gear lever in NEUTRAL.
	3 Verify 4WD control module PID reads NTRL.
	4 Shift the gear lever through all positions while monitoring 4WD control module PID NTRL_SW.
	• **Does the 4WD control module PID NTRL_SW read NTRL only for the neutral position?** → **Yes** GO to F8. → **No** GO to F4.
F4 CHECK CIRCUIT 463 (RD/WH) FOR A SHORT TO GROUND	
	1 Place the gear lever in any position except NEUTRAL.
2	2 Measure the resistance between 4WD control module C281a pin 16, circuit 463 (RD/WH), harness side and ground.

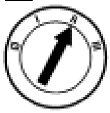
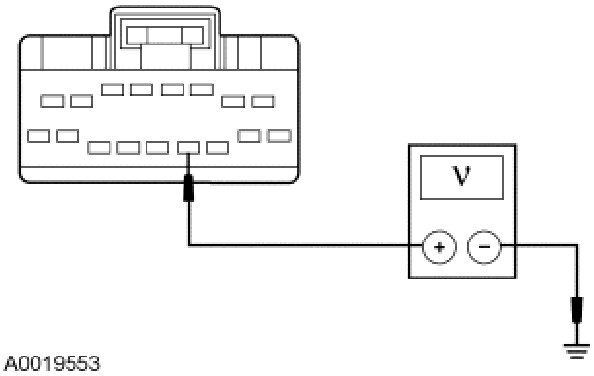
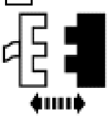
	
	• **Is the resistance more than 10,000 ohms?** → **Yes** GO to F5. → **No** REPAIR the circuit. SHIFT the gear lever between NEUTRAL and PARK twice. CLEAR the DTCs. REPEAT the self-test.
F5 CHECK CIRCUIT 463 (RD/WH) FOR A SHORT TO VOLTAGE	
1 	
2  4WD Control Module C281a	
3 	
4	4 Measure the voltage between 4WD control module C281a pin 16, circuit 463 (RD/WH), harness side and ground.

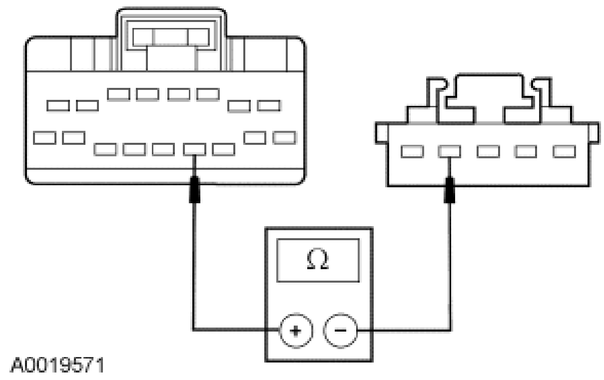
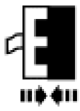
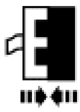
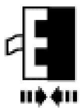
	
	• **Is any voltage present?** → **Yes** GO to F7. → **No** GO to F6.
F6 CHECK TRANSMISSION RANGE (TR) SENSOR CIRCUIT 463 (RD/WH) FOR AN OPEN	
1 	
2  TR Sensor C167	
3 	3 Measure the resistance between 4WD control module C281a pin 16, circuit 463 (RD/WH), harness side and TR sensor C167 pin 8, circuit 463 (RD/WH), harness side.
	• **Is the resistance less than 5 ohms?**

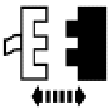
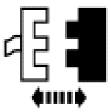
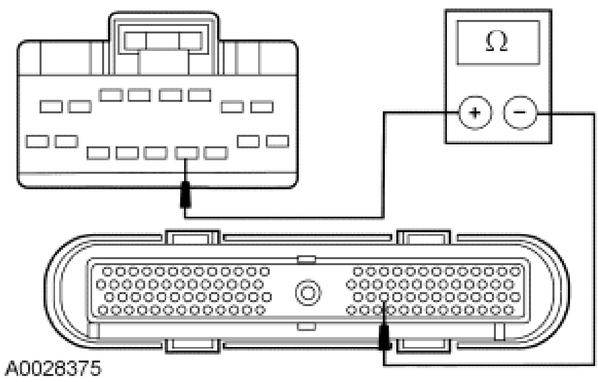
	→ **Yes** GO to F8. → **No** REPAIR the circuit. SHIFT the gear lever between NEUTRAL and PARK twice. CLEAR the DTCs. REPEAT the self-test.
F7 CHECK CIRCUIT 463 (RD/WH) FOR A SHORT TO VOLTAGE	
1 	
2 	2 Measure the voltage between 4WD control module C281a pin 16, circuit 463 (RD/WH), harness side and ground.
	• **Is there voltage present?** → **Yes** REPAIR the circuit. SHIFT the gear lever between NEUTRAL and PARK twice. CLEAR the DTCs. REPEAT the self-test. → **No** INSTALL a new TR sensor. REFER toSection 307-01. SHIFT the gear lever between NEUTRAL and PARK twice. CLEAR the DTCs. REPEAT the self-test.
F8 CHECK BRAKE PEDAL POSITION (BPP) SWITCH 4WD CONTROL MODULE PID	
1 	
2 	

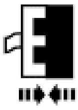
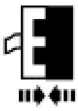
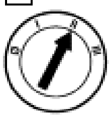
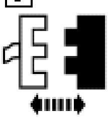
4WD Control Module C281a	
3  4WD Control Module C281b	
4 	
	5 Apply the parking brake.
	6 Press the brake pedal.
	7 Monitor 4WD control module PID BOO.
	• **Does the PID value reflect the vehicle condition?** → **Yes** GO to F13. → **No** GO to F9.
F9 CHECK CIRCUIT 810 (RD/LG) FOR A SHORT TO VOLTAGE	
1 	
2  4WD Control Module C281a	
3 	
4	4 Measure the voltage between 4WD control module C281a pin 12, circuit 810 (RD/LG), harness side and ground.

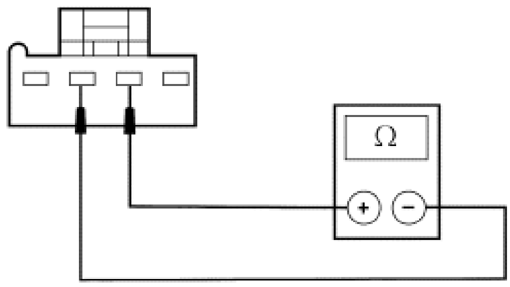
 A0019553	
	• **Is there any voltage present?** → **Yes** REPAIR the circuit. PRESS the brake pedal twice. CLEAR the DTCs. REPEAT the self-test. → **No** GO to F10.
F10 CHECK CIRCUIT 810 (RD/LG) FOR A SHORT TO GROUND	
1 	
2  A0019554	2 Measure the resistance between 4WD control module C281a pin 12, circuit 810 (RD/LG), harness side and ground.
	• **Is the resistance more than 10,000 ohms?** → **Yes** GO to F11. → **No** REPAIR the circuit. PRESS the brake pedal twice.

	CLEAR the DTCs. REPEAT the self-test.
F11 CHECK CIRCUIT 810 (RD/LG) FOR VOLTAGE	
1 	
	2 Press and hold the brake pedal.
3  A0019553	3 Measure the voltage between 4WD control module C281a pin 12, circuit 810 (RD/LG), harness side and ground.
	• **Is the voltage at least 10 volts?** → **Yes** GO to F12. → **No** REPAIR the circuit. PRESS the brake pedal twice. CLEAR the DTCs. REPEAT the self-test.
F12 CHECK CIRCUIT 810 (RD/LG) FOR AN OPEN	
1 	
2  BPP C278	
3	3 Measure the resistance between 4WD control module C281a pin 12, circuit 810 (RD/LG), harness side and BPP switch C278 pin 4, circuit 810 (RD/LG), harness side.

	
	• **Is the resistance less than 5 ohms?** → **Yes** GO to F13. → **No** REPAIR the circuit. PRESS the brake pedal twice. CLEAR the DTCs. REPEAT the self-test.
F13 CHECK THE SPEEDOMETER	
1 	
2  4WD Control Module C281a	
3  BPP C278	
4  TR Sensor C167	
	5 Monitor the speedometer.
	6 Monitor 4WD control module PID VSS2 while

	driving the vehicle 0 to 88.5 km/h (55 mph) at a steady rate.
	Does the 4WD control module PID VSS2 agree with the speedometer? → **Yes** GO to F15. → **No** GO to F14.
F14 CHECK POWERTRAIN CONTROL MODULE (PCM) CIRCUIT 679 (GY/BK) FOR AN OPEN	
1 	
2  4WD Control Module C281b	
3  PCM C175	
4 	4 Measure the resistance between 4WD control module 281b pin 12, circuit 679 (GY/BK), harness side and PCM C175, pin 68, circuit 679 (GY/BK), harness side.
	Is the resistance less than 5 ohms? → **Yes**

	GO to F15. → **No** REPAIR the circuit. DRIVE the vehicle to a speed of 40 mph (64 km/h). CLEAR the DTCs. REPEAT the self-test.
F15 CHECK THE MODE SELECT SWITCH (MSS) — MONITOR THE 4WD CONTROL MODULE PID 4WD_SW	
1 	
2  4WD Control Module C281b	
3  PCM C175	
4 	
	5 Monitor the 4WD control module PID 4WD_SW while cycling the MSS through 2WD, 4WD HIGH and 4WD LOW.
	• **Do the 4WD control module PID values agree with the MSS positions?** → **Yes** GO to F17. → **No** GO to F16.
F16 CHECK THE MSS — ALL POSITIONS	
1 	

<table>
<tr><td>MSS C284</td><td></td></tr>
<tr><td>2

A0018717</td><td>2 Measure the resistance between MSS C284, pin 2, component side and pin 3, component side. Refer to the following chart:
<table><tr><th>MSS Position</th><th>Resistance</th></tr><tr><td>2WD</td><td>3,705-4,095 Ohms</td></tr><tr><td>4WD HIGH</td><td>1,045-1,155 Ohms</td></tr><tr><td>4WD LOW</td><td>342-378 Ohms</td></tr></table></td></tr>
<tr><td></td><td>Are the resistances within the specified values?
→ Yes
GO to F17.

→ No
INSTALL a new MSS. REFER to Mode Select Switch (MSS) in this section. CLEAR the DTCs. REPEAT the self-test.</td></tr>
<tr><td colspan="2">F17 CHECK FOR CORRECT 4WD CONTROL MODULE OPERATION</td></tr>
<tr><td>1
</td><td></td></tr>
<tr><td></td><td>2 Disconnect all 4WD control module connectors (C281a, C281b) and the gearmotor encoder connector (C350).</td></tr>
<tr><td></td><td>3 Check for:
corrosion
pushed-out pins</td></tr>
<tr><td></td><td>4 Connect all 4WD control module connectors and the gearmotor encoder connector making sure they seat correctly.</td></tr>
<tr><td></td><td>5 Operate the system and verify the concern is still present.</td></tr>
</table>

- **Is the concern still present?**

→ **Yes**
GO to F18.

→ **No**
The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

F18 CHECK THE CONTACT PLATE ENCODER SWITCH

1 Monitor mode select switch (MSS) PIDs 2WD and 4WD LOW.

2 Monitor contact plate PIDs PLATE_A, PLATE_B, PLATE_C and PLATE_D.

3 **NOTE:** The contact plate PIDs can only be read for approximately two seconds. to continue reading, cycle the MSS again.

Cycle the MSS to 2WD and 4X4 LOW two times.

4 Compare the contact plate PID values for each shift position selected by the MSS.

Plate PID	MSS PID 2WD	MSS PID 4LOW
PLATE_A	CLOSED	OPEN
PLATE_B	OPEN	CLOSED
PLATE_C	CLOSED	OPEN
PLATE_D	CLOSED	CLOSED

- **Do the contact plate PID values agree with the MSS PIDs?**

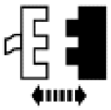
→ **Yes**
GO to F25.

→ **No**
GO to F19.

F19 CHECK CIRCUIT 762 (YE/WH), CIRCUIT 763 (OG/WH), CIRCUIT 764 (BN/WH), CIRCUIT 770 (WH), AND CIRCUIT 771 (VT/YE) FOR A SHORT TO VOLTAGE

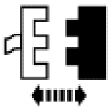
1

2



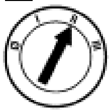
4WD Control Module C281a

3

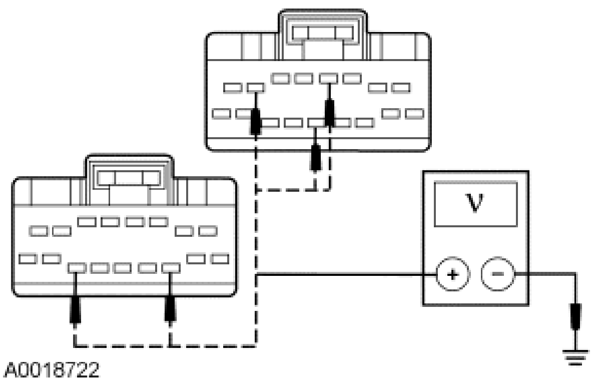


4WD Control Module C281b

4



5



5 Measure the voltage between the following circuits at the 4WD control module connector pins and ground.

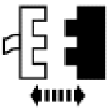
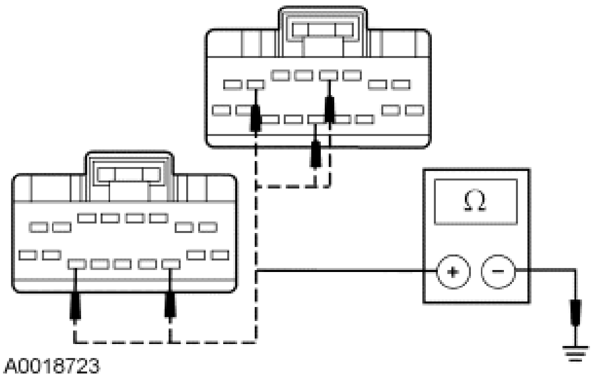
Circuit	4WD Control Module Connector and Pins
762 (YE/WH)	C281b pin 4
763 (OG/WH)	C281b pin 13
764 (BN/WH)	C281b pin 7
770 (WH)	C281a pin 15
771 (VT/YE)	C281a pin 11

- **Is any voltage present?**

→ **Yes**
REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to F20.

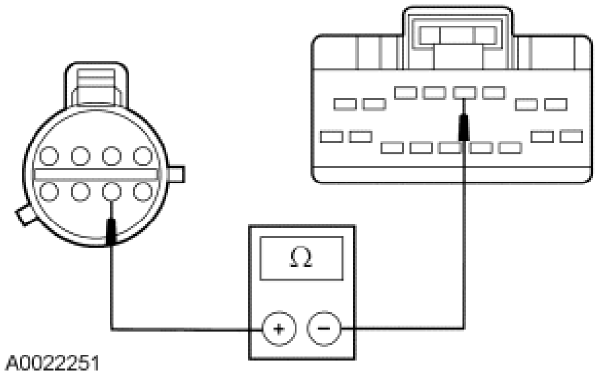
F20 CHECK CIRCUIT 762 (YE/WH), CIRCUIT 763 (OG/WH), CIRCUIT 764 (BN/WH), CIRCUIT 770 (WH), AND CIRCUIT 771 (VT/YE) FOR A SHORT TO GROUND

<table>
<tr><td>1
</td><td></td></tr>
<tr><td>2

Gearmotor Encoder C350</td><td></td></tr>
<tr><td>3

</td><td>3 Measure the resistance between the following circuits at the 4WD control module connector pins and ground.
<table>
<tr><th>Circuit</th><th>4WD Control Module Connector and Pins</th></tr>
<tr><td>762 (YE/WH)</td><td>C281b pin 4</td></tr>
<tr><td>763 (OG/WH)</td><td>C281b pin 13</td></tr>
<tr><td>764 (BN/WH)</td><td>C281b pin 7</td></tr>
<tr><td>770 (WH)</td><td>C281a pin 15</td></tr>
<tr><td>771 (VT/YE)</td><td>C281a pin 11</td></tr>
</table></td></tr>
<tr><td></td><td>

- **Are the resistances all over 10,000 ohms?**

→ **Yes**
GO to F21.

→ **No**
REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.</td></tr>
<tr><td colspan="2">F21 CHECK CIRCUIT 762 (YE/WH) FOR AN OPEN</td></tr>
<tr><td>1</td><td>1 Measure the resistance between gearmotor encoder C350 pin 6, circuit 762 (YE/WH), harness side and 4WD control module C281b pin 4, circuit 762 (YE/WH), harness side.</td></tr>
</table>



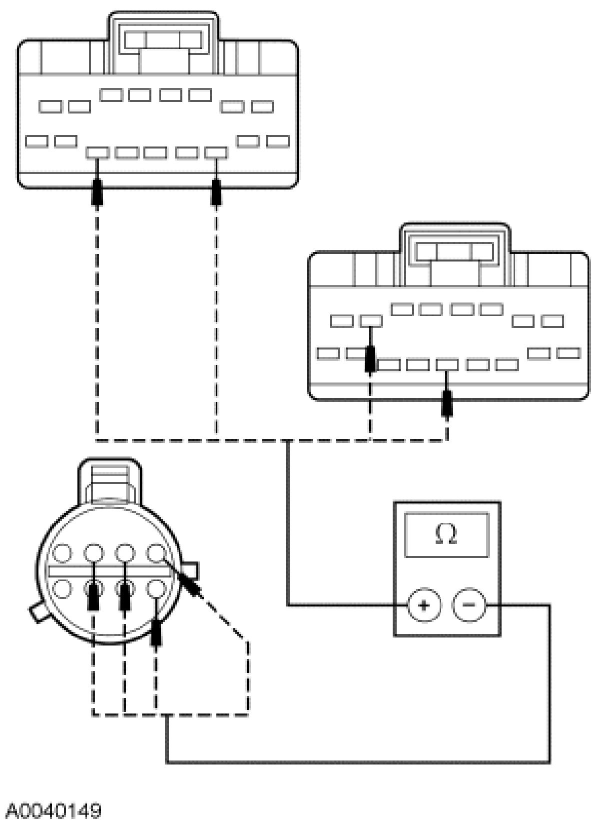
- **Is the resistance less than 5 ohms?**

→ **Yes**
GO to F22.

→ **No**
REPAIR the suspect circuit. CLEAR the DTCs. REPEAT the self-test.

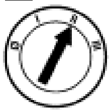
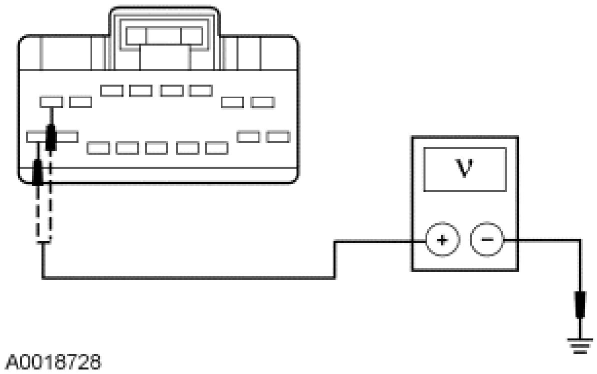
F22 CHECK CIRCUIT 763 (OG/WH), 764 (BN/WH), CIRCUIT 770 (WH), AND CIRCUIT 771 (VT/YE) FOR AN OPEN

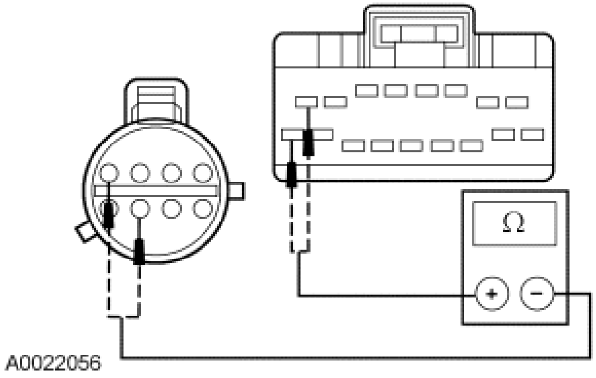
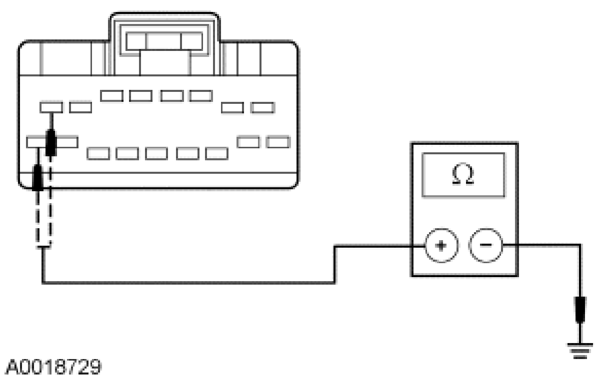
1

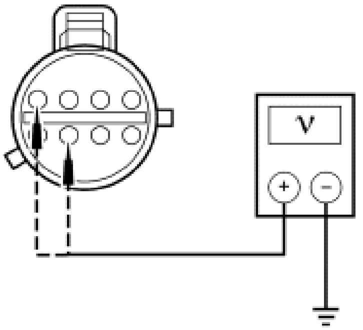


1 Measure the resistance of the following circuits at the 4WD control module connector pins and gearmotor encoder connector pins shown.

Circuit	4WD Control Module Connector and Pins	Gearmotor Encoder Connector and Pins
763 (OG/WH)	C281b pin 13	C350 pin 3
764 (BN/WH)	C281b pin 7	C350 pin 2
770 (WH)	C281a pin 15	C350 pin 1
771 (VT/YE)	C281a pin 11	C350 pin 5

	• **Are all the resistances less than 5 ohms?** → **Yes** GO to F23. → **No** REPAIR the circuit or circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.
F23 CHECK CIRCUIT 777 (YE) AND CIRCUIT 778 (OG) FOR A SHORT TO VOLTAGE	
1 	
2 	2 Measure the voltage between 4WD control module C281a pin 17, circuit 777 (YE), harness side and ground; and between 4WD control module C281a pin 8, circuit 778 (OG), harness side and ground.
	• **Is any voltage present?** → **Yes** REPAIR the circuit(s). CLEAR the DTCs. REPEAT the self-test. → **No** GO to F24.
F24 CHECK CIRCUIT 777 (YE) AND CIRCUIT 778 (OG) FOR AN OPEN	
1	1 Measure the resistance between 4WD control module C281a pin 17, circuit 777 (YE), harness side and gearmotor encoder C350 pin 4, circuit 777 (YE), harness side; and between 4WD control module C281a pin 8, circuit 778 (OG), harness side and gearmotor encoder C350 pin 7, circuit 778 (OG), harness side.

	
	• **Are the resistances less than 5 ohms?** → **Yes** GO to F25. → **No** REPAIR the suspect circuit. CLEAR the DTCs. REPEAT the self-test.
F25 CHECK CIRCUIT 777 (YE) AND CIRCUIT 778 (OG) FOR A SHORT TO GROUND	
1 	1 Measure the resistance between 4WD control module C281a pin 17, circuit 777 (YE), harness side and ground and between 4WD control module C281a pin 8, circuit 778 (OG), harness side and ground.
	• **Are the resistances more than 10,000 ohms?** → **Yes** GO to F26. → **No** REPAIR the suspect circuit. CLEAR the DTCs. REPEAT the self-test.
F26 CHECK CIRCUITS 777 (YE) AND 778 (RD) FOR POWER DURING ACTIVE COMMANDS (CONTINUED)	

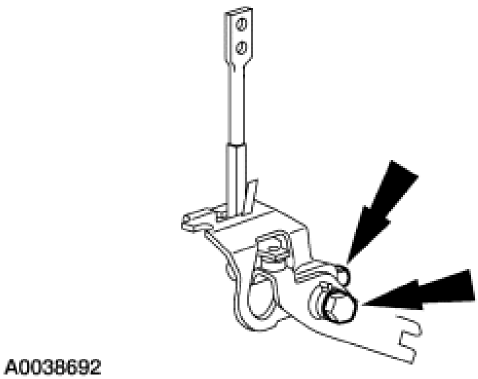
1  A0094097	1 Enter the clockwise transfer case shift motor relay active command ON and OFF and measure the voltage between transfer case C350-4, circuit 777 (YE) harness side and ground. Enter the counterclockwise transfer case shift motor relay active command ON and OFF and measure the voltage between transfer case C350-7, circuit 778 (OG) harness side and ground.
	• **Are the voltages 9 volts or greater on the circuit being commanded?** → **Yes** INSTALL a new transfer case shift motor. CLEAR the DTC(s). REPEAT the self-test, then GO to Pinpoint Test C. → **No** GO to F27.
F27 CHECK THE TRANSFER CASE	
1 	
	2 Release the parking brake.
	3 Using a wrench, manually shift the transfer case sector shaft to the full clockwise (2WD) direction while turning the rear driveshaft.
	4 Engage the parking brake.
	5 Rotate the front driveshaft.
	• **Does the front driveshaft turn?** → **Yes** GO to F28. → **No** REPAIR the transfer case as necessary. REFER to Section 308-07B. TEST the system for normal

	operation.
F28 CHECK THE SECTOR SHAFT TURNING EFFORT	
NOTE: The transfer case has three detented shift positions. The full clockwise position is 2WD, the next position is 4WD HIGH, and the full counterclockwise position is 4WD LOW. Normal operation should not take more than 45 Nm (33 lb-ft) to manually shift the transfer case.	
	1 Release the parking brake.
	2 Using a torque wrench, manually shift the transfer case sector shaft in a counterclockwise direction to the 4WD HIGH detent position while rotating the rear driveshaft.
	• **Did the torque required to shift exceed 45 Nm (33 lb-ft)?** → **Yes** REPAIR the transfer case as necessary. REFER to Section 308-07B. TEST the system for normal operation. → **No** GO to F29.
F29 CHECK THE TRANSFER CASE SHIFT TO 4WD HIGH AND 4WD LOW	
	1 Apply the parking brake.
	2 Rotate the front driveshaft.
	• **Does the front driveshaft rotate?** → **Yes** REPAIR the transfer case as necessary. REFER to Section 308-07B. → **No** INSTALL a new gearmotor encoder assembly. REFER to Gearmotor Encoder Assembly in this section. CLEAR the DTCs. REPEAT the self-test. If still inoperative, INSTALL a new 4WD control module. REFER to Four-Wheel Drive (4WD) Control Module in this section. CLEAR the DTCs. REPEAT the self-test.

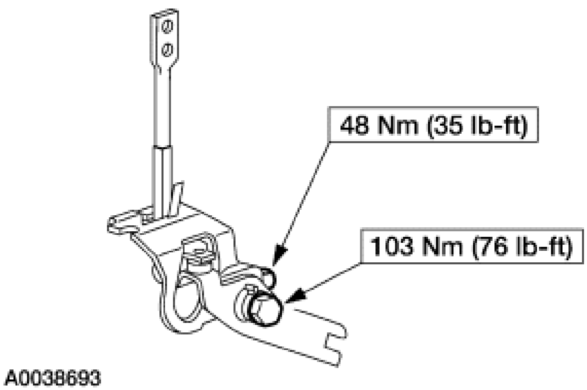
Gearshift Linkage Adjustment

NOTE: If partial or incomplete engagement of the transfer case shift lever detent occurs, or should the transfer case control assembly require removal, refer to the following procedure:

1. Raise the shift boot to expose the top surface of the cam plate.
2. Loosen the bolts approximately one full turn.

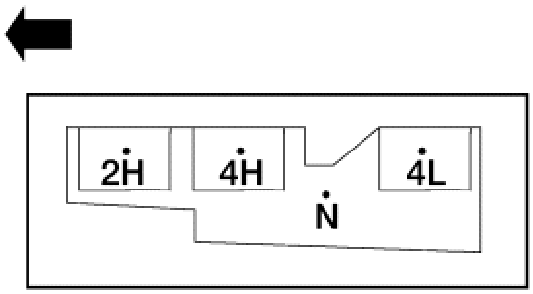


3. Position the transfer case shift lever to the 4WD LOW position.
4. Rotate the cam plate clockwise until the bottom of the chamfered corner of the neutral lug contacts the shift lever.
5. Hold the cam plate in position and tighten the bolts.



6. **NOTE:** There should be clearance between the shift lever and cam plate in the 2WD front, 4WD HIGH rear, and 4WD LOW shift positions.

   Move the transfer case shift lever to all shift positions to check for positive engagement.



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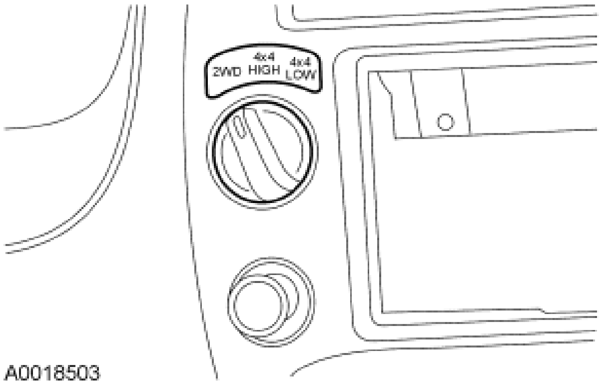
7. Lower the shift boot assembly onto the cam plate.

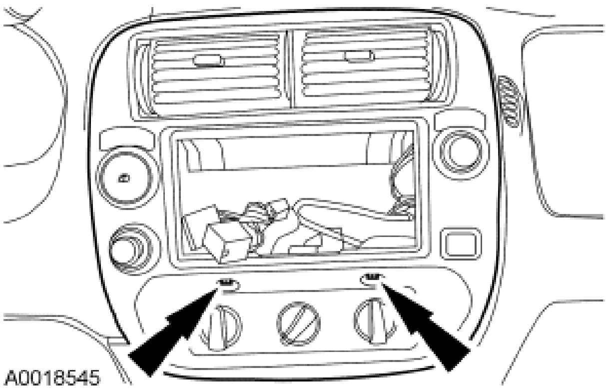
Mode Select Switch (MSS)

Removal and Installation

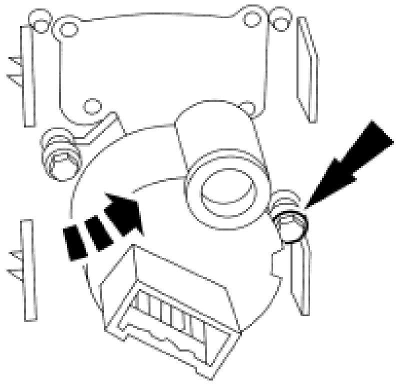
1. Remove the mode select switch (MSS) knob.



2. Remove the audio unit. For additional information, refer to Section 415-01.
3. Remove the screws and pull the instrument panel center finish panel out of the instrument panel.



4. Disconnect the harness connector, remove the two screws and the MSS.



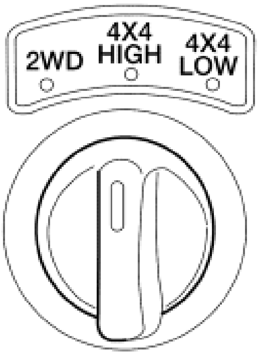
A0018546

5. To install, reverse the removal procedure.

Gearmotor Encoder Assembly

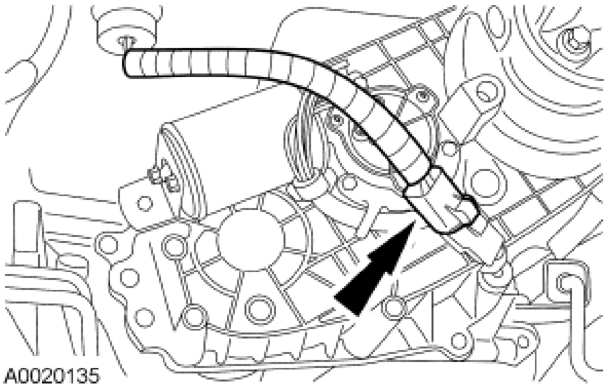
Removal and Installation

1. Set the mode select switch to the 4X4 HIGH position.



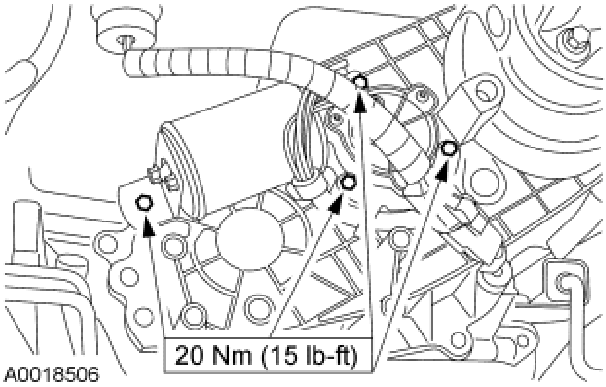
A0013189

2. Raise and support the vehicle. For additional information, refer to Section 100-02.
3. Disconnect the gearmotor encoder assembly harness connector.



A0020135

4. Remove the bracket bolt and the gearmotor encoder assembly mounting bolts and remove the gearmotor encoder assembly.



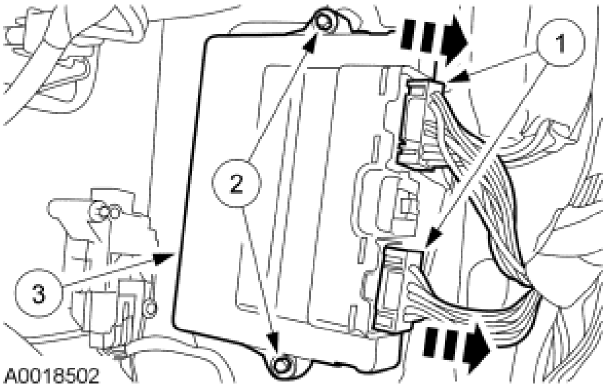
5. Remove the grease from the motor adapter and check for any nicks or burrs. If any damage is found, repair or install a new gearmotor encoder assembly as necessary. For additional information, refer to Section 308-07B.

6. To install, reverse the removal procedure.
    - Apply a coat of multi-purpose grease to the gearmotor encoder assembly.

Four-Wheel Drive (4WD) Control Module

Removal and Installation

1. Remove the passenger cowl side trim panel.
2. Remove the 4WD control module.
    1. Disengage the locking tangs and remove the harness connectors.
    2. Remove the screws.
    3. Remove the 4WD control module.



3. To install, reverse the removal procedure.

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GROUP 18: Electrical Distribution

SECTION 418-00:
Module Communications Network

General Specifications

Item	Specification
Heat shrink tube overlap mm (inch)	12.7 (0.5)
Wire insulation removal length (twist side) mm (inch)	37.2 (1.5)
Wire insulation removal length (receiving side) mm (inch)	19.5 (0.75)
Raychem SCT® Heat Shrink Tubing, Motorcraft part number WT-5627	ESB-M99D56-A2

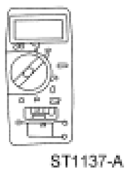
Communications Network

The module communications network consists of the following items:

- restraints control module (RCM)
- generic electronic module (GEM)
- 4-wheel drive (4WD) control module
- 4-wheel anti-lock brake (4WABS) control module
- powertrain control module (PCM)
- central security module
- standard corporate protocol (SCP) communications network
- international standard organization (ISO) communications network

Communications Network

Refer to Wiring Diagrams Cell 14 for schematic and connector information.

Special Tool(s)	
	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

The vehicle has two module communication networks: the standard corporate protocol (SCP), which is an unshielded twisted pair cable (data bus plus, Circuit 914 [TN/OG]) and data bus minus, (Circuit 915 [PK/LB]) and the international standards organization (ISO) 9141 communications network, which is a single wire network (Circuit 70 [LB/WH]). The diagnostic tool can connect to both networks through the data link connector (DLC). This makes diagnosis and testing of these systems easier by allowing one smart tester to be able to diagnose and control any module on the two networks from one connector. The DLC can be found under the instrument panel between the steering column and the radio.

The SCP communications network will remain operational even with the severing of one of the bus wires. Communications will also continue if one of the bus wires is shorted to ground or voltage, or if some but not all termination resistors are lost.

The ISO 9141 communications network does not permit intermodule communication. When the diagnostic tool communicates to modules on the ISO 9141 communication network, the diagnostic tool must ask for all information; the modules cannot initiate communications.

The ISO 9141 communications network will not function if the wire is shorted to ground or battery voltage. Also, if one of the modules on the ISO 9141 communications network loses power or shorts internally, communications to that module will fail.

The powertrain control module (PCM) is connected to the SCP communication network. The PCM controls the engine performance, electronic ignition, emission controls and on-board diagnostics. Refer to Section 3A in the Powertrain Control/Emissions Diagnosis (PC/ED) manual. The passive anti-theft system (PATS) is integrated into the PCM. The PCM controls the PATS system functions as well as illumination of the anti-theft indicator. The PCM stores the ignition key codes and controls engine disable. Refer to Section 419-01.

The restraints control module (RCM) is on the ISO 9141 network. The RCM controls the deployment of the air bags based on sensor input. Refer to Section 501-20B.

The generic electronic module (GEM) is on the ISO 9141 network. The GEM is equipped on all vehicles. The GEM controls additional functions that include:

- speed dependent windshield wipers
- illuminated entry and courtesy lamps
- windshield wipers
- warning chimes
- battery saver
- accessory delay
- power windows

Refer to Section 419-10.

The central security module (if equipped) is on the ISO 9141 communication network. The central security module controls keyless entry and door lock /unlock functions for the vehicle. Refer to Section 501-14.

The 4-wheel drive (4WD) control module (if equipped) is on the ISO 9141 communication network. The 4WD control module controls the four wheel drive for the vehicle. Refer to Section 308-07A .

The 4-wheel anti-lock brake (4WABS) control module (if equipped) is on the ISO 9141 communication network. The 4WABS control module controls the brake pressure to the four wheels to keep the vehicle under control while braking. Refer to Section 206-09 .

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious signs of electrical damage. Refer to the following chart:

Visual Inspection Chart

Electrical
• Central junction box (CJB) fuse 17 (20 A) • Damaged wiring harness • Loose or corroded connectors

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:

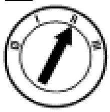
- check that the program card is correctly installed.
- check the connections to the vehicle.
- check the ignition switch is in RUN.

If the diagnostic tool still does not communicate with the vehicle, go to Pinpoint Test I.

4. Go to Pinpoint Test PC.

System Precheck

PINPOINT TEST PC: DATA LINK DIAGNOSTICS TEST

CONDITIONS	DETAILS/RESULTS/ACTIONS
PC1 DATA LINK DIAGNOSTICS TEST	
1 	
	2 Run the DATA LINK DIAGNOSTICS test.
	- **Is SYSTEM PASSED obtained?** → **Yes** Test PASSED. RETURN to the Symptom Chart of the section for the module in question. → **No** If no response from the diagnostic tool, GO to Pinpoint Test I. If CKT70, CKT914, or CKT915 = SOME ECUS NO RESP/NOT EQUIP, REFER to the Symptom Chart. If CKT70 = ALL ECUS NO RESP/NOT EQUIP, GO to Pinpoint Test G. If CKT914 = ALL ECUS NO RESP/NOT EQUIP, GO to Pinpoint Test H. If CKT915 = ALL ECUS NO RESP/NOT EQUIP, GO to Pinpoint Test H. If module in question is NO RESPONSE/NOT EQUIPPED, NO RESPONSE ON CKT914 (BUS+), or NO RESPONSE ON CKT915 (BUS-), REFER to the Symptom Chart.

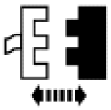
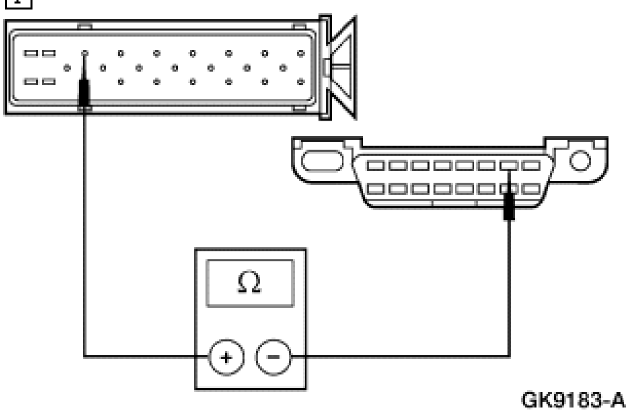
Symptom Chart

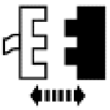
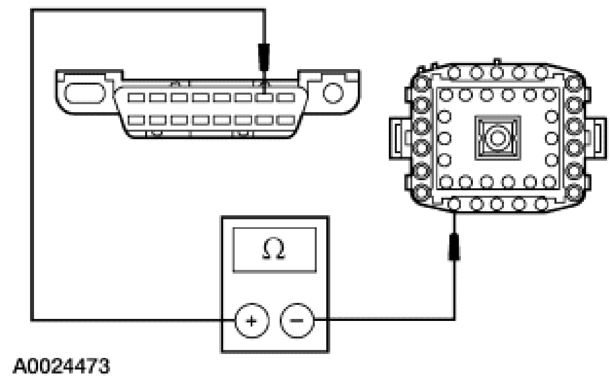
Symptom Chart

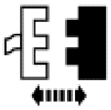
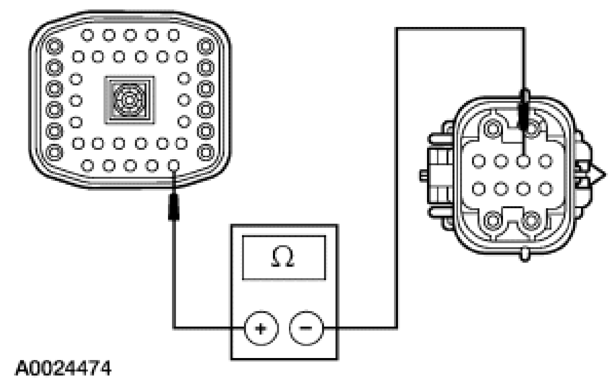
Condition	Possible Sources	Action
• The 4-wheel anti-lock brake (4WABS) control module does not respond to the diagnostic tool	• Circuit or connection in international standards organization (ISO) 9141 network. • 4WABS control module (if equipped).	• GO to Pinpoint Test A.
• The generic electronic module (GEM) does not respond to the diagnostic tool	• Circuit or connection in ISO 9141 network. • GEM.	• GO to Pinpoint Test B.
• The restraints control module (RCM) does not respond to the diagnostic tool	• Circuit or connection in ISO 9141 network. • RCM.	• GO to Pinpoint Test C.
• The central security module does not respond to the diagnostic tool	• Circuit or connection in ISO 9141 network. • Central security module (if equipped).	• GO to Pinpoint Test D.
• The powertrain control module (PCM) does not respond to the diagnostic tool	• Circuit or connection in standard corporate protocol (SCP) network. • PCM.	• GO to Pinpoint Test E.
• The four wheel drive (4WD) control module does not respond to the diagnostic tool	• Circuit or connection in SCP network. • 4WD control module (if equipped).	• GO to Pinpoint Test F.
• No ISO 9141 network module/network communication	• Circuit or connection in ISO 9141 network. • ISO 9141 networked modules.	• GO to Pinpoint Test G.
• No SCP module/network communication	• Circuit or connection in SCP network. • SCP networked modules.	• GO to Pinpoint Test H.
• No module/network communication — no power to the diagnostic tool	• DLC. • Central junction box (CJB) Fuse 17 (20 A). • Circuitry. • Diagnostic tool.	• GO to Pinpoint Test I.

Pinpoint Tests

PINPOINT TEST A: THE 4-WHEEL ANTI-LOCK BRAKE (4WABS) CONTROL MODULE DOES NOT RESPOND TO THE DIAGNOSTIC TOOL

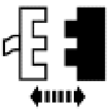
CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUIT 70 AT 4WABS CONTROL MODULE C135 PIN 23 FOR DAMAGE	
1 	
2  4WABS Control Module C135	
	3 Inspect 4WABS control module C135 for damage.
	• **Is the 4WABS control module C154 OK?** → **Yes** GO to A2. → **No** REPAIR 4WABS control module C135. TEST the system for normal operation.
A2 CHECK CIRCUIT 70 (LB/WH) BETWEEN DLC C251 AND 4WABS CONTROL MODULE C135 FOR AN OPEN	
1 	1 Measure the resistance between 4WABS control module C135 pin 23, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH), harness side.

