

DESCRIPTION AND OPERATION

Apply Components

Band — Overdrive

For component location, refer to Transmission in this section.

During 2nd and 5th gear operation, hydraulic pressure is applied to the overdrive servo.

- This pressure causes the piston to move and apply force to the band.
- This action causes the overdrive band to hold the overdrive drum.
- This causes the overdrive sun gear to be held stationary through the adapter plate and the overdrive drum.

Band — Low/Reverse

For component location, refer to Transmission in this section.

During 2nd gear, 1st gear and reverse operation, hydraulic pressure is applied to the low/reverse servo.

- This pressure causes the servo to move and apply force to the low/reverse band.
- This action causes the low/reverse brake drum to be held.
- This action causes the low/reverse planetary assembly to be held stationary.

Band — Intermediate

For component location, refer to Transmission in this section.

During 3rd gear operation, hydraulic pressure is applied to the intermediate servo.

- This pressure causes the servo to move and apply force to the intermediate band.
- This action causes the direct clutch drum to be held.
- The intermediate band holds the intermediate brake and direct clutch drum to the case in 3rd gear.
- This causes the input shell and forward sun gear to be held stationary.

Clutches — Direct

For component location, refer to Transmission in this section.

The direct clutch is a multi-disc clutch made up of steel and friction plates.

- The direct clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- It is housed in the direct clutch drum.
- During 4th, 5th and REVERSE gear application, the direct clutch is applied transferring torque from the forward clutch cylinder to the direct clutch drum.
- This action causes the forward sun gear to drive the pinions of the low/reverse planetary carrier.

Clutches — Forward

For component location, refer to Transmission in this section.

The forward clutch is a multi-disc clutch made up of steel and friction plates.

- The forward clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- The forward clutch is applied in all forward gears.
- When applied, the forward clutch provides a direct mechanical coupling between the center shaft and the forward ring gear and hub.

Clutches — Coast

For component location, refer to Transmission in this section.

The coast clutch is a multi-disc clutch made up of steel and friction plates.

- The coast clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- The coast clutch is housed in the overdrive drum.
- The coast clutch is applied when in 1st, 3rd, DRIVE and REVERSE positions.
- When applied, the coast clutch locks the overdrive sun gear to the overdrive planetary carrier, thus preventing the one-way clutch from overrunning when the vehicle is coasting.
 - This allows the use of engine compression to help slow the vehicle and provide engine braking.

DESCRIPTION AND OPERATION (Continued)**One-Way Clutch — Direct**

For component location, refer to Transmission in this section.

The direct one-way clutch is a sprag-type one-way clutch that is pressed into the center shaft.

- The direct one-way clutch is driven by the ring gear of the overdrive planetary carrier.
 - The direct one-way clutch holds and drives the outer splines of the center shaft in 1st, 3rd, 4th and REVERSE gears.
 - The direct one-way clutch overruns during all coast operations and at all times in 2nd and 5th gear.
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One-Way Clutch — Low/Reverse

For component location, refer to Transmission in this section.

The low/reverse one-way clutch is a sprag-type one-way clutch.

- The low/reverse one-way clutch holds the low/reverse drum and low/reverse planetary assembly to the case in 1st and 2nd gear.
- In all other gears the low/reverse one-way clutch overruns.

REMOVAL AND INSTALLATION

Brake Shift Interlock Actuator

Removal and Installation

NOTE: The brake shift interlock actuator is not serviced separately. If a new brake shift interlock actuator is required, install a new transmission selector lever assembly.

For additional information, refer to Selector Lever in this section.

GENERAL PROCEDURES

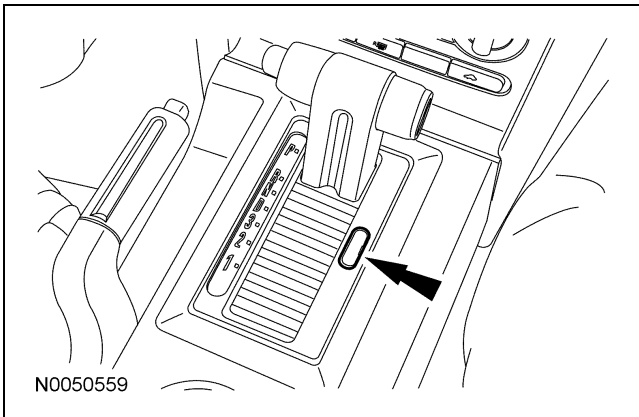
Brake Shift Interlock Override

NOTE: If it is necessary to use the override procedure to move the gearshift lever out of the PARK position, it is possible that a fuse has blown and the brake lights are not operational. Before driving the vehicle, verify that the brake lights are working.

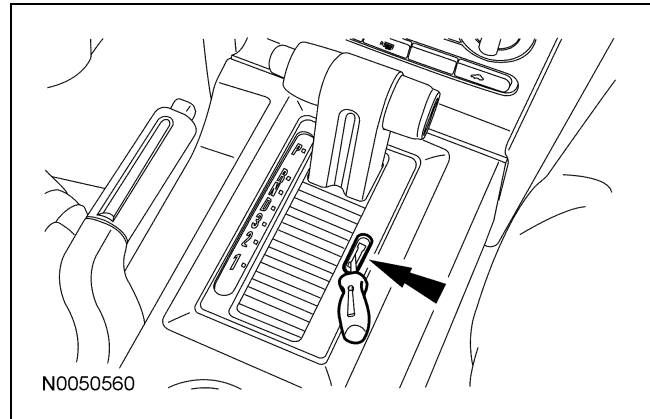
This vehicle is equipped with a brake shift interlock feature that prevents the gearshift lever from being moved out of PARK when the ignition is in the ON position unless the brake pedal is depressed.

If the gearshift lever cannot be moved out of the PARK position when the ignition is in the ON position and the brake pedal is depressed:

1. Apply the parking brake and remove the ignition key.
2. Remove the access panel.



3. Using a suitable tool, depress the brake shift interlock override mechanism on the selector lever, apply the brake, depress the button on the selector lever and move the selector lever into NEUTRAL.

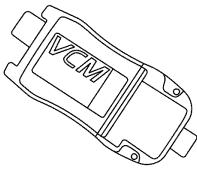


4. Start the vehicle.
5. To install, reverse the procedure.

DIAGNOSIS AND TESTING

Diagnosis By Symptom

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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The Diagnosis by Symptom Index gives the technician diagnostic information and direction, and suggests possible components, using a symptom as a starting point.

Diagnosis by Symptom Index — Directions

1. Using the Symptom Index, select the Concern/Symptom that best describes the condition.
2. Refer to the routine indicated in the Diagnosis by Symptom Index.
3. Always begin diagnosis of a symptom with:
 - a. preliminary inspections.
 - b. verification of conditions.

- c. checking the fluid levels.
- d. carrying out other test procedures as directed.

4. **NOTE:** Not all concerns and conditions with electrical components will set a diagnostic trouble code (DTC). Be aware that the components listed may still be the cause.

NOTE: When the battery is disconnected or a new battery is installed, certain transmission operating parameters can be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Begin with the ROUTINE, if indicated. Follow the reference or action statements. Always carry out the on-board diagnostic tests as necessary. Never skip steps. Repair as necessary.

5. These components are listed in the removal sequence and by most probable cause. All components listed must be inspected to make sure that the repairs are complete.

Diagnosis by Symptom Index

Diagnosis by Symptom Index

5R55S	Routines
Engagement Concerns: • No Forward in D or D ((D) cancelled) Only • No Forward Only (All Positions) • No Reverse Only • Harsh Reverse Only • Harsh Forward Only • Harsh Manual 1st Gear Only • Delayed/Soft Reverse Only • Delayed/Soft Forward Only • No Forward and No Reverse • Harsh Forward and Harsh Reverse • Delayed Forward and Delayed Reverse	201A 201B 202 203 204A 204B 205 206 207 208 209
Shift Concerns: • Some/All Shifts Missing (Automatic Mode Only)	210

DIAGNOSIS AND TESTING (Continued)**Diagnosis by Symptom Index (Continued)**

5R55S	Routines
• Timing Concern - Early/Late (Some/All) 211 - Erratic/Hunting (Some/All) 212 • Feel Concerns - Soft/Slipping (Some/All) 213 - Harsh (Some/All) 214 • No First Gear in Drive, Engages in a Higher Gear 215 • No First Gear in Manual 1st 216 • No Manual 2nd Gear 217	
Torque Converter Clutch Operation Concerns:	
• Does Not Apply 240 • Always Applied/Stalls Vehicle 241 • Cycling/Shudder/Chatter 242	
Other Concerns:	
• Shift Lever Efforts High 251 • External Leaks 252 • Noise/Vibration — Forward or Reverse 254 • Engine Will Not Crank 255 • No Park Range 256 • Transmission Overheating 257 • No Engine Braking in Manual 2nd Position 258 • No Engine Braking in Manual 1st Position 259 • Fluid Venting or Foaming 261 • Vehicle Movement with Gear Selector in “N” 262 • Slips/Chatters in Manual 1st Gear 263 • Slips/Chatters in Manual 2nd Gear 264 • No Engine Braking in Manual 3rd Position 280 • No Engine Braking in Manual 4th (D (D) cancelled) Position 281 • Slips/Chatters in Manual 3rd Gear 282 • Engine Braking in ALL Gears 283 • No 2nd and 5th Gears (manual 2nd is ok) 284 • No 3rd, 4th and 5th gears 285	

Diagnostic Routines**Engagement Concern: No Forward in D or D ((D) Cancelled) Only**

Possible Component	Reference/Action
201A — ROUTINE	
Powertrain Control System	

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: No Forward in D or D ((D) Cancelled) Only (Continued)**

Possible Component	Reference/Action
PCM, vehicle wiring harnesses, pressure control solenoid B	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Main Control - Screw not tightened to specification - Separator plate damaged - Contamination - Valves, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Center Support - Screw not tightened to specification - Seal rings or bearing damaged - Outside diameter of case bore damaged - Support damaged or leaking	- Tighten to specification. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Planetary Assembly Planetary damage	Inspect for damage. Repair as necessary.
Low One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Engagement Concern: No Forward

Possible Component	Reference/Action
201B — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoid B	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: No Forward (Continued)**

Possible Component	Reference/Action
	Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid - Incorrect level - Condition	- Adjust fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out the fluid condition check. Refer to Preliminary Inspection in this section.
Main Control - Screw not tightened to specification - Separator plate damaged - Contamination - Valves, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Case Damaged	Inspect for damage. Repair as necessary.

Engagement Concern: No Reverse

Possible Component	Reference/Action
202 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Pressure Control Solenoid C (PC C), Shift Solenoid B (SSB)	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A and GO to Pinpoint Test D.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: No Reverse (Continued)**

Possible Component	Reference/Action
	Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves, springs damaged, misassembled, missing, stuck or bore damage - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect or damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Band - Band damaged - Servo worn or damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Drum Assembly - One-way clutch damaged - Bearing damaged	- Inspect for damage. Install a new drum assembly. - Inspect for damage. Install a new drum assembly.
Torque Converter Assembly Torque converter internal failure preventing engagement, piston release	Remove the transmission. Inspect for damage. Refer to Torque Converter in this section. If the torque converter fails to pass the criteria or is damaged, install a new or remanufactured torque converter.

Engagement Concern: Harsh Reverse ONLY

Possible Component	Reference/Action
203 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoid C (PC C)	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Harsh Reverse ONLY (Continued)**

Possible Component	Reference/Action
	Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves, spring damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Band - Band damaged - Servo worn or damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Drum Assembly - One-way clutch damaged - Bearing damaged	- Inspect for damage. Install a new drum assembly. - Inspect for damage. Install a new drum assembly.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Harsh Forward ONLY**

Possible Component	Reference/Action
204A — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoid A (PC A), pressure control solenoid C (PC C)	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Center Support - Screw not tightened to specification - Seal rings or bearing damage - Outside diameter of case bore damage - Support damaged or leaking	- Tighten to specification. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Engagement Concern: Harsh Manual 1st Gear ONLY

Possible Component	Reference/Action
204B — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoid B (PC B), Turbine Shaft Speed (TSS) sensor	Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Harsh Manual 1st Gear ONLY (Continued)**

Possible Component	Reference/Action
	• GO to Pinpoint Test D and GO to Pinpoint Test E. • Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.

Engagement Concern: Delayed or Soft Reverse ONLY

Possible Component	Reference/Action
205 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, pressure control solenoid C (PC C)	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. • GO to Pinpoint Test D. • Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures • Low pressure	• Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control • Screws not tightened to specification • Separator plate damaged • Contamination • Valves, springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Tighten to specification. • Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean. • If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.
Direct Clutch Assembly • Seals, piston damaged • Check ball damaged, missing not seating, off location • Friction elements damaged or worn • Return springs damaged	• Inspect for damage. Repair as necessary. • Inspect for mislocation, poor seating, damage. Install a new cylinder. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Reverse Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Reverse Band • Band damaged • Servo worn or damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Delayed/Soft Forward ONLY**

Possible Component	Reference/Action
206 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoid B (PC B)	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures Low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves, spring damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged. - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Center Support - Screw not tightened to specification - Seal rings or bearing damaged - Outside diameter of case bore damaged - Support damaged or leaking	- Tighten to specification. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction element damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: No Forward and No Reverse**

Possible Component	Reference/Action
207 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoid B (PC B)	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid - Incorrect level - Condition	- Adjust to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Shift Cable/Digital TR Sensor Cable system or digital transmission range (TR) sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten screws to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Input Shaft Damaged	Inspect for damage. Repair as necessary.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs, or seals damaged, stuck or not assembled correctly	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.
Overdrive Planetary Assembly Planetary damaged	Inspect for damage. Repair as necessary.
Center Shaft Assembly Damaged. One-way clutch damaged	Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: No Forward and No Reverse (Continued)**

Possible Component	Reference/Action
- Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Planetary Assembly Planetary damaged	Inspect for damage. Repair as necessary.
Reverse Planetary Assembly Planetary damaged	Inspect for damage. Repair as necessary.
Output Shaft Damage	Inspect for damage. Repair as necessary.
Torque Converter - Damaged flexplate or adapter plate - Damaged impeller hub - Damaged turbine hub	Remove the transmission. Inspect for damage. Refer to Torque Converter in this section. If the torque converter fails to pass the criteria or is damaged, install a new or remanufactured torque converter.
Direct One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Engagement Concern: Harsh Forward and Harsh Reverse

Possible Component	Reference/Action
208 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, digital TR sensor, transmission fluid temperature (TFT) sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test B and GO to Pinpoint Test C. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid - Incorrect level - Condition	- Adjust to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Fluid Condition Check. Refer to Preliminary Inspection.
Incorrect Pressures High pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Harsh Forward and Harsh Reverse (Continued)**

Possible Component	Reference/Action
- Contamination - Valves, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Engagement Concern: Delayed Forward and Delayed Reverse

Possible Component	Reference/Action
209 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test B. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid - Incorrect level - Condition	- Adjust to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Fluid Condition Check. Refer to Preliminary Inspection.
Incorrect Pressures High pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves and springs damaged, misassembled, missing, stuck or bore damaged	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Delayed Forward and Delayed Reverse (Continued)**

Possible Component	Reference/Action
Filter damaged, missing	Inspect for damage, repair as necessary.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs, or seals damaged, stuck or not assembled correctly	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.

Shift Concern: Some/All Shifts Missing (Automatic Mode Only)

Possible Component	Reference/Action
210 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoids A, B, C, torque converter clutch (TCC) solenoid, pressure control solenoids A, B, C, output shaft speed (OSS) sensor, digital TR sensor, intake air temperature (IAT) sensor, vehicle speed sensor (VSS) input	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM, IAT and VSS. GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Some Shifts Missing ONLY	- If only some shifts are missing, determine which shift(s) is missing. - Refer to the following routine(s) for further No Shift concerns: — No 1-2 Shift, Routine 220 — No 2-3 Shift, Routine 221 — No 3-4 Shift, Routine 222 — No 4-5 Shift, Routine 270 — No 5-4 Shift, Routine 271 — No 4-3 Shift, Routine 223 — No 3-2 Shift, Routine 224 — No 2-1 Shift, Routine 225
Fluid - Incorrect level - Condition	- Adjust fluid to correct level, refer to the in this section. - Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Shift Cable/Digital TR Sensor Cable system or digital TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
Incorrect Pressures	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Some/All Shifts Missing (Automatic Mode Only) (Continued)**

Possible Component	Reference/Action
High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs, or seals damaged, stuck or not assembled correctly	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.
Overdrive Planetary Assembly Planetary damaged	Inspect for damage. Repair as necessary.
Center Support - Screw not tightened to specification - Seal rings or bearing damaged - Outside diameter of case bore damaged - Support damaged or leaking	- Tighten to specification. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Timing Concerns—Early/Late

Possible Component	Reference/Action
211— ROUTINE	
Powertrain Control System	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Timing Concerns—Early/Late (Continued)**

Possible Component	Reference/Action
PCM, vehicle wiring harnesses, OSS sensor, IAT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM and IAT. GO to Pinpoint Test E. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Some Shifts Early/Late ONLY	- If only some shifts are early/late, determine which shift(s) is missing. - Refer to the following routine(s) for further No Shift concerns: — Soft/Slipping 1-2 Shift, Routine 226 — Soft/Slipping 2-3 Shift, Routine 227 — Soft/Slipping 3-4 Shift, Routine 228 — Soft/Slipping 4-5 Shift, Routine 272 — Soft/Slipping 5-4 Shift, Routine 273 — Soft/Slipping 4-3 Shift, Routine 229 — Soft/Slipping 3-2 Shift, Routine 230 — Soft/Slipping 2-1 Shift, Routine 221
Fluid - Incorrect level - Condition	- Adjust to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Timing Concerns—Erratic/Hunting (Some/All)**

Possible Component	Reference/Action
212 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, OSS sensor, IAT sensor	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM and IAT. • GO to Pinpoint Test E. • Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid • Incorrect level • Condition	• Adjust to the correct level. Refer to Transmission Fluid Level Check in this section. • Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Main Control • Screws not tightened to specification • Separator plate damaged • Contamination • Valve, springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Tighten to specification. • Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean. • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.
Overdrive Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Timing Concerns—Erratic/Hunting (Some/All) (Continued)**

Possible Component	Reference/Action
Further Diagnosis For further diagnosis for timing issues, refer to Reference/Action	- Refer to the following routine(s) for specific diagnosis: - No 1-2 Shift, Routine 220 - No 2-3 Shift, Routine 221 - No 3-4 Shift, Routine 222 - No 4-5 Shift, Routine 270 - No 5-4 Shift, Routine 271 - No 4-3 Shift, Routine 223 - No 3-2 Shift, Routine 224 - No 2-1 Shift, Routine 225 - Soft/Slip 1-2 Shift, Routine 226 - Soft/Slip 2-3 Shift, Routine 227 - Soft/Slip 3-4 Shift, Routine 228 - Soft/Slip 4-5 Shift, Routine 272 - Soft/Slip 5-4 Shift, Routine 273 - Soft/Slip 4-3 Shift, Routine 229 - Soft/Slip 3-2 Shift, Routine 230 - Soft/Slip 2-1 Shift, Routine 231 - Harsh 1-2 Shift, Routine 232 - Harsh 2-3 Shift, Routine 233 - Harsh 3-4 Shift, Routine 234 - Harsh 4-5 Shift, Routine 274 - Harsh 5-4 Shift, Routine 275 - Harsh 4-3 Shift, Routine 235 - Harsh 3-2 Shift, Routine 236 - Harsh 2-1 Shift, Routine 237

Engagement Concern: Feel—Soft/Slipping (Some/All)

Possible Component	Reference/Action
213 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoids A, B, C, pressure control solenoids A, B, C, D, intermediate shaft speed sensor, TFT sensor, IAT sensor, VSS input	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM, IAT and VSS. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Some Shifts Soft/Slipping ONLY	If only some of the shifts are soft/slipping, determine which shift(s) is missing.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Feel—Soft/Slipping (Some/All) (Continued)**

Possible Component	Reference/Action
	- Refer to the following routine(s) for further Soft/Slipping concerns: — Soft/Slipping 1-2 Shift, Routine 226 — Soft/Slipping 2-3 Shift, Routine 227 — Soft/Slipping 3-4 Shift, Routine 228 — Soft/Slipping 4-5 Shift, Routine 272 — Soft/Slipping 5-4 Shift, Routine 273 — Soft/Slipping 4-3 Shift, Routine 229 — Soft/Slipping 3-2 Shift, Routine 230 — Soft/Slipping 2-1 Shift, Routine 231
Fluid - Incorrect level - Condition	- Adjust to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures High/low pressures	- Check pressure at line and PC C taps. - Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs, or seals damaged, stuck or not assembled correctly	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.
Coast Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Center Support Screw not tightened to specification	Tighten to specification.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Feel—Soft/Slipping (Some/All) (Continued)**

Possible Component	Reference/Action
- Seal rings or bearings damaged - Outside diameter of case bore damage - Support damaged or leaking	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Case Damaged	Inspect for damage. Repair as necessary.
Torque Converter Assembly Torque converter internal failure preventing engagement, piston release	Remove the transmission. Inspect for damage. Refer to Torque Converter in this section. If the torque converter fails to pass the criteria or is damaged, install a new or remanufactured torque converter.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Feel—Harsh (Some/All)**

Possible Component	Reference/Action
214— ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoids A, B, C, pressure control solenoids A, B, C, D, intermediate shaft speed sensor, digital TR sensor, TFT sensor, IAT sensor, VSS input	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM, IAT and VSS. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Some Shifts Harsh ONLY	- If only some of the shifts are harsh, determine which shift(s) is missing. - Refer to the following routine(s) for further No Shift concerns: — Harsh 1-2 Shift, Routine 232 — Harsh 2-3 Shift, Routine 233 — Harsh 3-4 Shift, Routine 234 — Harsh 4-5 Shift, Routine 274 — Harsh 5-4 Shift, Routine 275 — Harsh 4-3 Shift, Routine 235 — Harsh 3-2 Shift, Routine 236 — Harsh 2-1 Shift, Routine 237
Fluid Incorrect level	Adjust to the correct level. Refer to Transmission Fluid Level Check in this section.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves, springs damaged, misassembled, missing, stuck, or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Input Shaft Damaged	Inspect for damage. Install new as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Feel—Harsh (Some/All) (Continued)**

Possible Component	Reference/Action
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Center Shaft Assembly - Center shaft assembly damaged - One-way clutch damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Center Support Screw not tightened to specification	Tighten to specification.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Output Shaft Damaged	Inspect for damage. Install new as necessary.
Case Damaged	Inspect for damage. Repair as necessary.

Shift Concern: No 1st and 2nd Gear in Drive, Engages in a Higher Gear

Possible Component	Reference/Action
215 — ROUTINE	
Powertrain Control System	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 1st and 2nd Gear in Drive, Engages in a Higher Gear (Continued)**

Possible Component	Reference/Action
PCM, vehicle wiring harnesses, shift solenoids A, B, C, digital TR sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A and GO to Pinpoint Test C. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
Low One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Engagement Concern: No 1st Gear in Manual 1 Position

Possible Component	Reference/Action
216 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoids A, B, pressure control solenoids B, C	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A and GO to Pinpoint Test D. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control Screws not tightened to specification	Tighten to specification.

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: No 1st Gear in Manual 1 Position (Continued)**

Possible Component	Reference/Action
• Separator plate damaged • Contamination • Valves, springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean. • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.
Overdrive Planetary Assembly • Planetary damaged	• Inspect for damage. Repair as necessary.
Direct One-Way Clutch • Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as necessary.
Low One-Way Clutch • Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as necessary.

Shift Concern: No 2nd Gear in Manual 2 Position

Possible Component	Reference/Action
217 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, shift solenoids A, B, C, pressure control solenoid B	• Carry out on-board diagnostic tests. For additional information, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. • GO to Pinpoint Test A and GO to Pinpoint Test D. • Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures • High/low pressures	• Check pressure at line and PC C taps. • Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control • Screws not tightened to specification • Separator plate damaged • Contamination • Valves, springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Tighten to specification. • Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean. • If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.
Overdrive Servo • Servo retaining screws damaged	• Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 2nd Gear in Manual 2 Position (Continued)**

Possible Component	Reference/Action
- Seals (piston and cover) damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
Low One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Torque Converter Operation Concerns: Does Not Apply

Possible Component	Reference/Action
240 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, TCC solenoid, TFT sensor and engine coolant temperature (ECT) sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A and GO to Pinpoint Test B. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs or seals damaged, stuck or not assembled correctly	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.

DIAGNOSIS AND TESTING (Continued)**Torque Converter Operation Concerns: Does Not Apply (Continued)**

Possible Component	Reference/Action
Torque Converter Assembly Torque converter internal failure preventing engagement, piston application	Remove the transmission. Inspect for damage. Refer to Torque Converter in this section. If the torque converter fails to pass the criteria or is damaged, install a new or remanufactured torque converter.

Torque Converter Operation Concern: Always Applied/Stalls Vehicle

Possible Component	Reference/Action
241 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, TCC solenoid	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A. - Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Low One-Way Clutch Worn, damaged or assembled incorrectly.	Inspect for damage. Repair as necessary.
Torque Converter Assembly Torque converter internal failure preventing engagement, piston release	Remove the transmission. Inspect for damage. Refer to Torque Converter in this section. If the torque converter fails to pass the criteria or is damaged, install a new or remanufactured torque converter.

Torque Converter Operation Concern: Cycling/Shudder/Chatter

Possible Component	Reference/Action
242 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, TCC solenoid	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A.

DIAGNOSIS AND TESTING (Continued)**Torque Converter Operation Concern: Cycling/Shudder/Chatter (Continued)**

Possible Component	Reference/Action
	Repair as necessary. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid Condition—contaminated, degraded	Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section. If contaminated, locate source of contamination. If burnt, inspect mechanical bands, clutches. Repair as necessary. Change fluid. Carry out drain and refill procedure. Refer to Transmission Fluid Drain and Refill — Without Torque Converter Drain Plug in this section. Carry out fluid cooler and torque converter cleaning procedure. Refer to Transmission Fluid Cooler — Backflushing and Cleaning in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Torque Converter Assembly Torque converter internal leakage, clutch material damaged	Remove the transmission. Inspect for damage. Refer to Torque Converter in this section. If the torque converter fails to pass the criteria or is damaged, install a new or remanufactured torque converter.

Other Concerns: Shift Lever Efforts High

Possible Component	Reference/Action
251 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, digital TR sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test C. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Shift Cable, Digital TR Sensor Cable system or digital TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
Main Control Screws not tightened to specification	Tighten to specification.

DIAGNOSIS AND TESTING (Continued)**Other Concerns: Shift Lever Efforts High (Continued)**

Possible Component	Reference/Action
• Separator plate damaged • Contamination • Valve/springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean. • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.
Case • Manual control lever assembly damage, manual valve inner lever pin bent, manual valve inner lever damaged, spring rod damaged • Manual valve lever shaft retaining pin damaged	• Inspect for damage. If damaged, install a new part. • Inspect for damage. If damaged, repair as necessary.

Other Concerns: External Leaks

Possible Component	Reference/Action
252 — ROUTINE	
Powertrain Control System • OSS sensor, intermediate shaft speed, TSS sensor, digital TR sensor	• Inspect for leakage. If areas around sensor show signs of leakage, install a new sensor O-ring seal. If area behind digital TR sensor shows signs of a leak, a new manual lever shaft seal may need to be installed.
Fluid • Incorrect level	• Adjust to correct level. Refer to Transmission Fluid Level Check in this section.
Case • Case vent damaged • Output shaft flange damage	• Inspect for damage. If damaged, repair as necessary. • Inspect for damage. If damaged, repair as necessary.
Seals/Gaskets • Leakage at gaskets, seals, cooler lines, torque converter studs, etc.	• Refer to Leakage Inspection in this section for potential leak locations. • Remove all traces of lubricant on exposed surfaces of the transmission. Check vent for free breathing. Operate the vehicle at normal temperatures and carry out leak check test, refer to Leakage Inspection in this section. Repair as necessary.
Vents • Fluid leakage through the vent system into the bellhousing	• Incorrect fluid level may cause the transmission fluid to vent. If not already carried out verify and adjust the fluid to the correct level. Refer to Transmission Fluid Level Check in this section.

DIAGNOSIS AND TESTING (Continued)**Other Concerns: External Leaks (Continued)**

Possible Component	Reference/Action
	- Verify the transmission operating temperature by monitoring the TFT while driving the vehicle for 32 km (20 miles) or 20 minutes. If the TFT exceeds 102°C (215°F) during the drive, refer to Routine No. 257 Transmission Overheating, Main Control, Thermostatic bypass valve. - Remove all traces of fluid on exposed surfaces of the transmission. - Check the vent for damage and obstructions. Verify that the vent is operating correctly by applying air through the vent tubes. If the vent is damage or obstructed, repair as necessary.

Other Concern: Noise/Vibration—Forward or Reverse

Possible Component	Reference/Action
254 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, TCC solenoid, pressure control solenoids A, B, C	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Shift Cable/Digital TR Sensor Cable or digital TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck, or bore damaged, thermostatic bypass valve damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs or seals damaged, stuck or not assembled correctly	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.
Low One-Way Clutch	

DIAGNOSIS AND TESTING (Continued)**Other Concern: Noise/Vibration—Forward or Reverse (Continued)**

Possible Component	Reference/Action
Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
Flexplate or Adapter Plate - Damaged - Nuts not tightened to specification - Adapter plate not aligned correctly	- Inspect for damage. Repair as necessary. - Tighten to specification. - Remove transmission and using special service tool and procedure in this section, align adapter plate.
Clutch Assemblies - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for damage, mislocation, poor seating. Install a new cylinder as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Torque Converter Assembly Torque converter hub damaged	Inspect for damage. Repair as necessary.

Other Concern: Engine Will Not Crank

Possible Component	Reference/Action
255 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, digital TR sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test C. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Shift Cable/Digital TR Sensor Cable or digital TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
Main Control/Park System/TR Sensor Alignment Detent spring, rooster comb, manual lever and TR sensor are not correctly aligned together	Disconnect TR sensor electrical connector. Remove outer manual lever nut. Loosen TR sensor screws. Loosen detent spring screw. Move manual lever through all gear ranges. Place manual lever into the NEUTRAL position. Tighten the detent spring screw to correct specification. Install TR sensor alignment tool. Tighten the TR sensor screws alternating sequence until correct tightening specification is obtained. Remove tool. Install outer manual lever and nut. Tighten nut to correct specification. Install TR sensor connector. Verify that the vehicle will start in PARK and NEUTRAL. Verify that the reverse backup lamps illuminate in REVERSE.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket.

DIAGNOSIS AND TESTING (Continued)**Other Concern: Engine Will Not Crank (Continued)**

Possible Component	Reference/Action
- Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs or seals damaged, stuck or not assembled correctly	- Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.
Flexplate or Adapter Plate Damaged	Inspect for damage. Repair as necessary.

Other Concern: No Park Range

Possible Component	Reference/Action
256 — ROUTINE	
Shift Cable/Digital TR Sensor Cable system or digital TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
Case - Manual control lever assembly damage, manual valve inner lever pin bent, manual valve inner lever damaged, spring rod damaged - Manual valve lever shaft retaining pin damaged	- Inspect for damage. If damaged, repair as necessary. - Inspect for damage. If damaged, repair as necessary.
Park System - Park gear, parking pawl, parking pawl return spring, park or guide plate, parking actuating rod, parking pawl shaft, manual lever, manual lever detent spring damaged or misassembled - External linkages/brackets damaged	- Inspect for damage. If damaged, repair as necessary. - Inspect for damage. If damaged, repair as necessary.

Other Concern: Transmission Overheating

Possible Component	Reference/Action
257 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, TCC solenoid, pressure control solenoids A, B, C, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid Incorrect level	Adjust to correct level. Refer to Transmission Fluid Level Check in this section.
Hydraulic/Mechanical	

DIAGNOSIS AND TESTING (Continued)**Other Concern: Transmission Overheating (Continued)**

Possible Component	Reference/Action
Thermostatic bypass valve in the main control valve body assembly	Verify correct thermal valve function, while monitoring the TFT. Drive the vehicle for about 32 km (20 miles) or 20 minutes. If the temperature exceeds 102°C (215°F) during the drive, install a new main control valve body assembly.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck or bore damaged, thermostatic bypass valve damaged - Filter damaged, missing - Thermostatic bypass valve damaged or malfunctioning	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary. - If the verification procedure confirms the malfunction, install a new main control valve body assembly. If not malfunctioning, inspect for damage. If damaged, install a new main control valve body assembly.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs or seals damaged, stuck or not assembled correctly	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.
Case Case vent damaged	Inspect for damage. If damaged, repair as necessary.
Torque Converter Assembly - Seized torque converter one-way clutch - Excessive slip detected	Remove the transmission. Inspect for damage. Refer to Torque Converter in this section. If the torque converter fails to pass the criteria or is damaged, install a new or remanufactured torque converter.
Other - Restriction in the transmission cooling system - Excessive trailer tow load - Engine driveability concerns	- Refer to Section 307-02 for information and diagnosis of cooling system. - Refer to the owner guide for specifications on trailer towing. - Check engine. Refer to Section 303-00.

DIAGNOSIS AND TESTING (Continued)**Other Concern: No Engine Braking in Manual 3rd Position**

Possible Component	Reference/Action
280 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoids A, B, C, reverse pressure (RP) switch, pressure control solenoids A, B	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid Incorrect level	Adjust fluid to correct level. Refer to Transmission Fluid Level Check in this section.
Incorrect Pressures High/low pressures	Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Coast Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Center Support - Screw not tightened to specification - Seals rings or bearing damaged - Outside diameter of case bore damaged - Support damaged or leaking	- Tighten to specification. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Other Concern: No Engine Braking in Manual 4th (D (D) Cancelled) Position**

Possible Component	Reference/Action
281 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid D, RP switch, pressure control solenoid B	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid Incorrect level	Adjust fluid to correct level. Refer to Transmission Fluid Level Check in this section.
Main Control - Screws not tightened to specification - Filter damaged, missing - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged	- Tighten to specification. - Inspect for damage, repair as necessary. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage.
Coast Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Other Concerns: No Engine Braking in Manual 2nd Position

Possible Component	Reference/Action
258 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoids A, C, D, pressure control solenoid A	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid Incorrect level	Adjust fluid to correct level. Refer to Transmission Fluid Level Check in this section.
Incorrect Pressures	

DIAGNOSIS AND TESTING (Continued)**Other Concerns: No Engine Braking in Manual 2nd Position (Continued)**

Possible Component	Reference/Action
High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Other Concern: No Engine Braking in Manual 1st Position

Possible Component	Reference/Action
259 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoids A, C, D, pressure control solenoids A, B	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid Incorrect level	Adjust fluid to the correct level, refer to Transmission Fluid Level Check in this section.
Incorrect pressures High/low pressures	Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Reverse Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Reverse Band - Band damaged - Servo worn or damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Other Concerns: Fluid Venting/Foaming

Possible Component	Reference/Action
261 — ROUTINE	
Fluid Incorrect level	Adjust fluid to correct level. Refer to Transmission Fluid Level Check in this section.

DIAGNOSIS AND TESTING (Continued)**Other Concerns: Fluid Venting/Foaming (Continued)**

Possible Component	Reference/Action
Condition	Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary.
Case Case vent damaged	Inspect for damage. If damaged, repair as necessary.
Other Transmission overheating	Refer to 257 routine in this section.

Other Concern: Vehicle Movement with Gear Selector in N Position

Possible Component	Reference/Action
262 — ROUTINE	
Fluid Incorrect level	Adjust fluid to correct level. Refer to Transmission Fluid Level Check in this section.
Shift Cable/Digital TR Sensor Cable system or digital TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
Incorrect Pressures High/low pressures	Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage.
Clutch Assemblies - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn. - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for damage, mislocation, poor seating. Install a new cylinder as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Case	

DIAGNOSIS AND TESTING (Continued)**Other Concern: Vehicle Movement with Gear Selector in N Position (Continued)**

Possible Component	Reference/Action
Manual control lever assembly damage, manual valve inner lever pin bent, manual valve inner lever damaged, spring rod damaged	Inspect for damage. If damaged, repair as necessary.
Manual valve lever shaft retaining pin damaged	Inspect for damage. If damaged, repair as necessary.

