

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye 164-R3701 (Rotunda)	—	—
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V	1L (2.1 pt) ^a

a Capacities listed are average system capacities and may vary.

General Specifications

Item	Specification
Power Steering Gear	
Turning effort	2.27 kg (5 lb)
Turns lock-to-lock (4.0L)	3.13
Turns lock-to-lock (4.6L)	2.83
Turns lock-to-lock (4.6L with optional 18-inch wheels)	2.60
Turns lock-to-lock (5.4L)	2.60

General Specifications (Continued)

Item	Specification
Power Steering Pump	
Flow	4.0L and 4.6L — 8.35L/min (2.2 gpm) 5.4L — 7.57L/min (2.0 gpm) Fluid @ 41°-46°C (105°-115°F) 4.0L @ 2,150 rpm 4.6L @ 2,000 rpm
Minimum capacity	4.9L/min (1.3 gpm) Fluid @ 41°-46°C (105°-115°F) Engine at idle Pressure @ 5,171 kPa (750 psi)
Pressure	345 kPa (50 psi) Fluid @ 41°-46°C (105°-115°F) 4.0L @ 2,150 rpm 4.6L and 5.4L @ 2,000 rpm
Relief pressure	9,653-10,549 kPa (1,400-1,530 psi)
Power Steering Purge Vacuum	
Vacuum	68-85 kPa (20-25 in-Hg)

DESCRIPTION AND OPERATION

Steering System

The power steering system consists of the following components:

- Power steering pump
- Power steering fluid reservoir
- Steering gear
- Power steering lines
- Steering column
- Steering column shaft
- Power steering cooler (if equipped)

The power steering system transfers driver inputs at the steering wheel to the front wheels of the vehicle. The steering column, hydraulic system and linkages that transfer these driver inputs make up the steering system. Gearing and hydraulic assist are used to significantly reduce steering efforts.


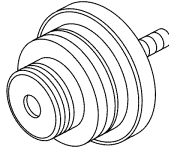

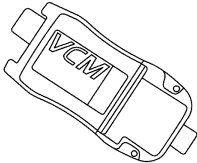
For information on the power steering fluid reservoir, power steering pump, power steering lines and steering gear, refer to Section 211-02.

For information on the steering wheel, steering column and steering column shaft, refer to Section 211-04.

DIAGNOSIS AND TESTING

Steering System

Special Tool(s)

 <p>ST1300-A</p>	100W/12 Volt DC UV Lamp 164-R0751
 <p>ST2670-A</p>	Evacuation Cap, Power Steering 211-265 or equivalent
 <p>ST1176-A</p>	Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent
 <p>ST2834-A</p>	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Material

Item	Specification
Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye 164-R3701 (Rotunda)	—
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

Principles of Operation

Power Steering

The power steering system uses a vane-type pump to move the fluid from the reservoir to the steering gear and through the rest of the steering hydraulic system. The power steering pump is mounted to the engine and driven by the engine accessory drive belt. Power steering fluid flows into the pump from the reservoir. The power steering fluid is trapped between the pump vanes and moved to the high-pressure side of the pump, creating a flow of fluid. The restriction of this flow by the steering gear creates the pressure that provides the steering assist. A combined pressure relief/flow valve is built into the pump to control the maximum pressure and flow provided to the steering system. This action prevents damage to the system and provides the correct level of assist during all engine speeds. While under pressure, the power steering fluid flows through the high-pressure power steering line to the steering gear. The fluid exits the gear and flows through the return line, cooler and finally to the reservoir. The reservoir slows the fluid, allows air to escape and filters the fluid before returning it to the pump.

Inspection and Verification

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

DIAGNOSIS AND TESTING (Continued)**Visual Inspection Chart**

Mechanical
<ul style="list-style-type: none"> • Fluid level • Tire pressure • Tires • Drive belt • Drive belt tensioner • Steering column alignment • Tie-rod ends • Suspension components • Steering column shaft U-joints • Steering column shaft bolts • Power steering reservoir screen or filter • Pressure lines, fittings or O-rings • Power steering return hoses and clamps • Steering gear • Power steering pump • Power steering fluid cooler (if equipped) • Power Steering Pressure (PSP) switch

3. Inspect the power steering fluid for the following conditions:
 - Aeration or foam: Purge the power steering system. Refer to Power Steering System Purging in this section.
 - Overheating or contamination: Flush the power steering system. Refer to Power Steering System Flushing in this section.
4. **NOTE:** It may be necessary to add power steering fluid to achieve the correct level.
 Check the fluid level and clean the power steering components.
 With the ignition OFF:
 - check the power steering fluid level and add fluid as necessary.
 - wipe off any visible signs of fluid or residue build up.
 - **NOTICE:** Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.
 Start the engine and turn the steering wheel from stop-to-stop several times.
5. Visually inspect the power steering hydraulic line/hose connections for damage or leaks.
 - If a leak is detected at a threaded fitting or clamp plate joint, tighten to specification. If the leak is still evident, visually inspect the O-rings or Teflon® seals. Install new O-rings or Teflon® seals as necessary. Refer to Section 211-02.
 - If a leak is detected at a constant tension spring clamp, verify that the hose is not damaged and fully installed on the hose fitting. Make sure that the constant tension spring clamp is positioned 2 mm (0.078 in) from the end of the hose. If the leak remains, install a new constant tension spring clamp.
 - If a leak is detected at a screw clamp joint, verify that the hose is not damaged and fully installed on the hose fitting and the clamp is positioned 2 mm (0.078 in) from the end of the hose before tightening the screw clamp. If the leak remains, install a new screw clamp. Refer to Section 211-02.
 - If a leak is detected at the Power Steering Pressure (PSP) switch, install a new switch as necessary.
6. Visually inspect the power steering components for leaks.
 - If a leak is detected in the pressure or return line, install a new line. Refer to Section 211-02.
 - If a leak is detected in the power steering pump, install a new power steering pump. Refer to Section 211-02.
 - **NOTE:** On vehicles with rack-and-pinion steering gear, it may be necessary to remove the bellows boot clamp from the steering gear bellows boot to inspect for internal steering gear leaks.
 If a leak is detected in the steering gear, repair or install a new steering gear. Refer to Section 211-02.
 - If a leak is detected in the power steering reservoir, install a new reservoir. Refer to Section 211-02.
7. For information on power steering leak detection, refer to Component Tests in this section.

DIAGNOSIS AND TESTING (Continued)

8. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding.
9. If the cause is not visually evident, verify the symptom and GO to [Symptom Chart — Steering System](#) or GO to [Symptom Chart — NVH](#).

Steering System Symptom Definitions**Drift/Pull**

Pull is described as a tugging sensation felt by the hands on the steering wheel that must be overcome to keep the vehicle going straight.

Drift describes what a vehicle with this condition does with the hands off the steering wheel.

- A vehicle-related drift/pull on a flat road can cause a consistent deviation from the straight-ahead path and require constant steering input in the opposite direction to counteract the effect.
- Drift/pull can be induced by conditions external to the vehicle, such as wind or road camber.

Excessive Steering Wheel Play

Excessive steering wheel play is a condition in which there is too much steering wheel movement before the wheels move. A small amount of steering wheel free play is considered normal.

Symptom Chart — Steering System**Symptom Chart — Steering System**

Condition	Possible Sources	Action
<ul style="list-style-type: none"> • Steering has lack of assist or inconsistent assist 	<ul style="list-style-type: none"> • Contaminated power steering fluid • Steering gear • Power steering pump • Restricted power steering lines/hoses 	<ul style="list-style-type: none"> • GO to Pinpoint Test A.
<ul style="list-style-type: none"> • Excessive steering wheel play 	<ul style="list-style-type: none"> • Steering gear • Steering column shaft/U-joints • Steering linkage 	<ul style="list-style-type: none"> • GO to Pinpoint Test B.
<ul style="list-style-type: none"> • Steering system drift/pull/wander 	<ul style="list-style-type: none"> • Steering column shaft/U-joints • Steering gear mounts • Steering gear valve 	<ul style="list-style-type: none"> • GO to Pinpoint Test C.

Lack of Assist or Inconsistent Assist

Lack of assist or inconsistent assist is experienced when the steering wheel effort is higher than normal. Hard steering can remain constant through the full turn or occur near the end of a turn. It is important to know the difference between hard steering/lack of assist and poor returnability/sticky steering.

Hard steering or lack of assist can result from either hydraulic or mechanical conditions. It is extremely important to know if this concern occurs during driving or during high-effort parking maneuvers.

Poor Returnability/Sticky Steering

Poor returnability and sticky steering is used to describe the poor return of the steering wheel to center after a turn or steering correction is completed.

Wander

Wander is the tendency of the vehicle to require frequent, random left and right steering wheel corrections to maintain a straight path down a level road.

DIAGNOSIS AND TESTING (Continued)**Symptom Chart — Steering System (Continued)**

Condition	Possible Sources	Action
<ul style="list-style-type: none"> Poor returnability/sticky steering 	<ul style="list-style-type: none"> Binding steering column shaft/U-joints Suspension components Binding steering column bearing(s) Binding dash boot seal Steering gear 	<ul style="list-style-type: none"> INSTALL a new steering column shaft. REFER to Section 211-04. To continue the suspension diagnosis, REFER to Section 204-00. INSTALL a new steering column. REFER to Section 211-04. INSTALL a new dash boot seal. REFER to Section 211-04. The steering gear cannot be adjusted. INSTALL a new steering gear as necessary. REFER to Section 211-02.

Symptom Chart — NVH**Symptom Chart — NVH**

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

Condition	Possible Sources	Action
<ul style="list-style-type: none"> Steering system cold start noise 	<ul style="list-style-type: none"> Blockage in the power steering fluid reservoir caused by power steering fluid contamination Air in the steering hydraulic system (aerated fluid) 	<ul style="list-style-type: none"> NOTE: Some noise during an extremely cold start (-12.2°C [-10°F]) is normal and should improve as the steering system warms up (usually within 60 seconds). NOTE: It may be necessary to remove the power steering fluid reservoir to flush contamination trapped in the reservoir screen. CHECK the power steering fluid reservoir for contamination. FLUSH the power steering system as necessary. REFER to Power Steering System Flushing in this section. CHECK for leaks in the system. REFER to Power Steering Leak Test Component Test in this section. PURGE the air from the system. REFER to Power Steering System Purging in this section.

DIAGNOSIS AND TESTING (Continued)**Symptom Chart — NVH (Continued)**

Condition	Possible Sources	Action
<ul style="list-style-type: none"> Steering grunt or shudder — occurs when turning into or out of a turn at low speeds (temperature sensitive) 	<ul style="list-style-type: none"> Air in the steering hydraulic system (aerated fluid) Steering gear or power steering hoses 	<ul style="list-style-type: none"> CHECK for leaks in the system. REFER to Power Steering Leak Test Component Test. PURGE the air from the system. REFER to Power Steering System Purging in this section. GO to Steering Gear Grunt/Shudder Component Test in this section.
<ul style="list-style-type: none"> Steering system clonk — hydraulic knocking sound 	<ul style="list-style-type: none"> Air in the steering hydraulic system (aerated fluid) 	<ul style="list-style-type: none"> NOTE: Some amount of clonk noise is considered acceptable. If in doubt of the acceptability, compare to another vehicle. CHECK for leaks in the system. REFER to Power Steering Leak Test Component Test in this section. PURGE the air from the system. REFER to Power Steering System Purging in this section.
<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Low fluid and/or air in the steering hydraulic system (aerated fluid) Power steering fluid reservoir or screen is blocked or damaged Power steering line/hose grounded to chassis Power steering pump bolts loose Steering gear isolators 	<ul style="list-style-type: none"> CHECK for leaks in the system. REFER to Power Steering Leak Test Component Test. PURGE the air from the system. REFER to Power Steering System Purging in this section. If a pump moan still exists, INSTALL a new power steering pump. REFER to Section 211-02. NOTE: It may be necessary to remove the power steering fluid reservoir to flush contamination trapped in the reservoir screen. CHECK the power steering fluid reservoir for contamination. FLUSH the power steering system as necessary. REFER to Power Steering System Flushing in this section. INSPECT the power steering lines/hoses. REPAIR as necessary. TIGHTEN bolts to specification. REPAIR or INSTALL new brackets as necessary. REFER to Section 211-02. INSPECT the isolators for wear or damage. REPAIR as necessary.

DIAGNOSIS AND TESTING (Continued)**Symptom Chart — NVH (Continued)**

Condition	Possible Sources	Action
<ul style="list-style-type: none"> Steering gear clunk — occurs only while cornering over a bump (can be temperature sensitive) 	<ul style="list-style-type: none"> Steering gear 	<ul style="list-style-type: none"> INSPECT the steering gear for loose mounting bolts. TIGHTEN to specification as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> Feedback (rattle, chuckle or knocking noise in the steering gear) — roughness is felt in the steering wheel when the vehicle is driven over rough surfaces 	<ul style="list-style-type: none"> Steering column shaft/U-joints damaged or worn Loose, damaged or worn tie-rod ends Steering gear insulators or mounting bolts loose or damaged Steering column shaft bolts are loose Steering column damaged or worn 	<ul style="list-style-type: none"> INSTALL a new steering column shaft. REFER to Section 211-04. INSPECT and INSTALL new tie-rod ends as necessary. GO to Steering Linkage Component Test in this section. TIGHTEN the bolts to specification or INSTALL new bolts as necessary. REFER to Section 211-02. TIGHTEN the bolts to specification. REFER to Section 211-04. REPAIR or INSTALL a new steering column as necessary. REFER to Section 211-04.
<ul style="list-style-type: none"> Power steering hiss or whistle 	<ul style="list-style-type: none"> Steering column shaft-to-steering gear is binding or misaligned Grounded or loose steering column boot at the dash panel Damaged or worn steering gear input shaft and valve Restricted power steering lines/hoses 	<ul style="list-style-type: none"> REPAIR or INSTALL a new steering column shaft as necessary. REFER to Section 211-04. REPAIR as necessary. REPAIR or INSTALL a new steering gear as necessary. REFER to Section 211-02. INSTALL new power steering lines/hoses as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> Steering column rattle 	<ul style="list-style-type: none"> Loose bolts or attaching brackets Loose, worn or insufficiently lubricated column bearings Steering shaft insulators damaged or worn Steering column shaft compressed or extended 	<ul style="list-style-type: none"> TIGHTEN the bolts to specification. LUBRICATE bearings or INSTALL new steering column bearings or steering column as necessary. REFER to Section 211-04. INSTALL new insulators. REFER to Section 211-04. INSPECT the rubber spider coupling for damage. INSTALL a new steering column shaft. REFER to Section 211-04.

DIAGNOSIS AND TESTING (Continued)**Symptom Chart — NVH (Continued)**

Condition	Possible Sources	Action
<ul style="list-style-type: none"> Steering gear squeak 	<ul style="list-style-type: none"> Incorrect power steering fluid in system Steering gear rotary seal Stone shield (if equipped) 	<ul style="list-style-type: none"> If incorrect power steering fluid is suspected, FLUSH the power steering system. REFER to Power Steering System Flushing in this section. If noise persists after system flush, INSTALL a new steering gear. REFER to Section 211-02. NOTE: VERIFY that the steering gear is the source of the noise. It may be necessary to replicate the customer operating conditions (fluid temperature, turning rate of steering wheel) to get the squeak to reoccur. INSTALL a new steering gear as necessary. REFER to Section 211-02. MAKE SURE that the stone shield is correctly installed and that it is not making contact with the steering shaft. REPOSITION stone shield or INSTALL a new stone shield as necessary.
<ul style="list-style-type: none"> Steering column squeak, clicks or grinds 	<ul style="list-style-type: none"> Loose or misaligned steering column shrouds Steering wheel rubbing against steering column shrouds Upper or lower steering column bearing 	<ul style="list-style-type: none"> TIGHTEN or ALIGN the steering column shrouds. REPOSITION the steering column shrouds. INSTALL a new steering column or steering column bearings as necessary.
<ul style="list-style-type: none"> Power steering pump noisy 	<ul style="list-style-type: none"> Power steering pump 	<ul style="list-style-type: none"> INSTALL a new power steering pump as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> Power steering pump noise (steering wheel turned fully to stop/lock) 	<ul style="list-style-type: none"> Power steering fluid flow into the bypass valve of the pump valve housing, with fluid temperature below 54°C (130°F) 	<ul style="list-style-type: none"> Acceptable condition.
<ul style="list-style-type: none"> Power steering pump whine noise 	<ul style="list-style-type: none"> Aerated fluid Damaged power steering pump 	<ul style="list-style-type: none"> CHECK for a leak in the system. REFER to Power Steering Fluid Leak Test Component Test in this section. PURGE the air from the system. REFER to Power Steering System Purging in this section. INSTALL a new power steering pump as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> High speed shake or shimmy — occurs at high speeds 	<ul style="list-style-type: none"> Worn or damaged steering linkage components 	<ul style="list-style-type: none"> GO to Steering Linkage Component Test in this section.

DIAGNOSIS AND TESTING (Continued)**Pinpoint Tests****Pinpoint Test A: Steering Has Lack of Assist or Inconsistent Assist**

NOTE: Hard steering or lack of assist is experienced when the steering wheel effort is higher than normal. Hard steering can remain constant through the full turn, occur near the end of a turn or differ right to left.

This pinpoint test is intended to diagnose

the following:

- Power steering fluid contamination
- Steering gear
- Power steering pump
- Power steering hoses

PINPOINT TEST A: STEERING HAS LACK OF ASSIST OR INCONSISTENT ASSIST

Test Step		Result / Action to Take
A1	CHECK FOR POWER STEERING FLUID CONTAMINATION	<p>Yes FLUSH the power steering system. REFER to Power Steering System Flushing in this section. CHECK the system for normal operation. If assist concern still exists, GO to A2.</p> <p>No GO to A2.</p>
	<ul style="list-style-type: none"> • Check the power steering fluid for contamination. • Is the power steering fluid contaminated? 	
A2	CHECK THE STEERING ASSIST WITH THE ENGINE RPM RAISED	<p>Yes INSTALL a new power steering pump. REFER to Section 211-02.</p> <p>No GO to A3.</p>
	<ul style="list-style-type: none"> • NOTICE: Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur. Set the engine at 2,100 rpm and turn the steering wheel fully to the left and right. • Is steering assist fully restored to normal with the engine rpm raised? 	
A3	CHECK FOR A CHANGE OF ASSIST ON LEFT AND RIGHT TURNS	<p>Yes INSTALL a new steering gear. REFER to Section 211-02.</p> <p>No GO to A4.</p>
	<ul style="list-style-type: none"> • With the engine at idle, turn the steering wheel fully to the left and to the right. • Does the steering assist change when turning from right to left? 	
A4	CHECK THE STEERING LINES AND HOSES FOR RESTRICTIONS	<p>Yes INSTALL new lines or hoses as necessary.</p> <p>No GO to A5.</p>
	<ul style="list-style-type: none"> • Inspect the steering lines and hoses for damage, kinks or restrictions. • Are the steering lines or hoses damaged, kinked or restricted? 	
A5	MONITOR THE ENGINE RPM CHANGES	<p>Yes INSTALL a new steering gear. REFER to Section 211-02.</p> <p>No INSTALL a new power steering pump. REFER to Section 211-02.</p>
	<p>NOTICE: Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.</p> <p>NOTE: Make sure that the vehicle is on a flat dry surface, all accessories are in the OFF position and that the steering system is at normal operating temperature.</p> <ul style="list-style-type: none"> • Connect the scan tool. • Start the engine. • With the engine at idle, raise the power steering fluid temperature to 74-80°C (165-176°F) by rotating the steering wheel fully to the left and right several times. • While monitoring the Engine Revolutions Per Minute (RPM) PID with the scan tool, turn the steering wheel quickly to the left stop position and then to the right stop position. • Note the engine rpm during the turns. • Does the engine rpm change (even temporarily) more than 30 rpm when turning the steering wheel? 	

DIAGNOSIS AND TESTING (Continued)**Pinpoint Test B: Excessive Steering Wheel Play**

This pinpoint test is intended to diagnose

the following:

- Steering linkage
- Steering column shaft U-joints
- Steering gear

PINPOINT TEST B: EXCESSIVE STEERING WHEEL PLAY

Test Step		Result / Action to Take
B1	CHECK THE STEERING LINKAGE	Yes GO to B2 . No INSTALL new steering linkage components as necessary. Refer to the appropriate section in Group 211 for the procedure.
	<ul style="list-style-type: none"> • Carry out the Steering Linkage Component Test in this section. • Is the steering linkage OK? 	
B2	CHECK THE STEERING COLUMN SHAFT	Yes INSTALL a new steering gear as necessary. REFER to Section 211-02. No TIGHTEN the steering column shaft fasteners or INSTALL a new steering column shaft. REFER to Section 211-04.
	<ul style="list-style-type: none"> • Inspect the steering column shaft U-joints and fasteners for looseness. • Are the U-joints and fasteners OK? 	

Pinpoint Test C: Steering System Drift/Pull/Wander

This pinpoint test is intended to diagnose

the following:

- Steering gear
- Steering column shaft
- Steering column shaft U-joints
- Steering gear mounts

PINPOINT TEST C: STEERING SYSTEM DRIFT/PULL/WANDER

Test Step		Result / Action to Take
C1	CHECK THE STEERING COLUMN SHAFT	Yes GO to C2 . No INSTALL a new steering column shaft as necessary. REFER to Section 211-04.
	<p>NOTE: Be sure to keep the clockspring centered when disconnecting the intermediate shaft. Refer to the appropriate section in Group 501 for the procedure.</p> <ul style="list-style-type: none"> • Check the steering column and shaft for grounding. • Disconnect the steering column shaft at the steering column. • Inspect the steering column shaft U-joints for looseness or wear. • Are the steering column shaft U-joints OK? 	
C2	CHECK THE STEERING GEAR MOUNTING	Yes GO to C3 . No INSTALL a new steering gear as necessary. REFER to Section 211-02.
	<ul style="list-style-type: none"> • Check the steering gear mounts for looseness or wear. • Are the steering gear mounts OK? 	
C3	CHECK THE STEERING GEAR	Yes REFER to Section 204-00 to diagnose suspension system drift/pull/wander. No REPAIR or INSTALL a new steering gear as necessary. REFER to Section 211-02.
	<ul style="list-style-type: none"> • Carry out the Steering Gear Valve Component Test in this section. • Is the steering gear valve OK? 	

DIAGNOSIS AND TESTING (Continued)**Component Tests****Power Steering Fluid Leak Test**

NOTE: This test should only be carried out if a leak in the system has not been detected during a thorough visual inspection. Refer to Inspection and Verification.

1. Check the power steering fluid level. If necessary, add the specified power steering fluid.
2. Remove the power steering fluid reservoir cap and tightly install the Power Steering Evacuation Cap to the power steering fluid reservoir.
3. Install the Vacuum Pump Kit to the Power Steering Evacuation Cap.
4. Using the Vacuum Pump Kit, apply 68-85 kPa (20-25 in-Hg) of vacuum to the power steering system.
5. Observe the vacuum gauge for 30 seconds. If the vacuum gauge reading drops more than 3 kPa (0.88 in-Hg) a leak is present.
6. Remove the Vacuum Pump Kit.
7. Place a Dial Thermometer in the power steering fluid reservoir.
8. **NOTICE: Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.**
Start the engine. With the engine at idle, raise the power steering fluid temperature to 74-80°C (165-176°F) by rotating the steering wheel fully to the left and right several times.
9. Visually inspect the system for leaks. If a leak is evident, repair as necessary. If a leak is not evident, add the specified UV fluorescent tracer dye to the power steering fluid. Use 14.78 ml (1/2 oz) of dye solution for every 1.89L (2 qt) of power steering fluid.
10. **NOTICE: Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.**
Start the engine. With the engine at idle, raise the power steering fluid temperature to 74-80°C (165-176°F) by rotating the steering wheel fully to the left and right several times.

11. Using the 100W/12 Volt DC UV Lamp, inspect the system for traces of UV dye. Repair as necessary.

Steering Gear Valve Test

1. With the vehicle in NEUTRAL, position it on a hoist. Refer to Section 100-02.
 - Raise the vehicle until the front wheels are off the ground.
2. **NOTE:** Do not hold the steering wheel while carrying out this step.
Start the engine.
 - If the steering wheel rotates in either direction (with no hand input), install a new steering gear. Refer to Section 211-02.

Steering Gear Grunt/Shudder Test

1. Place a Dial Thermometer in the power steering fluid reservoir.
2. With the engine cold, start the engine and set engine idle speed to 1,200 rpm.
3. **NOTICE: Do not hold the steering wheel against the stops for an extended amount of time. Damage to the power steering pump may occur.**
Rotate the steering wheel to the RH stop, then turn the steering wheel 90 degrees back from that position. Slowly turn the steering wheel back and forth approximately one-twelfth of a full turn.
4. Turn the steering wheel another 90 degrees. Slowly turn the steering wheel back and forth approximately one-twelfth of a full turn.
5. Repeat the test with the power steering fluid at different temperatures until the temperature reaches 74-80°C (165-176°F).
6. If a light grunt is heard or a low (50-200 Hz) shudder is present, this is a normal steering system condition.
7. If a loud grunt is heard or a strong shudder is felt, purge the power steering system. Refer to Power Steering System Purging in this section. If a loud grunt or strong shudder still exists, check the power steering lines/hoses for restrictions or damage and repair as necessary. Refer to Section 211-02. If the lines/hoses are OK, install a new steering gear. Refer to Section 211-02.

DIAGNOSIS AND TESTING (Continued)**Steering Linkage Test**

1. With the vehicle in NEUTRAL, position it on a hoist. Refer to Section 100-02.
 2. Using hand force only, check the inner and outer tie rods for vertical and lateral movement in the tie-rod ball studs/sockets.
 - If there is any lateral or vertical movement in the tie-rod ball studs/sockets (inner or outer), a new tie-rod must be installed. Refer to the appropriate section in Group 211 for the procedure.
-

GENERAL PROCEDURES

Power Steering System Flushing

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

NOTICE: Do not mix oil types. Any mixture or any unapproved oil may lead to seal deterioration and leaks. A leak may ultimately cause loss of fluid, which may result in a loss of power steering assist.