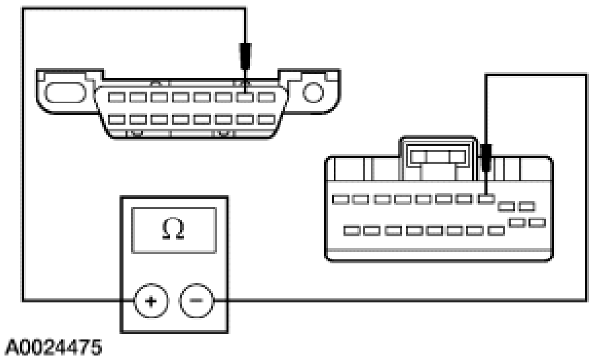
	• **Is the resistance less than 5 ohms?** → **Yes** GO to A7. → **No** GO to A3.
A3 CHECK IN-LINE C144 FOR DAMAGE	
1  In-Line C144	
	2 Inspect in-line C144M and C144F for damage.
	• **Is the in-line C144M and C144F OK?** → **Yes** GO to A4. → **No** REPAIR the damaged side(s) of in-line C144. TEST the system for normal operation.
A4 CHECK CIRCUIT 70 (LB/WH) BETWEEN IN-LINE C144F AND DLC C251 FOR AN OPEN	
1  	1 Measure the resistance between DLC C251 pin 7, circuit 70 (LB/WH), harness side and in-line C144F pin 12, circuit 70 (LB/WH), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to A5.

	→ **No** REPAIR the circuit between DLC C251 and in-line C144F. TEST the system for normal operation.
A5 CHECK IN-LINE C126 FOR DAMAGE	
1  In-Line C126	
	2 Inspect in-line C126F and C126M for damage.
	• **Is the in-line C126F and C126M OK?** → **Yes** GO to A6. → **No** REPAIR the damaged side(s) of in-line C126 TEST the system for normal operation.
A6 CHECK CIRCUIT 70 (LB/WH) BETWEEN IN-LINE C144M AND IN-LINE C126M FOR AN OPEN	
1 	1 Measure the resistance between in-line C144M pin 12, circuit 70 (LB/WH), harness side and in-line C126M pin 8, circuit 70 (LB/WH), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** REPAIR the circuit between in-line C126F and 4WABS control module C135. TEST the system for normal operation. → **No** REPAIR the circuit between in-line C144M and in-line

	C126M. TEST the system for normal operation.
A7 CHECK FOR CORRECT 4WABS CONTROL MODULE OPERATION	
	1 Disconnect all 4WABS control module connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all 4WABS control module connectors and make sure they seat correctly.
	4 Operate the system and verify the concern is still present.
	• **Is the concern still present?** → **Yes** INSTALL a new 4WABS control module. REFER to Section 206-09. TEST the system for normal operation. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

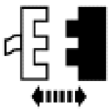
PINPOINT TEST B: THE GENERIC ELECTRONIC MODULE (GEM) DOES NOT RESPOND TO THE DIAGNOSTIC TOOL

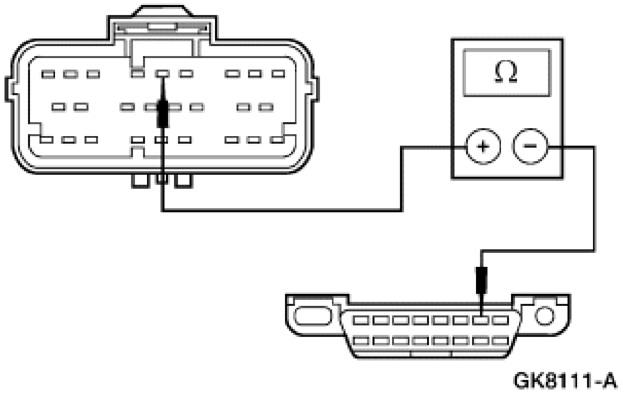
CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK GEM CONNECTOR FOR DAMAGE	
1 	
2  GEM C2100a	
	3 Inspect GEM connector for damage.

	• **Is the GEM C2100a or C201a OK?** → **Yes** GO to B2. → **No** REPAIR the GEM C2100a or C201a. TEST the system for normal operation.
B2 CHECK CIRCUIT 70 (LB/WH) BETWEEN DLC AND GEM FOR AN OPEN	
1 	1 Measure the resistance between GEM C2100a pin 3, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to B3. → **No** REPAIR the circuit. TEST the system for normal operation.
B3 CHECK FOR CORRECT GEM OPERATION	
	1 Disconnect all GEM connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all GEM connectors and make sure they seat correctly.
	4 Operate the system and verify the concern is still present.

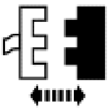
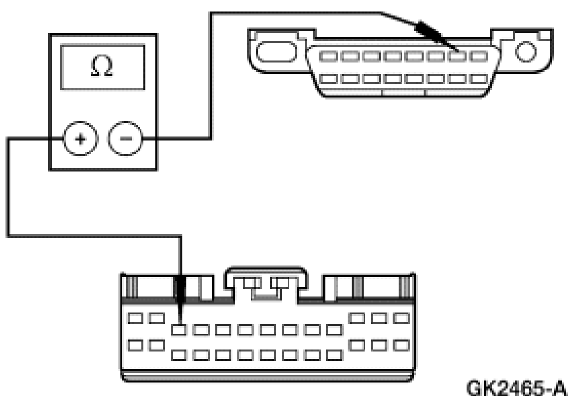
	• **Is the concern still present?** → **Yes** INSTALL a new GEM. REFER to Section 419-10. TEST the system for normal operation. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST C: THE RESTRAINT CONTROL MODULE (RCM) DOES NOT RESPOND TO THE DIAGNOSTIC TOOL

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK RCM C2041 FOR DAMAGE	
1 	
	2 Deactivate the air bag system; refer to Section 501-20B.
3  RCM C2041	
	4 Inspect RCM C2041 for damage.
	• **Is the RCM C2041 OK?** → **Yes** GO to C2. → **No** REPAIR the RCM C2041. TEST the system for normal operation.
C2 CHECK CIRCUIT 70 (LB/WH) BETWEEN DLC AND RCM FOR AN OPEN	
1	1 Measure the resistance between RCM C2041 pin 5, circuit 70 (LB/WH), harness side and DLC C251 pin 7,

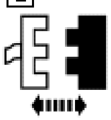
	circuit 70 (LB/WH), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to C3. → **No** REPAIR the circuit. TEST the system for normal operation.
C3 CHECK FOR CORRECT RCM OPERATION	
	1 Disconnect all RCM connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all RCM connectors and make sure they seat correctly.
	4 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. TEST the system for normal operation. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

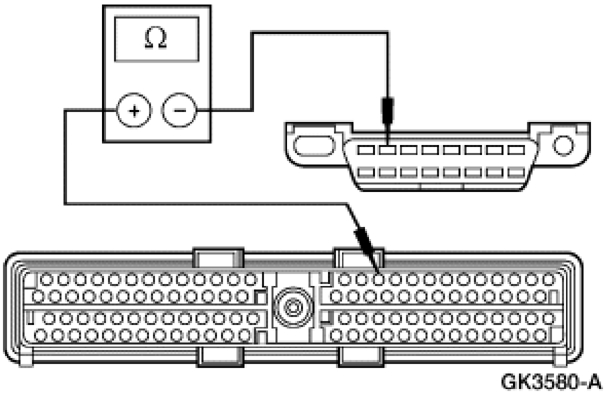
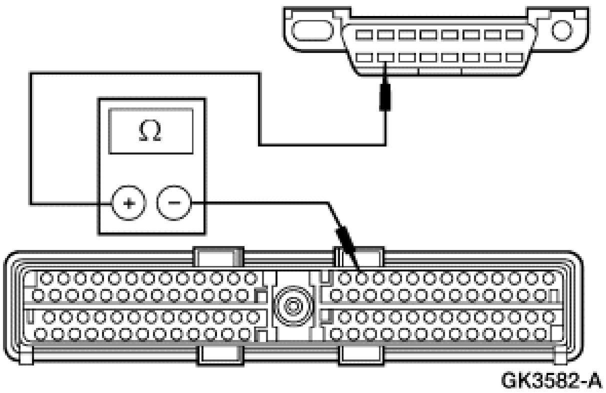
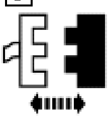
PINPOINT TEST D: THE CENTRAL SECURITY MODULE DOES NOT RESPOND TO THE DIAGNOSTIC TOOL

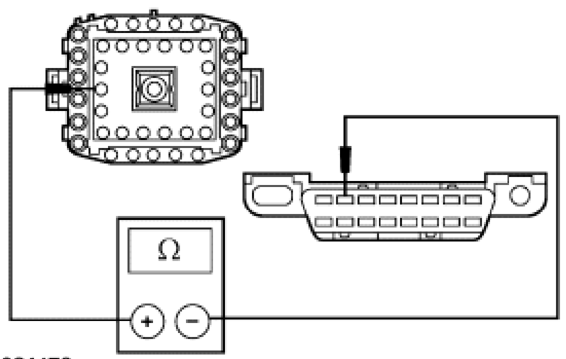
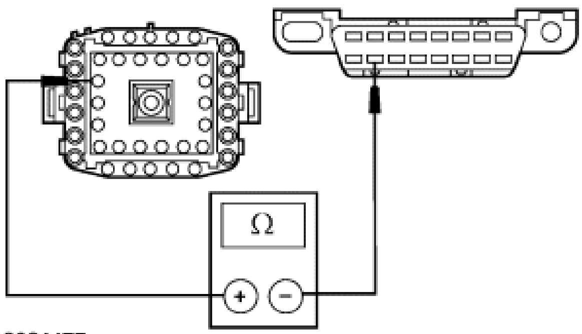
CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK CENTRAL SECURITY MODULE C274a FOR DAMAGE	
1 	
2  Central Security Module C274a	
	3 Inspect central security module C274a for damage.
	• **Is the central security module C274a OK?** → **Yes** GO to D2. → **No** REPAIR the central security module C274a. TEST the system for normal operation.
D2 CHECK CIRCUIT 70 (LB/WH) BETWEEN DLC AND CENTRAL SECURITY MODULE FOR AN OPEN	
1 	1 Measure the resistance between central security module C274a pin 3, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes**

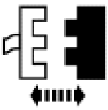
	GO to D3. → **No** REPAIR the circuit. TEST the system for normal operation.
D3 CHECK FOR CORRECT CENTRAL SECURITY MODULE OPERATION	
	1 Disconnect all central security module connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all central security module connectors and make sure they seat correctly.
	4 Operate the system and verify the concern is still present.
	• **Is the concern still present?** → **Yes** INSTALL a new central security module. REFER to Section 419-10. TEST the system for normal operation. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

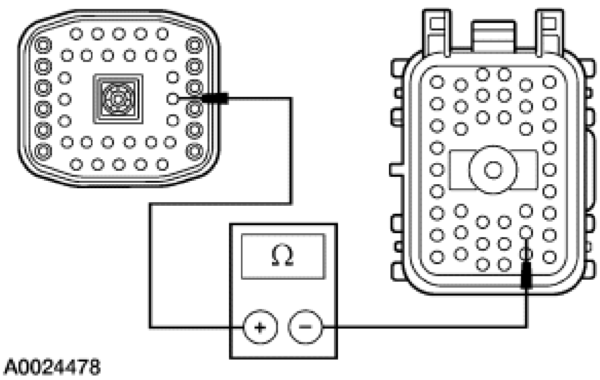
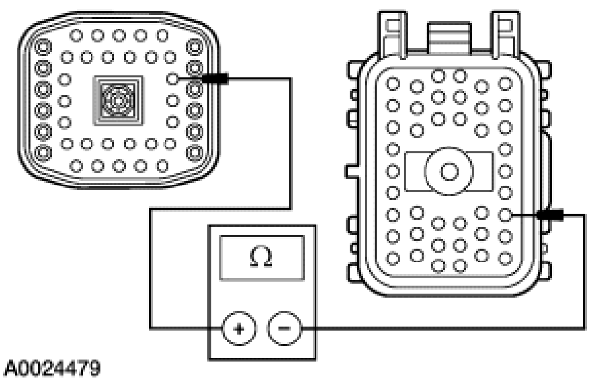
PINPOINT TEST E: THE POWERTRAIN CONTROL MODULE (PCM) DOES NOT RESPOND TO THE DIAGNOSTIC TOOL

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK CIRCUITS 914 (TN/OG) AND 915 (PK/LB) FOR AN OPEN	
1 	
2 	

PCM C175	
3 	3 Measure the resistance between PCM C175 pin 16, circuit 914 (TN/OG), harness side and DLC C251 pin 2, circuit 914 (TN/OG), harness side.
4 	4 Measure the resistance between PCM C175 pin 15, circuit 915 (PK/LB), harness side and DLC C251 pin 10, circuit 915 (PK/LB), harness side.
	• **Are the resistances less than 5 ohms?** → **Yes** GO to E6. → **No** GO to E2.
E2 CHECK IN-LINE C146 FOR DAMAGE	
1  In-Line C146	
	2 Inspect in-line C146M and C146F for damage.

	• **Is the in-line C146M and C146F OK?** → **Yes** GO to E3. → **No** REPAIR the damaged side(s) of in-line C146. TEST the system for normal operation.
E3 CHECK CIRCUITS 914 (TN/OG) AND 915 (PK/LB) BETWEEN IN-LINE C146F and DLC C251 FOR AN OPEN	
1  A0024476	1 Measure the resistance between in-line C146F pin 9, circuit 914 (TN/OG), harness side and DLC C251 pin 2, circuit 914 (TN/OG) harness side.
2  A0024477	2 Measure the resistance between in-line C146F pin 10, circuit 915 (PK/LB), harness side and DLC C251 pin 10, circuit 915 (PK/LB) harness side.
	• **Are the resistances less than 5 ohms?** → **Yes** GO to E4. → **No** REPAIR the circuit (s) in question between in-line C146F and DLC C251. REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation.

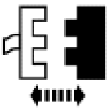
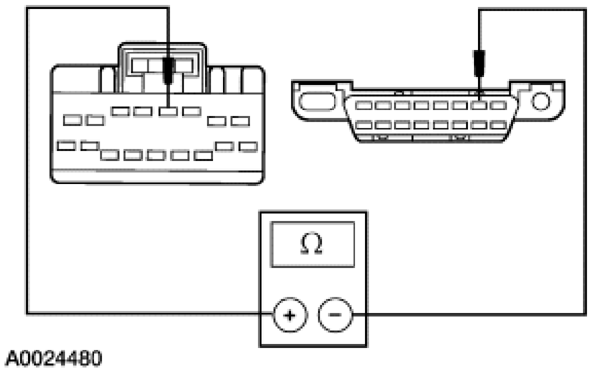
<table>
<tr><td colspan="2">E4 CHECK IN-LINE C110 FOR DAMAGE</td></tr>
<tr><td>1

In-Line C110</td><td></td></tr>
<tr><td></td><td>2 Inspect in-line C110M and C110F for damage.</td></tr>
<tr><td></td><td>Is the in-line C110M and C110F OK?
→ Yes
GO to E5.

→ No
REPAIR the damaged side(s) of in-line C110. TEST the system for normal operation.</td></tr>
<tr><td colspan="2">E5 CHECK CIRCUITS 914 (TN/OG) AND 915 (PK/LB) BETWEEN IN-LINE C146F AND IN-LINE C110M FOR AN OPEN</td></tr>
<tr><td>1

A0024478</td><td>1 Measure the resistance between in-line C146M pin 9, circuit 914 (TN/OG), harness side and in-line C110M pin 11, circuit 914 (TN/OG) harness side.</td></tr>
<tr><td>2

A0024479</td><td>2 Measure the resistance between in-line C146M pin 10, circuit 915 (PK/LB), harness side and in-line C110M pin 3, circuit 915 (PK/LB) harness side.</td></tr>
<tr><td></td><td></td></tr>
</table>

	• **Are the resistances less than 5 ohms?** → **Yes** REPAIR the circuit (s) in question between PCM C175 and in-line C110F. REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation. → **No** REPAIR the circuit (s) in question between in-line C146M and in-line C110M. REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation.
E6 CHECK FOR CORRECT PCM OPERATION	
	1 Disconnect all PCM connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all PCM connectors and make sure they seat correctly.
	4 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. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST F: THE FOUR WHEEL DRIVE (4WD) CONTROL MODULE DOES NOT RESPOND TO THE DIAGNOSTIC TOOL

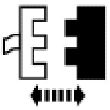
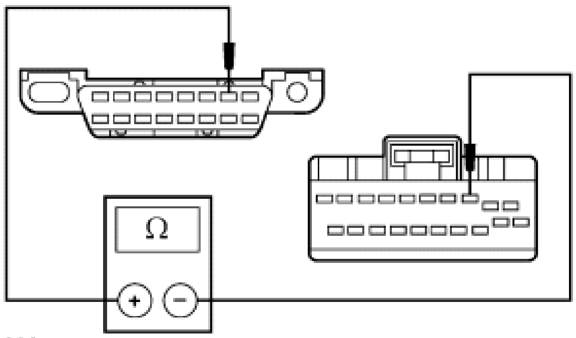
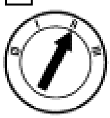
CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK 4WD CONTROL MODULE C281a FOR DAMAGE	

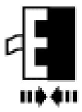
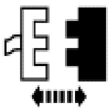
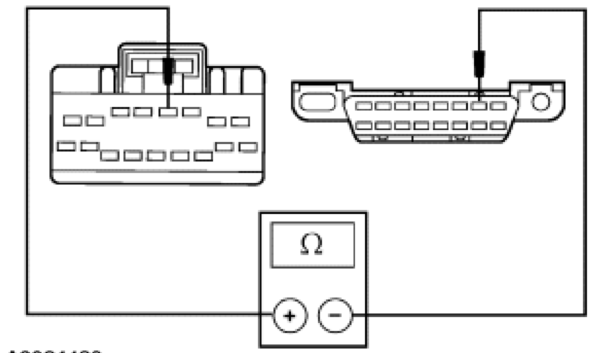
1 	
2  4WD Control Module C281a	
	3 Inspect 4WD control module C281a for damage.
	• **Is the 4WD control module C281a OK?** → **Yes** GO to F2. → **No** REPAIR the 4WD control module C281a. TEST the system for normal operation.
F2 CHECK CIRCUIT 70 (LB/WH) FOR AN OPEN	
1  	1 Measure the resistance between 4WD control module C281a pin 4, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH), harness side.
	• **Are the resistances less than 5 ohms?** → **Yes** GO to F3. → **No** REPAIR the circuit between the DLC C251 and 4WD control module C281a.
F3 CHECK FOR CORRECT 4WD CONTROL MODULE OPERATION	
	1 Disconnect all 4WD control module connectors.

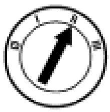
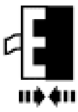
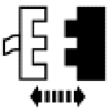
	2 Check for: • corrosion • pushed-out pins
	3 Connect all 4WD control module connectors and make sure they seat correctly.
	4 Operate the system and verify the concern is still present.
	• **Is the concern still present?** → **Yes** INSTALL a new 4WD control module. REFER to Section 308-07A. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

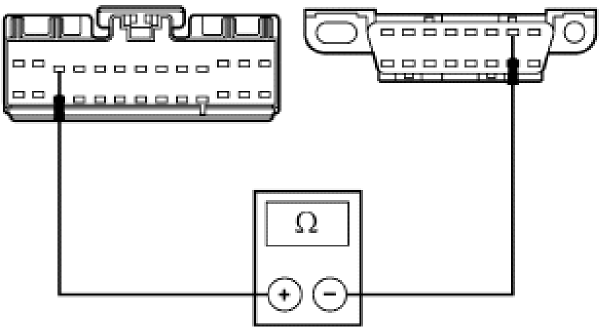
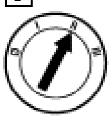
PINPOINT TEST G: NO MODULE / NETWORK COMMUNICATION — ISO 9141 NETWORK

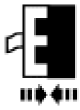
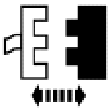
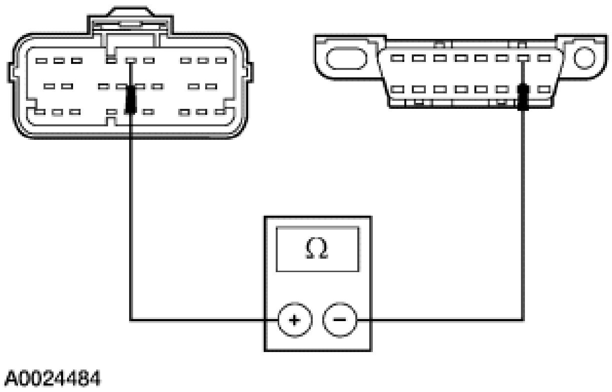
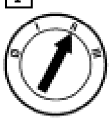
CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE DLC C251 FOR DAMAGE	
1 	
	2 Inspect DLC C251 pin 7 and the wire (circuit 70 [LB/WH]) leading to pin 7.
	• **Is DLC C251 OK?** → **Yes** GO to G2. → **No** REPAIR the DLC C251. TEST the system for normal operation.
G2 CHECK CIRCUIT 70 (LB/WH) BETWEEN DLC AND GENERIC ELECTRONIC MODULE FOR	

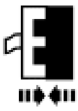
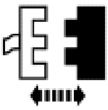
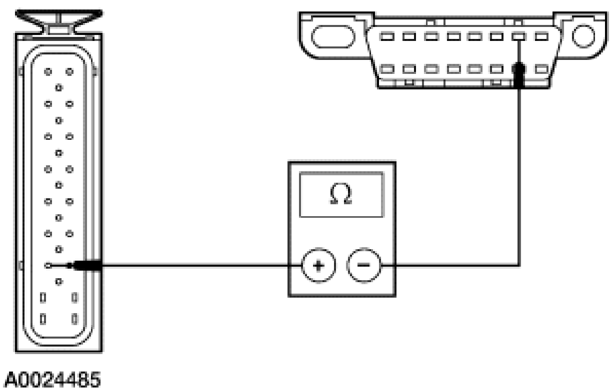
AN OPEN	
1  GEM C2100a	
2  A0024475	2 Measure the resistance between GEM C2100a pin 3, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to G3. → **No** REPAIR the circuit. TEST the system for normal operation.
G3 CHECK ISO 9141 NETWORK WITH GEM DISCONNECTED	
1 	
2 	
	3 Carry out the DATA LINK DIAGNOSTICS test.
	• **Did the diagnostic tool indicate SYSTEM PASSED?** → **Yes** GO to G12.

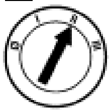
	→ **No** GO to G4.
G4 CHECK CIRCUIT 70 (LB/WH) FOR AN OPEN BETWEEN 4WD CONTROL MODULE C281a AND DLC C251	
1 	
2  GEM C2100a	
3  4WD Control Module C281a	
4 	4 Measure the resistance between 4WD control module C281a pin 4, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH) harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to G5. → **No** REPAIR the circuit between the DLC C251 and 4WD control module C281a. TEST the system for normal operation.
G5 CHECK ISO 9141 NETWORK WITH 4WD CONTROL MODULE C281a DISCONNECTED	
1	

	
2 	
	3 Carry out the DATA LINK DIAGNOSTICS test.
	• **Did the diagnostic tool indicate SYSTEM PASSED?** → **Yes** GO to G13. → **No** GO to G6.
G6 CHECK CIRCUIT 70 (LB/WH) FOR AN OPEN BETWEEN THE CENTRAL SECURITY (CSM) MODULE C274a AND DLC C251	
1 	
2  4WD Control Module C281a	
3  Central Security Module C274a	
4	4 Measure the resistance between central security module C274a pin 3, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH) harness side.

 A0024483	
	• **Is the resistance less than 5 ohms?** → **Yes** GO to G7. → **No** REPAIR the circuit between the DLC C251 and central security module C274a. TEST the system for normal operation.
G7 CHECK ISO 9141 NETWORK WITH THE CENTRAL SECURITY MODULE C274a DISCONNECTED	
1 	
2 	
	3 Carry out the DATA LINK DIAGNOSTICS test.
	• **Did the diagnostic tool indicate SYSTEM PASSED?** → **Yes** GO to G14. → **No** GO to G8.
G8 CHECK CIRCUIT 70 (LB/WH) FOR AN OPEN BETWEEN THE RESTRAINT CONTROL MODULE (RCM) C2041 AND DLC C251	
1	

	
2  Central Security Module C274a	
	3 Deactivate the air bag system; refer to Section 501-20B.
4  RCM C2041	
5 	5 Measure the resistance between RCM C2041 pin 5, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to G9. → **No** REPAIR the circuit between the DLC C251 and RCM C2041a. TEST the system for normal operation.
G9 CHECK ISO 9141 NETWORK WITH THE RCM C2041a DISCONNECTED	
1 	
2	

	
	3 Carry out the DATA LINK DIAGNOSTICS test.
	• **Did the diagnostic tool indicate SYSTEM PASSED?** → **Yes** GO to G15. → **No** GO to G10.
G10 CHECK CIRCUIT 70 (LB/WH) FOR AN OPEN BETWEEN THE 4 WHEEL ANTI-LOCK BRAKE SYSTEM (4WABS) CONTROL MODULE C135 AND DLC C251	
1 	
2  RCM C2041	
3  4WABS Control Module C135	
4 	4 Measure the resistance between 4WABS control module C135 pin 23, circuit 70 (LB/WH), harness side and DLC C251 pin 7, circuit 70 (LB/WH), harness side.

	• **Is the resistance less than 5 ohms?** → **Yes** GO to G11. → **No** REPAIR the circuit between the DLC C251 and 4WABS control module C135. TEST the system for normal operation.
G11 CHECK ISO 9141 NETWORK WITH THE 4WABS CONTROL MODULE C135 DISCONNECTED	
1 	
2 	
	3 Carry out the DATA LINK DIAGNOSTICS test.
	• **Did the diagnostic tool indicate SYSTEM PASSED?** → **Yes** GO to G16. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.
G12 CHECK FOR CORRECT GEM OPERATION	
	1 Disconnect all GEM connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all GEM connectors and make sure they seat correctly.
	4 Operate the system and verify the concern is still present.

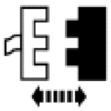
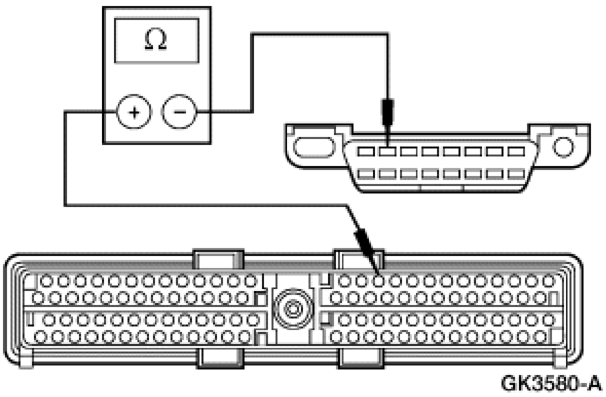
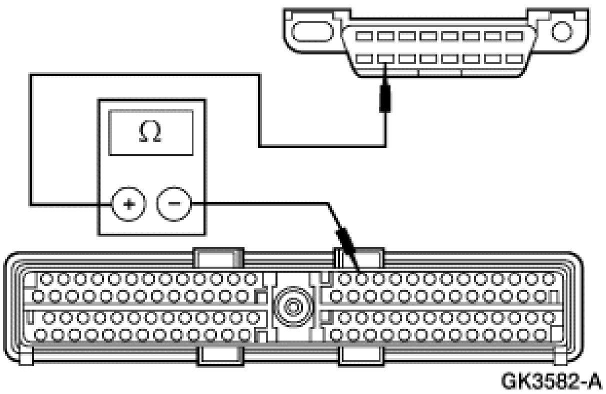
	• **Is the concern still present?** → **Yes** INSTALL a new GEM. REFER to Section 419-10. TEST the system for normal operation. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.
G13 CHECK FOR CORRECT 4WD CONTROL MODULE OPERATION	
	1 Disconnect all 4WD control module connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all 4WD control module connectors and make sure they seat correctly.
	4 Operate the system and verify the concern is still present.
	• **Is the concern still present?** → **Yes** INSTALL a new 4WD control module. REFER to Section 308-07A. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.
G14 CHECK FOR CORRECT CENTRAL SECURITY MODULE OPERATION	
	1 Disconnect all central security module connectors.
	2 Check for: • corrosion

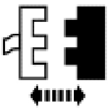
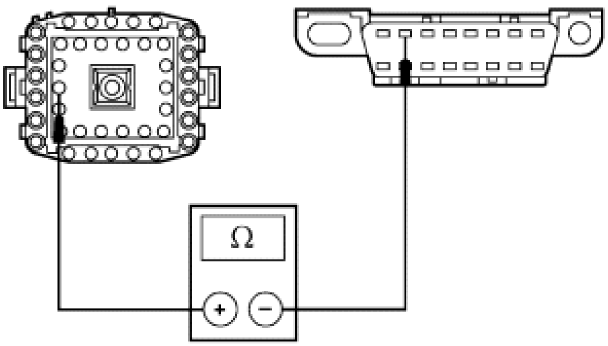
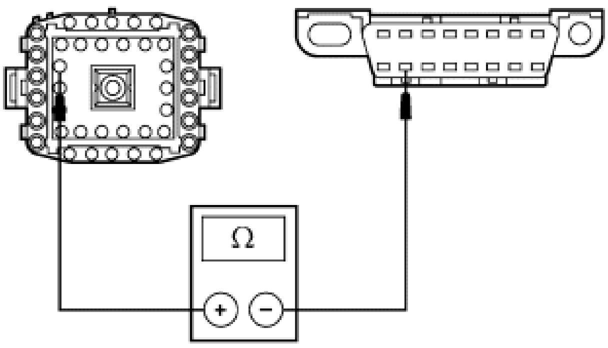
	• pushed-out pins
	3 Connect all central security connectors and make sure they seat correctly.
	4 Operate the system and verify the concern is still present.
	• **Is the concern still present?** → **Yes** INSTALL a new central security module. REFER to Section 419-10. TEST the system for normal operation. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.
G15 CHECK FOR CORRECT RCM OPERATION	
	1 Disconnect all RCM connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all RCM connectors and make sure they seat correctly.
	4 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. TEST the system for normal operation. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

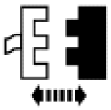
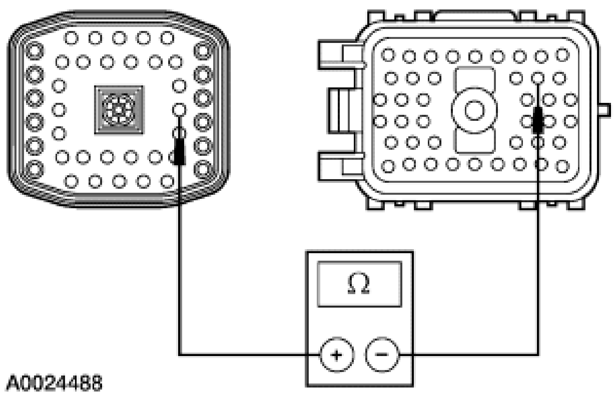
G16 CHECK FOR CORRECT 4-WHEEL ANTI-LOCK BRAKE (4WABS) CONTROL MODULE OPERATION	
	1 Disconnect all 4WABS control module connectors.
	2 Check for: • corrosion • pushed-out pins
	3 Connect all 4WABS control module connectors and make sure they seat correctly.
	4 Operate the system and verify the concern is still present.
	• **Is the concern still present?** → **Yes** INSTALL a new 4WABS control module. REFER to Section 206-09. TEST the system for normal operation. CARRY OUT the DATA LINK DIAGNOSTICS test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

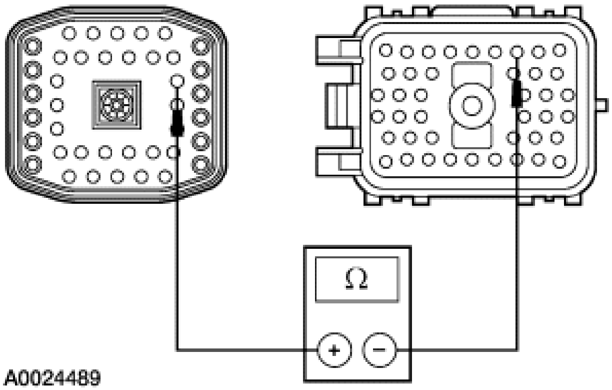
PINPOINT TEST H: NO MODULE / NETWORK COMMUNICATION — SCP LINK

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK DLC 251 PINS 2 AND 10 FOR DAMAGE	
1 	
	2 Inspect DLC C251 pins 2 and 10 and the wires leading to the pins for damage.
	• **Is the DLC C251 OK?** → **Yes** GO to H2. → **No**

	REPAIR DLC C251. TEST the system for normal operation.
H2 CHECK CIRCUITS 914 (TN/OG) AND 915 (PK/LB) FOR AN OPEN	
1 	
2  PCM C175	
3 	3 Measure the resistance between PCM C175 pin 16, circuit 914 (TN/OG), harness side and DLC C251 pin 2, circuit 914 (TN/OG), harness side.
4 	4 Measure the resistance between PCM C175 pin 15, circuit 915 (PK/LB), harness side and DLC C251 pin 10, circuit 915 (PK/LB), harness side.
	• **Are the resistances less than 5 ohms?** → **Yes** GO to H7. → **No** GO to H3.

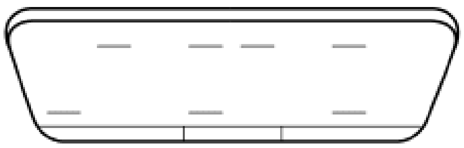
H3 CHECK IN-LINE C146 FOR DAMAGE	
1  In-Line C146	
	2 Inspect in-line C146M and C146F for damage.
	• **Is the in-line C146M and C146F OK?** → **Yes** GO to H4. → **No** REPAIR the damaged side(s) of in-line C146. TEST the system for normal operation.
H4 CHECK CIRCUITS 914 (TN/OG) AND 915 (PK/LB) BETWEEN IN-LINE C146F and DLC C251 FOR AN OPEN	
1  A0024486	1 Measure the resistance between in-line C146F pin 9, circuit 914 (TN/OG), harness side and DLC C251 pin 2, circuit 914 (TN/OG), harness side.
2  A0024487	2 Measure the resistance between in-line C146F pin 10, circuit 915 (PK/LB), harness side and DLC C251 pin 10, circuit 915 (PK/LB), harness side.

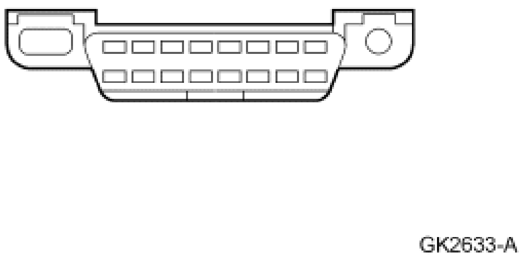
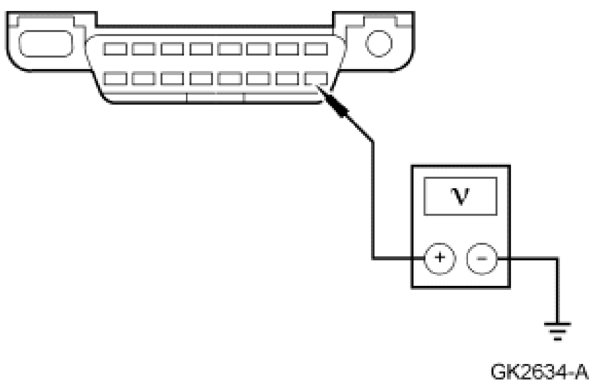
	• **Are the resistances less than 5 ohms?** → **Yes** GO to H5. → **No** REPAIR the circuit (s) in question between in-line C146F and DLC C251. REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation.
H5 CHECK IN-LINE C110 FOR DAMAGE	
1  In-Line C110	
	2 Inspect in-line C110M and C110F for damage.
	• **Is the in-line C110M and C110F OK?** → **Yes** GO to H6. → **No** REPAIR the damaged side(s) of in-line C110. TEST the system for normal operation.
H6 CHECK CIRCUITS 914 (TN/OG) AND 915 (PK/LB) BETWEEN IN-LINE C146F AND IN-LINE C110M FOR AN OPEN	
1  	1 Measure the resistance between in-line C146M pin 9, circuit 914 (TN/OG), harness side and in-line C110M pin 11, circuit 914 (TN/OG) harness side.
2	2 Measure the resistance between in-line C146M pin 10, circuit 915 (PK/LB), harness side and in-line C110M pin 3, circuit 915 (PK/LB), harness side.

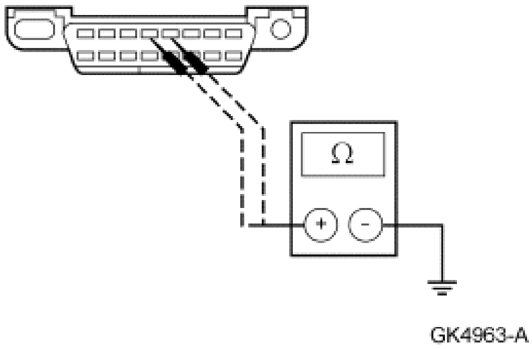
	
	- **Are the resistances less than 5 ohms?** → **Yes** REPAIR the circuit (s) in question between PCM C175 and in-line C110F. REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation. → **No** REPAIR the circuit(s) in question between in-line C146M and in-line C110M. REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation.
H7 CHECK FOR CORRECT PCM OPERATION	
	1 Disconnect all PCM connectors.
	2 Check for: - corrosion - pushed-out pins
	3 Connect all PCM connectors and make sure they seat correctly.
	4 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. CARRY OUT the DATA LINK DIAGNOSTICS test.

	→ **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

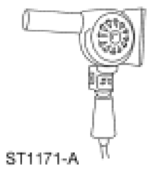
PINPOINT TEST I: NO MODULE / NETWORK COMMUNICATION — NO POWER TO THE DIAGNOSTIC TOOL

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK DIAGNOSTIC TOOL CONNECTOR	
1  GK2632-A	1 Inspect diagnostic tool pins.
	• **Are the pins OK?** → **Yes** GO to I2. → **No** REPAIR diagnostic tool connector. TEST the system for normal operation.
I2 CHECK THE DLC C251 PINS FOR DAMAGE	
1 	
2	2 Inspect DLC C251 pins for damage.

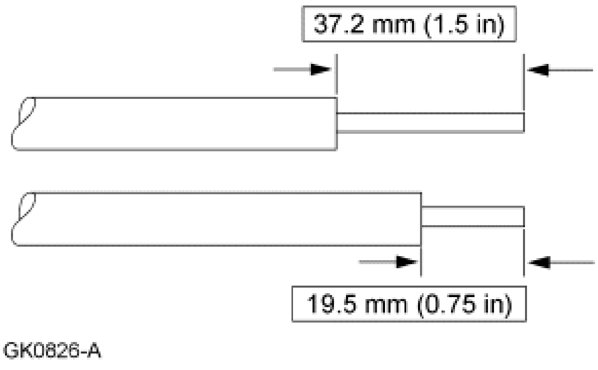
	
	• **Are the pins OK?** → **Yes** GO to [I3](#). → **No** REPAIR DLC C251. TEST the system for normal operation.
I3 CHECK VOLTAGE TO DIAGNOSTIC TOOL — CIRCUIT 693 (OG)	
1 	1 Measure the voltage between DLC C251 pin 16, circuit 693 (OG), harness side and ground.
	• **Is the voltage greater than 10 volts?** → **Yes** GO to [I4](#). → **No** REPAIR the circuit. TEST the system for normal operation.
I4 CHECK THE DLC GROUNDS CIRCUIT 57 (BK) AND CIRCUIT 570 (BK/WH)	
1	1 Measure the resistance between DLC C251 pin 4,

	circuit 57 (BK), harness side and ground; and between DLC C251 pin 5, circuit 570 (BK/WH), harness side and ground.
	Is the resistance less than 5 ohms? → **Yes** REPAIR the diagnostic tool. TEST the system for normal operation. → **No** REPAIR the circuit in question. TEST the system for normal operation.

Communication Circuit Wiring Repair

Special Tool(s)	
	Heat Gun 107-R0300 or equivalent

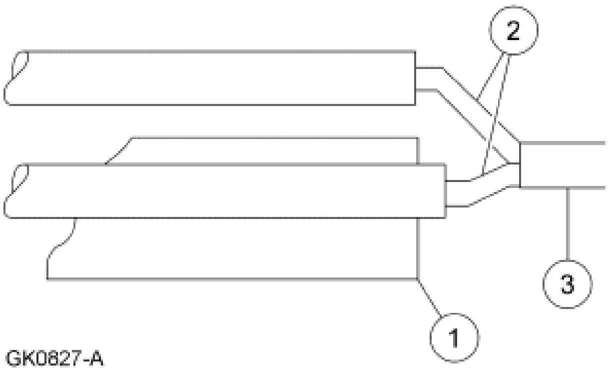
1. Disconnect the battery ground cable. For additional information, refer to Section 414-01.
2. Strip the wires.



3. **NOTE:** Use rosin core mildly activated (RMA) solder, not acid core solder.

   Solder the wires.

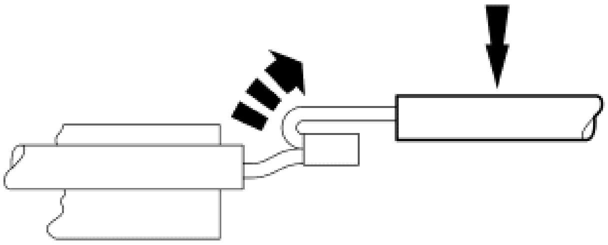
   1. Install the heat shrink tube.
   2. Twist the wires together.
   3. Solder the wires together.



GK0827-A

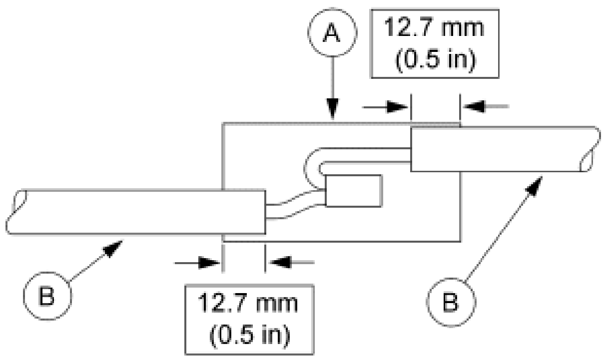
4. **NOTE:** Wait for the solder to cool before moving the wires.

   Bend the wires back in a straight line.



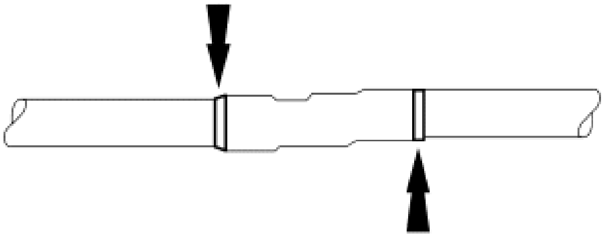
GK0828-A

5. Position the (A) heat shrink tube over the (B) wire repair.
   - Overlap the heat shrink tube on both wires.



GK0829-A

6. Use the heat gun to heat the repaired area until adhesive flows out both ends of the heat shrink tube.



GK0830-A

7. Reconnect the battery ground cable.

SECTION 419-01:
Anti-Theft

Torque Specifications

Description	Nm	lb-ft	lb-in
Anti-theft transceiver module screw	2		18
Lower instrument panel steering column cover screws.	9		80
Steering column opening cover reinforcement bolts	15	11	

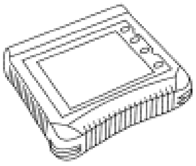
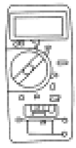
Anti-Theft—Passive Anti-Theft System (PATS)

The passive anti-theft system (PATS) contains the following components:

- theft indicator
- encoded ignition key
- PATS transceiver module
- powertrain control module (PCM)
- standard corporate protocol (SCP) communication network

Anti-Theft—Passive Anti-Theft System (PATS)

Refer to Wiring Diagrams Cell 12 for schematic and connector information.

Special Tool(s)	
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool
 ST1137-A	73III Digital Automotive Meter 105-R0057 or equivalent

Passive Anti-Theft System (PATS)—Principles of Operation

The PATS uses a specially encoded ignition key. Each encoded ignition key contains a permanently installed electronic device called a transponder. Each transponder contains a unique electronic identification code out of over 18 billion, billion combinations.

The passive anti-theft system (PATS), also known as SecuriLock ®, uses radio frequency identification technology to deter a driveaway theft. This system is known as Securilock® in North America, Safeguard® in the U.K., and PATS in Continental Europe. Passive means that it does not require any activity from the user.