Other Concern: Slips/Chatters in Manual 1st Position

Possible Component	Reference/Action
263 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoids A, B	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid - Incorrect level - Condition	- Adjust fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures High/low pressures	Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Fluid Pump Assembly - Screws not tightened to specification - Gasket damaged - Porosity, cross leaks, ball missing, plugged hole - Pump gears cracked and/or seized - Flow control valves, springs, or seals damaged, stuck or not assembled correctly	- Tighten screws to specification. - Inspect for damage. If damaged, install a new gasket. - Inspect for damage. If damaged, repair as necessary. - Inspect for damage. Install a new pump. - Inspect for damage. Install a new seal or flow control valve.
Forward Clutch Assembly Seals, piston damaged	Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Other Concern: Slips/Chatters in Manual 1st Position (Continued)**

Possible Component	Reference/Action
• Check ball damaged, missing, not seating, off location • Friction elements damaged or worn • Return springs damaged • Bronze seal ring or bearing damaged	• Inspect for mislocation, poor seating, damage. Install a new cylinder. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Reverse Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Reverse Band • Band damaged • Servo worn or damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Direct One-Way Clutch • Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as necessary.

Other Concern: Slips/Chatters in Manual 2nd Position

Possible Component	Reference/Action
264 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, pressure control solenoids A, B	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. • GO to Pinpoint Test D. • Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid • Incorrect level • Condition	• Adjust fluid to the correct level. Refer to Transmission Fluid Level Check in this section. • Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures • High/low pressures	• Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Overdrive Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Overdrive Band • Band damaged • Servo worn or damaged • Not adjusted correctly	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Overdrive Planetary Assembly • Planetary damaged	• Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Other Concern: Slips/Chatters in Manual 2nd Position (Continued)**

Possible Component	Reference/Action
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Other Concern: Slip/Chatters in Manual 3rd Position

Possible Component	Reference/Action
282 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoids A, B	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid - Incorrect level - Condition	- Adjust fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures High/low pressures	Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly	

DIAGNOSIS AND TESTING (Continued)**Other Concern: Slip/Chatters in Manual 3rd Position (Continued)**

Possible Component	Reference/Action
- Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
Low One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Other Concern: Engine Braking in ALL Gears

Possible Component	Reference/Action
283 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid D	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Torque Converter Assembly Torque converter internal failure preventing engagement, piston release	Remove the transmission. Inspect for damage. Refer to Torque Converter in this section. If the torque converter fails to pass the criteria or is damaged, install a new or remanufactured torque converter.

Other Concern: No 2nd and 5th Gears (Manual 2nd is Ok)

Possible Component	Reference/Action
284 — ROUTINE	
Hydraulic/Mechanical	Verify that Manual 2 is present and functions correctly. If Manual 2 is not operating correctly go to Shift Concerns: Routine 210 - Some/All Shifts Missing (Automatic Mode) and continue diagnosis. If Manual 2 is operating correctly continue with this routine.
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoids B, C	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.

DIAGNOSIS AND TESTING (Continued)**Other Concern: No 3rd, 4th and 5th Gears**

Possible Component	Reference/Action
285 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, pressure control solenoids A, B	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Planetary Assembly Planetary damaged	Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Harsh 1-2 Shift

Possible Component	Reference/Action
232 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift control solenoid C, pressure control solenoids B, TSS sensor, digital TR sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Harsh 1-2 Shift (Continued)**

Possible Component	Reference/Action
- Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Harsh 2-3 Shift

Possible Component	Reference/Action
233 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift control solenoid B, pressure control solenoids A, TSS sensor, intermediate shaft speed sensor, digital TR sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Harsh 2-3 Shift (Continued)**

Possible Component	Reference/Action
Filter damaged, missing	Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Shift Concern: Harsh 3-4 Shift

Possible Component	Reference/Action
234 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift control solenoid A, pressure control solenoids C, digital TR sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test C and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control Screws not tightened to specification	Tighten to specification.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Harsh 3-4 Shift (Continued)**

Possible Component	Reference/Action
• Separator plate damaged • Contamination • Valve/springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Inspect for damage. If damaged, install a new separator. • Disassemble and clean. • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.
Center Support • Screws not tightened to specification • Seal rings or bearing damaged • Outside diameter of case bore damaged • Support damaged or leaking	• Tighten to specification. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Direct Clutch Assembly • Seals, piston damaged • Check ball damaged, missing, not seating, off location • Friction elements damaged or worn • Return springs damaged	• Inspect for damage. Repair as necessary. • Inspect for mislocation, poor seating, damage. Install a new cylinder. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Intermediate Servo • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary.

Shift Concerns: Harsh 4-5 Shift

Possible Component	Reference/Action
274 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, TSS sensor, digital TR sensor, TFT sensor	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. • GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. • Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures • High/low pressures	• Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control • Screws not tightened to specification • Separator plate damaged	• Tighten to specification. • Inspect for damage. If damaged, install a new separator.

DIAGNOSIS AND TESTING (Continued)**Shift Concerns: Harsh 4-5 Shift (Continued)**

Possible Component	Reference/Action
- Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seal (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Harsh 5-4 Shift

Possible Component	Reference/Action
275 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift control solenoid C, pressure control solenoid C, TSS sensor, digital TR sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo Servo retaining screws damaged	Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Harsh 5-4 Shift (Continued)**

Possible Component	Reference/Action
Seals (piston and cover) damaged	Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Shift Concern: Harsh 4-3 Shift

Possible Component	Reference/Action
235 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid A, pressure control solenoid A, digital TR sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test C and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at Line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves, springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Harsh 4-3 Shift (Continued)**

Possible Component	Reference/Action
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Harsh 3-2 Shift

Possible Component	Reference/Action
236 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift control solenoid C, pressure control solenoid B, TSS sensor, intermediate shaft speed sensor, digital TR sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Harsh 3-2 Shift (Continued)**

Possible Component	Reference/Action
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Harsh 2-1 Shift

Possible Component	Reference/Action
237 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift control solenoid C, pressure control solenoid B, TSS sensor, digital TR sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct Clutch One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 1-2 Shift**

Possible Component	Reference/Action
220 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, OSS sensor, digital TR sensor, VSS input	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM and VSS. GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid Incorrect level	Adjust to correct level. Refer to Transmission Fluid Level Check in this section.
Incorrect Pressures High/low pressures	- Check pressure at line and PC C taps. - Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Planetary Assembly Planetary damaged	Inspect for damage. Repair as necessary.

Shift Concern: No 2-3 Shift

Possible Component	Reference/Action
221 — ROUTINE	
Powertrain Control System	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 2-3 Shift (Continued)**

Possible Component	Reference/Action
PCM, vehicle wiring harnesses, shift solenoid B, TCC solenoid, pressure control solenoid A, OSS sensor, digital TR sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball, damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: No 3-4 Shift

Possible Component	Reference/Action
222 — ROUTINE	
Powertrain Control System	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 3-4 Shift (Continued)**

Possible Component	Reference/Action
PCM, vehicle wiring harnesses, shift solenoid A, pressure control solenoid C, OSS sensor, digital TR sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Center Support - Screws not tightened to specification - Seal rings or bearing damaged - Outside diameter of case bore damaged - Support damaged or leaking	- Tighten to specification. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 4-5 Shift**

Possible Component	Reference/Action
270 — ROUTINE	
Powertrain Control System - PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, OSS sensor, digital TR sensor - Transmission control (TC) switch - TC switch	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test. - For TC switch diagnosis, refer to Section 307-05.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: No 5-4 Shift

Possible Component	Reference/Action
271 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid C, OSS sensor, digital TR sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 5-4 Shift (Continued)**

Possible Component	Reference/Action
• TC switch	• For TC switch diagnosis, refer to Section 307-05.
Incorrect Pressures • High/low pressures	• Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control • Screws not tightened to specification • Separator plate damaged • Contamination • Valves/springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Tighten to specification. • Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean. • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.
Overdrive Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Overdrive Band • Band damaged • Servo worn or damaged • Not adjusted correctly	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.

Shift Concern: No 4-3 Shift

Possible Component	Reference/Action
223 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, shift solenoid A, B, pressure control solenoid A, OSS sensor, digital TR sensor	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. • GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. • Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures • High/low pressures	• Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control • Screws not tightened to specification • Separator plate damaged • Contamination	• Tighten to specification. • Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 4-3 Shift (Continued)**

Possible Component	Reference/Action
- Valves/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: No 3-2 Shift

Possible Component	Reference/Action
224 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, OSS sensor, digital TR sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 3-2 Shift (Continued)**

Possible Component	Reference/Action
- Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged - Bronze seal ring or bearing damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: No 2-1 Shift

Possible Component	Reference/Action
225 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, OSS sensor, digital TR sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test C, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Forward Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 2-1 Shift (Continued)**

Possible Component	Reference/Action
• Bronze seal ring or bearing damaged	• Inspect for damage. Repair as necessary.
Overdrive Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Overdrive Band • Band damaged • Servo worn or damaged • Not adjusted correctly	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 1-2 Shift

Possible Component	Reference/Action
226 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, TFT sensor, VSS input	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. • GO to Pinpoint Test A, GO to Pinpoint Test B and GO to Pinpoint Test D. • Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Fluid • Incorrect level • Condition	• Adjust fluid to correct level. Refer to Transmission Fluid Level Check in this section. • Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures • High/low pressures	• Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control • Screws not tightened to specification • Separator plate damaged • Contamination • Valve/springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Tighten to specification. • Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean. • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.
Overdrive Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Soft/Slipping 1-2 Shift (Continued)**

Possible Component	Reference/Action
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 2-3 Shift

Possible Component	Reference/Action
227 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid A, pressure control solenoid A, intermediate shaft speed sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valve/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Soft/Slipping 3-4 Shift**

Possible Component	Reference/Action
228 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid A, pressure control solenoid C, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck or bore damaged	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage.
Center Support - Screw not tightened to specification - Seal rings or bearing damaged - Outside diameter of case bore damaged - Support damaged or leaking	- Tighten to specification. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 4-5 Shift

Possible Component	Reference/Action
272 — ROUTINE	
Powertrain Control System	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Soft/Slipping 4-5 Shift (Continued)**

Possible Component	Reference/Action
PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Feel — Soft/Slipping 5-4 Shift

Possible Component	Reference/Action
273 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid C, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Feel — Soft/Slipping 5-4 Shift (Continued)**

Possible Component	Reference/Action
High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Direct Clutch Assembly - Seals, piston damaged - Check ball damaged, missing, not seating, off location - Friction elements damaged or worn - Return springs damaged	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Direct One-Way Clutch Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Shift Concern: Feel — Soft/Slipping 4-3 Shift

Possible Component	Reference/Action
229 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid A, pressure control solenoid A, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B and GO to Pinpoint Test D. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Feel — Soft/Slipping 4-3 Shift (Continued)**

Possible Component	Reference/Action
- Valves/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Intermediate Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Intermediate Band - Band damaged - Servo worn or damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 3-2 Shift

Possible Component	Reference/Action
230 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, intermediate shaft speed sensor, TFT sensor	- Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test A, GO to Pinpoint Test B, GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures High/low pressures	Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control - Screws not tightened to specification - Separator plate damaged - Contamination - Valves/springs damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean. - If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. - Inspect for damage, repair as necessary.
Overdrive Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
Overdrive Band	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: Soft/Slipping 3-2 Shift (Continued)**

Possible Component	Reference/Action
• Band damaged • Servo worn or damaged • Not adjusted correctly	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
Direct One-Way Clutch • Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as necessary.

Shift Concern: Feel — Soft/Slipping 2-1 Shift

Possible Component	Reference/Action
231 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, shift solenoid C, pressure control solenoid B, TFT sensor	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. • GO to Pinpoint Test A, GO to Pinpoint Test B and GO to Pinpoint Test D. • Repair as required. Clear DTCs, road test and rerun on-board diagnostic test.
Incorrect Pressures • High/low pressures	• Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control • Screws not tightened to specification • Separator plate damaged • Contamination • Valves/springs damaged, misassembled, missing, stuck or bore damaged • Filter damaged, missing	• Tighten to specification. • Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean. • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage. • Inspect for damage, repair as necessary.

DIAGNOSIS AND TESTING

Diagnostic Trouble Code (DTC) Charts

Diagnostic Trouble Code Chart

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0102, P0103, P1100, P1101	MAF	MAF concerns	MAF system inoperative which may cause a transmission concern.	High/low EPC pressure, incorrect shift schedule. Incorrect torque converter clutch engagement scheduling. Symptoms similar to a TP failure.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0112	IAT	IAT indicates 125°C (254°F) (grounded)	Voltage drop across IAT exceeds scale set for temperature 125°C (254°F).	Incorrect EPC pressure. Either high or low which will result in harsh or soft shifts.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0113	IAT	IAT indicates -40°C (-40°F) (open circuit)	Voltage drop across IAT exceeds scale set for temperature -40°C (-40°F).	Incorrect EPC pressure. Either high or low which will result in harsh or soft shifts.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0114	IAT	IAT out of on-board diagnostic range	IAT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P1116	ECT	ECT out of on-board diagnostic range	ECT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0117	ECT	ECT indicates 125°C (254°F)	Voltage drop across ECT exceeds scale set for temperature 125°C (254°F) (grounded).	Torque converter clutch will always be off, resulting in reduced fuel economy.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0118	ECT	ECT indicates -40°C (-40°F)	Voltage drop across ECT exceeds scale set for temperature -40°C (-40°F) (open circuit).	Torque converter clutch will always be off, resulting in reduced fuel economy.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Com- ponent	Description	Condition	Symptom	Action
P0121, P0122, P0123, P1120, P1121, P1125, P1124	TP	TP concern	PCM has detected an error. This error may cause a transmission concern.	Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage. Torque converter clutch cycling.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0121- P0124, P0221- P0224, P2100- P2107, P2110- P2112, P2121- P2124, P2126- P2129, P2121- P2135, P2138- P2140	APP	APP concern	PCM has detected an error. This error may cause a transmission concern.	Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage. Torque converter clutch cycling.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0300- P0308, P0320, P0340, P1351- P1364	EI	EI concerns	EI system is inoperative which may cause a transmission concern.	Harsh engagements and shifts, late WOT shifts, no torque converter clutch engagement.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0503, P0500, U1039	ABS	Insufficient VSS input from ABS through the communication link	PCM detected a loss of vehicle speed signal through the communication link from ABS.	No transmission symptom. IP speedometer may be affected.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0705	Digital TR sensor	Digital TR circuit failure	Digital TR circuits, indicating an invalid pattern in TR__D. Condition caused by a short to ground or an open in TR4, TR3A, TR2 and/or TR1 circuits. This DTC cannot be set by an incorrectly adjusted digital TR sensor.	Harsh engagements or wrong gear commanded. Defaults to (D) or invalid position.	GO to Pinpoint Test C.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0708	Digital TR sensor	Digital TR sensor circuit TR3A open	Digital TR sensor circuit TR3A reading 2.6v - 5.0v (open circuit). This DTC cannot be set by an incorrectly adjusted digital TR sensor.	Harsh engagements or wrong gear commanded. Defaults to (D) or invalid position.	GO to Pinpoint Test C.
P1702	Digital TR sensor	Digital TR signal intermittent, code P0705, P0708 are set	See P0705, P0708 conditions.	See P0705, P0708 symptoms.	GO to Pinpoint Test C.
P1704	Digital TR sensor	Digital TR not in P or N positions during KOEO/KOER	Digital TR sensor or shift cable incorrectly adjusted or digital TR circuit failure.	DTC is set.	GO to Pinpoint Test C.
P1705	Digital TR sensor	Digital TR not in P or N during KOEO/KOER	KOEO/KOER not run in park or neutral, or digital TR circuit failure.	DTC is set.	RERUN KOEO/KOER in P or N or GO to Pinpoint Test C.
P0712	TFT	157°C (315°F) indicated TFT sensor circuit grounded	Voltage drop across TFT sensor exceeds scale set for temperature of 157°C (315°F).	DTC set.	GO to Pinpoint Test B.
P0713	TFT	-40°C (-40°F) indicated TFT sensor circuit open	Voltage drop across TFT sensor exceeds scale set for temperature -40°C (-40°F).	DTC set.	GO to Pinpoint Test B.
P1711	TFT	TFT out of on-board diagnostic range	Transmission not at operating temperature during on-board diagnostic.	DTC set — vehicle cold or overheated.	Warm or cool vehicle to normal operating temperature. GO to Pinpoint Test B.
P0711	TFT	No change in TFT	PCM has detected no TFT change during operation.	DTC is set.	GO to Pinpoint Test B.
P1783	TFT	Transmission overtemp condition indicated	Transmission fluid temperature exceeded 127°C (270°F).	Increase in control pressure.	GO to Pinpoint Test B.
P0715	TSS	Insufficient input from turbine shaft speed sensor	PCM detected a loss of TSS signal during operation.	—	GO to Pinpoint Test E.
P0717	TSS	Insufficient input from turbine shaft speed sensor	PCM detected a loss of TSS signal during operation.	—	GO to Pinpoint Test E.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0718	TSS	Turbine shaft speed sensor signal noisy	PCM has detected a noisy TSS signal.	—	GO to Pinpoint Test E.
P0720	OSS	Insufficient input from OSS sensor	PCM detected a loss of OSS signal during operation.	Abnormal shift schedule, harsh shifts.	GO to Pinpoint Test E.
P0721	OSS	Output shaft speed sensor signal noisy	PCM has detected an erratic OSS signal.	Abnormal shift schedule, harsh shifts.	GO to Pinpoint Test E.
P0722	OSS	Insufficient input from OSS sensor	PCM detected a loss of OSS signal during operation.	Abnormal shift schedule, harsh shifts.	GO to Pinpoint Test E.
P0731**	SSA, SSB, SSC or internal parts	1st gear ratio error	No 1st gear.	Correct gear ratio not achieved for commanded gear. Shift errors may also be due to other transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Charts. GO to Pinpoint Test A.
P0732**	SSA, SSB, SSC or internal parts	2nd gear ratio error	No 2nd gear.	Correct gear ratio not achieved for commanded gear. Shift errors may also be due to other transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Charts. GO to Pinpoint Test A.
P0733**	SSA, SSB, SSC or internal parts	3rd gear ratio error	No 3rd gear.	Correct gear ratio not achieved for commanded gear. Shift errors may also be due to other transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Charts. GO to Pinpoint Test A.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0734**	SSA, SSB, SSC or internal parts	4th gear ratio error	No 4th gear.	Correct gear ratio not achieved for commanded gear. Shift errors may also be due to other transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Charts. GO to Pinpoint Test A.
P0735	SSA, SSB, SSC, SSD or internal parts	5th gear ratio error	No 5th gear.	Correct gear ratio not achieved for commanded gear. Shift errors may also be due to other transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Chart. GO to Pinpoint Test A.
P0741**	TCC	TCC solenoid circuit error or stuck OFF	The PCM picked up an excessive amount of TCC slippage during normal vehicle operation.	Stuck OFF: harsh shifts or engagements. Engine RPM may be higher than expected.	GO to Pinpoint Test A.
P0743*	TCC	TCC solenoid circuit failure during on-board diagnostics	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostics.	Open or short to battery power: harsh shifts or engagements, engine rpm higher than expected. Short to ground: vehicle stalls when in drive gear at idle, harsh shifts or engagements or engine rpm lower than expected.	GO to Pinpoint Test A.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P1740**	TCC	TCC solenoid inoperative	TCC not commanded. Mechanical failure of the solenoid detected.	Stuck OFF: harsh shifts or engagements, engine rpm higher than expected. Stuck ON: vehicle stalls when in drive gear at idle, harsh shifts or engagements or engine rpm lower than expected.	GO to Pinpoint Test F.
P0740*	TCC	TCC solenoid circuit failure during on-board diagnostic	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostics. May flash TCIL.	Open or short to battery power: harsh shifts or engagements, engine rpm higher than expected. Short to ground: vehicle stalls when in drive gear at idle, harsh shifts or engagements or engine rpm lower than expected.	GO to Pinpoint Test A.
P0962**	PCA	PCA solenoid circuit failure, short to ground	Voltage through PCA solenoid is checked. An error will be noted if tolerance is exceeded.	Short circuit — causes minimum PCA pressure (minimum capacity) and limits engine torque (alternate firm). Slips in gear and 3rd gear incorrect.	GO to Pinpoint Test D.
P0745	PCA	PCA solenoid or circuit fault	PCA functional fault-low pressure	Incorrect shift pattern indicating mechanical or hydraulic failure of the transmission.	GO to Pinpoint Test D.
P0748	PCA	PCA solenoid inoperative	Electrical failure of the solenoid detected.	Possible slip in gear and/or 3rd gear ratio.	GO to Pinpoint Test D.
P0960	PCA	PCA solenoid circuit open	Voltage through PCA solenoid is checked. Error is noted if tolerance is exceeded.	Open circuit — causes maximum PCA pressure, harsh engagements and shifts.	GO to Pinpoint Test D.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0963	PCA	PCA solenoid short to battery power or short to ground	Voltage through PCA solenoid is checked. An error will be noted if tolerance is exceeded.	Short to power — causes maximum PCA pressure, harsh engagements and shifts. Short to ground — No 3rd gear.	GO to Pinpoint Test D.
P0966	PCB	PCB solenoid circuit failure, short to ground	Voltage through PCB solenoid is checked. An error will be noted if tolerance is exceeded.	Short to ground. No 2nd and 5th gear.	GO to Pinpoint Test D.
P0775	PCB	PCB solenoid or circuit fault	PCB functional fault — low pressure.	Incorrect shift pattern indicating mechanical or hydraulic failure of the transmission.	GO to Pinpoint Test D.
P0778	PCB	PCB solenoid inoperative	Electrical failure of the solenoid detected.	No 2nd and 5th gear.	GO to Pinpoint Test D.
P0967	PCB	PCB solenoid short to battery voltage, short to ground	Voltage through PCB solenoid is checked. An error will be noted if tolerance is exceeded.	Short to battery power: harsh shift and engagements. Short to ground — No 2nd and 4th gear.	GO to Pinpoint Test D.
P0964	PCB	PCB solenoid circuit open	Voltage through PCB solenoid is checked. Error is noted if tolerance is exceeded.	Open circuit — causes maximum PCB pressure, harsh engagements and shifts.	GO to Pinpoint Test D.
P0795	PCC	PCC solenoid or circuit fault	PCC functional fault — low pressure.	Incorrect shift pattern indicating mechanical or hydraulic failure of the transmission.	GO to Pinpoint Test D.
P0798	PCC	PCC solenoid inoperative	Electrical failure of the solenoid detected.	Incorrect gear ratio in 4th and 5th gear.	GO to Pinpoint Test D.
P0968	PCC	PCC solenoid circuit open	Voltage through PCC solenoid is checked. Error is noted if tolerance is exceeded.	Open circuit — causes maximum PCC pressure, harsh engagements and shifts.	GO to Pinpoint Test D.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0970	PCC	PCC solenoid circuit failure, short to ground	Voltage through PCC solenoid is checked. An error will be noted if tolerance is exceeded.	No 4th and 5th gear.	GO to Pinpoint Test D.
P0971	PCC	PCC solenoid short to power, short to ground	Voltage through PCC solenoid is checked. An error will be noted if tolerance is exceeded.	Short to battery power: harsh shift and engagements. Short to ground — No 4th and 5th gear.	GO to Pinpoint Test D.
P0750*	SSA	SSA solenoid circuit failure	SSA circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Open or short to battery power: 1st gear ratio incorrect or no gear ratio errors, no 1st gear. Short to ground: no 4th or 5th gear.	GO to Pinpoint Test A.
P0753*	SSA	SSA solenoid circuit failure	SSA circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Open or short to battery power: 1st gear ratio incorrect or no gear ratio errors, no 1st gear. Short to ground: no 4th or 5th gear.	GO to Pinpoint Test A.
P1714	SSA	SSA inoperative	Mechanical failure of the solenoid detected.	Stuck OFF. Open or short to battery power: 1st gear ratio incorrect or no gear ratio errors, no 1st gear. May turn on MIL. Stuck ON. No 4th or 5th gear.	GO to Pinpoint Test F.
P0755*	SSB	SSB solenoid circuit failure	SSB circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Open or short to battery power: no 3rd gear. Short to ground: no 1st gear.	GO to Pinpoint Test A.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0758*	SSB	SSB solenoid circuit failure	SSB circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Open or short to battery power: no 3rd gear. Short to ground: no 1st gear.	GO to Pinpoint Test A.
P1715	SSB	SSB inoperative	Mechanical failure of the solenoid detected.	Stuck OFF: 3rd gear ratio incorrect, no 3rd gear. Stuck ON: 1st gear ratio incorrect or no 1st gear.	GO to Pinpoint Test F.
P0760*	SSC	SSC solenoid circuit failure	SSC circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Open or short to battery power: 2nd and 5th gear ratio incorrect. Short to ground: 1st gear ratio incorrect or no gear ratio errors.	GO to Pinpoint Test A.
P0763*	SSC	SSC solenoid circuit failure	SSC circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Open or short to battery power: 2nd and 5th gear ratio incorrect. Short to ground: 1st gear ratio incorrect or no gear ratio errors.	GO to Pinpoint Test A.
P1716	SSC	SSC inoperative	Mechanical failure of the solenoid detected.	Stuck OFF: 2nd and 5th gear ratio incorrect. Stuck ON: 1st gear ratio incorrect or no gear ratio errors.	GO to Pinpoint Test F.
P0765	SSD	SSD solenoid circuit failure	SSD circuit failed to provide voltage drop across solenoid. Circuit shorted to ground.	Short to ground: no engine braking.	GO to Pinpoint Test A.
P0768	SSD	SSD solenoid circuit failure	SSD circuit failed to provide voltage drop across solenoid. Circuit shorted to ground.	Short to ground: no engine braking.	GO to Pinpoint Test A.
P1717	SSD	SSD inoperative	Mechanical failure of the solenoid detected.	Stuck ON: no engine braking.	GO to Pinpoint Test F.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0791	Intermediate shaft speed sensor	Intermediate shaft speed sensor signal failure	PCM has detected a loss of the intermediate shaft speed sensor signal.	Harsh shifts.	GO to Pinpoint Test E.
P0794	Intermediate shaft speed sensor	Intermediate shaft speed sensor signal intermittent	PCM has detected an intermittent intermediate shaft speed sensor signal.	Harsh shifts.	GO to Pinpoint Test E.
P1124	TP	TP voltage high/low for on-board diagnostic	TP was not in the correct position for on-board diagnostic.	Rerun at appropriate throttle position per application.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1460	A/C	A/C clutch cycling pressure switch error	A/C or defrost ON condition may result from A/C clutch being ON during on-board diagnostic.	DTC set during on-board diagnostic — rerun with A/C OFF. Failed ON — EPC pressure slightly low with A/C OFF.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1636	SSx	SSx ISIG communication error	PCM has detected an error with the ISIG chip.	—	INSTALL a new PCM.
P1700	TRANS	Transmission indeterminate failure	Internal component failure. Direct one-way clutch failure.	FMEM becomes active — engine rpm limited to 4,000 rpm. Failed a neutral condition in 1st, 3rd or 4th gear in automatic Mode. Only 2nd and 5th gear available. Other DTCs that may set P1700: P0745, P1747, P1760, P1714, P1715, P0750, P0755.	If other solenoid DTCs are present, diagnose and repair them first. CLEAR DTCs and drive vehicle. If P1700 returns, disassemble transmission and inspect the direct one-way clutch. Repair as required. CLEAR DTC. Drive vehicle and verify repair.
P1703	BPP	Brake not actuated during on-board diagnostic KOER	Brake not cycled during KOER.	Failed ON or not connected — torque converter clutch will not engage at less than 1/3 throttle. Failed OFF or not connected — torque converter clutch will not disengage when brake is applied.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

DIAGNOSIS AND TESTING (Continued)**Diagnostic Trouble Code Chart (Continued)**

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P1703	BPP	BPP switch circuit failed	Brake ON circuit failure during KOEO.	Failed ON or not connected — torque converter clutch will not engage at less than 1/3 throttle. Failed OFF or not connected — torque converter clutch will not disengage when brake is applied.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P1572	BPP	BPP switch circuit failed	Brake ON circuit failure during normal operation.	Failed ON or not connected — torque converter clutch will not engage at less than 1/3 throttle. Failed OFF or not connected — torque converter clutch will not disengage when brake is applied.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P1780	TCS switch	TCS not changing states	TCS not cycled during self-test. TCS circuit or switch open or shorted.	No overdrive cancel when cycled during KOER.	RERUN on-board diagnostics and cycle switch. REFER to Section 307-05 for further diagnosis and repair.

Rotunda Transmission Tester

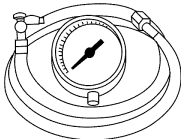
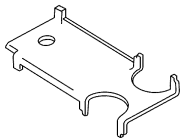
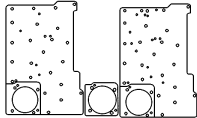
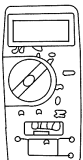
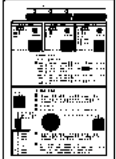
The Rotunda Transmission Tester is used to diagnose electronically controlled transmissions and is used in conjunction with the pinpoint tests. The tests should be carried out in order. Installing the Rotunda Transmission Tester allows separation of the vehicle electronics from transmission electronics. Refer to the Rotunda Transmission Tester manual for these tests.

- Digital Transmission Range (TR) Sensor Testing
- Resistance/Continuity Test
- Switch Test — Park/Neutral, Backup Lamp and Optional Circuits

DIAGNOSIS AND TESTING

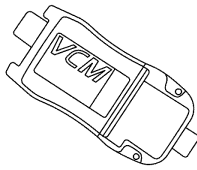
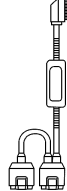
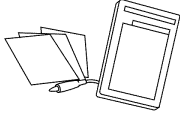
Diagnostics

Special Tool(s)

 ST1300-A	100W/12 Volt DC UV Lamp 164-R0751 or equivalent
 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)
 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
 ST2538-A	Air Test Plate and Gaskets, Transmission 307-433-01, 307-433-02, 307-433-03
 ST1137-A	73 III Automotive Meter 105-R0057 or equivalent
 ST1761-A	Trans Tester TR/MLP Overlay and Manual 007-00131 or equivalent

(Continued)

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST1632-A	MLP-TR Cable 418-F107 (007-00111) or equivalent
 ST1389-A	Transmission Tester 307-F016 (007-00130) or equivalent

Diagnosing electronically controlled automatic transmissions is simplified using the following procedures. It is important to remember that there is a definite procedure to follow. Do not take shortcuts or assume that critical checks or adjustments have already been made. Follow the procedures as written to avoid missing critical components or steps. By following the diagnostic sequence, the technician will be able to diagnose and repair the concern the first time.

On-Board Diagnostics with Scan Tool

NOTE: For detailed instruction and other diagnostic methods using the scan tool, refer to the scan tool tester and the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#).

These quick tests should be used to diagnose the powertrain control module (PCM) and should be carried out in order.

- Quick Test 1.0 — Visual Inspection
- Quick Test 2.0 — Set Up
- Quick Test 3.0 — Key On, Engine Off
- Quick Test 4.0 — Continuous Memory
- Quick Test 5.0 — Key On, Engine Running

DIAGNOSIS AND TESTING (Continued)

- Special Test Mode
 - Wiggle Test Mode
 - Output Test Mode
 - PCM Reset Mode
 - Clearing DTCs
 - OBD II Drive Cycle
-

For further information on other diagnostic testing features using the VCM or generic scan tool, refer to the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#).

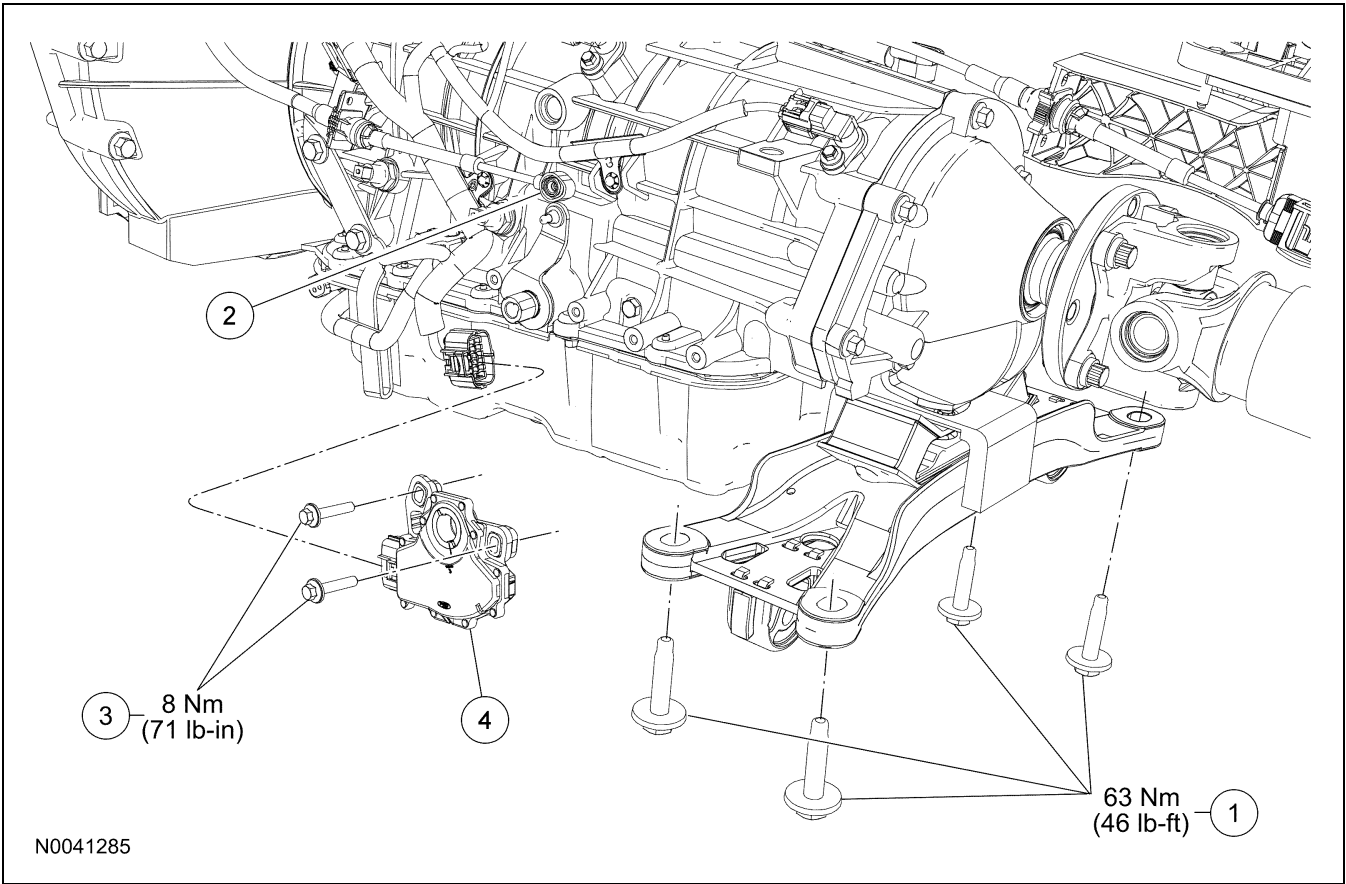
IN-VEHICLE REPAIR

Digital Transmission Range (TR) Sensor

Special Tool(s)

ST1633-A

Alignment Gauge, TR Sensor
307-351 (T97L-70010-A)



Item	Part Number	Description
1	W704971	Transmission crossmember-to-floor pan screws
2	7E395	Transmission selector lever cable
3	W500015	Digital transmission range (TR) sensor screws
4	7F293	Digital TR sensor

Removal

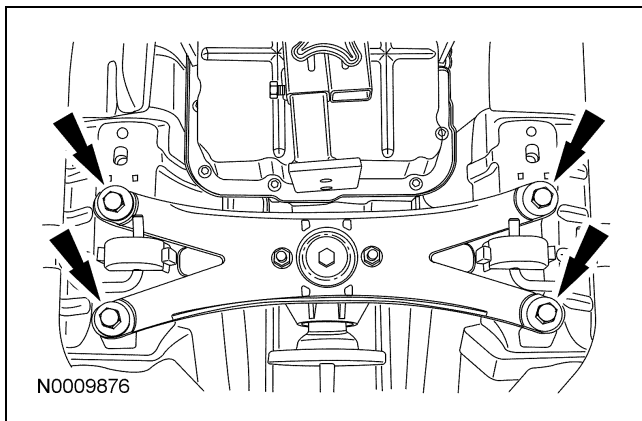
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

IN-VEHICLE REPAIR (Continued)

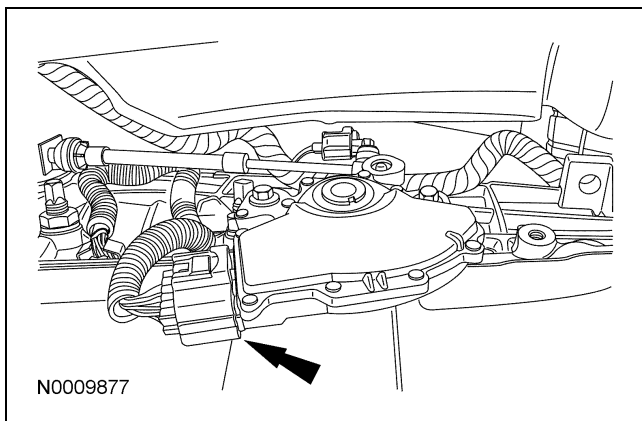
2.  **WARNING:** Secure the transmission to the transmission jack with a safety chain. Failure to follow these instructions may result in personal injury.