1. Remove the power steering fluid reservoir cap.
2. Using a suitable suction device, remove the power steering fluid from the reservoir.
3. Release the clamp and disconnect the return hose from the reservoir.
 - Remove the clamp.
4. Plug the power steering fluid reservoir inlet port.
5. Attach an extension hose to the return hose.
6. **NOTE:** Do not reuse the power steering fluid that has been flushed from the power steering system.
Place the open end of the extension hose into a suitable container.
7. If equipped with Hydro-Boost®, apply the brake pedal 4 times.
8. **NOTE:** Do not overfill the reservoir.
Fill the reservoir as needed with the specified fluid.
9. **NOTICE:** Do not allow the power steering pump to run completely dry of power steering fluid. Damage to the power steering pump may occur.
Start the engine while simultaneously turning the steering wheel to lock and then immediately turn the ignition switch to the OFF position.
10. **NOTE:** Avoid turning the steering wheel without the engine running as this may cause air to be pulled into the steering gear.
NOTE: Do not overfill the reservoir.
Fill the reservoir as needed.
11. Repeat Steps 8 and 9, turning the steering wheel in the opposite direction each time, until the fluid exiting the power steering fluid return hose is clean and clear of foreign material.
12. Remove the extension hose from the return hose.
13. Remove the plug from the fluid reservoir inlet port.
14. Install the power steering return hose to the reservoir.
 - Install the clamp.

GENERAL PROCEDURES (Continued)

15. **NOTE:** It is necessary to correctly fill the power steering system to remove any trapped air and completely fill the power steering system components.

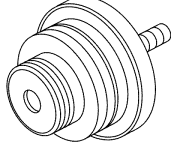

If, after correctly filling the power steering system, there is power steering noise accompanied by evidence of aerated fluid and there are no fluid leaks, it may be necessary to purge the power steering system. For additional information, refer to Power Steering System Purging in this section.

Fill the power steering system. For additional information, refer to Power Steering System Filling in this section.

GENERAL PROCEDURES

Power Steering System Purging

Special Tool(s)

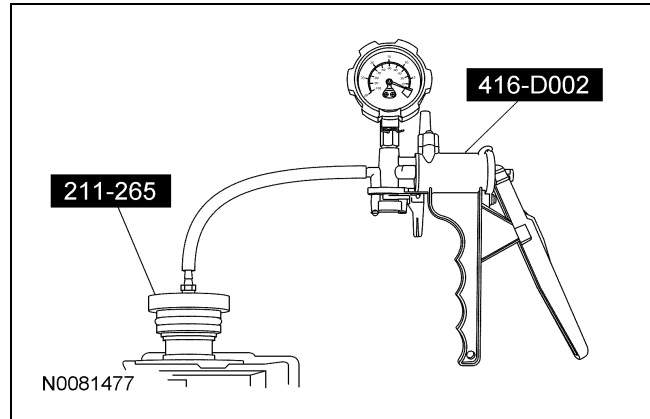
 <p>ST2670-A</p>	<p>Evacuation Cap, Power Steering 211-265</p>
 <p>ST1176-A</p>	<p>Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent</p>

Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)</p>	<p>MERCON® V</p>

NOTICE: If the air is not purged from the power steering system correctly, premature power steering pump failure may result. The condition may occur on pre-delivery vehicles with evidence of aerated fluid or on vehicles that have had steering component repairs.

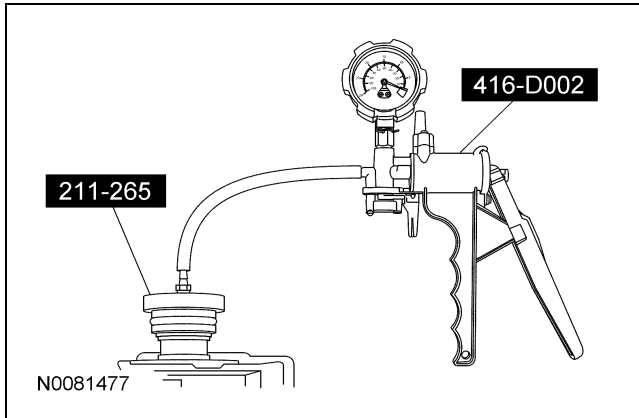
1. **NOTE:** A whine heard from the power steering pump can be caused by air in the system. The power steering purge procedure must be carried out prior to any component repair for which power steering noise complaints are accompanied by evidence of aerated fluid.
Remove the power steering reservoir cap.
Check the fluid.
2. Raise the front wheels off the floor. Refer to the appropriate section in Group 100 for the procedure.
3. Tightly insert the Power Steering Evacuation Cap into the reservoir and connect the Vacuum Pump Kit.



4. Start the engine.
5. Using the Vacuum Pump Kit, apply vacuum and maintain the maximum vacuum of 68-85 kPa (20-25 in-Hg).
 - If the Vacuum Pump Kit does not maintain vacuum, check the power steering system for leaks before proceeding. For additional information, refer to Power Steering Fluid Leak Test in this section.
6. If equipped with Hydro-Boost®, apply the brake pedal 4 times.
7. **NOTICE:** Do not hold the steering wheel against the stops for an extended amount of time. Damage to the power steering pump may occur.
Cycle the steering wheel fully from stop-to-stop 10 times.
8. Stop the engine.
9. Release the vacuum and remove the Vacuum Pump Kit and the Power Steering Evacuation Cap.
10. **NOTE:** Do not overfill the reservoir.
Fill the reservoir.
 - Use approved transmission fluid.
11. Start the engine.

GENERAL PROCEDURES (Continued)

12. Install the Power Steering Evacuation Cap and the Vacuum Pump Kit. Apply and maintain the maximum vacuum of 68-85 kPa (20-25 in-Hg).



13. **NOTICE:** Do not hold the steering wheel against the stops for an extended amount of time. Damage to the power steering pump may occur.

Cycle the steering wheel fully from stop-to-stop 10 times.

14. Stop the engine, release the vacuum and remove the Vacuum Pump Kit and the Power Steering Evacuation Cap.

15. **NOTE:** Do not overfill the reservoir.

Fill the reservoir as needed and install the reservoir cap.

16. Visually inspect the power steering system for leaks.

17. **NOTE:** Do not overfill the reservoir.

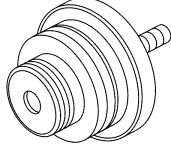
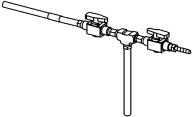

Fill the reservoir as needed and visually inspect the power steering system for leaks.

18. Install the reservoir cap.

GENERAL PROCEDURES

Power Steering System Filling

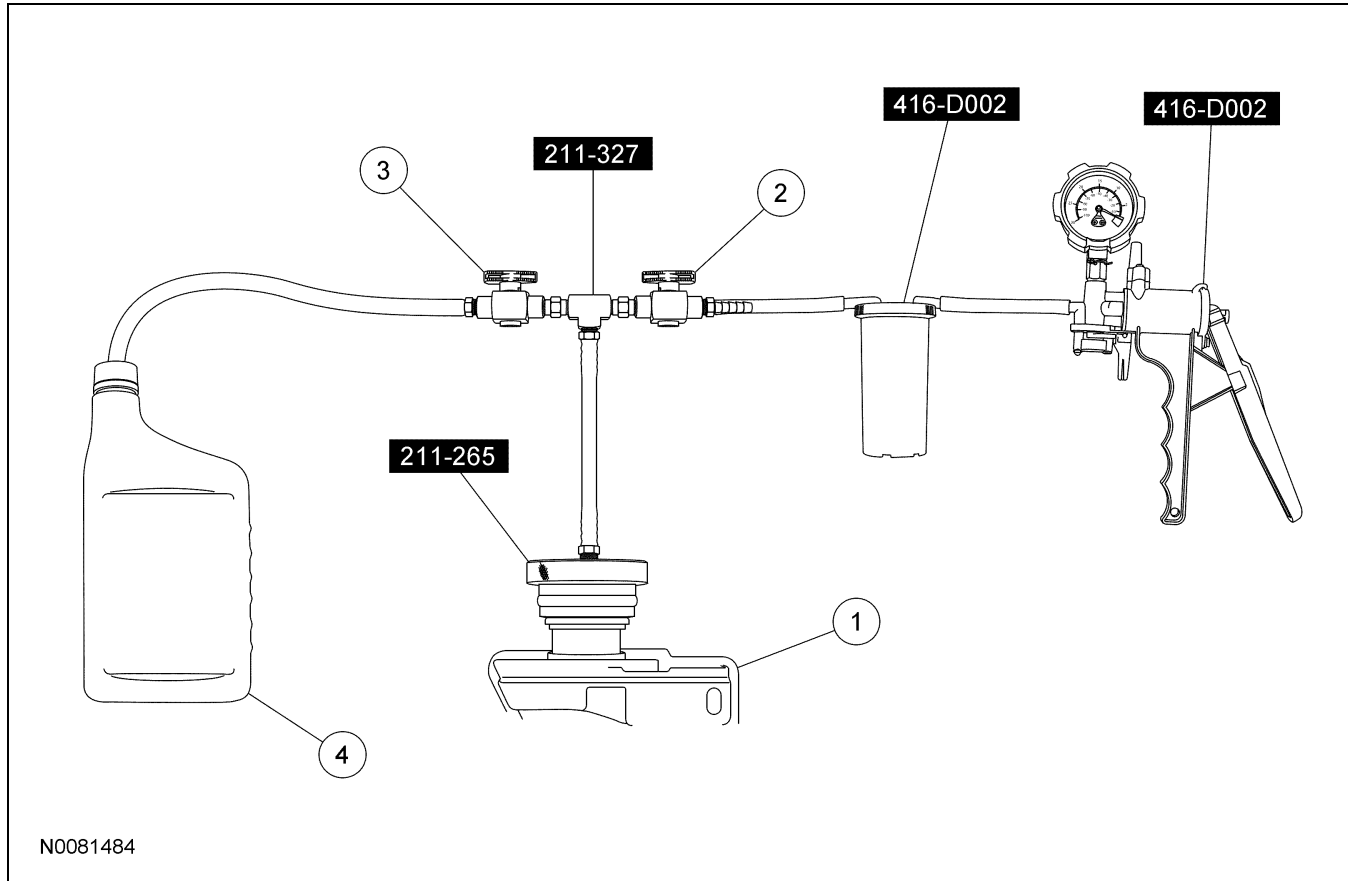
Special Tool(s)

 <p>ST2670-A</p>	<p>Evacuation Cap, Power Steering 211-265</p>
 <p>ST2826-A</p>	<p>Fill Adapter Manifold, Power Steering 211-327</p>
 <p>ST1176-A</p>	<p>Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent</p>

Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)</p>	<p>MERCON® V</p>

GENERAL PROCEDURES (Continued)



N0081484

Item	Description
1	Power steering fluid reservoir
2	Control valve (vacuum side)
3	Control valve (fluid container side)
4	Fluid container

- NOTICE:** If the air is not purged from the power steering system correctly, premature power steering pump failure may result. The condition can occur on pre-delivery vehicles with evidence of aerated fluid or on vehicles that have had steering component repairs.

Remove the power steering fluid reservoir cap.

- Install the Power Steering Evacuation Cap, Power Steering Fill Adapter Manifold and Vacuum Pump Kit as shown in the illustration.

- NOTE:** The Power Steering Fill Adapter Manifold control valves are in the OPEN position when the points of the handles face the center of the Power Steering Fill Adapter Manifold.

Close the Power Steering Fill Adapter Manifold control valve (fluid side).

- Open the Power Steering Fill Adapter Manifold control valve (vacuum side).
- Using the Vacuum Pump Kit, apply 68-85 kPa (20-25 in-Hg) of vacuum to the power steering system.
- Observe the Vacuum Pump Kit gauge for 30 seconds.
- If the Vacuum Pump Kit vacuum gauge reading drops more than 3 kPa (0.88 in-Hg), correct any leaks in the power steering system or the Power Steering Evacuation Cap, Power Steering Fill Adapter Manifold and Vacuum Pump Kit before proceeding.

GENERAL PROCEDURES (Continued)

8. **NOTE:** The Vacuum Pump Kit gauge reading will drop slightly during this step.
Slowly open the Power Steering Fill Adapter Manifold control valve (fluid side) until power steering fluid completely fills the hose and then close the control valve.
 9. Using the Vacuum Pump Kit, apply 68-85 kPa (20-25 in-Hg) of vacuum to the power steering system.
 10. Close the Power Steering Fill Adapter Manifold control valve (vacuum side).
 11. Slowly open the Power Steering Fill Adapter Manifold control valve (fluid side).
 12. Once power steering fluid enters the fluid reservoir and reaches the minimum fluid level indicator line on the reservoir, close the Power Steering Fill Adapter Manifold control valve (fluid side).
 13. Remove the Power Steering Evacuation Cap, Power Steering Fill Adapter Manifold and Vacuum Pump Kit.
 14. Install the reservoir cap.
 15. **NOTICE: Do not hold the steering wheel against the stops for an extended amount of time. Damage to the power steering pump may occur.**
NOTE: There will be a slight drop in the power steering fluid level in the reservoir when the engine is started.
Start the engine and turn the steering wheel from stop-to-stop.
 16. Turn the ignition switch to the OFF position.
 17. **NOTE:** Do not overfill the reservoir.
Remove the reservoir cap and fill the reservoir with the specified fluid.
 18. Install the reservoir cap.
-

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V	Keep fluid level between MIN and MAX on reservoir
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B	—

Torque Specifications

Description	Nm	lb-ft	lb-in
Inner tie rod	120	89	—
LH engine mount nut	63	46	—
Power steering fluid cooler nuts	8	—	71
Power steering fluid reservoir bolt	9	—	80
Power steering line clamp plate bolt	23	17	—
Power steering pump bolts	25	18	—
Power steering pump pulley bolts (4.0L)	25	18	—
Power steering pump supply hose bracket bolt (4.0L)	8	—	71

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Pressure line bracket-to-alternator stud nut (5.4L)	7	—	62
Pressure line bracket-to-A/C compressor stud nut (4.0L)	7	—	62
Pressure line bracket-to-crossmember bolt	9	—	80
Pressure line bracket-to-engine bolt (5.4L)	7	—	62
Pressure line bracket-to-pump stud nut (4.6L)	7	—	62
Pressure line bracket-to-steering gear bolt (4.6L, 5.4L)	9	—	80
Pressure line-to-pump fitting	65	48	—
Pressure line union fitting	65	48	—
Steering column coupling-to-steering gear bolt	25	18	—
Steering gear bolts	115	85	—
Tie-rod end nuts	80	59	—
Tie-rod jam nuts	55	41	—

DESCRIPTION AND OPERATION

Power Steering

The power steering system consists of the following components:

- Power steering pump
- Power steering fluid reservoir
- Power steering pressure and return lines/hoses
- Power steering fluid cooler
- Power steering gear
- Inner tie rod

The power steering system uses a vane-type pump to move the fluid from the reservoir to the steering gear and through the rest of the steering hydraulic system. The power steering pump is mounted to the engine and driven by the engine accessory drive belt. Power steering fluid flows into the pump from the reservoir. The power steering fluid is then trapped between the pump vanes and moved to the high-pressure side of the pump creating a flow of fluid. The restriction of this flow by the steering gear creates the pressure that provides the steering assist. A combined pressure relief/flow valve is built into the pump to control the maximum pressure and flow provided to the steering system. This action prevents damage to the system and provides the correct level of assist during all engine speeds. While under pressure, the power steering fluid flows through the high-pressure power steering line to the steering gear. The fluid exits the gear and flows through the return line, cooler and finally to the reservoir. The reservoir slows the fluid, allows air to escape and filters the fluid before returning it to the pump.

DIAGNOSIS AND TESTING

Power Steering

Refer to Section 211-00.

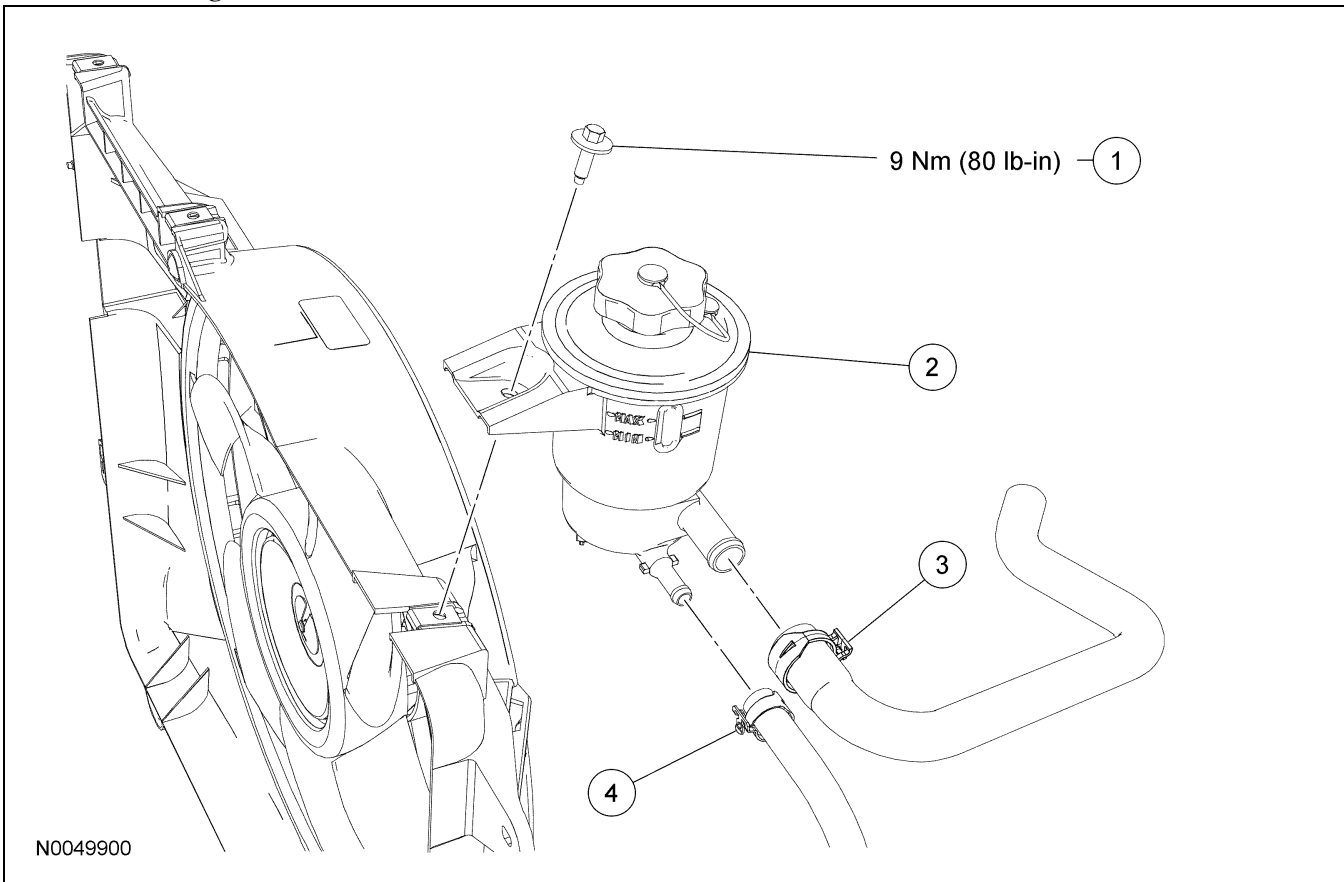
REMOVAL AND INSTALLATION

Power Steering Fluid Reservoir

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

4.0L and 4.6L Engine



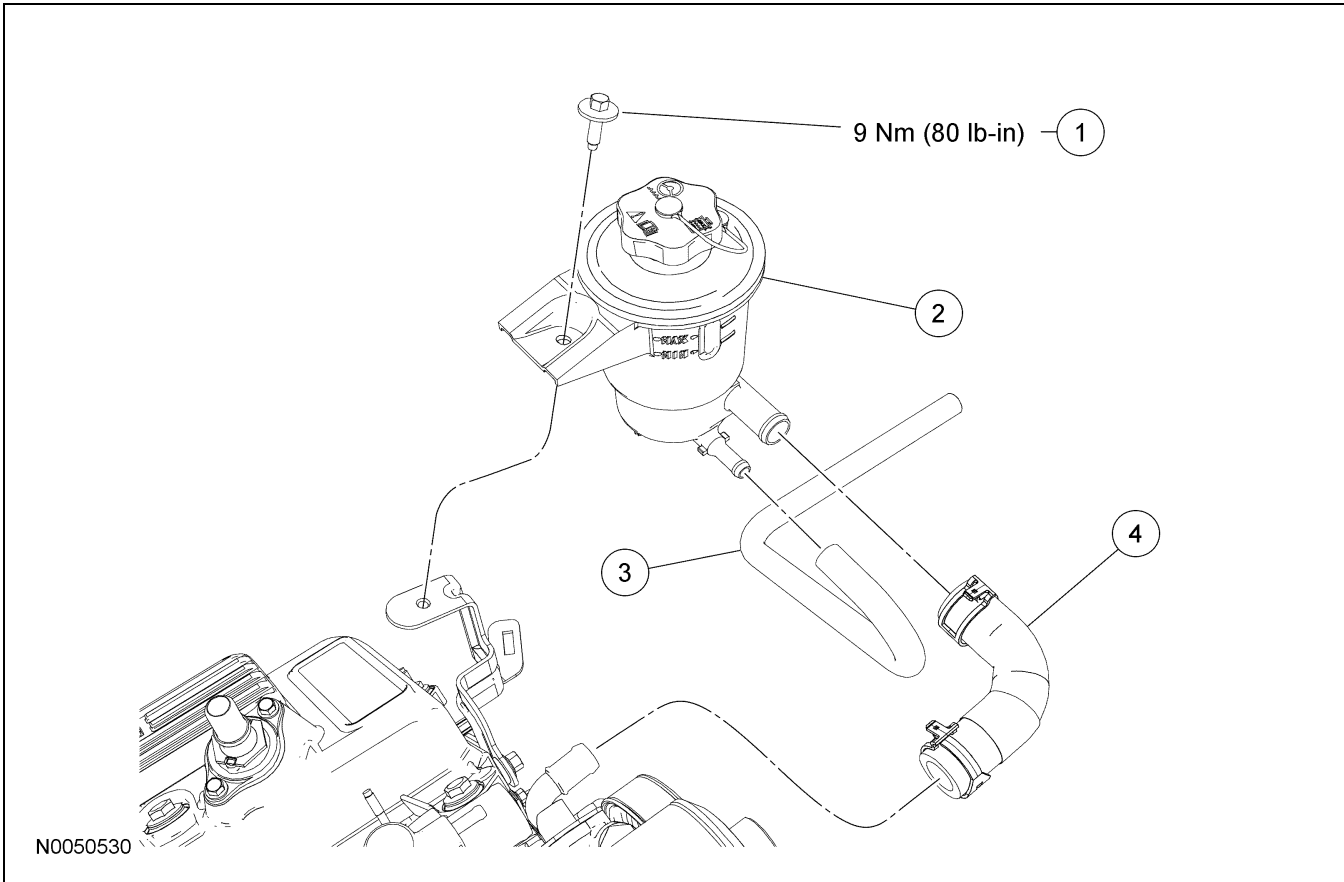
Item	Part Number	Description
1	W503924	Power steering fluid reservoir bolt
2	3A697	Power steering fluid reservoir
3	3691	Power steering pump supply hose

Item	Part Number	Description
4	—	Power steering fluid return hose (part of 3D746)

(Continued)

REMOVAL AND INSTALLATION (Continued)

5.4L Engine



Item	Part Number	Description
1	W503924	Power steering fluid reservoir bolt
2	3A697	Power steering fluid reservoir
3	—	Power steering fluid return hose (part of 3D746)
4	3691	Power steering pump supply hose

Removal and Installation

NOTICE: When repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

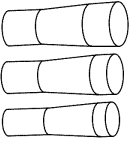
- Using a suitable suction device, remove the power steering fluid from the fluid reservoir.

- Remove the power steering fluid reservoir bolt.
 - To install, tighten to 9 Nm (80 lb-in).
- Release the clamp and disconnect the power steering pump supply hose from the power steering fluid reservoir.
- Release the clamp, disconnect the fluid return hose and remove the power steering fluid reservoir.
- To install, reverse the removal procedure.
 - Fill the power steering system. For additional information, refer to Section 211-00.