The SecuriLock® System (PATS) is not compatible with aftermarket remote start systems, which allow the vehicle to be started from outside the vehicle. These systems may reduce the vehicle security level, and also may cause no-start issues. If equipped the remote start system must be removed before investigation of PATS-related, no-start issues.

Each encoded ignition key must be programmed into the vehicle's powertrain electronic control (PCM) before it can be used to start the engine. There are special diagnostic repair procedures described in this section that must be carried out if a new encoded ignition key is necessary.

This system contains a new feature named Unlimited Key Mode. This feature allows a customer to program more than eight keys to the vehicle if they request it. Each vehicle in Unlimited Key Mode is set up with a special Unlimited Transponder Security Key. This allows all the customer vehicles to share the same keys, but no other keys from outside can be used to operate the vehicles. For an individual customer, any randomly selected Security Key is acceptable. Refer to Unlimited Key Mode Programming in Key Programming Switch State Control in this section.

The PATS transceiver module communicates with the encoded ignition key. The module is located behind the steering column shroud and contains an antenna connected to a small electronics module. During each vehicle start sequence, the transceiver module reads the encoded ignition key identification code and sends data to the PCM.

The control functions are contained in the PCM. This module carries out all of the PATS functions, such as receiving the identification code from the encoded ignition key and controlling the engine enable. The PCM initiates the key interrogation sequence when the vehicle ignition switch is turned to RUN or START.

All elements of the PATS must be functional before the engine is allowed to start. If any of the components are not working correctly, the vehicle will not start.

The PATS uses a visual theft indicator. The indicator will prove out for three seconds when the ignition switch is turned to RUN or START under normal operation. If there is a PATS concern, this indicator will either flash rapidly or glow steadily when the ignition switch is turned to RUN or START. The PATS system also flashes the theft indicator every two seconds at ignition OFF to act as a visual deterrent.

The following will activate the PATS and will disable the vehicle from starting:

- incorrectly encoded ignition key
- damaged encoded ignition key

- unprogrammed key
- non-encoded key (key has no electronics)
- damaged wiring
- damaged transceiver
- damaged PCM

Passive Anti-Theft System (PATS)—Inspection and Verification

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

Visual Inspection Chart

Mechanical	Electrical

• Large metallic objects, a second ignition key on the same key ring as the PATS ignition key or electronic devices on the key chain that can be use to purchase gasoline or similar items
• Ignition lock cylinder
• PATS key
• Use of a non-PATS key
• More than one PATS key on key chain
	• Central junction box (CJB) fuse
	  ▪ 19 (25A)
	  ▪ 28 (7.5A)
	• PATS transceiver module
	• PCM
	• Ignition switch
	• Loose or corroded connection(s)

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 diagnostic tool does not power up, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTICS test. If the diagnostic tool responds with:
   - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to Section 418-00.
   - NO RESP/NOT EQUIP for PCM, refer to Section 303-14.
   - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the PCM.
6. If the DTCs retrieved are related to the concern, go to the PCM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to the Symptom Chart to continue diagnostics.

Passive Anti-Theft System (PATS)—Diagnostic Trouble Codes (DTC) Index

Powertrain Control Module Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1213	Anti-Theft Number of Programmed Keys is Below Minimum	PCM	GO to Pinpoint Test F.
B2431	Transponder Program Failure	PCM	VERIFY if using correct PATS key, if defective USE new key.
B1342	ECU is Defective (EEFROM in PCM not working)	PCM	INSTALL a new PCM. REFER to Section 303-14.
B2103	Antenna Not Connected	PCM	GO to Pinpoint Test A.
B1600	PATS Ignition Key Transponder Signal is Not Received	PCM	GO to Pinpoint Test B.
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	PCM	GO to Pinpoint Test C.
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	PCM	GO to Pinpoint Test D.
B1681	PATS Transceiver Module Signal is Not Received	PCM	GO to Pinpoint Test E.
—	All Other DTCs	PCM	REFER to Section 419-10.

Passive Anti-Theft System (PATS)—Diagnostic Trouble Codes (DTC) Descriptions

Expanded DTC Descriptions

DTC	Expanded Description
B1213	Less than two keys programmed to the PATS control. Erase the continuous codes, cycle the ignition, then carry out the self test again. If DTC B1232, B1600, B1601, B1602 or B1681 are present, they must be serviced first. If DTC B1213 is the only self test DTC, then cycle the second PATS key in the ignition to program.
B1232	Transceiver module antenna failure. Memory failure in the PCM.
B1600	No PATS key read by the PCM. This can be caused by the PATS key, PATS transceiver, circuits between the PATS transceiver and the PCM and/or the PCM.
B1601	Unprogrammed PATS key. There is no issue with the PATS key itself, but the key must be programmed into the PATS memory (unless the maximum number of keys are already programmed). REFER to Spare Key Programming in this section. No parts need to be replaced for this DTC.
B1602	Partial PATS key was read. Make sure that approved PATS key (Ford, Rotunda, ILCO, Strattec, HUF or Valeo) is being used. Large metal objects, additional PATS keys, or devices used to purchase gasoline located on the customer's key ring can cause interference. Instruct the customer to keep such items from touching the ignition key during engine start. It is not necessary to remove the objects from the customer's key ring. Remote starter equipment can also cause this DTC. Remove any remote starter equipment close to the transceiver before conducting further diagnosis. This DTC can be caused by the PATS key or the PATS transceiver.
B1681	PATS transceiver module signal is not received by the PCM. This DTC can be caused by circuits between the PATS transceiver and the PCM, the PATS transceiver or the PCM. Follow the pinpoint test for diagnosis. This can also be caused by using the incorrect transceiver part number. Make sure that the correct transceiver part number is being used.
B2103	Transceiver module antenna failure. Replace the transceiver module.
B2431	The ignition key was not programmed. Make sure that the correct key is being used.

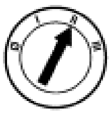
Passive Anti-Theft System (PATS)—Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
• The anti-theft indicator is always/never on	• Circuitry. • Theft LED. • Powertrain control module (PCM).	• GO to Pinpoint Test G.
• The vehicle does not start	• Starter relay. • PCM. • Circuitry. • Encoded ignition key. • Ignition key code. • Ignition key transponder key code. • Ignition key transponder key code format.	• GO to Pinpoint Test H.

Passive Anti-Theft System (PATS)—Pinpoint Tests

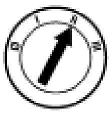
PINPOINT TEST A: NO ANTENNA DETECTED

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 INSPECT THE ANTENNA FOR CORRECT INSTALLATION OR PHYSICAL DAMAGE	
	
	Verify the PATS transceiver module is correctly installed. Refer to Passive Anti-Theft System (PATS) Transceiver in this section.
	Connect the diagnostic tool.
 ar Continuous DTCs	
	
	
 rieve PCM Continuous DTCs	
	• **Is DTC B2103 retrieved?** → **Yes** INSTALL a new PATS transceiver module. REFER to Passive Anti-Theft System (PATS) Transceiver in this section. CLEAR the DTCs. REPEAT the self-test. TURN the ignition OFF

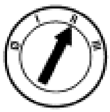
	then back to RUN. → **No** The system is OK.

PINPOINT TEST B: PATS IGNITION KEY TRANSPONDER SIGNAL IS NOT RECEIVED

NOTE: Large metallic objects, electronic devices on the key chain that can be used to purchase gasoline or similar items, or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key ring for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary concern if they are too close to the key during engine start. If a concern occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to make sure the encoded ignition key used by the customer is a Ford approved encoded ignition key (Rotunda is the only approved encoded ignition key).

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE DIAGNOSTIC TROUBLE CODES (DTCS)	
 ar Continuous PCM DTCs	
	
	
 rieve PCM Continuous DTCs	
	• **Is DTC B1600 retrieved?** → **Yes** GO to B2.

	→ **No** If other than PATS PCM DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. If no PATS DTCs are retrieved, the system is OK.
B2 INSTALL A NEW ENCODED IGNITION KEY	
NOTE: Check to make sure the customer and new encoded ignition keys are Ford approved, encoded PATS ignition keys. Unapproved PATS keys do not always operate correctly over different temperature ranges (Rotunda is the only approved encoded ignition key).	
	Cut a new encoded ignition key.
	Program the new encoded ignition key. Refer to Spare Key Programming in this section.
 ar PCM Continuous DTCs	
	
	
 rieve PCM Continuous DTCs	
	• **Is DTC B1600 present?** → **Yes** GO to B3. → **No** If other than PATS PCM DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. If no PATS DTCs are retrieved, the system is OK.
B3 INSTALL A NEW PATS TRANSCEIVER	
NOTE: When a new PCM is installed, the encoded ignition keys must be reprogrammed.	

	
	Install a new PATS transceiver. Refer to[Passive Anti-Theft System (PATS) Transceiver] in this section.
	
 ar Continuous DTCs	
	
	NOTE: Do not use the encoded ignition key that was programmed in Step B2. Turn the ignition to RUN using an existing customer encoded ignition key.
 rieve PCM Continuous DTCs	
	• **Is DTC B1600 retrieved?** → **Yes** GO to B4. → **No** The system is OK.
B4 CHECK FOR CORRECT PCM OPERATION	
	Disconnect all PCM connectors.
	Check for: • corrosion • pushed-out pins
	Connect all 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. REPROGRAM the encoded ignition keys. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST C: PATS RECEIVED INCORRECT KEY-CODE FROM IGNITION KEY TRANSPONDER

NOTE: The PCM disables the engine for 20 seconds every time DTC B1601 is set. The ignition must remain in the RUN position for at least 20 seconds before an attempt is made to start the vehicle with any encoded ignition key. Check the PCM PID ANTISCAN for this unprogrammed key timeout status.

NOTE: Large metallic objects, electronic devices on the key chain that can be used to purchase gasoline or similar items, or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key ring for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary concern if they are too close to the key during engine start. If a concern occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to make sure the encoded ignition key used by the customer is a Ford approved encoded ignition key (Rotunda is the only approved encoded ignition key).

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 RETRIEVE THE DIAGNOSTIC TROUBLE CODES (DTCS)	
 ar Continuous DTCs	
	
	

 rieve PCM Continuous DTCs	
	• **Is DTC B1601 retrieved?** → **Yes** GO to C2. → **No** System is OK. CHECK all customer encoded ignition keys by attempting to start the vehicle with each key to verify all other encoded ignition keys are programmed.
C2 CHECK FOR PROGRAMMED ENCODED IGNITION KEYS — MONITOR THE PCM PID NUMKEYS	
 nitor the PCM PID NUMKEYS	
	• **Does the PCM PID NUMKEYS display 8?** → **Yes** ERASE and REPROGRAM the key codes. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. → **No** GO to C3.
C3 CHECK THE NUMBER OF PROGRAMMED ENCODED IGNITION KEYS AVAILABLE	
	Verify there are at least two currently programmed encoded ignition keys available with the vehicle.
	• **Are at least two currently programmed encoded ignition keys available with the vehicle?** → **Yes** GO to C4. → **No** CUT a new encoded ignition key so that at least two encoded ignition keys are available. PROGRAM the encoded ignition keys. REFER to Spare Key Programming in this section. GO to C5 .

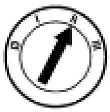
C4 VERIFY THE PCM PID SPARE_KY INDICATES YES	
	Monitor the PCM PID SPARE_KY.
	• **Does the PCM PID SPARE_KY indicate ENABLE?** → **Yes** Security access is enabled. REFER to Key Programming Using Two Programmed Keys in this section. CLEAR the DTCs. REPEAT the self-test. → **No** ENABLE the PCM PID SPARE_KEY. REFER to Key Programming Switch State Control in this section. CLEAR the DTCs. REPEAT the self-test.
C5 CHECK THE ENCODED IGNITION KEYS FOR CORRECT OPERATION	
	
	Turn the ignition switch to RUN for three seconds using the first encoded ignition key.
	
	Turn the ignition switch to RUN for three seconds using the second ignition key.
	Start the vehicle using the second encoded ignition key.
	• **Does the vehicle start?** → **Yes** The system is OK. If there are additional keys that need to be programmed, REFER to Key Programming Using Two Programmed Keys in this section. → **No** GO to C6.
C6 RETRIEVE THE DTCS — CHECK FOR DTC B1601	
NOTE: When a new PCM is installed, the encoded ignition keys must be reprogrammed.	
 ar PCM Continuous DTCs	

	
	
 rieve PCM Continuous DTCs	
	• **Is DTC B1601 retrieved?** → **Yes** GO to C7. → **No** If other than PATS PCM DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. If no PATS DTCs are retrieved, the system is OK.
C7 CHECK FOR CORRECT PCM OPERATION	
	Disconnect all PCM connectors.
	Check for: • corrosion • pushed-out pins
	Connect all 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. REPROGRAM the encoded ignition keys. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST D: PATS RECEIVED INVALID FORMAT OF KEY-CODE FROM IGNITION KEY TRANSPONDER

NOTE: Large metallic objects, electronic devices on the key chain that can be used to purchase gasoline or similar items, or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key ring for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary concern if they are too close to the key during engine start. If a concern occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to make sure the encoded ignition key used by the customer is a Ford approved encoded ignition key (Rotunda is the only approved encoded ignition key).

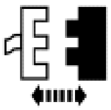
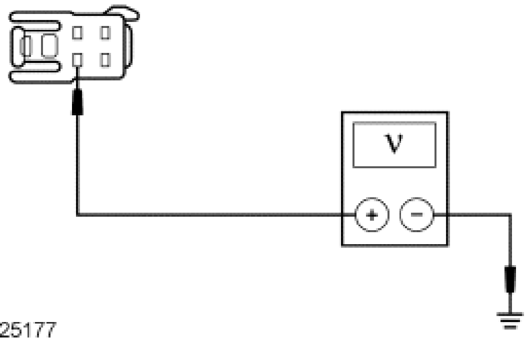
CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 RETRIEVE THE DTCS	
 ar Continuous DTCs	
	
	
 rieve PCM Continuous DTCs	
	• **Is DTC B1602 retrieved?** → **Yes** GO to D2. → **No** The system is OK. CHECK all customer encoded ignition keys by cycling them in the ignition switch and determining if the vehicle starts.
D2 INSTALL A NEW THE ENCODED IGNITION KEY	

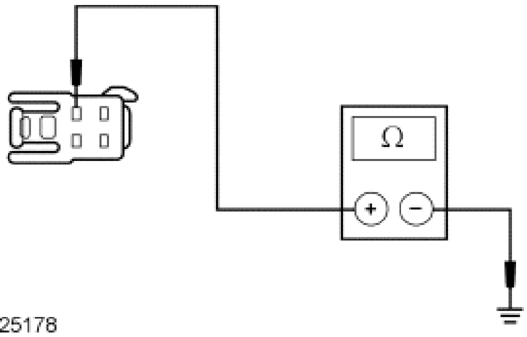
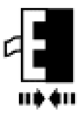
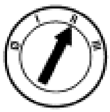
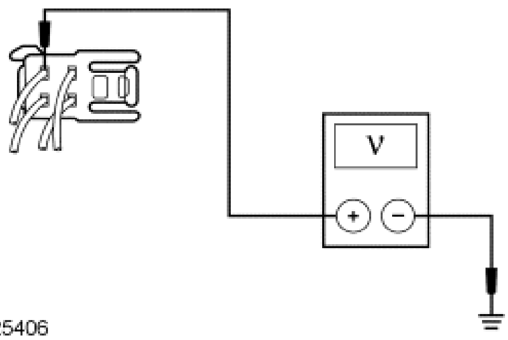
NOTE: Check to make sure the customer and new encoded ignition keys are approved encoded PATS ignition keys. Unapproved PATS keys do not always operate correctly over different temperature ranges (Rotunda is the only approved encoded ignition key).	
	Cut a new encoded ignition key.
	Program a new encoded ignition key. Refer to Spare Key Programming in this section.
	
	
 rieve PCM Continuous DTCs	
	• **Is DTC B1602 retrieved?** → **Yes** GO to D3. → **No** If other than PATS PCM DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. If no PATS DTCs are retrieved, the system is OK.
D3 INSTALL A NEW PATS TRANSCEIVER	
	
	Install a new PATS transceiver module. Refer to Passive Anti-Theft System (PATS) Transceiver in this section.
	
	

ar Continuous DTCs	
 rieve PCM Continuous DTCs	
	• **Are any PATS DTCs retrieved?** → **Yes** REFER to the Powertrain Control Module (PCM) Diagnostic Trouble Code (DTC) Index. → **No** The system is OK.

PINPOINT TEST E: PATS TRANSCEIVER MODULE SIGNAL IS NOT RECEIVED

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 RETRIEVE THE DTCS	
 ar PCM Continuous DTCs	
	
	
 rieve PCM Continuous DTCs	
	• **Is DTC B1681 retrieved?**

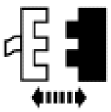
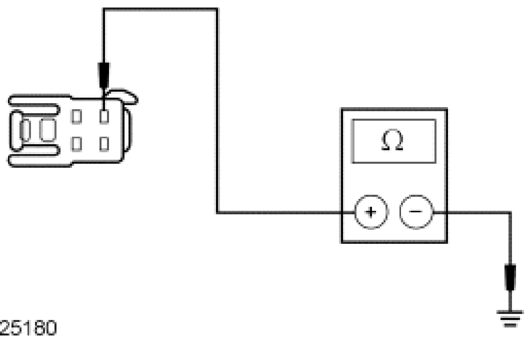
	→ **Yes** GO to E2. → **No** The system is OK.
E2 CHECK THE PATS TRANSCEIVER FOR VOLTAGE CIRCUIT 16 (RD/LG)	
	
 TS Transceiver C2097	
	
 A0025177	Measure the voltage between the PATS transceiver C2097 pin 2, circuit 16 (RD/LG), harness side and ground.
	• **Is the voltage greater than 10 volts?** → **Yes** GO to E3. → **No** REPAIR the supply circuit. CLEAR the DTCs. TEST the system for normal operation.
E3 CHECK THE PATS TRANSCEIVER GROUND CIRCUIT 570 (BK/WH) FOR AN OPEN	
	

 A0025178	Measure the resistance between the PATS transceiver C2097 pin 1, circuit 570 (BK/WH), harness side and ground.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to E4. → **No** REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.
E4 CHECK THE PATS TRANSCEIVER RECEIVE CIRCUIT FOR VOLTAGE CIRCUIT 1216 (GY/OG)	
 TS Transceiver C2097	
	
 A0025406	Measure the voltage by backprobing between the PATS transceiver C2097 pin 3, circuit 1216 (GY/OG), harness side and ground.

<table>
<tr><td></td><td>

- **Is the voltage greater than 9 volts?**

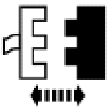
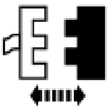
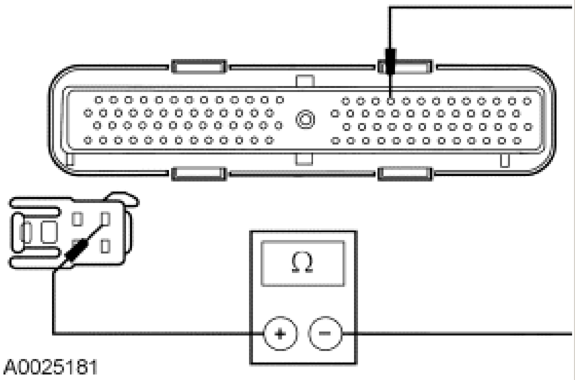
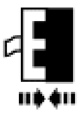
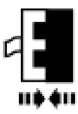
→ **Yes**
GO to E6.

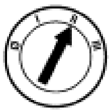
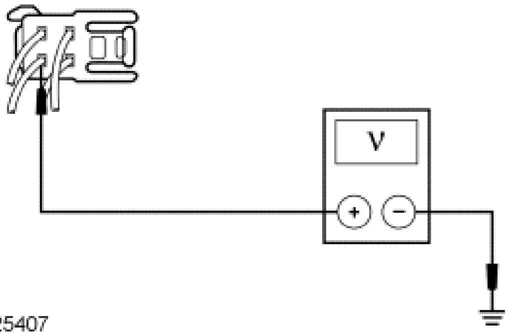
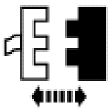
→ **No**
GO to E5.
</td></tr>
<tr><td colspan="2">E5 CHECK THE PATS TRANSCEIVER RECEIVE CIRCUIT FOR SHORT TO GROUND CIRCUIT 1216 (GY/OG)</td></tr>
<tr><td></td><td></td></tr>
<tr><td>
TS Transceiver C2097</td><td></td></tr>
<tr><td>
A0025180</td><td>Measure the resistance between PATS transceiver C2097 pin 3, circuit 1216 (GY/OG), harness side and ground.</td></tr>
<tr><td></td><td>

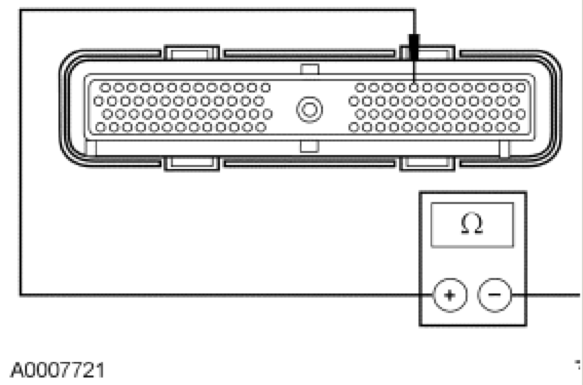
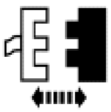
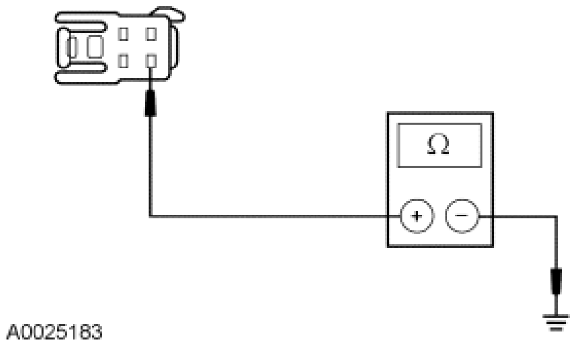
- **Is the resistance greater than 10,000 ohms?**

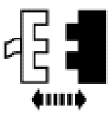
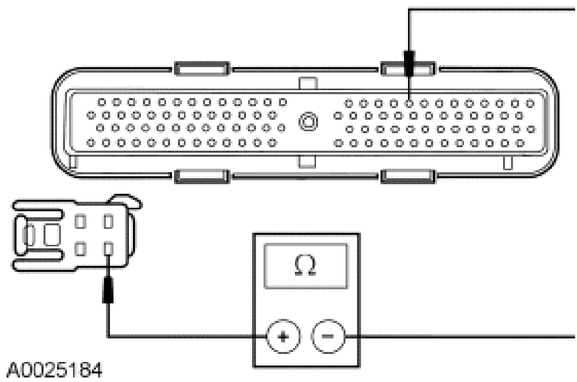
→ **Yes**
GO to E6.

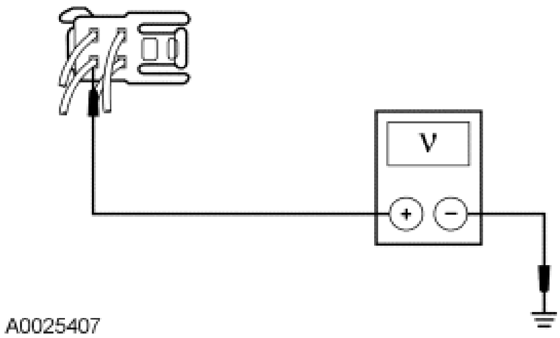
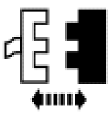
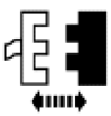
→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. If the system fails again, GO to E13 .
</td></tr>
<tr><td colspan="2">E6 CHECK CIRCUIT 1216 (GY/OG) FOR AN OPEN</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>

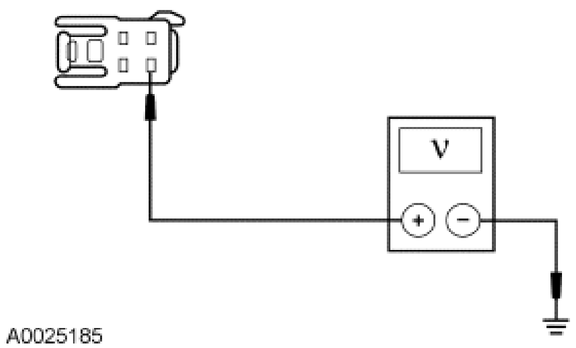
 TS Transceiver C2097	
 M C175	
	Measure the resistance between the PATS transceiver C2097 pin 3, circuit 1216 (GY/OG), harness side and the PCM C175 pin 17, circuit 1216 (GY/OG), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to E7. → **No** REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.
E7 CHECK THE PATS TRANSCEIVER TRANSMIT CIRCUIT FOR VOLTAGE CIRCUIT 1215 (WH/LG)	
	
 TS Transceiver C2097	
	

M C175	
	
 A0025407	Measure the voltage by backprobing between the PATS transceiver C2097 pin 4, circuit 1215 (WH/LG), harness side and ground.
	• **Is the voltage greater than 9 volts?** → **Yes** GO to E11. → **No** GO to E8.
E8 CHECK THE PATS TRANSCEIVER TRANSMIT CIRCUIT FOR SHORT TO GROUND CIRCUIT 1215 (WH/LG) TRANSCEIVER CONNECTED	
	
 M C175	
	Measure the resistance between the PCM C175 pin 18, circuit 1215 (WH/LG), harness side and ground.

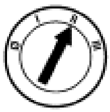
	
	• **Is the resistance greater than 10,000 ohms?** → **Yes** GO to E10. → **No** GO to E9.
E9 CHECK THE PATS TRANSCEIVER TRANSMIT CIRCUIT FOR SHORT TO GROUND CIRCUIT 1215 (WH/LG) TRANSCEIVER DISCONNECTED	
 TS Transceiver C2097	
	Measure the resistance between the PATS transceiver C2097 pin 4, circuit 1215 (WH/LG), harness side and ground.
	• **Is the resistance greater than 10,000 ohms?** → **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** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.
E10 CHECK THE PATS TRANSMIT CIRCUIT FOR AN OPEN CIRCUIT 1215 (WH/LG)	
NOTE: When a new PCM is installed, the encoded ignition keys must be reprogrammed.	
 TS Transceiver C2097	
 	Measure the resistance between the PATS transceiver C2097 pin 4, circuit 1215 (WH/LG), harness side and the PCM C175 pin 18, circuit 1215 (WH/LG), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** GO to E13. → **No** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.
E11 CHECK THE TRANSCEIVER TRANSMIT CIRCUIT FOR VOLTAGE CIRCUIT 1215 (WH/LG)	
	
	Select PCM active command TRANSMIT SIGNAL COMMAND.
	Trigger TRANSMIT to ON.
	Measure the voltage by back probing between the PATS transceiver C2097 pin 4, circuit 1215 (WH/LG), harness side and ground.

 	
	• **Is the voltage less than 5 volts?** → **Yes** INSTALL a new PATS transceiver. REFER toPassive Anti-Theft System (PATS) Transceiver in this section. CLEAR the DTCs. REPEAT the self-test. → **No** GO to E12.
E12 CHECK THE PATS TRANSCEIVER TRANSMIT CIRCUIT FOR A SHORT TO POWER	
NOTE: When a new PCM is installed, the encoded ignition keys must be reprogrammed.	
	
 M C175	
 TS Transceiver C2097	
	
	Measure the voltage between the PATS C2097 pin 4, circuit 1215 (WH/LG), harness side and ground.

 A0025185	
	• **Is voltage present?** → **Yes** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. → **No** GO to E13.
E13 CHECK FOR CORRECT PCM OPERATION	
	Disconnect all PCM connectors.
	Check for: • corrosion • pushed-out pins
	Connect all 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. REPROGRAM the encoded ignition keys. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

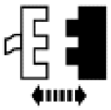
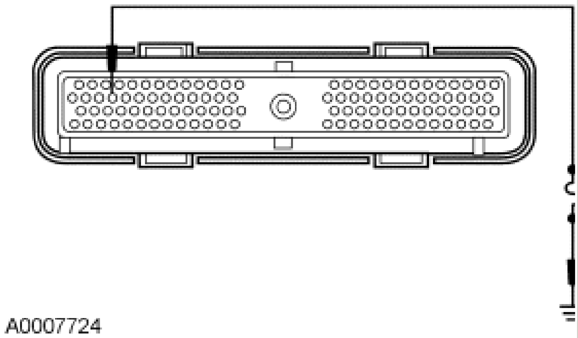
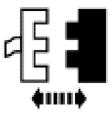
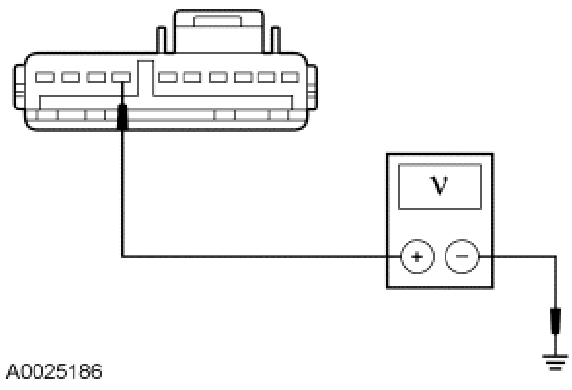
PINPOINT TEST F: ANTI-THEFT NUMBER OF PROGRAMMED KEYS IS BELOW MINIMUM

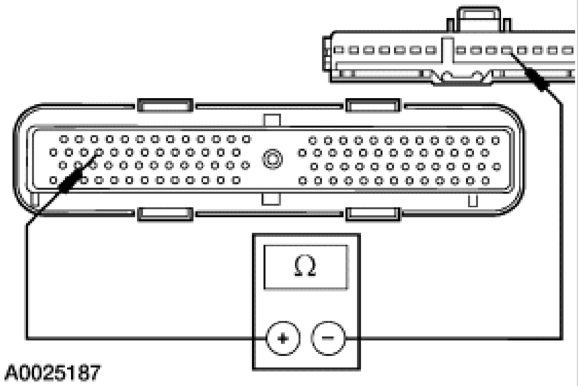
CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 RETRIEVE THE DTCS	
	
	Connect the diagnostic tool.
 rieve PCM Continuous DTCs	
 ar Continuous DTCs	
	
 rieve PCM Continuous DTCs	
	• **Is DTC B1213 retrieved?** → **Yes** GO to F2. → **No** If other than PATS PCM DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. If no PATS DTCs are retrieved, the system is OK.
F2 CHECK THE NUMBER OF KEYS ENCODED — MONITOR THE PCM PID NUMKEYS	
	Monitor the PCM PID NUMKEYS.

	• **Does the PCM PID NUMKEYS display less than two encoded ignition keys programmed?** → **Yes** GO to F3. → **No** The system is OK.
F3 PROGRAM ENCODED IGNITION KEYS	
	NOTE: Two programmed encoded ignition keys must be available to start the vehicle. Cut a new encoded PATS ignition lock cylinder key.
	PROGRAM the new encoded ignition key. REFER to Spare Key Programming in this section.
	• **Does the theft LED illuminate for three seconds and then go out?** → **Yes** CLEAR the DTCs. CYCLE the ignition OFF then back to RUN to verify all codes have been cleared. CLEAR the DTCs. REPEAT the self-test. → **No** GO to F4.
F4 CHECK FOR A REPAIR MODULE — MONITOR THE PCM PID SERV_MOD	
	Monitor the PCM PID SERV_MOD.
	• **Does the PCM PID SERV_MOD indicate YES?** → **Yes** PROGRAM the encoded ignition keys. REFER to Spare Key Programming in this section. CLEAR the DTCs. REPEAT the self-test. → **No** If the LED is illuminated continuously, REPEAT Step F3 using a new encoded ignition key. If the LED is flashing, RETRIEVE the PCM DTC stored for the new PATS fault.

PINPOINT TEST G: THE ANTI-THEFT INDICATOR IS ALWAYS/NEVER ON

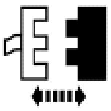
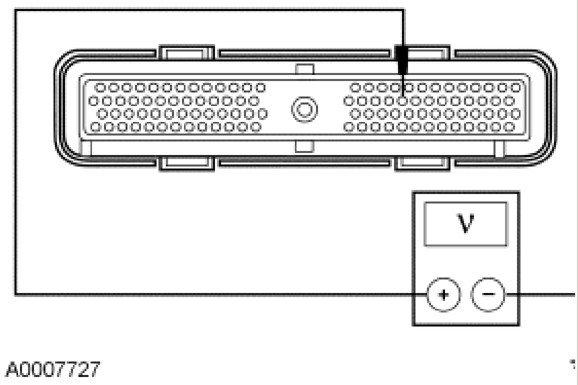
CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE ANTI-THEFT INDICATOR FOR CORRECT OPERATION	
NOTE: When a new PCM is installed, the encoded ignition keys must be reprogrammed.	
	

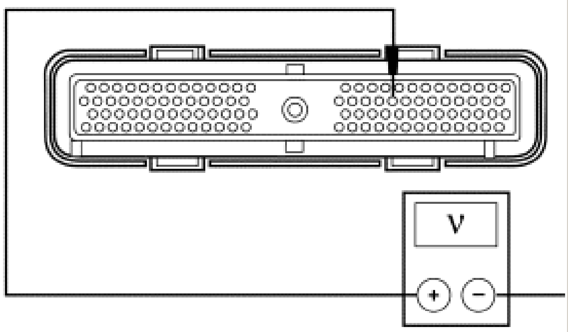
 M C175	
	Connect a fused (15A) jumper wire between the PCM C175 pin 30, circuit 343 (DB/LG), harness side and ground.
	• **Does the theft LED illuminate?** → **Yes** GO to G4. → **No** GO to G2.
G2 CHECK THE VOLTAGE TO THE ANTI-THEFT LED CIRCUIT 1001 (WH/YE)	
 rument Cluster C220c	
	Measure the voltage between the instrument cluster C220c pin 7, circuit 1001 (WH/YE), harness side and ground.

	• **Is the voltage greater than 10 volts?** → **Yes** GO to G3. → **No** REPAIR the supply circuit. TEST the system for normal operation.
G3 CHECK CIRCUIT 343 (DB/LG) FOR AN OPEN BETWEEN THE PCM AND THE INSTRUMENT CLUSTER	
	Measure resistance between the PCM C175 pin 30, circuit 343 (DB/LG), harness side and the instrument cluster C220a pin 6, circuit 343 (DB/LG), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** INSTALL a new anti-theft LED if necessary. REFER to Section 413-01. → **No** REPAIR the circuit in question. TEST system for normal operation.
G4 CHECK FOR CORRECT PCM OPERATION	
	Disconnect all PCM connectors.
	Check for: • corrosion • pushed-out pins
	Connect all 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.

	REPROGRAM the encoded ignition keys. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST H: THE VEHICLE DOES NOT START

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE STARTING SYSTEM FOR CORRECT VOLTAGE	
	
 M C175	
	
	Measure the voltage between the PCM C175 pin 44, circuit 325 (DB/OG), harness side and ground.
	• **Is the voltage less than 8 volts?** → **Yes** DIAGNOSE the starting system. REFER to Section 303-06. → **No**

	GO to H2.
H2 CHECK THE STARTING SYSTEM GROUND	
NOTE: When a new PCM is installed, the encoded ignition keys must be reprogrammed.	
 A0007727	Measure the voltage between the PCM C175 pin 44, circuit 325 (DB/OG), harness side and ground.
	• **Is the voltage less than 2 volts?** → **Yes** DIAGNOSE the starting system. REFER to Section 303-06. → **No** GO to H3.
H3 CHECK FOR CORRECT PCM OPERATION	
	Disconnect all PCM connectors.
	Check for: • corrosion • pushed-out pins
	Connect all 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. REPROGRAM the encoded ignition keys. REFER to Key Programming Using Diagnostic Equipment in this section. CLEAR the DTCs. REPEAT the self-test. → **No** The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

Key Programming Using Two Programmed Keys

NOTE: This procedure only works if two or more programmed ignition keys are available and it is desired to program additional key(s). If two keys are not available, follow the procedure in Key Programming Using Diagnostic Equipment in this section.

NOTE: PID SPARE_KY must be enabled for this procedure to operate. If this PID is not enabled, follow the security access procedure above and select SPARE KEY PROGRAMMING SWITCH: ENABLED.

NOTE: If the programming procedure is successful, the new key(s) will start the vehicle and the THEFT indicator will illuminate for approximately three seconds.

NOTE: If the programming procedure is not successful, the new key(s) will not start the vehicle and the THEFT indicator will flash. If the programming procedure was not successful leave the ignition switch in the RUN position for at least 30 seconds then repeat the key programming procedure from Step 1. If the failure repeats, refer to Diagnosis and Testing to review the DTCs and carry out pinpoint tests as necessary.

NOTE: A maximum of eight ignition keys can be programmed to a passive anti-theft system (PATS) equipped vehicle. If more are needed, refer to Key Programming Switch State Control in this section.

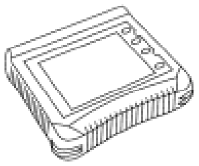
NOTE: If the steps are not carried out as described, the programming procedure will end.

NOTE: Ignition keys must have correct mechanical key cut for the vehicle and must be a PATS encoded key.

NOTE: If the vehicle is in unlimited key mode, this spare programming procedure still functions. Any two keys that can start the vehicle may be used to program in an additional unlimited key.

1. Insert the first programmed ignition key into the ignition lock cylinder and turn the ignition switch from OFF to RUN (maintain the ignition switch in RUN for three seconds).
2. Turn the ignition switch to OFF and remove the first key from the ignition lock cylinder.
3. Within seconds of turning the ignition switch to OFF, insert the second programmed ignition key into the ignition lock cylinder and turn the ignition switch from OFF to RUN (maintain the ignition switch in RUN for three seconds).
4. Turn the ignition switch to OFF and remove the second key from the ignition lock cylinder.
5. Within 20 seconds of turning the ignition lock cylinder to OFF, insert the unprogrammed ignition key (new key) into the ignition lock cylinder and turn the ignition switch from OFF to RUN (attempt to start the vehicle).
6. If it is desired to program additional key(s), repeat the key programming procedure from the beginning.

Key Programming Using Diagnostic Equipment

Special Tool(s)	
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224 New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool

NOTE: This procedure is used when a customer needs keys programmed into the system and does not have two programmed ignition keys available. This procedure is also useful when programmed ignition key(s) have been lost or a new ignition switch assembly as been installed, and it is desired to erase key(s) from the passive anti-theft system (PATS) memory.

NOTE: This procedure will erase all programmed ignition keys from the vehicle memory and the vehicle will not start until two keys have been reprogrammed to the vehicle.

NOTE: Two PATS encoded keys with the correct mechanical cut must be available to carry out this procedure. One or both of them may be the customer's original keys.

NOTE: If additional keys are to be programmed, refer to Key Programming Using Two Programmed Keys. If the remaining keys are with the customer and are not available with the vehicle, then instruct the customer to refer to the Owner's Guide under the "Programming Spare (SecuriLock ® North America, Safeguard ® U.K. or PATS for all other markets) Keys Procedure" for instructions on programming the remaining keys.

1. Turn the ignition switch from OFF to RUN.
2. Using the diagnostic tool, follow the SECURITY ACCESS to obtain security access. For additional information, refer toAnti-Theft Security Access procedure in this section.
3. From the diagnostic tool menu, select IGNITION KEY CODE ERASE.
4. **NOTE:** Do NOT select any additional commands from this menu.

   Turn the ignition switch to OFF and disconnect the diagnostic tool.
5. Insert the first encoded key into the ignition lock cylinder and turn the ignition switch to RUN for three seconds.
6. Insert the second encoded key into the ignition lock cylinder and turn the switch to the RUN position for three seconds.
7. Remove the second encoded key from the ignition lock cylinder.
8. The vehicle should now start with both ignition keys.

Key Programming Switch State Control

Special Tool(s)	
	Worldwide Diagnostic System (WDS) 418-F224 New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool

NOTE: The spare key programming switch is a diagnostic tool programmable switch which provides the capability to enable/disable the customer spare key programming procedure. This procedure is in the Owner's Literature spare key programming procedure or in this section under Key Programming Using Two Programmed Keys. This programmable switch is provided as a convenience for customers who may not want the spare key programming procedure available to the vehicle driver.

NOTE: The spare key programming switch state can be viewed by VIC PID SPARE_KY.

1. Insert a programmed ignition key into the ignition lock cylinder and turn the ignition switch to RUN.

2. Using the diagnostic tool Ford Service Function (FSF) card, select PCM from the menu. Follow SECURITY ACCESS to obtain security access. For additional information, refer to Anti-Theft Security Access procedure in this section.

3. **NOTE:** The default setting on delivery of all new vehicles is ⟨ENABLE>.

   From the diagnostic tool menu, select SPARE KEY PROGRAMMING SWITCH selection to desired setting:
   ⟨ENABLE> Spare key programming procedure is accessible.
   ⟨DISABLE> spare key programming procedure is not accessible.

Unlimited Key Mode Programming

Enabling Unlimited Key Mode

NOTE: Unlimited Key Mode is intended for use by those customers who need more than eight keys for their vehicle.

1. The customer must choose a 4-digit, non-0000 number that will be programmed to all of their vehicles. All customer vehicles need to use the same number. Valid digits are 0-9 plus the letters A-F.

2. Note: If the PID: UNLIMITED TRANSPONDER KEY ID is not available, Unlimited Key Mode is turned on, and must be turned off before viewing the stored code. At this time, unlimited keys may be programmed to the vehicle. To view/change the stored code, follow the procedure for turning off Unlimited Key Mode below. Check the PID: UNLIMITED TRANSPONDER KEY ID and compare its value against the code chosen in Step 1.

3. Using the diagnostic tool, select PCM from the menu. Follow SECURITY ACCESS to obtain security access. For additional information, refer to Anti-Theft Security Access in this section.

4. If the Unlimited Transponder Security Key PID was 0000, select Active Command: SET UNLIMITED TRANSPONDER KEY. Enter the 4-digit code chosen by the user.

5. Select: ENABLE UNLIMITED KEY MODE.

6. Select: IGNITION CODE ERASE.

7. Disconnect the diagnostic tool and turn the ignition keys off.

8. Program in two ignition keys to enable the vehicle.

9. Program any additional keys using either Key Programming Using Two Programmed Keys or Key Programming Using Diagnostic Equipment in this section.

Disabling Unlimited Key Mode

1. Using a diagnostic tool, select PCM from the menu. Follow SECURITY ACCESS to obtain security access. For additional information, refer to Anti-Theft Security Access in this section.

2. Select: DISABLE UNLIMITED KEY MODE.

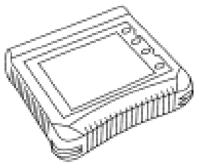
3. Select: IGNITION KEY CODE ERASE.

4. Disconnect the diagnostic tool and turn the ignition key to OFF.

5. Program in two keys to enable the vehicle.

6. Program any additional keys using either Key Programming Using Two Programmed Keys or Key Programming Using Diagnostic Equipment in this section.

Spare Key Programming

Special Tool(s)	
	Worldwide Diagnostic System (WDS) 418-F224 New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool

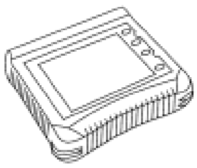
NOTE: This procedure is used when a customer needs to have an additional key programmed into the vehicle without erasing stored key codes, but does not have two programmed keys available. This procedure is also useful when attempting to determine if an ignition key is defective, as a new key can be installed without erasing keys or without having two programmed keys available.

NOTE: Before programming, the new key must have the correct mechanical cut for the ignition lock.

NOTE: If eight keys are already programmed, this procedure will not allow any further ignition keys to be programmed without erasing all stored key codes first. The number of keys programmed into the system can be determined using the PID NUMKEYS.

1. Turn the ignition switch from the OFF position to the RUN position using the new, unprogrammed ignition key.
2. Using the diagnostic tool Ford Service Function (FSF) card, select PCM from the menu. Follow Security Access to obtain security access. For additional information, refer to Anti-Theft Security Access in this section.
3. From the diagnostic tool menu select: IGNITION KEY CODE PROGRAM.
4. Turn the ignition switch to the OFF position and disconnect the diagnostic tool.
5. Attempt to start the engine with the new ignition key. The vehicle engine should start and run normally.