Using a suitable transmission jack, support the transmission.

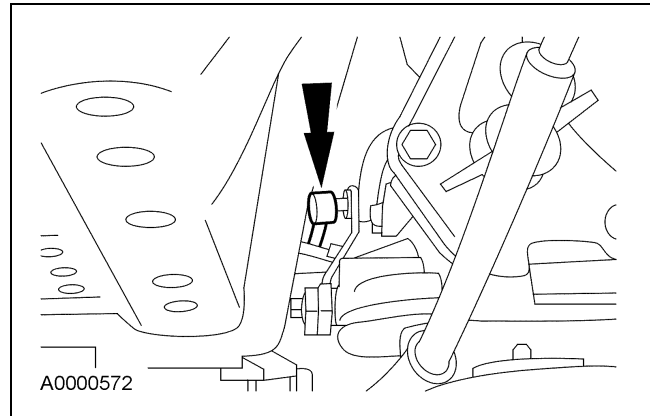
3. Remove the transmission crossmember-to-floor pan screws and lower the transmission enough to gain access to the TR sensor.



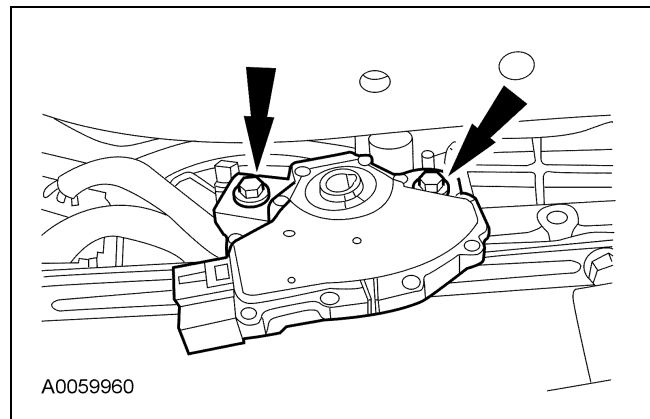
4. Disconnect the digital TR sensor connector.



5. Disconnect the transmission shift cable from the manual control lever.

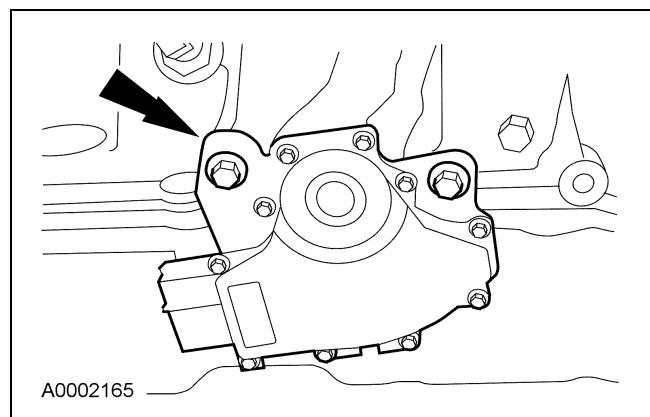


6. Remove the digital TR sensor screws and remove the digital TR sensor.

**Installation**

1.  **CAUTION:** The digital TR sensor must fit flush against the boss on the case to prevent damage to the sensor.

Install the digital TR sensor and loosely install the screws.



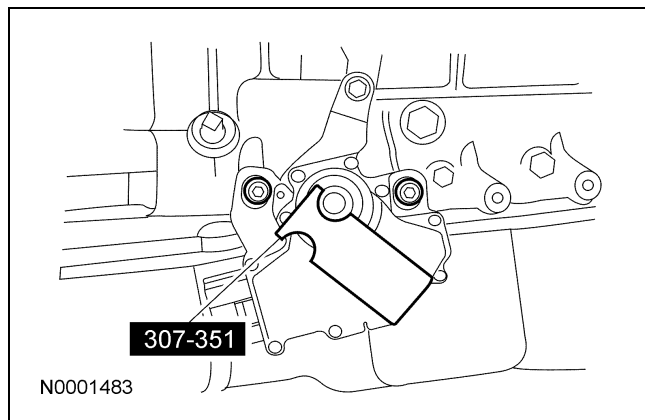
IN-VEHICLE REPAIR (Continued)

2.  **CAUTION:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

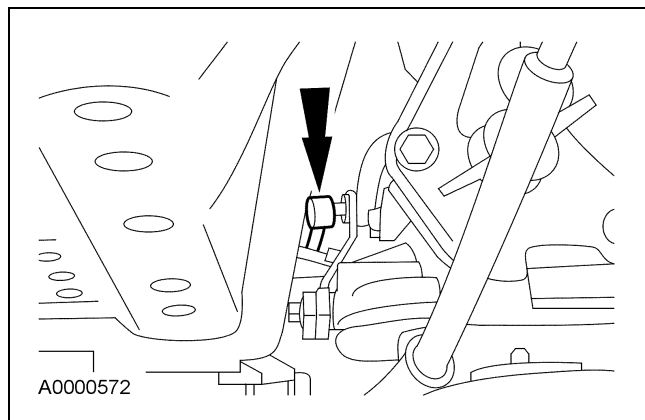
NOTE: The manual lever must be in the NEUTRAL position.

Using the special tool, align the digital TR sensor and tighten the screws in an alternating sequence.

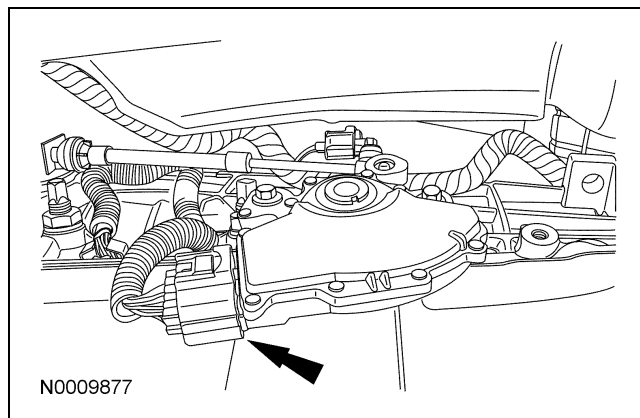
- Tighten 8 Nm (71 lb-in).



3. Connect the transmission shift cable to the manual control lever.

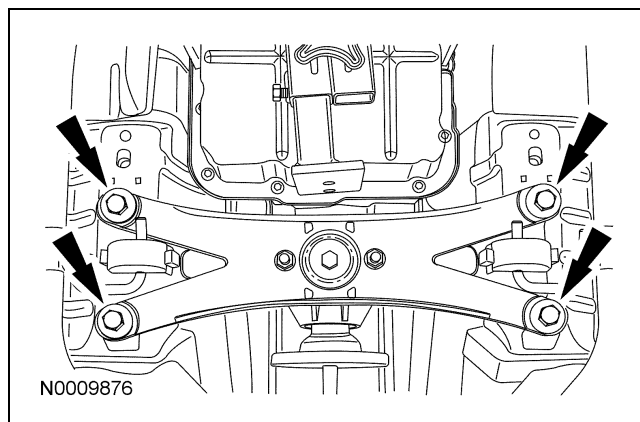


4. Connect the digital TR sensor connector.



5. Install the transmission crossmember-to-floor pan screws.

- Tighten to 63 Nm (46 lb-ft).

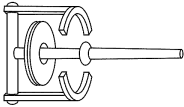
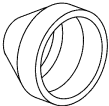


6. Verify that the shift cable is adjusted correctly. For additional information, refer to Section 307-05.

DISASSEMBLY AND ASSEMBLY
OF SUBASSEMBLIES

Direct Clutch Drum Assembly

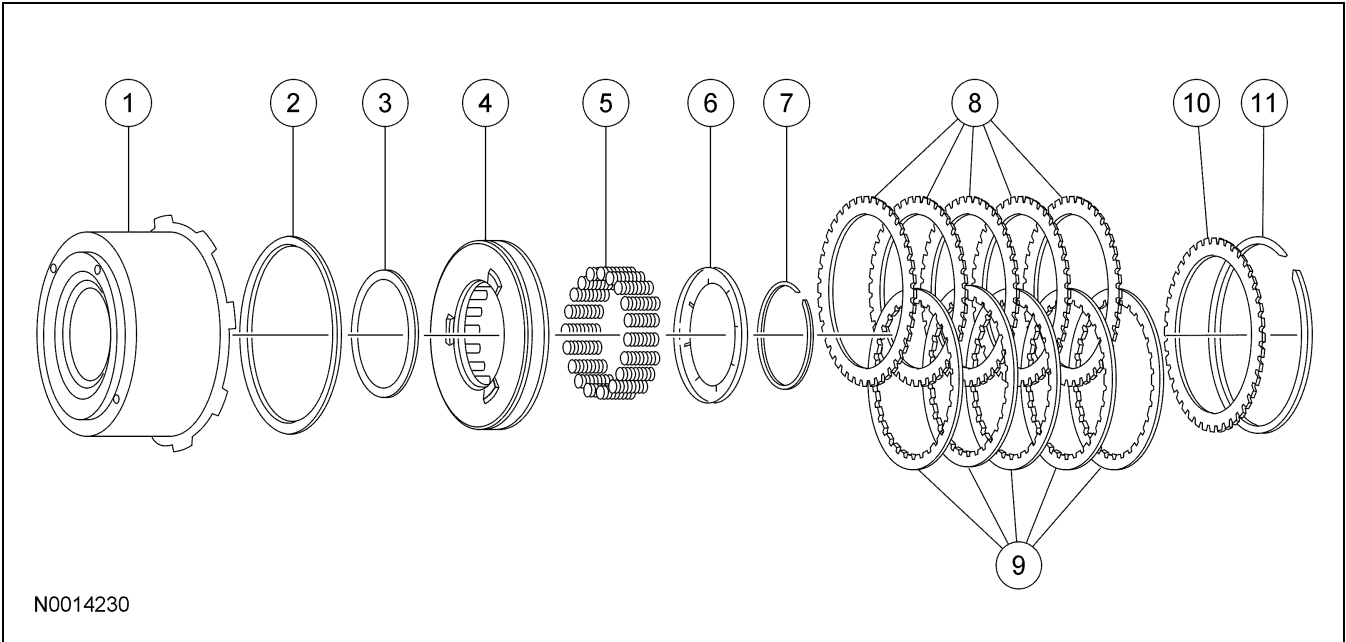
Special Tool(s)

 ST1190-A	Compressor, Clutch Spring 307-015 (T65L-77515-A)
 ST2431-A	Protector, Piston Seal 307-049 (T74P-77404-A)

Material

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

Direct Clutch Drum Assembly

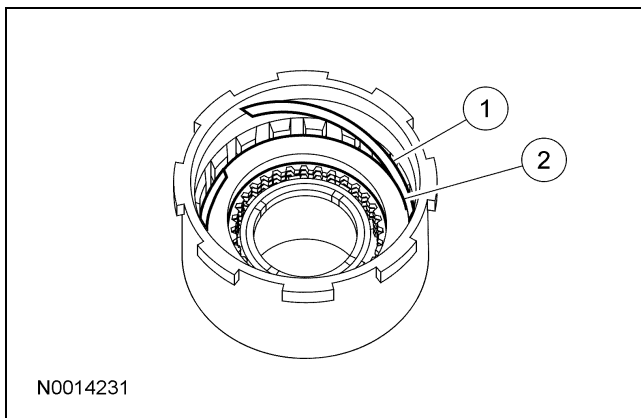


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

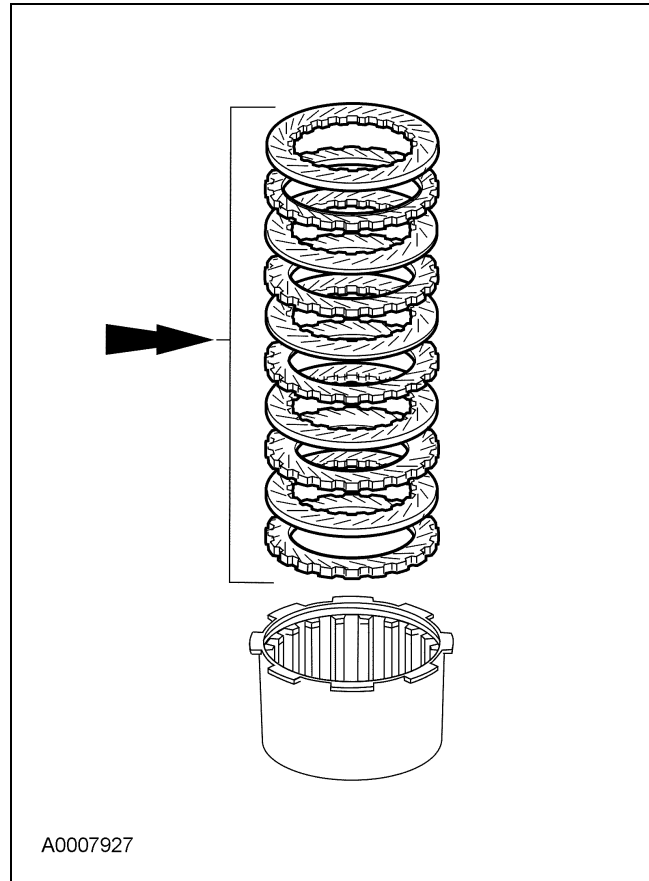
Item	Part Number	Description
1	7D044	Intermediate brake drum assembly
2	7A548	Direct piston outer seal ring
3	7D404	Direct piston inner seal ring
4	7A262	Direct clutch piston
5	7A480	Direct piston spring (20 required)
6	7A527	Direct clutch piston spring retainer
7	E860125-S	Retaining ring
8	7B442	Direct clutch external spline plates
9	7B164	Direct clutch internal spline plates
10	7B066	Direct clutch pressure plate
11	E860126S/129S	Retaining ring (select fit)

Disassembly

1. Remove the direct clutch retaining ring and the direct clutch pressure plate.
 - 1 Remove the direct clutch retaining ring.
 - 2 Remove the direct clutch pressure plate.



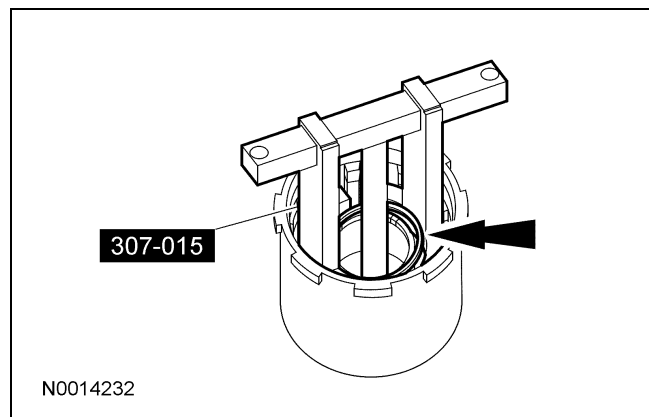
2. Remove the direct clutch disc pack.
 - Inspect and install new friction plates if worn, damaged or overheated.



3. **⚠ WARNING:** After removing the retaining ring, use care when releasing the pressure on the springs. Failure to follow these instructions may result in personal injury.

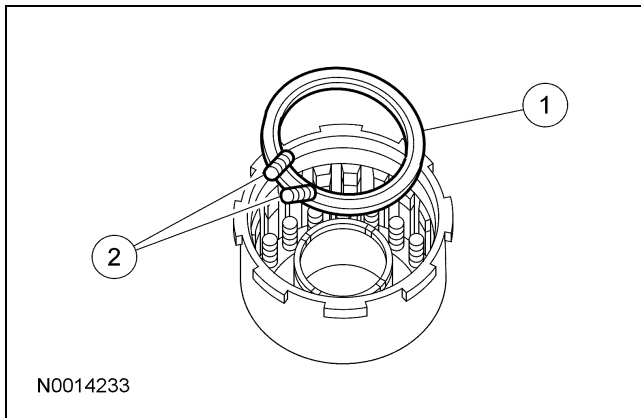
⚠ CAUTION: Do not fully compress the special tool or damage to the spring retainer may occur.

Using the special tool, remove the direct clutch piston retaining ring.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

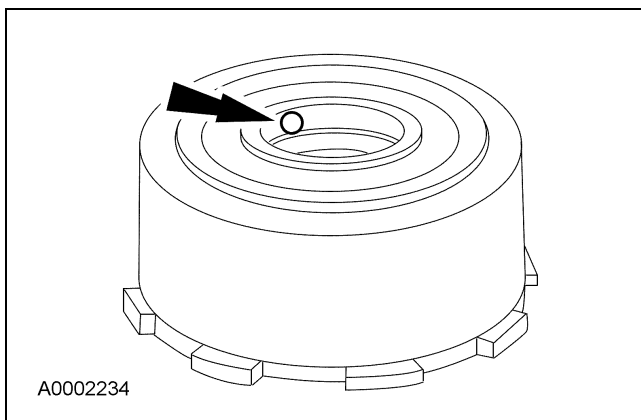
4. Relieve the direct clutch spring tension and remove the special tool.
5. Remove the direct clutch piston spring retainer and the direct clutch piston springs.
 - 1 Remove the direct clutch piston spring retainer.
 - 2 Remove the direct clutch piston springs.



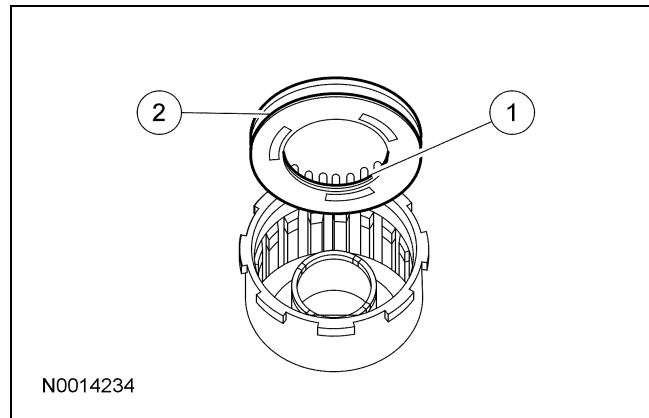
6. **⚠ WARNING: Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air, and make sure the drum is facing down as shown. Failure to follow these instructions may result in personal injury.**

Using compressed air, remove the direct clutch piston from the direct clutch drum.

- Apply air pressure to the hole in the drum while blocking the other hole with a finger.



7. Remove and discard the direct clutch piston inner and outer seal.
 - 1 Remove and discard the direct clutch piston inner seal.
 - 2 Remove and discard the direct clutch piston outer seal.
 - Clean the components as necessary.

**Assembly**

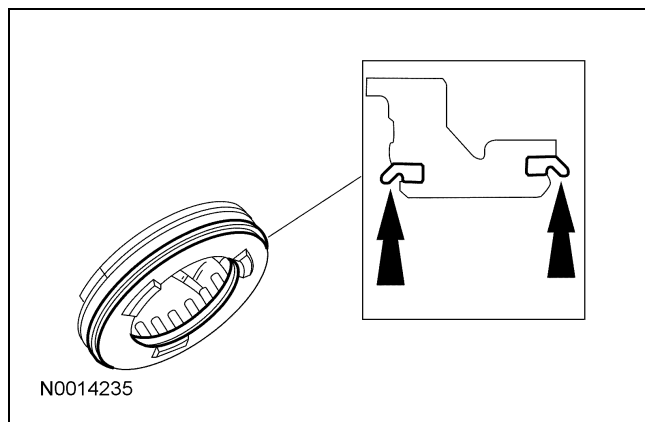
1. Inspect the clutch components for damage or wear. Install new components as necessary.
 - Inspect the drum surface for damage.
 - Inspect the clutch piston bore and piston.
 - Check the fluid passages for obstructions. All fluid passages must be clean and free of obstructions.
 - Inspect the clutch plates for damage.
 - Inspect the clutch springs.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

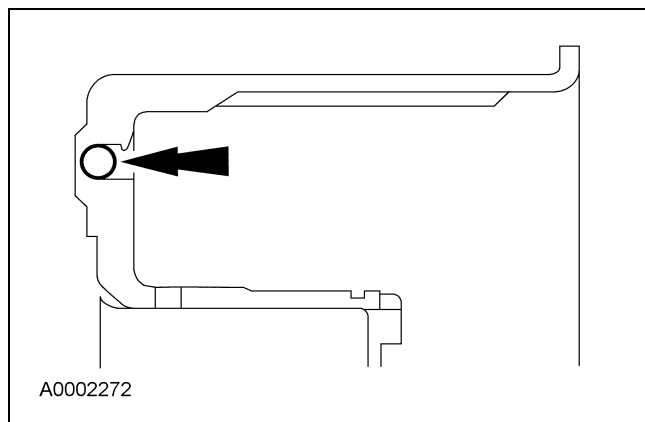
2.  **CAUTION:** The lip seals must be positioned as shown. Care must be taken to prevent rollover of the lip seal.

NOTE: Use new seals to help prevent seal failures.

Install the new direct clutch piston inner seal and the direct clutch piston outer seal.



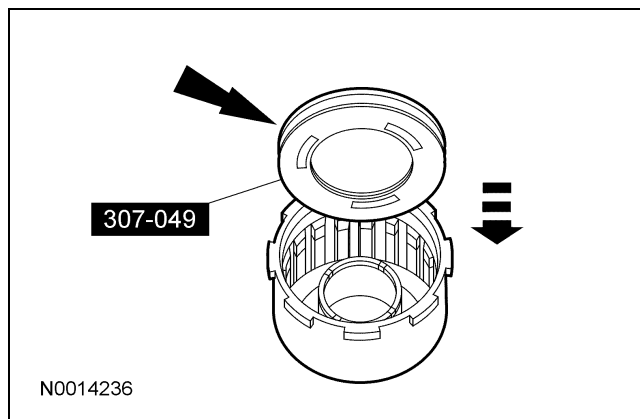
3. Verify the check ball is free to move.



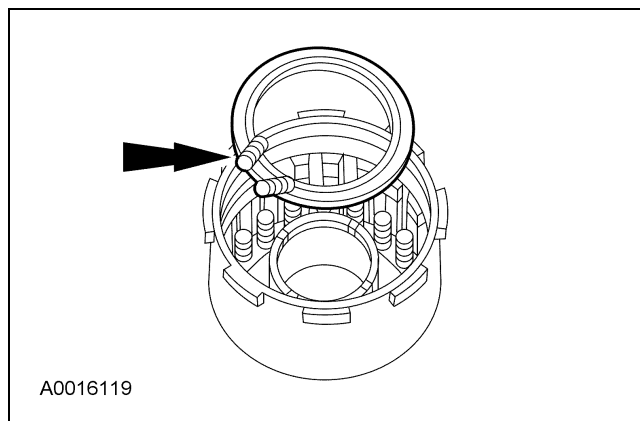
4.  **CAUTION:** Care must be taken to prevent damage to the seals during installation.

Using the special tool, install the direct clutch piston.

- Lubricate the seals with transmission fluid before installing.



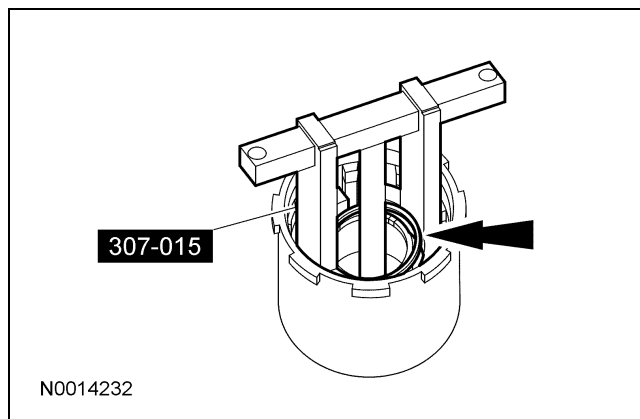
5. Install the direct clutch piston springs and the retainer.



6.  **WARNING:** After removing the retaining ring, use care when releasing the pressure on the springs. Failure to follow these instructions may result in personal injury.

 **CAUTION:** Do not fully compress the special tool or damage to the spring retainer may occur.

Using the special tool, install the direct clutch piston retaining ring.

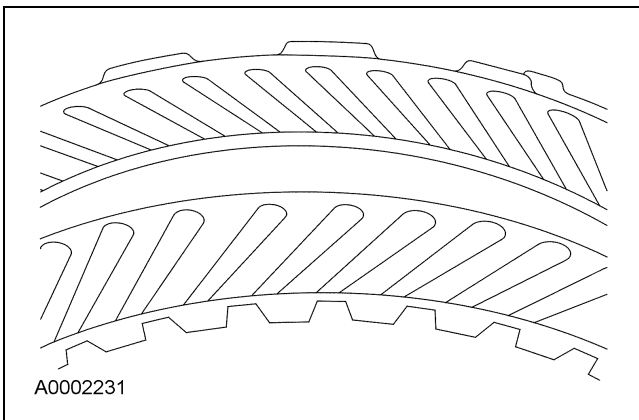


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

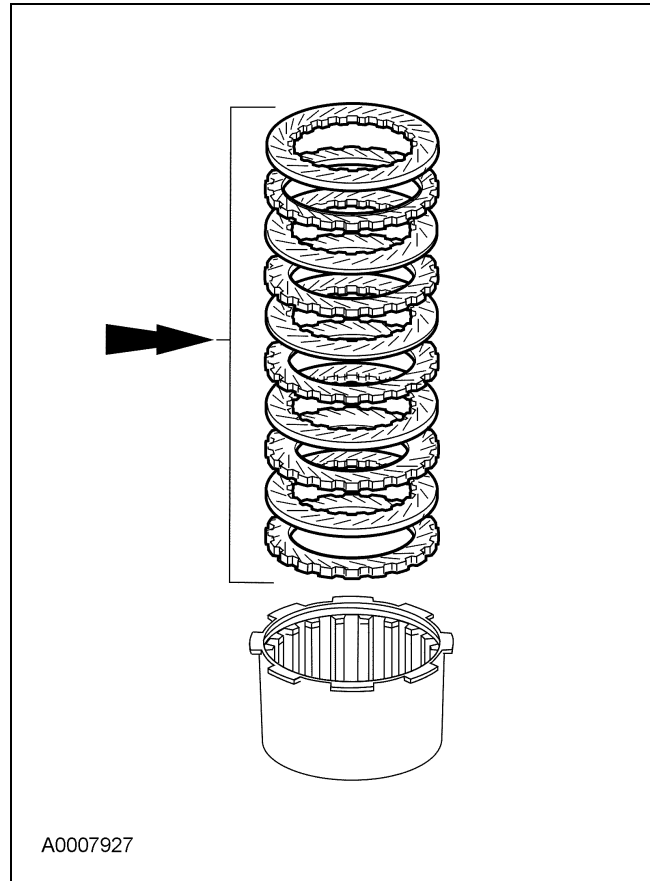
7.  **CAUTION:** The direct clutch friction plates are directional and must be installed correctly. Alternate the internally splined (clockwise) and the externally splined (counterclockwise) clutch plates.

 **CAUTION:** If new plates are used, they should be soaked in clean automatic transmission fluid before assembly.

When installing friction plates, alternate the internally splined (clockwise) and the externally splined (counterclockwise) clutch plates. Install the direct clutch disc pack.

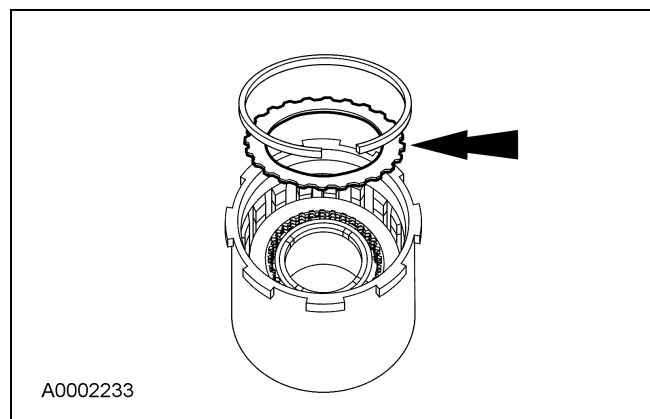


8. Install the friction plates alternating the internally splined (clockwise) and the externally splined (counterclockwise) clutch plates starting with an externally splined (counterclockwise) clutch plate.



9.  **CAUTION:** The retaining ring is a select fit.

Install the direct clutch pressure plate using the original direct clutch retaining ring.

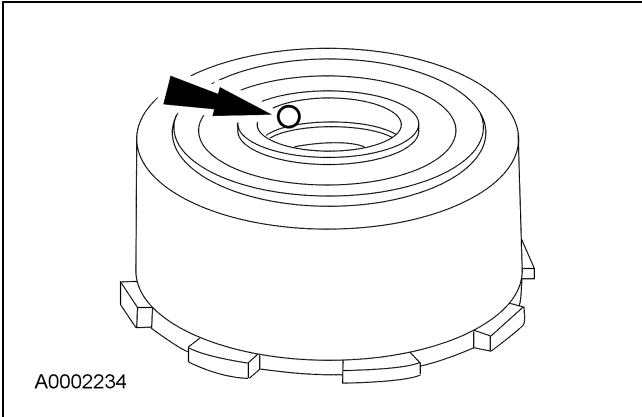


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

10. ⚠ **WARNING:** Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air, and make sure drum is facing down as shown. Failure to follow these instructions may result in personal injury.

Air check the assembly.

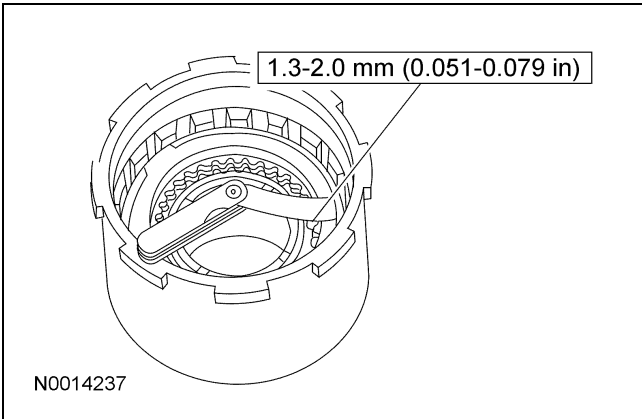
- Apply air pressure to the hole in the drum while blocking the other hole with a finger.



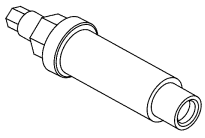
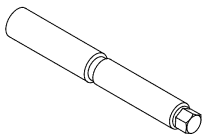
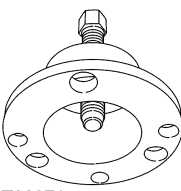
11. Push down on the direct clutch disc pack and check the gap between the direct clutch retaining ring and the direct clutch pressure plate with a feeler gauge.
- If the specifications do not match, use a select fit direct clutch retaining ring to match specifications and verify with a feeler gauge.

Direct Clutch

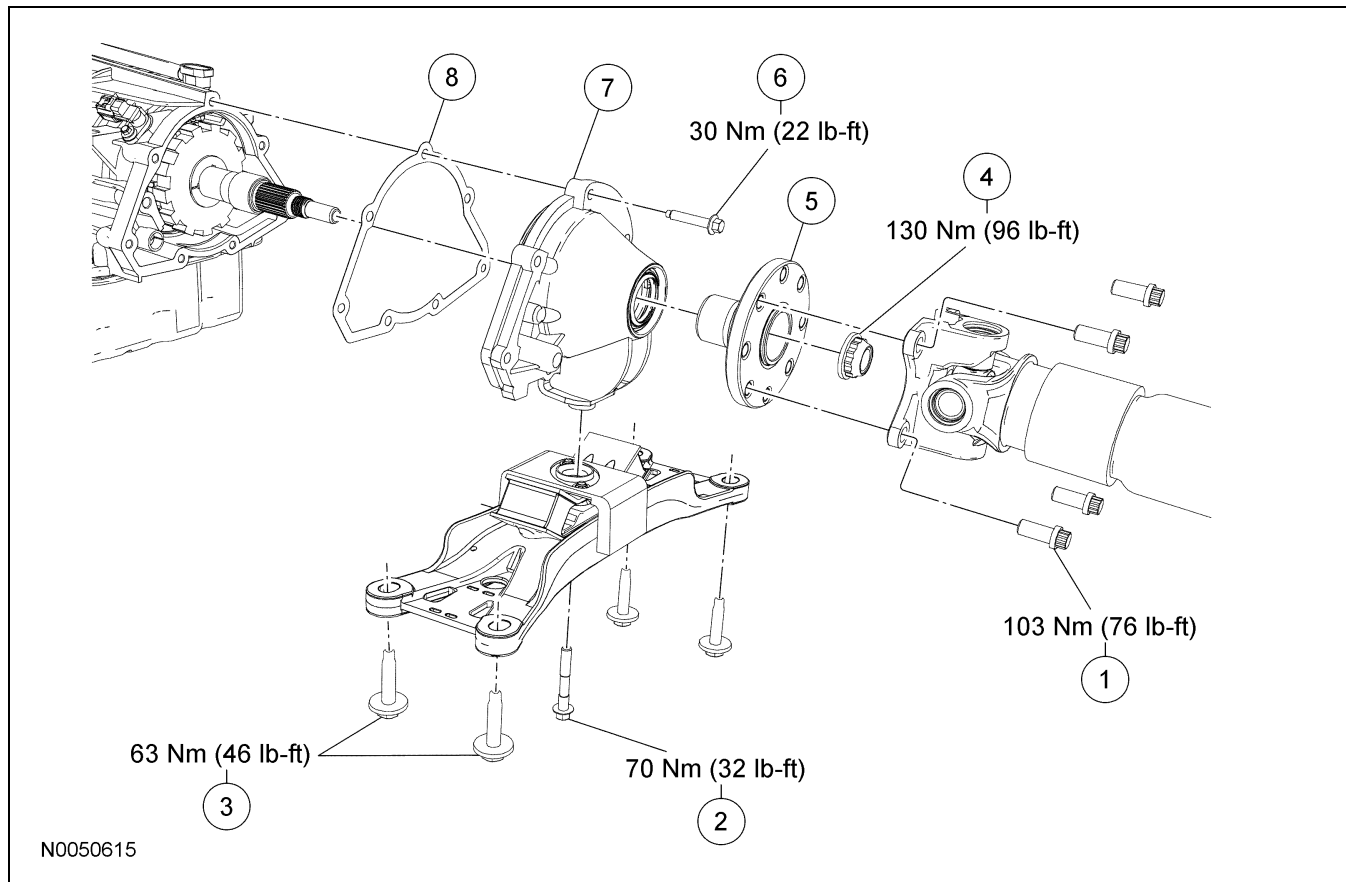
Part Number	Thickness		Diameter	
	mm	In	mm	In
E860126-S	1.37	0.0539	130.1	5.122
E860127-S	1.73	0.0681	130.1	5.122
E860128-S	2.08	0.0819	130.1	5.122
E860129-S	2.44	0.0961	130.1	5.122



IN-VEHICLE REPAIR**Extension Housing Gasket****Special Tool(s)**

 ST2440-A	Installer, Drive Pinion Flange 205-479
 ST2416-A	Installer, Output Shaft Flange 307-404
 ST2937A	Remover, Output Shaft Flange 307-523

IN-VEHICLE REPAIR (Continued)

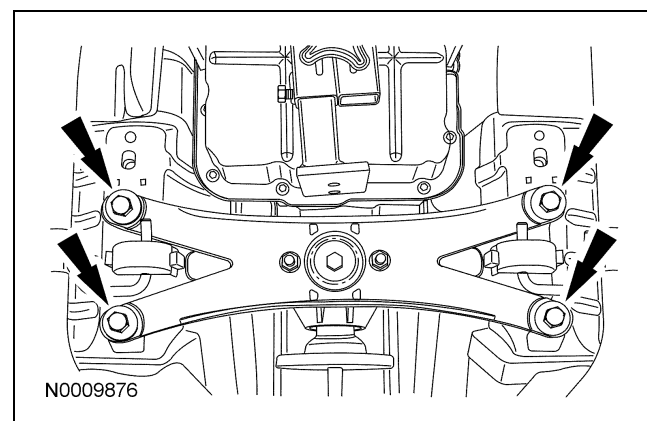


Item	Part Number	Description
1	W701357	Transmission output shaft flange coupler bolt (4 required)
2	W705966	Transmission insulator-to-extension housing center screw
3	W704971	Transmission crossmember-to-floor pan screws
4	W701357	Transmission output shaft flange nut
5	7089	Transmission output shaft flange
6	W500311	Extension housing-to-case screw
7	7A039	Extension housing
8	7086	Extension housing gasket

Removal

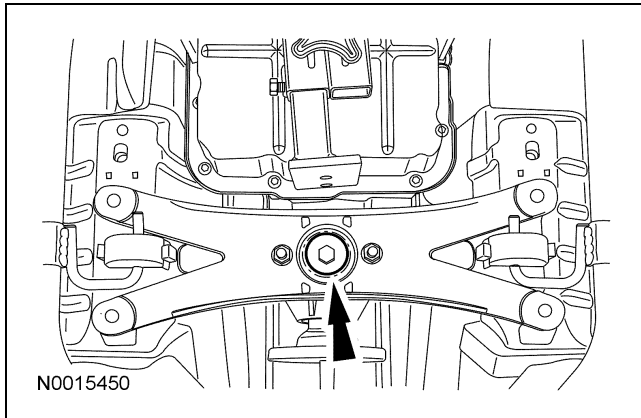
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

2. Remove the driveshaft. For additional information, refer to Section 205-01.
3. Remove the catalytic converter assembly. For additional information, refer to Section 309-00.
4. **NOTE:** Use a suitable transmission jack to support the transmission. Remove the 4 transmission crossmember-to-floor pan screws.