REMOVAL AND INSTALLATION

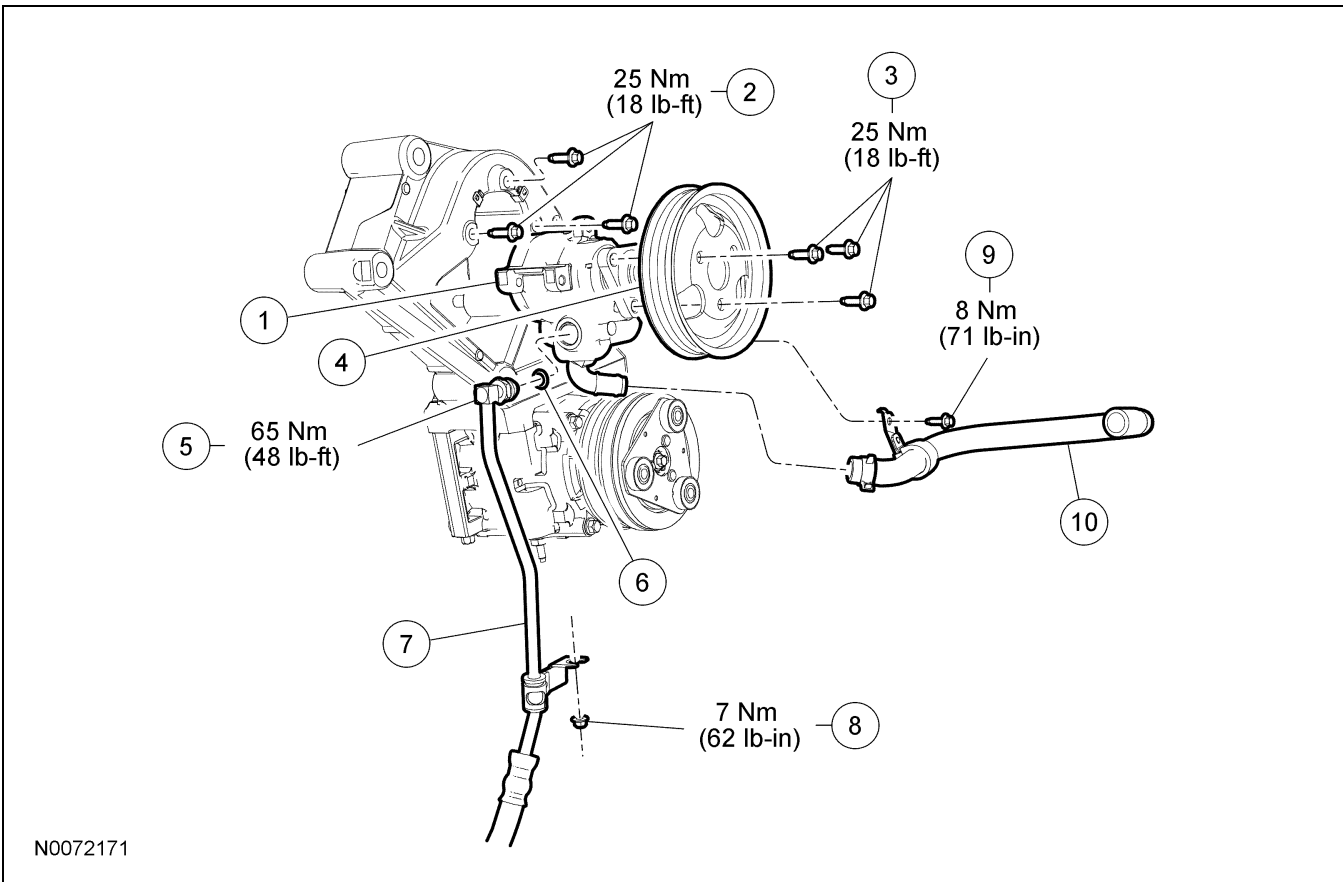
Power Steering Pump — 4.0L

Special Tool(s)

 <p>ST1444-A</p>	<p>Installer Set, Teflon® Seal 211-D027 (D90P-3517-A) or equivalent</p>
---	---

Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)</p>	<p>MERCON® V</p>



Item	Part Number	Description
1	3A674	Power steering pump
2	W700839	Power steering pump bolts (3 required)

(Continued)

Item	Part Number	Description
3	N605784	Power steering pump pulley bolts (3 required)
4	3A733	Power steering pump pulley

(Continued)

REMOVAL AND INSTALLATION (Continued)

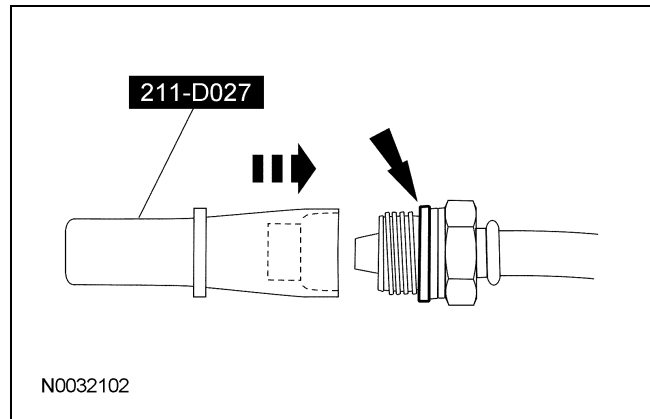
Item	Part Number	Description
5	—	Pressure line-to-pump fitting (part of 3A719)
6	388898	Teflon® seal
7	3A719	Power steering pressure line
8	W503924	Pressure line bracket-to-A/C compressor stud nut
9	W503934	Power steering pump supply hose bracket bolt
10	3691	Power steering pump supply hose

Removal and Installation

NOTICE: When repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

- Remove the air cleaner outlet pipe. For additional information, refer to Section 303-12.
- Using a suitable suction device, remove the power steering fluid from the fluid reservoir.
- Loosen the 3 power steering pump pulley bolts.
- Rotate the tensioner and remove the accessory drive belt from the power steering pump pulley.
- Remove the 3 bolts and the power steering pump pulley.
 - To install, tighten to 25 Nm (18 lb-ft).
- Release the clamp and disconnect the power steering pump supply hose from the power steering pump.
- Remove the pressure line bracket-to-A/C compressor stud nut.
 - To install, tighten to 7 Nm (62 lb-in).
- Remove the power steering pump supply hose bracket bolt.
 - To install, tighten to 8 Nm (71 lb-in).
- NOTE:** A new Teflon® seal must be installed. Disconnect the pressure line-to-pump fitting from the power steering pump.
 - Discard the Teflon® seal.
 - To install, tighten to 65 Nm (48 lb-ft).
- Remove the 3 bolts and the power steering pump.
 - To install, tighten to 25 Nm (18 lb-ft).
- NOTE:** For additional information on the accessory drive belt routing, refer to Section 303-05.

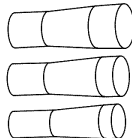
To install, reverse the removal procedure.
- NOTE:** A new Teflon® seal must be installed. Using the Teflon® Seal Installer Set, install a new Teflon® seal to the pressure line-to-pump fitting.
- Fill the power steering system. For additional information, refer to Section 211-00.



REMOVAL AND INSTALLATION

Power Steering Pump — 4.6L

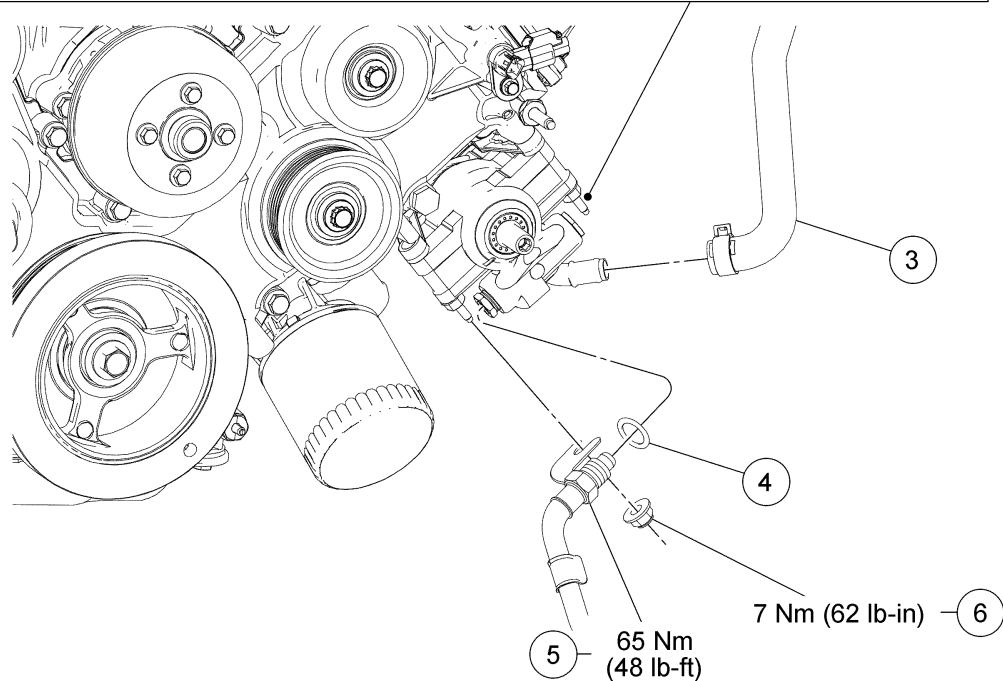
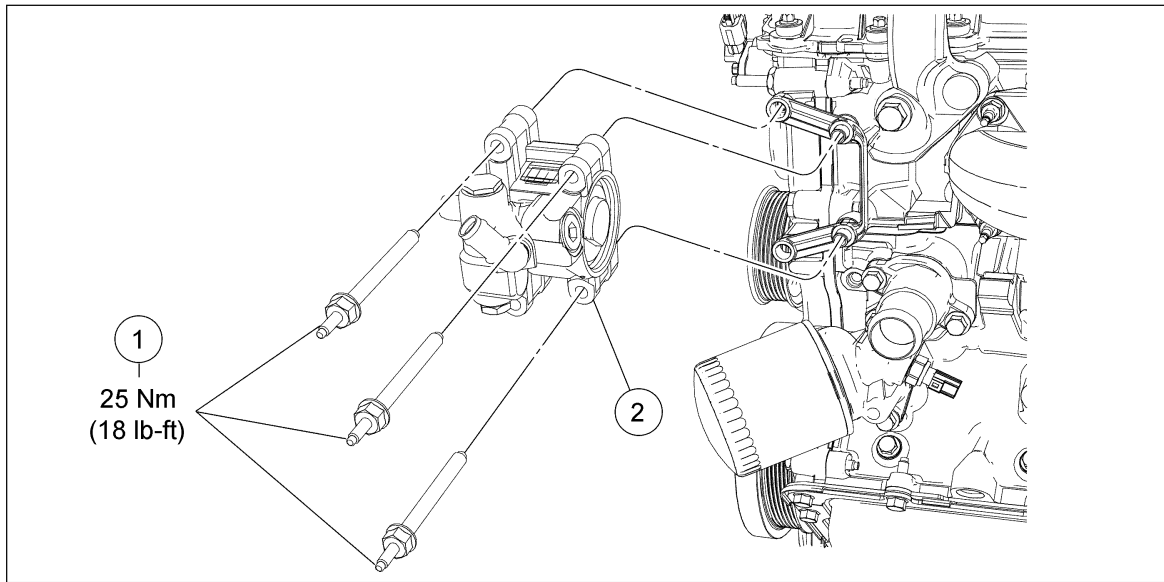
Special Tool(s)

 <p>ST1444-A</p>	<p>Installer Set, Teflon® Seal 211-D027 (D90P-3517-A) or equivalent</p>
---	---

Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)</p>	<p>MERCON® V</p>

REMOVAL AND INSTALLATION (Continued)



N0072153

Item	Part Number	Description
1	W707225	Power steering pump bolts (3 required)
2	3A674	Power steering pump
3	3691	Power steering pump supply hose
4	388898	Teflon® seal
5	—	Pressure line-to-pump fitting (part of 3A719)
6	N805320	Pressure line bracket-to-pump stud nut

Removal and Installation

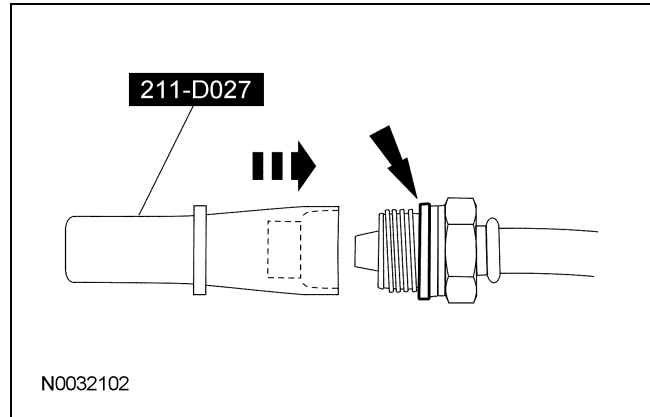
NOTICE: When repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Using a suitable suction device, remove the power steering fluid from the fluid reservoir.

REMOVAL AND INSTALLATION (Continued)

3. Remove the power steering pump pulley. For additional information, refer to Power Steering Pump Pulley — 4.6L, 5.4L in this section.
4. Remove the pressure line bracket-to-pump stud nut.
 - To install, tighten to 7 Nm (62 lb-in).
5. Release the clamp and disconnect the power steering pump supply hose from the pump.
6. **NOTE:** A new Teflon® seal must be installed. Disconnect the pressure line-to-pump fitting.
 - Discard the Teflon® seal.
 - To install, tighten to 65 Nm (48 lb-ft).
7. Remove the 3 bolts and the power steering pump.
 - To install, tighten to 25 Nm (18 lb-ft).

8. **NOTE:** A new Teflon® seal must be installed. To install, reverse the removal procedure.
 - Using the Teflon® Seal Installer Set, install a new Teflon® seal to the pressure line-to-pump fitting.

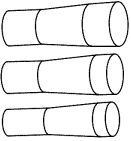


9. Fill the power steering system. For additional information, refer to Section 211-00.

REMOVAL AND INSTALLATION

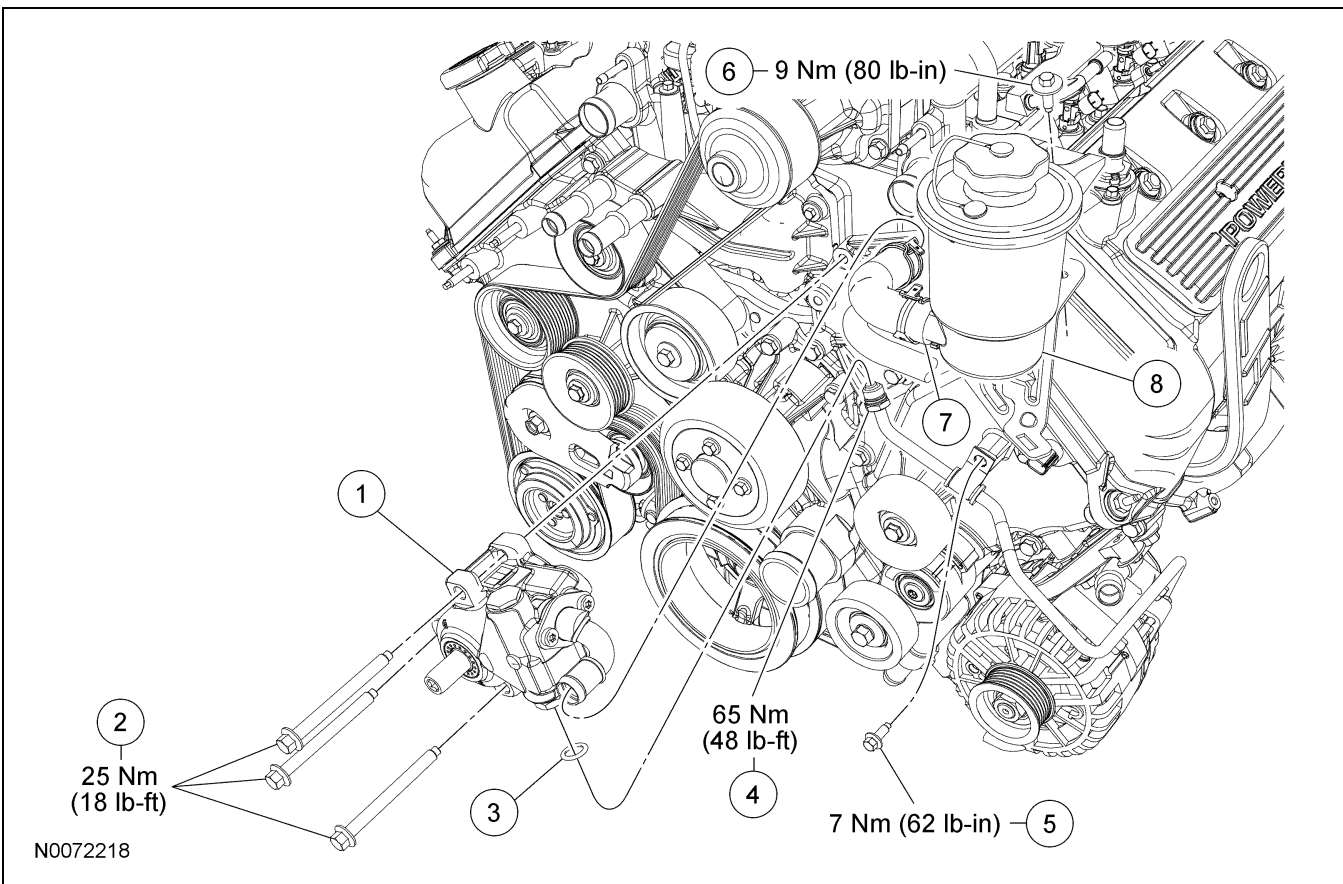
Power Steering Pump — 5.4L

Special Tool(s)

 <p>ST1444-A</p>	<p>Installer Set, Teflon® Seal 211-D027 (D90P-3517-A) or equivalent</p>
---	---

Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)</p>	<p>MERCON® V</p>



Item	Part Number	Description
1	3A674	Power steering pump
2	W700839	Power steering pump bolts (3 required)

(Continued)

Item	Part Number	Description
3	388898	Teflon® seal
4	—	Pressure line-to-pump fitting (part of 3A719)

(Continued)

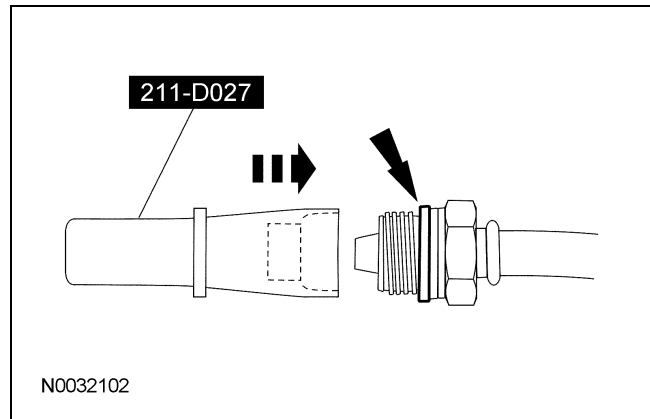
REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
5	W505255	Pressure line bracket-to-engine bolt
6	W503924	Power steering fluid reservoir bolt
7	3691	Power steering pump supply hose
8	3A697	Power steering fluid reservoir

Removal and Installation

NOTICE: When repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

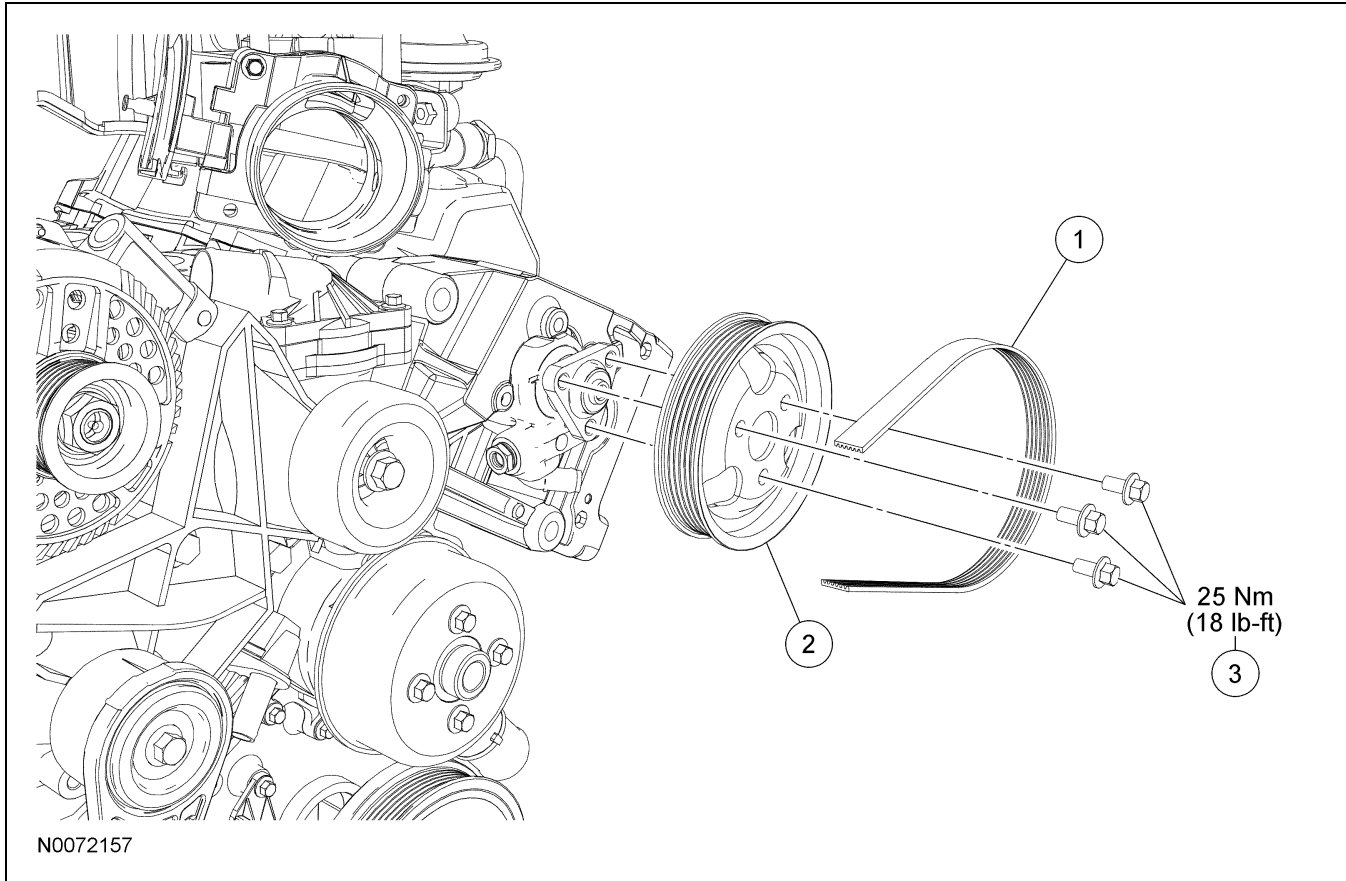
- Remove the power steering pump pulley. For additional information, refer to Power Steering Pump Pulley — 4.6L, 5.4L in this section.
- Using a suitable suction device, remove the power steering fluid from the fluid reservoir.
- NOTICE:** Make sure to remove the power steering reservoir bolt and separate the reservoir from the bracket or damage to the power steering reservoir may occur.
Remove the power steering fluid reservoir bolt and separate the reservoir from the power steering reservoir bracket.
 - To install, tighten to 9 Nm (80 lb-in).
- Release the clamp and disconnect the power steering pump supply hose from the power steering pump.
 - Position the power steering fluid reservoir aside.
- Remove the pressure line bracket-to-engine bolt.
 - To install, tighten to 7 Nm (62 lb-in).
- NOTE:** A new Teflon® seal must be installed. Disconnect the pressure line-to-pump fitting.
 - Discard the Teflon® seal.
 - To install, tighten to 65 Nm (48 lb-ft).
- Remove the 3 bolts and the power steering pump.
 - To install, tighten to 25 Nm (18 lb-ft).
- To install, reverse the removal procedure.
- NOTE:** A new Teflon® seal must be installed. Using the Teflon® Seal Installer Set, install a new Teflon® seal to the pressure line-to-pump fitting.



- Fill the power steering system. For additional information, refer to Section 211-00.

REMOVAL AND INSTALLATION

Power Steering Pump Pulley — 4.0L



Item	Part Number	Description
1	8620	Accessory drive belt
2	N605784	Power steering pump pulley
3	3A733	Power steering pump pulley bolts (3 required)

Removal and Installation

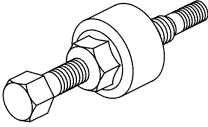
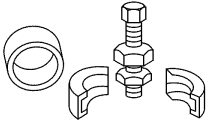
1. Remove the air cleaner outlet pipe. For additional information, refer to Section 303-12.
2. Loosen the 3 power steering pump pulley bolts.

3. Rotate the tensioner and remove the accessory drive belt from the power steering pump pulley.
4. Remove the 3 bolts and the power steering pump pulley.
 - To install, tighten to 25 Nm (18 lb-ft).
5. To install, reverse the removal procedure.
 - For additional information on accessory drive belt routing, refer to Section 303-05.