Anti-Theft Security Access

Special Tool(s)	
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224 New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool

NOTE: The security access procedure is utilized to obtain passive anti-theft system (PATS) security access. PATS security access must be granted to erase ignition keys, enable/disable unlimited key mode, and enable/disable the spare key programming switch (PID SPARE_KEY). The security access procedure invokes an inherent 10 minute time delay prior to granting security access during which the diagnostic tool must remain connected to the vehicle. Once security access has been granted, a security access command menu is displayed which offers various command options. (For additional information, refer to Powertrain Control Module (PCM) Configuration Command Index).

NOTE: Once security access has been granted, multiple security access commands should be executed (if necessary) prior to exiting the command menu. This avoids the carrying out of an additional security access procedure and the associated 10 minute time delay.

1. From the diagnostic tool Ford Service Function (FSF) card, enter PCM. Select SECURITY ACCESS. This procedure will take 10 minutes to carry out, during which the ignition switch must be in RUN and the diagnostic tool must be connected to the vehicle.

2. After the 10 minute security access procedure has been completed, a new menu will be displayed with command options. Select only those functions necessary before exiting out of this menu. Once exited out of this menu, the security access procedure must be repeated again to carry out additional commands.

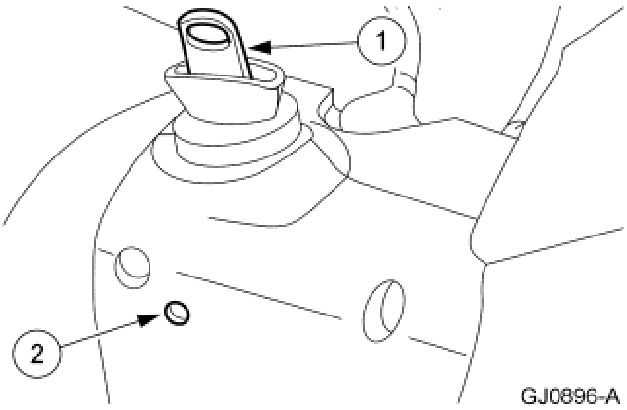
Passive Anti-Theft System (PATS) Transceiver

Removal

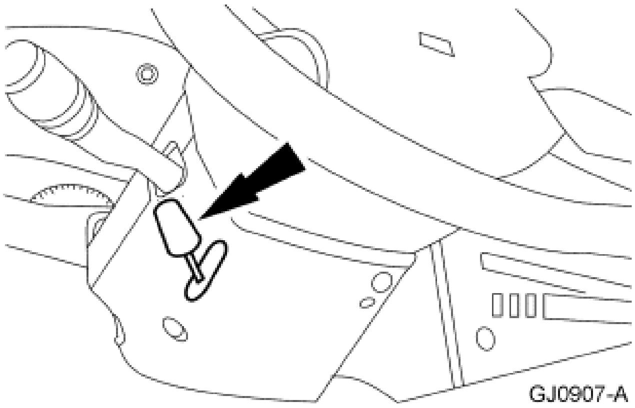
1. Disconnect the battery ground cable. For additional information, refer toSection 414-01.

2. Remove the ignition switch lock cylinder.
    1. Insert the ignition key into the ignition switch lock cylinder and turn to the RUN position.

    2. Push the ignition switch lock cylinder release tab with a punch while pulling out the ignition switch lock cylinder.

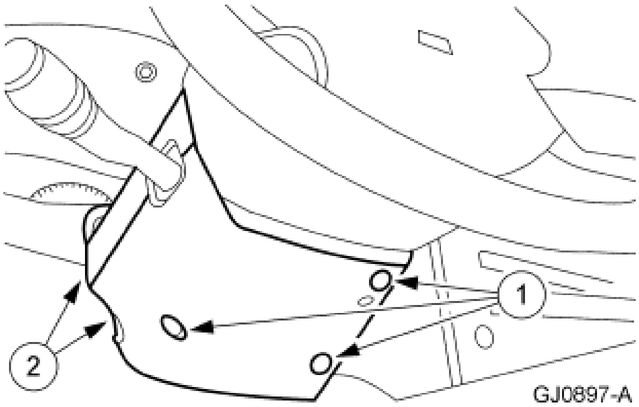


3. If equipped, remove the tilt wheel handle.



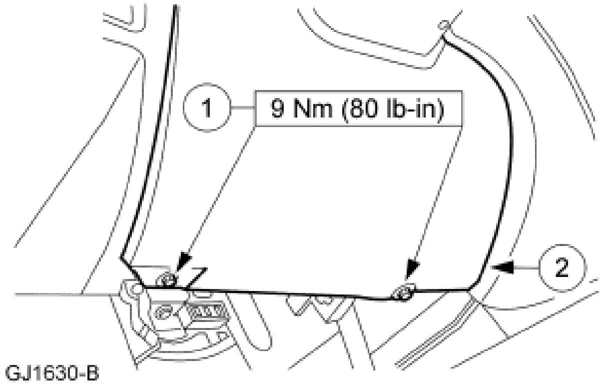
4. Remove the upper and lower steering column shrouds.
    1. Remove the screws.

    2. Remove the upper and lower steering column shroud.



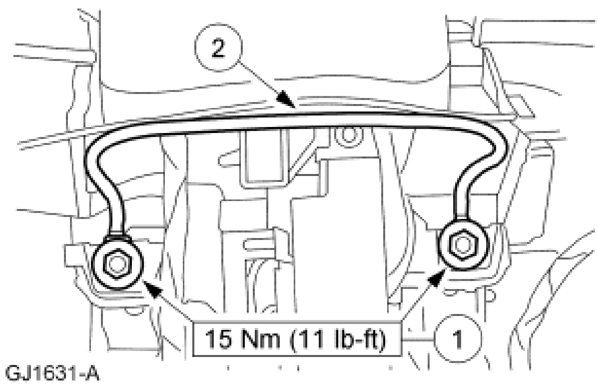
5. Remove the lower instrument panel steering column cover.
    1. Remove the screws.

    2. Remove the lower instrument panel steering column cover.



6. Remove the instrument panel steering column opening cover reinforcement.
    1. Remove the bolts.

    2. Remove the instrument panel steering column opening cover reinforcement.



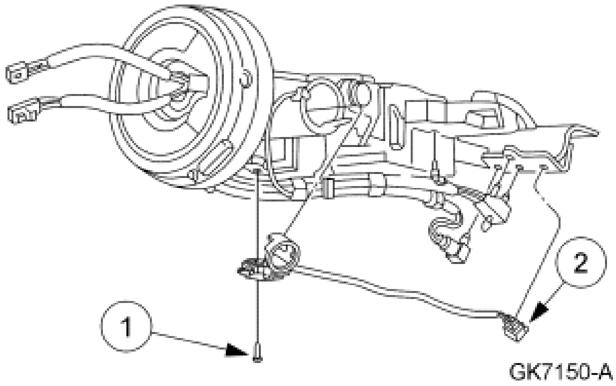
7. **NOTE:** The steering wheel has been removed for clarity.

    Remove the anti-theft transceiver module.

    1. Remove the screw from the bottom of the transceiver module.

2. **NOTE:** Only apply pressure or leverage below the key cylinder lower rib.

Disconnect the electrical connector and remove the module.



8. To install, reverse the removal procedure.

2002 Ranger Contents/Index

GROUP 01: Body

SECTION 501-20B:
Supplemental Restraint System

GENERAL PROCEDURES

Supplemental Restraint System (SRS) Depowering and Repowering

Supplemental Restraint System (SRS) Deactivation and Reactivation

Inspection and Repair After a Supplemental Restraint System (SRS) Deployment

Pyrotechnic Device Disposal

Disposal of Deployable Devices and Pyrotechnic Devices That Are Undeployed/Inoperative

Disposal of Deployable Devices and Pyrotechnic Devices That Are Deployed

Disposal of Deployable Devices and Pyrotechnic Devices That Require Manual Deployment

Driver Air Bag Module, Passenger Air Bag Module and Seat Side Air Bag Modules — Remote Deployment

Safety Belt Buckle Pretensioners, Safety Belt Retractor Pretensioners and Adaptive Load Limiting Safety Belt Retractors — Remote Deployment

Safety Belt Buckle Pretensioners, Safety Belt Retractor Pretensioners and Load Limiting Safety Belt Retractors — In-Vehicle Deployment

Safety Canopy Modules and Side Air Curtain Modules — In-Vehicle Deployment

Deployable Steering Column — In-Vehicle Deployment

Weld Nut Repair — 'J' Nut, Restraints Control Module (RCM)

Weld Nut Repair — Missing Weld Nut, Restraints Control Module (RCM)

Weld Nut Repair — Stripped Weld Nut, Restraints Control Module (RCM)

REMOVAL AND INSTALLATION

Restraints Control Module (RCM)

Driver Air Bag Module

Passenger Air Bag Module

Clockspring

Passenger Air Bag Deactivation (PAD) Switch

Torque Specifications

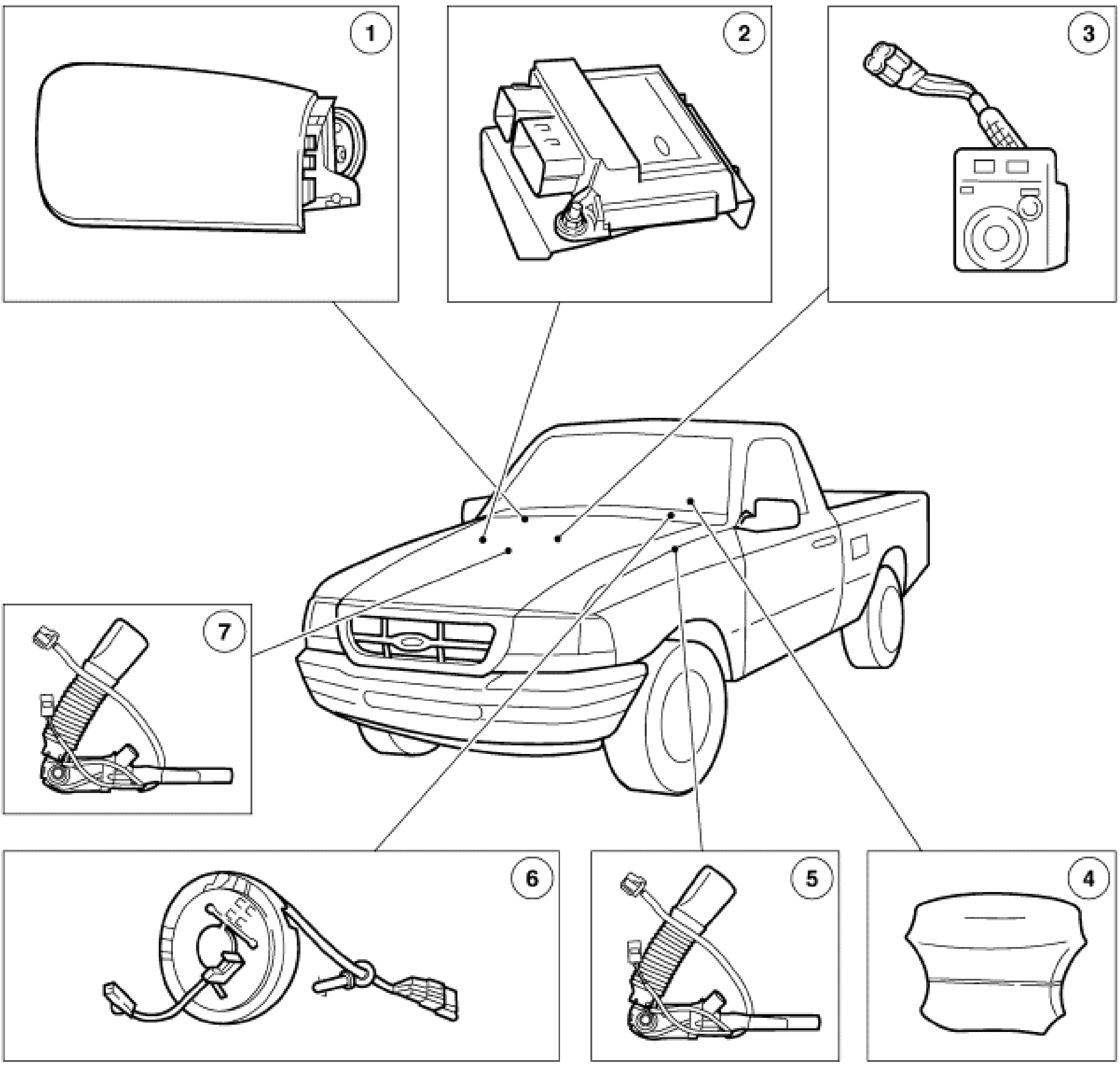
Description	Nm	lb-ft	lb-in
Restraints control module (RCM) bolts	12	9	—
Driver air bag module bolts	9	—	80
Passenger air bag module bolts	7.6-10.4	—	67-92
Lower steering column opening finish panel reinforcement	12	9	—
Ash receptacle retaining bolts	3	—	27
Crash sensor grounding screw (N802455-S190) (Weld nut repair screw [8 mm (0.32 in)])	12	9	—
Grounding screw 6 mm (0.24 in) (N806327-S190)	12	9	—

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

The air bag supplemental restraint system (SRS) is designed to provide increased collision protection for front seat occupants in addition to that provided by the three-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 air bag supplemental restraint system (SRS) components are shown in the following illustration.

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) Components



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Item	Part Number	Description
1	044A74	Passenger air bag module
2	14B321	Restraints control module (RCM)
3	14B268	Passenger air bag deactivation (PAD) switch
4	043B13	Driver air bag module
5	16203	Driver safety belt buckle and pretensioner
6	14A664	Clockspring
7	16203	Passenger safety belt buckle and pretensioner

Driver Air Bag Module

The driver air bag module:

- is steering wheel mounted.
- will deploy upon receiving a signal from the restraints control module (RCM).

Clockspring

The clockspring:

- is mounted on the steering column, behind the steering wheel.
- provides a continuous electrical path from the driver air bag module to the restraints control module (RCM).

Passenger Air Bag Module

The passenger air bag module:

- is installed as an assembly.
- is mounted in the RH side of the instrument panel.

Passenger Air Bag Deactivation (PAD) Switch

The passenger air bag deactivation (PAD) switch:

- is located on the LH side of the instrument panel ash receptacle.
- contains a light emitting diode (LED) that indicates when the PAD switch is activated (air bag disabled).
- allows the passenger air bag deployment circuit to be disabled using the ignition key.
- should be used whenever a child safety seat is being used in the front passenger seating position.

Safety Belt Pretensioners

NOTE: There is no restraint system diagnostic tool for the safety belt buckle pretensioners. If the ignition switch is set to RUN or START with the safety belt buckle pretensioner electrical connector(s) disconnected, the DTC for an open circuit will be activated.

As part of the supplemental restraint system (SRS), the safety belt buckles are equipped with pretensioners. The safety belt buckle pretensioners remove excess slack from the safety belt webbing. The pretensioners are activated by the restraints control module (RCM) when the module detects a crash event force exceeding a programmed limit.

Safety Belt Switches

As part of the supplemental restraint system (SRS), the driver safety belt buckle is equipped with switches. The driver safety belt switch indicates to the restraints control module (RCM) whether the driver safety belt is connected or disconnected.

Restraints Control Module (RCM)

The restraints control module (RCM) is mounted on the center tunnel under the instrument panel. The RCM performs the following functions:

- signals the inflators to deploy the air bags in the event of a deployable crash.
- activates the safety belt buckle pretensioners to remove slack from the safety belt.
- monitors the air bag supplemental restraint system (SRS) for faults.
- illuminates the air bag indicator if a fault is detected.
- flashes the air bag indicator to indicate the lamp fault code (LFC) detected.
- communicates through the data link connector (DLC) the current or historical diagnostic trouble codes (DTCs).
- signals the generic electronic module (GEM) to activate a chime if the air bag indicator is not available and another SRS fault exists.
- contains an internal safing sensor which is not serviced separately.

The RCM monitors the SRS for possible faults. If a fault is detected while the ignition switch is in the RUN position, the RCM will illuminate the air bag indicator located in the instrument cluster.

When the ignition is cycled (turned off and then on), the air bag indicator will remain lit for six seconds and then go out. If an SRS fault exists, the air bag indicator will then flash the two-digit LFC. The air bag indicator will flash the LFC five times, then it will remain illuminated for the rest of the key cycle. The RCM will also communicate the current and historical DTCs through the data link connector (DLC), using the scan tool. If the air bag indicator does not function, and the system detects a fault condition, the RCM will signal the GEM to activate an audible chime. The chime is a series of five sets of five tone bursts. If the chime is heard, the SRS and the air bag indicator require repair.

LFCs are prioritized. If two or more faults occur at the same time, the fault having the highest priority will be displayed first. After that fault has been corrected, the next highest priority fault will be displayed.

The RCM includes a backup power supply. This feature provides sufficient backup power to deploy the air bags in the event that the ignition circuit is damaged in a collision before the safing and air bag sensors determine that an air bag deployment is required. The backup power supply will deplete its stored energy approximately one minute after the battery ground cable is disconnected.

Electrical System

The electrical system that supports the air bag supplemental restraint system (SRS):

- is powered by the battery through the ignition circuit.
- provides the electrical path from the restraints control module (RCM) to the SRS components.
- provides the electrical path from the RCM to the air bag indicator.
- provides the electrical path from the RCM to the data link connector (DLC).
- provides the electrical path from the RCM to the instrument cluster.

Impact Sensors

WARNING: The restraints control module (RCM) orientation is critical for correct system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) has been involved in a collision in which the center tunnel area has been damaged, inspect the mounting and bracket for deformation. If damaged, the RCM must be replaced whether or not the air bags have deployed. In addition, make sure the area of the RCM mounting is restored to its original condition.

For this vehicle the SRS employs two impact sensors which are integral to the RCM and are not separately serviceable. The RCM is mounted on the center tunnel under the instrument panel. Mounting orientation is critical for correct operation of all impact sensors.

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

Refer to Wiring Diagrams Cell 46, Air Bags for schematic and connector information.

Restraint System Diagnostic Tool Warning

WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.

Diagnosing Customer Concerns Without Hard DTCs

If a lamp fault code (LFC) is reported by the customer but is not present when the vehicle comes in for service, follow the Diagnostic Instruction procedures in this section to identify the intermittent DTC.

Once the DTC is known, read the Normal Operation section of the pinpoint test for the DTC involved.

- Follow the deactivation or depowering procedure as directed in this section.
- Determine the location of components involved in creating the DTC.
- Carry out a thorough visual inspection of:
  - components.
  - connectors.
  - splices and wiring harnesses.
  - insulation on conductors.

Refer to the Possible Causes section of the pinpoint test for the DTC involved, which lists the common concerns that relate to the DTC. Concerns are listed according to priority.

Diagnosing Customer Concerns with Hard DTCs

Most Supplemental Restraint System (SRS) diagnostic procedures will require deactivation and reactivation or depowering and repowering of the system. Deactivation and reactivation requires the disconnection of most SRS components and the installation of restraint system diagnostic tools. Depowering and repowering requires disconnecting of the battery and removal of the restraints control module (RCM) fuse. This reduces the risk of inadvertent deployment of SRS components while diagnostic procedures are being carried out.

Restraint system diagnostic tools are required for the diagnosis and testing of the SRS. It is not acceptable to short-circuit the air bag module connections with a jumper wire. If a jumper wire is used to short-circuit the air bag module connections, a lamp fault code (LFC) will be displayed.

Prove Out Procedure

Turn the ignition switch from the OFF to the ON position and visually monitor the air bag indicator with all SRS components connected or restraint system diagnostic tools installed. The air bag indicator will light continuously for approximately six seconds and then turn off. If an SRS fault is present, the air bag indicator will either:

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

The flashing might not occur 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 restraints control module (RCM) to complete the testing of the SRS. If the air bag indicator is inoperative and an SRS fault exists, a chime will sound in a pattern of five sets of five beeps. If this occurs, the air bag indicator will need to be repaired before diagnosis can continue.

Glossary

Secondary Air Bag Warning

The secondary air bag warning is an audible fault format that consists of five sets of five tone bursts, with each set of five tone bursts separated by a five second quiet period. One tone burst cycle will consist of one second ON and one second OFF. This series of five activations is repeated every 30 minutes.

Air Bag/Pretensioner Restraint System Diagnostic Tools

Air bag/pretensioner restraint system diagnostic tools are used to simulate the equivalent resistance of an air bag module or safety belt pretensioner during certain diagnostic procedures.

Disconnect the Component

Disconnect the component means to disconnect the component vehicle harness connector, not to remove the component. Do not reconnect a disconnected component unless instructed to do so.

Deactivate the System

Deactivate the system means to carry out a deactivation procedure. For additional information, refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.

Depower the System

Depower the system means to disconnect the battery and remove the restraints control module (RCM) fuse. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

Prove Out the System

Prove out the system means to turn the ignition switch from the OFF to the ON position, and to visually monitor the air bag indicator with the air bag modules and safety belt pretensioners or restraint system diagnostic tools installed. For additional information, refer to Prove Out Procedure in this section.

Reactivate the System

Reactivate the system means to carry out the reactivation procedure. For additional information, refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.

Repower the System

Repower the system means to remove any restraint system diagnostic tools that may have been installed, turn the ignition ON, install the RCM fuse, and connect the battery ground cable. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

Reconnect the System

Reconnect the system means to reconnect all system components. For additional information, refer to Air Bag System Reconnect Checklist in this section.

Install a New Component

Install a new component means to remove the existing component and install a new authorized part obtained from Ford Customer Service Division.

Verify the System

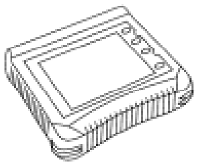
Verify the system means to prove out the system with restraint system diagnostic tools installed in place of the SRS components.

Air Bag System Reconnect Checklist

The checklist below should be completed following diagnosis or repair of any air bag system concern.

1. Is the connector at the base of the steering column connected?
2. Are the air bag modules connected?
3. Is the restraints control module (RCM) connected?
4. Is the vehicle battery connected?

Diagnostic Instructions — Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

Special Tool(s)	
 ST2332-A	Worldwide Diagnostic System (WDS) 418-FS317 New Generation STAR (NGS) Tester 418-F052 or equivalent scan tool

The symptom chart can be used to help locate the air bag supplemental restraint system (SRS) concerns if no diagnostic trouble codes (DTCs) are retrieved and the listed symptoms are observed. Whether or not the listed symptoms are observed, always perform the following.

1. Retrieve all DTCs stored in the restraints control module (RCM) memory. Refer to Retrieve/Clear Continuous DTCs in this section.
2. Run the On-Demand Self Test to determine what DTCs are currently being sensed by the restraints control module (RCM) (14B321). Refer to On-Demand Self Test in this section.
3. If the stored DTCs are different than the current DTCs, always repair the current DTCs first.
4. If memory displays different continuous DTCs than the On-Demand Self-Test, perform in the following order:

- On-Demand Self-Test.
- Memory (Retrieve/Clear Continuous DTCs).

A DTC can indicate several concerns. The DTCs are to assist in system diagnosis and are not to be considered definitive. Always refer to the pinpoint test corresponding to the DTC to determine where the concern lies and to repair the concern correctly.

The SRS diagnostics can be divided into three sections.

- Diagnostic test modes
- PID/data monitor and record
- Active command modes

Diagnostic Test Modes

Two menu options are available under the diagnostic test modes.

- Retrieve/Clear Continuous DTCs.
- On-Demand Self Test.

Retrieve/Clear Continuous DTCs

During vehicle operation, the restraints control module (RCM) will detect and store both intermittent and hard fault DTCs in nonvolatile memory. The DTC strategy employed by the RCM incorporates a time-out scheme for determining when a concern exists in the system. This requires a concern to exist for up to one minute in the system before the RCM will detect it. For the RCM to determine that a concern no longer exists, the concern must be absent for up to one minute. The actual detection time-outs vary with each DTC. The DTCs can be retrieved with the scan tool. Any DTCs stored in the RCM will be displayed on the scan tool along with a brief description of the DTC. If no DTCs are present, the scan tool will display a SYSTEM PASSED message. This option can also be used to clear DTCs from the RCM memory, as long as the concern no longer exists. Once 256 key cycles have been recorded since the concern was last detected, the DTC will automatically be removed from memory.

To retrieve or clear DTCs, follow these steps.

1. Connect the scan tool to the data link connector (DLC).
2. Turn the ignition switch to the RUN position.
3. Follow manufacturer's instructions for the scan tool being used.
4. All continuous DTCs will be displayed on the screen. Before proceeding with the clearing operation, make note of the DTCs displayed because, once cleared, they cannot be retrieved.
5. The scan tool will retrieve DTCs again after clearing DTCs and, if any remain, they will be displayed. Hard DTCs will be redisplayed after clearing DTCs since they cannot be cleared from the RCM.

On-Demand Self Test

The On-Demand Self Test option is used to verify that no electrical concerns exist with the air bag supplemental restraint system (SRS). Upon entering the self test, the restraints control module (RCM) will make an electrical check of each electrical component in the system. If a concern is detected, a DTC is displayed on the scan tool with a brief description of the DTC. Concerns detected during the self test are not stored in memory, unless the same concern was also detected during normal vehicle operation. The self test should always be run after any repair to verify that the repair was successful.

To run the On-Demand Self Test, follow these steps:

1. Connect the scan tool to the data link connector (DLC).
2. Turn the ignition switch to the RUN position.
3. Follow manufacturer's instructions for the scan tool being used.
4. The RCM will run the On-Demand Self Test and display on-demand DTCs (reflecting hard system concerns) on the screen.

PID/Data Monitor and Record

The PID/Data Monitor and Record option allows the scan tool operator to read the state of several parameter IDs (PIDs) to aid in diagnosing the system. PIDs are real time measurements of parameters such as voltages, resistances, etc., calculated by the restraints control module (RCM) and sent to the scan tool for display. Many of the PIDs supported by the RCM are calculated periodically and are, therefore, not true real time readings. The following is a table of supported PIDs, expected range and units of measurement.

To retrieve PIDs, follow these steps:

1. Connect the scan tool to data link connector (DLC).
2. Turn the ignition switch to the RUN position.
3. Follow manufacturer's instructions for the scan tool being used.
4. PIDs are continuously updated on the display.

Active Commands

This command allows the technician to verify operation of the air bag indicator, passenger air bag deactivation (PAD) lamp and chime. When the air bag output command is executed, the indicator, the PAD lamp, chime and the chime are activated simultaneously for approximately four seconds. All devices are deactivated automatically.

Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table

DTC[a]	LFC[b]	Fault Priority	Description	Action To Take
—	Continuous	1	RCM Disconnected or Inoperative, Loss of Battery Feed, or Loss of Signal Ground	GO to Pinpoint Test A.
B1342	24	2	RCM is Faulted	INSTALL a new RCM.
B1231	19	3	RCM Crash Data Memory Full	INSTALL a new RCM.
B1921	21	4	RCM Bracket Ground Resistance High	GO to Pinpoint Test B.
C1414	15	5	Incorrect Vehicle ID	GO to Pinpoint Test C.
B1887	15	6	Driver Air Bag Circuit Shorted to Ground	GO to Pinpoint Test D.
B1916	15	7	Driver Air Bag Circuit Shorted to Battery or Ignition	GO to Pinpoint Test E.
B1888	16	8	Passenger Air Bag Circuit Shorted to Ground	GO to Pinpoint Test F.
B1925	16	9	Passenger Air Bag Circuit Shorted to Battery or Ignition	GO to Pinpoint Test G.
B1932	32	10	Driver Air Bag Circuit Resistance High	GO to Pinpoint Test H.
B1933	33	11	Passenger Air Bag Circuit Resistance High	GO to Pinpoint Test I.
B1934	34	12	Driver Air Bag Circuit Resistance Low	GO to Pinpoint Test J.
B1935	35	13	Passenger Air Bag Circuit Resistance Low	GO to Pinpoint Test K.
B1871	25	14	Passenger Air Bag Deactivation (PAD) Switch Fault	GO to Pinpoint Test L.
B1884	27	15	Passenger Air Bag Deactivation (PAD) Warning Lamp Inoperative	GO to Pinpoint Test M.

B1890	27	16	Passenger Air Bag Deactivation (PAD) Warning Lamp Shorted to Battery	GO to Pinpoint Test N.
B1892	—	17	Air Bag Tone Warning Indicator Circuit Shorted to Ground or Open	GO to Pinpoint Test O.
B1891	—	18	Air Bag Tone Warning Indicator Circuit Short to Battery or Ignition	GO to Pinpoint Test P.
B1869	NONE Secondary air bag warning sounds if another fault is present	19	Lamp Air Bag Warning Indicator Circuit Open	GO to Pinpoint Test Q.
B1870	NONE Secondary air bag warning sounds if another fault is present	20	Lamp Air Bag Warning Indicator Circuit Short to Battery	GO to Pinpoint Test R.
B1877	46	—	Driver Pretensioner Circuit Resistance High	GO to Pinpoint Test S.
B1885	46	—	Driver Pretensioner Circuit Resistance Low	GO to Pinpoint Test S.
B1881	47	—	Passenger Pretensioner Circuit Resistance High	GO to Pinpoint Test T.
B1886	47	—	Passenger Pretensioner Circuit Resistance Low	GO to Pinpoint Test T.
B1878	17	—	Driver Pretensioner Circuit Shorted to Battery or Ignition	GO to Pinpoint Test U.
B1879	17	—	Driver Pretensioner Circuit Shorted to Ground	GO to Pinpoint Test V.
B1882	18	—	Passenger Pretensioner Circuit Shorted to Battery or Ignition	GO to Pinpoint Test W.
B1883	18	—	Passenger Pretensioner Circuit Shorted to Ground	GO to Pinpoint Test X.
B1318	—	—	Battery Voltage Low	CHECK battery voltage; to be above 9.0 volts. REFER to Section 414-00.
B2477	5 Hz Flashing	—	Module Configuration Fault	INSTALL a new RCM.

[a] DTC: Diagnostic trouble code, retrieved using scan tool.
[b] LFC: Lamp fault code, flashed on air bag indicator.

Inspection and Verification

1. Verify the customer concern by checking the air bag indicator in the instrument cluster. Refer to Prove Out the System in this section.
2. Visually inspect for obvious signs of mechanical and electrical damage using the following chart:

Visual Inspection Chart

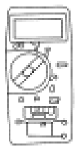
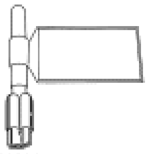
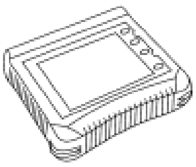
Mechanical	Electrical
• Damaged restraints control module (RCM) bracket	• Open fuse(s) • Damaged wiring harness • Loose or corroded connectors • Circuitry open/shorted

3. If the concern is not visually evident, use the scan tool to retrieve diagnostic trouble codes (DTCs) and perform the on-demand self test.
4. If the on-demand self test is passed and no DTCs are retrieved, GO to Symptom Chart.
5. If DTCs are retrieved, proceed to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table.

Symptom Chart

Symptom Chart		
Condition	**Possible Sources**	**Action**
• Air bag warning indicator is illuminated continuously	• Circuitry. • RCM. • Shorting bar or camming beam in connector. • Instrument cluster.	• GO to Pinpoint Test A.
• Air bag indicator flashing	• Air bag SRS system fault.	• REFER to DTC Priority Table.
• Audible tone — DTCs retrieved	• Air bag SRS system fault.	• GO to Pinpoint Test Q. • GO to Pinpoint Test R.
• No communication with the restraints control module	• Scan Tool. • Data Link Connector (DLC). • RCM. • Circuitry.	• GO to Pinpoint Test Y.

Pinpoint Tests — Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

Special Tool(s)	
 ST1137-A	73III Automotive Meter 105-R0057 or Equivalent
 ST2506-A	Restraint System Diagnostic Tool 418-F088 (105-R0012)
 ST2332-A	Worldwide Diagnostic System (WDS) 418-FS317, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool

Material	
Item	**Specification**
Deoxit Spray Electrical Contact Cleaner/Lubricant	D5S-6

Restraint System Diagnostic Tool Warning

WARNING: This tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

Pinpoint Test A: The Air Bag Warning Indicator Is Illuminated Continuously — RCM Disconnected, Inoperative or Lost/Low Ignition Feed

Normal Operation

NOTE: During normal operation the air bag indicator will be lit continuously for 6 seconds after the ignition switch is placed in the RUN position and after five cycles of a lamp fault code (LFC) if a fault exists. Be sure to cycle the ignition switch and look for a 6 second indicator prove-out without LFCs.

The restraints control module (RCM) will communicate diagnostic trouble codes (DTCs) to the scan tool using the data link connector (DLC). If the scan tool displays NO COMMUNICATION when retrieving continuous DTCs, GO to Pinpoint Test Y to troubleshoot the system.

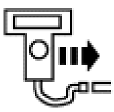
Possible Causes

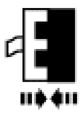
An air bag indicator that is illuminated continuously could be caused by one of the following:

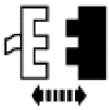
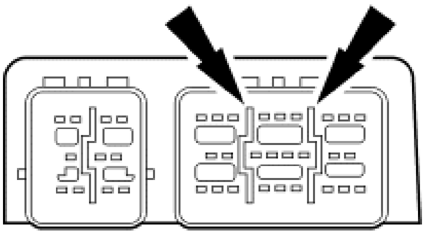
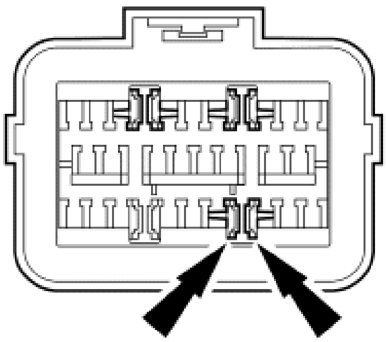
- circuitry
- the ignition circuit damaged
- the RCM disconnected from the vehicle harness
- a loss of RCM ground circuit
- the RCM inoperative
- shorting bar or camming beam in connector

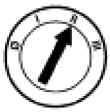
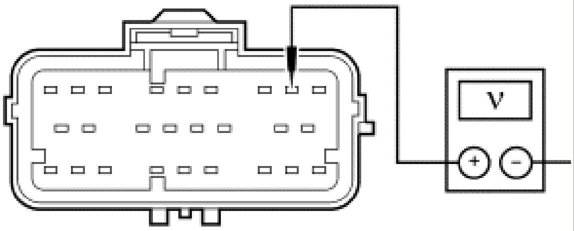
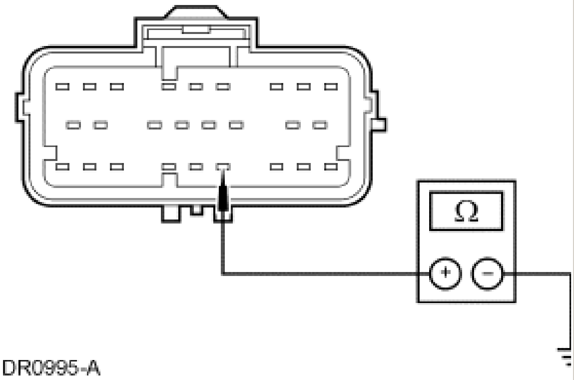
PINPOINT TEST A: THE AIR BAG WARNING INDICATOR IS ILLUMINATED CONTINUOUSLY — RCM DISCONNECTED, INOPERATIVE, OR LOST/LOW IGNITION FEED

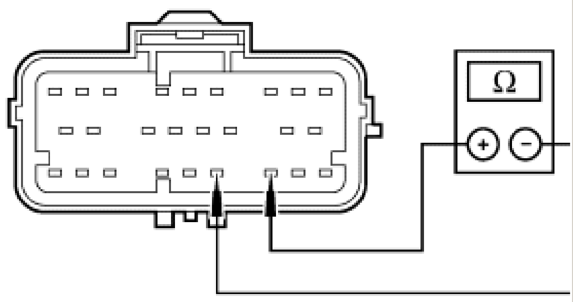
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK FOR CONTINUOUS OR ON-DEMAND SELF TEST DTCs	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
	Retrieve and record any continuous DTCs for use later in this pinpoint test.

 rieve/Clear Continuous DTCs	
 Demand Self Test	
	• **Were any continuous or on-demand self test DTCs retrieved?** → **Yes** If continuous DTCs were retrieved, GO to A2. If on-demand DTCs were retrieved, GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** GO to A2.
A2 CHECK THE RCM CONNECTION	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	Make sure RCM C2041 is fully connected and the red locking tab is engaged.
	• **Is RCM C2041 fully connected and are the red locking tabs engaged?** → **Yes** GO to A3. → **No** CONNECT C2041 and engage the locking tabs. GO to A7.
A3 CHECK THE RCM CONNECTOR	

	
 M C2041	
 DR1540-A	Inspect C2041 component side for a worn, or damaged camming beam. Inspect for foreign material.
 DR1541-A	**NOTE:** The shorting bars can be accessed by prying out the blue cover from the harness side of the connector. Inspect C2041 harness side for worn, damaged or dislodged shorting bar at pins 20 and 21. Inspect for foreign material.
	• **Were any connector concerns found?** → **Yes** CORRECT connector concerns. GO to A7. → **No** GO to A4.
A4 CHECK THE IGNITION CIRCUIT 364 (BK/LG) FOR AN OPEN	
	Deactivate the SRS. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.

	
 DR0994-A	Measure the voltage between RCM C2041-2, circuit 364 (BK/LG), harness side and ground.
	• **Is the voltage between 9 and 16 volts?** → **Yes** GO to A5. → **No** REPAIR the circuit. GO to A7.
A5 CHECK THE GROUND CIRCUIT 649 (BK/OG) FOR AN OPEN	
	
 DR0995-A	Measure the resistance between RCM C2041-21, circuit 649 (BK/OG), harness side and a sheet metal ground near the RCM.
	• **Is the resistance less than 10 ohms?** → **Yes** GO to A6.

	→ **No** REPAIR the circuit. GO to A7.
A6 CHECK CIRCUIT 608 (BK/YE) FOR A SHORT TO GROUND	
 DR1217-A	Measure the resistance between RCM C2041-20, circuit 608 (BK/YE), harness side and RCM C2041-21, circuit 649 (BK/OG), harness side.
	• **Is the resistance less than 5 ohms?** → **Yes** REPAIR the circuit. GO to A7. → **No** INSTALL a new RCM. GO to A7.
A7 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step A1.
	• **Were any continuous DTCs retrieved during Step A1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test B: LFC 21/DTC B1921 — RCM Bracket Ground Resistance High

Normal Operation

WARNING: The tightening torque of the restraints control module (RCM) retaining bolts is critical for proper air bag supplemental restraint system (SRS) operation. Refer to Restraints Control Module (RCM) in this section for correct torque values.

The restraints control module (RCM) monitors the resistance between the ground connections at its housing and the reference ground at pin 21. If the RCM detects a resistance greater than 100 ohms, it will store a diagnostic trouble code (DTC) B1921 in memory and flash a lamp fault code (LFC) 21 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

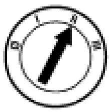
High resistance between the RCM housing ground and pin ground could be caused by:

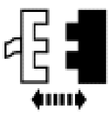
- incorrect seating of the RCM retaining bolts.
- incorrect tightening torque of the RCM retaining bolts.
- wiring, terminals, or connectors.

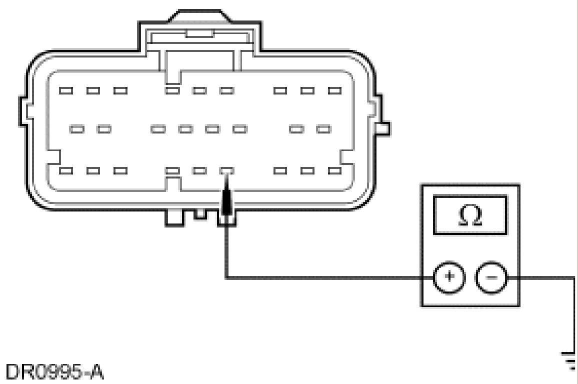
PINPOINT TEST B: LFC 21/DTC B1921 — RCM BRACKET GROUND RESISTANCE HIGH

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	

	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1921 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to B2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to B6.
B2 INSPECT THE RCM MOUNTING, MOUNTING BRACKET AND MOUNTING SURFACE	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	Remove the RCM. Refer to Restraints Control Module (RCM) in the Removal and Installation portion of this section.
	Visually inspect the RCM, mounting bracket and mounting surface for damage, corrosion or dirt.
	Inspect the RCM mounting and make sure that the retaining bolts are fully seated and tightened correctly. Refer to Restraints Control Module (RCM) in this section for correct tightening torque.
	• **Was a significant amount of corrosion or dirt found, the RCM mounting bracket attached to the mounting surface incorrectly or were the three RCM retaining**

	bolts not fully seated and tightened correctly? → **Yes** Make sure the RCM, mounting bracket and mounting surface are free of damage, corrosion or dirt and the three retaining bolts are fully seated and correctly tightened and the plastic fastener correctly seated. REATTACH the RCM and mounting bracket to the mounting surface. GO to B7. → **No** GO to B3.
B3 CHECK THE RCM HARNESS CONNECTION	
	Check the RCM harness connection.
	• **Is the RCM harness connector connected to the RCM correctly?** → **Yes** GO to B4. → **No** ATTACH the RCM harness connector correctly. GO to B7.
B4 CHECK THE VEHICLE CHASSIS GROUND	
	Measure the resistance between a known good chassis ground and the mounting surface of the RCM.
	• **Is the resistance greater than 100 ohms?** → **Yes** REPAIR the chassis grounding system. GO to B7. → **No** GO to B5.
B5 CHECK THE GROUND CIRCUIT 649 (BK/OG) FOR AN OPEN	
	
 M C2041	
	Measure the resistance between RCM C2041-21, circuit 649 (BK/OG), harness side and a sheet metal ground near the RCM.

	
	• **Is the resistance greater than 100 ohms?** → **Yes** REPAIR the circuit. GO to B7. → **No** INSTALL a new RCM. GO to B7.
B6 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step B1.
	• **Was the continuous DTC retrieved during Step B1 an intermittent fault?** → **Yes** CHECK for causes or intermittent high resistance on circuit 649 (BK/OG). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to B7. → **No** GO to B7.
B7 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step B1.
	• **Were any continuous DTCs retrieved during Step B1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the

	system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test C: LFC 29/DTC C1414 — Incorrect Vehicle Identification Code

Normal Operation

The restraints control module (RCM) monitors the voltage at pins 10, 13 and 14 to determine if it is installed on the correct vehicle. If the RCM detects an incorrect voltage on any of these pins, it will store a diagnostic trouble code (DTC) C1414 in memory and flash a lamp fault code (LFC) 29 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

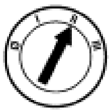
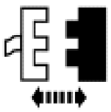
An incorrect vehicle identification code could be caused by:

- an RCM installed on the wrong vehicle.
- an incorrectly programmed RCM.
- vehicle ID pins not connected as expected.

PINPOINT TEST C: LFC 29/DTC C1414 — INCORRECT VEHICLE IDENTIFICATION CODE

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	

	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC C1414 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to C2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to C4.
C2 CHECK THE VEHICLE IDENTIFICATION PINS NO. 1 AND NO. 3	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	
	Make sure the RCM C2041-10 and C2041-14 connector slots are empty and no connection is

	made when connected to the RCM.
	Are the RCM C2041-10 and C2041-14 connector slots empty? → **Yes** GO to C3. → **No** REPAIR any concern found at the RCM C2041-10 and C2041-14 connector slots. GO to C6.
C3 CHECK THE VEHICLE IDENTIFICATION PIN NO. 2	
NOTE: For this vehicle application, RCM C2041-13, circuit 1001 (WH/YE) should be connected to ignition voltage.	
	Deactivate the SRS. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
	
	Measure the voltage between RCM C2041-13, circuit 1001 (WH/YE), harness side and RCM C2041-21, circuit 649 (BK/OG), harness side.
	Is the voltage greater than 9 volts? → **Yes** GO to C4. → **No** REPAIR the circuit. GO to C5.
C4 CHECK THE RCM PROGRAMMED VEHICLE ID	
 /Data Monitor and Record	
	Select PID VID#1, VID#2, VID#3.
	Was vehicle ID #1 NO CONNECT, vehicle ID #2 IGNITION and vehicle ID #3 NO CONNECT? → **Yes** GO to C5. → **No**

	INSTALL a new RCM. GO to C6.
C5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step C1.
	• **Was the continuous DTC retrieved during Step C1 an intermittent fault or were you directed to this step from Step C3?** → **Yes** CHECK for causes of an intermittent open on circuit 1001 (WH/YE). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to C6. → **No** GO to C6.
C6 CHECK FOR ADDITIONAL DTCs	
	Refer to continuous DTCs recorded during Step C1.
	• **Were any continuous DTCs retrieved during Step C1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test D: LFC 15/DTC B 1887— Driver Air Bag Circuit Shorted to Ground

Normal Operation

The restraints control module (RCM) checks for driver air bag circuit shorts to ground by monitoring the voltage of circuits 614 (GY/OG) and 615 (GY/WH) at pins 3 and 4. If the RCM detects a short to ground on either of these pins, it will store a diagnostic trouble code (DTC) B1887 in memory and flash a lamp fault code (LFC) 15 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

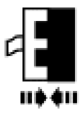
A driver air bag circuit short to ground could be caused by:

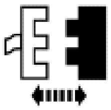
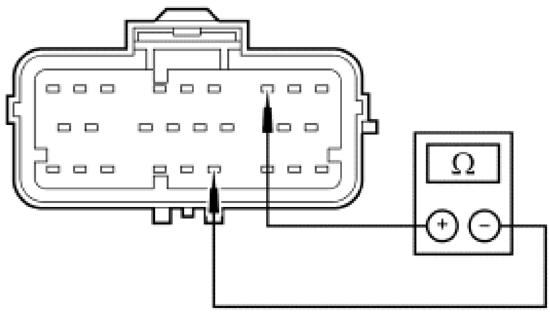
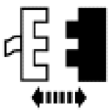
- wiring, terminals, or connectors.
- a short to ground on the clockspring (14A664).
- a short to ground on the driver air bag module.
- an RCM internal concern.