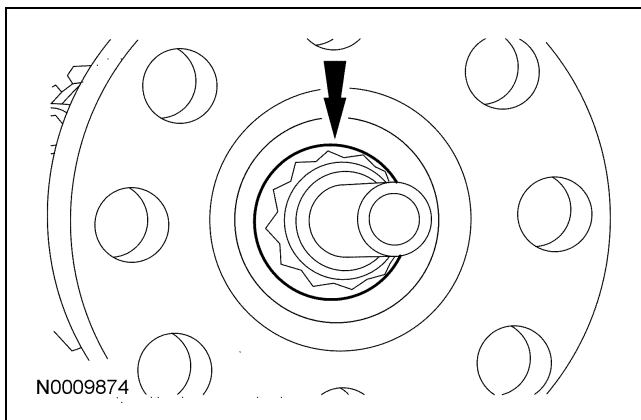


IN-VEHICLE REPAIR (Continued)

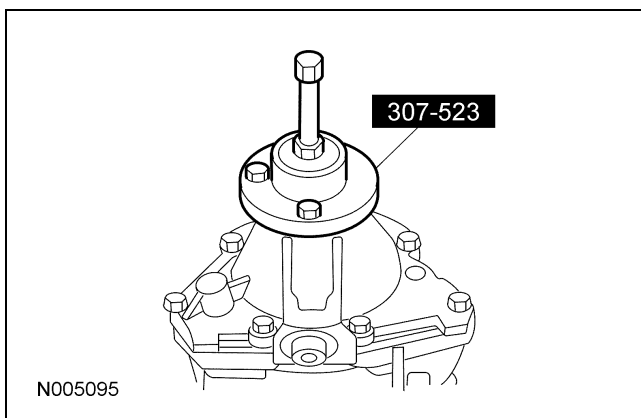
5. Remove the transmission insulator-to-extension housing center screw and remove the transmission crossmember.



6. Remove and discard the nut.

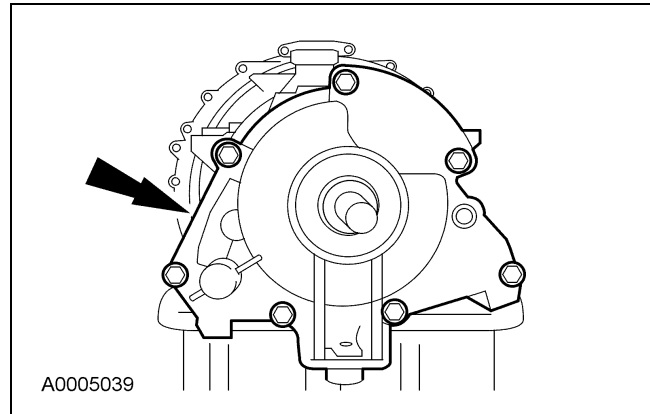


7. Using the special tool, remove the output shaft flange.

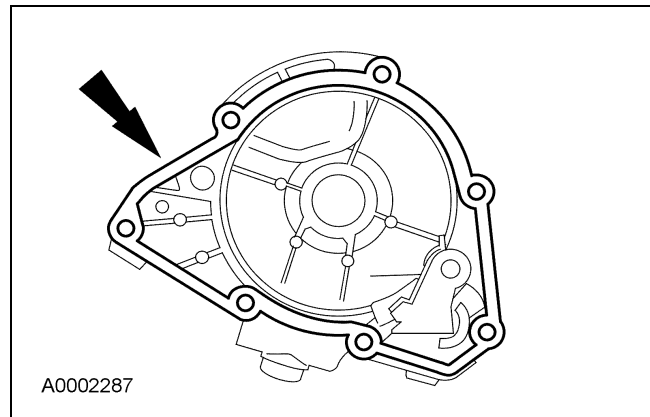


8.  **CAUTION:** The parking pawl, parking pawl return and parking pawl shaft could fall out during removal of the extension housing.

Remove the 7 extension housing screws and the extension housing.

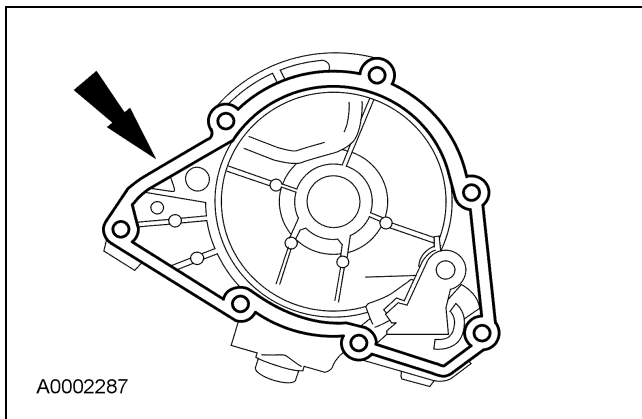


9. Remove and discard the extension housing gasket.



IN-VEHICLE REPAIR (Continued)**Installation**

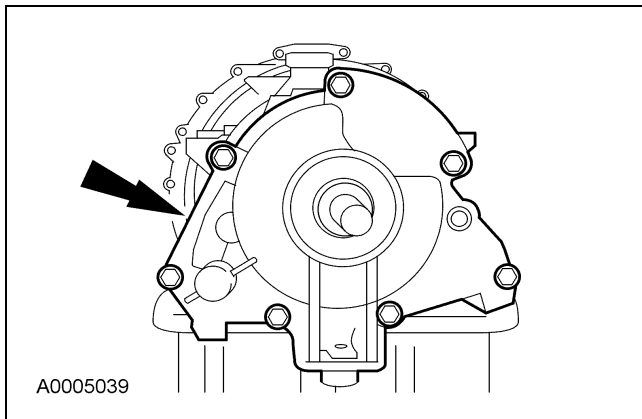
1. Clean the extension housing and install a new extension housing gasket. Make sure the park pawl is installed correctly.



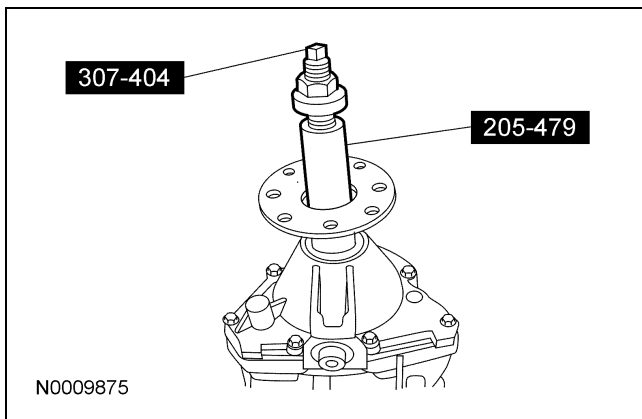
2.  **CAUTION:** Make sure the parking lever actuating rod is correctly seated into the case parking rod guide cup.

Install the extension housing and screws.

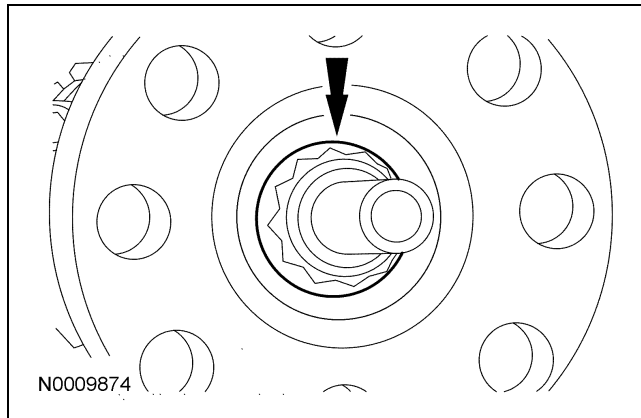
- Tighten to 30 Nm (22 lb-ft).



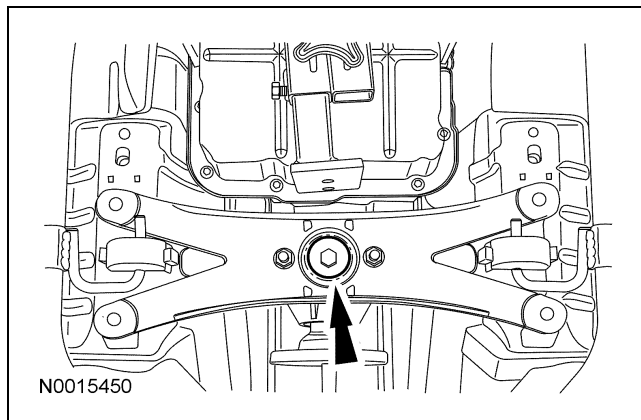
3. Using the special tools, install the output flange.



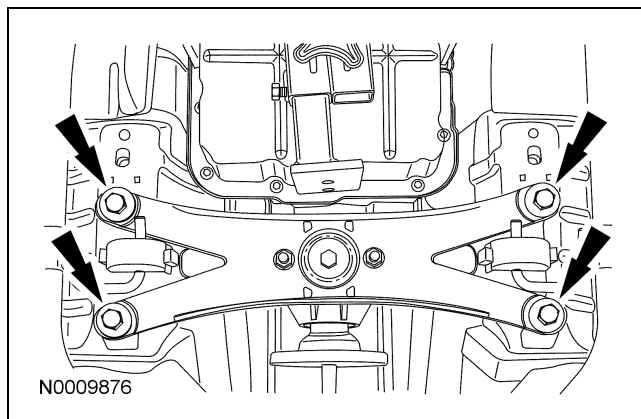
4. Install a new nut.
 - Tighten to 130 Nm (96 lb-ft).



5. Loosely install the transmission insulator-to-extension housing center screw.



6. Position the transmission crossmember in the vehicle and loosely install the transmission crossmember-to-floor pan screws.



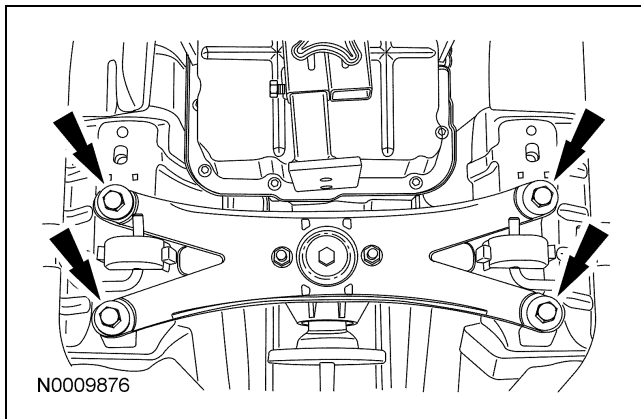
IN-VEHICLE REPAIR (Continued)

7. **NOTE:** The transmission support insulator must be neutralized.

Slide the transmission support insulator forward, rearward and side-to-side until the gaps between the transmission support insulator snubber and crossmember are equal.

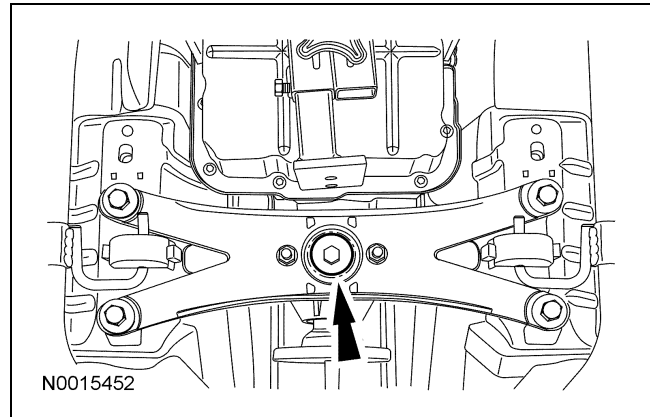
8. With the transmission support insulator neutralized, tighten the transmission crossmember-to-floor pan screws.

- Tighten to 63 Nm (46 lb-ft).



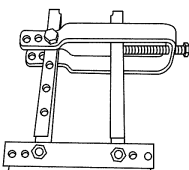
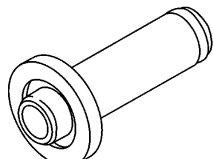
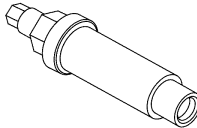
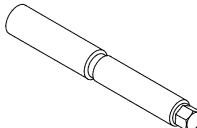
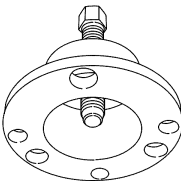
9. With the transmission support insulator neutralized, tighten the transmission insulator-to-extension housing center screw.

- Tighten to 70 Nm (52 lb-ft).

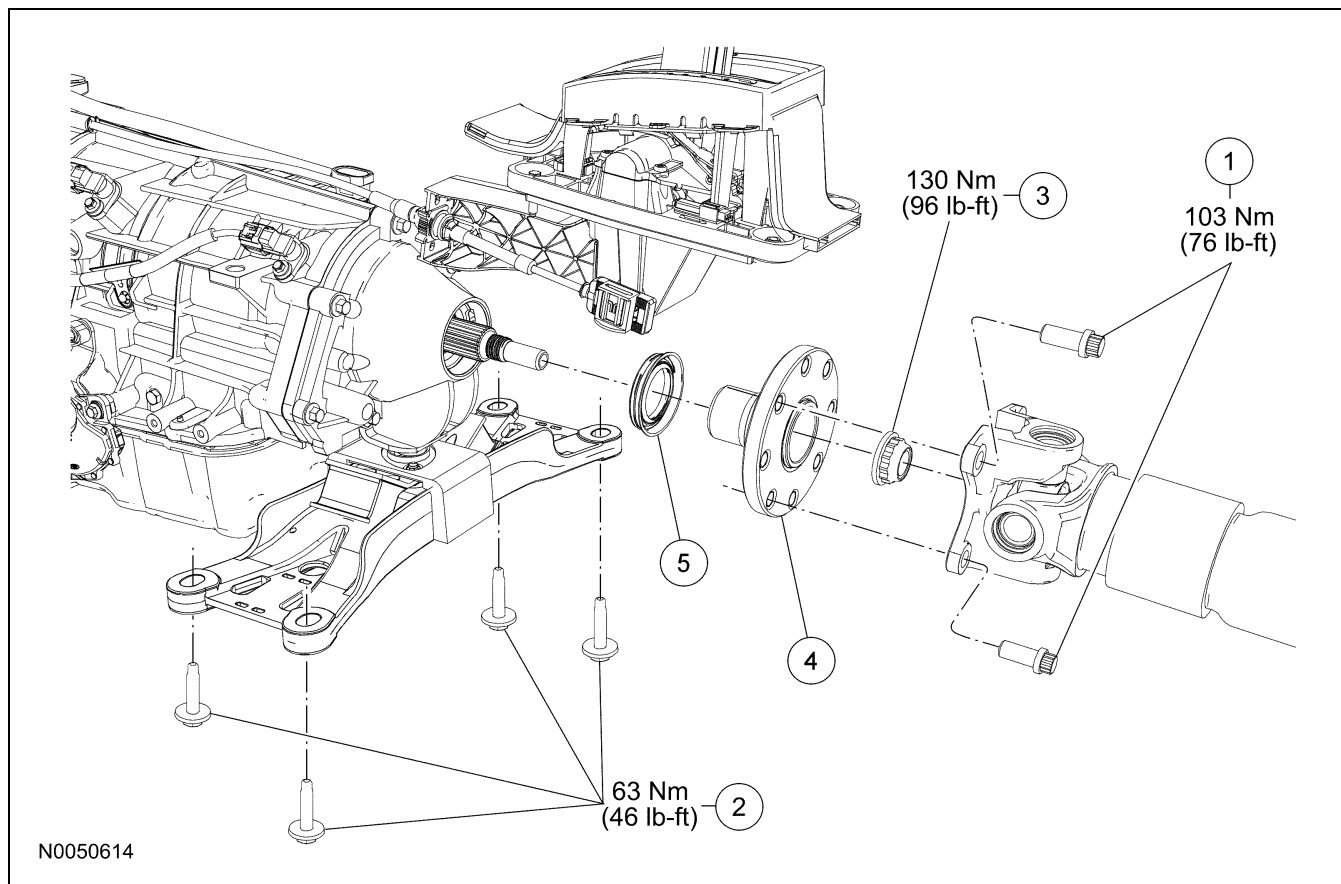


10. Install the catalytic converter assembly. For additional information, refer to Section 309-00.
11. Install the driveshaft. For additional information, refer to Section 205-01.
12. Check the transmission fluid level. For additional information, refer to Transmission Fluid Level Check in this section.

IN-VEHICLE REPAIR**Extension Housing Seal****Special Tool(s)**

 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST1758-A	Remover, Torque Converter Fluid Seal 307-309 (T94P-77001-BH)
 ST2498-A	Installer, Drive Pinion Oil Seal 205-115
 ST2440-A	Installer, Drive Pinion Flange 205-479
 ST2416-A	Installer, Output Shaft Flange 307-404
 ST2937A	Remover, Output Shaft Flange 307-523

IN-VEHICLE REPAIR (Continued)

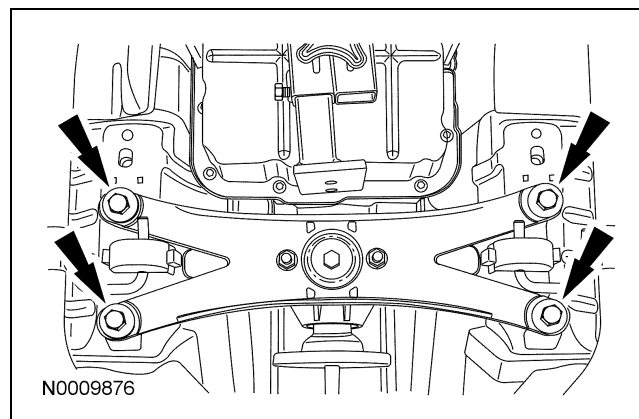


Item	Part Number	Description
1	W701357	Transmission output shaft flange coupler bolts (4 required)
2	W704971	Transmission crossmember-to-floor pan screws
3	W701357	Transmission output shaft flange nut
4	7089	Transmission output shaft flange
5	7052	Extension housing seal

Removal

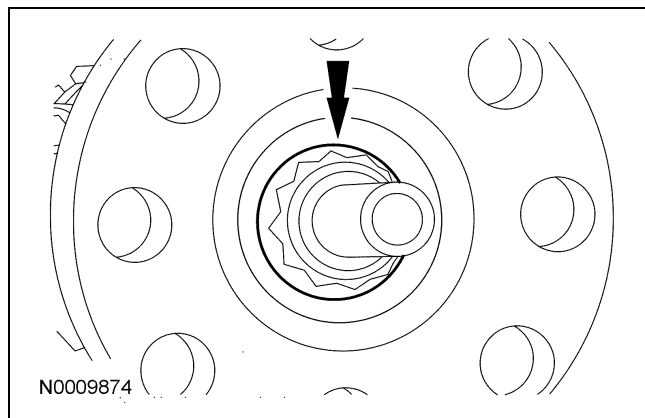
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the driveshaft. For additional information, refer to Section 205-01.

3. Using a suitable transmission jack, support the transmission.
4. Remove the 4 transmission crossmember-to-floor pan screws only and lower the transmission enough to gain access to the extension housing seal.

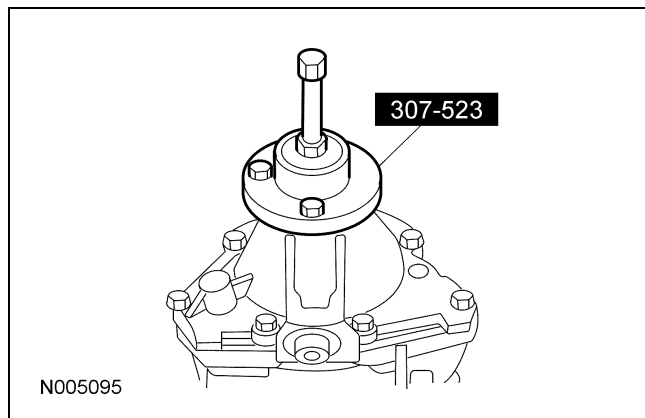


IN-VEHICLE REPAIR (Continued)

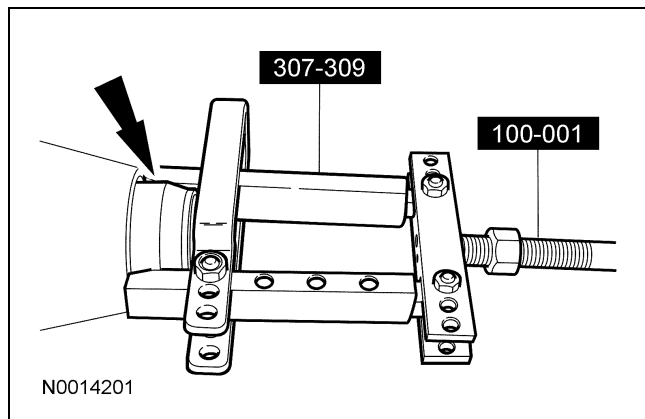
5. Remove and discard the nut.



6. Using the special tool, remove the output shaft flange.

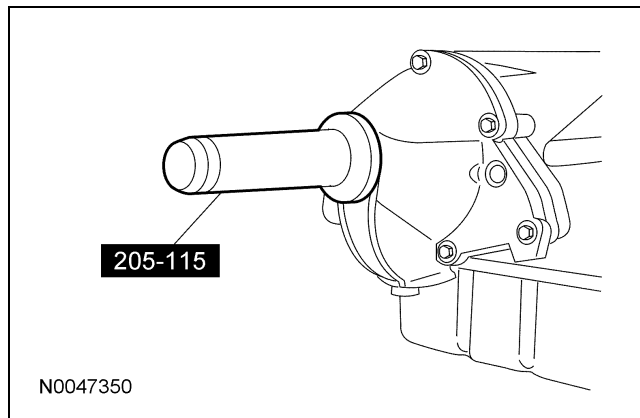


7. Using the special tools, remove and discard the extension housing seal.

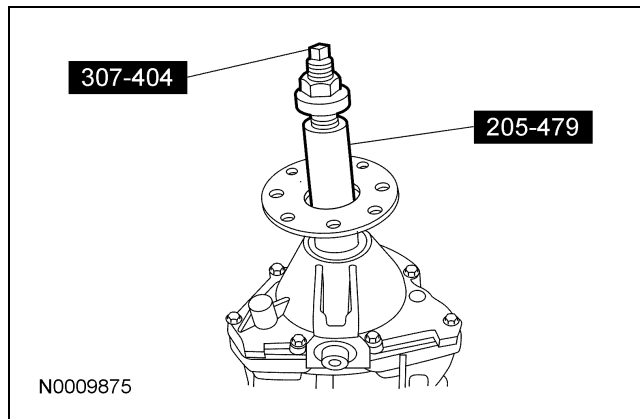
**Installation**

1. **NOTE:** Make sure the extension housing seal is correctly installed onto the special tool and the garter spring is in the correct position.

Using the special tool, install the new extension housing seal.

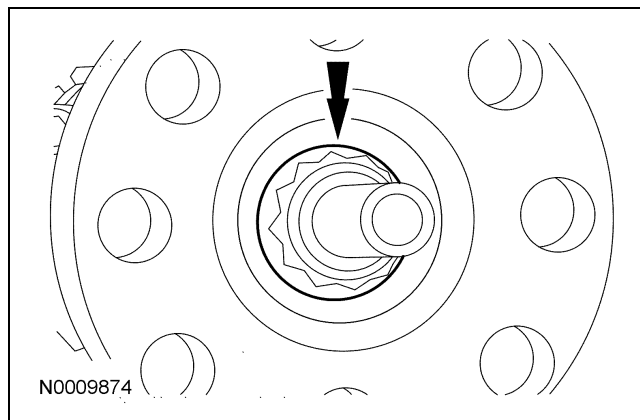


2. Using the special tools, install the output flange.



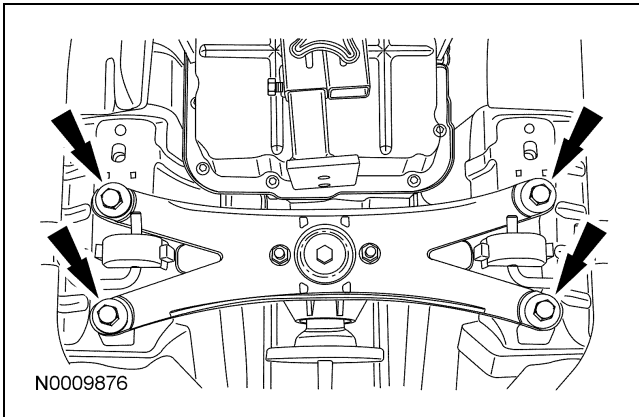
3. Install a new nut.

- Tighten to 130 Nm (96 lb-ft).



IN-VEHICLE REPAIR (Continued)

4. Install the 4 transmission crossmember-to-floor pan screws only.
 - Tighten to 63 Nm (46 lb-ft).

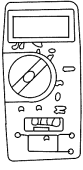


5. Install the driveshaft. For additional information, refer to Section 205-01.
6. Check the transmission fluid level. For additional information, refer to Transmission Fluid Level Check in this section.

DIAGNOSIS AND TESTING

External Controls

Special Tool(s)

 ST1137-A	73 Digital Multimeter 105-R0051 or equivalent
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Inspection and Verification

1. Verify the customer concern by operating the transmission external control.
2. Visually inspect for obvious signs of mechanical and electrical damage; refer to the following chart:
3. If the concern is not visually evident, determine the symptom. GO to [Symptom Chart](#).

Visual Inspection Chart

Mechanical	Electrical
• Shift control linkage binding • Shift interlock actuator • Selector lever cable • Interlock cable	• Circuitry • Central junction box (CJB) fuses: — 17 (15A) — 28 (15A) — 35 (15A) • Brake pedal position (BPP) switch • Wiring harness • Loose or corroded connections • LED

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
• The shift interlock system does not release/lock correctly	• Circuitry • CJB fuse 17 (15A) or fuse 35 (15A) • Shift interlock actuator • Brake pedal position (BPP) switch	• GO to Pinpoint Test A.
• The shift control is out of correct gear relationship	• Transmission selector lever cable and bracket • Retainer bracket • Shift control linkage out of adjustment	• GO to Pinpoint Test B.
• Transmission range indicator does not correspond to the gear	• Transmission selector lever cable bracket • Shift linkage	• TIGHTEN the bolts holding the transmission selector lever cable bracket. • VERIFY digital transmission range (TR) sensor range for correct adjustment. REFER to Section 307-01.
• The transmission control (TC) switch is inoperative	• CJB fuse 28 (15A) • TC switch • TC switch not cycled during self-test • Powertrain control module (PCM) • Circuitry	• GO to Pinpoint Test C.
• The transmission control indicator lamp (TCIL) is not operating correctly	• LED • Instrument cluster • PCM	• REFER to Section 413-01.

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

Condition	Possible Sources	Action
Excessive shift effort	- Transmission selector lever cable - Cable bracket	- INSTALL a new transmission selector lever cable. - ADJUST the cable. - TIGHTEN the screws.
Transmission selector lever will not shift	- Transmission selector lever cable - Broken transmission selector level cable	- INSTALL a new transmission selector lever cable. - INSTALL a new transmission selector lever cable.

Pinpoint Tests

Refer to Wiring Diagrams Cell 37, Shift Lock for schematic and connector information.

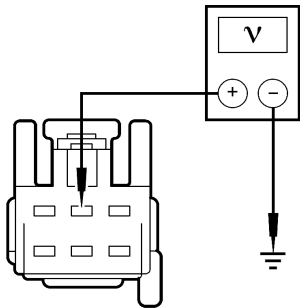
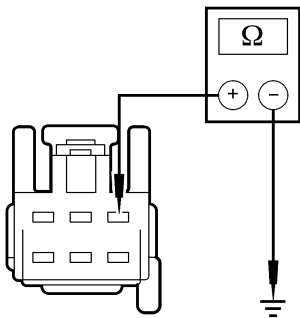
Refer to Wiring Diagrams Cell 29, Transmission Control for schematic and connector information.

PINPOINT TEST A: THE SHIFT INTERLOCK SYSTEM DOES NOT RELEASE/LOCK CORRECTLY

Test Step		Result / Action to Take
A1	TEST THE BRAKE LIGHTS	Yes GO to A2 . No REFER to Section 417-01.
	- Key in ON position. - Apply the brake pedal and observe the stoplamps. Do the stoplamps illuminate?	
A2	CHECK CIRCUIT 511 (LG) FOR AN OPEN	Yes GO to A3 . No REPAIR the circuit. TEST the system for normal operation.
	- Key in OFF position. - Disconnect: Selector Lever C307. - Measure the voltage between selector lever C307-3, circuit 511 (LG), harness side, and ground while depressing and releasing the brake pedal. N0050538 Is the voltage greater than 10 volts with the brake pedal depressed and 0 volts with the brake pedal released?	
A3	CHECK CIRCUIT 294 (WH/LB) FOR AN OPEN	
	Key in ON position.	

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST A: THE SHIFT INTERLOCK SYSTEM DOES NOT RELEASE/LOCK CORRECTLY (Continued)**

Test Step		Result / Action to Take
A3	CHECK CIRCUIT 294 (WH/LB) FOR AN OPEN (Continued)	
	- Measure the voltage between selector lever C307-2, circuit 294 (WH/LB), harness side, and ground.  N0050539 - Is the voltage greater than 10 volts?	Yes GO to A4. No REPAIR the circuit. TEST the system for normal operation.
A4	TEST CIRCUIT 1205 (BK) FOR AN OPEN	
	- Measure the resistance between selector lever C307-1, circuit 1205 (BK), harness side, and ground.  N0050540 - Is the resistance less than 5 ohms?	Yes INSTALL a new selector lever assembly. REFER to Selector Lever. TEST the system for normal operation. No REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST B: THE SHIFT CONTROL IS OUT OF CORRECT GEAR RELATIONSHIP

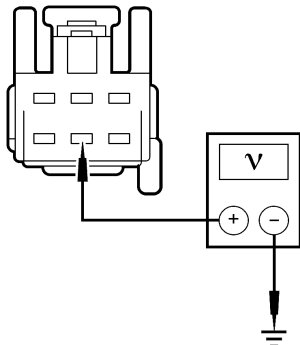
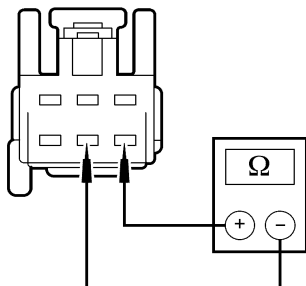
Test Step		Result / Action to Take
B1	CHECK THE SHIFT CONTROL LINKAGE	
	- Key in ON position. - Apply the brake pedal. - Actuate the transmission selector lever in all ranges. - Observe the shift control linkage during operation. - Is the shift control linkage OK?	Yes GO to B2. No REPAIR as necessary. TEST the system for normal operation.
B2	CHECK THE TRANSMISSION SHIFT CABLE	
	- Check the transmission selector lever cable and bracket installation and tightness. - Is the transmission selector lever cable correctly installed and adjusted?	Yes GO to B3. No REPAIR as necessary. TEST the system for normal operation.

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST B: THE SHIFT CONTROL IS OUT OF CORRECT GEAR RELATIONSHIP (Continued)**

Test Step		Result / Action to Take
B3	CHECK THE LINKAGE/CABLE FOR CORRECT GEAR RELATIONSHIP	Yes VERIFY the correct adjustment of the digital transmission range (TR) sensor. REFER to Section 307-01. ADJUST the digital TR sensor if necessary. TEST the system for normal operation. No ADJUST the transmission selector lever cable. REFER to Selector Lever Cable Adjustment. TEST the system for normal operation.
• Apply the brake pedal. • Actuate the transmission selector lever in all ranges. • Does the indicator match the gear selection?		

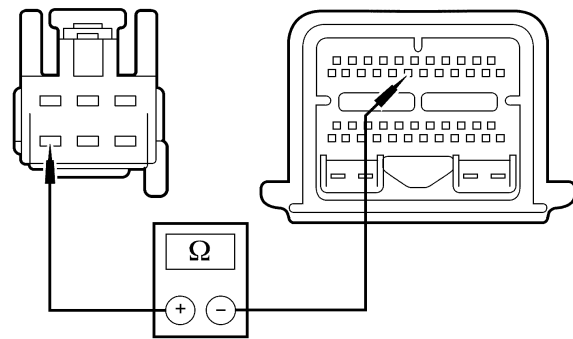
PINPOINT TEST C: THE TRANSMISSION CONTROL (TC) SWITCH IS INOPERATIVE

Test Step		Result / Action to Take
C1	CHECK THE VOLTAGE TO THE TRANSMISSION CONTROL (TC) SWITCH	Yes GO to C2. No REPAIR the circuit. TEST the system for normal operation.
- Key in OFF position. - Disconnect: Selector Lever C307. - Key in ON position. - Measure the voltage between selector lever C307-5, circuit 911 (WH/LG), harness side, and ground.  N0050541 - Is the voltage greater than 10 volts?		
C2	CHECK THE TC SWITCH	Yes GO to C3. No INSTALL a new TC switch. Test the system for normal operation.
- Measure the resistance between selector lever C307-5 and C307-6, component side, while depressing and releasing the TC switch.  N0051230 - Is the resistance less than 5 ohms with the TC switch depressed and greater than 10,000 ohms with the TC switch released?		

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: THE TRANSMISSION CONTROL (TC) SWITCH IS INOPERATIVE (Continued)

Test Step		Result / Action to Take
C3	CHECK CIRCUIT 224 (TN/WH) FOR AN OPEN - Key in OFF position. - Disconnect: Powertrain Control Module (PCM) C175T. - Measure the resistance between selector lever C307-4, circuit 224 (TN/WH), harness side and PCM C175T-18, circuit 224 (TN/WH), harness side.  N0052238 - Is the resistance less than 5 ohms?	Yes REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual. No REPAIR the circuit. TEST the system for normal operation.

DESCRIPTION AND OPERATION

External Controls

The indicated position of the transmission floor mounted selector lever is transferred to the transmission through the cable and down to the manual control lever on the transmission.

Shift Interlock System

The brake/shift interlock mechanism is used on vehicles equipped with an automatic transmission. This system is used to prevent shifting from PARK unless the brake pedal is depressed. The brake/shift interlock system consists of an actuator attached to the key interlock assembly and necessary wiring. The shift interlock actuator is energized when the ignition switch is turned to the RUN position, locking the floor mounted transmission range selector lever in the PARK position. When the brake pedal is depressed, the shift interlock actuator is deactivated and the floor mounted transmission range selector lever can be moved out of the PARK position.