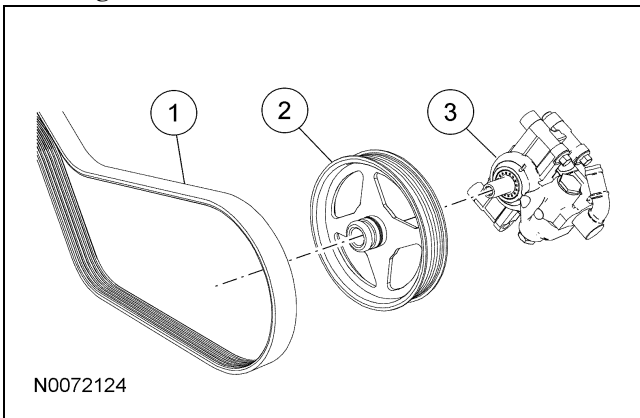
REMOVAL AND INSTALLATION

Power Steering Pump Pulley — 4.6L, 5.4L

Special Tool(s)

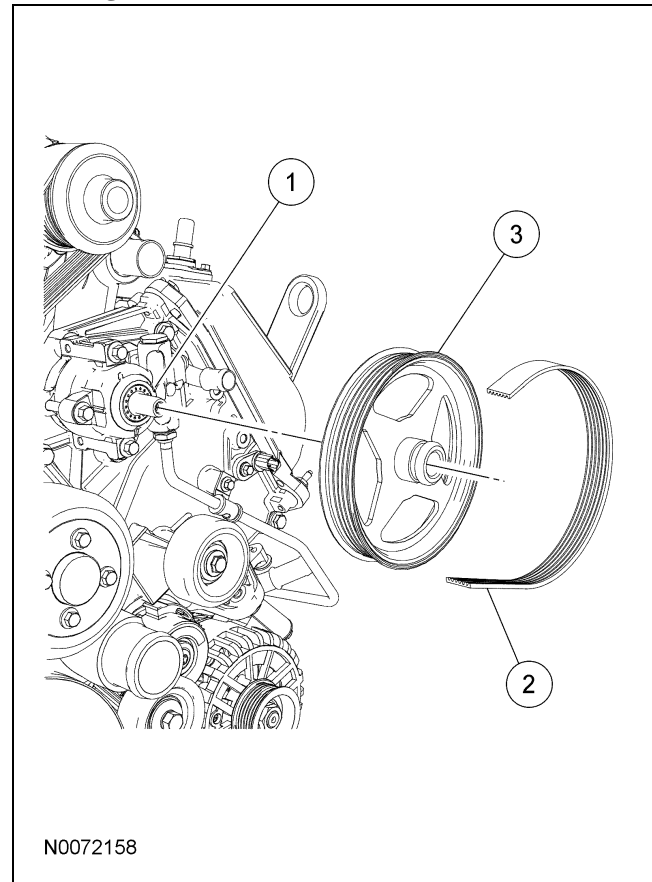
 <p>ST1586-A</p>	<p>Installer, Power Steering Pump Pulley 211-185 (T91P-3A733-A)</p>
 <p>ST1290-A</p>	<p>Remover, Power Steering Pump Pulley 211-016 (T69L-10300-B)</p>

4.6L Engine



Item	Part Number	Description
1	8620	Accessory drive belt
2	3A733	Power steering pump pulley
3	3A674	Power steering pump

5.4L Engine



Item	Part Number	Description
1	3A674	Power steering pump
2	8620	Accessory drive belt
3	3A733	Power steering pump pulley

Removal

4.6L engine

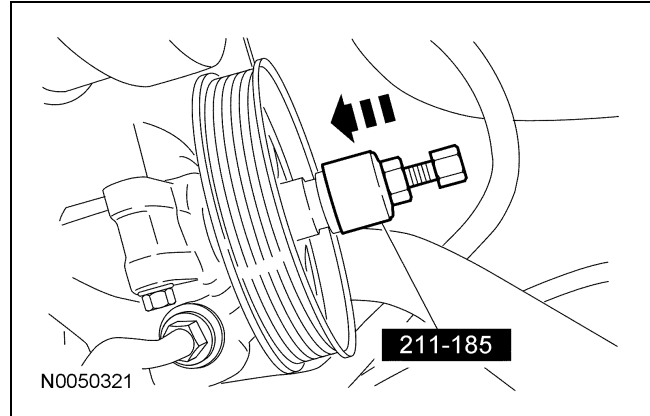
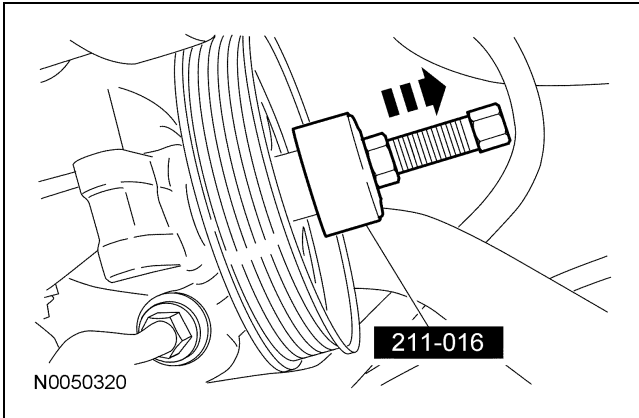
1. Remove the air cleaner outlet pipe. For additional information, refer to Section 303-12.

4.6L and 5.4L engines

2. Rotate the tensioner and remove the accessory drive belt from the power steering pump pulley.

REMOVAL AND INSTALLATION (Continued)

- Using the Power Steering Pump Pulley Remover, remove the pulley.



- Rotate the tensioner and install the accessory drive belt to the power steering pump pulley. For additional information on the accessory drive belt routing, refer to Section 303-05.

Installation**4.6L and 5.4L engines**

- NOTICE:** Installation of a new power steering pump pulley is necessary after being removed and installed 2 times or pulley and/or pump failure may occur.

Using the Power Steering Pump Pulley Installer, install the pulley.

- Inspect the pulley for paint marks in the web area near the hub. If there are 2 paint marks, install a new pulley. If there is no paint or one paint mark, use a paint pencil to mark the web area of the pulley near the hub.

4.6L engine

- Install the air cleaner outlet pipe. For additional information, refer to Section 303-12.

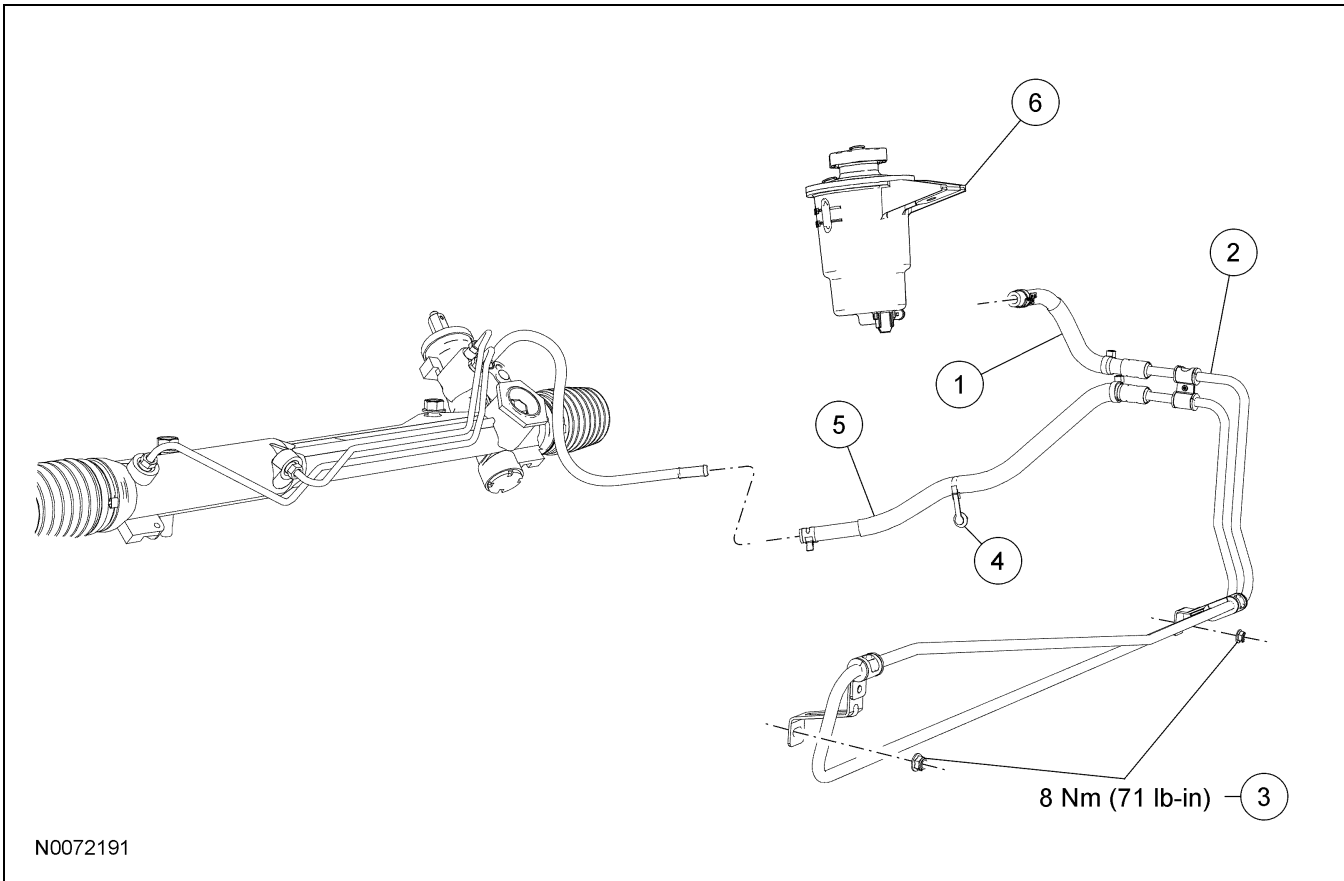
REMOVAL AND INSTALLATION

Power Steering Fluid Cooler

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

NOTE: 4.6L shown, 5.4L similar.



Item	Part Number	Description
1	—	Fluid cooler-to-reservoir hose (part of 3D746)
2	3D746	Power steering fluid cooler line
3	W520101	Power steering fluid cooler nuts (2 required)
4	—	Pin-type retainer (part of 3F780)
5	—	Return line-to-fluid cooler hose (part of 3D746)
6	3A697	Power steering fluid reservoir

Removal and Installation

NOTICE: When repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Release the clamp and disconnect the fluid cooler-to-reservoir hose.

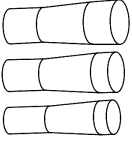
REMOVAL AND INSTALLATION (Continued)

3. Release the clamp and disconnect the return line-to-fluid cooler hose.
 4. Disconnect the return line-to-fluid cooler hose pin-type retainer from the stabilizer bar bracket.
 5. Remove the 2 fluid cooler nuts and the fluid cooler tube.
 - To install, tighten to 8 Nm (71 lb-in).
 6. To install, reverse the removal procedure.
 - Fill the power steering system. For additional information, refer to Section 211-00.
-

REMOVAL AND INSTALLATION

Power Steering Pump to Steering Gear Pressure Line — 4.0L, 4.6L

Special Tool(s)

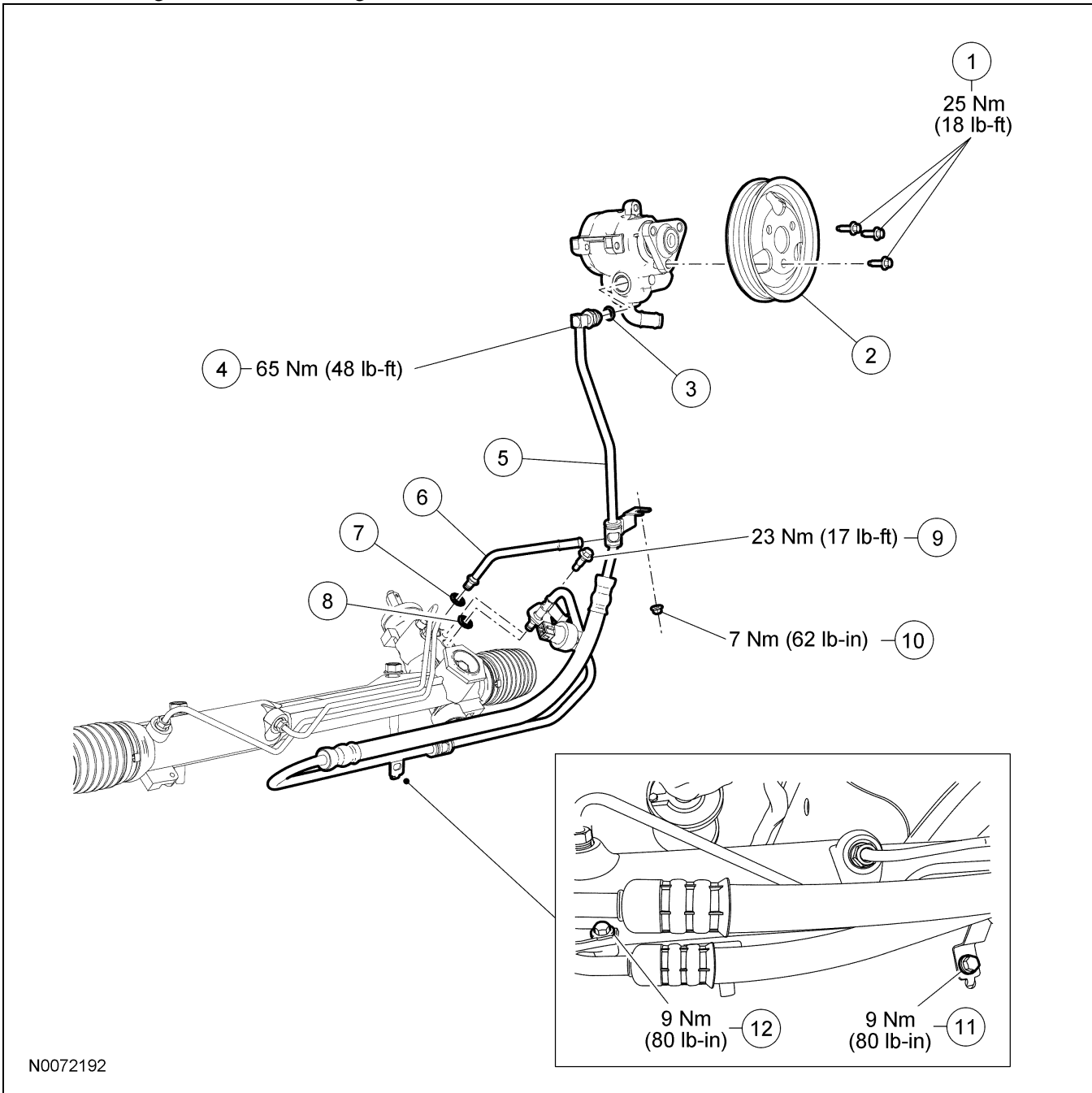
 <p>ST1444-A</p>	<p>Installer Set, Teflon® Seal 211-D027 (D90P-3517-A) or equivalent</p>
---	---

Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)</p>	<p>MERCON® V</p>

REMOVAL AND INSTALLATION (Continued)

NOTE: 4.0L engine shown, 4.6L engine similar.



N0072192

Item	Part Number	Description
1	N605784	Power steering pump pulley bolts
2	3A733	Power steering pump pulley
3	388898	Teflon® seal
4	—	Pressure line-to-pump fitting (part of 3A719)
5	3A719	Power steering pressure line
6	3A713	Power steering fluid cooler return line

(Continued)

Item	Part Number	Description
7	3F886-BA	O-ring seal
8	3F886-AA	O-ring seal
9	W707622	Power steering line clamp plate bolt
10	W520101	Pressure line bracket-to-A/C compressor stud nut
11	W505255	Pressure line bracket-to-crossmember bolt

(Continued)

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
12	W505255	Power steering pressure line bracket-to-steering gear bolt (4.6L)

Removal and Installation

NOTICE: When repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

4.0L and 4.6L engines

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the air cleaner outlet pipe. For additional information, refer to Section 303-12.

4.0L engine

3. Loosen the 3 power steering pump pulley bolts.
4. Rotate the tensioner and remove the accessory drive belt from the power steering pump pulley.
5. Remove the 3 bolts and the power steering pump pulley.
 - To install, tighten to 25 Nm (18 lb-ft).
6. Remove the pressure line-to-A/C compressor stud nut.

4.6L engine

7. Remove the power steering pump pulley. For additional information, refer to Power Steering Pump Pulley — 4.6L, 5.4L in this section.
8. Remove the pressure line bracket-to-pump stud nut.
 - To install, tighten to 7 Nm (62 lb-in).
9. Remove the pressure line bracket-to-steering gear bolt.
 - To install, tighten to 9 Nm (80 lb-in).

4.0L and 4.6L engines

10. Remove the pressure line bracket-to-crossmember bolt.
 - To install, tighten to 9 Nm (80 lb-in).
11. **NOTE:** A new Teflon® seal must be installed. Disconnect the pressure line-to-pump fitting.
 - Discard the Teflon® seal.
 - To install, tighten to 65 Nm (48 lb-ft).
12. **NOTICE:** When installing the pressure and return lines to the steering gear, make sure the lines are fully seated into the steering gear prior to installing the clamp plate. Additionally, make sure that the clamp plate surfaces are free of foreign material. **DO NOT** exceed the specified torque when tightening the clamp plate. Leakage and/or failure of the power steering components may occur.

NOTE: New O-ring seals must be installed any time the lines are disconnected from the steering gear.

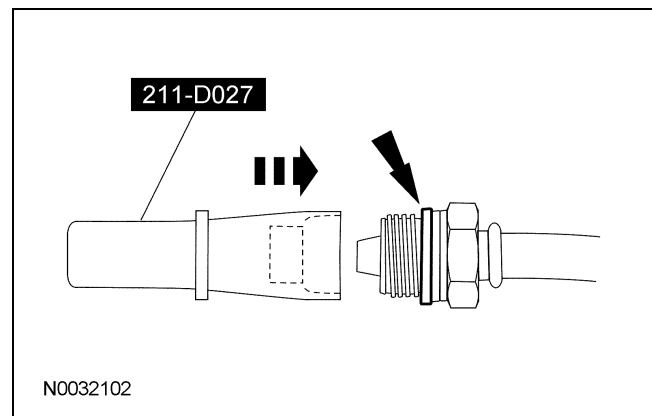
Remove the power steering line clamp plate bolt, rotate the clamp plate and remove the power steering pressure line.

- Discard the O-ring seal.
- To install, tighten to 23 Nm (17 lb-ft).

13. To install, reverse the removal procedure.

NOTE: New Teflon® seals must be installed.

Using the Teflon® Seal Installer Set, install a new Teflon® seal to the pressure line fitting.



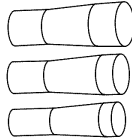
REMOVAL AND INSTALLATION (Continued)

14. For additional information on the accessory drive belt routing, refer to Section 303-05.
- Fill the power steering system. For additional information, refer to Section 211-00.
-

REMOVAL AND INSTALLATION

Power Steering Pump to Steering Gear Pressure Line — 5.4L

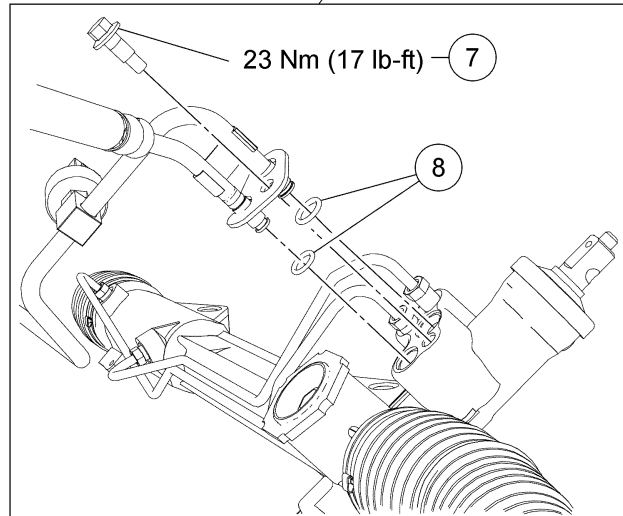
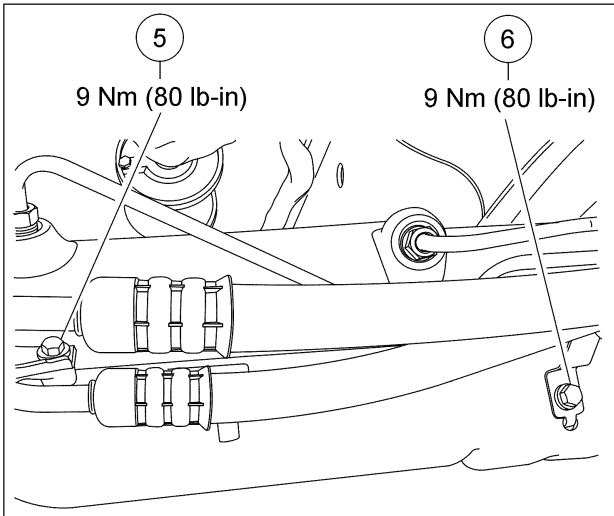
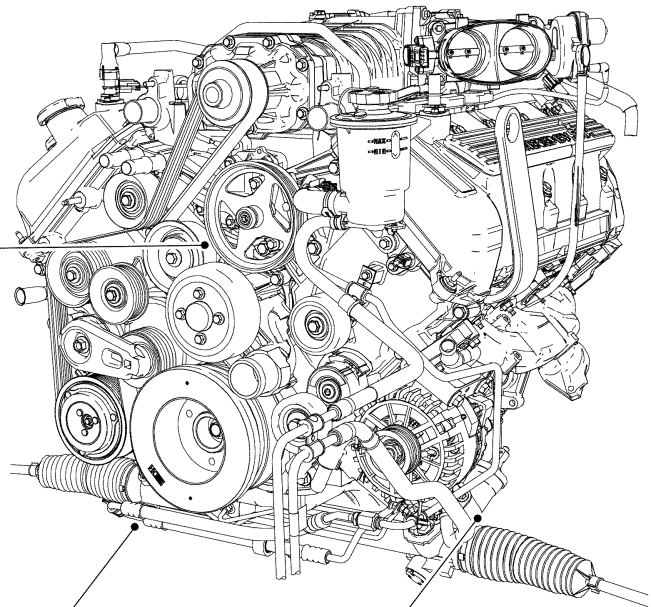
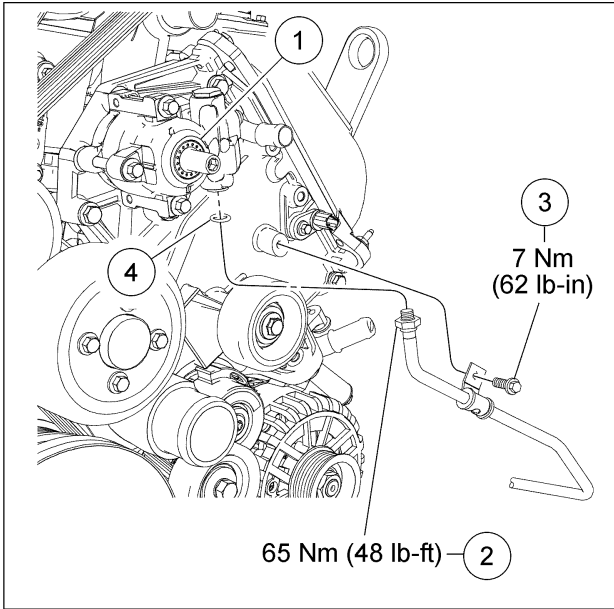
Special Tool(s)

 <p>ST1444-A</p>	<p>Installer Set, Teflon® Seal 211-D027 (D90P-3517-A) or equivalent</p>
---	---

Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)</p>	<p>MERCON® V</p>

REMOVAL AND INSTALLATION (Continued)



N0072428

Item	Part Number	Description
1	3A674	Power steering pump
2	—	Pressure line-to-pump fitting (part of 3A719)
3	W505255	Pressure line bracket-to-engine bolt
4	388898	Teflon® seal
5	W505255	Pressure line bracket-to-steering gear bolt

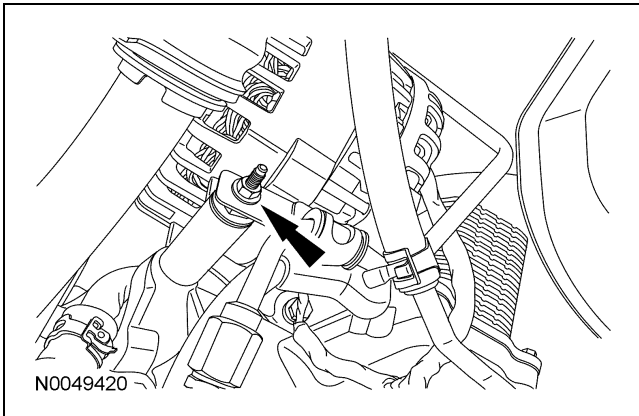
Item	Part Number	Description
6	W505255	Pressure line bracket-to-crossmember bolt
7	W707622	Power steering line clamp plate bolt
8	3F886-AA 3F886-BA	O-ring seals (2 required)

(Continued)

REMOVAL AND INSTALLATION (Continued)**Removal and Installation**

NOTICE: When repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

1. With the vehicle in NEUTRAL position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the power steering pump pulley. For additional information, refer to Power Steering Pump Pulley — 4.6L, 5.4L in this section.
3. **NOTE:** A new Teflon® seal must be installed. Disconnect the pressure line-to-pump fitting.
 - Discard the Teflon® seal.
 - To install, tighten to 65 Nm (48 lb-ft).
4. Remove the pressure line bracket-to-engine bolt.
 - To install, tighten to 7 Nm (62 lb-in).
5. Remove the pressure line bracket-to-alternator stud nut.
 - To install, tighten to 7 Nm (62 lb-in).



6. Remove the pressure line bracket-to-crossmember bolt.
 - To install, tighten to 9 Nm (80 lb-in).

7. Remove the pressure line bracket-to-steering gear bolt.
 - To install, tighten to 9 Nm (80 lb-in).

8. **NOTICE:** When installing the pressure and return lines to the steering gear, make sure the lines are fully seated into the steering gear prior to installing the clamp plate. Additionally, make sure that the clamp plate surfaces are free of foreign material. **DO NOT** exceed the specified torque when tightening the clamp plate. Leakage and/or premature failure of the power steering components may occur.

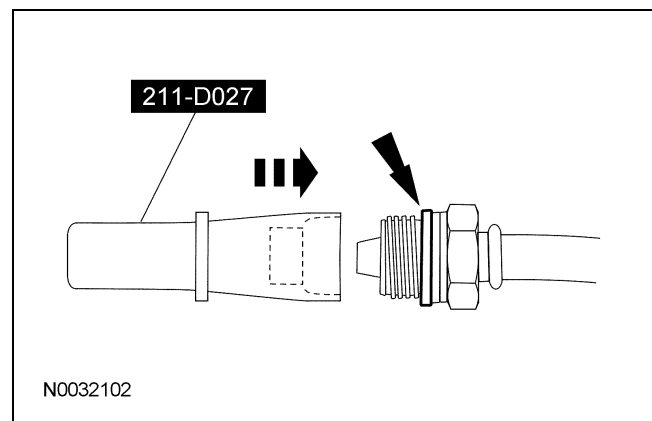
NOTE: New O-ring seals must be installed any time the lines are disconnected from the steering gear.