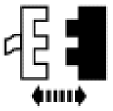
PINPOINT TEST D: LFC 15/DTC B1887 — DRIVER AIR BAG CIRCUIT SHORTED TO GROUND

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	

	• **Was DTC B1887 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to D2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to D5.
D2 CHECK THE DRIVER AIR BAG MODULE	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	Remove the driver air bag module. Refer to Driver Air Bag Module in this section.
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 traint System Diagnostic Tool 418-F088 to the Driver Air Bag Module Electrical Connector	
	
	
 Demand Self Test	
	• **Was DTC B1887 retrieved?** → **Yes**

	GO to D3. → **No** INSTALL a new driver air bag module. GO to D6.
D3 CHECK THE DRIVER AIR BAG MODULE CIRCUIT	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	
 DR0999-B	**NOTE:** Do not separate or remove shorting bars from RCM C2041. Measure the resistance between RCM C2041-3, circuit 614 (GY/OG), harness side and RCM C2041-21, circuit 649 (BK/OG), harness side.
	• **Is the resistance less than 10,000 ohms?** → **Yes** GO to D4. → **No** INSTALL a new RCM. GO to D6.
D4 CHECK THE DRIVER AIR BAG MODULE WIRING AND THE CLOCKSPRING	
 ver Air Bag Module Restraint System Diagnostic Tool	

 ckspring C218b	
	Inspect all crimps, terminals, wires and connectors in circuit 614 (GY/OG) feeding the RCM pin 3, circuit 615 (GY/WH) feeding pin 4, the clockspring assembly and the clockspring connector C218b. Check for pinched wires and damaged connector pin terminals.
	• **Was any damage found?** → **Yes** REPAIR as necessary. GO to D6. → **No** GO to D6.
D5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step D1.
	• **Was the continuous DTC retrieved during Step D1 an intermittent fault?** → **Yes** CHECK for causes of intermittent short to ground on circuit 614 (GY/OG), circuit 615 (GY/WH), and the clockspring assembly. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to D6. → **No** GO to D6.
D6 CHECK FOR ADDITIONAL DTCs	
	Refer to continuous DTCs recorded during Step D1.
	• **Were any continuous DTCs retrieved during Step D1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No**

	RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test E: LFC 15/DTC B1916 — Driver Air Bag Circuit Shorted to Battery or Ignition

Normal Operation

The restraints control module (RCM) checks for driver air bag circuit shorts to battery or ignition by monitoring the voltage of circuit 614 (GY/OG) and 615 (GY/WH) at pins 3 and 4. If the RCM detects a short to battery or ignition on either of these pins, it will store a diagnostic trouble code (DTC) B1916 in memory and flash a lamp fault code (LFC) 15 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

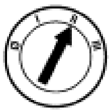
A driver air bag circuit short to battery or ignition could be caused by:

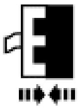
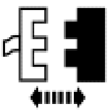
- wiring, terminals, or connectors.
- a short to battery or ignition on the clockspring.
- a short to battery or ignition on the driver air bag module.
- an RCM internal concern.

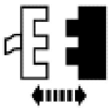
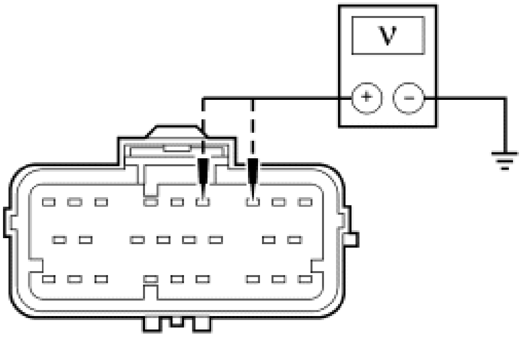
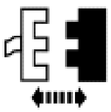
PINPOINT TEST E: LFC 15/DTC B1916 — DRIVER AIR BAG CIRCUIT SHORTED TO BATTERY OR IGNITION

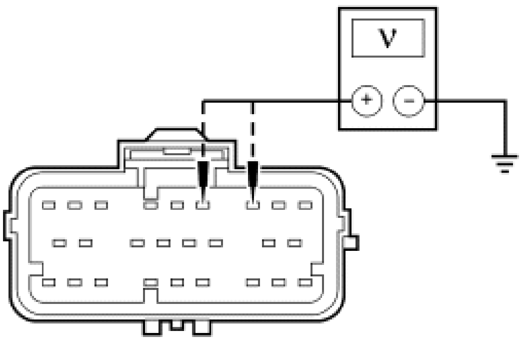
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	

	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1916 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to E2. → **No** This in an intermittent fault. The fault condition is not present at this time. GO to E5.
E2 CHECK THE DRIVER AIR BAG MODULE	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	Remove the driver air bag module. Refer to Driver Air Bag Module in this section.

 traint System Diagnostic Tool 418-F088	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	
 Demand Self Test	
	• **Was DTC B1916 retrieved?** → **Yes** GO to E3. → **No** CHECK for causes of intermittent short to battery or ignition on circuit 614 (GY/OG), circuit 615 (GY/WH), and the clockspring assembly. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to E6.
E3 CHECK THE DRIVER AIR BAG MODULE CIRCUIT	
	
	Deactivate the SRS. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
 ver Air Bag Module Restraint System Diagnostic Tool	

 M C2041	
	
 A0042186	**NOTE:** Do not separate or remove shorting bars from RCM C2041. Measure the voltage between RCM C2041-3, circuit 614 (GY/OG), harness side and ground; and between RCM C2041-4, circuit 615 (GY/WH), harness side and ground.
	• **Are the voltages less than 0.2 volt?** → **Yes** INSTALL a new RCM. REFER to RCM in this section. GO to E6. → **No** GO to E4.
E4 CHECK THE DRIVER AIR BAG MODULE WIRING AND THE CLOCKSPRING	
 ckspring C218b	
	NOTE: Do not separate or remove shorting bars from RCM C2041. Measure the voltage between RCM C2041-3, circuit 614 (GY/OG), harness side and ground; and between RCM C2041-4, circuit 615 (GY/WH), harness side and ground.

<table>
<tr><td>
A0042186</td><td></td></tr>
<tr><td></td><td>

- **Are the voltages less than 0.2 volt?**

→ **Yes**
INSTALL a new clockspring. REFER to Clockspring in this section. GO to E6.

→ **No**
REPAIR as necessary. GO to E6.</td></tr>
<tr><td colspan="2">E5 CHECK FOR AN INTERMITTENT FAULT</td></tr>
<tr><td></td><td>Refer to the continuous DTCs recorded during Step E1.</td></tr>
<tr><td></td><td>

- **Was the continuous DTC retrieved during Step E1 an intermittent fault?**

→ **Yes**
CHECK for causes of intermittent short to battery or ignition on circuit 614 (GY/OG), circuit 615 (GY/WH), and the clockspring assembly. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to E6.

→ **No**
GO to E6.</td></tr>
<tr><td colspan="2">E6 CHECK FOR ADDITIONAL DTCs</td></tr>
<tr><td></td><td>Refer to continuous DTCs recorded during Step E1.</td></tr>
<tr><td></td><td>

- **Were any continuous DTCs retrieved during Step E1?**

→ **Yes**
Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</td></tr>
</table>

	→ **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test F: LFC 16/DTC B1888 — Passenger Air Bag Circuit Shorted to Ground

Normal Operation

The restraints control module (RCM) checks for passenger air bag circuit shorts to ground by monitoring the voltage of circuits 607 (LB/OG) and 616 (PK/BK) at pins 6 and 7. If the RCM detects a short to ground on either of these pins, it will store a diagnostic trouble code (DTC) B1888 in memory and flash a lamp fault code (LFC) 16 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

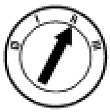
A passenger air bag circuit short to ground could be caused by:

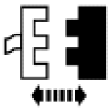
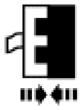
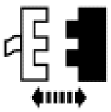
- wiring, terminals, or connectors.
- a short to ground on the passenger air bag module.
- an RCM internal concern.

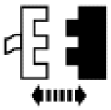
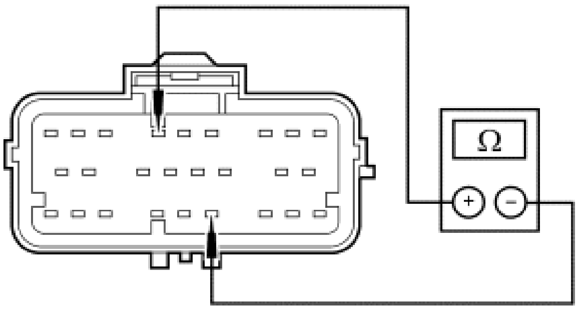
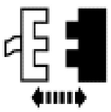
PINPOINT TEST F: LFC 16/DTC B1888 — PASSENGER AIR BAG CIRCUIT SHORTED TO GROUND

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK FOR A HARD OR INTERMITTENT DTC	
⚠ **WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.**	
⚠ **WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.**	
⚠ **WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.**	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	

	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1888 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to F2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to F5.
F2 CHECK THE PASSENGER AIR BAG MODULE	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

 senger Air Bag Module C256	
 traint System Diagnostic Tool 418-F088 to the Passenger Air Bag Module C256	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	
 Demand Self Test	
	• **Was DTC B1888 retrieved?** → **Yes** GO to F3. → **No** INSTALL a new passenger air bag module. GO to F6.
F3 CHECK THE PASSENGER AIR BAG MODULE CIRCUIT	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	

M C2041	
 senger Air Bag Module Restraint System Diagnostic Tool	
 DR1000-B	**NOTE:** Do not separate or remove shorting bars from RCM C2041. Measure the resistance between RCM C2041-6, circuit 607 (LB/OG), harness side and RCM C2041-21, circuit 649 (BK/OG), harness side.
	• **Is the resistance less than 10,000 ohms?** → **Yes** GO to F4. → **No** INSTALL a new RCM. GO to F6.
F4 CHECK THE PASSENGER AIR BAG MODULE WIRING	
 senger Air Bag Module C256	
	Inspect all crimps, terminals, wires and connectors in circuit 607 (LB/OG) feeding the RCM pin 6, circuit 616 (PK/BK) feeding pin 7. Check for pinched wires and damaged connector pin terminals.
	• **Was any damage found?** → **Yes** REPAIR as necessary. GO to F6.

	→ **No** GO to F6.
F5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step F1.
	• **Was the continuous DTC retrieved during Step F1 an intermittent fault?** → **Yes** CHECK for causes of intermittent short to ground on circuit 607 (LB/OG) and circuit 616 (PK/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to F6. → **No** GO to F6.
F6 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step F1.
	• **Were any continuous DTCs retrieved during Step F1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test G: LFC 16/DTC B1925 — Passenger Air Bag Circuit Shorted to Battery or Ignition

Normal Operation

The restraints control module (RCM) checks for passenger air bag circuit shorts to battery or ignition by monitoring the voltage of circuits 607 (LB/OG) and 616 (PK/BK) at pins 6 and 7. If the RCM detects a short to battery or ignition on either of these pins, it will store a diagnostic trouble code (DTC) B1925 in memory and flash a lamp fault code (LFC) 16 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

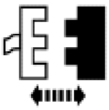
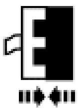
A passenger air bag circuit short to battery or ignition could be caused by:

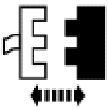
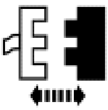
- wiring, terminals, or connectors.
- a short to battery or ignition on the passenger air bag module.
- an RCM internal concern.

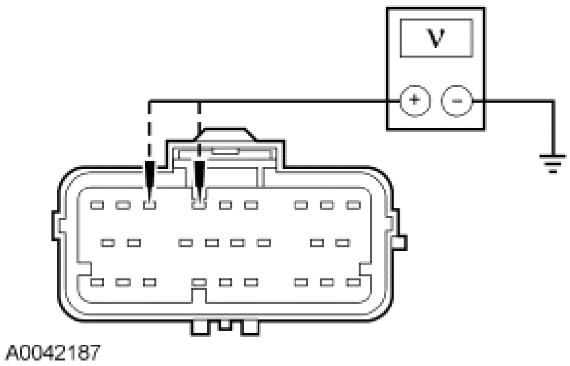
PINPOINT TEST G: LFC 16/DTC B1925 — PASSENGER AIR BAG CIRCUIT SHORTED TO BATTERY OR IGNITION

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.

 Demand Self Test	
	• **Was DTC B1925 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to G2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to G5.
G2 CHECK THE PASSENGER AIR BAG MODULE	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 senger Air Bag Module C256	
 traint System Diagnostic Tool 418-F088	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	

 Demand Self Test	
	• **Was DTC B1925 retrieved?** → **Yes** GO to G3. → **No** CHECK for causes of intermittent short to battery or ignition on circuit 607 (LB/OG) and circuit 616 (PK/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to G6.
G3 CHECK THE PASSENGER AIR BAG MODULE CIRCUIT	
	
	Deactivate the SRS. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
 senger Air Bag Module Restraint System Diagnostic Tool	
 M C2041	
	
	NOTE: Do not separate or remove shorting bars from RCM C2041. Measure the voltage between RCM C2041-6, circuit 607 (LB/OG), harness side and ground; and between RCM C2041-7, circuit 616 (PK/BK), harness side and ground.

	
	• **Are the voltages less than 0.2 volt?** → **Yes** INSTALL a new RCM. REFER to RCM in this section. GO to G6. → **No** GO to G4.
G4 CHECK THE PASSENGER AIR BAG MODULE WIRING	
	Inspect all crimps, terminals, wires and connectors in circuit 607 (LB/OG) feeding the RCM pin 6, circuit 616 (PK/BK) feeding pin 7. Check for pinched wires and damaged connector pin terminals.
	• **Was any damage found?** → **Yes** REPAIR as necessary. GO to G6. → **No** GO to G6.
G5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step G1.
	• **Was the continuous DTC retrieved during Step G1 an intermittent fault?** → **Yes** CHECK for causes of intermittent short to battery or ignition on circuit 607 (LB/OG) and circuit 616 (PK/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to G6.

	→ **No** GO to G6.
G6 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step G1.
	• **Were any continuous DTCs retrieved during Step G1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test H: LFC 32/DTC B1932 — Driver Air Bag Circuit Resistance High

Normal Operation

The restraints control module (RCM) monitors the resistance for the driver air bag ignitor by measuring the resistance between pins 3 and 4. If the RCM detects high resistance between these pins, it will store a diagnostic trouble code (DTC) B1932 in memory and flash a lamp fault code (LFC) 32 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

Driver air bag high resistance could be caused by:

- a poor connection or corrosion in the driver air bag module circuits or the clockspring.
- an open circuit or high resistance in the clockspring windings.
- wiring, terminals, or connectors.
- an open circuit or high resistance in the driver air bag module.
- an RCM internal concern.

PINPOINT TEST H: LFC 32/DTC B1932 — DRIVER AIR BAG CIRCUIT RESISTANCE HIGH

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS

H1 CHECK FOR A HARD OR INTERMITTENT DTC

WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.

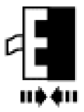
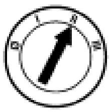
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

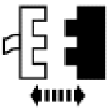
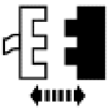
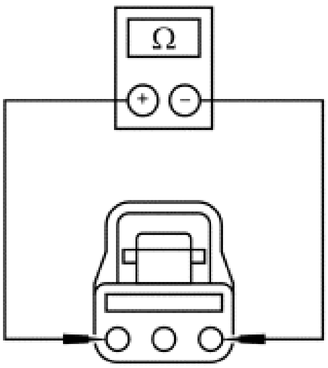
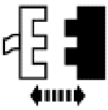
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.

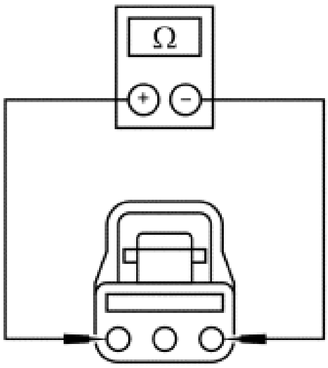
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

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

	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1932 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to H2.

	→ **No** This is an intermittent fault. The fault condition is not present at this time. GO to H5.
H2 CHECK THE DRIVER AIR BAG MODULE	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	Remove the driver air bag module. Refer to Driver Air Bag Module in this section.
 traint System Diagnostic Tool 418-F088 to the Driver Air Bag Module Electrical Connector	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	
 Demand Self Test	
	• **Was DTC B1932 retrieved?** → **Yes** GO to H3. → **No** INSTALL a new driver air bag module. GO to H6.
H3 CHECK THE DRIVER AIR BAG MODULE CIRCUIT	

	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	
 ver Air Bag Restraint System Diagnostic Tool	
 DR0292-B	**NOTE:** By disconnecting the RCM connector, circuit 614 (GY/OG) and circuit 615 (GY/WH) of the RCM connector are shorted together with a shorting bar. Do not remove the shorting bar. **NOTE:** Zero the multimeter prior to taking the measurement. Measure the resistance between driver air bag, circuit 614 (GY/OG), harness side and driver air bag, circuit 615 (GY/WH), harness side.
	• **Is the resistance greater than 0.5 ohm?** → **Yes** GO to H4. → **No** INSTALL a new RCM. GO to H6.
H4 CHECK THE CLOCKSPRING	
 ckspring C218b	
	NOTE: By disconnecting the clockspring connector, the

 DR0292-B	connector pins are shorted together with a shorting bar. Do not remove the shorting bar. **NOTE:** Zero the multimeter prior to taking the measurement. Measure the resistance between clockspring C218b, circuit 614 (GY/OG), harness side and clockspring C218b, circuit 615 (GY/WH), harness side.
	• **Is the resistance greater than 0.5 ohm?** → **Yes** INSTALL a new clockspring. GO to H6. → **No** REPAIR the circuit(s) as necessary. GO to H6.
H5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step H1.
	• **Was the continuous DTC retrieved during Step H1 an intermittent fault?** → **Yes** CHECK for causes of intermittent high resistance on circuit 614 (GY/OG), circuit 615 (GY/WH), and the clockspring assembly. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to H6. → **No** GO to H6.
H6 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step H1.
	• **Were any continuous DTCs retrieved during Step H1.** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No**

	RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test I: LFC 33/DTC B1933 — Passenger Air Bag Circuit Resistance High

Normal Operation

The restraints control module (RCM) monitors the resistance of the passenger air bag ignitor by measuring the resistance between pins 6 and 7. If the RCM detects high resistance between these pins, it will store a diagnostic trouble code (DTC) B1933 in memory and flash a lamp fault code (LFC) 33 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

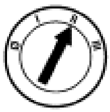
A passenger air bag high resistance could be caused by:

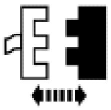
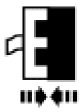
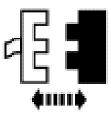
- wiring, terminals, or connectors.
- an open circuit or high resistance in the passenger air bag module.
- an RCM internal concern.

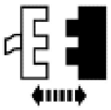
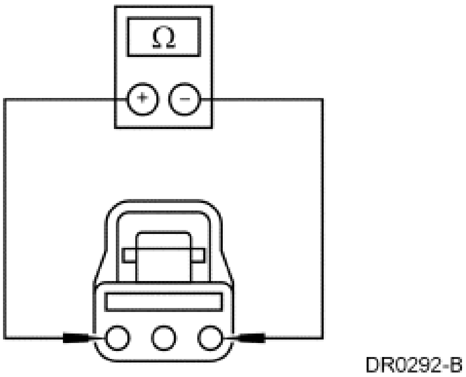
PINPOINT TEST I: LFC 33/DTC B1933 — PASSENGER AIR BAG CIRCUIT RESISTANCE HIGH

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK FOR A HARD OR INTERMITTENT DTC	
⚠ **WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.**	
⚠ **WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.**	
⚠ **WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.**	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	

	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1933 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to I2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to I4.
I2 CHECK THE PASSENGER AIR BAG MODULE	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

 senger Air Bag Module C256	
 traint System Diagnostic Tool 418-F088 to the Passenger Air Bag Module C256 Connector	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	
 Demand Self Test	
	• **Was DTC B1933 retrieved?** → **Yes** GO to I3. → **No** INSTALL a new passenger air bag module. GO to I5.
I3 CHECK THE PASSENGER AIR BAG MODULE CIRCUIT	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	

M C2041	
 senger Air Bag Restraint System Diagnostic Tool	
 	**NOTE:** By disconnecting the RCM connector, circuit 607 (LB/OG) and circuit 616 (PK/BK) of the RCM connector are shorted together with a shorting bar. Do not remove the shorting bar. **NOTE:** Zero the multimeter prior to taking the measurement. Measure the resistance between passenger air bag C256, circuit 607 (LB/OG), harness side and passenger air bag C256, circuit 616 (PK/BK), harness side.
	• **Is the resistance greater than 0.5 ohm?** → **Yes** REPAIR the circuit(s) as necessary. GO to I5. → **No** INSTALL a new RCM. GO to I5.
I4 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step I1.
	• **Was the continuous DTC retrieved during Step I1 an intermittent fault?** → **Yes** CHECK for causes of intermittent high resistance on circuit 607 (LB/OG) and circuit 616 (PK/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to I5. → **No** GO to I5.
I5 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step I1.

	• **Were any continuous DTCs retrieved during Step I1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test J: LFC 34/DTC B1934 — Driver Air Bag Circuit Resistance Low

Normal Operation

The restraints control module (RCM) monitors the resistance of the driver air bag ignitor by measuring the resistance between pins 3 and 4. If the RCM detects low resistance between these pins, it will store a diagnostic trouble code (DTC) B1934 in memory and flash a lamp fault code (LFC) 34 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

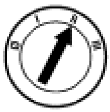
Driver air bag low resistance could be caused by:

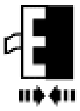
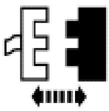
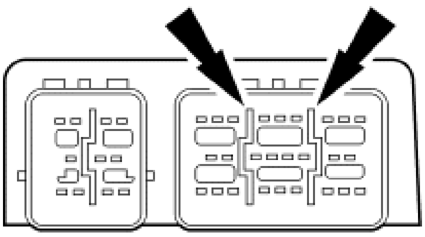
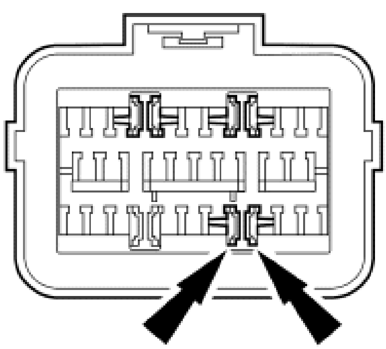
- a short in the clockspring windings.
- wiring, terminals, or connectors.
- a low resistance in the driver air bag module.
- an RCM internal concern.

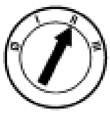
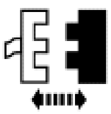
PINPOINT TEST J: LFC 34/DTC B1934 — DRIVER AIR BAG CIRCUIT RESISTANCE LOW

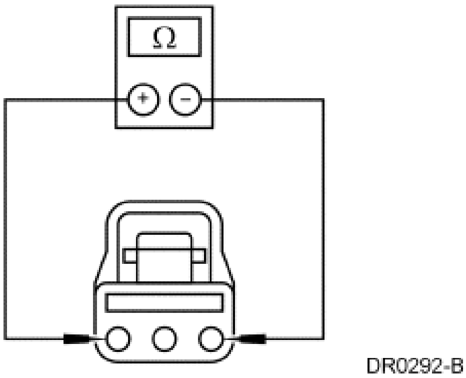
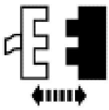
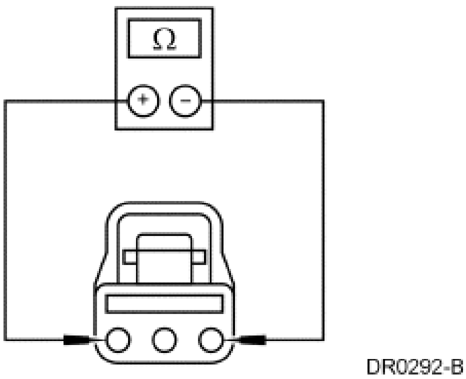
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK FOR A HARD OR INTERMITTENT DTC	
⚠ **WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.**	
⚠ **WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag**	

deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1934 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to J2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to J6.
J2 CHECK THE RCM CONNECTOR	

	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	Remove the driver air bag module. Refer to Driver Air Bag Module in this section.
 traint System Diagnostic Tool 418-F088 to the Driver Air Bag Module Electrical Connector	
 M C2041	
 DR1540-A	Inspect C2041 component side for a worn, or damaged camming beam. Inspect for foreign material.
 DR1541-A	**NOTE:** The shorting bars can be accessed by prying out the blue cover from the harness side of the connector. Inspect C2041 harness side for worn, damaged or dislodged shorting bars. Inspect for foreign material.

	• **Were any connector concerns found?** → **Yes** CORRECT connector concerns. GO to J7. → **No** GO to J3.
J3 CHECK THE DRIVER AIR BAG MODULE	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	
 Demand Self Test	
	• **Was DTC B1934 retrieved?** → **Yes** GO to J4. → **No** INSTALL a new driver air bag module. GO to J7.
J4 CHECK THE DRIVER AIR BAG MODULE CIRCUIT	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 ver Air Bag Restraint System Diagnostic Tool	
	NOTE: By disconnecting the RCM connector, circuit 614 (GY/OG) and circuit 615 (GY/WH) of the RCM connector are

	shorted together with a shorting bar. Do not remove the shorting bar. **NOTE:** Zero the multimeter prior to taking the measurement. Measure the resistance between driver air bag, circuit 614 (GY/OG), harness side and between driver air bag, circuit 615 (GY/WH), harness side.
	• **Is the resistance greater than 10,000 ohms?** → **Yes** INSTALL a new RCM. GO to J7. → **No** GO to J5.
J5 CHECK THE CLOCKSPRING	
 ckspring C218b	
	**NOTE:** By disconnecting the clockspring connector, the connector pins are shorted together with a shorting bar. Do not remove the shorting bar. **NOTE:** Zero the multimeter prior to taking the measurement. Measure the resistance between clockspring C218b, circuit 614 (GY/OG), harness side and clockspring C218b, circuit 615 (GY/WH), harness side.
	• **Is the resistance greater than 10,000 ohms?** → **Yes** INSTALL a new clockspring. GO to J7. → **No** REPAIR the circuit(s) as necessary. GO to J7.

J6 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step J1.
	• **Was the continuous DTC retrieved during Step J1 an intermittent fault?** → **Yes** CHECK for causes of intermittent low resistance on circuit 614 (GY/OG), circuit 615 (GY/WH), and the clockspring assembly. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to J7. → **No** GO to J7.
J7 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step J1.
	• **Were any continuous DTCs retrieved during Step J1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test K: LFC 35/DTC B1935 — Passenger Air Bag Circuit Resistance Low

Normal Operation

The restraints control module (RCM) monitors the resistance of the passenger air bag ignitor by measuring the resistance between pins 6 and 7. If the RCM detects low resistance between these pins, it will store a diagnostic trouble code (DTC) B1935 in memory and flash a lamp fault code (LFC) 35 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

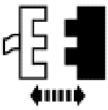
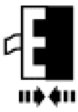
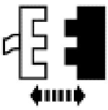
Passenger air bag low resistance could be caused by:

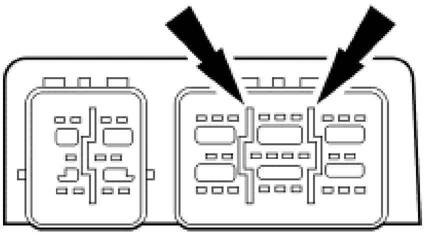
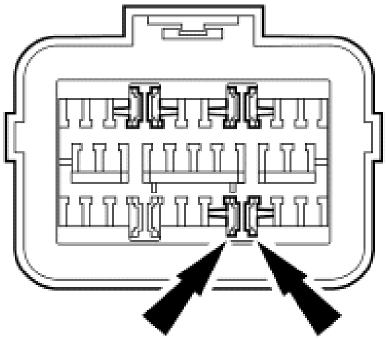
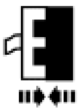
- wiring, terminals, or connectors.
- a low resistance in the passenger air bag module.
- an RCM internal concern.

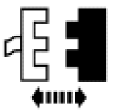
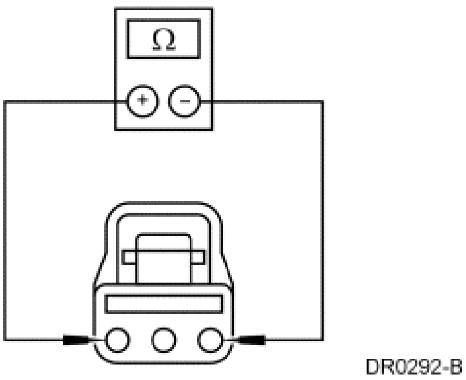
PINPOINT TEST K: LFC 35/DTC B1935 — PASSENGER AIR BAG CIRCUIT RESISTANCE LOW

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.

 Demand Self Test	
	• **Was DTC B1935 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to K2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to K5.
K2 CHECK THE RCM CONNECTOR	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 senger Air Bag Module C256	
 traint System Diagnostic Tool 418-F088 to the Passenger Air Bag Module C256 Connector	
 M C2041	
	Inspect C2041 component side for a worn, or damaged camming beam. Inspect for foreign material.

 DR1540-A	
 DR1541-A	**NOTE:** The shorting bars can be accessed by prying out the blue cover from the harness side of the connector. Inspect C2041 harness side for worn, damaged or dislodged shorting bars. Inspect for foreign material.
	• **Were any connector concerns found?** → **Yes** CORRECT connector concerns. GO to K6. → **No** GO to K3.
K3 CHECK THE PASSENGER AIR BAG MODULE	
 M C2041	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	

 Demand Self Test	
	• **Was DTC B1935 retrieved?** → **Yes** GO to K4. → **No** INSTALL a new passenger air bag module. GO to K6.
K4 CHECK THE PASSENGER AIR BAG MODULE CIRCUIT	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 senger Air Bag Restraint System Diagnostic Tool	
 	**NOTE:** By disconnecting the RCM connector, circuit 607 (LB/OG) and circuit 616 (PK/BK) of the RCM connector are shorted together with a shorting bar. Do not remove the shorting bar. **NOTE:** Zero the multimeter prior to taking the measurement. Measure the resistance between passenger air bag C2099, circuit 607 (LB/OG), harness side and passenger air bag C2099, circuit 616 (PK/BK), harness side.
	• **Is the resistance greater than 10,000 ohm?** → **Yes** INSTALL a new RCM. GO to K6. → **No**

	REPAIR the circuit(s) as necessary. GO to K6.
K5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step K1.
	• **Was the continuous DTC retrieved during Step K1 an intermittent fault?** → **Yes** CHECK for causes of intermittent low resistance on circuit 607 (LB/OG) and circuit 616 (PK/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to K6. → **No** GO to K6.
K6 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step K1.
	• **Were any continuous DTCs retrieved during Step K1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test L: LFC 25/DTC B1871 — Passenger Air Bag Deactivation (PAD) Switch Fault

Normal Operation

The restraints control module (RCM) monitors the status of the passenger air bag deactivation (PAD) switch circuit. The PAD switch signals the RCM by switching a resistance to ground. If the RCM senses 900-1100 ohms in the PAD switch, it enables the passenger air bag and turns off the PAD switch warning lamp. If the RCM senses 400-600 ohms in the PAD switch, it deactivates the passenger air bag and turns the PAD switch warning lamp on. If the RCM detects an invalid resistance, it will store a diagnostic trouble code (DTC) B1871 in memory and flash a lamp fault code (LFC) 25 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

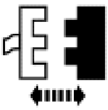
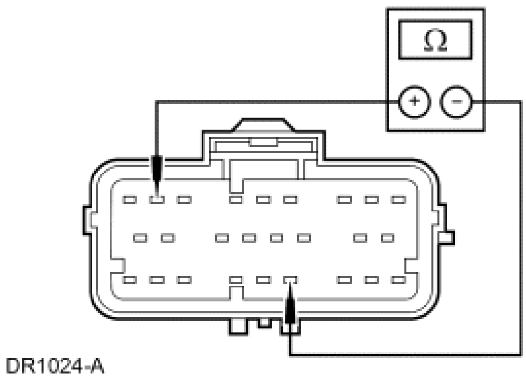
A PAD switch fault could be caused by:

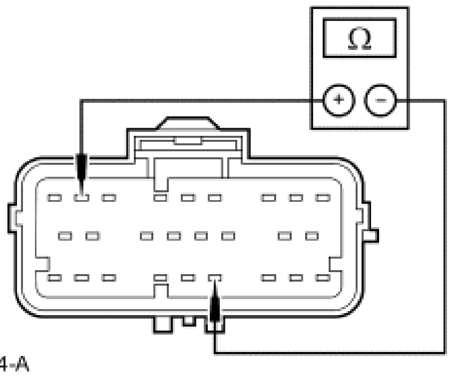
- a damaged or inoperative PAD switch.
- a damaged or inoperative RCM module.
- wiring, terminals, or connectors.

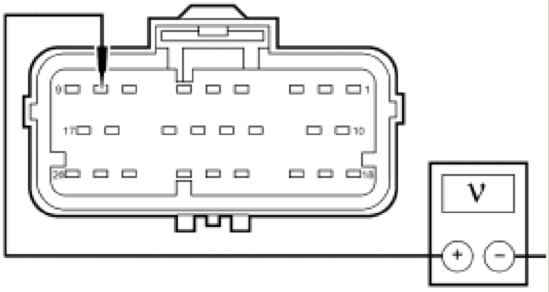
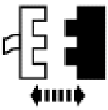
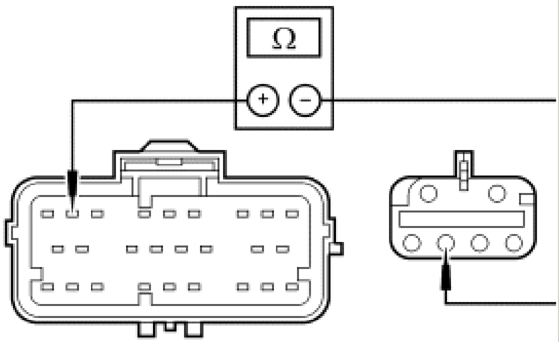
PINPOINT TEST L: LFC 25/DTC B1871 — PASSENGER AIR BAG DEACTIVATION (PAD) SWITCH FAULT

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.

 Demand Self Test	
	• **Was DTC B1871 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to L2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to L6.
L2 CHECK THE PAD SWITCH "ON" POSITION	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	
	Place the PAD switch in the "ON" position.
	Measure the resistance between RCM C2041-8, circuit 1112 (WH/LB), harness side and RCM C2041-21, circuit 649 (BK/OG), harness side.

	• **Is the resistance between 900 and 1100 ohms?** → **Yes** GO to L3. → **No** GO to L4.
L3 CHECK THE PAD SWITCH "OFF" POSITION	
	Place the PAD switch in the "OFF" position.
 DR1024-A	Measure the resistance between RCM C2041-8, circuit 1112 (WH/LB), harness side and RCM C2041-21, circuit 649 (BK/OG), harness side.
	• **Is the resistance between 400 and 600 ohms?** → **Yes** INSTALL a new RCM. GO to L7. → **No** GO to L4.
L4 CHECK CIRCUIT 1112 (WH/LB) FOR A SHORT TO BATTERY	
	Deactivate the system. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
	
	Measure the voltage between RCM C2041-8, circuit 1112 (WH/LB), harness side and ground.

 A0042742	
	• **Is the voltage less than 0.2 volt?** → **Yes** GO to L5. → **No** REPAIR the circuit. GO to L7.
L5 CHECK CIRCUIT 1112 (WH/LB) FOR AN OPEN	
 D Switch C2099	
 DR1026-A	Measure the resistance between RCM C2041-8, circuit 1112 (WH/LB), harness side and PAD switch C2099-3, circuit 1112 (WH/LB), harness side.
	• **Is the resistance less than 10 ohms?** → **Yes** INSTALL a new PAD switch. GO to L7. → **No** REPAIR the circuit. GO to L7.

L6 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step L1.
	• **Was the continuous DTC retrieved during Step L1 an intermittent fault?** → **Yes** CHECK for causes of intermittent faults on circuit 1112 (WH/LB). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to L7. → **No** GO to L7.
L7 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step L1.
	• **Were any continuous DTCs retrieved during Step L1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test M: LFC 27/DTC B1884 — Passenger Air Bag Deactivation (PAD) Warning Lamp Inoperative

Normal Operation

The restraints control module (RCM) has the ability to deactivate the passenger air bag under certain conditions. When the passenger air bag is deactivated, the passenger air bag deactivation (PAD) switch warning lamp will be illuminated.

The RCM monitors the PAD switch warning lamp for open or short to ground conditions. If the RCM detects an open or short to ground condition on the PAD switch warning lamp circuit, it will store a diagnostic trouble code (DTC) B1884 in memory and flash a lamp fault code (LFC) 27 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

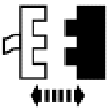
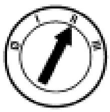
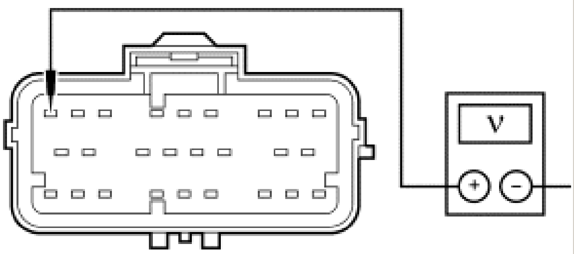
A PAD warning lamp inoperative fault could be caused by:

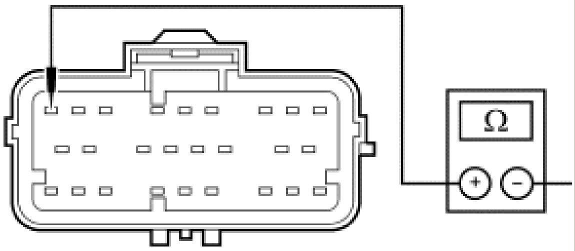
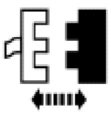
- wiring, terminals, or connectors.
- a damaged or burned out PAD indicator.
- a damaged or inoperative PAD lamp.
- a damaged or inoperative RCM.
- a blown PAD switch I/P fuse.

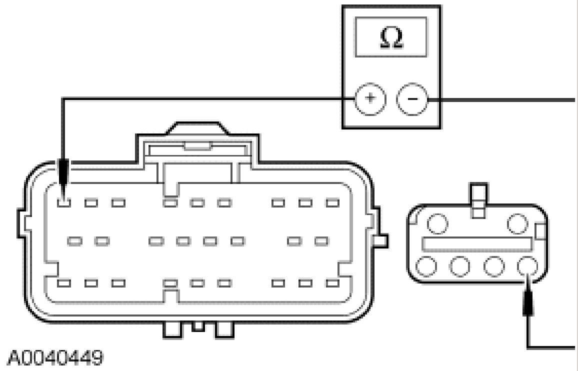
PINPOINT TEST M: LFC 27/DTC B1884 — PASSENGER AIR BAG DEACTIVATION (PAD) WARNING LAMP INOPERATIVE

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.

 Demand Self Test	
	• **Was DTC B1884 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to M2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to M5.
M2 CHECK THE PAD SWITCH WARNING LAMP VOLTAGE	
	
	Deactivate the system. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
 M C2041	
	
 DR1027-A	Measure the voltage between RCM C2041-9, circuit 1113 (YE/LG), harness side and ground.

	• **Is the voltage between 9 and 16 volts?** → **Yes** INSTALL a new RCM. GO to M6. → **No** GO to M3.
M3 CHECK CIRCUIT 1113 (YE/LG) FOR A SHORT TO GROUND	
	
 DR1028-A	Measure the resistance between RCM C2041-9, circuit 1113 (YE/LG), harness side and ground.
	• **Is the resistance less than 1000 ohms?** → **Yes** REPAIR the circuit. GO to M6. → **No** GO to M4.
M4 CHECK CIRCUIT 1113 (YE/LG) FOR AN OPEN	
 D Switch C2099	
	Measure the resistance between RCM C2041-9, circuit 1113 (YE/LG), harness side and PAD switch C2099-3, circuit 1113 (YE/LG), harness side.

 	
	• **Is the resistance less than 10 ohms?** → **Yes** INSTALL a new PAD switch. GO to M6. → **No** REPAIR the circuit. GO to M6.
M5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step M1.
	• **Was the continuous DTC retrieved during Step M1 an intermittent fault?** → **Yes** CHECK for causes of intermittent faults on circuit 1113 (YE/LG). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to M6. → **No** GO to M6.
M6 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step M1.
	• **Were any continuous DTCs retrieved during Step M1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the

	system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test N: LFC 27/DTC B1890 — Passenger Air Bag Deactivation (PAD) Warning Lamp Short to Battery

Normal Operation

The restraints control module (RCM) has the ability to deactivate the passenger air bag under certain conditions. When the passenger air bag is deactivated, the passenger air bag deactivation (PAD) switch warning lamp will be illuminated.

The RCM monitors the PAD switch warning lamp for short to battery conditions. If the RCM detects a short to battery condition on the PAD switch warning lamp circuit, it will store a diagnostic trouble code (DTC) B1890 in memory and flash a lamp fault code (LFC) 27 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

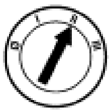
A PAD warning lamp short to battery fault could be caused by:

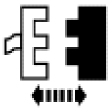
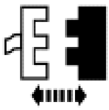
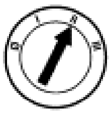
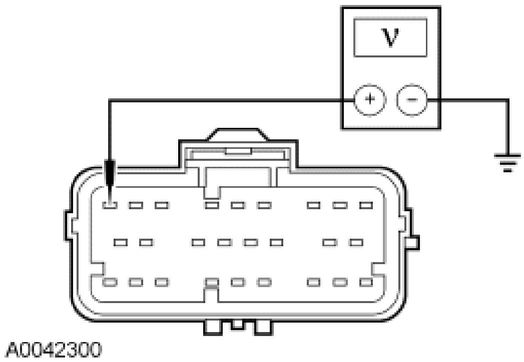
- wiring, terminals, or connectors.
- a damaged or inoperative PAD switch.
- a damaged or inoperative RCM.