Transmission Control (TC) Switch

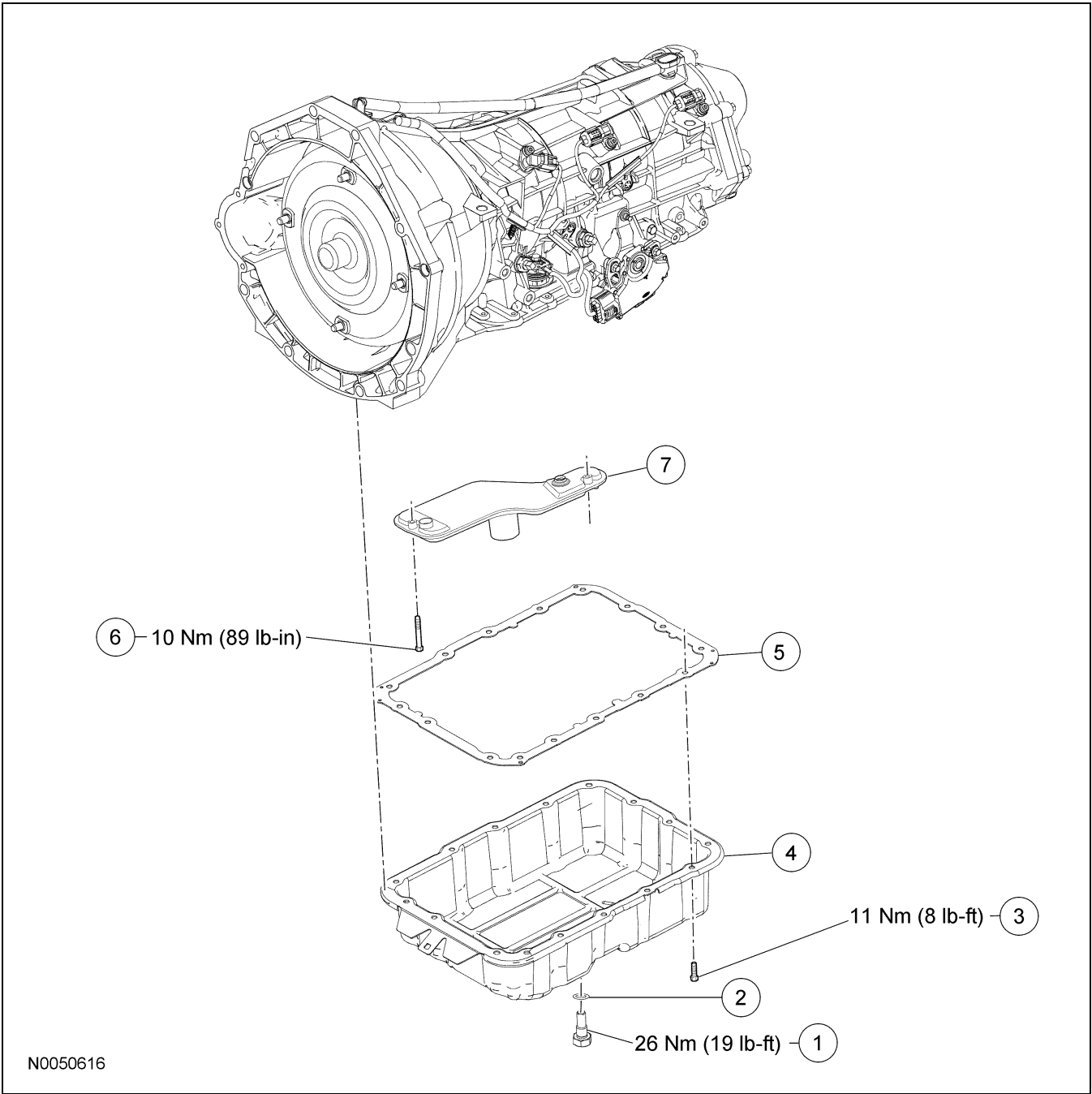
The transmission control (TC) switch is a momentary contact switch that is located on the floor mounted transmission range selector lever. Pushing the TC switch will either disengage or engage the overdrive function of the automatic transmission. If OVERDRIVE is disengaged, the word O/D OFF will illuminate on the instrument cluster.

IN-VEHICLE REPAIR

Fluid Pan, Gasket and Filter

Material

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



IN-VEHICLE REPAIR (Continued)

Item	Part Number	Description
1	7A010	Transmission fluid pan drain plug
2	6734	Transmission fluid pan drain plug gasket
3	W500213	Transmission fluid pan-to-case screw (16 required)
4	7A194	Transmission fluid pan
5	7A191	Transmission fluid pan gasket
6	W705559	Transmission fluid filter screw (2 required)
7	7A098	Transmission fluid filter

Removal

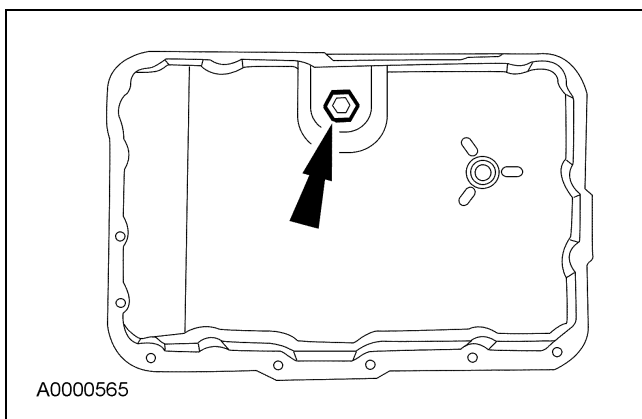
⚠ CAUTION: Lubricate the fluid filter seals with clean automatic transmission fluid or they may be damaged.

NOTE: Make sure that the fluid filter seals are correctly seated on the filter.

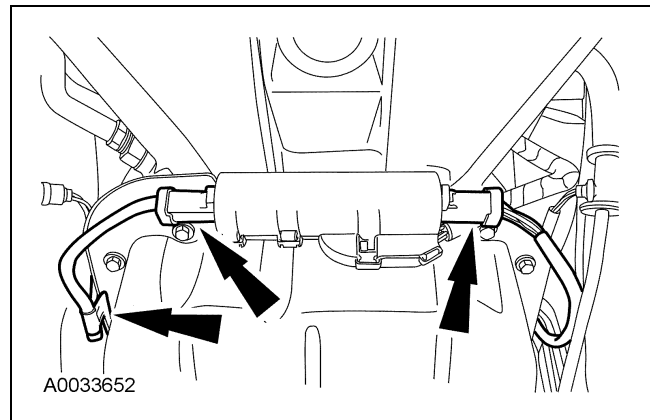
NOTE: The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

NOTE: Install a new transmission fluid filter.

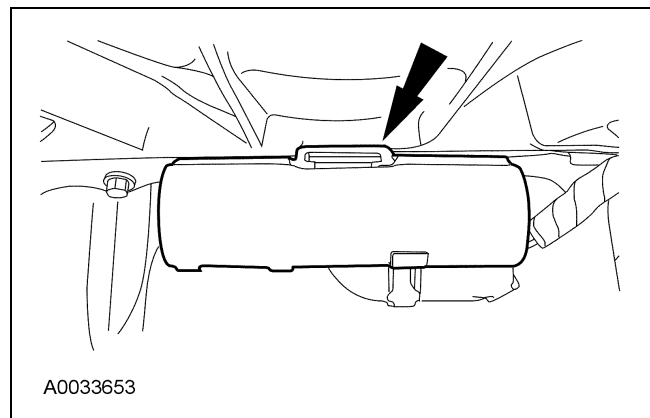
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the drain plug and drain the transmission fluid.
 - Discard the gasket.



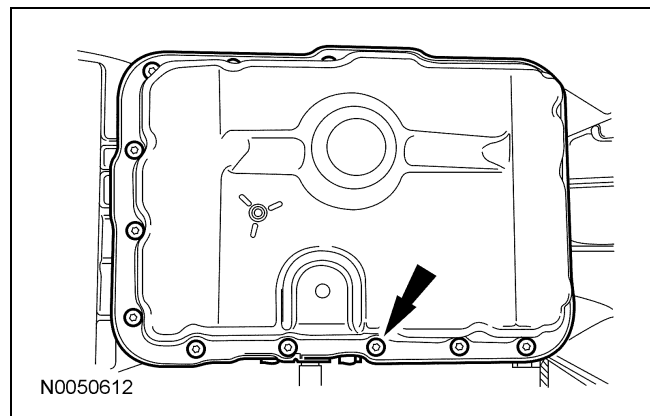
3. Disconnect the heated oxygen sensor (HO2S) connectors and retaining clip from the RH pan rail and then position the connectors aside.



4. Remove the HO2S connector from the front of the transmission pan rail.

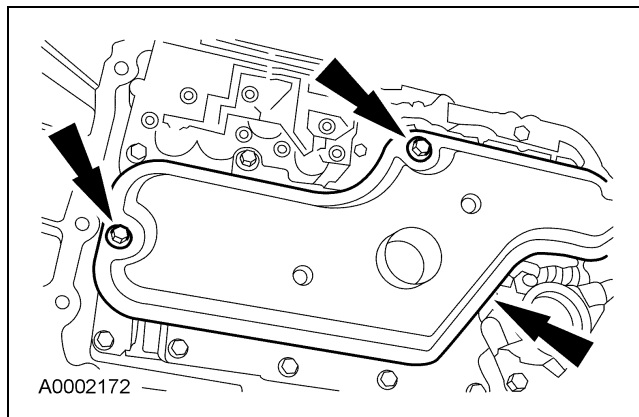
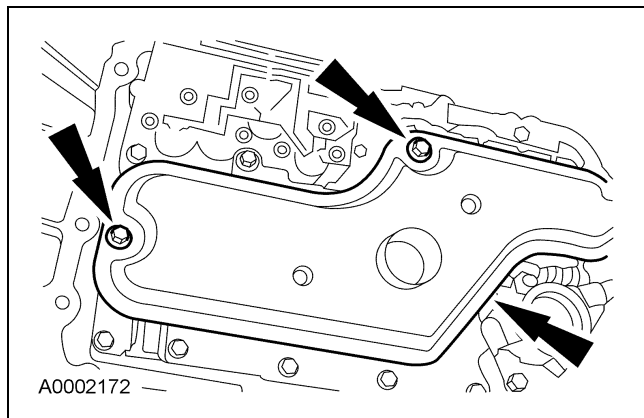


5. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the gasket should be reused.
Remove the transmission fluid pan and gasket.



IN-VEHICLE REPAIR (Continued)

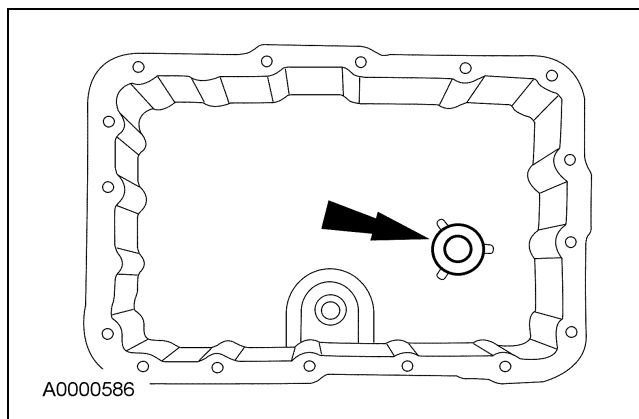
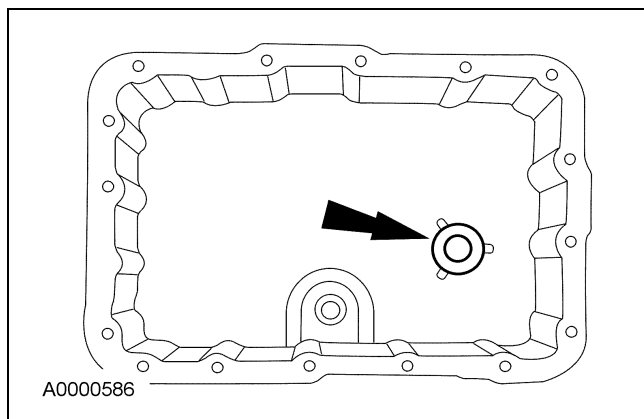
6. Remove and discard the transmission fluid filter.



3. Install the fluid pan magnet in the transmission fluid pan.

Installation

1. Clean and inspect the transmission fluid pan and magnet.



4. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the gasket should be reused.

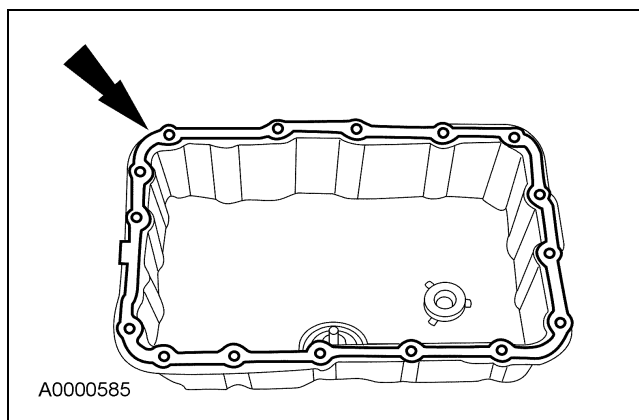
Install the transmission fluid pan and gasket and loosely install the screws.

2. **⚠ CAUTION:** Lubricate the transmission fluid filter O-ring seals with clean automatic transmission fluid or the seals may be damaged.

NOTE: Make sure the transmission fluid filter seals are correctly seated on the filter.

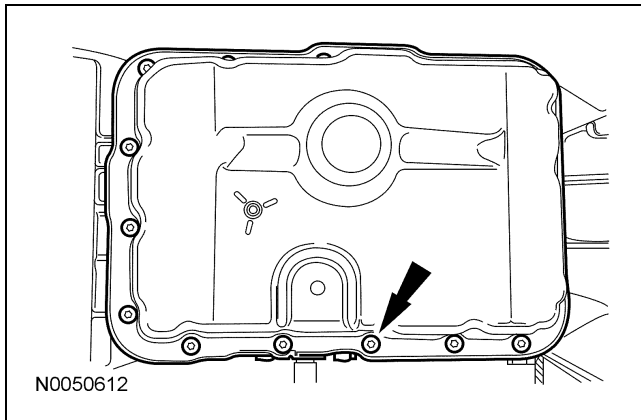
Lubricate the seals and install the transmission fluid filter and screws.

- Tighten to 10 Nm (89 lb-in).

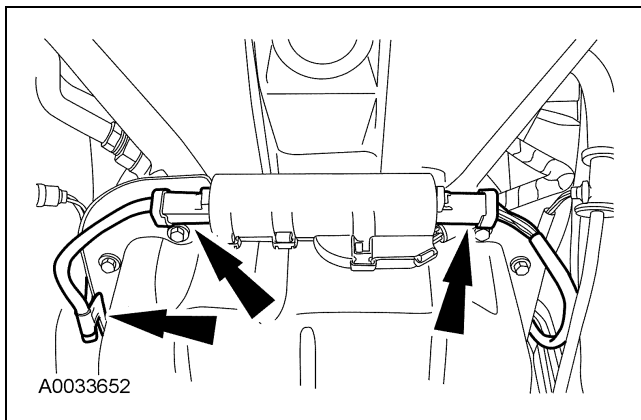


IN-VEHICLE REPAIR (Continued)

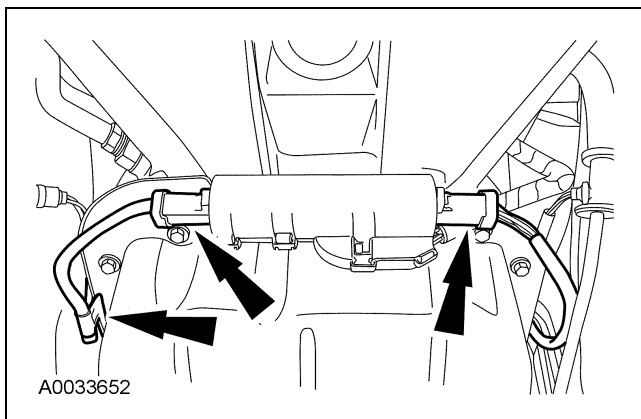
5. Tighten the screws in a crisscross sequence.
- Tighten to 11 Nm (8 lb-ft).



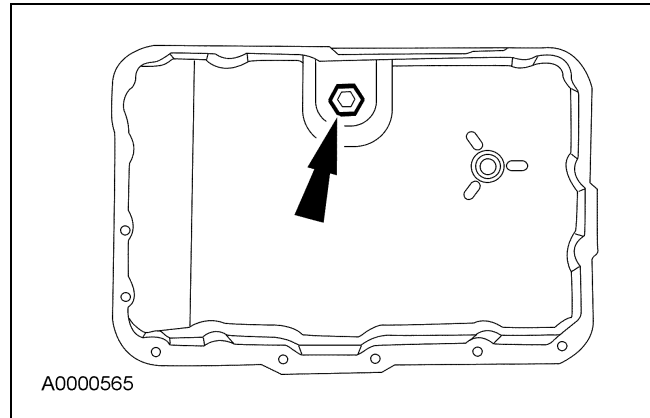
6. Install the HO2S connector to the front of the transmission pan rail.



7. Connect the HO2S connector and install the sensor wire retaining clip to the RH side of the transmission pan rail.



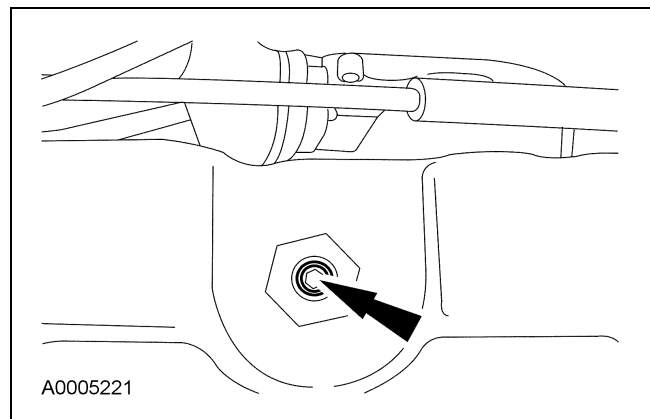
8. Install the drain plug.
- Install a new gasket onto the drain plug assembly.
 - Tighten to 26 Nm (19 lb-ft).



9. **NOTE:** It will be necessary to hold the drain plug with a wrench when removing the fluid level indicator plug.

NOTE: Use a 3/16-inch Allen key to remove the fluid level indicator plug.

Remove the fluid level indicator plug.

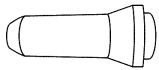
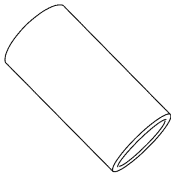
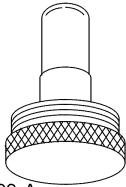
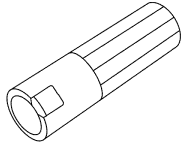
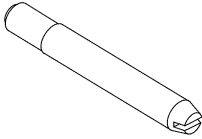


10. Carry out the fluid level check. Refer to Transmission Fluid Level Check in this section.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

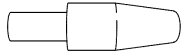
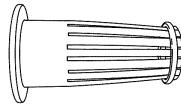
Fluid Pump

Special Tool(s)

 ST1833-A	Installer, Torque Converter Fluid Seal 307-349 (T97T-77000-A)
 ST1817-A	Alignment Set, Fluid Pump 307-S039 (T74P-77103-X)
 ST2532-A	Aligner, Fluid Pump Handle 307-431
 ST2533-A	Aligner, Fluid Pump Pilot 307-432
 ST1826-A	Sizer, Piston Seal 307-338 (T95L-70010-G)
 ST2419-A	Alignment Pins, Transmission Pump 307-398

(Continued)

Special Tool(s)

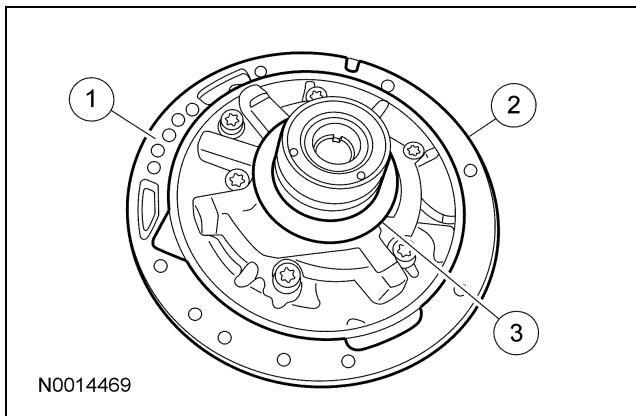
 ST2684-A	Transmission Fluid Pump Seal Aligner 307-451/1
 ST2685-A	Transmission Fluid Pump Seal Sizer 307-451/2
 ST2686-A	Transmission Fluid Pump Seal Installer 307-451/3

Material

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

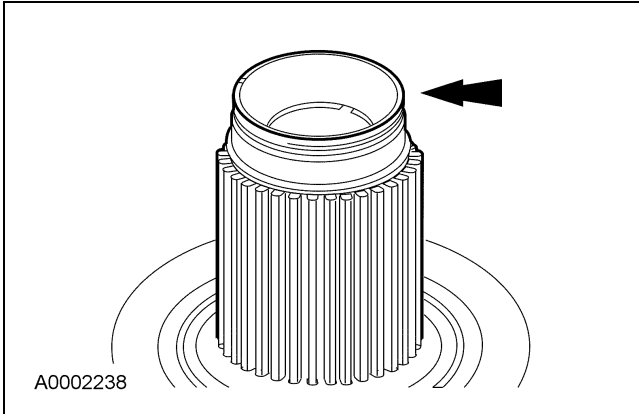
Disassembly

1. Remove the fluid pump gasket, fluid pump seal ring and the No. 1 thrust washer.
 - 1 Remove and discard the fluid pump gasket.
 - 2 Remove and discard the fluid pump seal ring (square cut).
 - 3 Remove and tag the No. 1 thrust washer.

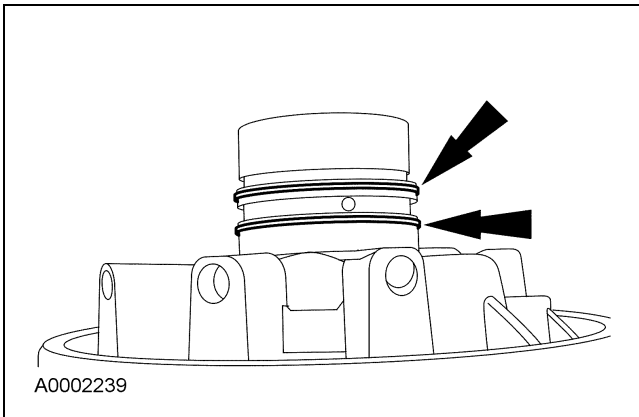


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

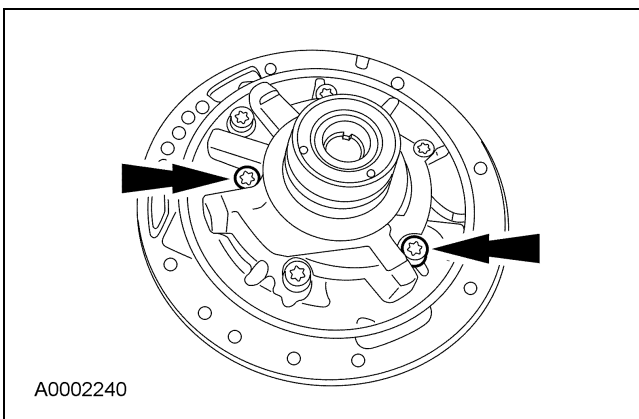
2. Remove the fluid pump support seal ring.



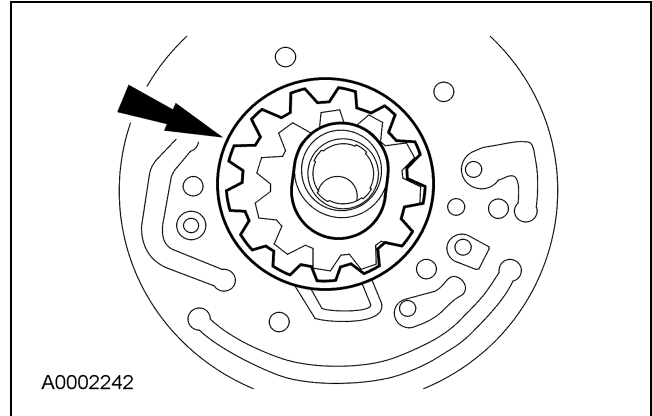
3. Remove the seal rings.



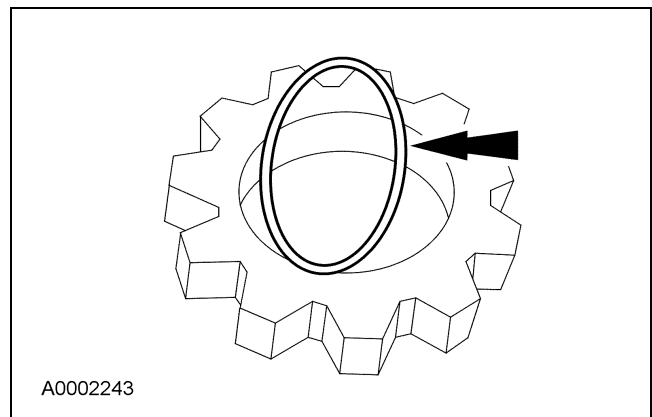
4. Remove the fluid pump housing.



5. **NOTE:** A rough casting on the pump surface crescent is not a flaw.
NOTE: The fluid pump gears are part of the pump assembly and are not repaired separately.
 Remove the fluid pump gears.

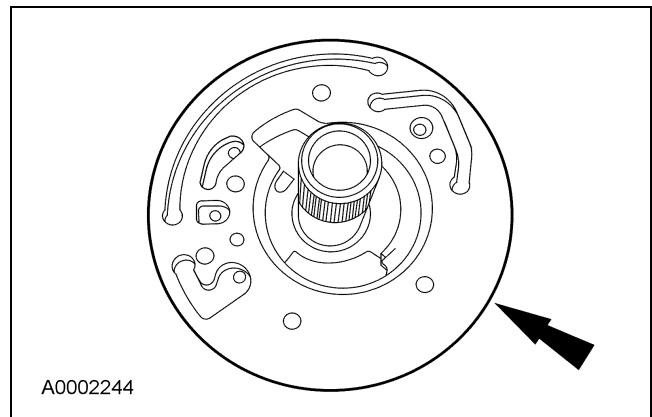


6. Remove the drive gear O-ring seal and discard. Inspect the fluid pump gears for cracks and scoring.



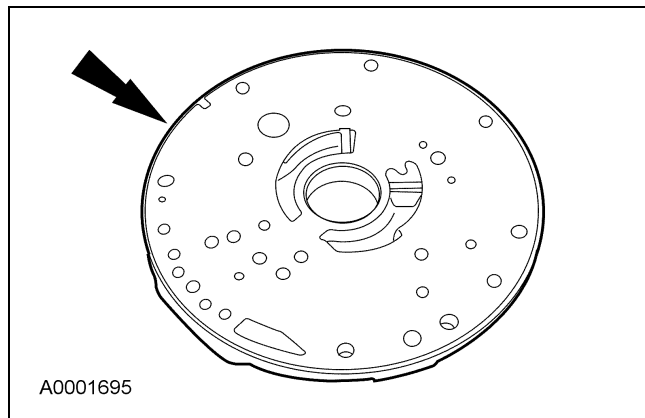
7. Inspect the overdrive pump.

- Inspect the overdrive pump support gear pockets for scoring and wear.
- Clean and inspect the overdrive and rear input shaft bushings.

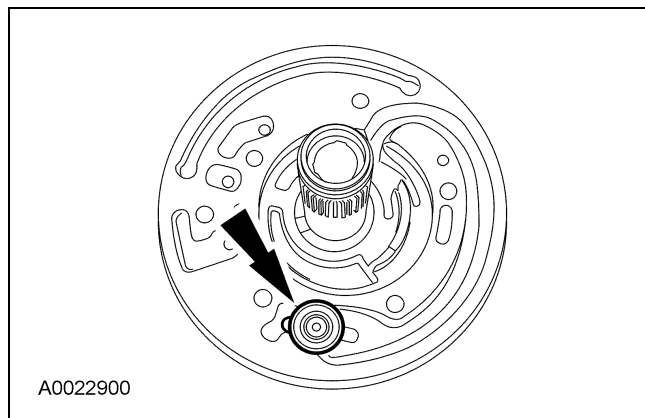


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

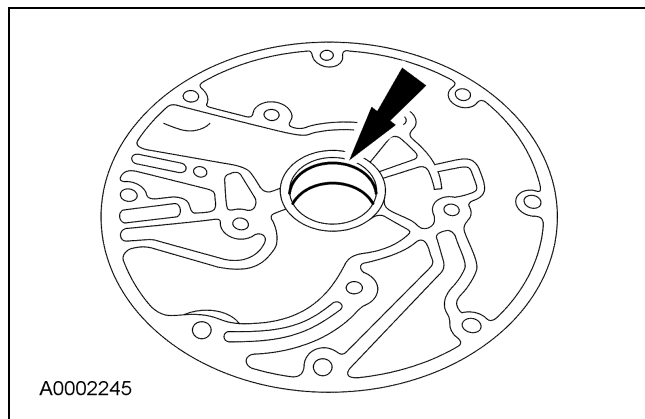
8. Inspect the fluid pump adapter plate for scoring and wear.



9. Remove and discard the valve.



10. Inspect the fluid pump to converter housing bushing.

**Assembly**

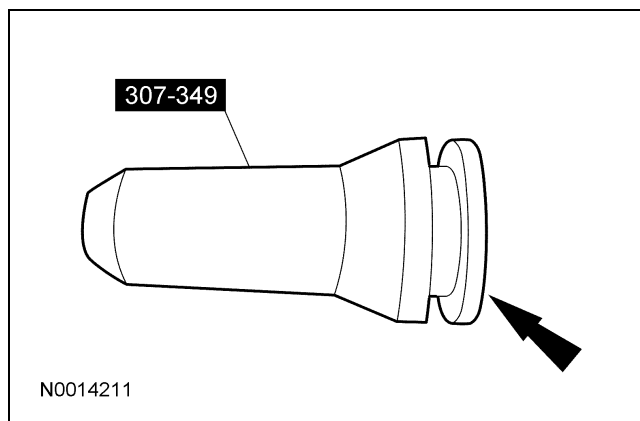
1. **NOTE:** Minor burrs and scoring may be removed with crocus cloth. If damage is found, install a new assembly.

Inspect the fluid pump components for the following:

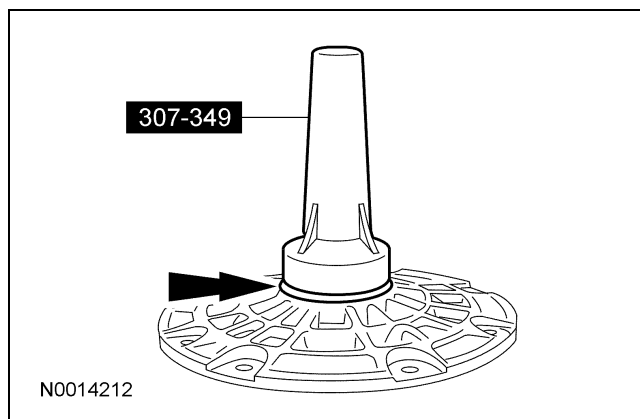
- Pump body and case for burrs.
- Fluid passages for obstructions.

2. **NOTE:** Check and make sure that the garter spring in the seal has not popped off of the converter hub seal.

Install a new seal onto the special tool.

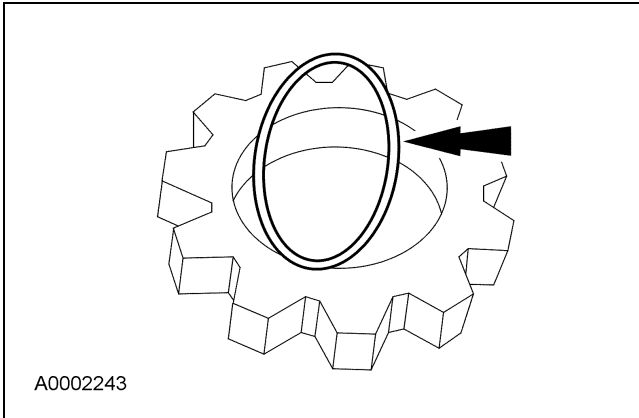


3. Using the special tool, install the converter hub seal.



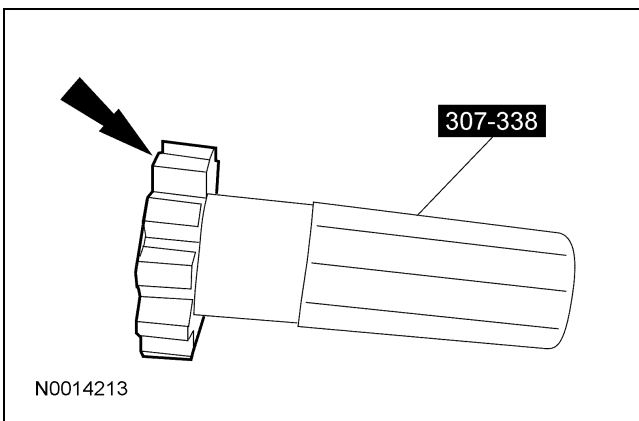
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

4. Install a new O-ring seal in the fluid pump drive gear.



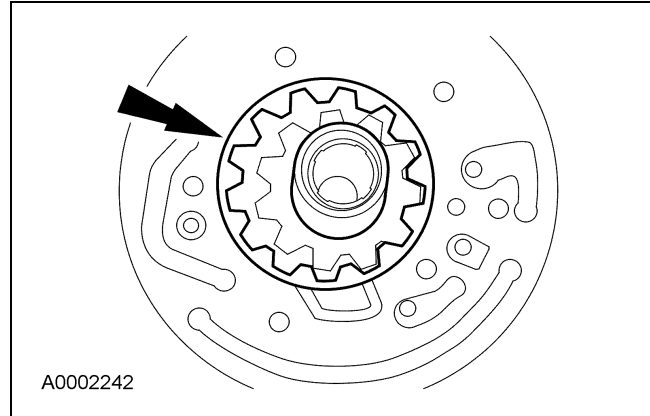
5. **CAUTION:** Lubricate the special tool with multi-purpose grease.

Using the special tool, seat the O-ring seal in the pump gear.

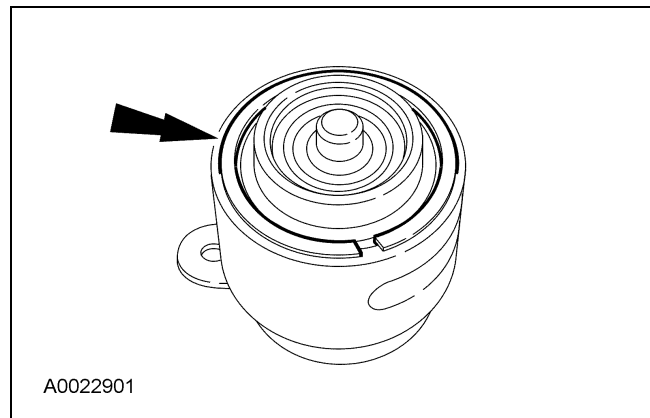


6. **CAUTION:** The chamber on the inside edge of the small gear must be UP when in the pump housing gear pocket. The dimple on the larger gear must be DOWN when in the pump housing gear pocket.

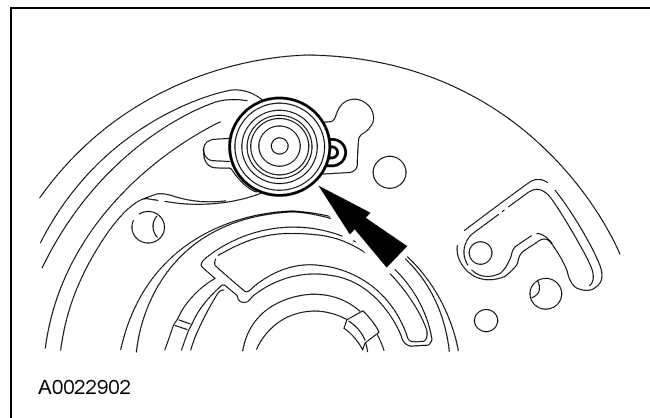
Install the pump gears into the fluid pump housing. Apply multi-purpose grease to the pump gear to prevent scoring at start up.