Remove the power steering line clamp plate bolt, rotate the clamp plate and remove the power steering pressure line.

- Discard the O-ring seal.
- To install, tighten to 23 Nm (17 lb-ft).

9. To install, reverse the removal procedure.

10. **NOTE:** A new Teflon® seal must be installed. Using the Teflon® Seal Installer Set, install a new Teflon® seal to the pressure line-to-pump fitting.



11. Fill the power steering system. For additional information, refer to Section 211-00.

REMOVAL AND INSTALLATION

Steering Gear

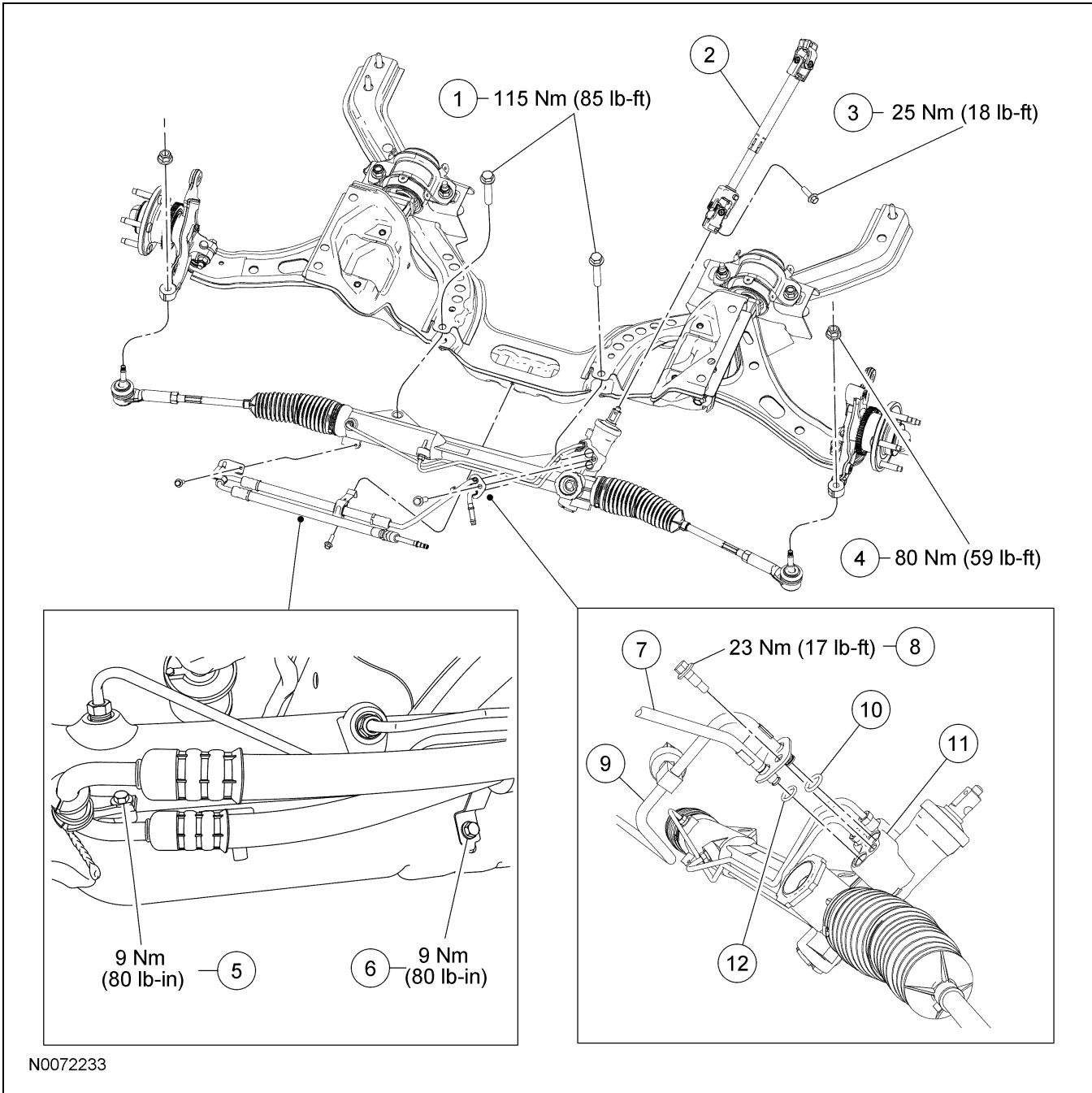
Special Tool(s)

<p>ST1603-A</p>	<p>Lifting Bracket, Engine 303-D087 (D93P-6001-A1)</p>
<p>ST2176-B</p>	<p>Support Bar, Engine 303-F070</p>
<p>ST1106-A</p>	<p>Tie-Rod End Remover 211-105 (T85M-3395-A)</p>

Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)</p>	<p>MERCON® V</p>

REMOVAL AND INSTALLATION (Continued)



N0072233

Item	Part Number	Description
1	W10909	Steering gear bolts (2 required)
2	3B676	Steering column lower shaft
3	W704980	Steering column coupling-to-steering gear bolt
4	W705606	Tie-rod end nut (2 required)
5	W505255	Pressure line bracket-to-steering gear bolt (4.6L and 5.4L)

Item	Part Number	Description
6	W505255	Pressure line bracket-to-crossmember bolt
7	3A713	Power steering return line
8	W707622	Power steering line clamp plate bolt
9	3A719	Power steering pressure line
10	3F886-AA	O-ring seal
11	3504	Steering gear
12	3F886-BA	O-ring seal

(Continued)

REMOVAL AND INSTALLATION (Continued)

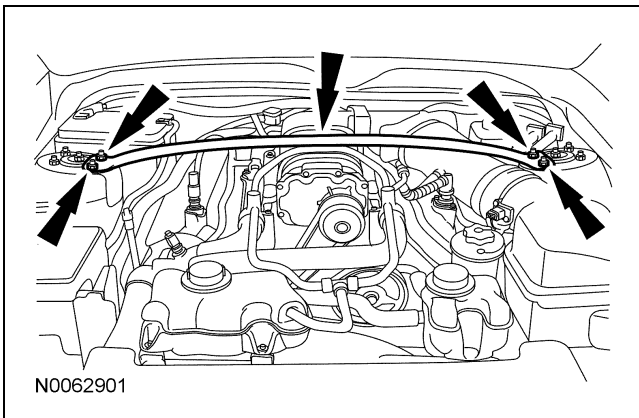
Removal and Installation

NOTICE: When repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

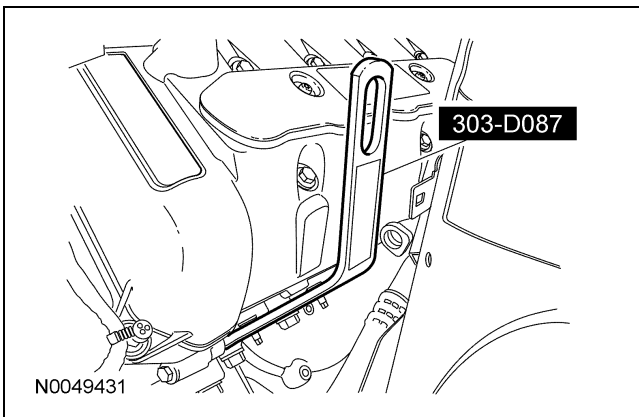
NOTICE: Do not allow the intermediate shaft to rotate while it is disconnected from the steering gear or damage to the clockspring may result. If there is evidence that the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to Section 501-20B.

5.4L engine

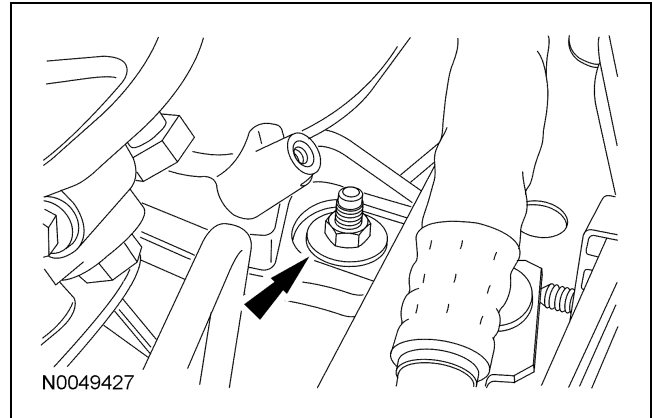
1. Remove the 4 nuts and the strut tower cross brace.



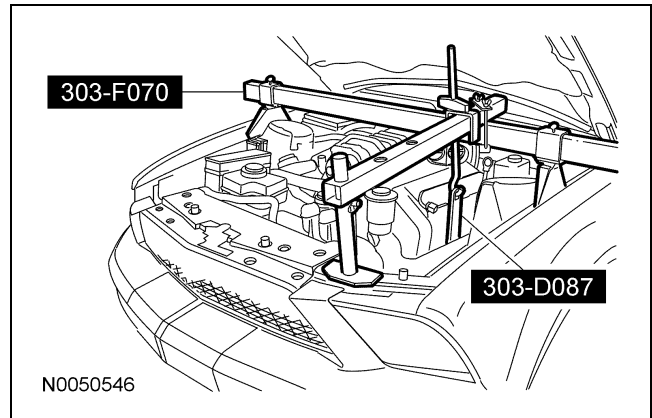
2. Remove the air cleaner outlet pipe. For additional information, refer to Section 303-12.
3. Install the Engine Lifting Bracket.



4. Remove the LH engine mount nut.
 - To install, tighten to 63 Nm (46 lb-ft).



5. Install the Engine Support Bar.
 - Using the Engine Lifting Bracket and Engine Support Bar, raise the LH side of the engine to gain clearance for removal of the power steering pressure line clamp plate bolt and the steering gear mounting bolt.

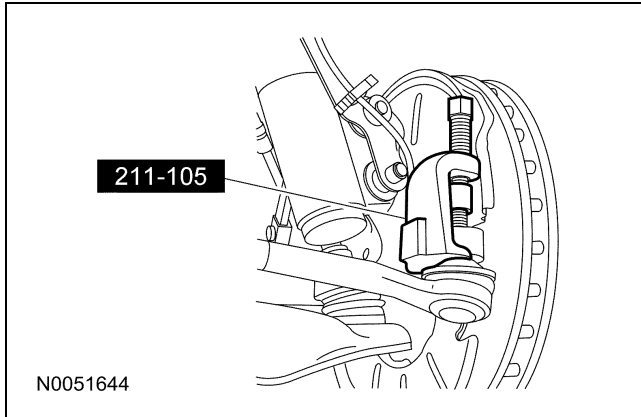


All vehicles

6. Remove the front wheels and tires. For additional information, refer to Section 204-04.

REMOVAL AND INSTALLATION (Continued)

7. Remove and discard the 2 tie-rod end nuts. Using the Tie-Rod End Remover, disconnect the tie-rod ends from the wheel knuckles.
- To install, tighten the new nuts to 80 Nm (59 lb-ft).



8. **NOTICE: Do not allow the intermediate shaft to rotate while it is disconnected from the steering gear or damage to the clockspring may result. If there is evidence that the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to Section 501-20B.**

Remove the steering column coupling-to-steering gear bolt and disconnect the coupling from the steering gear.

- Discard the bolt.
- To install, tighten the new bolt to 25 Nm (18 lb-ft).

9. **NOTICE: When installing the pressure and return lines to the steering gear, make sure the lines are fully seated into the steering gear prior to installing the clamp plate. Additionally, make sure that the clamp plate surfaces are free of foreign material. DO NOT exceed the specified torque when tightening the clamp plate. Leakage and/or premature failure of the power steering components may occur.**

NOTE: New O-ring seals must be installed anytime the power steering lines are disconnected from the steering gear.

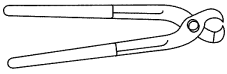
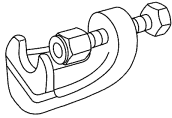
Remove the power steering line clamp plate bolt, rotate the clamp plate and disconnect the power steering pressure and return lines.

- Discard the O-ring seals.
 - To install, tighten to 23 Nm (17 lb-ft).
10. Remove the pressure line bracket-to-steering gear bolt.
- To install, tighten to 9 Nm (80 lb-in).
11. Remove the pressure line bracket-to-crossmember bolt.
- Position the pressure line aside.
 - To install, tighten to 9 Nm (80 lb-in).
12. Remove the 2 bolts and the steering gear.
- To install, tighten to 115 Nm (85 lb-ft).
13. To install, reverse the removal procedure.
14. Fill the power steering system. For additional information, refer to Section 211-00.
15. Check and, if necessary, adjust the front toe. For additional information, refer Section 204-00.

REMOVAL AND INSTALLATION

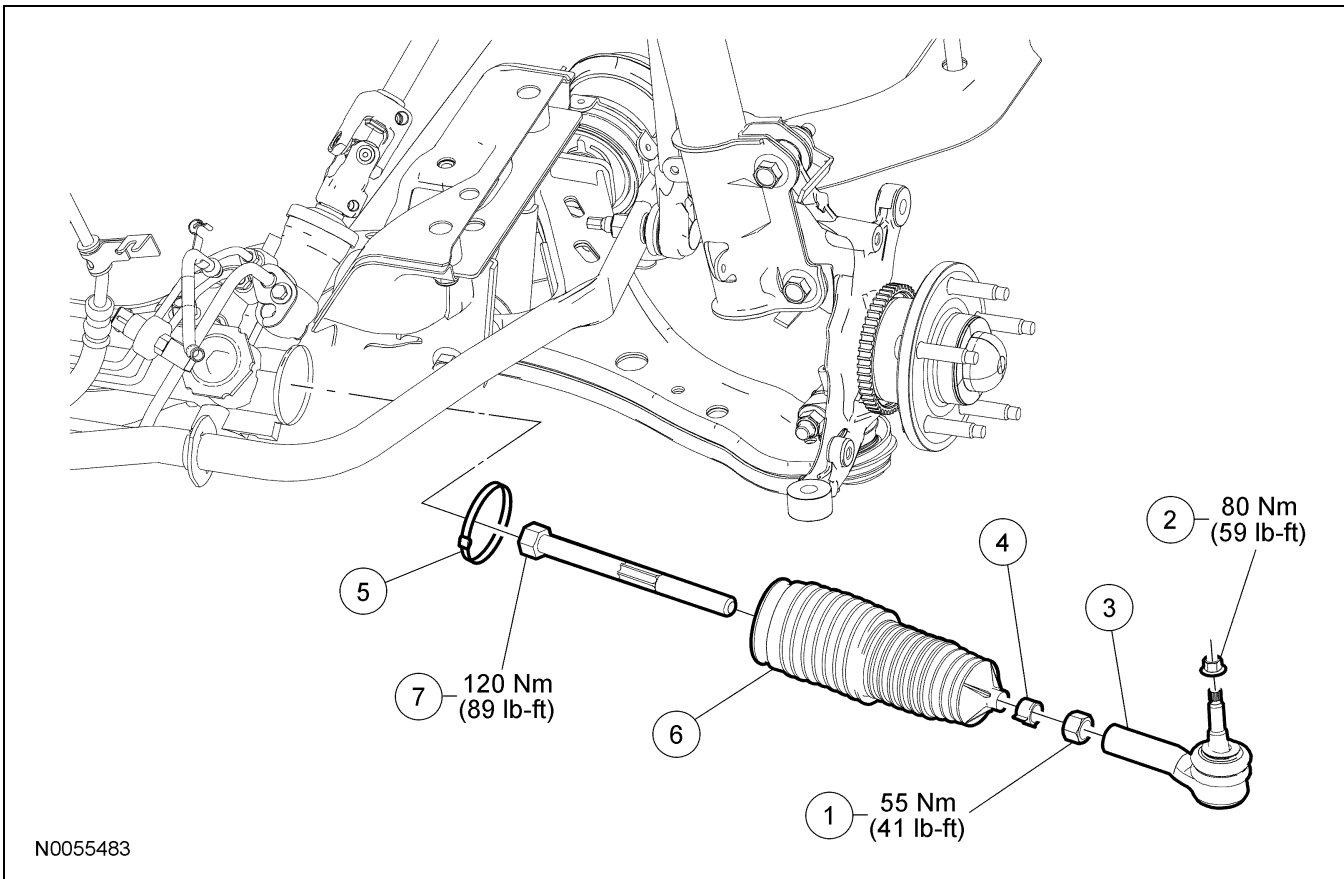
Inner Tie Rod

Special Tool(s)

 <p>ST1525-A</p>	<p>Boot Clamp Pliers 205-D067 (D87P-1098-A) or equivalent</p>
 <p>ST1106-A</p>	<p>Tie-Rod End Remover 211-105 (T85M-3395-A)</p>

Material

Item	Specification
<p>Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)</p>	<p>ESA-M1C75-B</p>



REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	14094	Tie-rod jam nut (part of 3280)
2	W705606	Tie-rod end nut
3	3289	Tie-rod end
4	3C650A	Outer bellows boot clamp
5	3K745	Inner bellows boot clamp
6	3K661	Steering gear bellows boot
7	3280	Inner tie rod

Removal

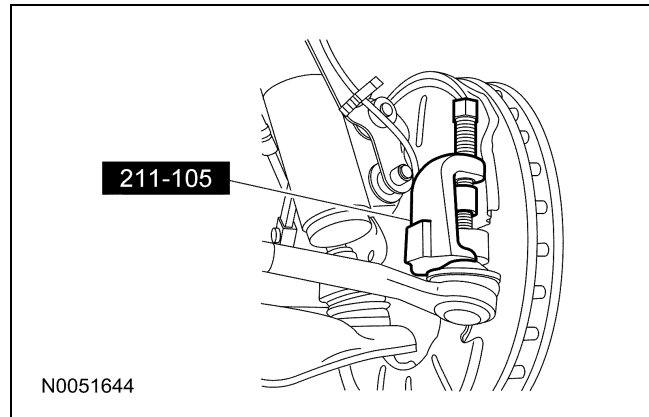
NOTICE: The steering gear bellows boots and clamps are designed to provide an airtight seal and protect the internal components of the steering gear. If the seal is not airtight, the vacuum generated during turning will draw water and foreign material into the gear causing damage. Zip ties do not produce an airtight seal and must not be used.

NOTICE: The inner tie-rod ball joint grease is not compatible with water. Water trapped in the grease may damage the joint.

NOTICE: If present, the orientation of the vent tube must be noted so the boots and vent tubes may be installed in the correct location. Incorrect venting may cause damage to internal components.

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

2. Loosen the tie-rod end jam nut.
3. Remove and discard the tie-rod end nut.
4. Using the Tie-Rod End Remover, disconnect the tie-rod end from the wheel knuckle.



5. **NOTE:** Count the number of turns required to remove the tie-rod end for reference during installation.
Remove the tie-rod end.
6. Remove the tie-rod end jam nut.
7. **NOTE:** New bellows boot clamps must be installed.
Remove and discard the inner and outer bellows boot clamp.
8. Remove the steering gear bellows boot.

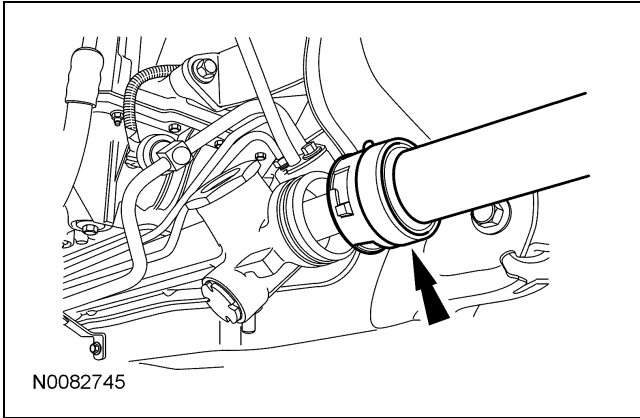
REMOVAL AND INSTALLATION (Continued)

9. **NOTICE:** Place the steering gear at the center position. Use an appropriate-sized wrench on the flat of the rack gear to resist rotation and to prevent damage during removal and installation of the inner tie rod.

NOTE: If repairing the RH side, it will be necessary to pull back the LH inner tie-rod boot to hold the steering gear.

NOTE: An assistant may be needed for removal of the RH inner tie rod.

While holding the steering gear rack, use a suitable crowfoot-style inner tie-rod tool or an appropriate-sized crowfoot wrench to remove the inner tie rod.

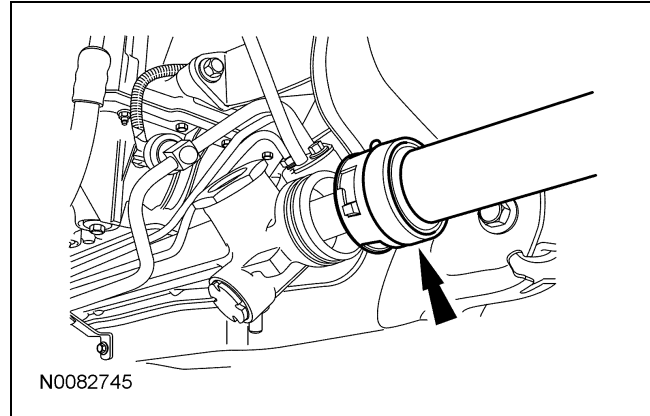


10. **NOTICE:** Thoroughly remove any abrasive material. This material is extremely harmful and may damage the steering gear.

Thoroughly clean and inspect all the parts to be reused. Install new parts as necessary.

Installation

- While holding the steering gear rack, use a suitable crowfoot-style inner tie-rod tool or an appropriate-sized crowfoot wrench to install the inner tie rod.
 - Tighten to 120 Nm (89 lb-ft).



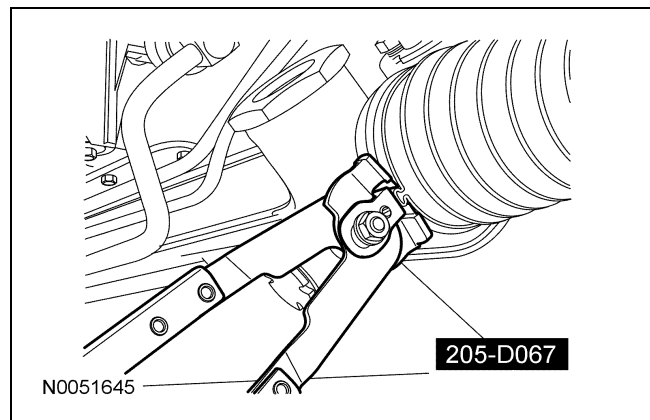
- NOTE:** Apply steering gear grease to the steering gear bellows boot groove in the inner tie rod.

NOTE: Make sure the steering gear bellows boot is positioned correctly over the steering gear housing bead and the groove in the inner tie rod.

NOTE: Make sure the steering gear bellows boot is not twisted and the vent tube is securely inserted into the vent nipple of the steering gear bellows boot.

Install the steering gear bellows boot.

- Using the Boot Clamp Pliers, install a new inner bellows boot clamp.



- NOTE:** Make sure the end of the steering gear bellows is positioned between the 2 grooves on the inner tie rod or an internal leak can result. Install a new outer bellows boot clamp.
- Thread the tie-rod end jam nut onto the inner tie rod.

REMOVAL AND INSTALLATION (Continued)

6. **NOTE:** Install the tie-rod end the same number of turns as recorded during the removal.
Install the tie-rod end to the inner tie rod.
 7. Position the tie-rod end to the wheel knuckle and install a new tie-rod end nut.
 - Tighten to 80 Nm (59 lb-ft).
 8. Tighten the tie-rod end jam nut.
 - Tighten to 55 Nm (41 lb-ft).
 9. Check and, if necessary, adjust the front toe. For additional information, refer to Section 204-00.
-

SPECIFICATIONS

Torque Specifications

Description	Nm	lb-ft	lb-in
Dash boot bearing nuts	9	—	80
Lower steering column shaft-to-steering column coupling bolt	47	35	—
Lower steering column shaft-to-upper steering column shaft bolt	25	18	—
Steering column coupling-to-steering gear bolt	25	18	—

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Steering column nuts	18	—	159
Steering column opening cover reinforcement bolts	9	—	80
Steering column shaft-to-steering column bolt	25	18	—
Steering wheel bolt	55	41	—

DESCRIPTION AND OPERATION

Steering Column

The steering column consists of the following:

- Steering wheel
- Steering column
- Upper and lower steering column shafts
- Steering column switches
- Ignition lock cylinder

The steering column is the mechanical linkage between the steering wheel and the steering gear. The steering wheel is mounted to a shaft which passes through the center of the steering column. The shaft is centered by bearings within the steering column. The steering column shaft then connects the steering column to the steering gear. The upper and lower steering column shaft connections utilize U-joint type couplings. The tilt function of the steering column is controlled by a mechanical lever on the underside of the steering column which uses a cam to lock and unlock the steering column. When the tilt lever is unlocked, the steering column can then be adjusted to various positions. The steering column switches (multifunction and ignition) are mounted to the steering column. These switches are covered by the upper and lower steering column shrouds.

For steering column switch service information, refer to Section 211-05.

For ignition lock cylinder service information, refer to Section 501-14.