PINPOINT TEST N: LFC 27/DTC B1890 — PASSENGER AIR BAG DEACTIVATION (PAD) WARNING LAMP SHORT TO BATTERY

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1890 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to N2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to N4.
N2 CHECK THE PAD SWITCH WARNING LAMP	
	Place the PAD switch in the "OFF" position.
	• **Does the PAD lamp illuminate correctly?** → **Yes** INSTALL a new RCM. GO to N5. → **No**

	GO to N3.
N3 CHECK CIRCUIT 1113 (YE/LG) FOR A SHORT TO BATTERY	
	
	Deactivate the system. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
 M C2041	
 D Switch C2099	
	
	Measure the voltage between RCM C2041-9, circuit 1113 (YE/LG), harness side and ground.
	• **Is the voltage less than 0.2 volt?** → **Yes** INSTALL a new PAD switch. GO to N5. → **No** REPAIR the circuit. GO to N5.
N4 CHECK FOR AN INTERMITTENT FAULT	

	Refer to the continuous DTCs recorded during Step N1.
	• **Was the continuous DTC retrieved during Step N1 an intermittent fault?** → **Yes** CHECK for causes of intermittent short to battery on circuit 1113 (YE/LG). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to N5. → **No** GO to N5.
N5 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step N1.
	• **Were any continuous DTCs retrieved during Step N1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test O: B1892 — Air Bag Tone Warning Indicator Circuit Shorted to Ground or Open

Normal Operation

The restraints control module (RCM) monitors its connection to the generic electronic module (GEM). This connection is used to signal a chime if the air bag indicator is inoperative and another SRS fault exists. If the RCM detects a short to ground or open on the connection to the GEM, it will store a diagnostic trouble code (DTC) B1892 in memory.

Possible Causes

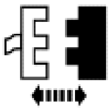
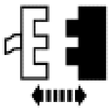
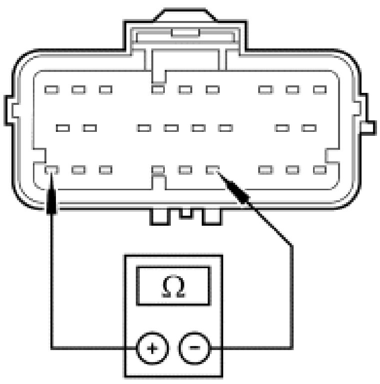
An air bag tone warning indicator circuit short to ground or open could be caused by:

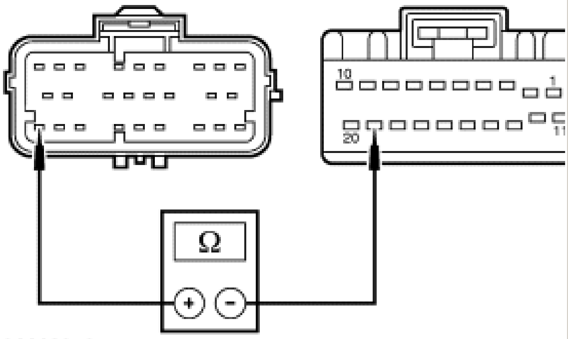
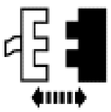
- wiring, terminals, or connectors.
- a damaged or inoperative GEM.

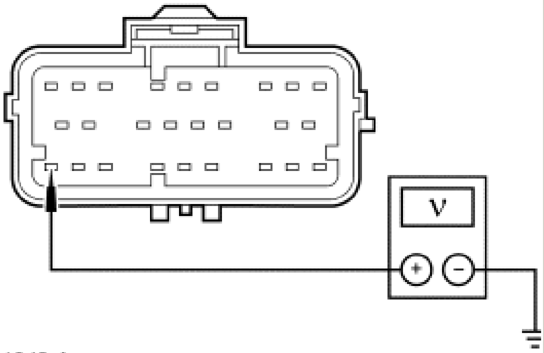
PINPOINT TEST O: DTC B1892 — AIR BAG TONE WARNING INDICATOR CIRCUIT SHORTED TO GROUND OR OPEN

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	

	• **Was DTC B1892 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to O2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to O5.
O2 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	
 M C2100b	
 DR1013-A	Measure the resistance between RCM C2041-26, circuit 1083 (LB/BK), harness side and RCM C2041-21, circuit 649 (BK/OG), harness side.
	• **Is the resistance less than 10,000 ohms?** → **Yes**

	REPAIR the circuit. GO to O6. → **No** GO to O3.
O3 CHECK THE AIR BAG TONE WARNING INDICATOR MODULE CIRCUIT	
 A0069040	Measure the resistance between RCM C2041-26, circuit 1083 (LB/BK), harness side and GEM C2100b-19, circuit 1083 (LB/BK), harness side.
	• **Is the resistance greater than 100 ohms?** → **Yes** REPAIR the circuit. GO to O6. → **No** GO to O4.
O4 CHECK THE AIR BAG TONE WARNING INDICATOR	
 M C2100b	
	Deactivate the system. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
	
	Measure the voltage between RCM C2041-26, circuit 1083 (LB/BK), harness side and ground.

 DR1042-A	
	• **Is the voltage less than 1.0 volt?** → **Yes** INSTALL a new GEM. GO to O6. → **No** INSTALL a new RCM. GO to O6.
O5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step O1.
	• **Was the continuous DTC retrieved during Step O1 an intermittent fault?** → **Yes** CHECK for causes of intermittent short to ground or open on circuit 1083 (LB/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to O6. → **No** GO to O6.
O6 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step O1.
	• **Were any continuous DTCs retrieved during Step O1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the

	system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test P: DTC B1891 — Air Bag Tone Warning Indicator Circuit Shorted to Battery or Ignition

Normal Operation

The restraints control module (RCM) monitors its connection to the generic electronic module (GEM) at pin 20. This connection is used to signal a chime if the air bag indicator is inoperative and another SRS fault exists. If the RCM detects a short to battery or ignition on the connection to the GEM, it will store a diagnostic trouble code (DTC) B1891 in memory.

Possible Causes

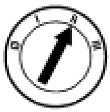
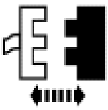
An air bag tone warning indicator circuit short to battery or ignition could be caused by:

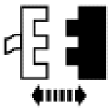
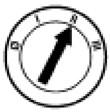
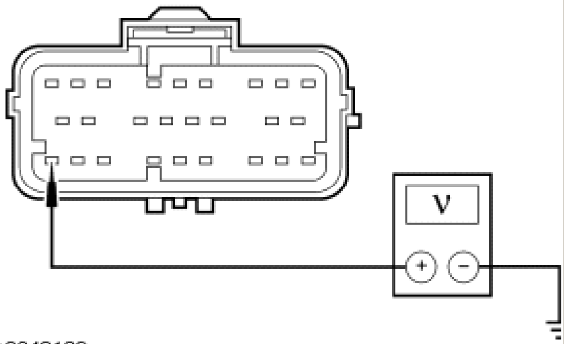
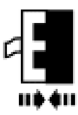
- wiring, terminals, or connectors.
- a damaged or inoperative GEM.

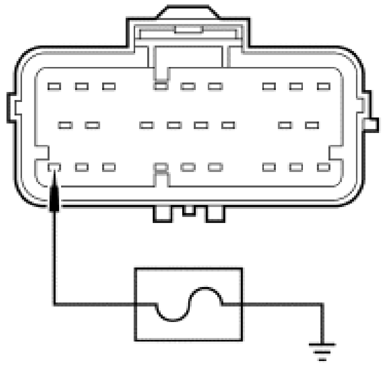
PINPOINT TEST P: DTC B1891 — AIR BAG TONE WARNING INDICATOR CIRCUIT SHORTED TO BATTERY OR IGNITION

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
P1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	

	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1891 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to P2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to P4.
P2 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT	
	
	Deactivate the system. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
 M C2041	

 M C100b	
	
 A0042189	Measure the voltage between RCM C2041-26, circuit 1083 (LB/BK), harness side and ground.
	• **Is the voltage less than 0.2 volt?** → **Yes** GO to P3. → **No** REPAIR the circuit. GO to P5.
P3 CHECK THE AIR BAG TONE WARNING INDICATOR	
	
 M C100b	
	
	Jumper RCM C2041-26, circuit 1083 (LB/BK), harness side to ground.

 DR1043-A	
	• **Does the GEM generate a tone?** → **Yes** INSTALL a new RCM. GO to P5. → **No** INSTALL a new GEM. GO to P5.
P4 CHECK FOR AN INTERMITTENT FAULT	
	Refer to continuous DTCs recorded during Step P1.
	• **Was the continuous DTC retrieved during step P1 an intermittent fault?** → **Yes** Check for causes of intermittent short to ground or open on circuit 1083 (LB/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to P5. → **No** GO to P5.
P5 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step P1.
	• **Were any continuous DTCs retrieved during Step P1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the

	system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test Q: DTC B1869 — Air Bag Indicator Inoperative

Normal Operation

The air bag indicator is designed to illuminate for 6 (+/-2) seconds when the ignition switch is turned to the RUN position. This initial 6 seconds of illumination is considered normal operation and is called prove out of the air bag indicator. The air bag indicator is then used to warn the driver that there is a fault in the air bag supplemental restraint system (SRS).

The restraints control module (RCM) monitors the air bag indicator for open and short to ground conditions. If the RCM detects an open or short to ground condition on the air bag indicator circuit, it will store a diagnostic trouble code (DTC) B1869 in memory.

If the RCM detects an air bag indicator failure in addition to another SRS failure, the RCM will send a signal to the generic electronic module (GEM) to produce five sets of five tone bursts.

Possible Causes

An air bag indicator inoperative condition could be caused by:

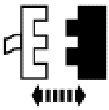
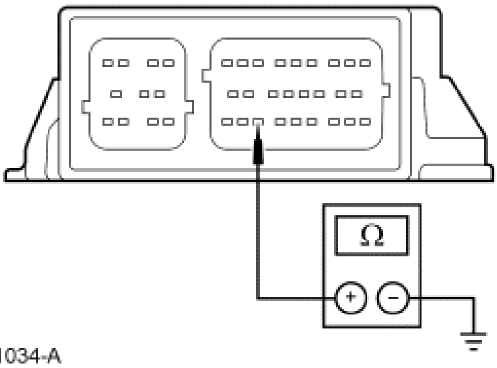
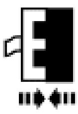
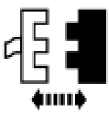
- wiring, terminals, or connectors.
- a damaged or burned out air bag indicator.
- worn or damaged instrument cluster.

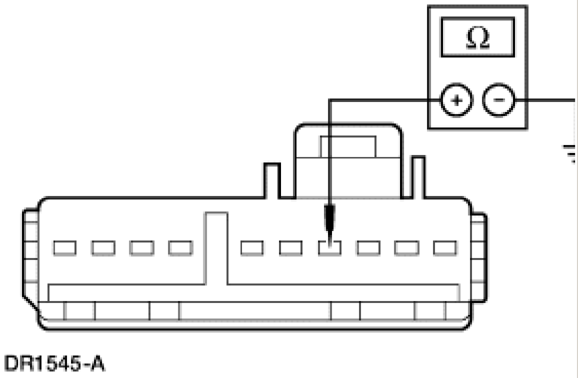
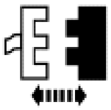
PINPOINT TEST Q: DTC B1869 — AIR BAG INDICATOR INOPERATIVE

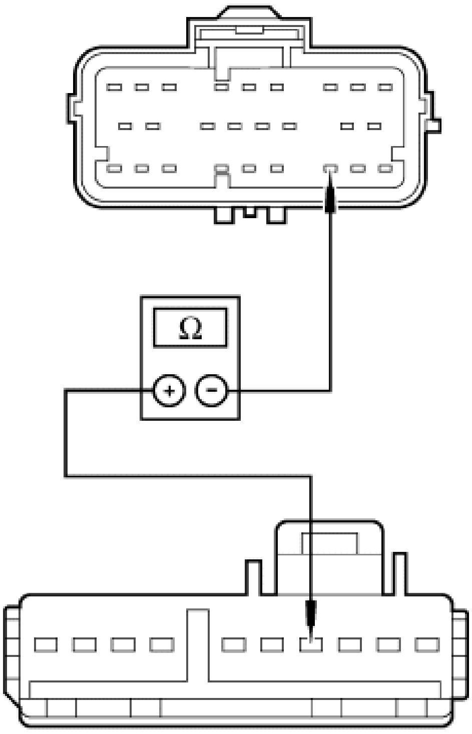
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1 CHECK FOR A HARD OR INTERMITTENT DTC	
⚠ **WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.**	
⚠ **WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.**	
⚠ **WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.**	

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1869 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to Q2. → **No** This is an intermittent fault. The fault conditions not present at this time. GO to Q5.
Q2 CHECK THE RCM	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

 M C2041	
 DR1034-A	Measure the resistance between RCM C2041-20, component side and a known good chassis ground.
	• **Is the resistance less than 10 ohms?** → **Yes** INSTALL a new RCM. GO to Q6. → **No** GO to Q3.
Q3 CHECK CIRCUIT 608 (BK/YE) FOR A SHORT TO GROUND	
	
 M C2041	
 rument Cluster C220c	
	Measure the resistance between instrument cluster C220c-4, circuit 608 (BK/YE), harness side and a known good chassis ground.

	
	- **Is the resistance less than 100 ohms?** → **Yes** REPAIR the circuit. GO to Q6. → **No** GO to Q4.
Q4 CHECK CIRCUIT 608 (BK/YE) FOR AN OPEN	
 rument Cluster C220c	
	Measure the resistance between RCM C2041-20, circuit 608 (BK/YE), harness side and instrument cluster C220c-4, circuit 608 (BK/YE), harness side.

 DR1335-A	
	• **Is the resistance greater than 10 ohms?** → **Yes** REPAIR the circuit. GO to Q6. → **No** REPAIR the instrument cluster. GO to Q6.
Q5 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step Q1.
	• **Was the continuous DTC retrieved during Step Q1 an intermittent fault?** → **Yes** CHECK for causes of intermittent short to ground or open on circuit 608 (BK/YE). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to Q6. → **No** GO to Q6.
Q6 CHECK FOR ADDITIONAL DTCs	

	Refer to the continuous DTCs recorded during Step Q1.
	• **Were any continuous DTCs retrieved during Step Q1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test R: DTC B1870 — Air Bag Indicator Shorted to Battery

Normal Operation

The air bag indicator is designed to illuminate for 6 (+/-2) seconds when the ignition switch is turned to the RUN position. This initial 6 seconds of illumination is considered normal operation and is called prove out of the air bag indicator. The air bag indicator is then used to warn the driver that there is a fault in the air bag supplemental restraint system (SRS).

While the air bag indicator is lit the restraints control module (RCM) monitors the air bag indicator for short to battery conditions. If the RCM detects a short to battery condition on the air bag indicator circuit, it will store a diagnostic trouble code (DTC) B1870 in memory.

If the RCM detects an air bag indicator failure in addition to another SRS failure, the RCM will send a signal to the generic electronic module (GEM) to produce five sets of five tone bursts.

Possible Causes

An air bag indicator short to battery condition could be caused by:

- wiring, terminals, or connectors.
- a worn or damaged instrument cluster.

PINPOINT TEST R: DTC B1870 — AIR BAG INDICATOR SHORTED TO BATTERY

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
R1 CHECK FOR A HARD OR INTERMITTENT DTC	

WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.

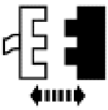
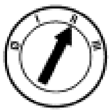
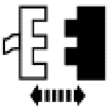
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

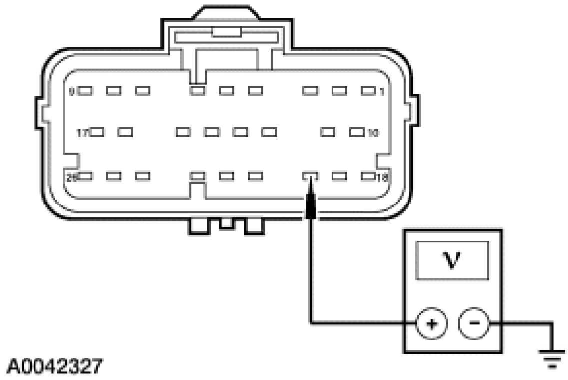
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

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

	
	
	
 rieve/Clear Continuous DTCs	Retrieve and record any continuous DTCs for use later in this pinpoint test.
 Demand Self Test	
	• **Was DTC B1870 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to R2. → **No**

	This is an intermittent fault. The fault condition is not present at this time. GO to R4.
R2 CHECK THE AIR BAG INDICATOR CIRCUIT	
	
	Deactivate the system. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
 M C2041	
	
	• **Is the air bag indicator illuminated?** → **Yes** INSTALL a new RCM. GO to R5. → **No** GO to R3.
R3 CHECK AIR BAG INDICATOR CIRCUIT FOR SHORT TO BATTERY	
 rument Cluster C220c	
	
	Measure the voltage between RCM C2041-20, circuit 608 (BK/YE), harness side and ground.

 A0042327	
	• **Is the voltage less than 0.2 volt?** → **Yes** REPAIR the circuit. GO to R5. → **No** REPAIR the instrument cluster. GO to R5.
R4 CHECK FOR AN INTERMITTENT FAULT	
	Refer to the continuous DTCs recorded during Step R1.
	• **Was the continuous DTC retrieved during Step R1 an intermittent fault?** → **Yes** CHECK for causes of intermittent short to battery on circuit 608 (BK/YE). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to R5. → **No** GO to R5.
R5 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step R1.
	• **Were any continuous DTCs retrieved during Step R1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental

	Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test S: LFC 46/DTC B1877/B1885— Driver Pretensioner Circuit Resistance High or Low

Normal Operation

NOTE: There is no restraint system diagnostic tool for the safety belt buckle pretensioners. If the ignition switch is set to RUN or START with the safety belt buckle pretensioner electrical connector(s) disconnected, the DTC for an open circuit will be activated.

The restraints control module (RCM) monitors the resistance of the circuit to the driver safety belt buckle pretensioner. If the RCM detects a resistance that is out of the range on the driver safety belt pretensioner circuits, it will store diagnostic trouble code (DTC) B1877 or B1885 in memory and flash, depending on the fault indicator, and lamp fault code (LFC) 46 depending on the fault (or higher priority code if one exists) on the air bag indicator.

Fault Conditions

The RCM monitors for the following fault conditions:

- low resistance.
- high resistance.
- circuit open.

Possible Causes

A safety belt pretensioner fault can be caused by:

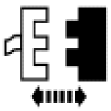
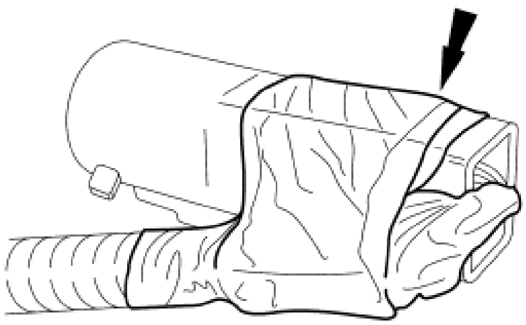
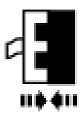
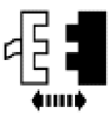
- damaged wiring, terminals or connectors.
- a faulted pretensioner.
- a faulted RCM.

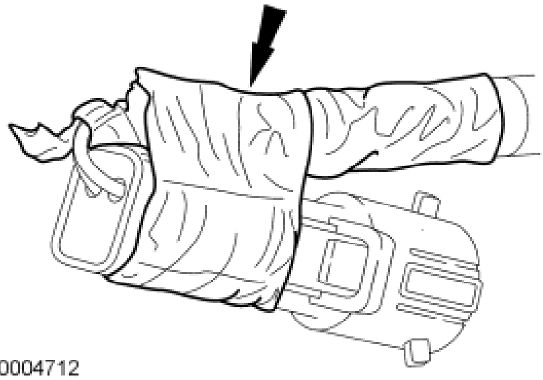
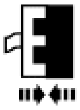
PINPOINT TEST S: LFC 46/DTC B1877/B1885— DRIVER PRETENSIONER CIRCUIT RESISTANCE HIGH OR LOW

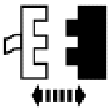
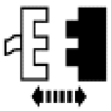
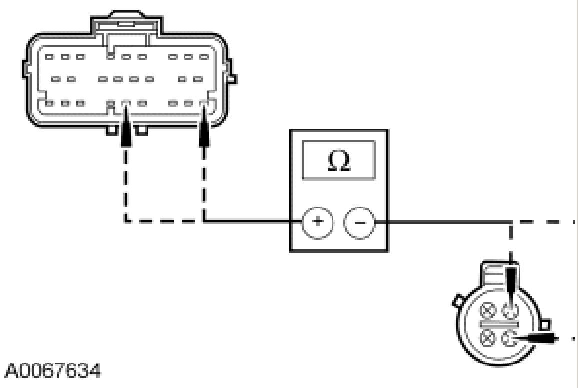
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

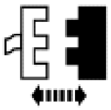
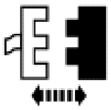
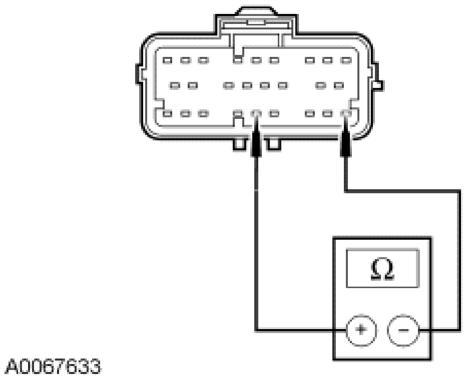
CONDITIONS	DETAILS/RESULTS/ACTIONS
S1 CHECK FOR A HARD OR INTERMITTENT DTC	
⚠ **WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.**	
⚠ **WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag**	

deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
 rieve Continuous DTCs	
 Demand Self Test	
	• **Was DTC B1877 or B1885 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to S2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to S6.
S2 CHECK THE DRIVER SAFETY BELT PRETENSIONER RESISTANCE	
 ect PID D_PRTNR	
	• **Is the resistance greater than 3.2 ohms or less than 1.7 ohms?** → **Yes** If the PID D_PRTNR is greater than 3.2 ohms, GO to S3. If the PID D_PRTNR is less than 1.7 ohms, GO to S5.

	→ **No** INSTALL a new RCM. GO to S7.
S3 CHECK THE DRIVER SAFETY BELT PRETENSIONER ELECTRICAL CONNECTOR	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 ver Pretensioner C3014	
	Inspect both connectors, wires and harnesses for cracks, breaks, bent terminal pins, pinched or damaged wires and repair as necessary.
 A0004613	Bend the driver side safety belt pretensioner C3014 over the instrument panel wiring harness (14401) and apply tape as shown. ▪ Make sure to orient the wire on the connector as illustrated or the wire harness may bind after installation.
	Spray Deoxit Spray Electrical Contact Cleaner/Lubricant on both pins in the male and female connectors. Spray for two seconds into each to load the terminal pins. Wipe off any excess liquid from exterior of connectors.
 ver Pretensioner C3014	
 senger Pretensioner C303	

	Inspect both connectors, wires and harnesses for cracks, breaks, bent terminal pins, pinched or damaged wires and repair as necessary.
 A0004712	Bend the passenger side safety belt pretensioner C303 over the instrument panel wiring harness (14401) and apply tape as shown. ▪ Make sure to orient the wire on the connector as illustrated or the wire harness may bind after installation.
	Spray Deoxit Spray Electrical Contact Cleaner/Lubricant on both pins in the male and female connectors. Spray for two seconds into each to load the terminal pins. Wipe off any excess liquid from exterior of connectors.
 senger Pretensioner C303	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	
 Demand Self Test	
	• **Was DTC B1877 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to S4.

	→ **No** Fault corrected. GO to S7.
S4 CHECK THE DRIVER SAFETY BELT PRETENSIONER CIRCUITS FOR HIGH RESISTANCE	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 ver Pretensioner C3014	
 M C2041	
	Measure the resistance between the RCM C2041 pin 18, circuit 1079 (LG/RD), harness side and the driver safety belt pretensioner C3014, circuit 1079 (LG/RD), harness side; and between the RCM C2041 pin 22, circuit 1080 (LG/BK), harness side and the driver safety belt pretensioner C3014, circuit 1080 (LG/BK), harness side.
	• **Are the resistances less than 0.5 ohm?** → **Yes** INSTALL a new driver safety belt pretensioner. GO to S7. → **No** REPAIR circuit 1079 (LG/RD) or circuit 1080 (LG/BK) as necessary. GO to S7.
S5 CHECK THE DRIVER SAFETY BELT PRETENSIONER CIRCUITS FOR LOW RESISTANCE	

	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 ver Pretensioner C3014	
 M C2041	
	Measure the resistance between the RCM C2041 pin 18, circuit 1079 (LG/RD), and pin 22, circuit 1080 (LG/BK), harness side.
	• **Is the resistance greater than 1,000,000 ohms?** → **Yes** INSTALL a new driver safety belt pretensioner. GO to S7. → **No** REPAIR circuit 1079 (LG/RD) and circuit 1080 (LG/BK). GO to S7.
S6 CHECK FOR AN INTERMITTENT FAULT	
	

 Demand Self Test	
	• **Was DTC B1877 or B1885 retrieved during the on-demand self test?** → **Yes** For DTC B1885, GO to S5. For DTC B1877, GO to S3. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found.GO to S7.
S7 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step S1.
	• **Were any continuous DTCs retrieved during Step S1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test T: LFC 47/DTC B1881/B1886 — Passenger Pretensioner Circuit Resistance High or Low

Normal Operation

NOTE: There is no restraint system diagnostic tool for the safety belt buckle pretensioners. If the ignition switch is set to RUN or START with the safety belt buckle pretensioner electrical connector(s) disconnected, the DTC for an open circuit will be activated.

The restraints control module (RCM) monitors the resistance of the circuit to the passenger safety belt pretensioner. If the RCM detects a resistance that is out of the range on the passenger safety belt pretensioner circuits, it will store diagnostic trouble code (DTC) B1881 or B1886 in memory and flash, depending on the fault indicator, and lamp fault code (LFC) 47 depending on the fault (or higher priority code if one exists) on the air bag indicator.

Fault Conditions

The RCM monitors for the following fault conditions:

- low resistance.
- high resistance.
- circuit open.

Possible Causes

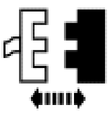
A safety belt pretensioner fault can be caused by:

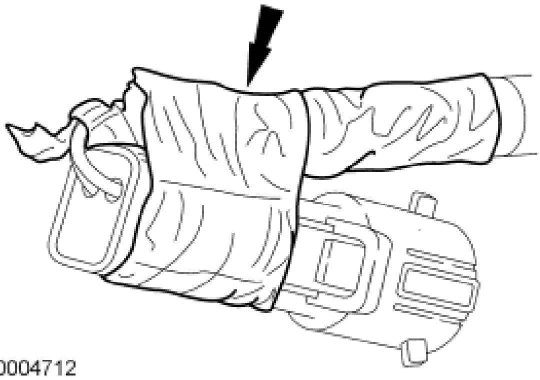
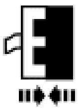
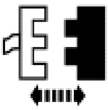
- damaged wiring, terminals or connectors.
- a faulted pretensioner.
- a faulted RCM.

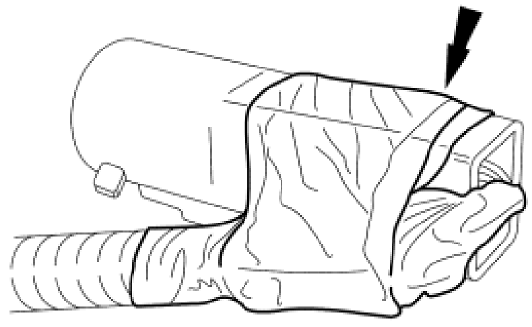
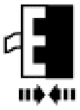
PINPOINT TEST T: LFC 47/DTC B1881/B1886— PASSENGER PRETENSIONER CIRCUIT RESISTANCE HIGH OR LOW

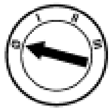
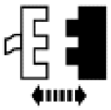
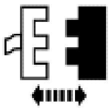
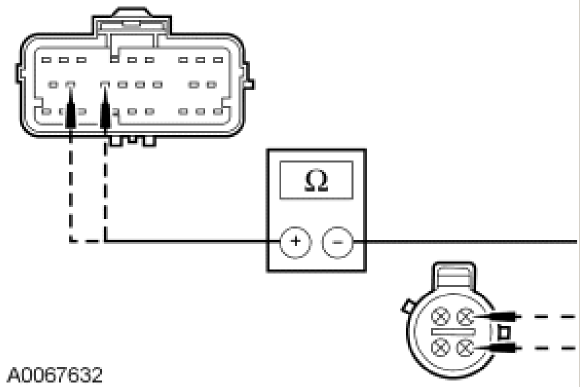
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

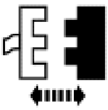
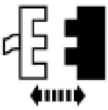
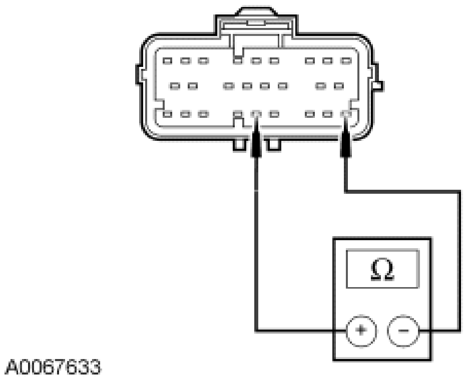
CONDITIONS	DETAILS/RESULTS/ACTIONS
T1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
 rieve Continuous DTCs	

 Demand Self Test	
	• **Was DTC B1881 or B1886 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to T2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to T6.
T2 CHECK THE PASSENGER SAFETY BELT PRETENSIONER RESISTANCE	
 ect PID D_PRTNR	
	• **Is the resistance greater than 3.2 ohms or less than 1.7 ohms?** → **Yes** If the PID D_PRTNR is greater than 3.2 ohms, GO to T3. If the PID D_PRTNR is less than 1.7 ohms, GO to T5. → **No** INSTALL a new RCM. GO to T7.
T3 CHECK THE PASSENGER SAFETY BELT PRETENSIONER ELECTRICAL CONNECTOR	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	

senger Pretensioner C303	
	Inspect both connectors, wires and harnesses for cracks, breaks, bent terminal pins, pinched or damaged wires and repair as necessary.
 A0004712	Bend the passenger side safety belt pretensioner C303 over the instrument panel wiring harness (14401) and apply tape as shown. ▪ Make sure to orient the wire on the connector as illustrated or the wire harness may bind after installation.
	Spray Deoxit Spray Electrical Contact Cleaner/Lubricant on both pins in the male and female connectors. Spray for two seconds into each to load the terminal pins. Wipe off any excess liquid from exterior of connectors.
 senger Pretensioner C303	
 ver Pretensioner C3014	
	Inspect both connectors, wires and harnesses for cracks, breaks, bent terminal pins, pinched or damaged wires and repair as necessary.
	Bend the driver side safety belt pretensioner C3014 over the instrument panel wiring harness (14401) and apply tape as shown. ▪ Make sure to orient the wire on the connector as illustrated or the wire harness may bind after installation.

 A0004613	
	Spray Deoxit Spray Electrical Contact Cleaner/Lubricant on both pins in the male and female connectors. Spray for two seconds into each, to load the terminal pins. Wipe off any excess liquid from exterior of connectors.
 ver Pretensioner C3014	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	
 Demand Self Test	
	• **Was DTC B1881 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to T4. → **No** Fault corrected. GO to T7.
T4 CHECK THE PASSENGER SAFETY BELT PRETENSIONER CIRCUITS FOR HIGH RESISTANCE	

	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 senger Pretensioner C303	
 M C2041	
	Measure the resistance between the RCM C2041 pin 15, circuit 1081 (YE/RD), harness side and the passenger safety belt pretensioner C303, circuit 1081 (YE/RD), harness side; and between the RCM C2041 pin 16, circuit 1082 (YE/BK), harness side and the passenger safety belt pretensioner C303, circuit 1082 (YE/BK), harness side.
	• **Are the resistances less than 0.5 ohms?** → **Yes** INSTALL a new passenger safety belt pretensioner. GO to T7. → **No** REPAIR circuit 1081 (YE/RD) or circuit 1082 (YE/BK). GO to T7.
T5 CHECK THE PASSENGER SAFETY BELT PRETENSIONER CIRCUITS FOR LOW RESISTANCE	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

 senger Pretensioner C303	
 M C2041	
	Measure the resistance between the RCM C2041 pin 16, circuit 1082 (YE/RD), and pin 15, circuit 1081 (YE/BK), harness side.
	• **Is the resistance greater than 1,000,000 ohms?** → **Yes** INSTALL a new passenger safety belt pretensioner. GO to T7. → **No** REPAIR circuit 1082 (YE/RD) and circuit 1081 (YE/BK). GO to T7.
T6 CHECK FOR AN INTERMITTENT FAULT	
	
 Demand Self Test	
	• **Was DTC B1881 or B1886 retrieved during the on-**

	demand self test? → **Yes** For DTC B1886, GO to T5. For DTC B1881, GO to T3. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to T7.
T7 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step T1.
	• **Were any continuous DTCs retrieved during Step T1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test U: LFC 17 DTC B1878 — Driver Pretensioner Circuit Short to Voltage

Normal Operation

NOTE: There is no restraint system diagnostic tool for the safety belt buckle pretensioners. If the ignition switch is set to RUN or START with the safety belt buckle pretensioner electrical connector(s) disconnected, the DTC for an open circuit will be activated.

The restraints control module (RCM) monitors the circuits to the driver safety belt pretensioner for faults. If the RCM detects an unexpected voltage on the driver safety belt pretensioner circuits, it will store diagnostic trouble code (DTC) B1878 in memory and flash, depending on the fault indicator, and lamp fault code (LFC) 17 depending on the fault (or higher priority code if one exists) on the air bag indicator.

Fault Conditions

The RCM monitors for the following fault conditions:

- circuit short to voltage.

Possible Causes

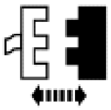
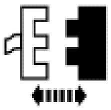
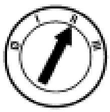
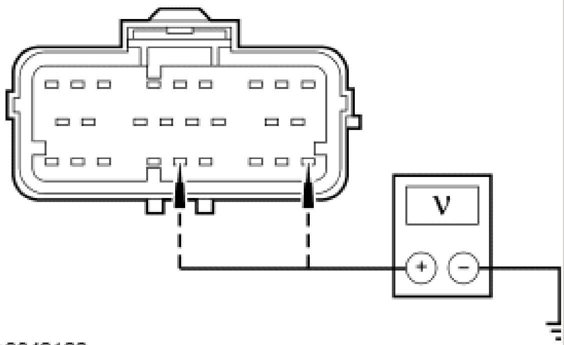
A safety belt pretensioner fault can be caused by:

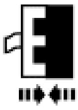
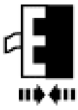
- damaged wiring, terminals, or connectors.
- a faulted RCM.

PINPOINT TEST U: LFC 17 /DTC B1878 — DRIVER PRETENSIONER CIRCUIT SHORT TO VOLTAGE

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
U1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
 rieve Continuous DTCs	
 Demand Self Test	
	• **Was DTC B1878 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault

	cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to U2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to U4.
U2 CHECK THE DRIVER SAFETY BELT PRETENSIONER	
	
	Deactivate the system. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
 ver Safety Belt Pretensioner C3014	
 M C2041	
	
 A0042188	Measure the voltage between the RCM C2041 pin 18, circuit 1079 (LG/RD), harness side and ground; and between the RCM C2041 pin 22, circuit 1080 (LG/BK), harness side and ground.
	• **Are the voltages less than 0.2 volt?** → **Yes** GO to U3.

	→ **No** REPAIR circuit 1079 (LG/RD) or circuit 1080 (LG/BK). GO to U5.
U3 CONFIRM THE RCM FAULT	
NOTE: Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connector are connected before carrying out the on-demand self test. If not, erroneous DTCs will be recorded.	
	
 M C2041	
 ver Safety Belt Pretensioner C3014	
 Demand Self Test	
	• **Was DTC B1878 retrieved during the on-demand self test?** → **Yes** INSTALL a new RCM. REFER to Restraints Control Module (RCM) in this section. GO to U5. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to U5.
U4 CHECK FOR AN INTERMITTENT FAULT	
	

 Demand Self Test	
	• **Was DTC B1878 retrieved during the on-demand self test?** → **Yes** GO to U2. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to U5.
U5 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step U1.
	• **Were any continuous DTCs retrieved during Step U1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test V: LFC 17 DTC B1879 — Driver Pretensioner Circuit Short to Ground

Normal Operation

NOTE: There is no restraint system diagnostic tool for the safety belt buckle pretensioners. If the ignition switch is set to RUN or START with the safety belt buckle pretensioner electrical connector(s) disconnected, the DTC for an open circuit will be activated.

The restraints control module (RCM) monitors the circuits to the driver safety belt pretensioner for faults. If the RCM detects a short to ground on either of the driver safety belt pretensioner circuits, it will store diagnostic trouble code (DTC) B1878 in memory and flash, depending on the fault indicator, and lamp fault code (LFC) 17 depending on the fault (or higher priority code if one exists) on the air bag indicator.

Fault Conditions

The RCM monitors for the following fault conditions:

- circuit short to ground.

Possible Causes

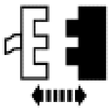
A safety belt pretensioner fault can be caused by:

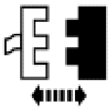
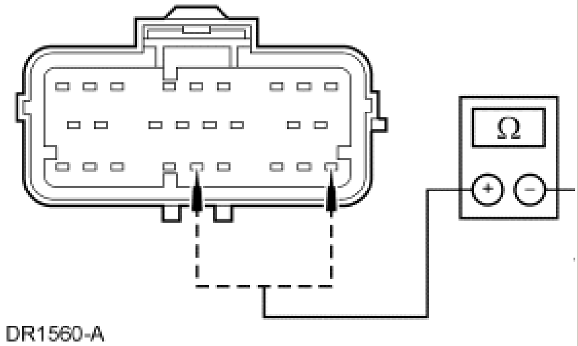
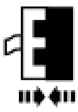
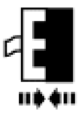
- damaged wiring, terminals, or connectors.
- a faulted pretensioner.
- a faulted RCM.

PINPOINT TEST V: LFC 17 /DTC B1879 — DRIVER PRETENSIONER CIRCUIT SHORT TO GROUND

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
V1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
 rieve Continuous DTCs	
 Demand Self Test	

	• **Was DTC B1879 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to V2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to V5.
V2 CHECK THE DRIVER PRETENSIONER	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 ver Safety Belt Pretensioner C3014	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 Demand Self Test	**NOTE:** DTC B1877 is expected to be retrieved during the on-demand self test, disregard the DTC at this time.
	• **Was DTC B1879 retrieved during the on-demand self test?** → **Yes** GO to V3. → **No** INSTALL a new driver safety belt pretensioner. GO to V6.
V3 CHECK THE DRIVER SAFETY BELT PRETENSIONER CIRCUITS	

	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	
 	Measure the resistance between the RCM C2041 pin 18, circuit 1079 (LG/RD), harness side and ground; and between the RCM C2041 pin 22, circuit 1080 (LG/BK), harness side and ground.
	• **Are the resistances greater than 1,000,000 ohms?** → **Yes** GO to V4. → **No** REPAIR circuit 1079 (LG/RD) or circuit 1080 (LG/BK). GO to V6.
V4 CONFIRM THE RCM FAULT	
NOTE: Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connector are connected before carrying out the on-demand self test. If not, erroneous DTCs will be recorded.	
 M C2041	
 ver Safety Belt Pretensioner C3014	

	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 Demand Self Test	
	• **Was DTC B1879 retrieved during the on-demand self test?** → **Yes** INSTALL a new RCM. REFER to Restraints Control Module (RCM) in this section. GO to V6. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to V6.
V5 CHECK FOR AN INTERMITTENT FAULT	
 Demand Self Test	
	• **Was DTC B1879 retrieved during the on-demand self test?** → **Yes** GO to V2. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to V6.
V6 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step V1.
	• **Were any continuous DTCs retrieved during Step**

	V1? → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test W: LFC 18 DTC B1882 — Passenger Pretensioner Circuit Short to Voltage

Normal Operation

NOTE: There is no restraint system diagnostic tool for the safety belt buckle pretensioners. If the ignition switch is set to RUN or START with the safety belt buckle pretensioner electrical connector(s) disconnected, the DTC for an open circuit will be activated.

The restraints control module (RCM) monitors the circuits to the passenger belt pretensioner for faults. If the RCM detects an unexpected voltage on the passenger safety belt pretensioner circuits, it will store diagnostic trouble code (DTC) B1882 in memory and flash, depending on the fault indicator, and lamp fault code (LFC) 18 depending on the fault (or higher priority code if one exists) on the air bag indicator.

Fault Conditions

The RCM monitors for the following fault conditions:

- circuit short to voltage.

Possible Causes

A safety belt pretensioner fault can be caused by:

- damaged wiring, terminals, or connectors.
- a faulted RCM.

PINPOINT TEST W: LFC 18 /DTC B1882 — PASSENGER PRETENSIONER CIRCUIT SHORT TO VOLTAGE

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
W1 CHECK FOR A HARD OR INTERMITTENT DTC	

WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.

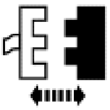
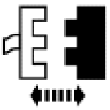
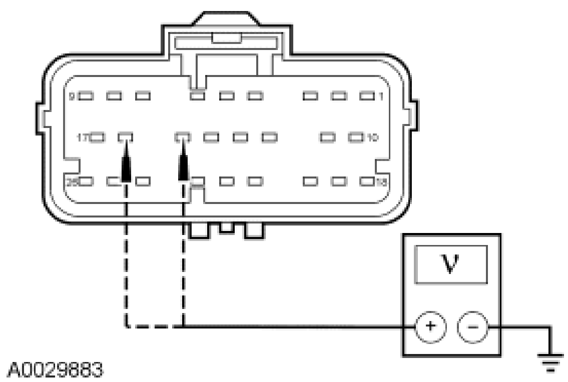
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

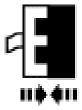
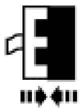
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

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

 rieve Continuous DTCs	
 Demand Self Test	
	• **Was DTC B1882 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to W2. → **No** This is an intermittent fault. The fault condition is not present at this time. GO to W4.
W2 CHECK THE PASSENGER SAFETY BELT PRETENSIONER	
	
	Deactivate the system. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.

 senger Safety Belt Pretensioner C303	
 M C2041	
	
	Measure the voltage between the RCM C2041 pin 15, circuit 1081 (YE/RD), harness side and ground; and between the RCM C2041 pin 16, circuit 1082 (YE/BK), harness side and ground.
	• **Are the voltages less than 0.2 volt?** → **Yes** GO to W3. → **No** REPAIR circuit 1081 (YE/RD) or circuit 1082 (YE/BK). GO to W5.
W3 CONFIRM THE RCM FAULT	
NOTE: Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connector are connected before carrying out the on-demand self test. If not, erroneous DTCs will be recorded.	
	

 M C2041	
 senger Safety Belt Pretensioner C303	
 Demand Self Test	
	• **Was DTC B1882 retrieved during the on-demand self test?** → **Yes** INSTALL a new RCM. REFER to Restraints Control Module (RCM) in this section. GO to W5. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to W5.
W4 CHECK FOR AN INTERMITTENT FAULT	
	
 Demand Self Test	
	• **Was DTC B1882 retrieved during the on-demand self test?** → **Yes** GO to W2.

	→ **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to W5.
W5 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step W1.
	• **Were any continuous DTCs retrieved during Step W1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Table in this section for pinpoint test direction. → **No** RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test X: LFC 18 DTC B1883 — Passenger Pretensioner Circuit Short to Ground

Normal Operation

NOTE: There is no restraint system diagnostic tool for the safety belt buckle pretensioners. If the ignition switch is set to RUN or START with the safety belt buckle pretensioner electrical connector(s) disconnected, the DTC for an open circuit will be activated.

The restraints control module (RCM) monitors the circuits to the passenger safety belt pretensioner for faults. If the RCM detects a short to ground on either of the passenger safety belt pretensioner circuits, it will store diagnostic trouble code (DTC) B1883 in memory and flash, depending on the fault indicator, and lamp fault code (LFC) 18 depending on the fault (or higher priority code if one exists) on the air bag indicator.

Fault Conditions

The RCM monitors for the following fault conditions:

- circuit short to ground.

Possible Causes

A safety belt pretensioner fault can be caused by:

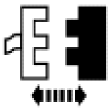
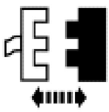
- damaged wiring, terminals, or connectors.
- a faulted pretensioner.

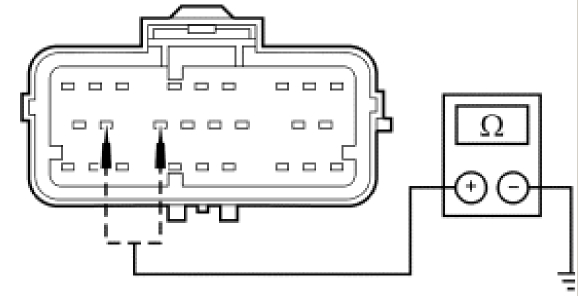
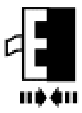
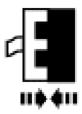
- a faulted RCM.