7. Install a new seal on the new valve.

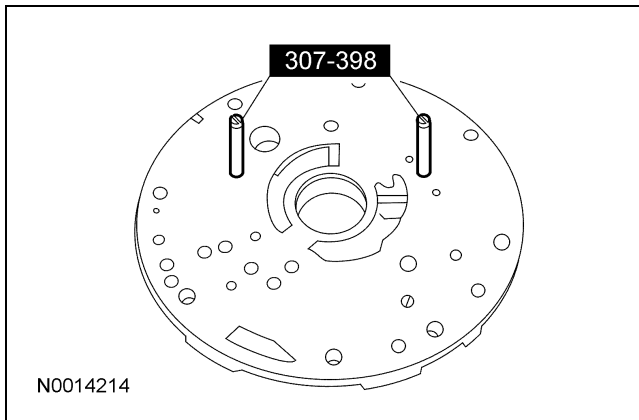


8. Install a new valve with the tab facing down.

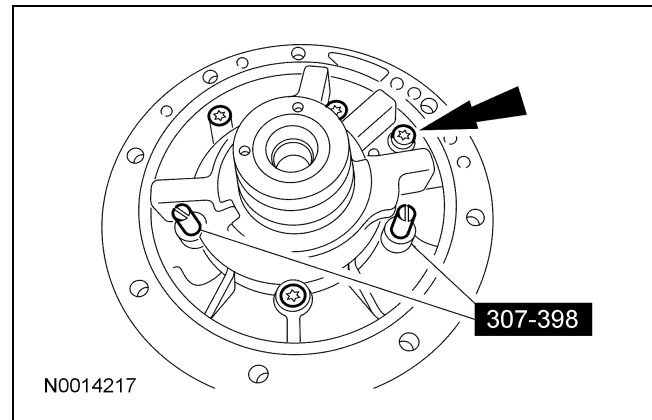


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

9. First, install the fluid pump adapter plate, then install the alignment pins in their correct location.

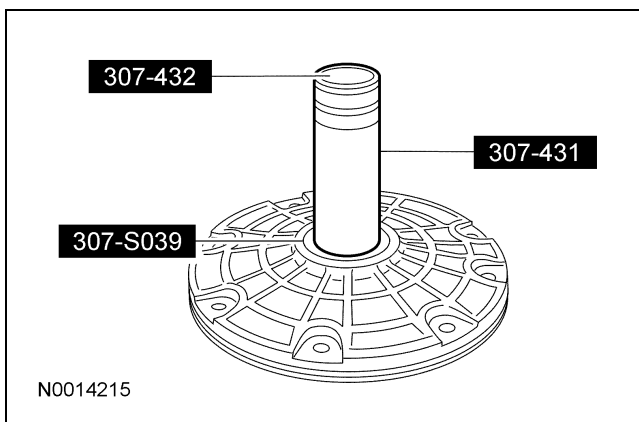


12. Loosely install the fluid pump housing screws in their correct location and remove the special tools.

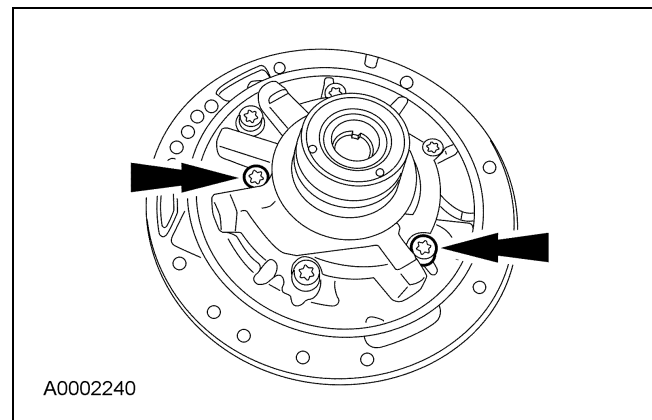


10. **CAUTION:** The special tools must be used to correctly align the pump with the adapter plate to reduce gear noise, bushing failure and leakage.

Using the special tool, align the fluid pump to the adapter plate.



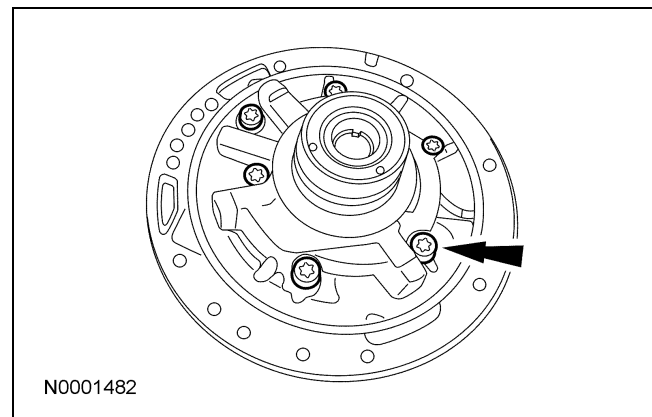
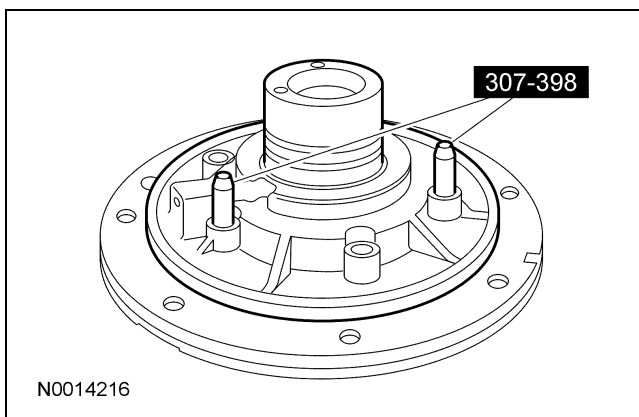
13. Install the 2 remaining screws.



14. Tighten all of the fluid pump screws in a star pattern.

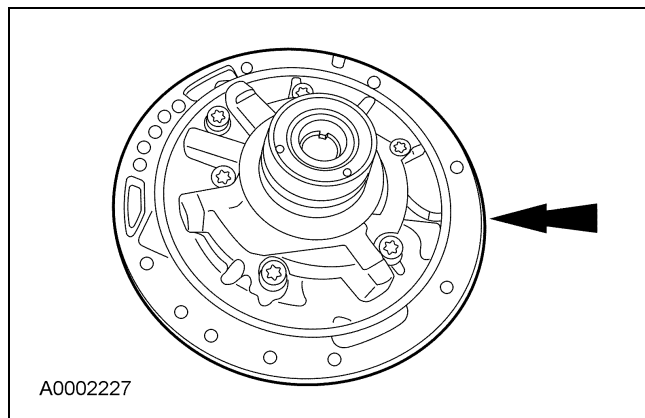
- Tighten to 22 Nm (16 lb-ft).

11. Using the special tools, assemble the pump.

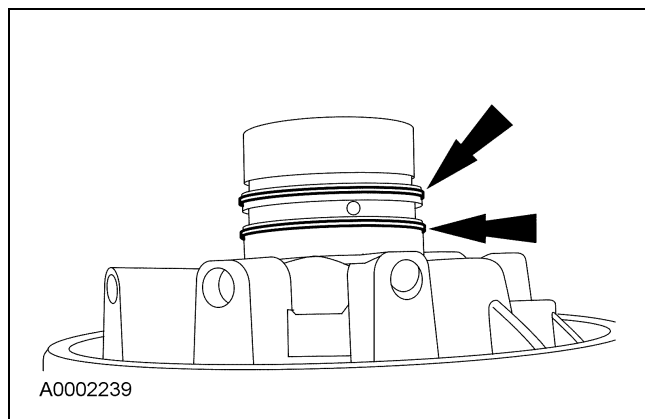


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

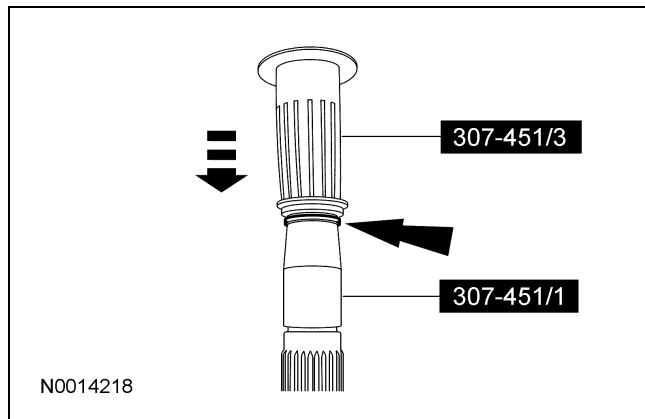
15. Install a new fluid pump seal ring.



16. Install the 2 new seal rings.



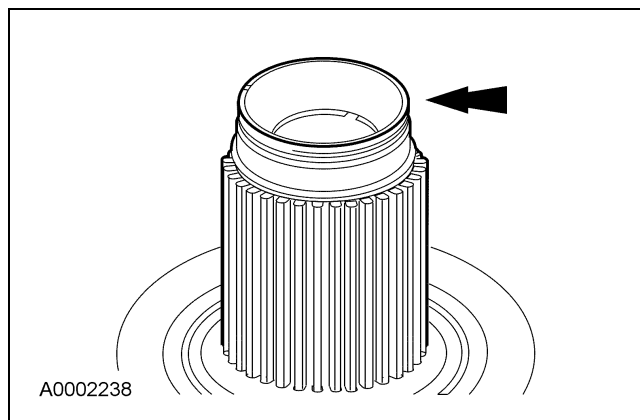
17. **CAUTION:** Be careful not to overstretch the seal ring past the seal ring groove. Damage to the seal will occur.
- Using the special tools, install the fluid pump seal ring.



18. **CAUTION:** Verify correct seal installation. Make sure seal grooves are clean and free of burrs.

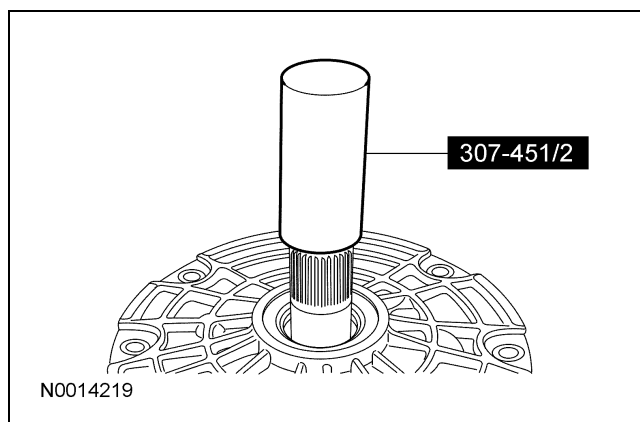
NOTE: Make sure seal grooves are clean and free of burrs. Make sure that the seal is seated into the groove.

Verify the seal is installed correctly.



19. **CAUTION:** Failure to correctly size the seal will cause damage to the seal when the torque converter is installed.

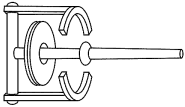
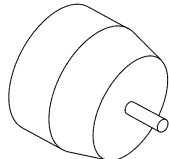
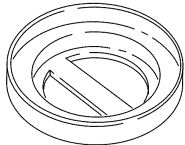
Using the special tool, size the seal to the correct size. Leave the special tool on the seal ring for 2 minutes to obtain the correct seal size.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Forward Clutch

Special Tool(s)

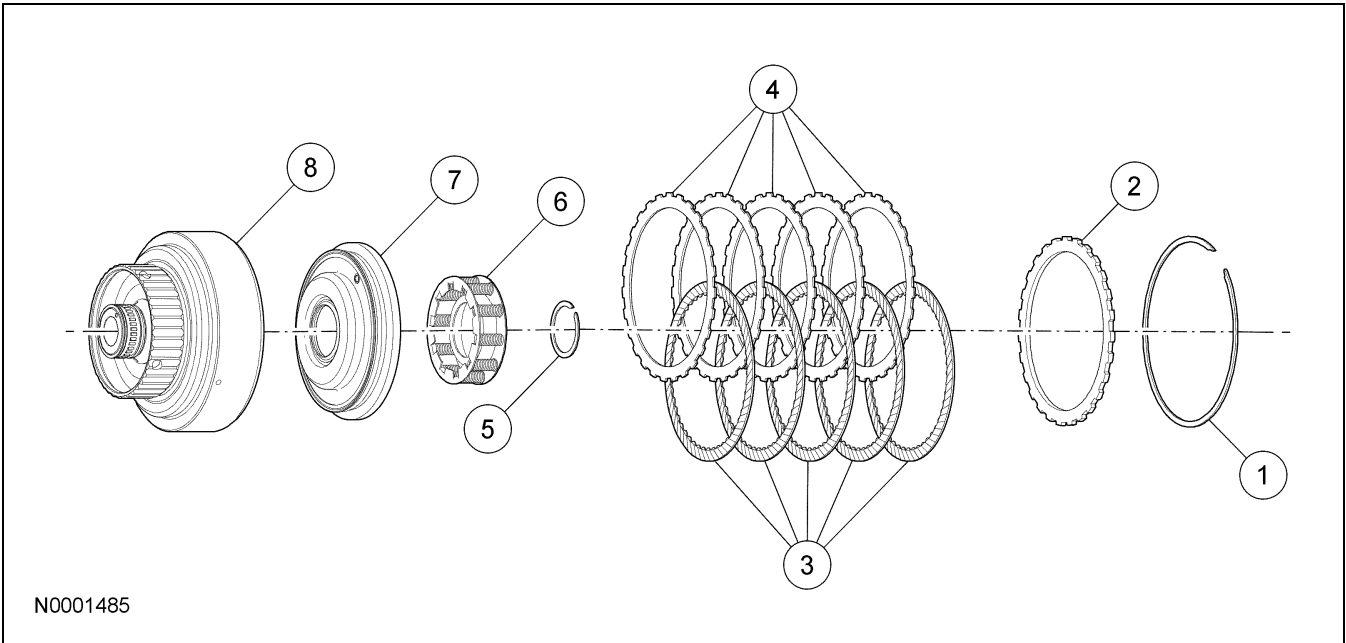
 ST1190-A	Compressor, Clutch Spring 307-015 (T65L-77515-A)
 ST1813-A	Protector, Piston Seal 307-051 (T74P-77548-A)
 ST2534-A	Gauge, Forward Clutch Seal 307-434

Material

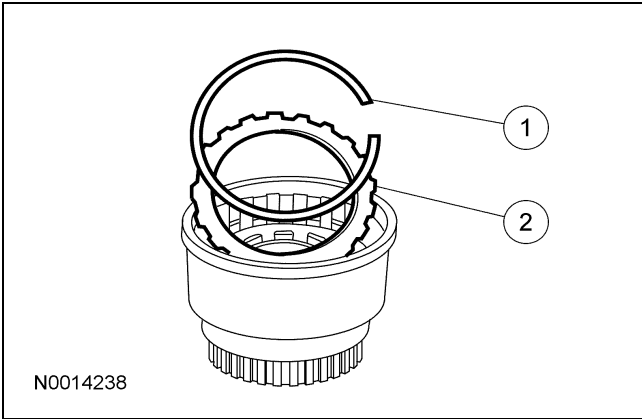
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Forward Clutch Assembly



Item	Part Number	Description
1	7D483	Forward clutch retaining ring (select fit)
2	7B066	Forward clutch pressure plate
3	7B164	Forward clutch internal plates — friction (vehicle-dependent)
4	7B442	Forward clutch external plates — steel (vehicle-dependent)
5	E860109	Forward clutch retaining ring
6	7G229	Forward clutch spring assembly
7	7A262	Forward clutch piston
8	7A360	Forward clutch cylinder assembly

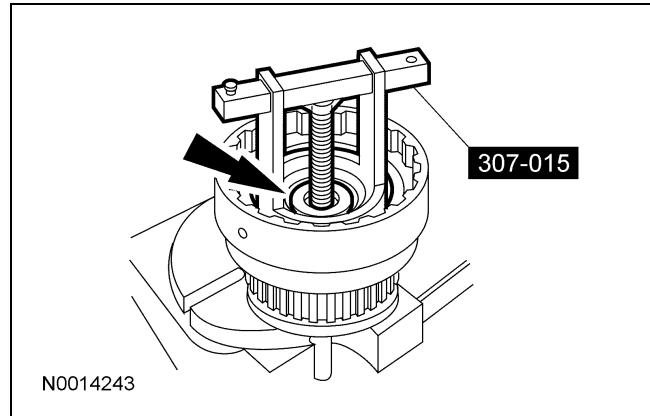
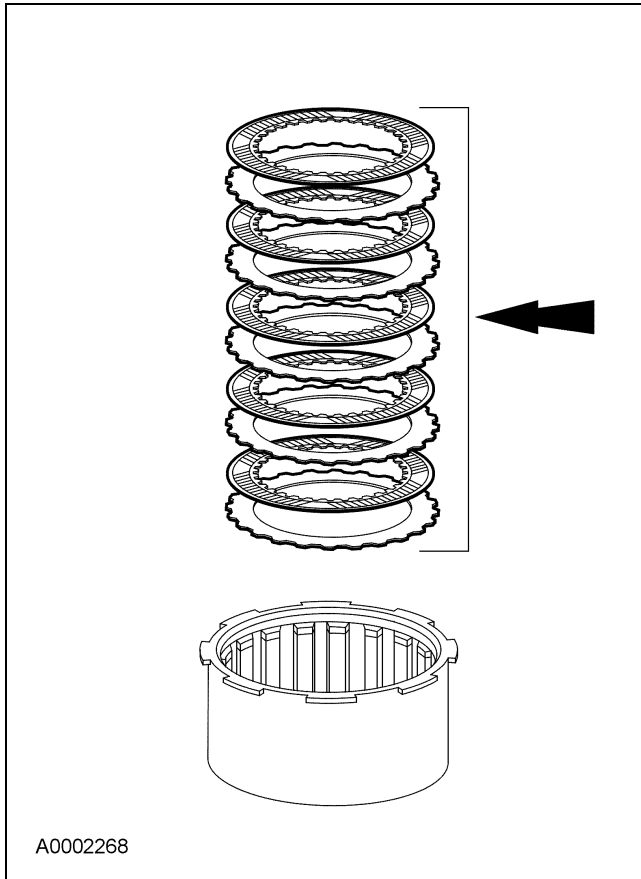


Disassembly

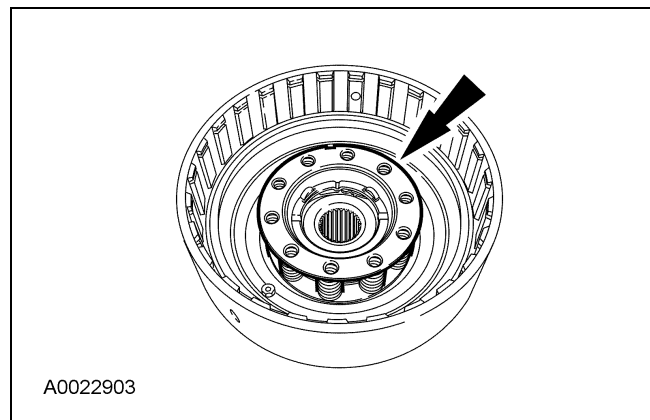
1. Remove the pressure plate.
 - 1 Remove the forward clutch retaining ring.
 - 2 Remove the pressure plate.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

2. Remove the forward clutch disc pack.
 - Inspect the forward clutch plates for wear, damage or overheating.



4. Relieve the forward clutch spring tension and remove the tool.
5. Remove the forward clutch piston spring assembly.



3. **WARNING:** Use caution when releasing tool pressure on the clutch piston springs. Failure to follow these instructions may result in personal injury.

CAUTION: Do not fully depress the special tool or damage to the spring retainer may occur.

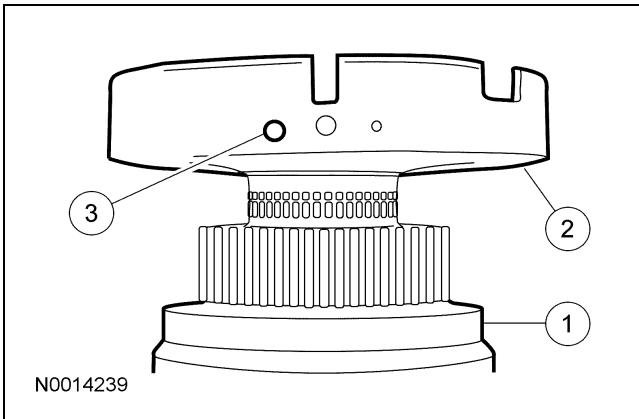
Using the special tool, remove the forward clutch piston retaining ring.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

6.  **WARNING:** Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air. Make sure the cylinder is facing down as shown. Failure to follow these instructions may result in personal injury.

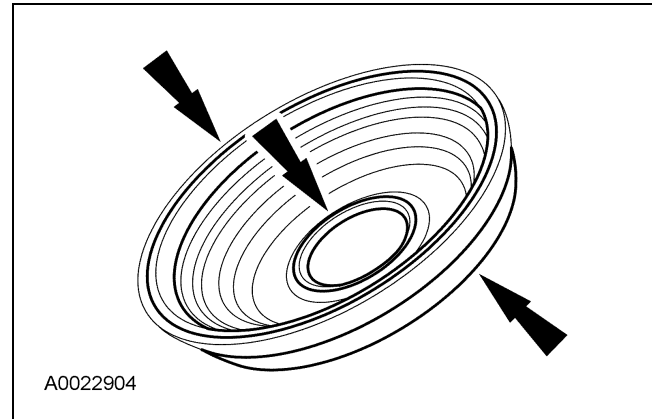
Remove the forward clutch piston.

- 1 Place the forward clutch cylinder with forward clutch piston facing down.
- 2 Install the center support on the forward clutch cylinder.
- 3 Apply air pressure to the left port of the center support.

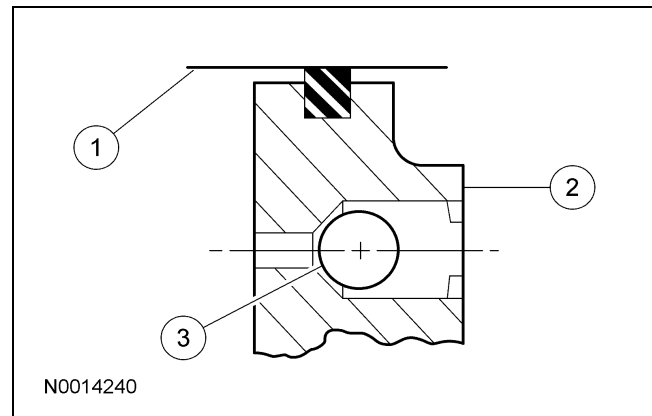
**Assembly**

1. Inspect the clutch components for damage or wear. Install new components as necessary.
 - Check the fluid passages for obstructions. All fluid passages must be clean and free of obstructions.
 - Inspect the clutch plates for damage.
 - Inspect the clutch springs.
 - Inspect the needle bearing and seal rings for damage.
 - Check clutch hub thrust surfaces for damage.
 - Check clutch plates for flatness and fit on the clutch hub serrations.

2. **NOTE:** If the seals on the forward clutch piston show any signs of damage, a new forward clutch piston will need to be installed. Inspect the forward clutch piston and seals.



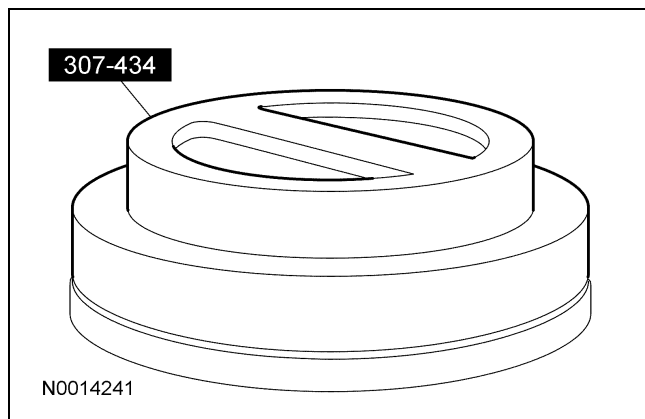
3. Inspect the forward clutch drum assembly.
 - 1 Inspect the forward clutch cylinder surfaces for scores or burrs.
 - 2 Inspect the forward clutch piston for scores or burrs.
 - 3 Verify the check ball is free to move in the piston.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

4. **NOTE:** The special tool must be installed on the forward clutch piston for a couple of minutes prior to installing it into the forward clutch cylinder.

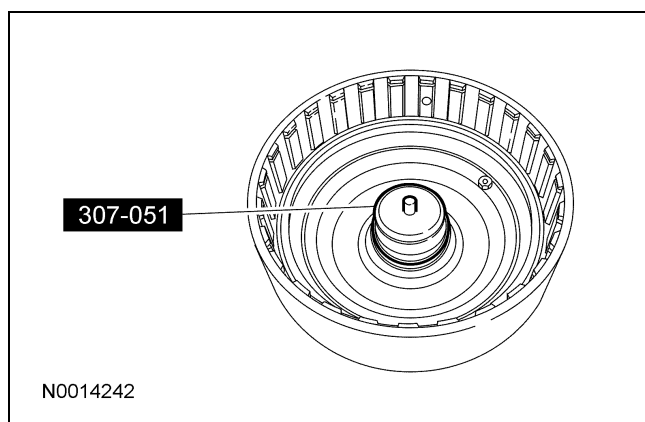
Install the special tool on the forward clutch piston.



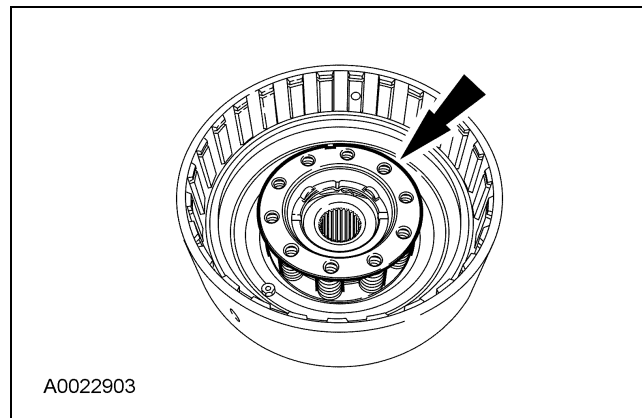
5. **⚠ CAUTION:** Care must be taken to prevent damage to the seals.

NOTE: Lubricate the forward clutch piston inner and outer seal with clean automatic transmission fluid.

Using the special tool, install the forward clutch piston assembly into the forward clutch cylinder.

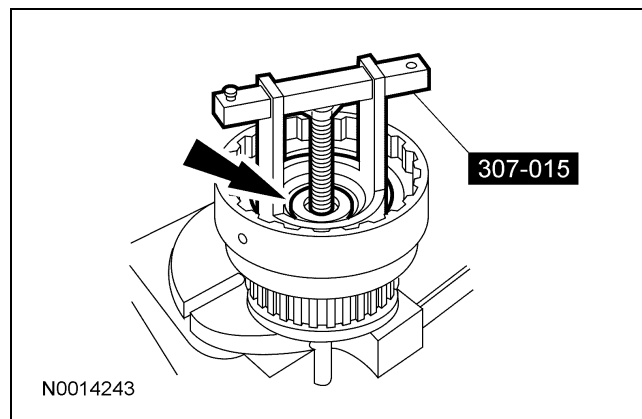


6. Install the forward clutch piston spring assembly.



7. **⚠ CAUTION:** Do not fully depress the clutch spring compressor or damage to the spring retainer may occur.

Using the special tool, install the forward clutch piston spring retaining ring.

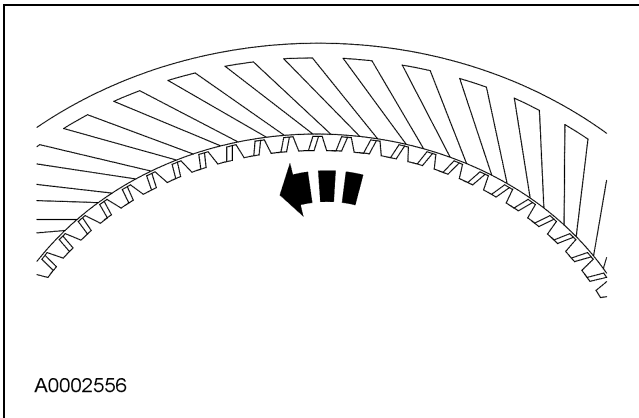


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

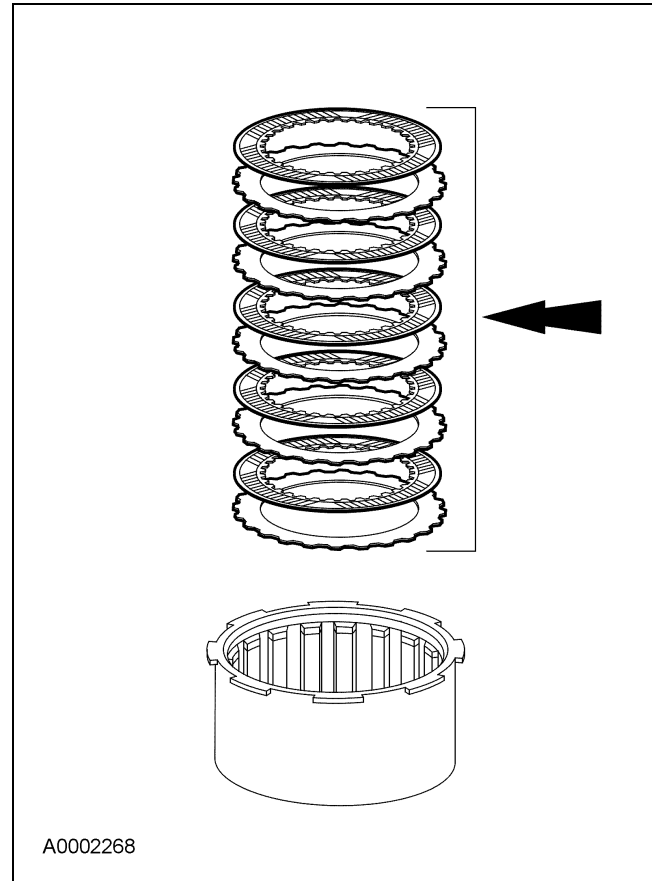
8.  **CAUTION:** The forward clutch friction plates are directional and must be installed with grooves pointing counterclockwise.

 **CAUTION:** If new plates are used, they should be soaked in clean automatic transmission fluid before assembly.

If reusing plates, grooves must be installed counterclockwise. Install the direct clutch disc pack.



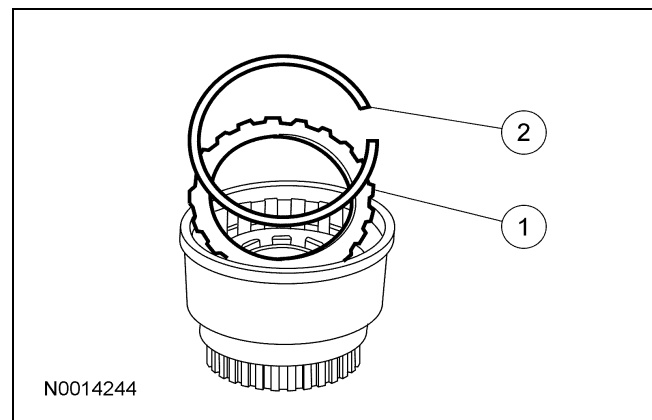
9. Install the steel clutch plates and friction clutch plates in alternating order starting with a steel clutch plate.



10.  **CAUTION:** The retaining ring is a select fit.

Install the original selective retaining ring.

- 1 Install the forward clutch pressure plate.
- 2 Install the original selective retaining ring.

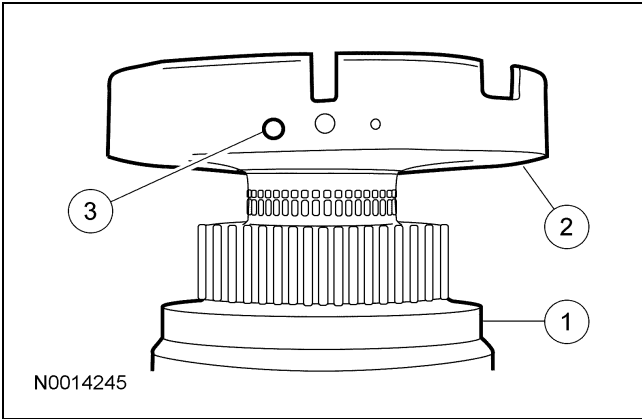


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

11.  **WARNING:** Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air. Make sure the cylinder is facing down as shown. Failure to follow these instructions may result in personal injury.

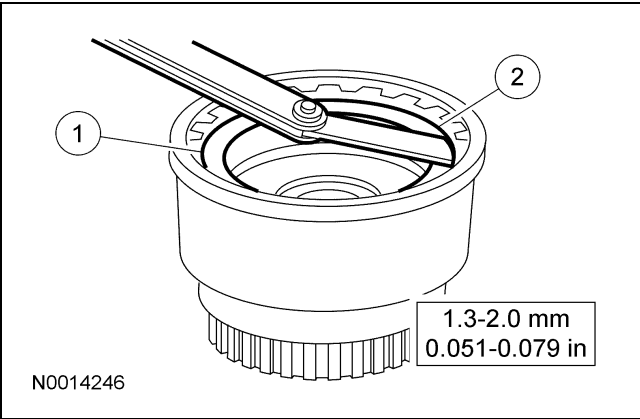
Air check the forward clutch piston.

- 1 Place the forward clutch cylinder with the forward clutch piston facing down.
- 2 Install the transmission center support on the forward clutch cylinder.
- 3 Apply air pressure to the left port of the center support.



12. Check the forward clutch disc pack free play.
- 1 Press down on the forward clutch disc pack.
 - 2 Using a feeler gauge, check the gap between the forward clutch retaining ring and the forward clutch pressure plate.
- If the clearance is not within specifications, install the correct size retaining ring.

Part Number	Thickness		Diameter	
	mm	In	mm	In
XW4Z-7D483-AB	1.73	0.0681	141.45	5.65
XW4Z-7D483-AC	2.08	0.0819	141.45	5.65
XW4Z-7D483-AD	2.44	0.0961	141.45	5.65



DESCRIPTION AND OPERATION

Geartrain

Power is transmitted from the torque converter to the planetary gearsets through the input shaft. Bands and clutches are used to hold and drive certain combinations of gearsets. This results in 5 forward ratios and 1 reverse ratio, which are transmitted to the output shaft and differential.

Gear Ratio	
1st	3.22 to 1
2nd	2.29 to 1
3rd	1.55 to 1
4th	1.00 to 1
5th	0.71 to 1
Reverse	3.07 to 1

Planetary Gearset — Overdrive

For component location, refer to Transmission in this section.

The planetary gear overdrive carrier is driven by the input shaft.

- The overdrive planetary gearset carrier drives the center shaft via the overdrive one-way clutch in 1st, 3rd, 4th and REVERSE gears.
- In 2nd and 5th gears, the overdrive sun gear is held causing the pinion gears to rotate around the overdrive sun gear.
- The pinion gears, in turn, drive the overdrive ring gear resulting in the 5th (overdrive) gear ratio.
- The overdrive planetary gearset is internally splined to the coast clutch for engine braking.

Planetary Gearset — Forward

For component location, refer to Transmission in this section.

The forward planetary gearset is splined to the output shaft.

- The forward planetary gearset is driven by the forward ring gear when the forward clutch is applied.

- The forward planetary gearset pinions drive the forward sun gear.
- The forward sun gear is splined to the input shell.
- The forward carrier is splined to the output shaft.

Planetary Gearset — Low/Reverse

For component location, refer to Transmission in this section.

The low/reverse planetary gearset is connected to the reverse brake drum by lugs from the low/reverse brake drum to the lugs of the low/reverse planetary gearset.

- The low/reverse planetary gearset is driven by the forward sun gear which is splined to the input shell.
- The forward sun gear drives the pinions in the low/reverse planetary gearset.
- The pinions of the low/reverse planetary gearset drive the output shaft ring gear and output shaft hub which is splined to the output shaft.
- The low/reverse planetary gearset can be held by the low one-way clutch in the low/reverse brake drum, or by the low/reverse band.

Input Shaft

For component location, refer to Transmission in this section.

- The radial positioning of the input shaft is controlled by 2 bushings in the stator support.
- Axial positioning of the input shaft is controlled by the splines in the converter turbine hub and the retaining ring in the overdrive planetary carrier.

Output Shaft

For component location, refer to Transmission in this section.

The output shaft is supported by a bearing in the case and by a bearing in the extension housing. End positioning is controlled by the parking gear and by the reverse ring gear hub and snap ring.

DESCRIPTION AND OPERATION

Hydraulic System

Fluid Pump

For component location, refer to Transmission in this section.

- The fluid pump provides the fluid pressure necessary to charge the torque converter, main control assembly, transmission cooling system, lubrication system and apply devices.
- The fluid pump is a positive displacement, gear type pump.
 - The fluid pump is driven by the torque converter impeller hub.

Filter

For component location, refer to Transmission in this section.