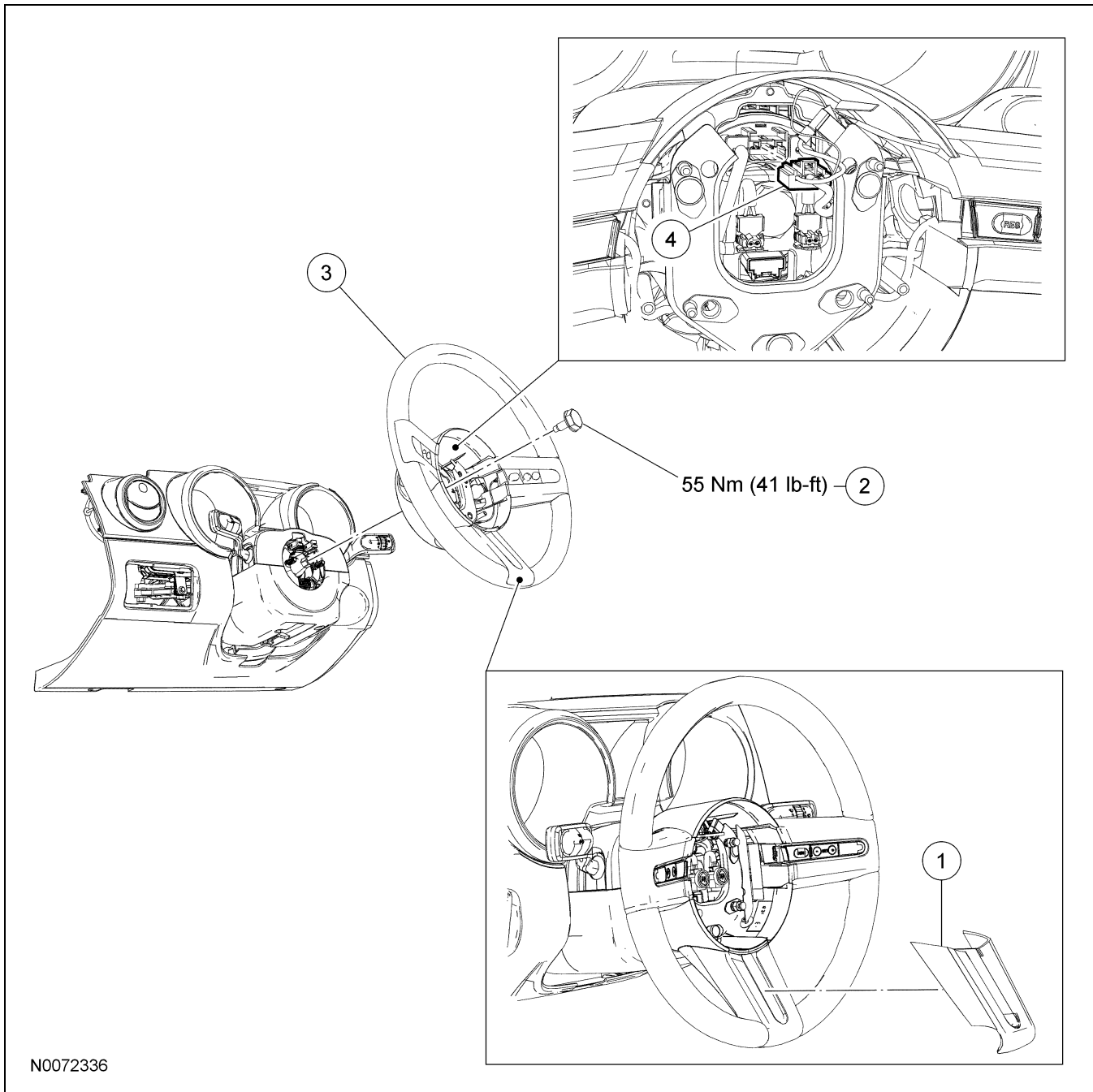
DIAGNOSIS AND TESTING

Steering Column

Refer to Section 211-00.

REMOVAL AND INSTALLATION

Steering Wheel



N0072336

Item	Part Number	Description
1	3F830	Steering wheel spoke finish panel (3 required)
2	043B13	Steering wheel bolt
3	3600	Steering wheel
4	—	Steering wheel switches/horn electrical connector (part of 3600)

Removal and Installation

1. Place the steering wheel in the straight-ahead position and turn the ignition switch to the OFF position.
2. Remove the driver air bag module. For additional information, refer to Section 501-20B.

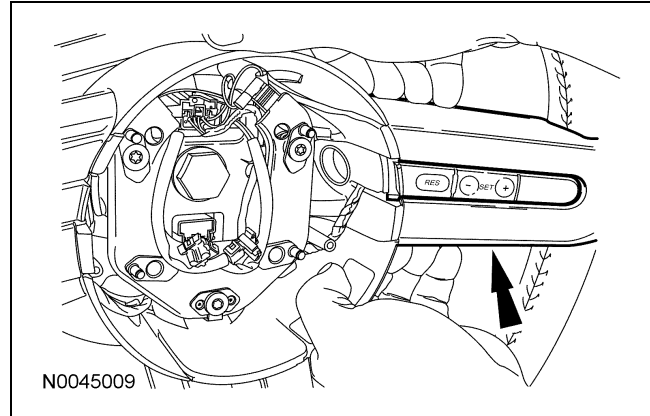
REMOVAL AND INSTALLATION (Continued)

3. **NOTICE:** Do not use a screwdriver or prying device to remove the steering wheel spoke finish panel(s) or damage to the steering wheel may occur. Place fingers near the base of the wheel spoke and gently pull upward to remove the finish panel(s).

NOTE: The steering wheel spoke finish panel(s) can be serviced separately. A new steering wheel does not need to be installed.

NOTE: It is not necessary to remove the steering wheel when installing new steering wheel spoke finish panel(s).

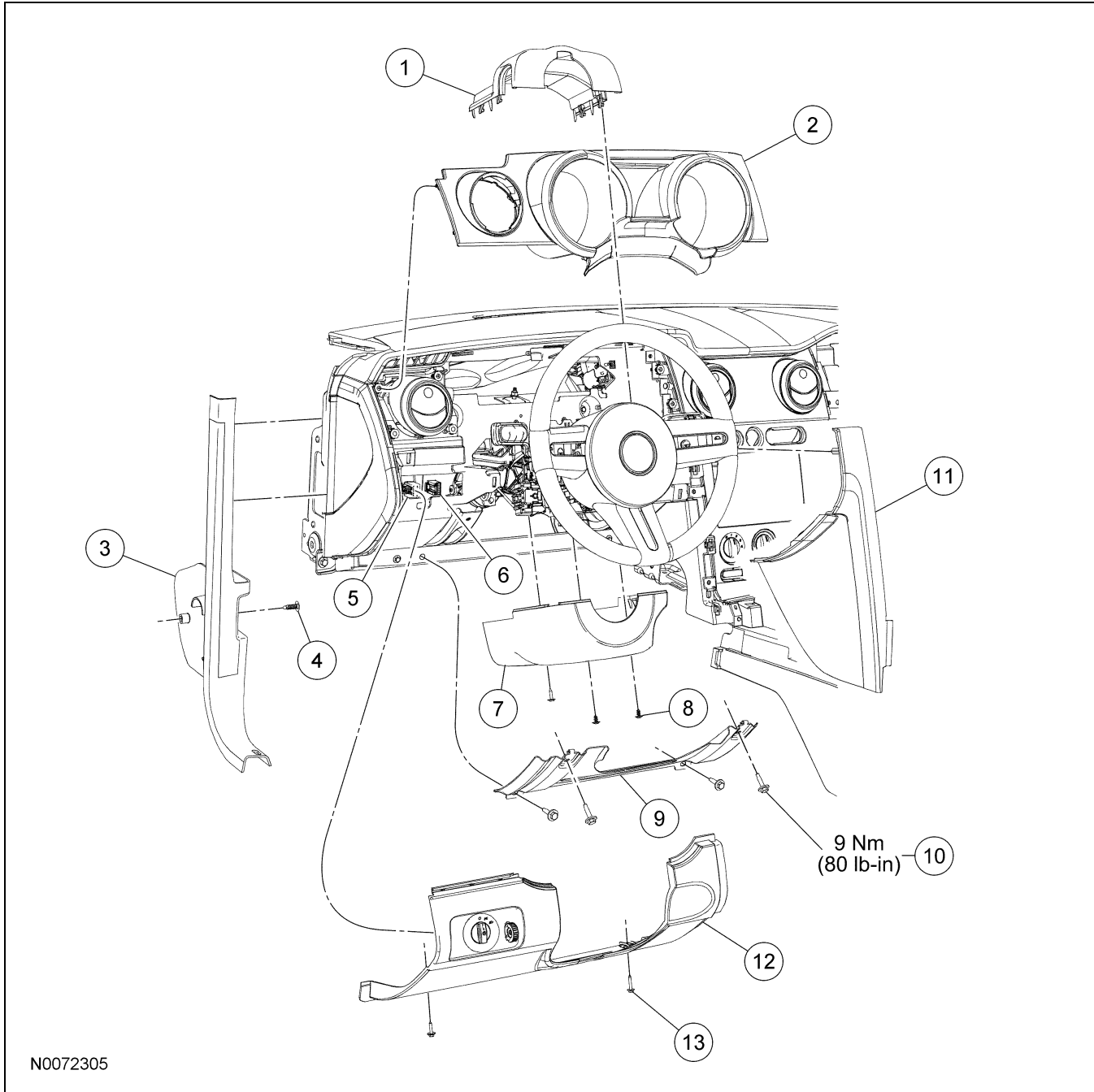
If necessary, remove the steering wheel spoke finish panel(s).



4. Remove and discard the steering wheel bolt.
 - To install, tighten the new bolt to 55 Nm (41 lb-ft).
5. Disconnect the steering wheel switches/horn electrical connector from the clockspring.
6. Remove the steering wheel.
 - Route the connectors for the clockspring through the steering wheel.
7. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Steering Column



N0072305

Item	Part Number	Description
1	3530A	Upper steering column shroud
2	044D70	Instrument cluster finish panel
3	A30A64	LH A-pillar lower trim panel
4	W505156	LH A-pillar lower trim panel screw
5	—	Headlamp switch electrical connector (part of 14401)

(Continued)

Item	Part Number	Description
6	—	Courtesy lamp switch electrical connector (part of 14401)
7	3530B	Lower steering column shroud
8	W707281	Lower steering column shroud screw (2 required)

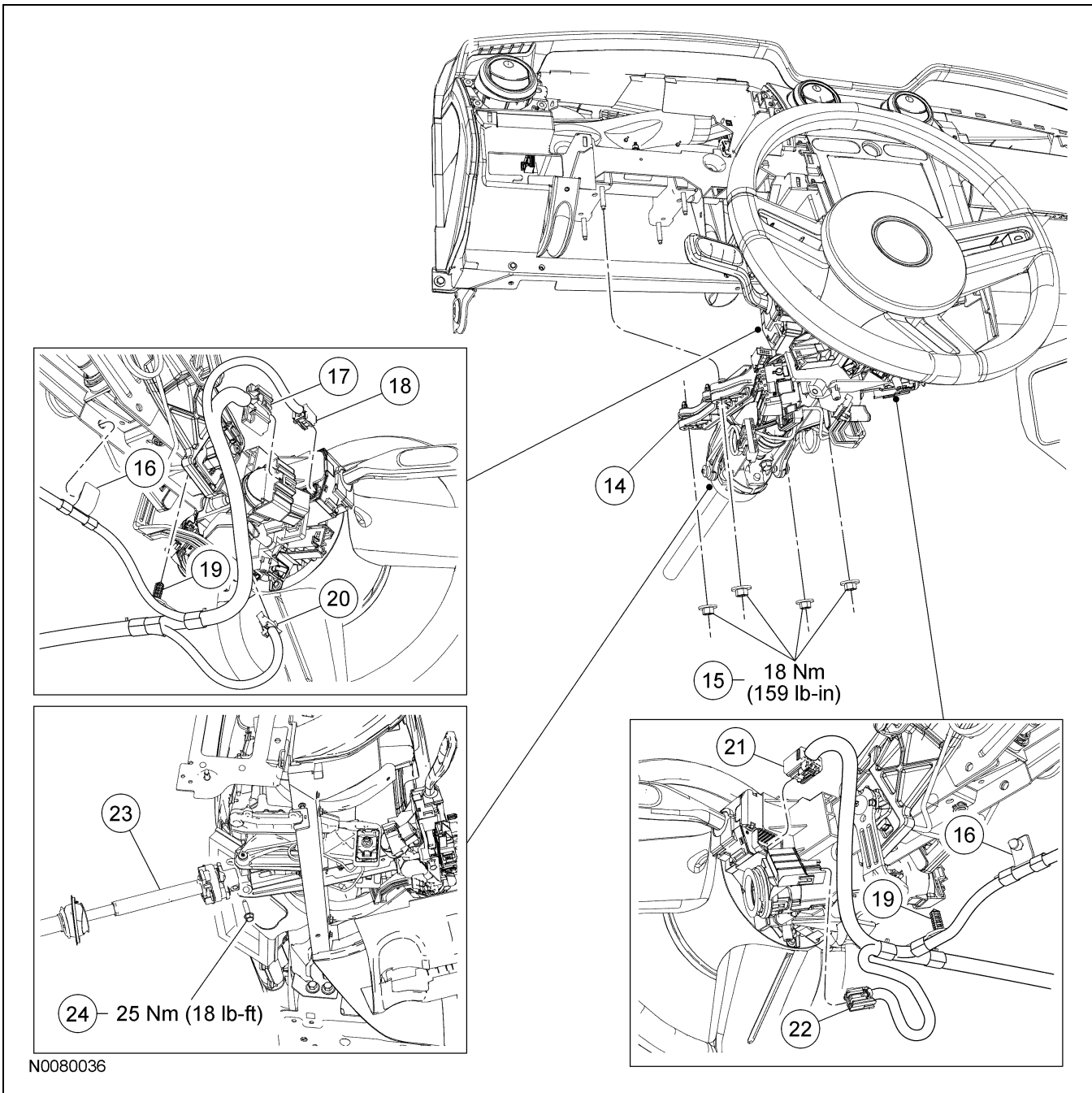
(Continued)

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
9	04502	Steering column opening cover reinforcement
10	W505424	Steering column opening cover reinforcement screw (4 required)
11	04608	Left center stack wing

Item	Part Number	Description
12	04459	Steering column opening cover
13	W505156	Steering column opening cover screw (2 required)

(Continued)



N0080036

REMOVAL AND INSTALLATION (Continued)

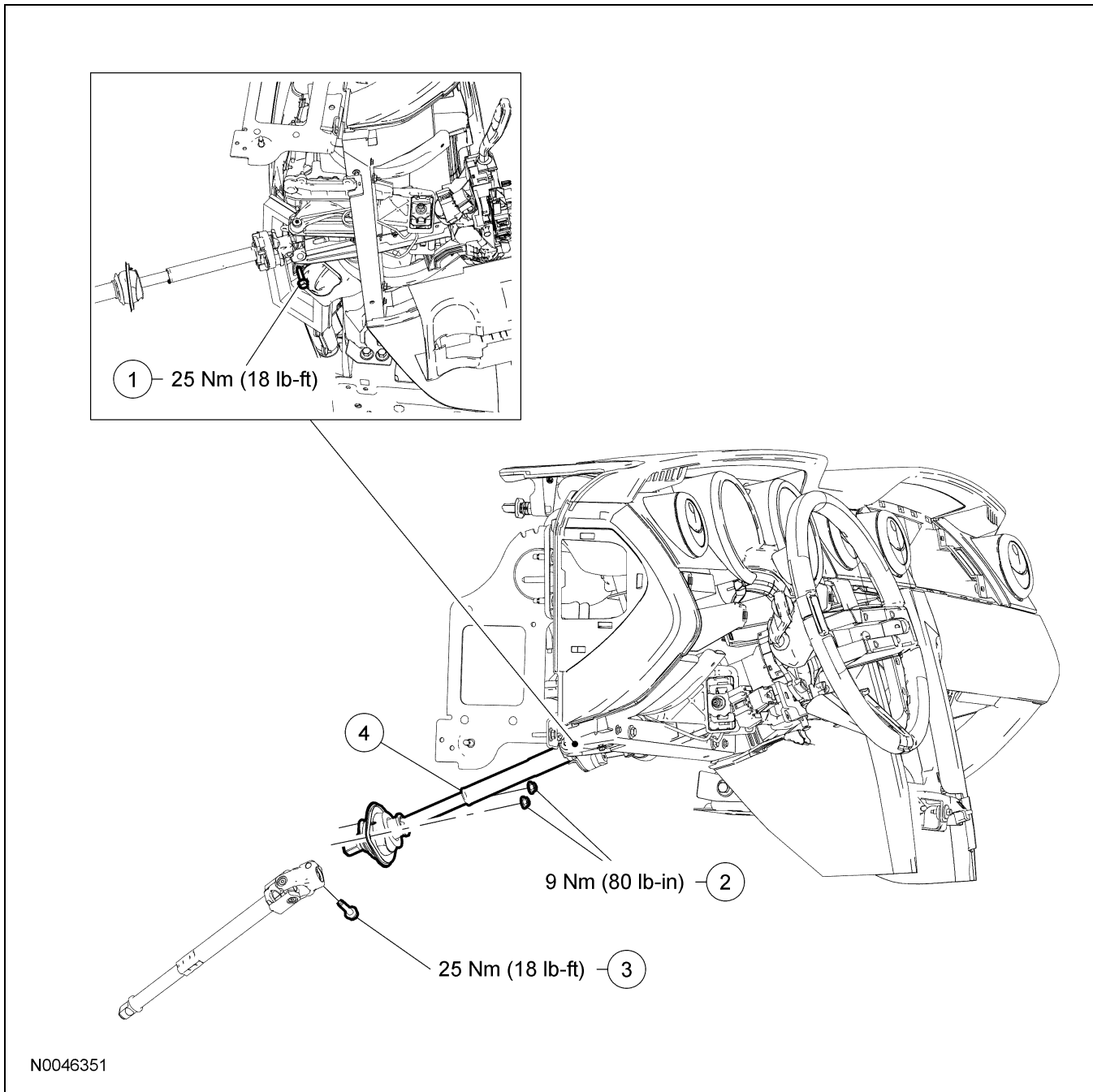
Item	Part Number	Description
14	3C529	Steering column
15	W705047	Steering column nuts (4 required)
16	—	Electrical harness retainer (part of 14401)
17	—	Ignition switch electrical connector (part of 14401)
18	—	Multifunction switch electrical connector (turn signal/hazard flasher) (part of 14401)
19	—	Electrical harness retainer (part of 14401)
20	—	Clockspring electrical connector (part of 14401)
21	—	Multifunction switch electrical connector (windshield wiper/washer) (part of 14401)
22	—	Passive Anti-Theft System (PATS) electrical connector (part of 14401)
23	3E751	Steering column shaft
24	W704980	Steering column shaft-to-steering column bolt

Removal and Installation

- Depower the Supplemental Restraint System (SRS). For additional information, refer to Section 501-20B.
- Place the steering wheel in the straight-ahead position and remove the ignition key.
- NOTE:** The instrument cluster finish panel is held in place with retaining clips that are attached to the bezel.
Remove the instrument cluster finish panel.
- Remove the floor console finish panel. For additional information, refer to Section 501-12.
- Remove the LH A-pillar lower trim panel.
- Remove the left center stack wing.
- Remove the 2 screws and the steering column opening cover.
 - Disconnect the headlamp and courtesy light switch electrical connectors.
- Remove the 4 bolts and the steering column opening cover reinforcement.
 - To install, tighten to 9 Nm (80 lb-in).
- Remove the upper steering column shroud by carefully pressing the sides inward.
- Remove the 3 screws and the lower steering column shroud.
- Disconnect the electrical harness pin-type retainers.
- Disconnect the following electrical connectors:
 - Ignition switch
 - Multifunction switch (turn signal/hazard flasher)
 - Clockspring
 - Multifunction switch (windshield wiper/washer)
 - PATS
- NOTICE: Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence that the steering column shaft has rotated the clockspring must be removed and recentered. For additional information, refer to Section 501-20B.**
Remove and discard the steering column shaft-to-steering column bolt and disconnect the shaft from the steering column.
 - To install, tighten the new bolt to 25 Nm (18 lb-ft).
- Remove the 4 nuts and the steering column.
 - To install, tighten to 18 Nm (159 lb-in).
- To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Steering Column Shaft — Upper



Item	Part Number	Description
1	W704980	Steering column shaft-to-steering column bolt
2	W707137	Dash boot bearing nuts (2 required)

Item	Part Number	Description
3	W704980	Lower steering column shaft-to-upper steering column shaft bolt
4	3E751	Upper steering column shaft

(Continued)

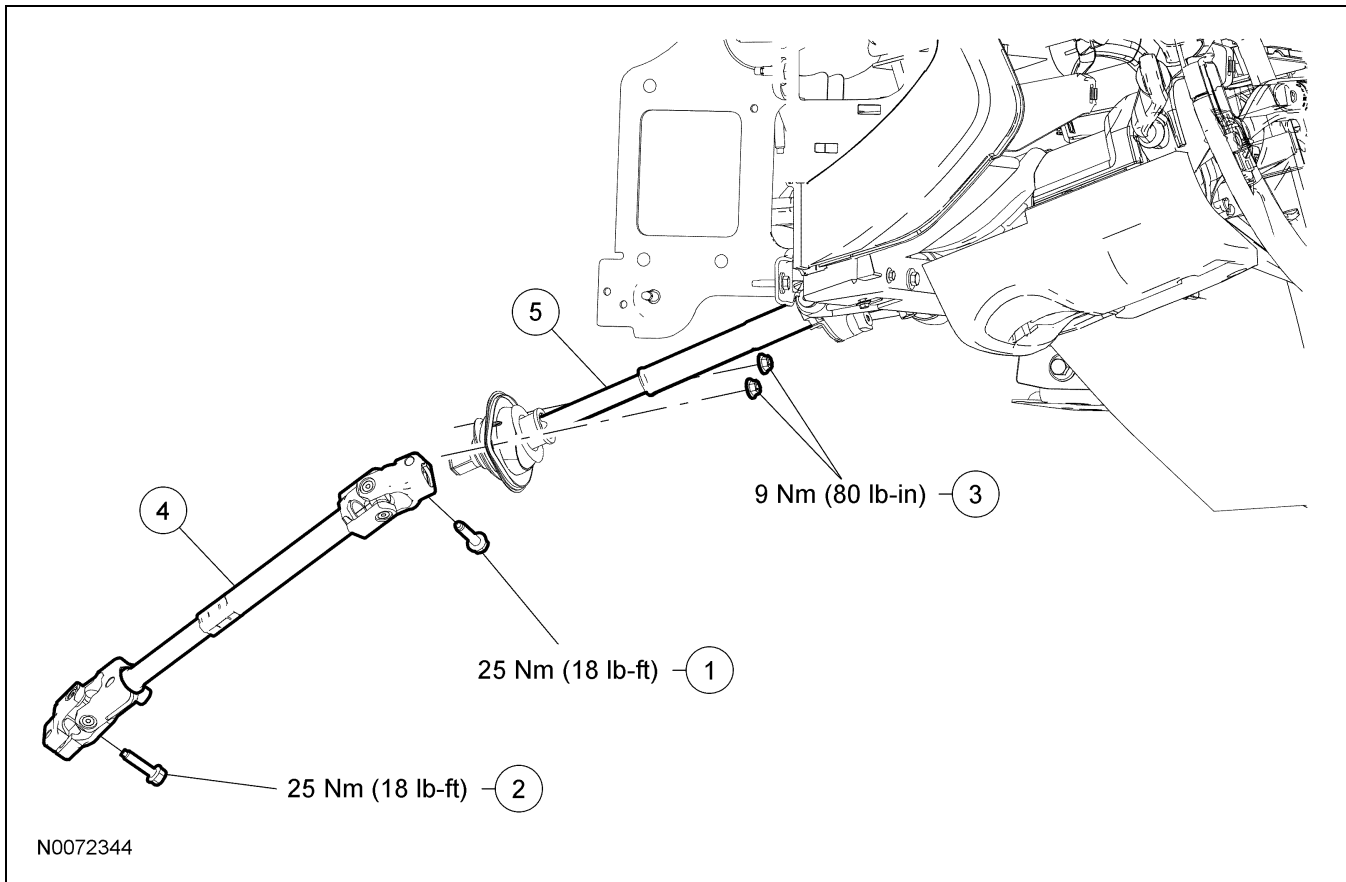
REMOVAL AND INSTALLATION (Continued)**Removal and Installation**

NOTICE: Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence that the steering column shaft has rotated the clockspring must be removed and recentered. For additional information, refer to Section 501-20B.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
 2. Place the steering wheel in the straight-ahead position and turn the ignition switch to the OFF position.
 3. Remove and discard the lower steering column shaft-to-upper steering column shaft bolt.
 - To install, tighten the new bolt to 25 Nm (18 lb-ft).
 4. Remove the 2 dash boot bearing nuts.
 - To install, tighten to 9 Nm (80 lb-in).
 5. Remove and discard the steering column shaft-to-steering column bolt.
 - To install, tighten the new bolt to 25 Nm (18 lb-ft).
 6. Collapse the steering column shaft slightly and remove the upper steering column shaft.
 7. To install, reverse the removal procedure.
-

REMOVAL AND INSTALLATION

Steering Column Shaft — Lower



Item	Part Number	Description
1	W704980	Lower steering column shaft-to-upper steering column shaft bolt
2	W704980	Steering column coupling-to-steering gear bolt
3	W707137	Dash boot bearing nuts (2 required)
4	3C662	Lower steering column shaft
5	3E751	Upper steering column shaft

Removal and Installation

NOTICE: Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence that the steering column shaft has rotated the clockspring must be removed and recentered. For additional information, refer to Section 501-20B.