PINPOINT TEST X: LFC 18 /DTC B1883 — PASSENGER PRETENSIONER CIRCUIT SHORT TO GROUND

NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
X1 CHECK FOR A HARD OR INTERMITTENT DTC	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
 rieve Continuous DTCs	
 Demand Self Test	
	• **Was DTC B1883 retrieved during the on-demand self test?** → **Yes** This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to X2. → **No** This is an intermittent fault. The fault condition is not present at

	this time. GO to X5.
X2 CHECK THE PASSENGER SAFETY BELT PRETENSIONER	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 senger Safety Belt Pretensioner C303	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 Demand Self Test	**NOTE:** DTC B1881 is expected to be retrieved during the on-demand self test, disregard the DTC at this time.
	• **Was DTC B1883 retrieved during the on-demand self test?** → **Yes** GO to X3. → **No** INSTALL a new passenger safety belt pretensioner. GO to X6.
X3 CHECK THE PASSENGER SAFETY BELT PRETENSIONER CIRCUITS	
	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	

 DR1562-A	Measure the resistance between the RCM C2041 pin 15, circuit 1081 (YE/RD), harness side and ground; and between the RCM C2041 pin 16, circuit 1082 (YE/BK), harness side and ground.
	• **Are the resistances greater than 1,000,000 ohms?** → **Yes** GO to X4. → **No** REPAIR circuit 1081 (YE/RD) or circuit 1082 (YE/BK). GO to X6.
X4 CONFIRM THE RCM FAULT	
NOTE: Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connector are connected before carrying out the on-demand self test. If not, erroneous DTCs will be recorded.	
 M C2041	
 senger Safety Belt Pretensioner C303	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 Demand Self Test	

	• **Was DTC B1883 retrieved during the on-demand self test?** → **Yes** INSTALL a new RCM. REFER to Restraints Control Module (RCM) in this section. GO to X6. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to X6.
X5 CHECK FOR AN INTERMITTENT FAULT	
	
 Demand Self Test	
	• **Was DTC B1883 retrieved during the on-demand self test?** → **Yes** GO to X2. → **No** CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to X6.
X6 CHECK FOR ADDITIONAL DTCs	
	Refer to the continuous DTCs recorded during Step X1.
	• **Were any continuous DTCs retrieved during Step X1?** → **Yes** Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Table in this section for pinpoint test direction. → **No**

	RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test Y: No Communication with the Restraints Control Module (RCM).

Normal Operation

The RCM communicates with the scan tool using ISO 9141 communication mode through the data link connector (DLC).

Possible Causes

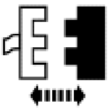
A no communication condition could be caused by:

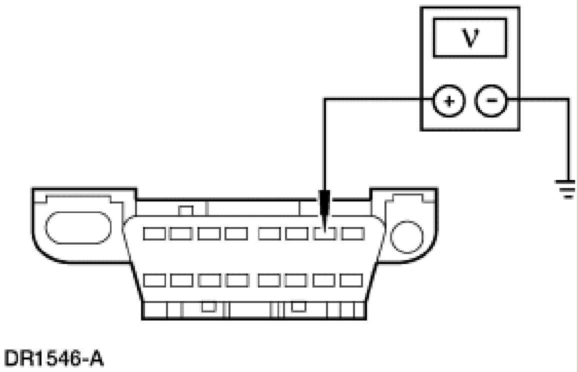
- wiring, terminals, or connectors.
- a damaged DLC.
- a damaged scan tool.
- an RCM internal concern.

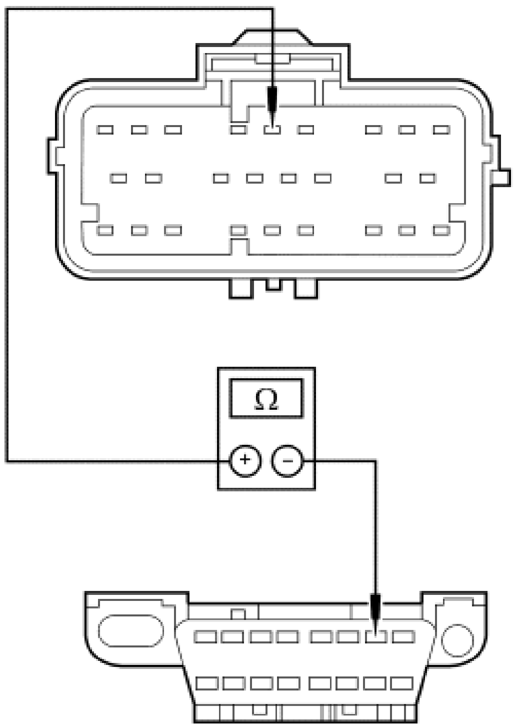
PINPOINT TEST Y: NO COMMUNICATION WITH THE RESTRAINTS CONTROL MODULE

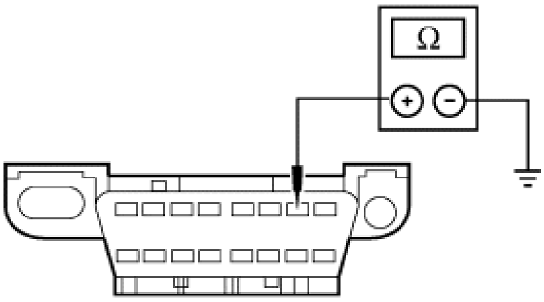
NOTE: Most faults are due to connector and/or wiring concerns. Carry out a thorough Inspection and Verification before proceeding with the Pinpoint Test.

CONDITIONS	DETAILS/RESULTS/ACTIONS
Y1 CHECK THE RCM CONNECTOR C2041 AND CONNECTOR PIN 5 FOR DAMAGE	
WARNING: Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove restraint system diagnostic tools could result in injury and possible violation of vehicle safety standards.	
WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.	
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.	
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**	
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.	
	

	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
 M C2041	
	Inspect RCM C2041, harness side and RCM C2041, component side, pin 5 for damage.
	• **Are RCM C2041 and RCM C2041-5 OK?** → **Yes** GO to Y2. → **No** REPAIR RCM C2041 or RCM C2041-5 as necessary. RETEST the communication with RCM. RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.
Y2 CHECK THE DLC CONNECTOR C209 AND CONNECTOR PIN 7 FOR DAMAGE	
	Inspect DLC C209 and DLC C209-7 for damage.
	• **Are DLC C209 and DLC C209-7 OK?** → **Yes** GO to Y3. → **No** REPAIR DLC C209 or DLC C209-7 as necessary. RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.
Y3 CHECK CIRCUIT 70 (LB/WH) FOR SHORT TO BATTERY	
	Repower the system. **Do not** prove out the system at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	Measure the voltage to ground at DLC C209-7, circuit 70

	(LB/WH).
	• **Can any voltage be measured?** → **Yes** REPAIR the battery short. RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs. → **No** GO to Y4.
Y4 CHECK CIRCUIT 70 (LB/WH) FOR AN OPEN	
	Depower the system. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
	Measure the resistance between RCM C2041-5, circuit 70 (LB/WH), harness side and DLC C209-7, circuit 70 (LB/WH), harness side.

 	
	• **Is the resistance less than 5 ohms?** → **Yes** GO to Y5. → **No** REPAIR the circuit. RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.
Y5 CHECK CIRCUIT 70 (LB/WH) FOR SHORT TO GROUND	
	Measure the resistance to ground at DLC C209-7, circuit 70 (LB/WH).

 DR1547-A	
	• **Is the resistance less than 10,000 ohms?** → **Yes** REPAIR the circuit. RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs. → **No** INSTALL a new RCM. RECONNECT the system. If previously directed to deactivate the system, REACTIVATE the system. REFER to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section. REPOWER the system. REFER to Supplemental Restraint System (SRS) Depowering and Repowering in this section. PROVE OUT the system. CLEAR all DTCs.

Supplemental Restraint System (SRS) Depowering and Repowering

Depowering Procedure

WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

WARNING: To reduce the risk of personal injury, do not use any memory saver devices.

NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, **the supplemental restraint system (SRS) must be depowered.**

NOTE: The air bag warning lamp illuminates when the RCM fuse is removed and the ignition switch is ON. This is normal operation and does not indicate a supplemental restraint system (SRS) fault.

NOTE: The 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 switch to OFF.
3. At the central junction box (CJB), located on the LH end of the instrument panel, open the kick panel cover and remove the restraints control module (RCM) fuse F2.2 (10A) and F2.26 (10A) from the CJB. For additional information, refer to the Wiring Diagram Manual.
4. Turn the ignition ON and visually monitor the air bag indicator for at least 30 seconds. The air bag indicator will remain lit continuously (no flashing) if the correct RCM fuse has been removed. If the air bag indicator does not remain lit continuously, remove the correct RCM fuse before proceeding.
5. Turn the ignition OFF.
6. **WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors or RCM, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.**

   To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

   Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to Section 414-01.

Repowering Procedure

1. **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

   Make sure all restraint system diagnostic tool(s) that may have been installed during the repair have been removed from the vehicle and all SRS components are connected.

2. Turn the ignition switch from OFF to ON.

3. Install the RCM fuse F2.2 (10A) and F2.26 (10A) to the CJB and close the cover.

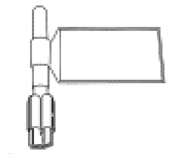
4. **WARNING: Be sure that nobody is in the vehicle and that there is nothing blocking or set in front of any air bag module when the battery ground cable is connected.**

   Connect the battery ground cable.

5. Prove out the supplemental restraint system (SRS) as follows:
   Turn the ignition key from ON to OFF. Wait 10 seconds, then turn the key back to ON and visually monitor the air bag indicator with the air bag modules installed. The air bag indicator will light continuously for approximately six seconds and then turn off. If an air bag supplemental restraint system (SRS) fault is present, the air bag indicator will either:
   - fail to light.
   - remain lit continuously.
   - flash.

   The flashing might not occur 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 restraints control module (RCM) to complete the testing of the SRS. If the air bag indicator is inoperative and a SRS fault exists, a chime will sound in a pattern of five sets of five beeps. If this occurs, the air bag indicator and any SRS fault discovered must be diagnosed and repaired.
   Clear all continuous DTCs from the restraints control module using a scan tool.

Supplemental Restraint System (SRS) Deactivation and Reactivation

Special Tool(s)	
 ST2506-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F088 (105-R0012)

Deactivation Procedure

WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

WARNING: To reduce the risk of personal injury, do not use any memory saver devices.

NOTE: The air bag warning lamp illuminates when the RCM fuse is removed and the ignition switch is ON. This is normal operation and does not indicate a supplemental restraint system (SRS) fault.

NOTE: There is no restraint system diagnostic tools available for the safety belt buckle pretensioners under the seat. If the ignition switch is set to the RUN or START position with the

NOTE: The 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 switch to OFF.

3. At the central junction box (CJB), located on the LH end of the instrument panel, open the kick panel cover and remove the restraints control module (RCM) fuses F2.2 (10A) and fuse F2.26 (10A) from the CJB. For additional information, refer to the Wiring Diagram Manual.

4. Turn the ignition ON and visually monitor the air bag indicator for at least 30 seconds. The air bag indicator will remain lit continuously (no flashing) if the correct RCM fuse has been removed. If the air bag indicator does not remain lit continuously, remove the correct RCM fuse before proceeding.

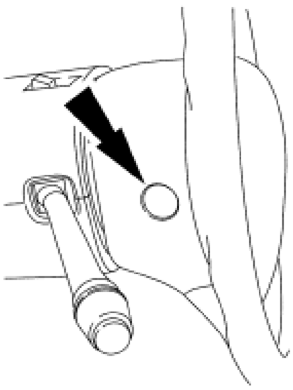
5. Turn the ignition OFF.

6. **WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors or RCM, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.**

   To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

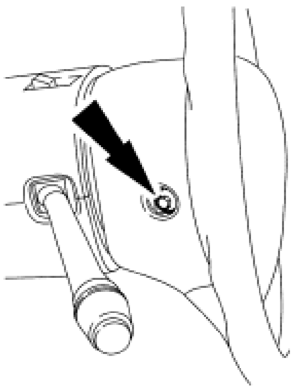
   Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to Section 414-00.

7. Remove the two steering wheel back cover plugs.



DR1305-A

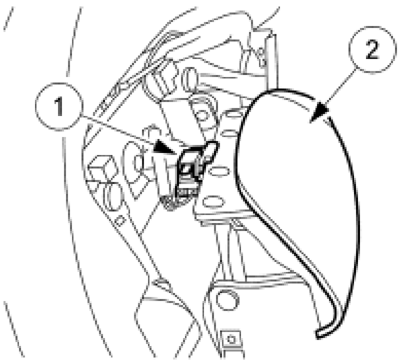
8. Remove the two driver air bag module bolts (one shown).



DR1306-A

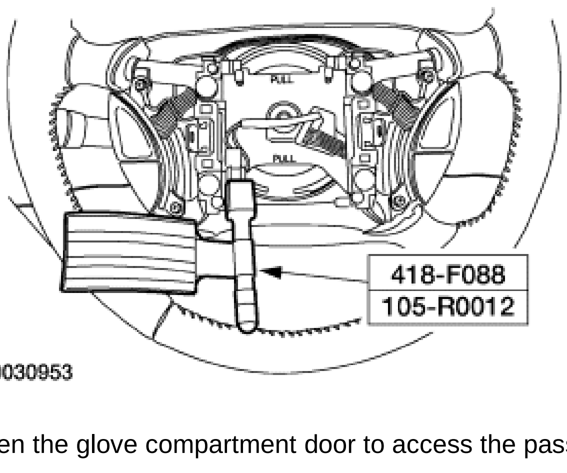
9. Remove the driver air bag module.
    1. Disconnect the driver air bag module electrical connector.

    2. Remove the driver air bag module.



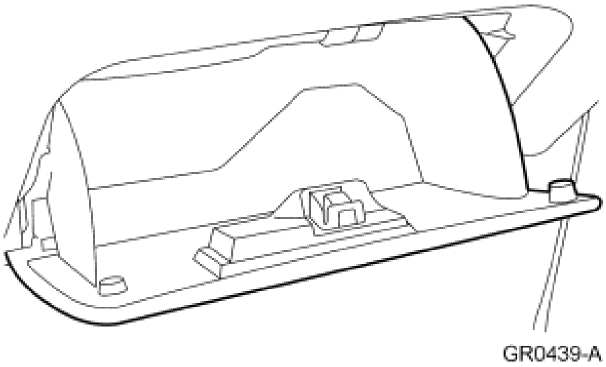
DR1307-A

10. Connect the restraint system diagnostic tool to the clockspring electrical connector at the top of the steering column.

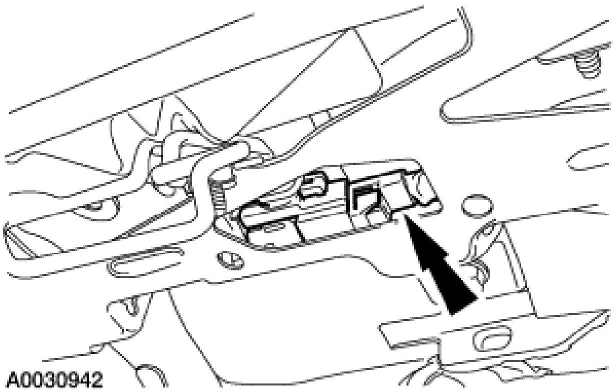


A0030953

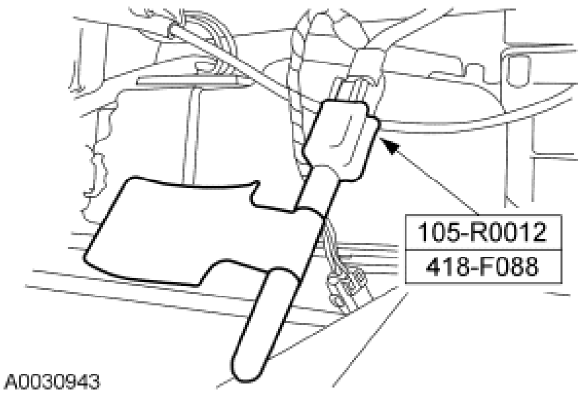
11. Open the glove compartment door to access the passenger air bag electrical connector.



12. Release the tab and disconnect the passenger air bag module electrical connector.



13. Connect the restraint system diagnostic tool to the vehicle harness side of the of the passenger air bag module electrical connector.



14. Install the RCM fuses F2.2 (10A) and F2.26 (10A) to the CJB.

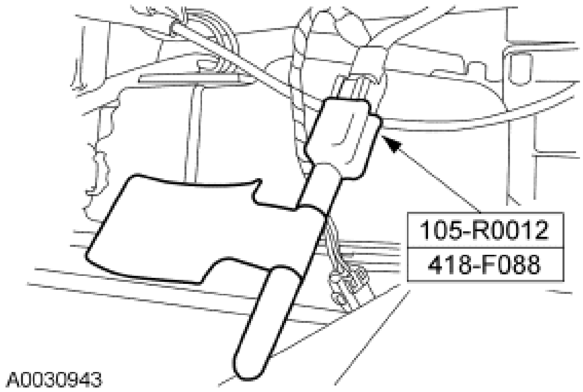
15. Connect the battery ground cable. For additional information, refer to Section 414-01.

Reactivation Procedure

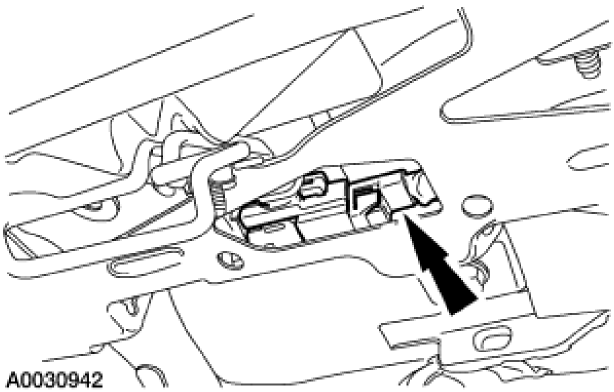
1. Remove the RCM fuses F2.2 (10A) and F2.26 (10A) from the CJB.

2. Disconnect the battery ground cable and wait at least one minute. For additional information, refer to Section 414-01.

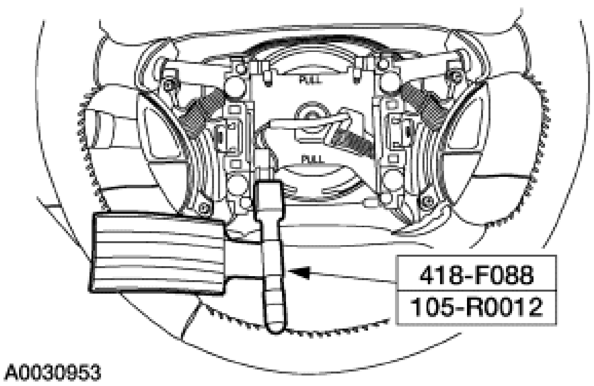
3. Remove the restraint system diagnostic tool from the vehicle harness side of the passenger air bag module electrical connector.



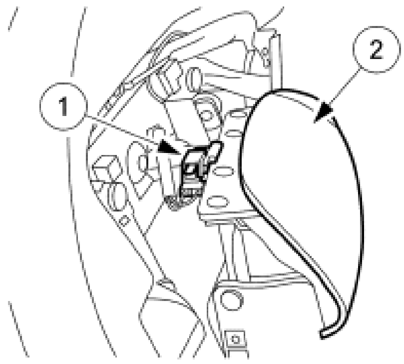
4. Connect the passenger air bag module electrical connector.



5. Remove the restraint system diagnostic tool from the clockspring electrical connector at the top of the steering column.

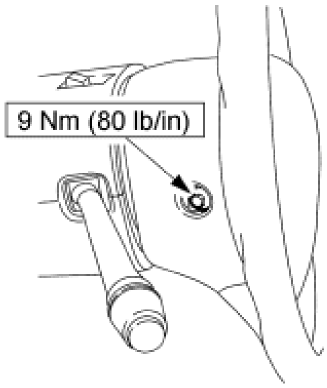


6. Position the driver air bag module.
    1. Connect the driver air bag module electrical connector.
    2. Position the driver air bag module to the steering wheel.



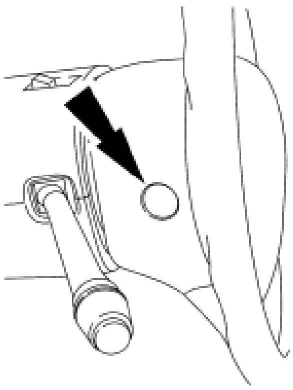
DR1307-A

7. Install the two driver air bag module bolts (one shown).



DR1308-A

8. Install the two steering wheel back cover plugs.



DR1305-A

9. **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

   Make sure all restraint system diagnostic tool(s) that may have been installed during the repair have been removed from the vehicle and all SRS components are connected.

10. Turn the ignition from OFF to ON,

11. Install the restraint system control module fuse F2.2 (10A) and F2.26 (10A) to the CJB and install the LH kick panel cover.

12. **WARNING: Be sure that nobody is in the vehicle and that there is nothing blocking or set in front of any air bag module when the battery ground cable is connected.**

    Connect the battery ground cable.

13. Prove out the supplemental restraint system (SRS) as follows:
    Turn the ignition key from ON to OFF. Wait 10 seconds, then turn the key back to ON and visually monitor the air bag indicator with the air bag modules installed. The air bag indicator will light continuously for approximately six seconds and then turn off. If an air bag supplemental restraint system (SRS) fault is present, the air bag indicator will either:
    - fail to light.
    - remain lit continuously.
    - flash.
    The flashing might not occur 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 restraints control module (RCM) to complete the testing of the SRS. If the air bag indicator is inoperative and a SRS fault exists, a chime will sound in a pattern of five sets of five beeps. If this occurs, the air bag indicator and any SRS fault discovered must be diagnosed and repaired. Clear all continuous DTCs from the restraints control module using a scan tool.

Inspection and Repair After a Supplemental Restraint System (SRS) Deployment

WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools 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 supplemental restraint system (SRS) and safety belt system.

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

1. When any deployable device or combination of devices are deployed and/or the restraints control module (RCM) has the diagnostic trouble code (DTC) B1231 (Crash Data Memory Full) in memory, the repair of the vehicle's 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 restraint control module (RCM).

2. 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.

3. When the driver air bag module has deployed, a new clockspring must be installed.

4. Inspect the entire vehicle for damage, including the following components:
   - Steering column
   - Instrument panel knee bolsters and mounting points
   - Instrument panel braces and brackets
   - Instrument panel and mounting points
   - Seats and seat mounting points
   - Safety belts, safety belt buckles and safety belt retractors. For additional information, refer to Section 501-20A
   - SRS wiring, wiring harnesses and connectors

5. 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 system. 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 system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
2. Remove the deployed device. For additional information, refer to the appropriate procedure in this section or Section 501-20A.
3. **NOTE:** If a dual stage driver or passenger air bag module has deployed due to a crash event, the air bag module requires manual deployment to make sure both stages have deployed before scrapping the vehicle or disposing of the air bag module. To determine if a vehicle is equipped with dual stage driver or passenger air bag modules, refer to the Description and Operation portion of this section.

   Dispose of the deployed device in the same manner as any other part to be scrapped.

Disposal of Deployable Devices and Pyrotechnic Devices That Require Manual Deployment

1. Safety and environmental concerns require consideration and treatment of restraints system deployable and pyrotechnic devices when disposing of vehicles, deployable devices or pyrotechnic devices. Deploying deployable and pyrotechnic devices before scrapping a vehicle or the device eliminates the potential for hazardous exposures or reactions during processing. If special handling procedures are followed, deployable and pyrotechnic devices can be deployed safely and recycled with the vehicle, shipped separately to a recycling facility or disposed of safely.

NOTE: To determine the deployable devices a vehicle is equipped with, refer to the Description and Operation portion of this section.

A vehicle equipped with any of the following deployable devices requires manual deployment of the devices before scrapping the vehicle or component. For additional information, refer to the appropriate portion of this procedure.

- Driver air bag module
- Passenger air bag module
- Seat side air bag modules
- Safety canopy modules
- Side air curtain modules

2. **NOTE:** To determine the pyrotechnic devices a vehicle is equipped with, refer to the Description and Operation portion of this section.

   A vehicle equipped with any of the following pyrotechnic devices requires manual deployment of the devices before scrapping the vehicle or component. For additional information, refer to the appropriate portion of this procedure.

   - Safety belt buckle pretensioners
   - Safety belt retractor pretensioners
   - Adaptive load limiting retractors
   - Deployable steering column

3. **NOTE:** To determine if a vehicle is equipped with dual stage driver or passenger air bag modules, refer to the Description and Operation portion of this section.

   If a dual stage driver or passenger air bag module has deployed due to a crash event, the air bag module requires manual deployment to make sure both stages have deployed before scrapping the vehicle or disposing of the air bag module. For additional information, refer to Driver Air Bag Module, Passenger Air Bag Module and Seat Side Air Bag Modules — Remote Deployment in this procedure.

Driver Air Bag Module, Passenger Air Bag Module and Seat Side Air Bag Modules — Remote Deployment

WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

WARNING: Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Carry a live seat side air bag module with the air bag and tear seam pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Deployment is to be carried out outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when the air bag is deployed, hearing protection is required.

WARNING: After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

NOTE: For air bag modules with multiple squibs, all the squibs on the air bag module must be deployed.

NOTE: Some driver and passenger front air bags have 2 deployment stages. After a crash event it is possible that stage 1 has deployed and the second stage has not.

If a front air bag module has deployed, it is **mandatory** that the front air bag module be remotely deployed using the appropriate air bag disposal procedure.

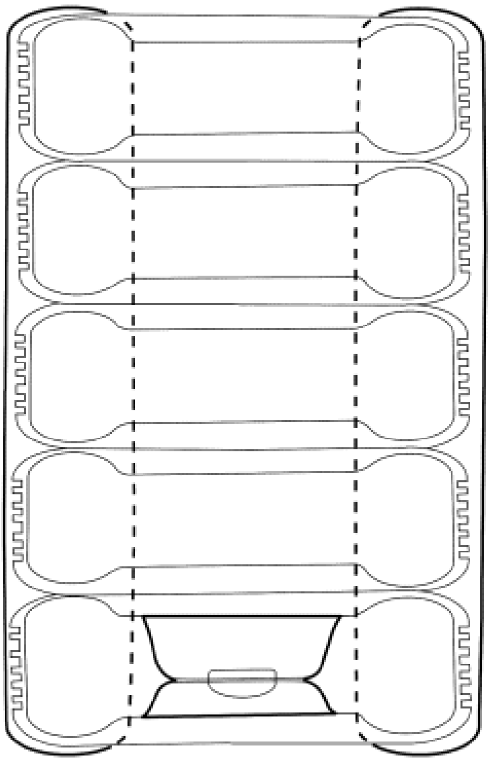
NOTE: A typical air bag disposal is shown that is similar for all vehicles.

All driver, passenger and seat side air bag modules

1. Make a container to house the air bag module for deployment.
    - **NOTE:** The tires must be of sufficient size to accommodate the air bag module.

      Obtain a tire and wheel assembly and an additional 4 tires (without wheels) of the same size.

    - With the tire and wheel assembly on the bottom, stack the tires.
    - Securely tie all of the tires together.



N0033182

2. Depower the system. 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.

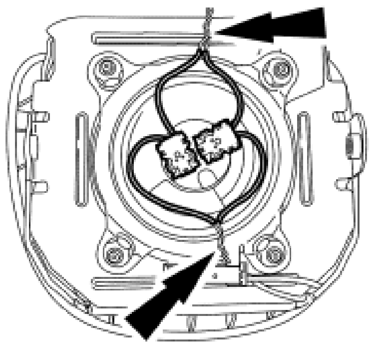
4. **NOTE:** If the air bag module does not have a hard-wired pigtail, it will be necessary to cut the wires and connector(s) from the vehicle wire harness and reconnect to the air bag module.

   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 squibs shown, other air bag modules with multiple squibs similar.

   For air bag modules with multiple squibs, twist together a wire from each squib then repeat for the remaining wires from each squib.



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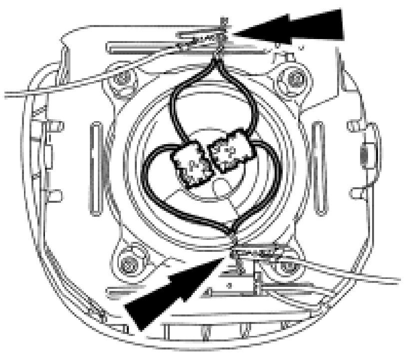
7. Make a jumper harness to deploy the air bag module.
    - Obtain 2 wires (20 gauge minimum) at least 9.14 meters (30 feet) long and strip both ends of each wire.
    - At one end of the jumper harness, connect the wires together.

8. Using the end of the jumper harness that 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 squibs. Use tape or other insulating material to make sure that the leads do not make contact with each other.

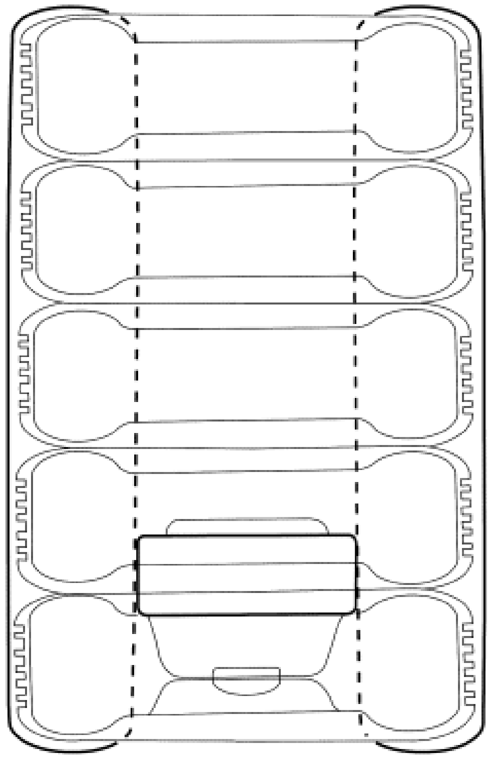


A0043896

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.



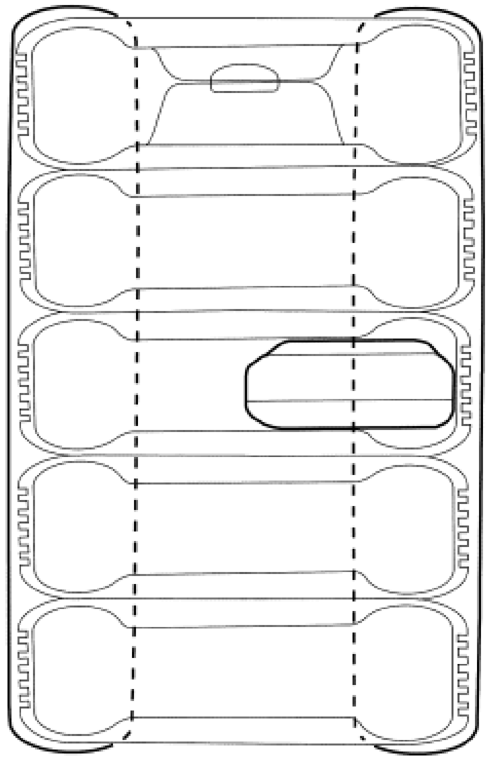
N0033183

Passenger and seat side air bag modules

10. **NOTE:** Make sure to maintain the connections to the air bag module.

    Tip the stack of tires on its side and place the air bag module inside the center tire, making sure that there are 2 tires beneath the tire containing the air bag module and 2 tires (including the tire and wheel assembly) above the tire containing the air bag module.

11. Place the tire stack upright, with the wheel on top.



N0033184

All driver, passenger and seat side air bag modules

12. Remain at least 9.14 meters (30 feet) 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

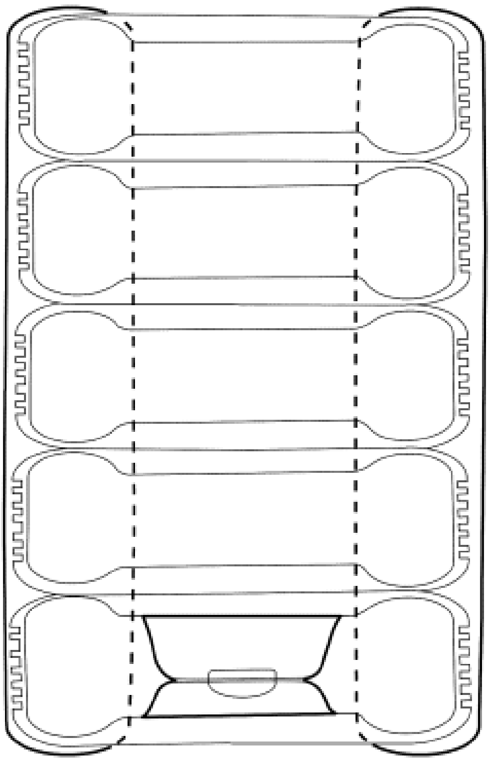
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.

WARNING: Deployment is to be carried out outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when the pretensioner or adaptive load limiting retractor is deployed, hearing protection is required.

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.



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2. Depower the system. 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.

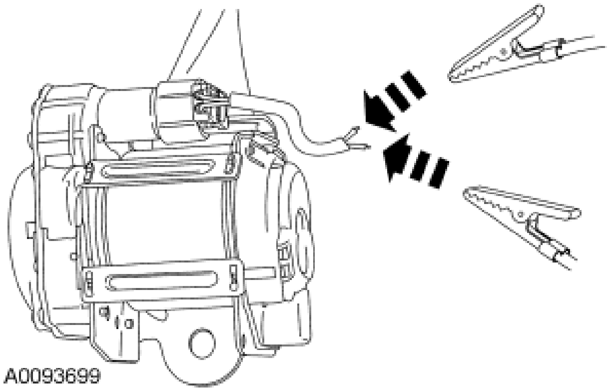
Cut each of the safety belt buckle or retractor wires near the electrical connector that connects to the vehicle wire harness.

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 meters (30 feet) 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 are similar.

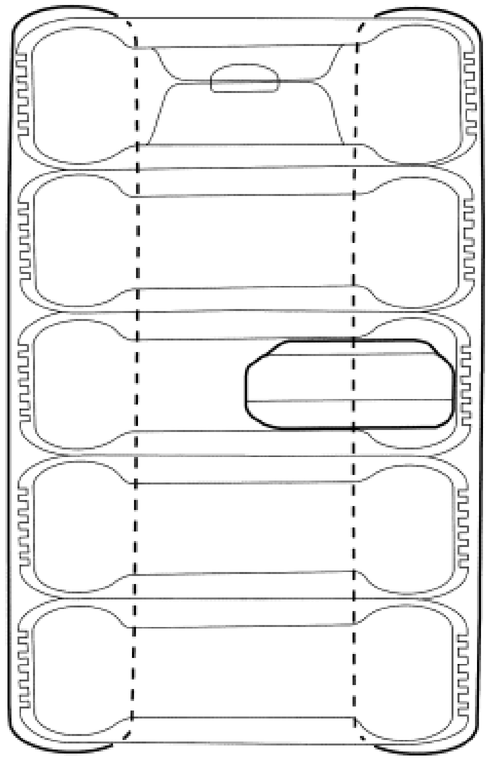
    Using the end of the jumper harness that the wires are not connected together, attach each wire of the jumper harness to each wire of the safety belt buckle or retractor. Use tape or other insulating material to make sure that the leads do not make contact with each other.



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.



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10. Remain at least 9.14 meters (30 feet) 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

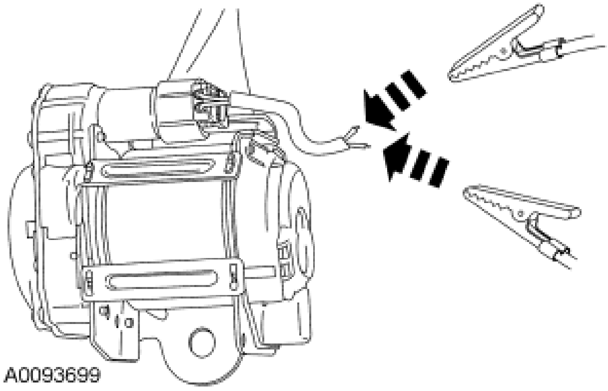
WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.

WARNING: Deployment is to be carried out outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when the pretensioner or adaptive load limiting retractor is deployed, hearing protection is required.

NOTE: A typical safety belt buckle and retractor disposal is shown that is similar for all vehicles.

1. Depower the system. 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 4 inches 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 meters (30 feet) 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 meters (30 feet) 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: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

WARNING: Deployment is to be carried out outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when the safety canopy or side air curtain is deployed, hearing protection is required.

NOTE: The safety canopy module deployment for a scrapped vehicle will occur in its installed position in the vehicle.

NOTE: A typical safety canopy module disposal is shown that is similar for all vehicles.

1. Depower the system. 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 4 inches 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 squibs shown, other safety canopy/side air curtain modules with 2 squibs are similar.

   For safety canopy/side air curtain modules with multiple squibs, twist together a wire from each squib then repeat for the remaining wires from each squib.

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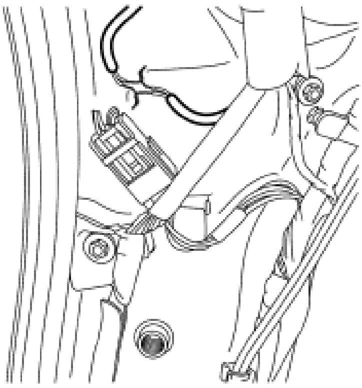
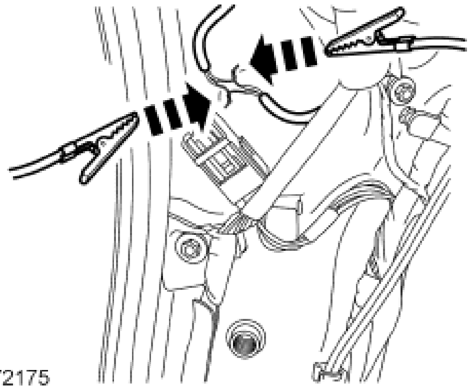
   

6. Make a jumper harness to deploy the safety canopy/side air curtain module.
   - Obtain 2 wires (20 gauge minimum) at least 9.14 meters (30 feet) long and strip both ends of each wire.
   - At one end of the jumper harness, connect the wires together.

7. Using the end of the jumper harness that 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 squibs. Use tape or other insulating material to make sure that the leads do not make contact with each other.


A0072175

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: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Deployment is to be carried out outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when the deployable steering column is deployed, hearing protection is required.

1. Depower the system. 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 4 inches 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 meters (30 feet) 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 that 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.

N0037423

7. Remain at least 9.14 meters (30 feet) 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.

Weld Nut Repair — 'J' Nut, Restraints Control Module (RCM)

WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

NOTE: There are two procedures to repair a vehicle having missing air bag crash sensor attaching weld nut(s). Read both procedures before proceeding with the repair.

NOTE: If two or more weld nuts are missing, do not install the "J" nuts as outlined in this procedure. Weld nuts must be installed as outlined in Weld Nut Repair — Missing Weld Nut, Restraints Control Module (RCM).

NOTE: The following procedure applies to vehicles that have a rectangular hole in the sheet metal that is in close proximity to the missing weld nut.

1. Depower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
2. Obtain a "J" nut (part number N623332-S301) or any of the following optional "J" nuts (part numbers: N623342-S101, N800854-S100, N800925-S100).
3. Obtain a 6 mm (0.24 in) grounding screw (part number N806327-S190) or equivalent.
4. Install the "J" nut through the rectangular hole in the sheet metal.
5. **NOTE:** Be sure the threaded portion of the "J" nut is aligned with the clearance hole in the sheet metal.

   Install the crash sensor.
6. Tighten the attaching screws to specification. Refer to Torque Specifications in this section.

Weld Nut Repair — Missing Weld Nut, Restraints Control Module (RCM)

WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

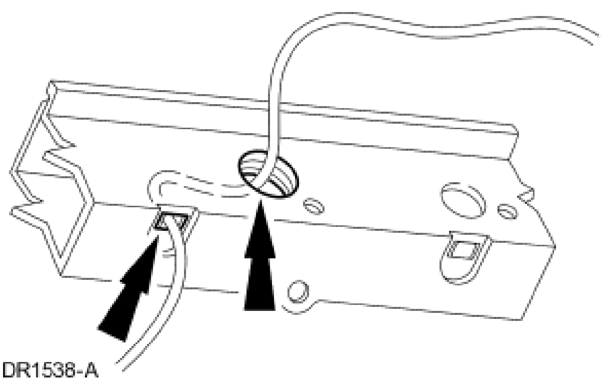
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

NOTE: There are two procedures to repair a vehicle having missing air bag crash sensor attaching weld nut(s). Read both procedures before proceeding with the repair.

NOTE: If two or more weld nuts are missing, do not install the "J" nuts as outlined in Weld Nut Repair — "J" Nut, Restraints Control Module (RCM). Weld nuts must be installed as outlined in this procedure.

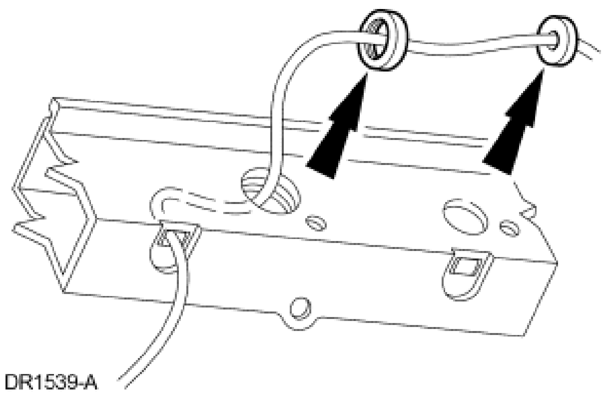
NOTE: Radiator support repair shown, others are similar.

1. Depower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
2. Obtain a 6 mm (0.24 in) weld nut (part number N806285-S190).
3. Obtain a 6 mm (0.24 in) grounding screw (part number N806327-S190).
4. Route a sufficient length of copper welding wire through the weld nut clearance hole and back out an adjacent access hole.



DR1538-A

5. Feed the copper welding wire through the weld nut, then through a standard flatwasher.



6. Secure the flatwasher so that it cannot be pulled off the end of the copper welding wire.

7. Pull the copper welding wire back through the clearance hole, allowing the weld nut and flatwasher to follow the copper welding wire through.

8. Position the weld nut to the weld nut clearance hole, firmly pulling on the copper welding wire allowing the secured flatwasher to hold the weld nut in position.

9. Holding the weld nut securely in place and using a MIG welder, weld in four places around the edge of the weld nut.

10. Metal finish as required.

11. Verify the nut is securely in place.

12. Install the crash sensor.

13. Tighten the attaching screws to specification. Refer to Torque Specifications in this section.

Weld Nut Repair — Stripped Weld Nut, Restraints Control Module (RCM)

WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

1. Depower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
2. Obtain an 8 mm (0.32 in) grounding screw (part number N802455-S190).
3. Drill out the internal threads of the stripped-out weld nut to 7.37 mm (0.29 in) using a letter "L" size drill bit.
4. Position the crash sensor to the vehicle.
5. Install the 8 mm (0.32 in) grounding screw into the drilled-out weld nut.
6. Install the remaining attaching screws.
7. Tighten the attaching screws to specification. For additional information, refer to Torque Specifications in this section.

Restraints Control Module (RCM)

Removal

WARNING: The restraints control module (RCM) orientation is critical for correct air bag supplemental restraint system (SRS) operation. If a vehicle equipped with an SRS system has been involved in a collision in which the center tunnel area has been damaged, inspect the mounting and bracket for deformation. If damaged, the RCM must be replaced whether or not the air bags have deployed. In addition, make sure the area of the RCM mounting is restored to its original condition.

WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. Replace and properly position the sensor or any other damaged supplemental restraint system (SRS) components whether or not the air bag is deployed.

WARNING: To reduce the risk of personal injury, do not use any memory saver devices.

CAUTION: Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage can result.

NOTE: The air bag warning lamp illuminates when the RCM fuse is removed and the ignition switch is ON. This is normal operation and does not indicate a supplemental restraint system (SRS) fault.