- All fluid drawn from the transmission fluid pan by the fluid pump passes through the fluid filter.
 - The transmission fluid filter and its accompanying seals are part of the fluid path from the sump (pan) to the fluid pump.
 - The transmission fluid filter has a bypass section which allows fluid vented at the main regulator valve to be recirculated to the fluid pump, without passing through the transmission fluid filter.
-

Main Control

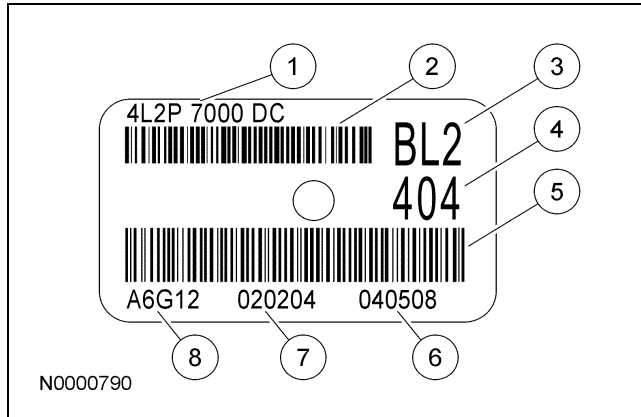
For component location, refer to Transmission in this section.

- The main control assembly and related components are part of the pressure side of the hydraulic system.
- The main control assembly consists of the solenoids, the valve body assembly and the separator plate.
- These components combine to convert electrical signals into hydraulic actions.
 - All valves in the main control assembly are anodized aluminum and cannot be sanded, filed or dressed in any other way. If there is any damage to the valves that prevents or restricts their movement, install a new main control assembly.

DESCRIPTION AND OPERATION

Identification Tags

ID Tag Located on Transmission Case



Item	Description
1	Transmission part number
2	Bar code 1
3	Transmission plant model code part 1
4	Transmission plant model code part 2
5	Bar code 2
6	Transmission serial number
7	Transmission build date (DD MM YY)
8	Assembly plant line shift

All vehicles are equipped with a vehicle certification label, located on the driver side door lock post. Refer to the code in the space marked TR. For model, service ID level or build date information, refer to the transmission service ID tag located on the transmission case.

DIAGNOSIS AND TESTING

Leakage Inspection

Special Tool(s)

 ST1300-A	100W/12 Volt DC UV Lamp 164-R0751 or equivalent
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Material

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

Leak Check Test with A Black Light

Automatic Transmission/Power Steering Dye

164-R3701 or equivalent (specifically formulated for ATF) is used to detect a transmission fluid leak.

1. Add Automatic Transmission/Power Steering Dye to the transmission fluid. Use one 30.0 mL (1 oz) of dye solution for every 3.8L (4 quarts) of transmission fluid.
2. Start and run the engine until the transaxle reaches its normal operating temperature. Observe the back of the cylinder block and top of the torque converter housing for evidence of fluid leakage. Raise the vehicle on a hoist and run the engine at fast idle, then at engine idle, occasionally shifting to the DRIVE and REVERSE ranges to increase pressure within the transaxle. Observe the front of the flexplate, back of the cylinder block (in as far as possible), inside the torque converter housing and the entire case until fluid leakage is evident and the probable source of leakage can be determined.

External Fluid Leaks

Leak Path	Possible Source
Leaks at the fluid pan to case	• Pan bolts not tightened to specification. • Pan gasket damaged. • Case pan rail damaged.
Fluid cooler lines or fittings leaking	• Cooler line(s), cooler line fitting(s) damaged. Refer to Section 307-02. • Cooler line fitting to case union damaged. Refer to Section 307-02. • Case damage at case fitting.
Fluid cooler line nut-to-case fittings leaking	• Damaged or missing O-ring seals. Refer to Section 307-02. • Fitting(s) not tightened to specifications. Refer to Section 307-02.
Leaks at the fluid cooler	• Fluid cooler damage. Refer to Section 307-02. • Fitting(s) damaged or not tightened to specifications. Refer to Section 307-02.
Leaks at external sensors	• Damaged or missing O-ring seals. • Screw not tightened to specification.
Leaks at the manual control lever seal	• Damaged or missing lever seal.
Leaks at the solenoid body harness connector	• Solenoid body harness connector O-ring seal(s), either on the harness end or the solenoid body, damaged or missing.
Fluid leakage in torque converter area	• For possible sources, refer to Fluid Leakage in the Torque Converter Area Chart.

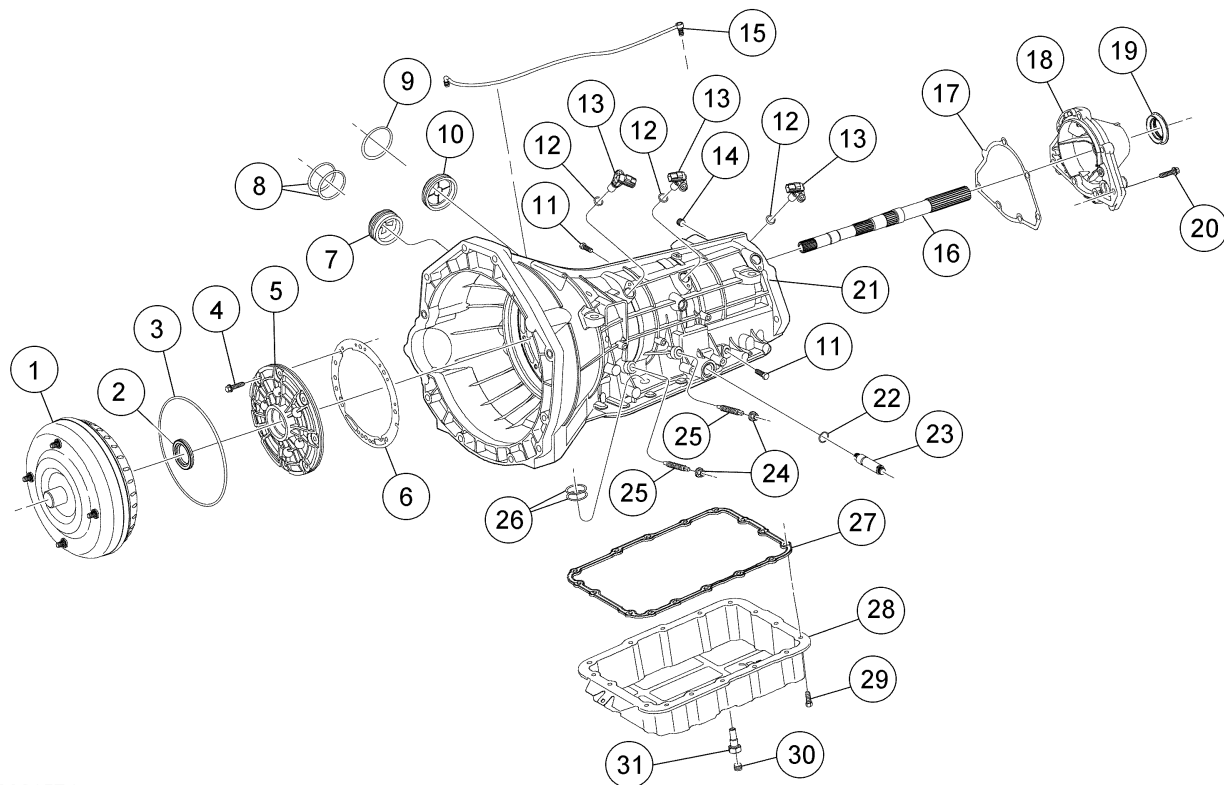
DIAGNOSIS AND TESTING (Continued)**External Sealing**

⚠ CAUTION: Do not try to stop a fluid leak by increasing the torque beyond specifications. This may cause damage to the transmission case threads.

The transmission has the following parts to prevent external fluid leakage:

- Gaskets
- Lip-type seals

- O-ring seals
- Seal rings
- Seal grommets
- Seal washers
- Thread sealant

External Sealing

A0081574

Item	Part Number	Description
1	7902	Torque converter assembly
2	7A248	Seal assembly — front fluid pump
3	7A248	Seal — front fluid pump
4	W704892-S300	Screw and washer assembly (8 required)
5	7G187	Fluid pump
6	7A136	Gasket — fluid pump
7	7D027	Cover — overdrive servo
8	W703119-S300	Seals — overdrive servo cover (2 required)

(Continued)

Item	Part Number	Description
9	W702969-S300	Seal — intermediate servo cover
10	7D027	Cover — intermediate servo
11	390318-S2	Plugs — pipe (2 required)
12	W702981-S300	O-ring seals — sensor-to-case (3 required)
13	7H103	Sensor assembly — (3 required)
14	6026	Plug — case
15	7034	Vent assembly
16	7060	Shaft — output

(Continued)

DIAGNOSIS AND TESTING (Continued)

Item	Part Number	Description
17	7086	Gasket — extension housing
18	7A039	Extension housing assembly
19	7052	Seal — extension housing
20	W500311-S309	Screw — extension housing (7 required)
21	7005	Case assembly
22	7B498	Seal — manual lever
23	7A256	Manual lever
24	7C492	Screw — band adjuster (2 required)
25	71000-S100	Nuts — band adjuster (2 required)
26	W705928-S300	O-ring seals (2 required)
27	7A191	Gasket — fluid pan
28	7A194	Fluid pan
29	W500213-S309	Screw — fluid pan (16 required)
30	W704999	Plug — short hex
31	7A101	Plug — fluid drain

External Sealing

⚠ CAUTION: Do not try to stop a fluid leak by increasing the torque beyond specifications. This may cause damage to the transmission case threads.

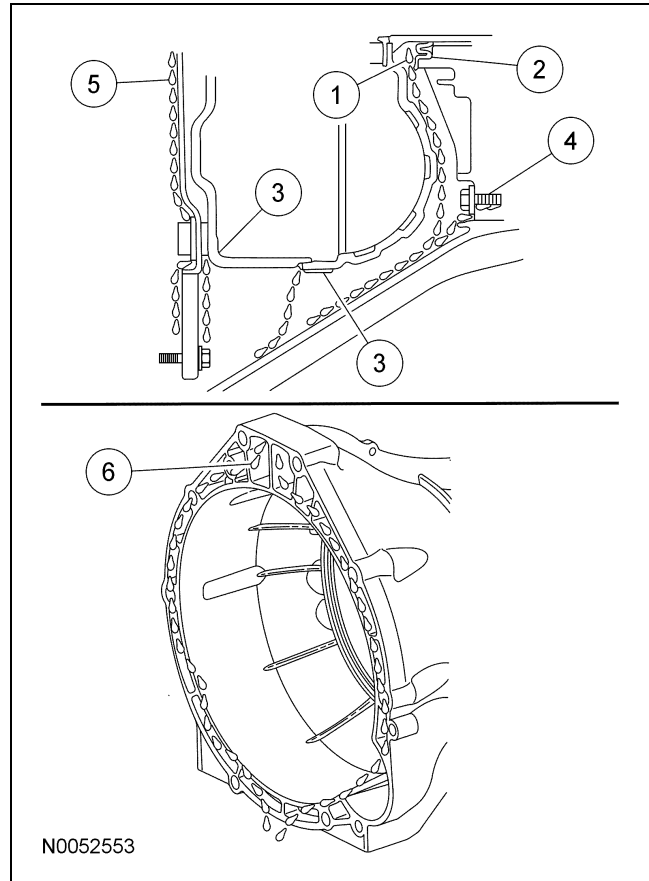
The transmission has the following parts to prevent external fluid leakage:

- Gaskets
- Lip-type seals
- O-ring seals
- Seal rings
- Seal grommets
- Seal washers
- Thread sealant

Fluid Leakage In Torque Converter Area

Leakage at the front of the transmission, as evidenced by fluid around the torque converter housing part of the case, may have several sources. By careful observation, it is possible in many instances to pinpoint the source of the leak before removing the transmission from the vehicle.

The paths, which the fluid takes to reach the bottom of the torque converter housing part of the case, are shown in the illustration. The 5 numbers in the illustration correspond with the 5 flow path steps.



Leak Path	Symptom	Possible Source
1, 2 and 4	Leak at the front of the transmission	Pump lip seal
1, 2 and 4	Leak at the front of the transmission	Converter hub weld
1, 2 and 4	Leak at the front of the transmission	External pump seal (large)
1, 2 and 4	Leak at the front of the transmission	Pump-to-case screws
1, 2 and 4	Leak at the front of the transmission	Pump gasket
3	Leak at the front of the transmission	Torque converter seal weld
3	Leak at the front of the transmission	Torque converter stud
5	Leak at the front of the transmission	Engine oil leak; rear main seal

DIAGNOSIS AND TESTING (Continued)

Leak Path	Symptom	Possible Source
5	Leak at the front of the transmission	Engine valve cover
5	Leak at the front of the transmission	Oil galley

Leak Path	Symptom	Possible Source
5	Leak at the front of the transmission	Engine oil pressure sensor
6	Leak between engine and transmission case	Venting

IN-VEHICLE REPAIR

Main Control Valve Body

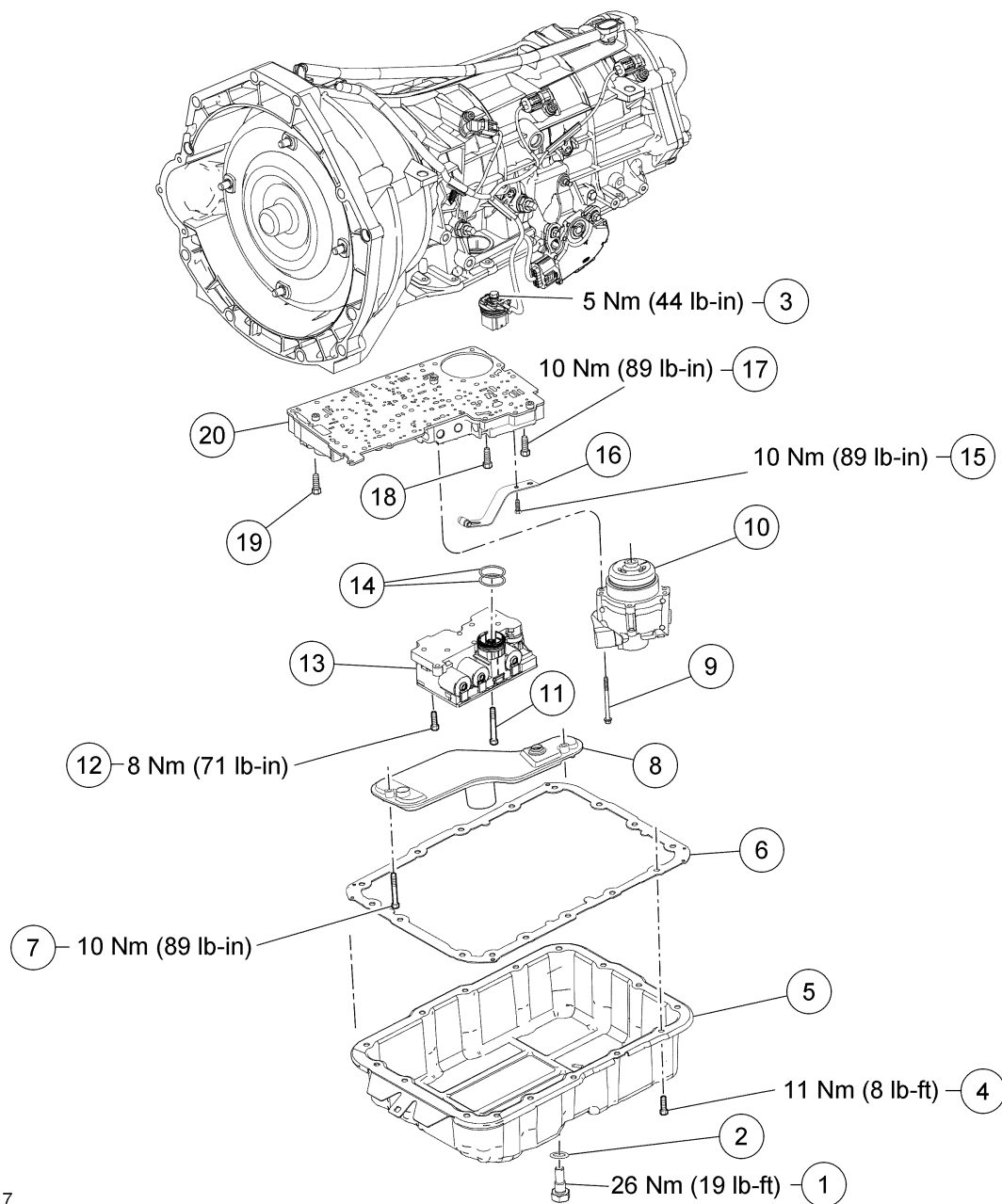
Special Tool(s)

 ST1639-A	Aligner, Valve Body (2 required) 307-334 (T95L-70010-C)
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Material

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

IN-VEHICLE REPAIR (Continued)



N0050617

Item	Part Number	Description
1	7A010	Transmission fluid pan drain plug assembly
2	6734	Transmission fluid pan drain plug gasket
3	—	Solenoid body electrical connector screw
4	W500213	Transmission fluid pan-to-case screw (16 required)
5	7A194	Transmission fluid pan
6	7A191	Transmission fluid pan gasket

(Continued)

Item	Part Number	Description
7	W705559	Transmission fluid filter screw (2 required)
8	7A098	Transmission fluid filter
9	W702359	Reverse servo screw (4 required)
10	7B193	Reverse servo assembly
11	W703189	Solenoid body screw (7 required)
12	W702921	Solenoid body screw
13	7G391	Solenoid body

(Continued)

IN-VEHICLE REPAIR (Continued)

Item	Part Number	Description
14	W705928	Solenoid body O-rings
15	W500100	Manual valve detent spring screw
16	7E332	Manual valve detent spring
17	W500102	Main control valve body screw (18 required)
18	W702791	Main control valve body screw
19	W706672	Main control valve body screw
20	7A100	Main control valve body assembly

Removal

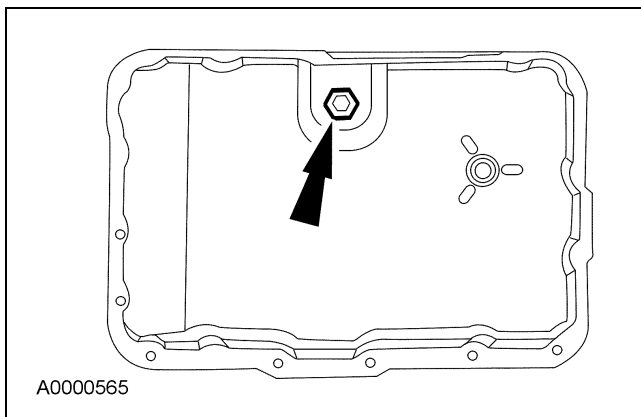
 **CAUTION:** Lubricate the fluid filter seals with clean automatic transmission fluid or they may be damaged.

NOTE: Make sure that the fluid filter seals are correctly seated on the filter.

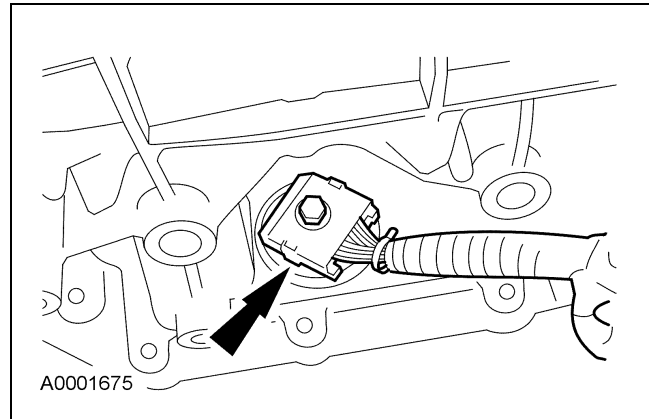
NOTE: Clean the area around the solenoid body connector to prevent contamination.

NOTE: The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

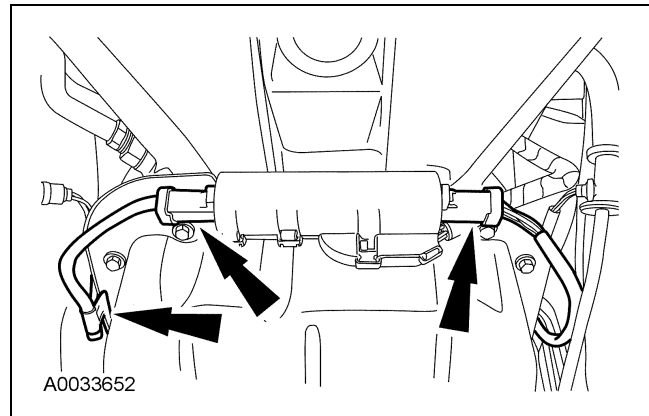
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the drain plug and drain the transmission fluid.
 - Discard the drain plug gasket.



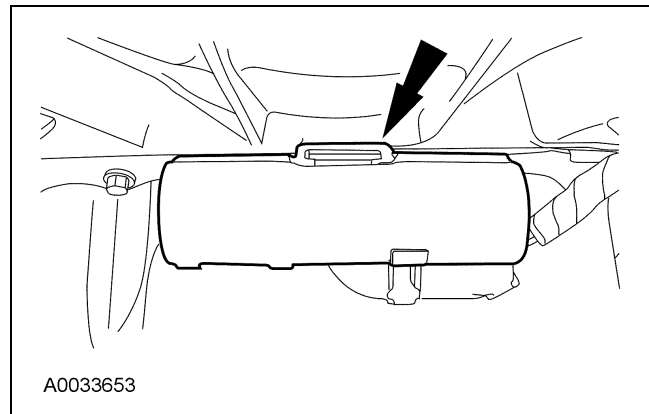
3. **NOTE:** Clean the area around the solenoid body connector to prevent contamination. Disconnect the solenoid body harness electrical connector.



4. Disconnect the heated oxygen sensor (HO2S) connectors and retaining clip from the RH pan rail and then position the connectors aside.



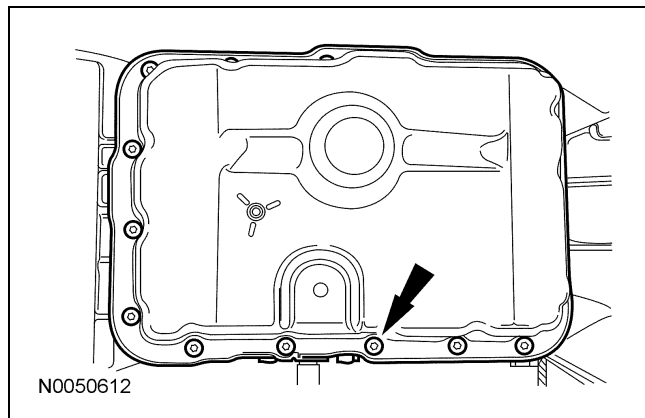
5. Remove the HO2S connector from the front of the transmission pan rail.



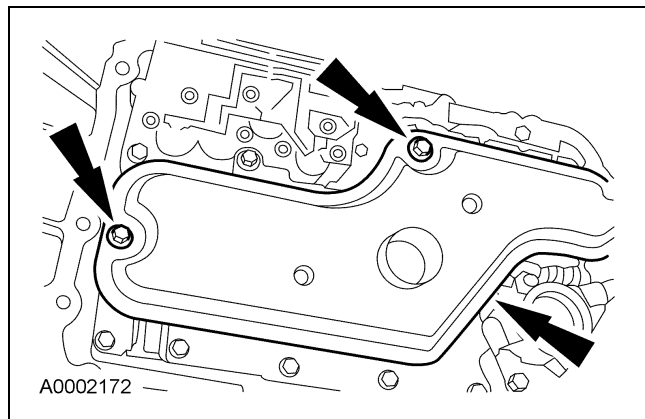
IN-VEHICLE REPAIR (Continued)

6. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect the gasket for damage. If not damaged, the gasket should be reused.

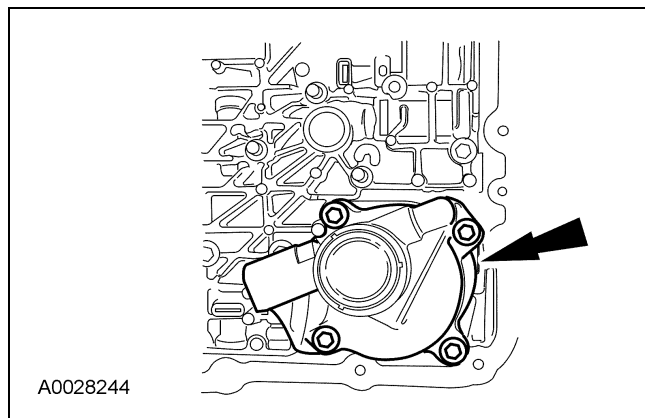
Remove the transmission fluid pan and gasket.



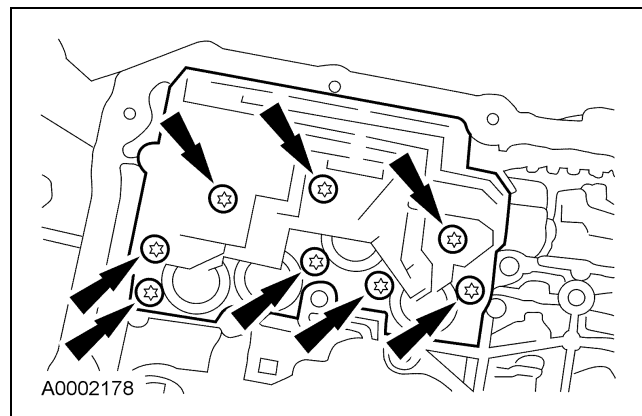
7. Remove the transmission fluid filter.



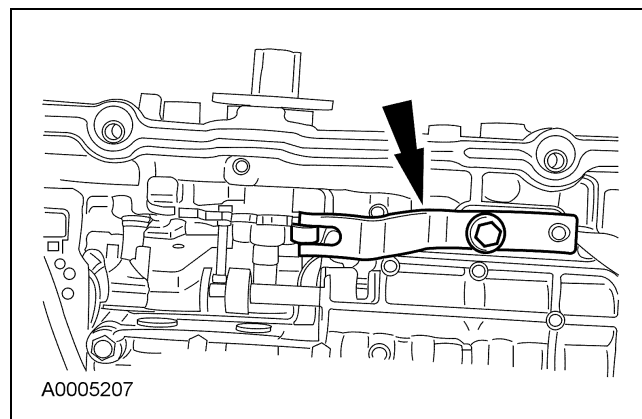
8. Remove the 4 screws attaching the reverse servo to the transmission case and remove the servo.



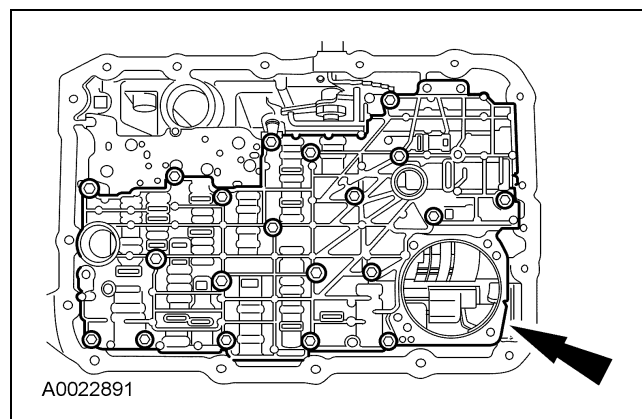
9. Remove the screws and the solenoid body.



10. Remove the manual control valve detent spring.

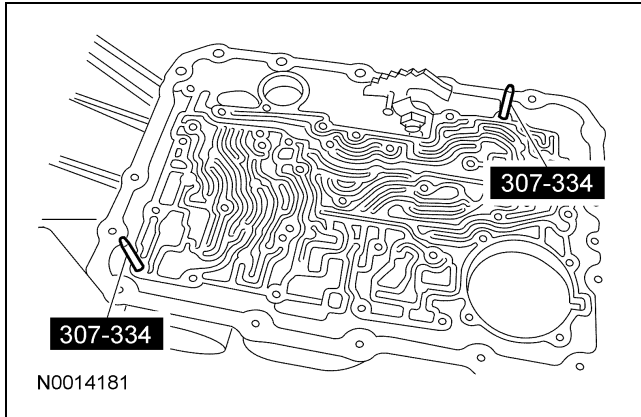


11. Remove the main control valve body bolts and the main control valve body assembly.

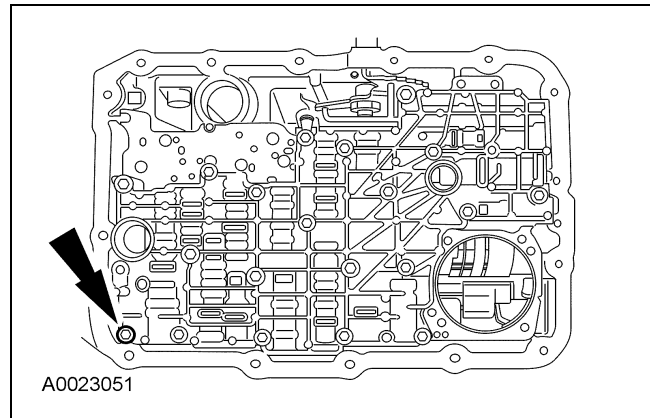


IN-VEHICLE REPAIR (Continued)**Installation**

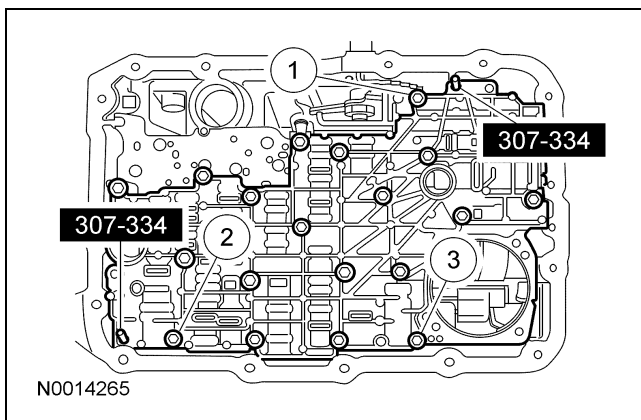
1. Install the special tools into the transmission case.



3. Remove the special tool and loosely install the screw.

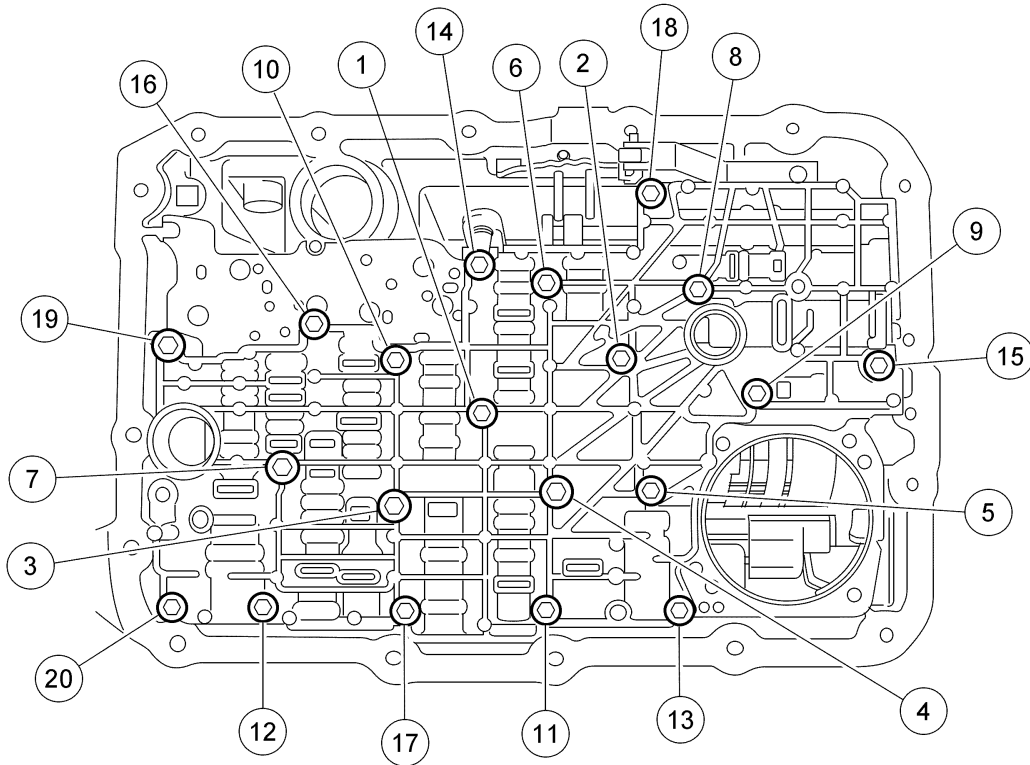


2. Using the special tools, install the main control valve body and loosely install the screws.
 - 1 Install the short screw.
 - 2 Install the screw with the larger head.
 - 3 Install the remaining screws.



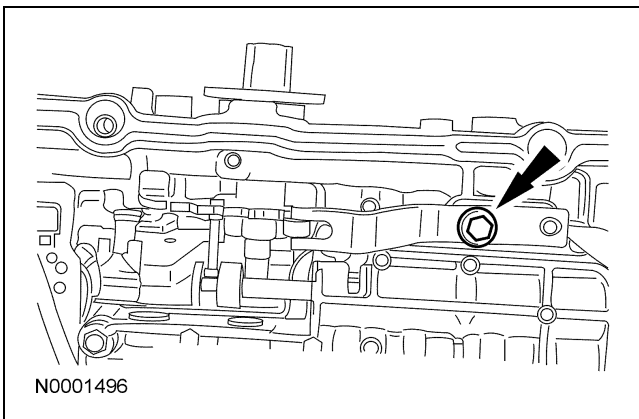
IN-VEHICLE REPAIR (Continued)

4. Tighten the screws in the sequence shown.
- Tighten to 10 Nm (89 lb-in).

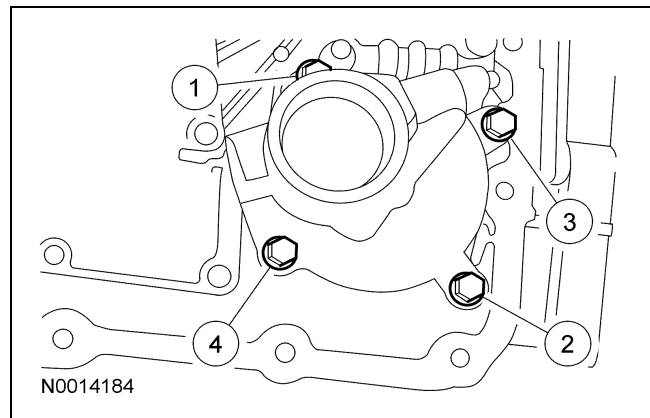


N0014183

5. Install the manual control valve detent spring.
- Tighten to 10 Nm (89 lb-in).



N0001496

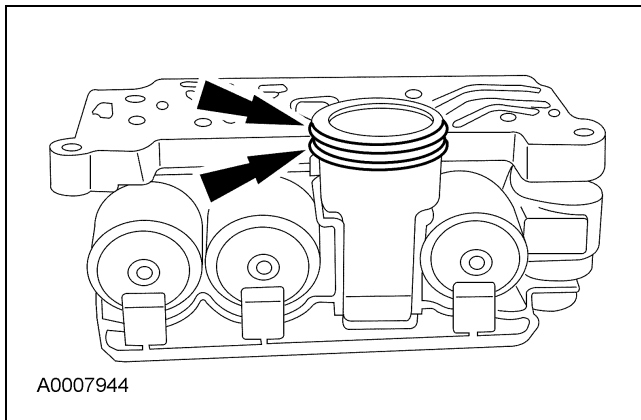


N0014184

6. Install the reverse servo and the 4 screws.
Tighten the screws in sequence in 2 stages.
- Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 11 Nm (8 lb-ft).

IN-VEHICLE REPAIR (Continued)

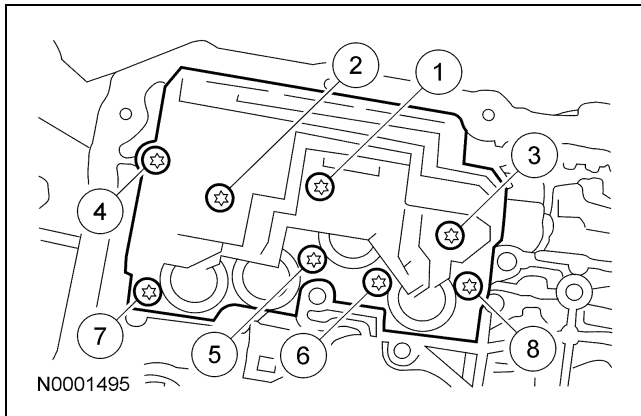
7. Install new O-ring seals on the solenoid body connector. Lubricate the O-ring seals with clean automatic transmission fluid.



8. **⚠ CAUTION:** Inspect the transmission case bore to make sure it is free of foreign material and not damaged. If it is damaged, transmission leak may occur.