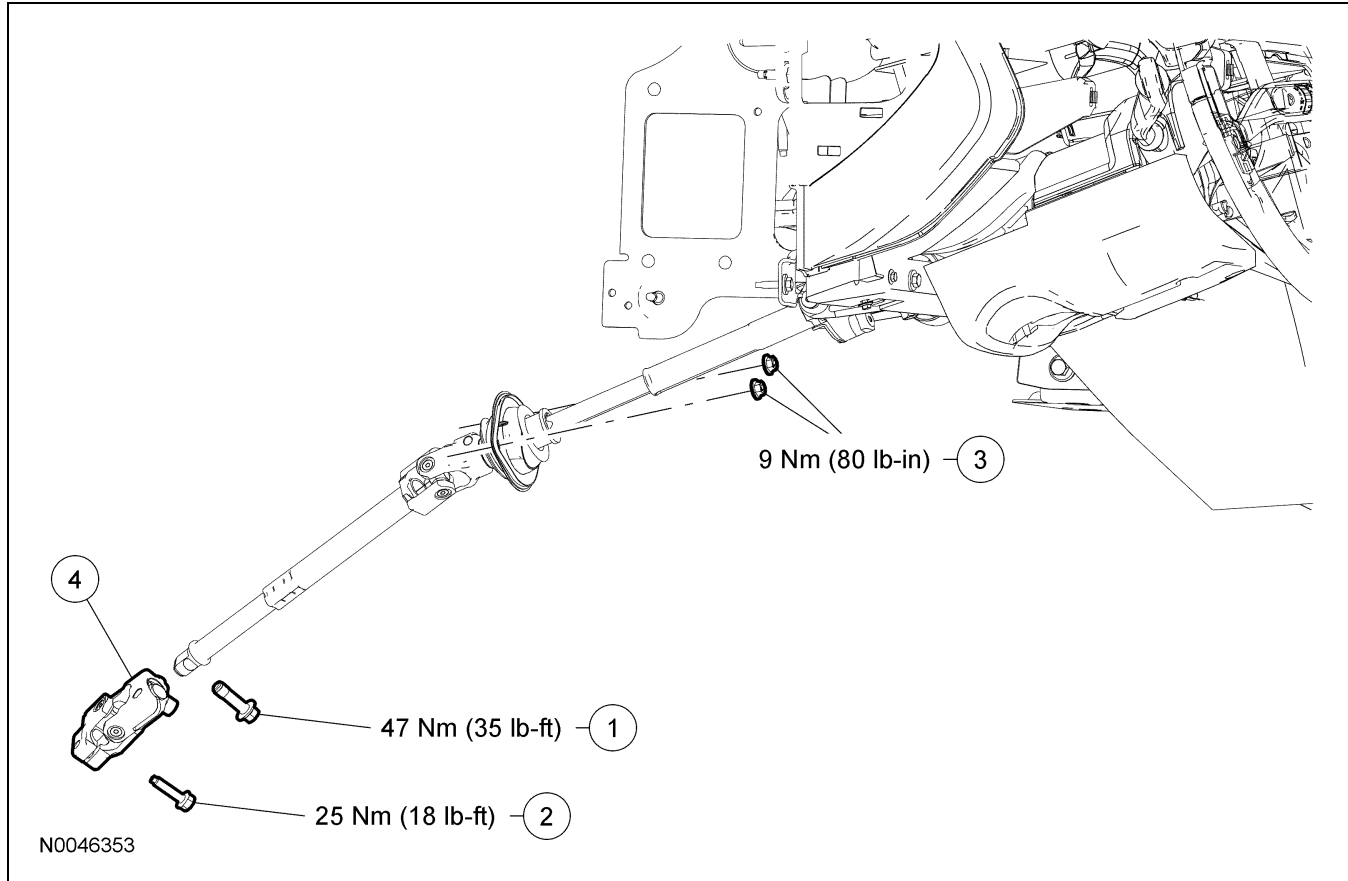
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove and discard the lower steering column shaft-to-upper steering column shaft bolt.
 - To install, tighten the new bolt to 25 Nm (18 lb-ft).

REMOVAL AND INSTALLATION (Continued)

3. Remove and discard the steering column coupling-to-steering gear bolt.
 - To install, tighten the new bolt to 25 Nm (18 lb-ft).
 4. Remove the 2 dash boot bearing nuts.
 - To install, tighten to 9 Nm (80 lb-in).
 5. Collapse the upper steering column shaft slightly and disconnect it from the lower steering column shaft.
 6. Remove the lower steering column shaft.
 7. To install, reverse the removal procedure.
-

REMOVAL AND INSTALLATION

Steering Column Coupling



Item	Part Number	Description
1	W702600	Lower steering column shaft-to-steering column coupling bolt
2	W704980	Steering column coupling-to-steering gear bolt
3	W707137	Dash boot bearing nuts (2 required)
4	3N725	Steering column coupling

Removal and Installation

NOTICE: Do not allow the steering column to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence that the steering column shaft has rotated the clockspring must be removed and recentered. For additional information, refer to Section 501-20B.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Place the steering wheel in the straight-ahead position and turn the ignition switch to the OFF position.
3. Remove and discard the lower steering column shaft-to-steering column coupling bolt.
 - To install, tighten the new bolt to 47 Nm (35 lb-ft).

REMOVAL AND INSTALLATION (Continued)

4. Remove and discard the steering column coupling-to-steering gear bolt.
 - To install, tighten the new bolt to 25 Nm (18 lb-ft).
 5. Remove the 2 dash boot bearing nuts.
 - To install, tighten to 9 Nm (80 lb-in).
 6. Collapse the upper steering column shaft slightly and disconnect the lower steering column shaft from the steering column coupling.
 7. Remove the steering column coupling.
 8. To install, reverse the removal procedure.
-

SPECIFICATIONS

Torque Specifications

Description	Nm	lb-in
Steering column opening cover reinforcement bolts	9	80

DESCRIPTION AND OPERATION

Steering Column Switches

The steering column switches system consists of the following components:

- Multifunction switch
- Key release button (manual transmission only)
- Ignition switch

The steering column switches receive driver inputs and send signals to various components.

The multifunction switch consists of 2 separate switches, one mounted to each side of the steering column. The multifunction switch mounted to the LH side of the steering column controls the turn signals, hazard flasher and headlamp dimmer/flash-to-pass. The multifunction switch mounted to the RH side of the steering column controls the windshield wiper/washer.

The key release button is equipped with manual transmissions only.

The ignition switch is mounted below the steering column and is activated by rotating the key lock cylinder on the steering column.

For information concerning the turn signals and hazard flasher, refer to Section 417-01.

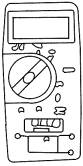
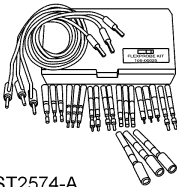
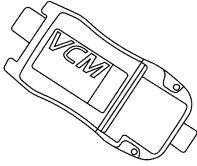
For information concerning the windshield wiper/washer, refer to Section 501-16.

For information concerning the headlamp dimmer/flash-to-pass, refer to Section 417-01.

DIAGNOSIS AND TESTING

Steering Column Switches

Special Tool(s)

 <p>ST1137-A</p>	<p>73III Automotive Meter 105-R0057 or equivalent</p>
 <p>ST2574-A</p>	<p>Flex Probe Kit 105-R025B or equivalent</p>
 <p>ST2834-A</p>	<p>Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool</p>

Principles of Operation

Ignition Switch

NOTE: The Smart Junction Box (SJB) is also identified as the Generic Electronic Module (GEM).

The ignition switch is controlled by the ignition lock cylinder with a key. When the ignition lock cylinder is turned using the key, a mechanical connection positions the ignition switch to the selected position and allows the ignition switch to send voltage to the SJB. The ignition switch also contains a key-in-ignition system that allows the instrument cluster to detect when the key has been inserted in the ignition switch. This information is used by the instrument cluster for the brake shift interlock system and for the chime warning system. For information on the brake shift interlock system, refer to Section 307-05. For information on the chime warning system, refer to Section 413-01.

The available ignition switch positions are:

- OFF
- ACC
- RUN
- START

Multifunction Switch

The multifunction switches control various components electrically. The headlamp switch sends constant voltage to the headlamps when placed in the ON position, while the flash-to-pass is a momentary switch used to send voltage to the headlamp high beams only. The headlamp high beam/low beam switch sends voltage to the low or high beam headlamps while the headlamps are on. The turn signal switch portion of the multifunction switch operates the left and right turn signals. The windshield wiper switch function uses a ground signal to activate the various wiper modes and the wiper/washer.

For diagnosis and testing of the multifunction switch, refer to Section 417-01 for headlamps and turn signal concerns, and Section 501-16 for wiper and washer concerns.

Inspection and Verification

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

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> • Ignition key • Ignition key turning effort • Ignition switch • Multifunction switch • Steering column shrouds 	<ul style="list-style-type: none"> • Bussed Electrical Center (BEC) • BEC fuse 68 (20A) • Ignition switch • Passive Anti-Theft System (PATS) transceiver • Smart Junction Box (SJB) • SJB fuse(s): <ul style="list-style-type: none"> — 3 (10A) — 7 (10A) — 20 (10A) — 21 (10A) • Wiring, terminals or connectors

NOTE: For multifunction switch concerns, refer to one of the following sections:

- Exterior Lighting, Section 417-01.
 - Wipers and Washers, Section 501-16.
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

DIAGNOSIS AND TESTING (Continued)

4. **NOTE:** Make sure to use the latest scan tool software release.
If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).
5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM.
If the scan tool does not communicate with the VCM:
- check the VCM connection to the vehicle.
 - check the scan tool connection to the VCM.
 - refer to Section 418-00, No Power To The Scan Tool, to diagnose no communication with the scan tool.
6. If the scan tool does not communicate with the vehicle:
- verify the ignition key is in the ON position.
 - verify the scan tool operation with a known good vehicle.
 - refer to Section 418-00 to diagnose no response from the PCM.
7. Carry out the network test.
- If the scan tool responds with no communication for one or more modules, refer to Section 418-00.
 - If the network test passes, retrieve and record continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self-test diagnostics for the SJB.
9. If the DTCs retrieved are related to the concern, go to the Smart Junction Box (SJB) DTC Chart. For all other DTCs, refer to Section 419-10.
10. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#).

Smart Junction Box (SJB) DTC Chart

DTC	Description	Source	Action
B1356	Ignition RUN Circuit Open	Smart Junction Box (SJB)	GO to Pinpoint Test C.
B1360	Ignition RUN/ACC Circuit Open	SJB	GO to Pinpoint Test B.
B1365	Ignition START Circuit Short to Battery	SJB	GO to Pinpoint Test E.
—	All other SJB DTCs	SJB	REFER to the Master DTC Chart in Section 419-10.

Symptom Chart**Symptom Chart**

Condition	Possible Sources	Action
<ul style="list-style-type: none"> • No power in all ignition switch positions 	<ul style="list-style-type: none"> • Fuse • Wiring, terminals or connectors • Ignition switch • Bussed Electrical Center (BEC) 	<ul style="list-style-type: none"> • GO to Pinpoint Test A.
<ul style="list-style-type: none"> • No power in ACC 	<ul style="list-style-type: none"> • Fuse(s) • Wiring, terminals or connectors • Ignition switch • Smart Junction Box (SJB) 	<ul style="list-style-type: none"> • GO to Pinpoint Test B.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart (Continued)

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No power in RUN 	<ul style="list-style-type: none"> Wiring, terminals or connectors Ignition switch SJB 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> No power in START 	<ul style="list-style-type: none"> Wiring, terminals or connectors Ignition switch SJB 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The ignition key is inoperative/hard to turn 	<ul style="list-style-type: none"> Ignition key Ignition lock cylinder Ignition switch 	<ul style="list-style-type: none"> GO to the Ignition Switch — Mechanical Component Test in this section.
<ul style="list-style-type: none"> The multifunction switch does not operate correctly 	<ul style="list-style-type: none"> Multifunction switch 	<ul style="list-style-type: none"> For exterior lighting concerns, REFER to diagnosis and testing in Section 417-01. For wiper and washer concerns, REFER to diagnosis and testing in Section 501-16.

Pinpoint Tests

Pinpoint Test A: No Power in All Ignition Switch Positions

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

Normal Operation

The ignition switch receives fused battery voltage from Bussed Electrical Center (BEC) fuse 68 (20A) along circuit 1050 (LG/VT), this voltage is then sent to the Smart Junction Box (SJB) for various systems depending on the ignition switch position. The ignition switch has 4 possible positions:

- OFF, there is no voltage sent to the SJB, but voltage is sent to the instrument cluster for the key-in ignition system. Refer to Section 413-01 to diagnose any key-in ignition concerns.

- ACC, the voltage is sent to the SJB along circuit 1002 (PK/BK).
- RUN, the voltage is sent to the SJB along circuit 1044 (WH/YE).
- START, the voltage is sent to the SJB along circuit 1522 (DG).

This pinpoint test is intended to diagnose the following:

- Fuse(s)
- Wiring, terminals or connectors
- Ignition switch
- BEC
- SJB

PINPOINT TEST A: NO POWER IN ALL IGNITION SWITCH POSITIONS

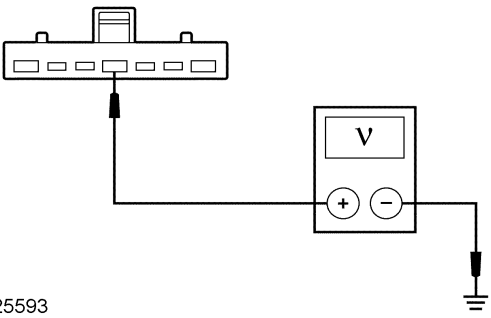
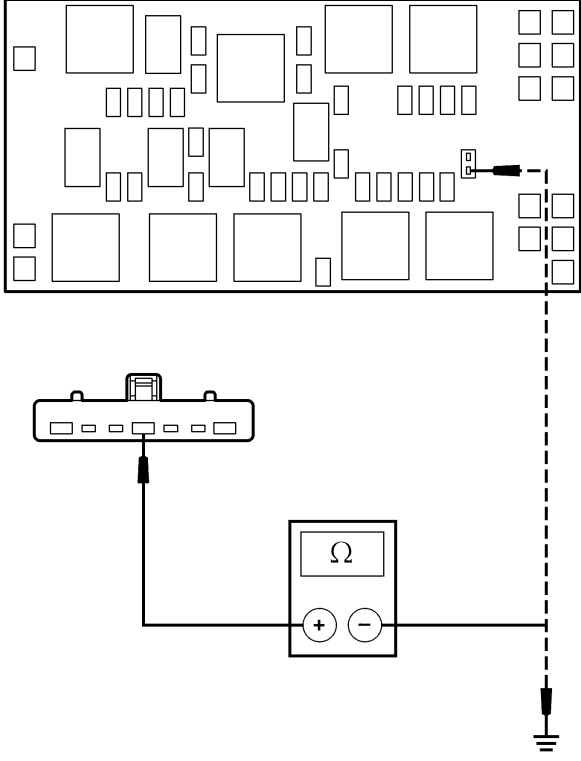
NOTICE: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
A1 CHECK THE VOLTAGE AT THE IGNITION SWITCH <ul style="list-style-type: none"> Ignition OFF. Disconnect: Ignition Switch C250. 	

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: NO POWER IN ALL IGNITION SWITCH POSITIONS (Continued)

Test Step		Result / Action to Take
A1	<p>CHECK THE VOLTAGE AT THE IGNITION SWITCH (Continued)</p> <ul style="list-style-type: none"> Measure the voltage between ignition switch C250-4, circuit 1050 (LG/VT), harness side and ground.  <p>A0025593</p> <ul style="list-style-type: none"> Is the voltage greater than 10 volts? 	<p>Yes GO to A3.</p> <p>No VERIFY BEC fuse 68 (20A) is OK. If not OK, refer to the Wiring Diagrams Manual to identify the possible causes of the circuit short. If OK, GO to A2.</p>
A2	<p>CHECK CIRCUIT 1050 (LG/VT) FOR AN OPEN OR A SHORT TO GROUND</p> <ul style="list-style-type: none"> Disconnect: BEC Fuse 68 (20A). Measure the resistance between: <ul style="list-style-type: none"> — ignition switch C250-4, circuit 1050 (LG/VT), harness side and BEC fuse 68 (20A), circuit 1050 (LG/VT), output side. — ignition switch C250-4, circuit 1050 (LG/VT), harness side and ground.  <p>N0012094</p> <ul style="list-style-type: none"> Are the resistances less than 5 ohms between the ignition switch and the BEC, and greater than 10,000 ohms between the ignition switch and ground? 	<p>Yes REPAIR or INSTALL a new BEC as necessary. TEST the system for normal operation.</p> <p>No REPAIR circuit 1050 (LG/VT). TEST the system for normal operation.</p>

(Continued)

DIAGNOSIS AND TESTING (Continued)

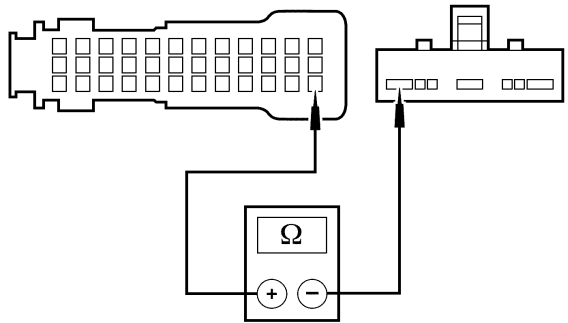
PINPOINT TEST A: NO POWER IN ALL IGNITION SWITCH POSITIONS (Continued)

Test Step		Result / Action to Take
A3	CHECK THE IGNITION SWITCH	<p>Yes GO to A4.</p> <p>No INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation.</p>
<ul style="list-style-type: none"> Carry out the Ignition Switch Component Test. Refer to Wiring Diagrams Cell 149 for component testing. Is the ignition switch OK? 		
A4	CHECK CIRCUIT 1002 (PK/BK) FOR AN OPEN	<p>Yes GO to A5.</p> <p>No VERIFY SJB fuses 20 (10A) and 21 (10A) are OK. If OK, REPAIR circuit 1002 (PK/BK). If not OK, refer to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<ul style="list-style-type: none"> Disconnect: SJB C2280a. Measure the resistance between ignition switch C250-6, circuit 1002 (PK/BK), harness side and SJB C2280a-11, circuit 1002 (PK/BK), harness side. <p>N0072215</p> <ul style="list-style-type: none"> Is the resistance less than 5 ohms? 		
A5	CHECK CIRCUIT 1044 (WH/YE) FOR AN OPEN	<p>Yes GO to A6.</p> <p>No VERIFY SJB fuses 20 (10A) and 21 (10A) are OK. If OK, REPAIR circuit 1002 (PK/BK). If not OK, refer to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<ul style="list-style-type: none"> Measure the resistance between ignition switch C250-1, circuit 1044 (WH/YE), harness side and SJB C2280a-36, circuit 1044 (WH/YE), harness side. <p>N0072216</p> <ul style="list-style-type: none"> Is the resistance less than 5 ohms? 		

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: NO POWER IN ALL IGNITION SWITCH POSITIONS (Continued)

Test Step		Result / Action to Take
A6	<p>CHECK CIRCUIT 1522 (DG) FOR AN OPEN</p> <ul style="list-style-type: none"> Measure the resistance between ignition switch C250-7, circuit 1522 (DG), harness side and SJB C2280a-12, circuit 1522 (DG), harness side.  <p>N0076805</p> <ul style="list-style-type: none"> Is the resistance less than 5 ohms? 	<p>Yes GO to A7.</p> <p>No VERIFY SJB fuses 20 (10A) and 21 (10A) are OK. If OK, REPAIR circuit 1002 (PK/BK). If not OK, refer to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
A7	<p>CHECK FOR CORRECT SJB OPERATION</p> <ul style="list-style-type: none"> Check SJB C2280a for: <ul style="list-style-type: none"> — corrosion. — pushed-out pins. — spread terminals. Connect: SJB C2280a. Make sure the connector seats correctly, then operate the system and verify the concern is still present. Is the concern still present? 	<p>Yes INSTALL a new SJB. REFER to Section 419-10. REPEAT the self-test.</p> <p>No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

Pinpoint Test B: No Power in ACC

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

Normal Operation

When the ignition switch is turned to the ACC position, fused battery voltage is sent to the Smart Junction Box (SJB) along circuit 1002 (BK/PK).

- DTC B1360 Ignition RUN/ACC Circuit Open — If during the on-demand self test the SJB does not receive the RUN/ACC input from the ignition switch, DTC B1360 will be set.

This pinpoint test is intended to diagnose the following:

- Fuse(s)
- Wiring, terminals or connectors
- Ignition switch
- SJB

PINPOINT TEST B: NO POWER IN ACC

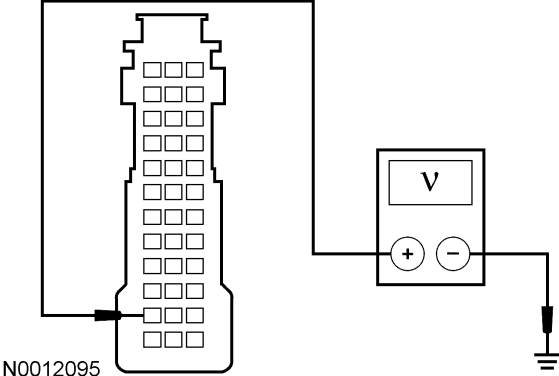
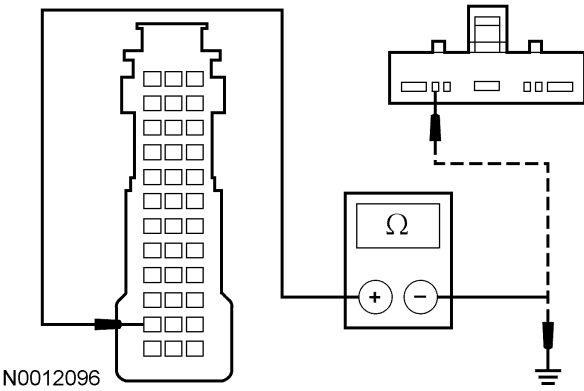
NOTICE: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step		Result / Action to Take
B1	<p>CHECK THE IGNITION SWITCH</p> <ul style="list-style-type: none"> Carry out the Ignition Switch Component Test. Refer to Wiring Diagrams Cell 149 for component testing. Is the ignition switch OK? 	<p>Yes GO to B2.</p> <p>No INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation.</p>

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: NO POWER IN ACC (Continued)

Test Step		Result / Action to Take
B2	<p>CHECK FOR VOLTAGE AT THE SJB</p> <ul style="list-style-type: none"> Ignition OFF. Disconnect: SJB C2280a. Ignition In ACC. Measure the voltage between SJB C2280a-11, circuit 1002 (BK/PK), harness side and ground.  <p>N0012095</p> <ul style="list-style-type: none"> Is the voltage greater than 10 volts? 	<p>Yes GO to B4.</p> <p>No GO to B3.</p>
B3	<p>CHECK CIRCUIT 1002 (BK/PK) FOR AN OPEN OR A SHORT TO GROUND</p> <ul style="list-style-type: none"> Ignition OFF. Disconnect: Ignition Switch C250. Measure the resistance between: <ul style="list-style-type: none"> SJB C2280a-11, circuit 1002 (BK/PK), harness side and ignition switch C250-6, circuit 1002 (BK/PK), harness side. SJB C2280a-11, circuit 1002 (BK/PK), harness side and ground.  <p>N0012096</p> <ul style="list-style-type: none"> Are the resistances less than 5 ohms between the SJB and the ignition switch, and greater than 10,000 ohms between the SJB and ground? 	<p>Yes GO to B4.</p> <p>No VERIFY SJB fuses 3 (10A) and 7 (10A) are OK. If OK, REPAIR circuit 1002 (BK/PK). If not OK, refer to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
B4	<p>CHECK FOR CORRECT SJB OPERATION</p> <ul style="list-style-type: none"> Ignition OFF. Check SJB C2280a for: <ul style="list-style-type: none"> corrosion. pushed-out pins. spread terminals. Connect: SJB C2280a. Make sure the connector seats correctly, then operate the system and verify the concern is still present. Is the concern still present? 	<p>Yes INSTALL a new SJB. REFER to Section 419-10. REPEAT the self-test.</p> <p>No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

DIAGNOSIS AND TESTING (Continued)

Pinpoint Test C: No Power in RUN

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

Normal Operation

When the ignition switch is turned to the RUN position, fused battery voltage is sent to the Smart Junction Box (SJB) along circuit 1044 (WH/YE).

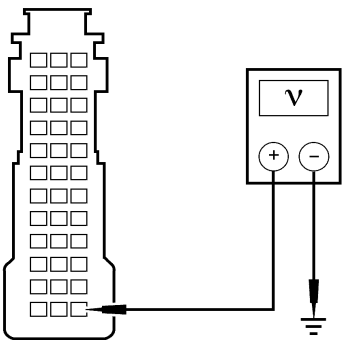
- DTC B1356 Ignition RUN Circuit Open — If during the on-demand self test the SJB does not receive the RUN input from the ignition switch or if the ignition switch position cannot be determined, DTC B1356 will be set.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Ignition switch
- SJB

PINPOINT TEST C: NO POWER IN RUN

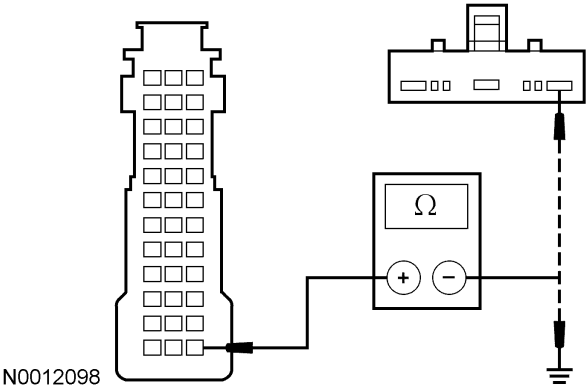
NOTICE: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step		Result / Action to Take
C1	CHECK THE IGNITION SWITCH	<p>Yes GO to C2.</p> <p>No INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation.</p>
	<ul style="list-style-type: none"> • Carry out the Ignition Switch Component Test. Refer to Wiring Diagrams Cell 149 for component testing. • Is the ignition switch OK? 	
C2	CHECK FOR VOLTAGE AT THE SJB	<p>Yes GO to C4.</p> <p>No GO to C3.</p>
	<ul style="list-style-type: none"> • Ignition OFF. • Disconnect: SJB C2280a. • Ignition ON. • Measure the voltage between SJB C2280a-36, circuit 1044 (WH/YE), harness side and ground. <div style="text-align: center;">  <p>N0059338</p> </div> <ul style="list-style-type: none"> • Is the voltage greater than 10 volts? 	
C3	CHECK CIRCUIT 1044 (WH/YE) FOR AN OPEN OR A SHORT TO GROUND	
	<ul style="list-style-type: none"> • Ignition OFF. • Disconnect: Ignition Switch C250. 	