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

NOTE: Repair is made by installing a new part only. If the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

All vehicles

1. Depower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

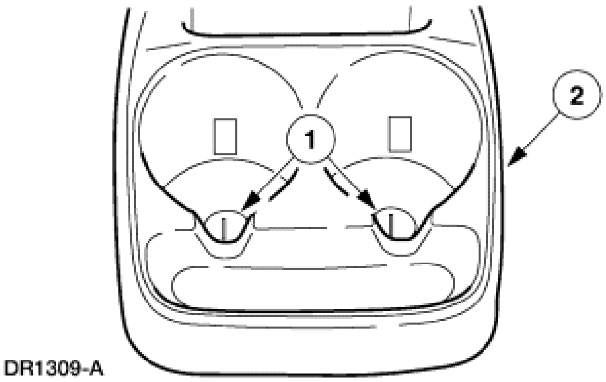
Vehicles with floor console

2. Remove the floor console. For additional information, refer to Section 501-10.

Vehicles with utility tray

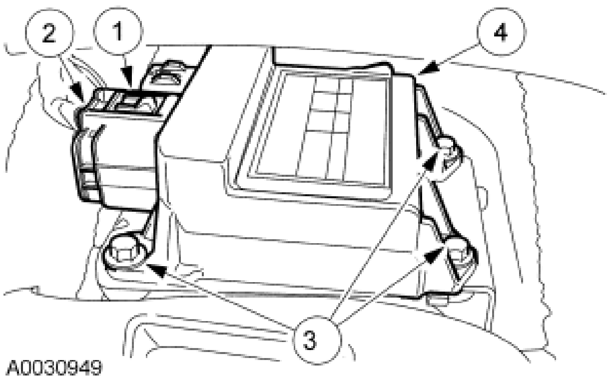
3. Remove the utility tray.

1. Unscrew the two retainers.
2. Remove the utility tray.



All vehicles

4. Remove the restraints control module (RCM).
    1. Slide and disengage the RCM electrical connector locking clip.
    2. Release the tab and disconnect the RCM.
    3. Remove the bolts.
    4. Remove the RCM.



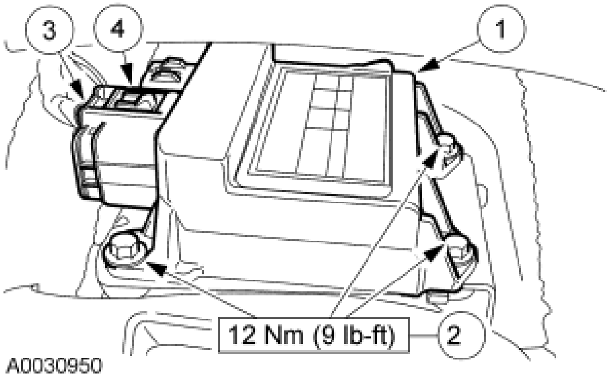
Installation

1. **WARNING: The tightening torque of the air bag restraints control module (RCM) bracket retaining bolts is critical for correct system operation.**

    Install the RCM.

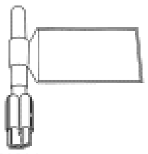
    1. Position the RCM.
    2. Install the bolts.
    3. Connect the RCM electrical connector.

4. Slide and engage the RCM electrical connector locking tab.



2. Install the floor console or the utility tray.
3. Repower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

Driver Air Bag Module

Special Tool(s)	
 ST2506-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F088 (105-R0012)

Removal

WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

WARNING: Air bag modules with discolored or damaged trim covers must be installed new, not repainted.

WARNING: To reduce the risk of personal injury, do not use any memory saver devices.

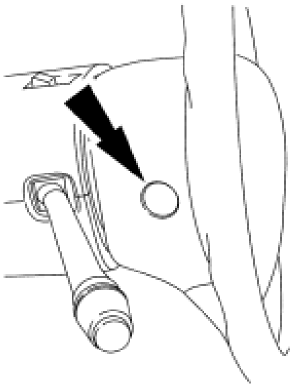
NOTE: The air bag warning lamp illuminates when the RCM fuse is removed and the ignition switch is ON. This is normal operation and does not indicate a supplemental restraint system (SRS) fault.

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

NOTE: Repair is made by installing a new part only. If the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

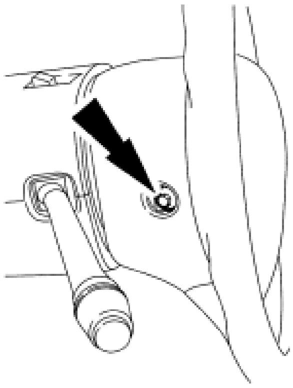
1. Depower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

2. Remove the two steering wheel back cover plugs.



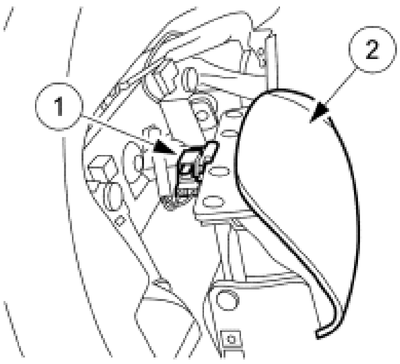
DR1305-A

3. Remove the two driver air bag module retaining bolts.



DR1306-A

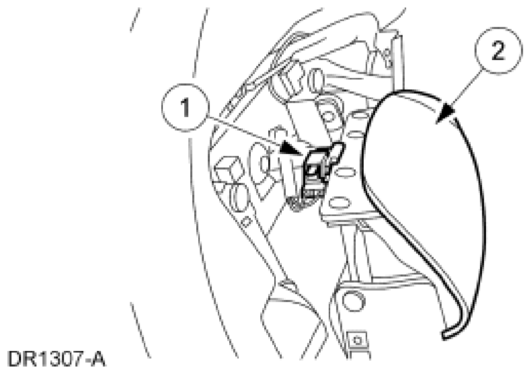
4. Remove the driver air bag module.
    1. Disconnect the driver air bag module electrical connector.
    2. Remove the driver air bag module.



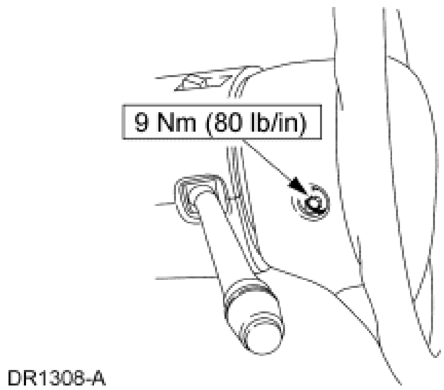
DR1307-A

Installation

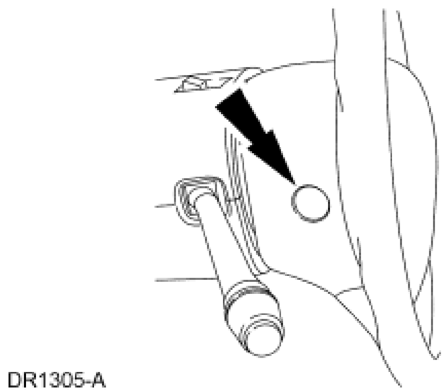
1. Install the driver air bag module.
    1. Connect the driver air bag module electrical connector.
    2. Position the driver air bag module into the steering wheel.



2. Install the two driver air bag module bolts.
    - Install the two steering wheel back cover plugs.



3. Install the two steering wheel back cover plugs.



4. Repower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

Passenger Air Bag Module

Removal

WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Carry a live air bag module with the air bag and deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Do not set a live air bag module down with the deployment door face down. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment which can result in personal injury.

WARNING: Air bag modules with discolored or damaged deployment doors must be installed new, not repainted.

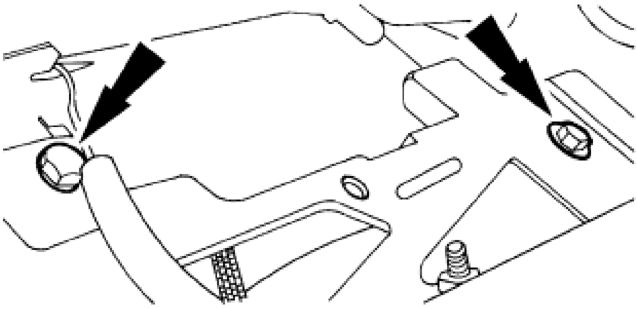
WARNING: To reduce the risk of personal injury, do not use any memory saver devices.

NOTE: The air bag warning lamp illuminates when the RCM fuse is removed and the ignition switch is ON. This is normal operation and does not indicate a supplemental restraint system (SRS) fault.

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

NOTE: Repair is made by installing a new part only. If the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

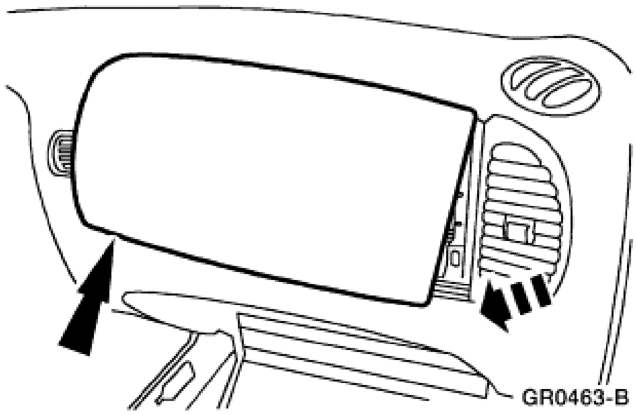
1. Depower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
2. Open the glove compartment to access the passenger air bag module bolts.
3. Remove the two passenger air bag retaining bolts.



GR0462-C

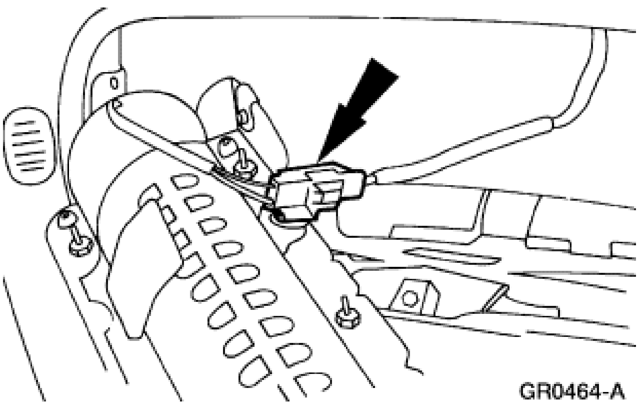
4. **CAUTION: Do not handle the passenger air bag module by grabbing the edges of the deployment doors.**

   Placing one hand in the glove compartment, push the passenger air bag out enough to access the electrical connector.



GR0463-B

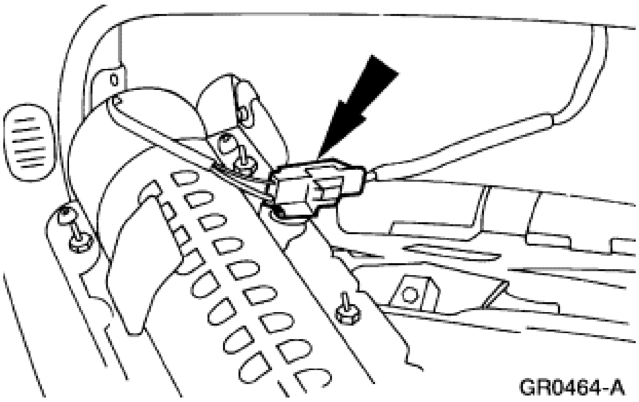
5. Disconnect the passenger air bag module electrical connector.



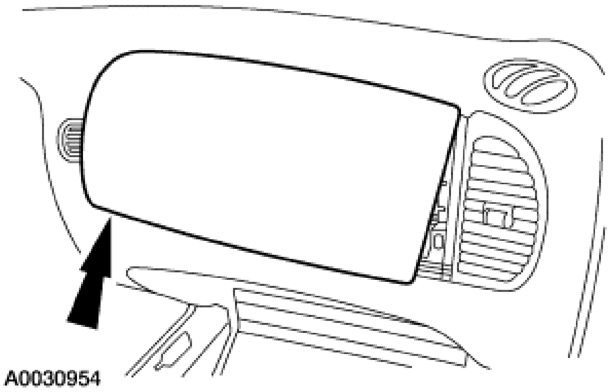
GR0464-A

Installation

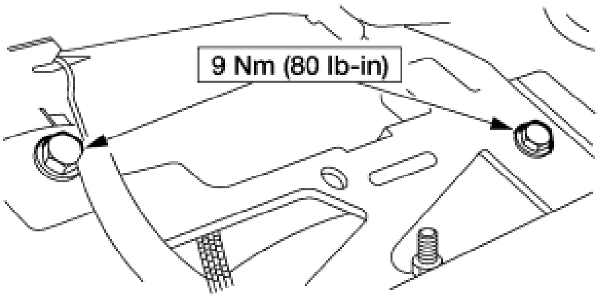
1. Connect the passenger air bag module electrical connector.


GR0464-A

2. Position the passenger air bag module into the instrument panel.


A0030954

3. Install the passenger air bag module bolts.



A0030955

4. Close the glove compartment.

5. Repower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

Clockspring

Removal

WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

WARNING: Air bag modules with discolored or damaged trim covers must be installed new, not repainted.

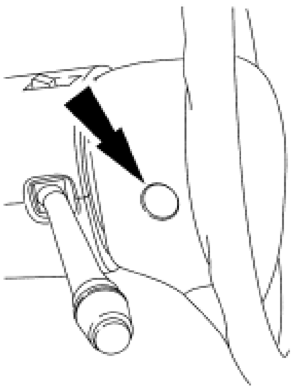
WARNING: To reduce the risk of personal injury, do not use any memory saver devices.

NOTE: The air bag warning lamp illuminates when the RCM fuse is removed and the ignition switch is ON. This is normal operation and does not indicate a supplemental restraint system (SRS) fault.

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

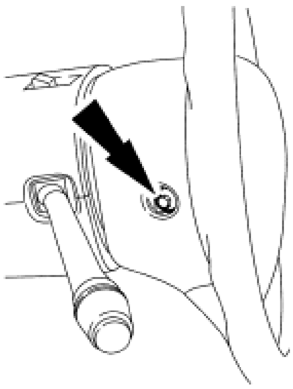
NOTE: A repair is made by installing a new part only. If the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

1. Depower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
2. Remove the steering wheel back cover plugs.



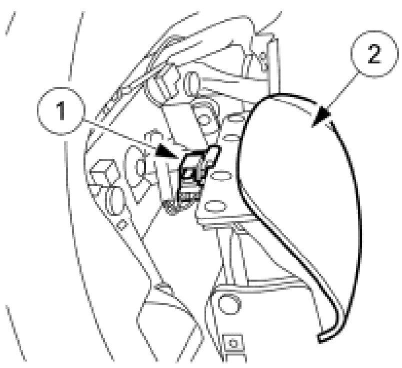
DR1305-A

3. Remove the two driver air bag module bolts.



DR1306-A

4. Remove the driver air bag module.
    1. Disconnect the driver air bag module electrical connector.
    2. Remove the driver air bag module.



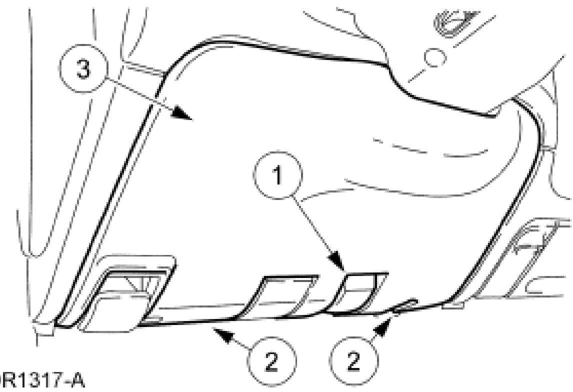
DR1307-A

5. **NOTE:** Make sure the wheels (1007) are in the straight-ahead position.

    Remove the steering wheel (3600). For additional information, refer to Section 211-04.

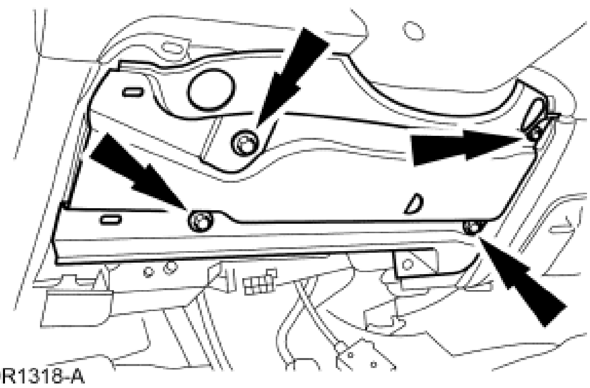
6. Remove the lower steering column opening finish panel.
    1. Remove the screws and position the hood release handle out of the way.
    2. Remove the screws from the lower steering column opening finish panel.

3. Pull out to release the retaining clips and remove the lower steering column opening finish panel.



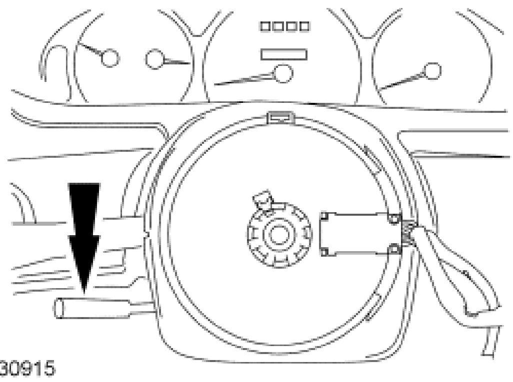
DR1317-A

7. Remove the five bolts and remove the lower steering column opening finish panel reinforcement.



DR1318-A

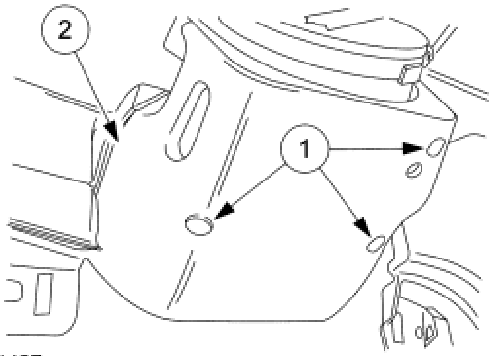
8. Remove the tilt wheel handle and shank.



A0030915

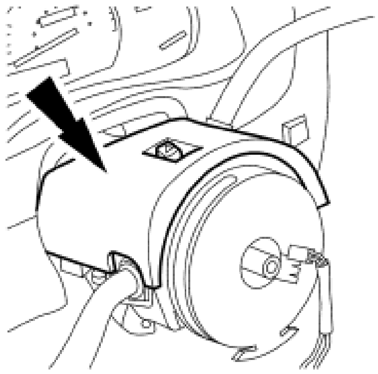
9. Remove the lower steering column shroud.
    1. Remove the screws.

    2. Remove the lower steering column shroud.



A0021487

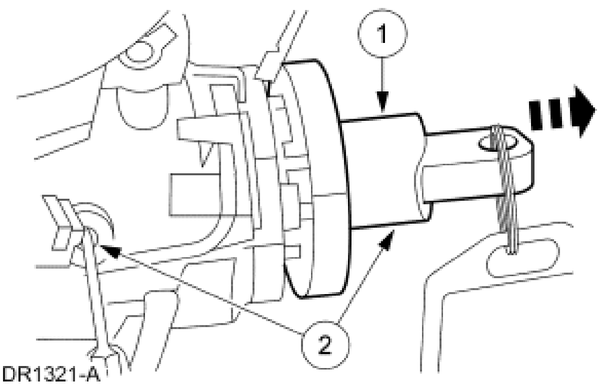
10. Position the upper steering column shroud up enough to access the clockspring retaining clips.



A0030916

11. Remove the ignition switch lock cylinder (11582).
    1. Position the ignition switch lock cylinder to the RUN position.

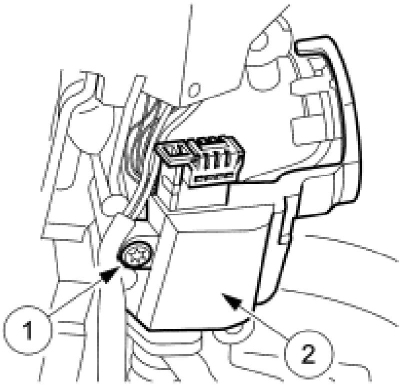
    2. Using a suitable tool, push upward on the cylinder release tab while pulling the ignition switch lock cylinder outward.



DR1321-A

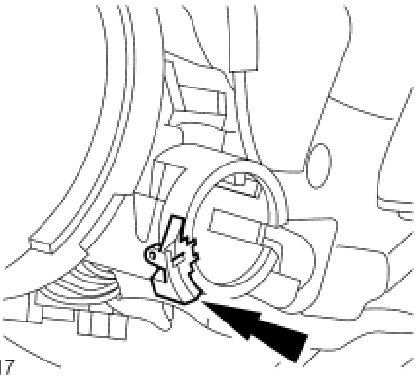
12. Remove the passive anti-theft system (PATS) transmitter.
    1. Remove the PATS transmitter retaining screw.

    2. Position the PATS transmitter out of the way.



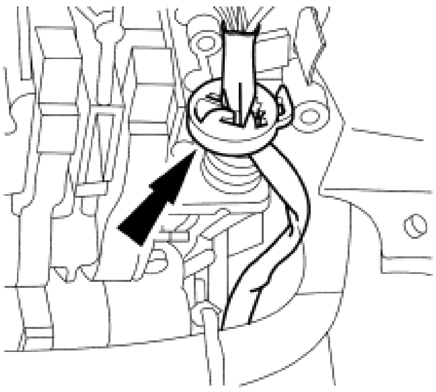
DR1323-A

13. Remove the key-in-ignition warning indicator switch.



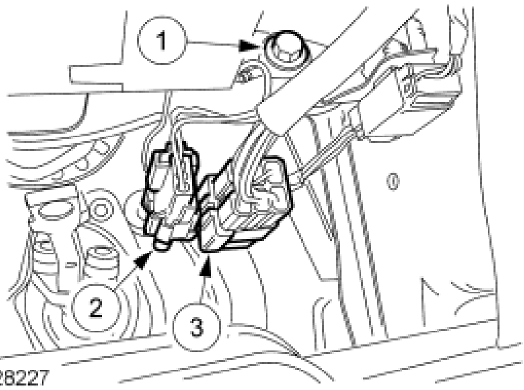
A0030917

14. Remove the wire harness from the holder.



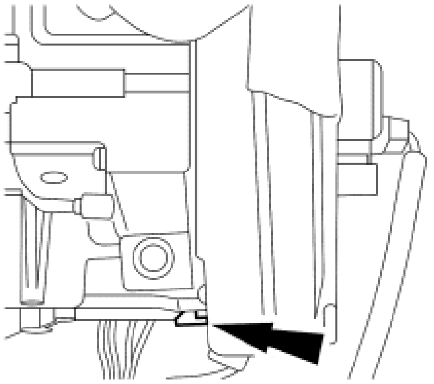
DR1326-A

15. Remove the clockspring electrical connectors.
    1. Remove the bolt.
    2. Release the pin-type retainer and disconnect the electrical connector.
    3. Release the pin-type retainer and disconnect the electrical connector.

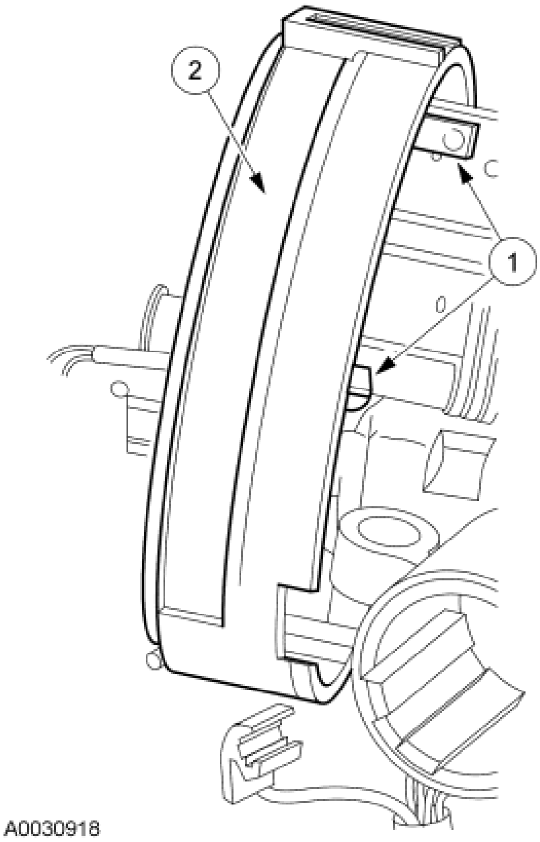


A0028227

16. Release the lower clockspring retaining clip.


DR1327-A

17. Remove the clockspring.
    1. Release the remaining two clockspring retaining clips.
    2. Remove the clockspring.



Installation

Vehicles receiving a new clockspring

1. **NOTE:** A new clockspring is supplied in a centralized position and held there with a key.

   Remove the key from the clockspring, holding the rotor in its centralized position.

   - Do not allow the clockspring rotor to turn.

Vehicles needing clockspring recentering

2. **WARNING: Incorrect centralization may result in premature component failure. If in doubt when centralizing the clockspring, repeat the centralizing procedure. Failure to follow this instruction may result in personal injury.**

   CAUTION: Make sure the road wheels are in the straight-ahead position.

   NOTE: If a clockspring has rotated out of center, follow through with this step.

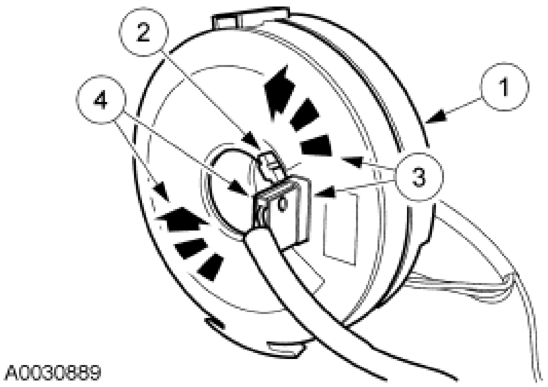
   Centralize the clockspring.

   1. Hold the clockspring outer housing stationary.
   2. Depress the clockspring locking tab to release the rotor.

3. **CAUTION: Overturning will destroy the clockspring. The internal ribbon wire acts as the stop and can be broken from its internal connection.**

   While holding the clockspring locking tab in the released position, turn the rotor counterclockwise, carefully feeling for the ribbon wire to run out of length and a slight resistance to be felt. Stop turning at this point.

4. While holding the clockspring locking tab in the released position, turn the clockspring clockwise approximately 2.25 turns. This is the center point of the clockspring.
   - Release the clockspring locking tab. Do not allow the rotor to turn from this position.



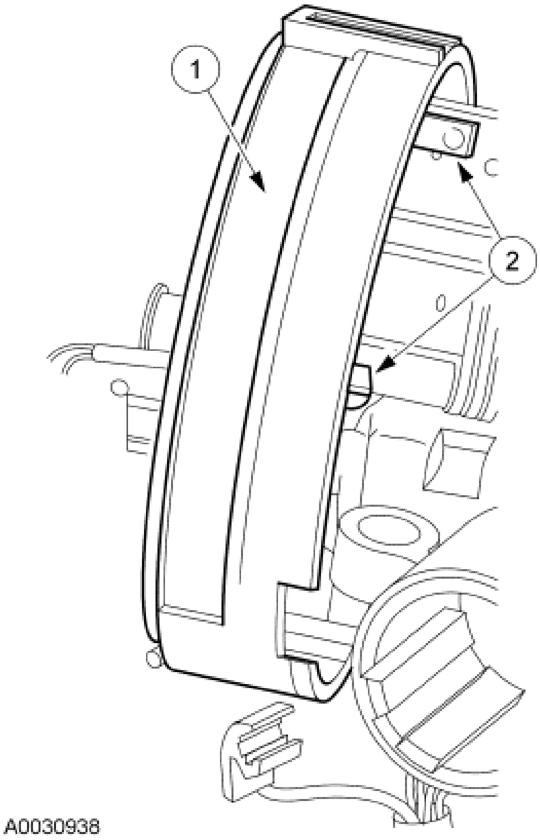
All vehicles

3. **NOTE:** Slight turning of the clockspring rotor is allowable for alignment purposes to the steering column.

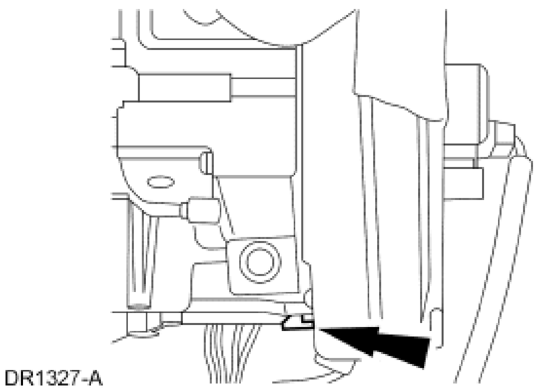
   Install the clockspring onto the steering column.

   1. With the flats of the clockspring aligned to the flats of the steering column, slide the clockspring onto the steering column.

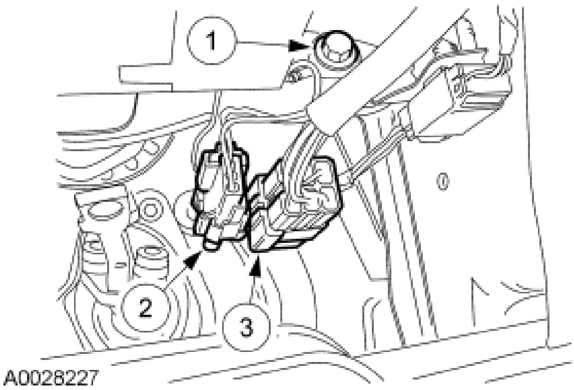
   2. Engage the upper and side retaining tabs.



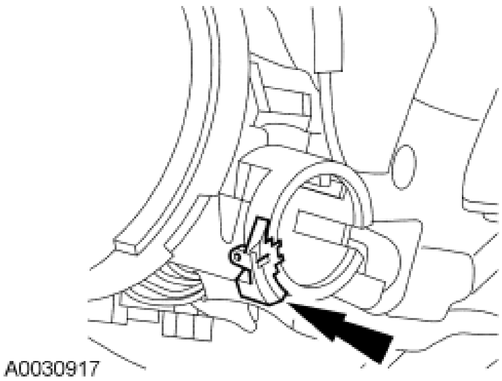
4. Engage the lower clockspring retaining clip.



5. Install the clockspring electrical connectors.
    1. Install the bolt.
    2. Connect the electrical connector. Install the pin-type retainer and electrical connector to the bracket.
    3. Connect the electrical connector. Install the pin-type retainer and electrical connector to the bracket.

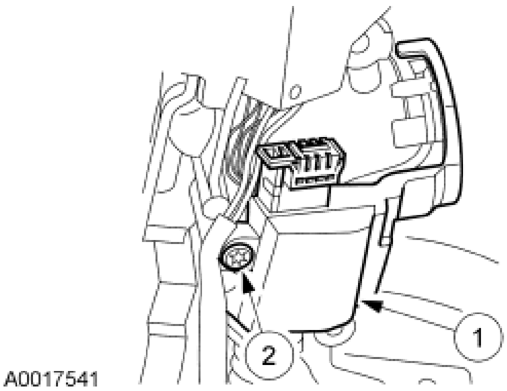


6. Install the key-in-ignition warning indicator switch to the steering column.

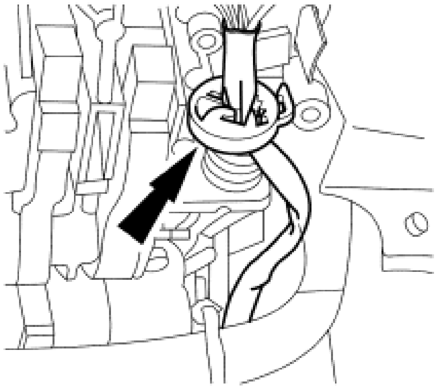


7. Install the passive anti-theft system (PATS) transmitter.
    1. Position the PATS transmitter to the steering column.

    2. Install the PATS transmitter retaining screw.

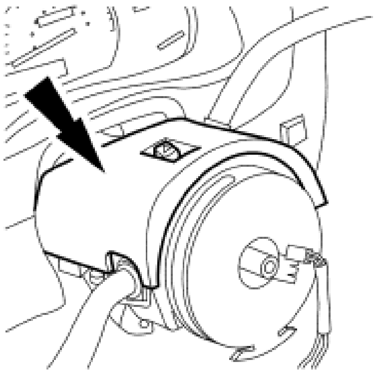


8. Route the clockspring wire harness into the retainer.



DR1326-A

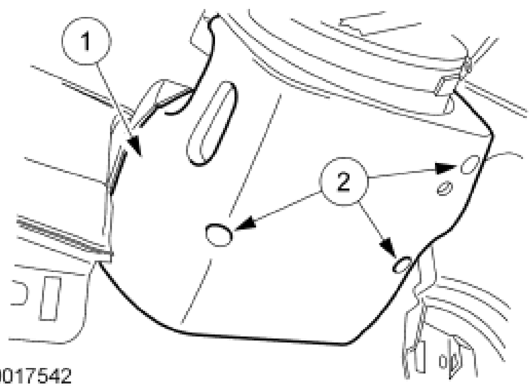
9. Reposition the upper steering column shroud.



A0030916

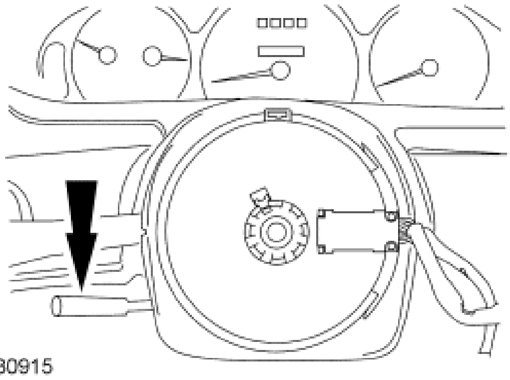
10. Install the lower steering column shroud.
    1. Position the lower steering column shroud.

    2. Install the screws.



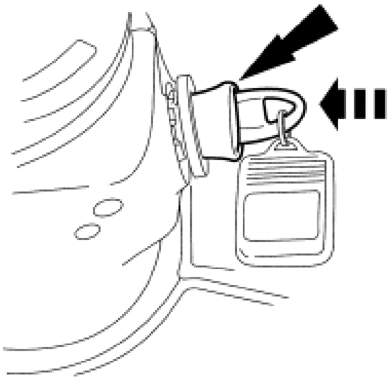
A0017542

11. Install the tilt wheel handle and shank.



A0030915

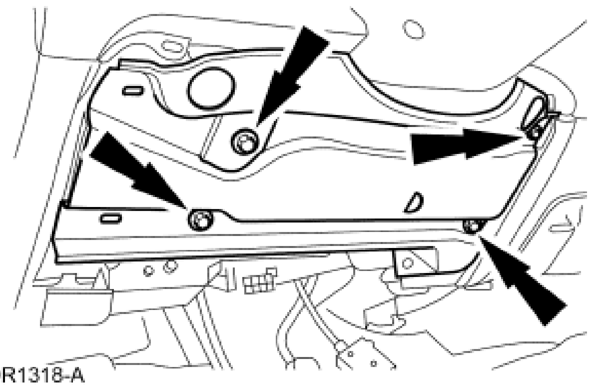
12. Install the ignition switch lock cylinder.
    - Align and install the ignition switch lock cylinder to the steering column.
        - Position the ignition switch lock cylinder to the OFF position.



A0020782

13. Install the steering wheel. Do not install the driver air bag module at this time. For additional information, refer to [Section 211-04](#).

14. Position the steering column opening finish panel reinforcement. Install the bolts.

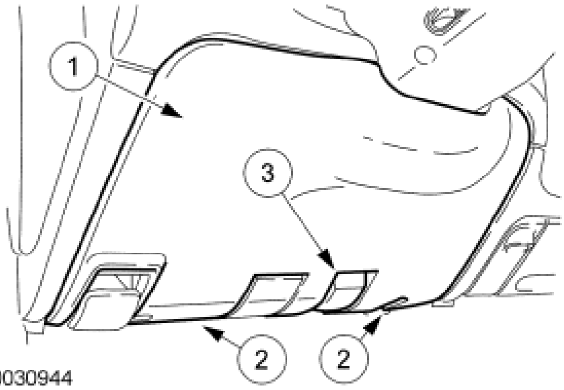


DR1318-A

15. Install the lower steering column opening finish panel.
    1. Align the lower steering column opening finish panel and push in, seating the retaining clips.

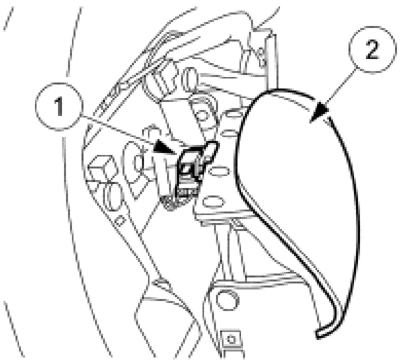
    2. Install the screws.

    3. Position the hood release handle. Install the screws.



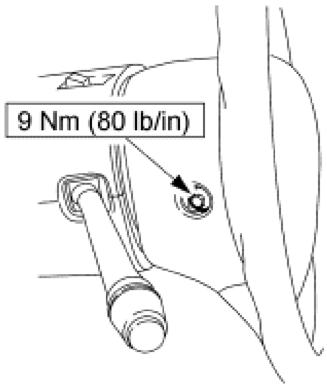
A0030944

16. Install the driver air bag module.
    1. Connect the driver air bag module electrical connector.
    2. Position the driver air bag module into the steering wheel.



DR1307-A

17. Install the two driver air bag module bolts.
    - Install the two steering wheel back cover plugs.



DR1308-A

18. Repower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

Passenger Air Bag Deactivation (PAD) Switch

Removal

WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

WARNING: To reduce the risk of personal injury, do not use any memory saver devices.

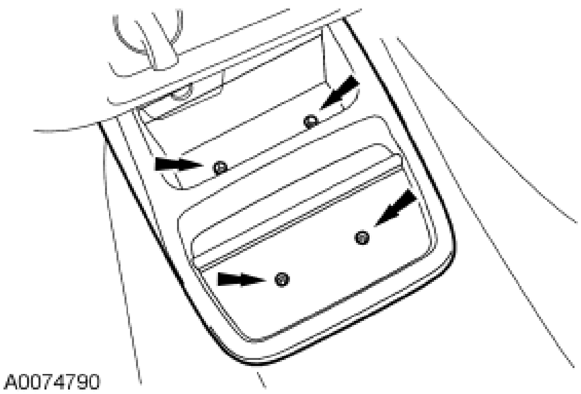
NOTE: The air bag warning lamp illuminates when the RCM fuse is removed and the ignition switch is ON. This is normal operation and does not indicate a supplemental restraint system (SRS) fault.

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

NOTE: A repair is made by installing a new part only. If the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

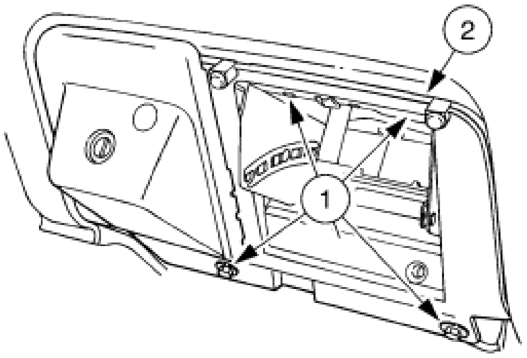
1. Depower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

2. Release the clips and remove the utility tray (if equipped).



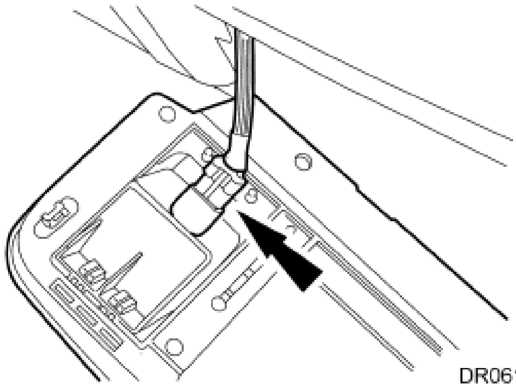
3. Remove the instrument panel ash receptacle (04810).

4. Remove the ash receptacle bracket.
    1. Remove the retaining bolts.
    2. Remove the ash receptacle bracket.

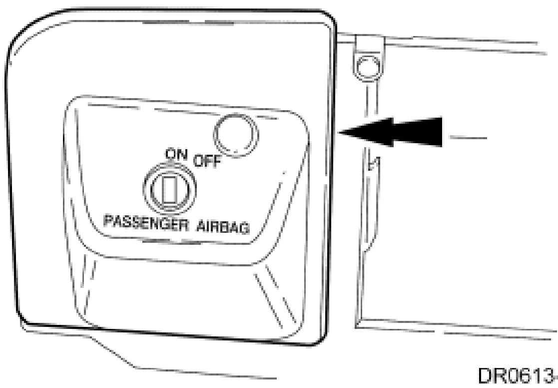


DR0611-A

5. Disconnect the passenger air bag deactivation (PAD) switch electrical connector.


DR0612-A

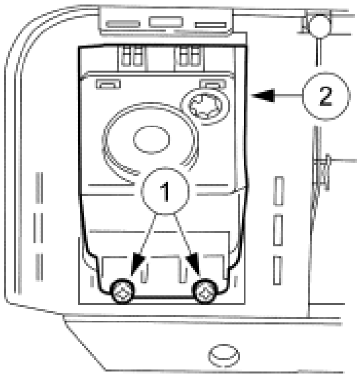
6. Remove the passenger air bag deactivation (PAD) switch cover.



DR0613-A

7. Remove the passenger air bag deactivation (PAD) switch.
    1. Remove the retaining screws.

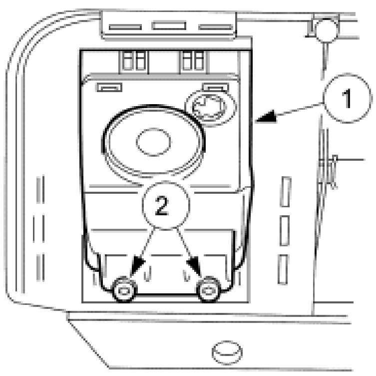
    2. Remove the passenger air bag deactivation (PAD) switch.



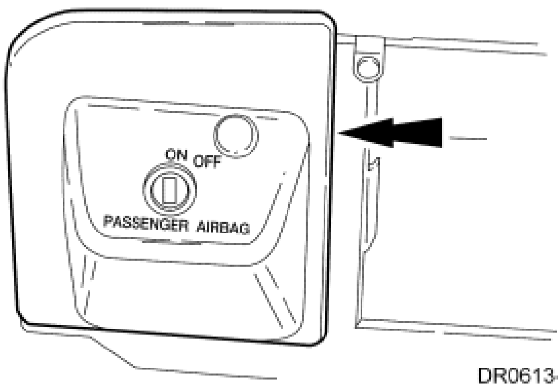
Installation

1. Install the PAD switch.
    1. Position the PAD switch to the instrument panel finish panel.

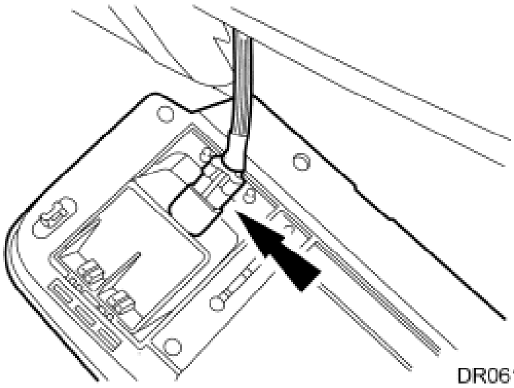
    2. Install the screws.



2. Install the PAD switch cover.

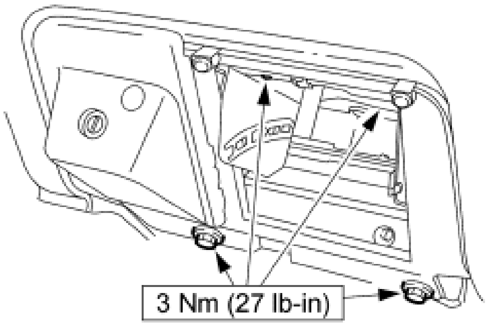


3. Connect the PAD switch electrical connector.



DR0612-A

4. Position the ash receptacle bracket. Install the screws.



A0030968

5. Install the ash receptacle.

6. Install the utility tray.

7. Repower the system. For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.