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: NO POWER IN RUN (Continued)

Test Step		Result / Action to Take
C3	CHECK CIRCUIT 1044 (WH/YE) FOR AN OPEN OR A SHORT TO GROUND (Continued)	
<ul style="list-style-type: none"> Measure the resistance between: <ul style="list-style-type: none"> SJB C2280a-36, circuit 1044 (WH/YE), harness side and ignition switch C250-1, circuit 1044 (WH/YE), harness side. SJB C2280a-36, circuit 1044 (WH/YE), harness side, and ground.  <p>N0012098</p> <ul style="list-style-type: none"> Are the resistances less than 5 ohms between the SJB and the ignition switch, and greater than 10,000 ohms between the SJB and ground? 		<p>Yes GO to C4.</p> <p>No REPAIR circuit 1044 (WH/YE). TEST the system for normal operation.</p>
C4	CHECK FOR CORRECT SJB OPERATION	
<ul style="list-style-type: none"> Ignition OFF. Check SJB C2280a for: <ul style="list-style-type: none"> corrosion. pushed-out pins. spread terminals. Connect: SJB C2280a. Make sure the connector seats correctly, then operate the system and verify the concern is still present. Is the concern still present? 		<p>Yes INSTALL a new SJB. REFER to Section 419-10. REPEAT the self-test.</p> <p>No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

Pinpoint Test D: No Power in START

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

Normal Operation

When the ignition switch is turned to the START position, fused battery voltage is sent to the Smart Junction Box (SJB) along circuit 1522 (DG).

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Ignition switch
- SJB

PINPOINT TEST D: NO POWER IN START

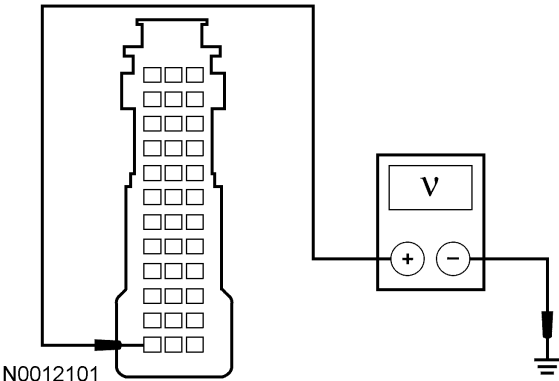
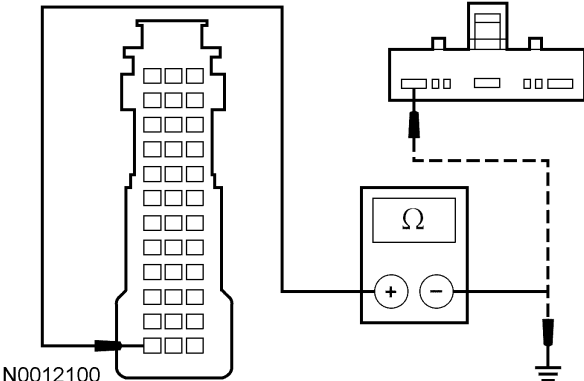
NOTICE: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step		Result / Action to Take
D1	CHECK THE IGNITION SWITCH	
<ul style="list-style-type: none"> Carry out the Ignition Switch Component Test. Refer to Wiring Diagrams Cell 149 for component testing. Is the ignition switch OK? 		<p>Yes GO to D2.</p> <p>No INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation.</p>

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: NO POWER IN START (Continued)

Test Step		Result / Action to Take
D2	<p>CHECK FOR VOLTAGE AT THE SJB</p> <ul style="list-style-type: none"> Ignition OFF. Disconnect: SJB C2280a. With the ignition key in the START position, measure the voltage between SJB C2280a-12, circuit 1522 (DG), harness side and ground.  <p>N0012101</p> <ul style="list-style-type: none"> Is the voltage greater than 10 volts? 	<p>Yes GO to D4.</p> <p>No GO to D3.</p>
D3	<p>CHECK CIRCUIT 1522 (DG) FOR AN OPEN OR A SHORT TO GROUND</p> <ul style="list-style-type: none"> Ignition OFF. Disconnect: Ignition Switch C250. Measure the resistance between: <ul style="list-style-type: none"> SJB C2280a-12, circuit 1522 (DG), harness side and ignition switch C250-7, circuit 1522 (DG), harness side. SJB C2280a-12, circuit 1522 (DG), harness side and ground.  <p>N0012100</p> <ul style="list-style-type: none"> Are the resistances greater than 10,000 ohms between the SJB and the ignition switch, and less than 5 ohms between the SJB and ground? 	<p>Yes GO to D4.</p> <p>No REPAIR circuit 1522 (DG). TEST the system for normal operation.</p>
D4	<p>CHECK FOR CORRECT SJB OPERATION</p> <ul style="list-style-type: none"> Ignition OFF. Check SJB C2280a for: <ul style="list-style-type: none"> corrosion. pushed-out pins. spread terminals. Connect: SJB C2280a. Make sure the connector seats correctly, then operate the system and verify the concern is still present. Is the concern still present? 	<p>Yes INSTALL a new SJB. REFER to Section 419-10. REPEAT the self-test.</p> <p>No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

DIAGNOSIS AND TESTING (Continued)**Pinpoint Test E: DTC B1365 — Ignition START Circuit Short to Battery**

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

Normal Operation

When the ignition switch is turned to the START position, fused battery voltage is sent to the Smart Junction Box (SJB) along circuit 1522 (DG). The voltage is sent from the SJB to the audio unit along circuit 1000 (RD/BK) and to the starter relay in the Bussed Electrical Center (BEC) along circuit 32 (RD/LB).

- DTC B1365 Ignition START Circuit Short to Battery — If during the on-demand self test or during normal operation the SJB detects voltage on the START circuit while the ignition switch is in the RUN or ACC position, DTC B1365 will be set.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Ignition switch
- SJB

PINPOINT TEST E: DTC B1365 — IGNITION START CIRCUIT SHORT TO BATTERY

NOTICE: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step		Result / Action to Take
E1	CHECK THE IGNITION SWITCH	
	<ul style="list-style-type: none"> • Carry out the Ignition Switch Component Test. Refer to Wiring Diagrams Cell 149 for component testing. • Is the ignition switch OK? 	<p>Yes GO to E2.</p> <p>No INSTALL a new ignition switch. REFER to Ignition Switch in this section. TEST the system for normal operation.</p>
E2	CHECK CIRCUIT 1522 (DG) FOR A SHORT TO VOLTAGE	
	<ul style="list-style-type: none"> • Disconnect: SJB Fuse 20 (10A). • Ignition ON. • Measure the voltage between SJB fuse 20 (10A), circuit 1522 (DG), input side and ground. • Is any voltage present? 	<p>Yes REPAIR circuit 1522 (DG). CLEAR the DTCs. REPEAT the self-test.</p> <p>No GO to E3.</p>
E3	CHECK CIRCUITS 1000 (RD/BK) AND 32 (RD/LB) FOR A SHORT TO VOLTAGE	
	<ul style="list-style-type: none"> • Disconnect: SJB Fuse 21 (10A). • Measure the voltage between: <ul style="list-style-type: none"> — SJB fuse 20 (10A), circuit 1000 (RD/BK), output side and ground. — SJB fuse 21 (10A), circuit 32 (RD/LB), output side and ground. • Is any voltage present? 	<p>Yes If voltage is present at SJB fuse 20 (10A), REFER to Section 415-00 to diagnose the audio system.</p> <p>If voltage is present at SJB fuse 21 (10A), REFER to Section 303-06 to diagnose the starting system.</p> <p>No GO to E4.</p>
E4	CHECK FOR CORRECT SJB OPERATION	
	<ul style="list-style-type: none"> • Ignition OFF. • Check SJB C2280a for: <ul style="list-style-type: none"> — corrosion. — pushed-out pins. — spread terminals. • Connect: SJB C2280a. • Make sure the connector seats correctly, then operate the system and verify the concern is still present. • Is the concern still present? 	<p>Yes INSTALL a new SJB. REFER to Section 419-10. REPEAT the self-test.</p> <p>No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

DIAGNOSIS AND TESTING (Continued)

Component Tests

Ignition Switch — Mechanical

The following conditions can cause difficulty in operating the ignition switch and lock cylinder:

- Burrs on the lock cylinder key
- Insufficient lube on the lock cylinder
- Binding lock cylinder
- Burrs or foreign material around the rack and pinion actuator in the lock cylinder housing
- Insufficient lube on the actuator (do not apply lubricant to the inside of the ignition switch)
- Binding ignition switch

If the steering wheel lock is engaged with the wheels loaded against a curb, high effort will be necessary to turn the key from lock. Turn the steering wheel to either side of the lock to unload the system.

Carry out the following test to determine if the ignition switch and lock cylinder are operating correctly.

1. Inspect the ignition key for any burrs, damage or incorrect cut. Have a new ignition key made as necessary.
2. **NOTE:** The steering wheel may be locked full left or full right. If the steering wheel is locked, it will be necessary to apply turning effort to the steering wheel in the direction of the lock while turning the key.

Turn the key to the ACC position and then the RUN position.

- If the ignition key turns to the ACC and RUN position, continue with Step 3.
- If the ignition key will not turn to the ACC and RUN position, continue with Step 4.

3. **NOTE:** The ignition switch and lock cylinder should return from the START position back to the RUN position without assistance.

Turn the ignition key to the START position and release the key.

- If the ignition switch and lock cylinder return from the START position back to the RUN position without assistance, the ignition switch is operating correctly at this time.
 - If the ignition switch and lock cylinder do not return from the START position back to the RUN position without assistance, continue with Step 4.
4. Remove the ignition lock cylinder. Refer to Section 501-14.
 5. Rotate the ignition lock cylinder through all of the switch positions.
 - If the lock cylinder operates correctly, continue with Step 6.
 - If the lock cylinder does not operate correctly, install a new ignition lock cylinder. Refer to Section 501-14.
 6. Check for binding or sticking ignition switch actuating rod, burrs around the rack-and-pinion actuator in the ignition lock cylinder housing or insufficient lubrication.
 - If there is sufficient lubrication and there are no burrs, binding or sticking conditions; install a new ignition switch. Refer to Ignition Switch in this section.
 - If there is insufficient lubrication, burrs, binding or sticking conditions; repair or lubricate as necessary.

Ignition Switch — Electrical

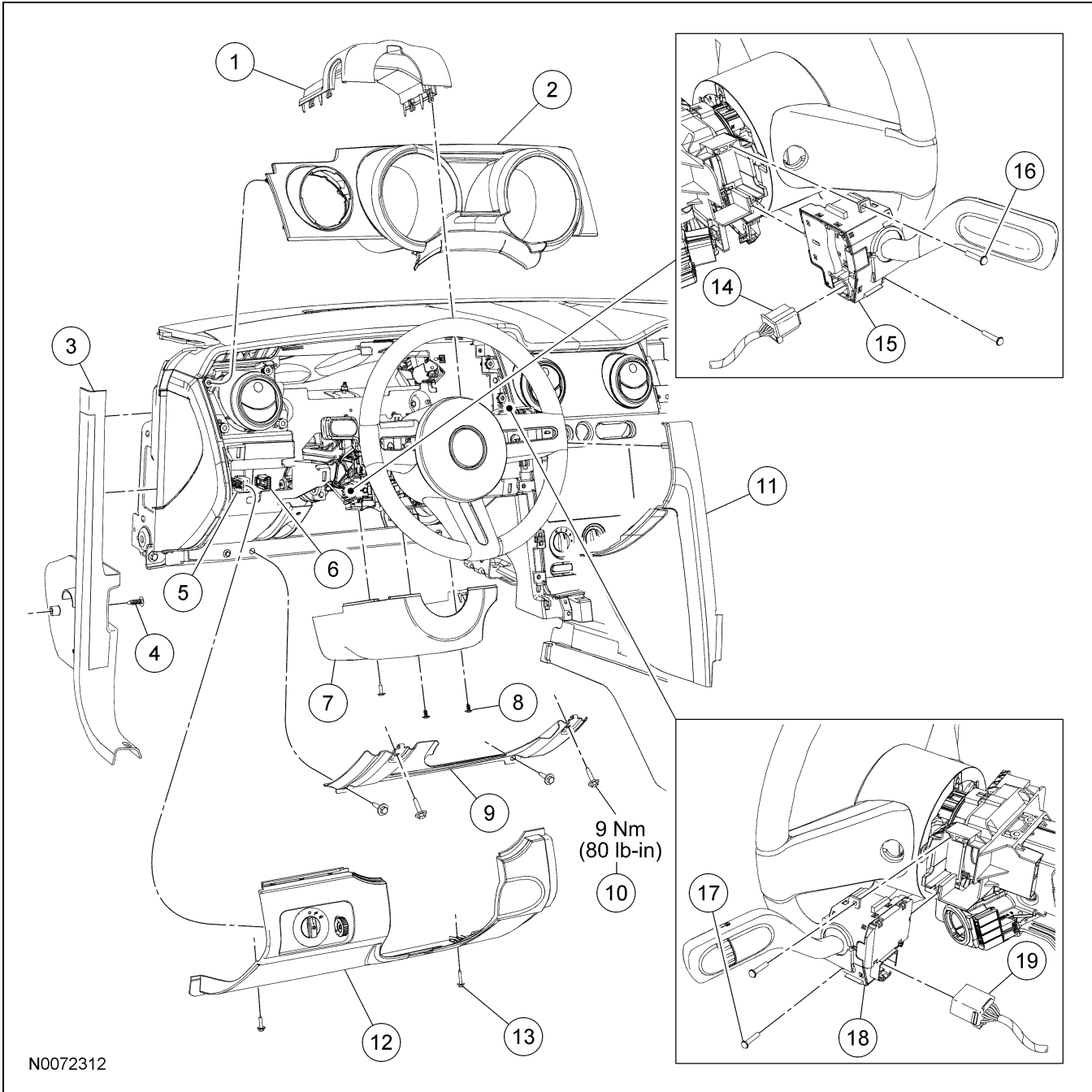
[Refer to Wiring Diagrams Cell 149 for component testing.](#)

Multifunction Switch — Electrical

[Refer to Wiring Diagrams Cell 149 for component testing.](#)

REMOVAL AND INSTALLATION

Steering Column Multifunction Switch



Item	Part Number	Description
1	3530A	Upper steering column shroud
2	044D70	Instrument cluster finish panel
3	A30A64	LH A-pillar lower trim panel
4	W505156	LH A-pillar lower trim panel screw
5	—	Headlamp switch electrical connector (part of 14401)

(Continued)

Item	Part Number	Description
6	—	Courtesy lamp switch electrical connector (part of 14401)
7	3530B	Lower steering column shroud
8	W707281	Lower steering column shroud screw (3 required)

(Continued)

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
9	04502	Steering column opening cover reinforcement
10	W505424	Steering column opening cover reinforcement bolt (4 required)
11	04608	Left center stack wing
12	04459	Steering column opening cover
13	W505156	Steering column opening cover screw (2 required)
14	—	Multifunction switch electrical connector (turn signal/warning flasher) (part of 14401)
15	13341	Multifunction switch (turn signal/warning flasher)
16	390345	Multifunction switch screw (turn signal/warning flasher) (2 required)
17	—	Multifunction switch electrical connector (windshield wiper/washer) (part of 14401)
18	17A553	Multifunction switch (windshield wiper/washer)
19	390345	Multifunction switch screw (windshield wiper/washer) (2 required)

Removal and Installation**Turn signal/headlamp switch and windshield wiper/washer switch**

- NOTE:** The instrument cluster finish panel is held in place with retaining clips that are attached to the bezel.
Remove the instrument cluster finish panel.
- Remove the floor console finish panel. For additional information, refer to Section 501-12.

- Remove the LH A-pillar lower trim panel.
- Remove the left center stack wing.
- Remove the 2 screws and the steering column opening cover.
 - Disconnect the headlamp and courtesy light switch electrical connectors.
- Remove the 4 bolts and the steering column opening cover reinforcement.
 - To install, tighten to 9 Nm (80 lb-in).
- Remove the upper steering column shroud by carefully pressing the sides inward.
- Remove the 3 lower steering column shroud screws and the shroud.

Turn signal/headlamp switch

- Disconnect the turn signal/headlamp switch electrical connector.
- Remove the 2 screws and the turn signal/headlamp switch.

Windshield wiper/washer switch

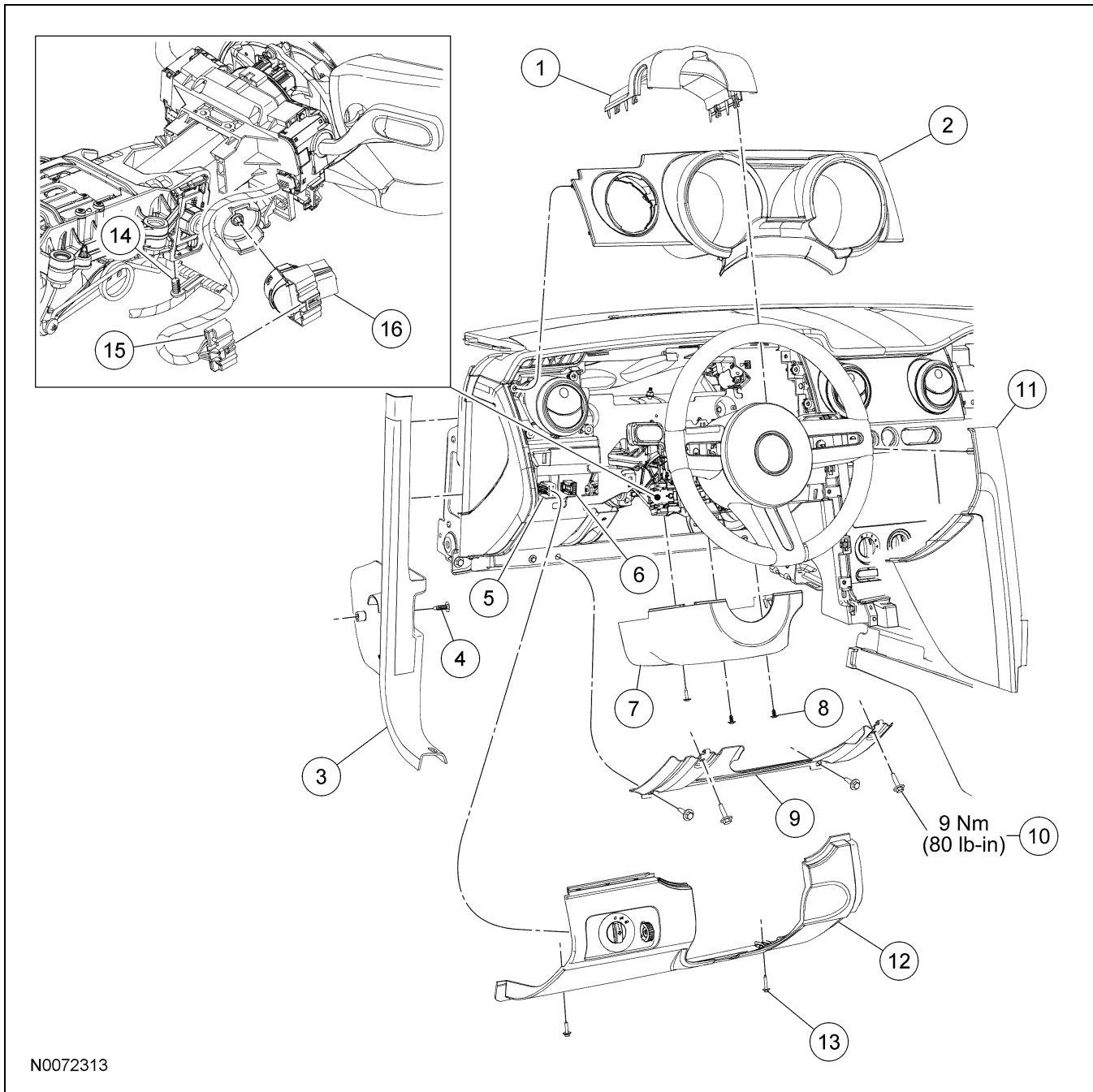
- Disconnect the windshield wiper/washer switch electrical connector.
- Remove the 2 screws and the windshield wiper/washer switch.

Turn signal/headlamp switch and windshield wiper/washer switch

- To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Ignition Switch



N0072313

Item	Part Number	Description
1	3530A	Upper steering column shroud
2	044D70	Instrument cluster finish panel
3	A30A64	LH A-pillar lower trim panel
4	W505156	LH A-pillar lower trim panel screw
5	—	Headlamp switch electrical connector (part of 14401)

(Continued)

Item	Part Number	Description
6	—	Courtesy lamp switch electrical connector (part of 14401)
7	3530B	Lower steering column shroud
8	W707281	Lower steering column shroud screw (3 required)

(Continued)

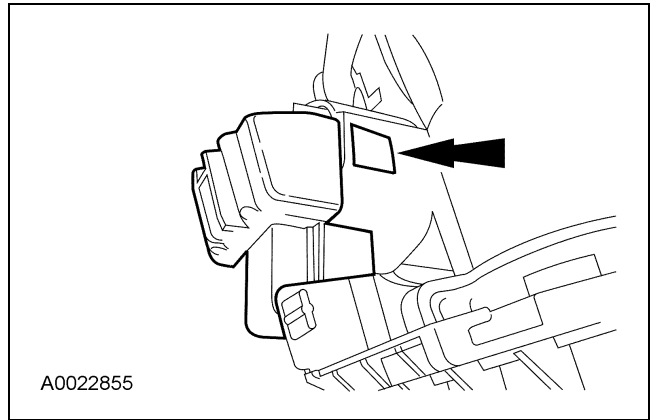
REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
9	04502	Steering column opening cover reinforcement
10	W505424	Steering column opening cover reinforcement bolt (4 required)
11	04608	Left center stack wing
12	04459	Steering column opening cover
13	W505156	Steering column opening cover screw (2 required)
14	—	Wiring harness retainer (part of 14401)
15	—	Ignition switch electrical connector (part of 14401)
16	11572	Ignition switch

Removal and Installation

NOTICE: Do not remove the ignition lock cylinder and the ignition switch at the same time or damage to the column may result.

- Depower the Supplemental Restraint System (SRS). For additional information, refer to Section 501-20B.
- NOTE:** The instrument cluster finish panel is held in place with retaining clips that are attached to the bezel.
Remove the instrument cluster finish panel.
- Remove the floor console finish panel. For additional information, refer to Section 501-12.
- Remove the LH A-pillar lower trim panel.
- Remove the left center stack wing.
- Remove the 2 screws and the steering column opening cover.
 - Disconnect the headlamp and courtesy light switches electrical connectors.
- Remove the 4 bolts and the steering column opening cover reinforcement.
 - To install, tighten to 9 Nm (80 lb-in).
- Remove the upper steering column shroud by carefully pressing the sides inward.
- Remove the 3 screws and the lower steering column shroud.
- Disconnect the ignition switch electrical harness retainer.
- Disconnect the ignition switch electrical connector.
- Release the 2 locking tabs and remove the ignition switch.
- To install, reverse the removal procedure.
- Repower the SRS. For additional information, refer to Section 501-20B.



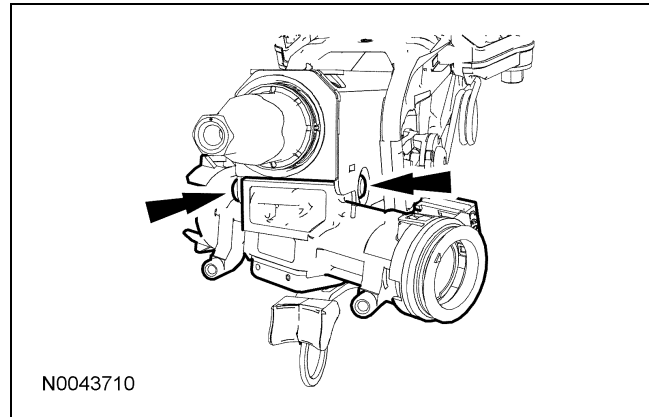
REMOVAL AND INSTALLATION

Steering Column Lock Module

Removal and Installation

NOTICE: Do not remove the ignition lock cylinder and the ignition switch at the same time or damage to the column may result.

1. Remove the ignition switch. For additional information, refer to Ignition Switch in this section.
2. Remove the clockspring. For additional information, refer to Section 501-20B.
3. **NOTE:** Clean all metal shavings and foreign material after cutting slots in the steering column lock module bolts.
Cut slots into the heads of the 2 steering column lock module bolts.



4. Remove the 2 steering column lock module bolts.
 - Discard the bolts.
5. Remove the steering column lock module clamp.
6. Remove the steering column lock module.
7. To install, reverse the removal procedure.
 - Align the ribs on the steering column lock module with the window of the steering column tube.
 - Align the locating pin with the slot on the locating bracket of the steering column.
 - Tighten the 2 new bolts until the heads of the bolts shear off.