Install the solenoid body. Tighten the screws in sequence shown.

- Tighten to 8 Nm (71 lb-in).

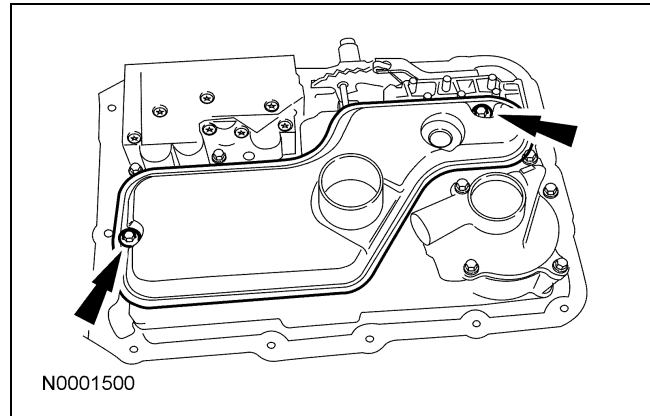


9. **⚠ CAUTION:** Lubricate the fluid filter seals with clean automatic transmission fluid or they may be damaged.

NOTE: Make sure that the fluid filter seals are correctly seated on the filter.

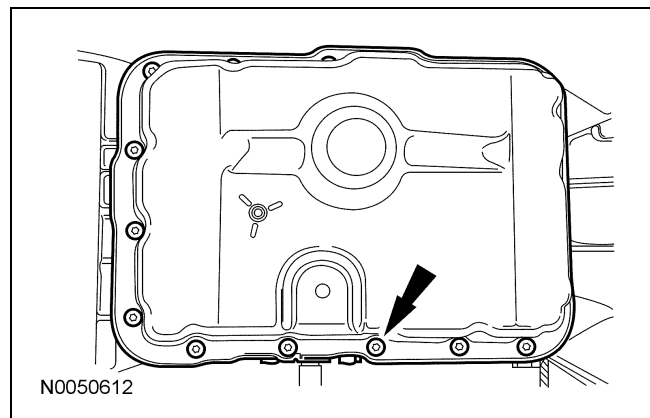
Lubricate the seals and install the transmission fluid filter.

- Tighten to 10 Nm (89 lb-in).



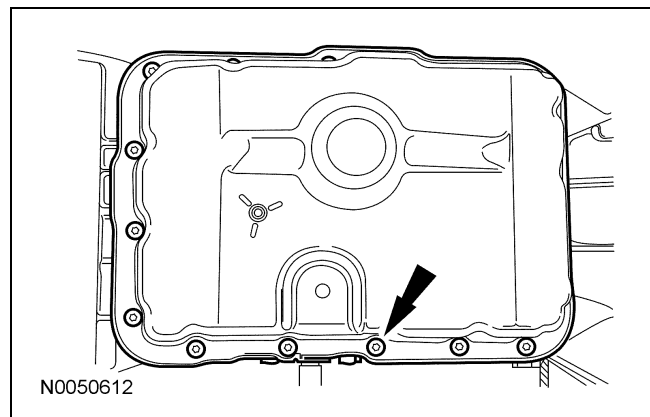
10. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the gasket should be reused.

Install the transmission fluid pan and gasket and loosely install the screws.



11. Tighten the screws in a crisscross sequence.

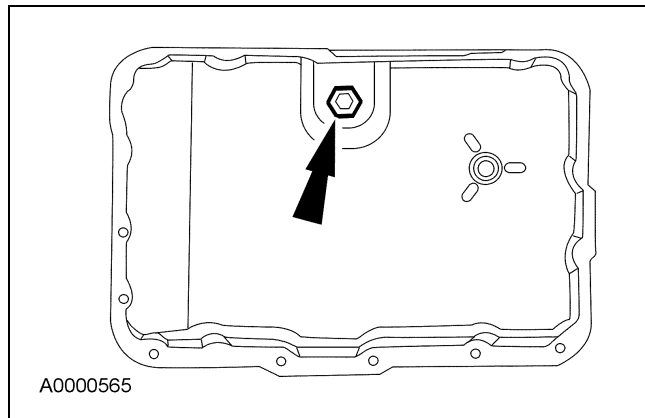
- Tighten to 11 Nm (8 lb-ft).



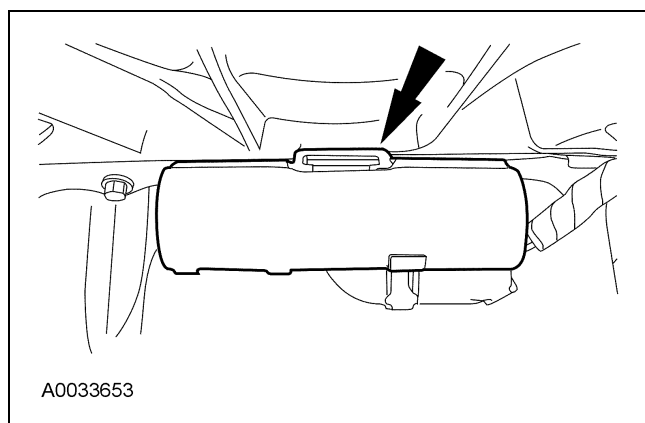
IN-VEHICLE REPAIR (Continued)

12. Install the drain plug.

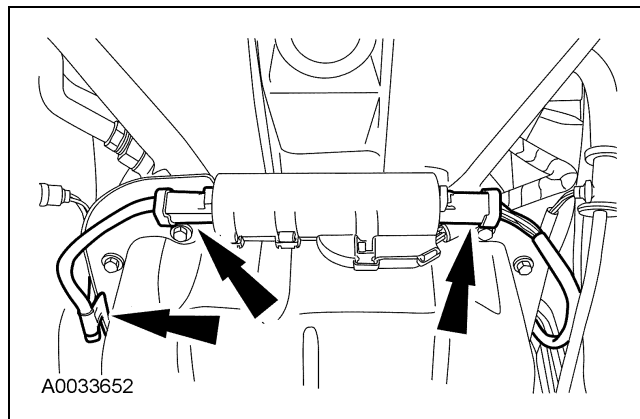
- Install a new gasket onto the drain plug assembly.
- Tighten to 26 Nm (19 lb-ft).



13. Install the HO2S connector to the front of the transmission pan rail.



14. Connect the HO2S connector and install the sensor wire retaining clip to the RH side of the transmission pan rail.



15. **⚠ CAUTION:** Damage will occur to the solenoid body assembly if the screw is tightened above specification.

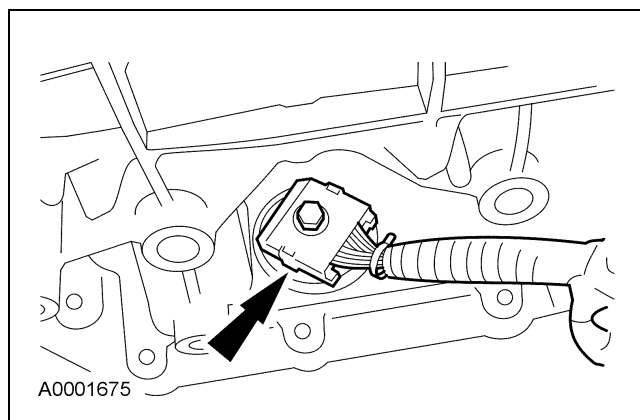
NOTE: Always install new O-ring seals on the vehicle harness connector.

NOTE: Clean the area around the connector to prevent contamination of the solenoid body connector.

NOTE: Use petroleum jelly to lubricate the O-ring seals to aid in the installation process.

Install and lubricate new O-ring seals on the transmission connector and connect the connector.

- Tighten to 5 Nm (44 lb-in).



16. Fill the transmission to the correct level. For additional information, refer to Transmission Fluid Drain and Refill — Without Torque Converter Drain Plug in this section.

DISASSEMBLY AND ASSEMBLY
OF SUBASSEMBLIES

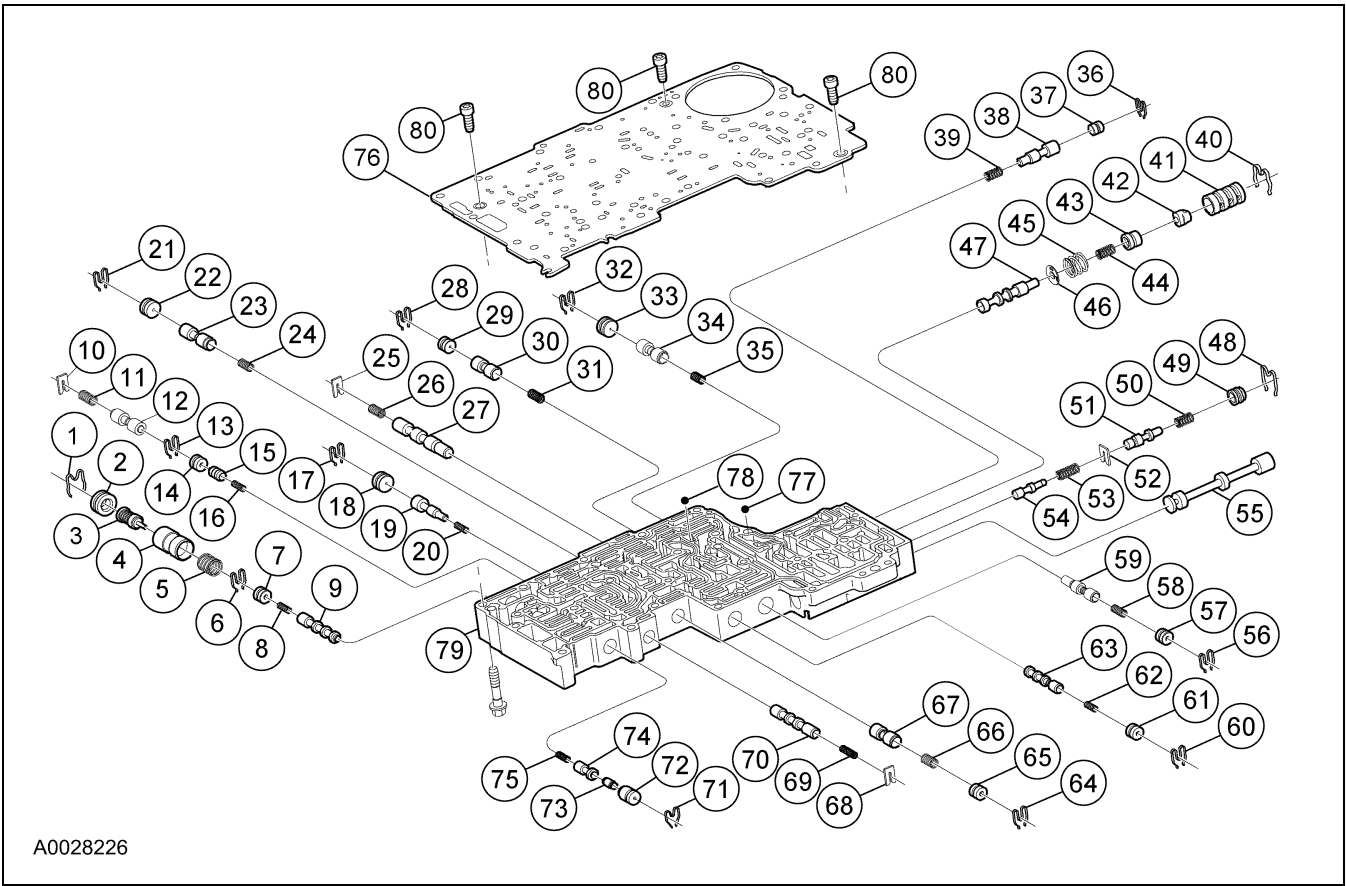
Main Control Valve Body

Special Tool(s)



ST1639-A

Aligner, Valve Body (2 required)
307-334 (T95L-70010-C)



Item	Part Number	Description
1	—	Clip — retainer
2	—	Plug — retainer
3	—	Valve assembly — thermo
4	—	Valve — fluid cooler bypass
5	—	Spring — fluid cooler bypass
6	—	Clip — retainer
7	—	Plug — retainer

(Continued)

Item	Part Number	Description
8	—	Spring — converter clutch control valve
9	—	Valve — converter clutch control
10	—	Plate
11	—	Spring — coast clutch control
12	—	Valve — coast clutch control
13	—	Clip — retainer

(Continued)

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Item	Part Number	Description
14	—	Plug — retainer
15	—	Valve — converter clutch back pressure
16	—	Spring — converter clutch back pressure
17	—	Clip — retainer
18	—	Plug — retainer
19	—	Valve — VFS2 modulator
20	—	Spring — VFS2 modulator valve
21	—	Clip — retainer
22	—	Plug — retainer
23	—	Valve — intermediate servo release
24	—	Spring — intermediate servo release valve
25	—	Plate
26	—	Spring — high clutch control
27	—	Valve — high clutch control
28	—	Plug — retainer
29	—	Clip — retainer
30	—	Valve — reverse modulator
31	—	Spring — reverse modulator valve
32	—	Clip — retainer
33	—	Plug — retainer
34	—	Valve — reverse engagement
35	—	Spring — reverse engagement valve
36	—	Clip — retainer
37	—	Plug — retainer
38	—	Valve — VFS1 modulator
39	—	Spring — VFS1 modulator valve
40	—	Clip — retainer
41	—	Sleeve
42	—	Valve — booster
43	—	Valve — booster
44	—	Spring — inner
45	—	Spring — outer
46	—	Spring — retainer
47	—	Valve — main regulator
48	—	Clip — retainer

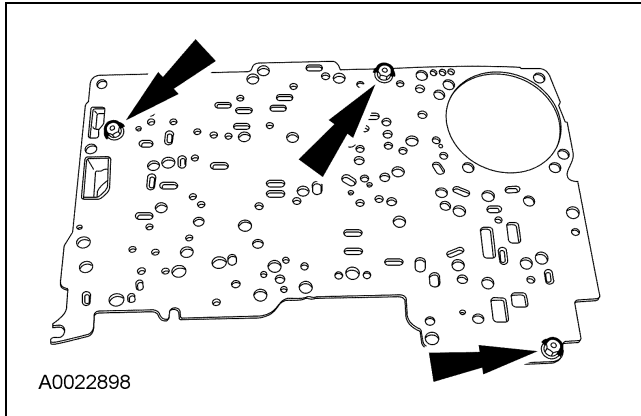
(Continued)

Item	Part Number	Description
49	—	Plug — retainer
50	—	Spring — converter limit
51	—	Valve — converter limit
52	—	Plate
53	—	Spring — solenoid regulator valve
54	—	Valve — solenoid regulator
55	—	Valve — manual
56	—	Clip — retainer
57	—	Plug — retainer
58	—	Spring — rear servo control valve
59	—	Valve — rear servo control
60	—	Clip — retainer
61	—	Plug — retainer
62	—	Spring — RS ISA select valve
63	—	Valve — RS ISA select
64	—	Clip — retainer
65	—	Plug — retainer
66	—	Spring — forward engagement control valve
67	—	Valve — forward engagement control
68	—	Plate
69	—	Spring — Overdrive servo control
70	—	Valve — Overdrive servo control
71	—	Retainer — clip
72	—	Sleeve — converter clutch modulator control
73	—	Valve — converter clutch modulator control
74	—	Valve — converter clutch modulator
75	—	Spring — converter clutch modulator control
76	7Z490	Plate assembly — main control valve body separator
77	7E195	Ball — lubrication check
78	7E195	Ball — shuttle valve
79	7A101	Body — control valve lower
80	W701099	Screws — separator plate

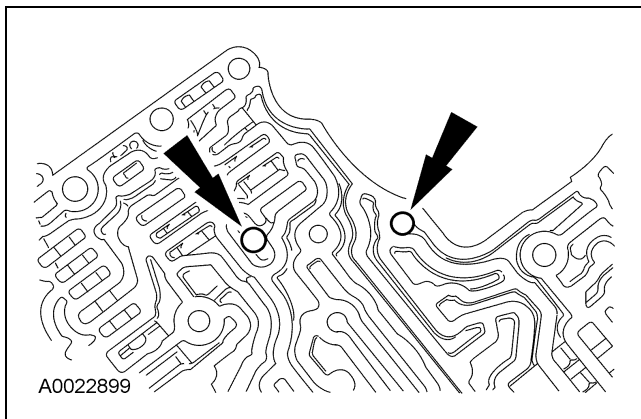
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Disassembly

1. **NOTE:** The valve body separator plate has a bonded gasket. Do not reuse. Discard the plate. Remove and discard the valve body separator plate.



2. Remove the check balls.



3. **NOTE:** Refer to the disassembled view. Disassemble the main control valve body only if cleaning is required.

Assembly

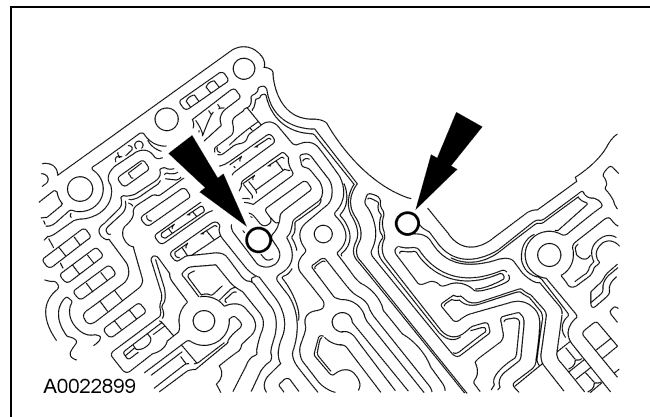
1. **CAUTION:** Do not lose parts when cleaning or repairing. Thoroughly clean all parts in solvent and blow dry with moisture-free compressed air.

2. **CAUTION:** Do not stone, file or sand the valves. This will remove the anodized finish and may result in further main control or transmission damage.

After cleaning the main control valve body, carry out the following:

- Inspect all valve and plug bores for scoring or burrs.
- Check all fluid passages for obstructions.
- Inspect all valves and plugs for burrs.
- Inspect all mating surfaces for burrs or distortion.
- Inspect all springs for distortion.
- Check all valves and plugs for free movement in their respective bores.
 - Valves and plugs, when dry, must fall from their own weight into their respective bores.
- Roll the manual valve on a flat surface to check for a bent condition.

3. Assemble the main control valve body.
4. Install the main control valve body check balls.

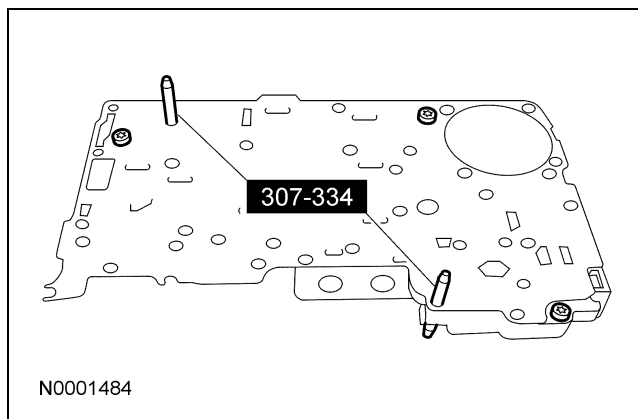


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

5. **NOTE:** Use a new valve body separator plate for main control valve body installation.

Using the special tools, install a new main control valve body separator plate.

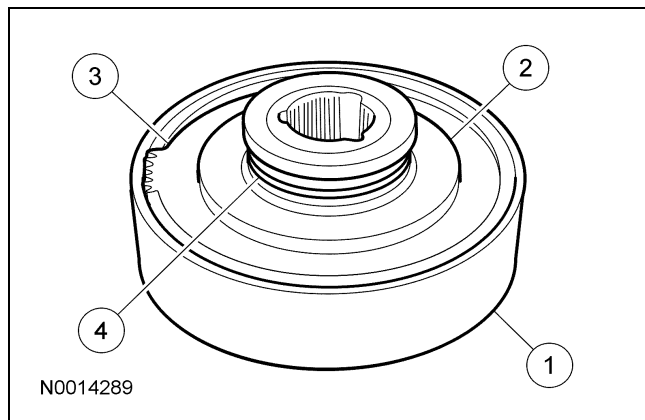
- Tighten to 7 Nm (62 lb-in).



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

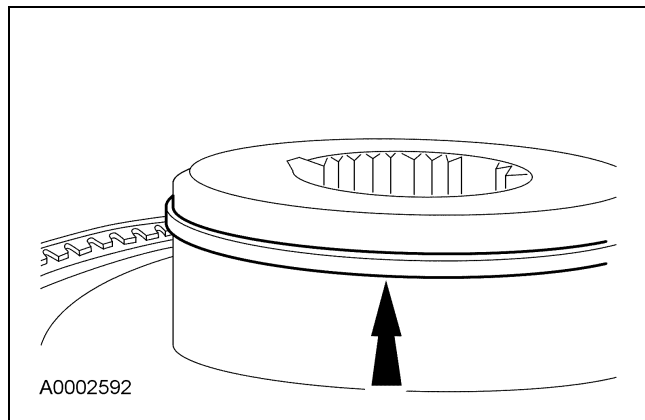
Output Shaft Ring Gear and Hub Shaft Assembly

Disassembly

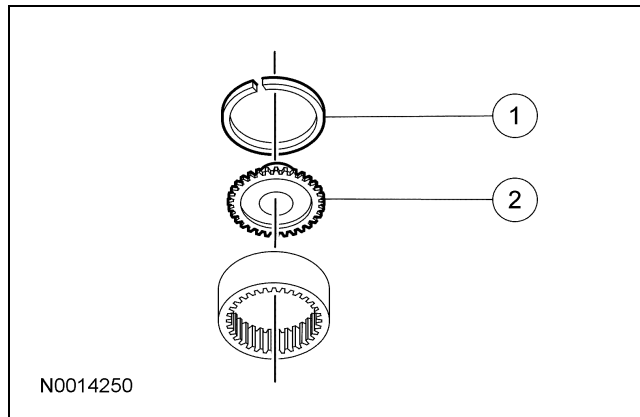


Item	Part Number	Description
1	7A153	Output shaft ring gear
2	7D164	Output shaft hub
3	7C122	Retaining ring
4	7D019	Output shaft hub seal

1. Inspect the output shaft ring gear and hub shaft assembly for damage. If repair is necessary, use the following procedure.
2. Remove the seal.

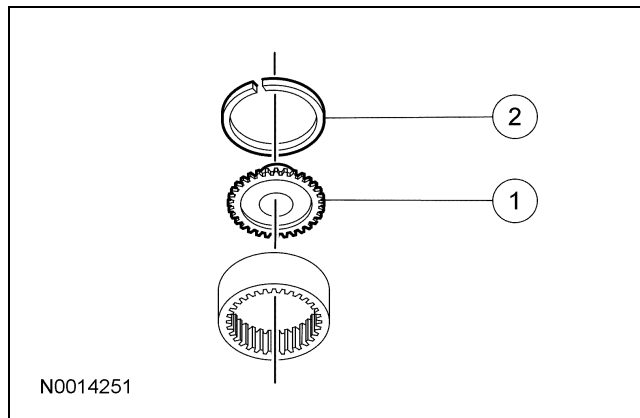


3. Remove the output shaft ring gear from the output shaft hub.
 - 1 Remove the retaining ring.
 - 2 Remove the output shaft ring gear.



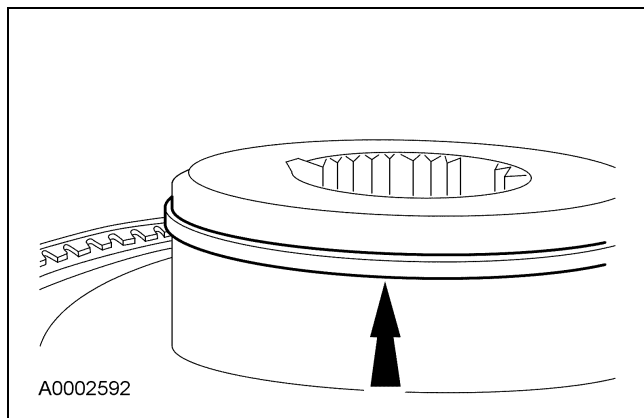
Assembly

1. Install the output shaft ring gear onto the output shaft hub.
 - 1 Install the output shaft ring gear.
 - 2 Install the retaining ring.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

2. Install the seal.



DIAGNOSIS AND TESTING

Output State Control (OSC) Mode

Output state control (OSC) mode allows the technician to take control of certain parameters to function the transmission.

For example, OSC allows the technician to shift the transmission only when commanding a gear change. If the technician commands 1st gear in OSC, the transmission will remain in 1st gear until the technician commands the next gear.

Another example of the OSC features is that a technician can command a shift solenoid to turn ON or OFF when carrying out an electrical circuit check. OSC has 2 modes of operation for transmission, the BENCH Mode and the DRIVE Mode. Each mode/parameter has a unique set of vehicle operating requirements that the technician must meet before being allowed to operate OSC.

NOTE: To operate OSC, the digital transmission range (TR) sensor and the vehicle speed sensor (VSS) must be operational. No diagnostic trouble codes (DTCs) related to the digital TR sensor or the VSS can be present.

- The vehicle requirements **MUST BE MET** when SENDING the OSC value. Refer to vehicle requirements for each individual test.
- If the vehicle requirements are **NOT MET** when SENDING the OSC value, an **ERROR MESSAGE** will appear. When the **ERROR MESSAGE** is received, OSC is aborted and must be restarted.
- If after a sent value is substituted and the vehicle requirements are no longer met, the powertrain control module (PCM) will cancel the OSC value and resume normal operation. No error message will be sent.
- The OSC value XXX may be sent anytime to cancel OSC.

OSC Procedures

- Carry out visual inspection and vehicle preparation as necessary.
- Select “Vehicle and Engine Selection” menu.
- Select appropriate vehicle and engine.
- Select “Diagnostic Data Link.”
- Select “Powertrain Control module.”
- Select “Diagnostic Test Mode.”

- Select “KOEO On-Demand Self Test and KOER On-Demand Self Tests.”
- Carry out test and record DTCs.
- Repair all non-Transmission DTCs.
- Repair all VSS and digital TR sensor DTCs.
- Make sure that VSS and digital TR sensors are functional.
- Select “Active Command Modes.”
- Select “Output State Control.”
- Select “Trans - Bench Mode or Trans - Drive Mode.”

OSC — Transmission Bench Modes

The following transmission BENCH Modes may be used as necessary during diagnostics.

SSA, SSB, SSC, SSD and TCC in Bench Mode

 **CAUTION:** The parking brake must be set prior to carrying out this procedure.

The BENCH Mode allows the technician to carry out electrical circuit checks on the following components:

- SSA - Activates SS A OFF or ON.
- SSB - Activates SS B OFF or ON.
- SSC - Activates SS C OFF or ON.
- SSD - Activates SS D OFF or ON.
- TCC - Activates TCC OFF or ON.

OSC “SSA, SSB, SSC, SSD, TCC” BENCH Mode operates **ONLY** when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Transmission range selector lever is in P or N.
- Key ON.
- Engine OFF.

OSC Command Values:

- OFF - Turns solenoid OFF.
- ON - Turns solenoid ON.
- XXX - Cancels OSC value sent.
- SEND - Sends the values to PCM.

DIAGNOSIS AND TESTING (Continued)

Bench Mode Procedure for SSA, SSB, SSC, SSD and TCC

Follow operating instructions from the scan tool menu screen:

- Select “Output State Control.”
- Select “Trans - Bench Mode.”
- Select “PIDs” to be monitored.
- Monitor all selected PIDs during test.
- Select “Parameters - SSA, SSB, SSC, SSD or TCC.”
- Select “ON” to turn solenoid ON.
- Press “SEND” to send command ON.
- Select “OFF” to turn solenoid OFF.
- Press “SEND” to send command OFF.
- Select “XXX” to cancel at any time.
- Press “SEND.”

PCA, PCB, PCC in Bench Mode

 **CAUTION: The parking brake must be set prior to carrying out this procedure.**

The BENCH Mode is also used to test the functionality of the transmission electronic pressure control. During BENCH Mode, the PCx solenoids can be commanded in increments of 15 psi from 0 to 90 psi and 90 to 0 psi.

The line pressure tap is used to verify output pressure from PC A or PC B by turning either one OFF while verifying the output from the other solenoid. The second pressure tap is used to verify the output from the PC C solenoid.

The OSC functions for the parameter PCx allows the technician to choose the following options:

- PCx - Activates PCx to selected values.
- 00 - Sets PCx pressure to 00 psi.
- 15 - Sets PCx pressure to 15 psi.
- 30 - Sets PCx pressure to 30 psi.
- 45 - Sets PCx pressure to 45 psi.
- 60 - Sets PCx pressure to 60 psi.
- 75 - Sets PCx pressure to 75 psi.
- 90 - Sets PCx pressure to 90 psi.

OSC “PCx” BENCH Mode should ONLY be operated to check PRESSURE FUNCTIONALITY using an installed pressure gauge (300 psi) when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Transmission range selector lever is in P or N.
- Pressure gauge installed.
- Key ON.
- Engine ON.
- Engine rpm at least 1500.

OSC “PCx” BENCH Mode should ONLY be operated to complete PCx SOLENOID CIRCUIT PINPOINT TESTS when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs are present.
- Transmission range selector lever is in P or N.
- Key ON.
- Engine OFF.

OSC Command Values:

- 00 - Sets PCx pressure to 00 psi.
- 15 - Sets PCx pressure to 15 psi.
- 30 - Sets PCx pressure to 30 psi.
- 45 - Sets PCx pressure to 45 psi.
- 60 - Sets PCx pressure to 60 psi.
- 75 - Sets PCx pressure to 75 psi.
- 90 - Sets PCx pressure to 90 psi.
- XXX - Cancels OSC value sent.
- SEND - Sends the values to PCM.

Bench Mode Procedure for PCx

Following operating instructions from the scan tool menu screen:

- Select “Output State Control.”
- Select “Trans - Bench Mode.”
- Select “PIDs” to be monitored.
- Monitor all selected PIDs during test.
- Select “Parameters - PCx.”
- Select Value “0 - 90 psi.”
- Press “SEND” to send command.
- Select “XXX” to cancel at any time.
- Press “SEND.”

DIAGNOSIS AND TESTING (Continued)**OSC — Transmission Drive Modes**

The DRIVE Mode allows control of 3 transmission parameters. Each mode/parameter has a unique set of vehicle operating requirements that the technician must meet before being allowed to operate OSC.

The recommended procedure, when using the DRIVE Mode, is to control one parameter at a time.

The DRIVE Mode allows the technician to carry out the following functions on the transmission:

- GEAR - Allows upshifts or downshifts.
- TCC - Engages or disengages the torque converter clutch.
- FIRM__SFT - Commands a higher control pressure during upshift.

The pressure control (PCx) solenoids for this transmission are not directly controlled during DRIVE mode testing. Pressures may be raised during an upshift via the harsh shift control channel (FIRM__SFT).

GEAR in Drive Mode

This OSC function is used to test the transmission shift functions.

The OSC functions for the GEAR parameter allow the technician to choose the following options:

- 1 - PCM selects 1st gear.
- 2 - PCM selects 2nd gear.
- 3 - PCM selects 3rd gear.
- 4 - PCM selects 4th gear.
- 5 - PCM selects 5th gear.

OSC “GEAR” mode operates ONLY when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Engine ON.
- TCC OFF (TCC cannot be engaged).
- Transmission range selector lever in (D).
- Vehicle speed is greater than 3 km/h (2 mph).

OSC Command Values:

- 1 - PCM selects 1st gear.
- 2 - PCM selects 2nd gear.
- 3 - PCM selects 3rd gear.
- 4 - PCM selects 4th gear.

- 5 - PCM selects 5th gear.
- XXX - Cancels OSC value sent.
- SEND - Sends the values to the PCM.

Drive Mode Procedure for GEAR

Follow operating instructions from the scan tool menu screen.

- Select “Output State Control.”
- Select “Trans - Drive Mode.”
- Select “PIDs” to be monitored.
- Monitor all selected PIDs during test.
- Select “Parameters - GEAR.”
- Select Value “1-5.”
- Press “SEND” to send command.
- Reselect Value “1-5.”
- Press “SEND” to send command.
- Select “XXX” to cancel at any time.
- Press “SEND.”

TCC in Drive Mode

This OSC function is used to test whether the torque converter clutch (TCC) is engaging and disengaging correctly.

The OSC functions for the TCC parameter allows the technician to choose the following:

- TCC - Activates TCC OFF and ON.
- ON - Turns TCC solenoid ON.
- OFF - Turns TCC solenoid OFF.

OSC “TCC OFF” DRIVE Mode operates ONLY when:

- VSS and digital TR sensors are operational.
- No VSS and digital TR sensor DTCs present.
- Engine ON.
- Transmission range selector lever in (D).
- Vehicle speed is greater than 3 km/h (2 mph).

OSC “TCC ON” DRIVE Mode operates ONLY when:

- VSS and digital TR sensors are operational.
- No VSS and digital TR sensor DTCs present.
- Engine ON.
- Transmission range selector lever in (D).
- Vehicle speed is greater than 3 km/h (2 mph).

DIAGNOSIS AND TESTING (Continued)

- Transmission in 2nd gear or higher.
- TFT is between 33-153°C (60-275°F).
- Brake not applied. “OFF” below 32 km/h (20 mph).
- Maintain steady speed.

OSC Command Values:

- OFF - Turns TCC OFF.
- ON - Turns TCC ON.
- XXX - Cancels OSC value sent.
- SEND - Sends the values to PCM.

Drive Mode Procedures for TCC

Follow operating instructions from the scan tool menu screen.

- Select “Output State Control.”
- Select “Trans-Drive Mode.”
- Select “PIDs” to be monitored.
- Monitor all selected PIDs during test.
- Select “Parameters - TCC.”
- Select “ON” to turn solenoid ON.
- Press “SEND” to send command ON.
- Select “OFF” to turn solenoid OFF.
- Press “SEND” to send command OFF.
- Select “XXX” to cancel at any time.
- Press “SEND.”

FIRM__SFT in Drive Mode

This OSC function is used to raise pressure during an upshift to determine whether the pressure control system is functioning correctly. Harsher shifts indicate that the pressure control system works at higher pressure. The best test for isolating pressure control system problems is to carry out the PCA, PCB, PCC in BENCH Mode using a hydraulic pressure gauge.

The OSC functions for the parameter FIRM__SFT allows the technician to choose the following options:

- FIRM__SFT - Activates the harsh shift channel.
 - ON - Sets control pressure higher for all upshifts (determined by the PCM).
 - OFF - Sets control pressure to normal for all upshifts (determined by the PCM).
 - XXX - Cancels OSC for FIRM__SFT.

OSC “FIRM__SFT” DRIVE Mode operates ONLY when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Transmission range selector lever in O/D.
- Pressure gauge installed (optional).
- Key ON.
- Engine ON.
- Vehicle speed greater than 3 km/h (2 mph).
- TCC is OFF (TCC is not engaged).

OSC Command Values:

- ON - Sets control pressure high for all upshifts (determined by the PCM).
- OFF - Sets control pressure to normal for all upshifts (determined by the PCM).
- XXX - Cancel OSC for FIRM__SFT.
- SEND - Sends the values to the PCM.

DRIVE Mode procedure for FIRM__SFT

Follow operating instructions from the scan tool menu screen.

- Select “Output State Control”.
- Select “Trans - Drive Mode”.
- Select “PIDs” to be monitored.
- Monitor all selected PIDs during test.
- Select “Parameters - FIRM__SFT.”
- Press “SEND” to send command.
- Select “XXX” to cancel at any time.
- Press “SEND.”

Using Output State Control (OSC) and Accessing PIDs

To confirm that the OSC value was sent by the scan tool and the PCM has accepted the OSC substitution, a corresponding PID for each OSC parameter must be monitored. Additional PIDs should be monitored to help the technician adequately diagnose the transmission.

The following is a list of OSC parameters and their corresponding PID:

DIAGNOSIS AND TESTING (Continued)

Corresponding PID	PID Description
BPP	Brake Pedal Position Switch On/Off
PCA	Pressure Control Solenoid A — Commanded Pressure
PCB	Pressure Control Solenoid B — Commanded Pressure
PCC	Pressure Control Solenoid C — Commanded Pressure
FIRMST	Firm Shift Control (FMC) Status Requested by OSC; 0 = FSC not Commanded by OSC, NGS PID Output = OFF; 1 = FSC Commanded by OSC, NGS PID Output = ON
GEAR	Commanded Transmission Gear (use in DRIVE only)
RPM	Engine Revolutions Per Minute
SSA	Shift Solenoid A Commanded ON
SSB	Shift Solenoid B Commanded ON

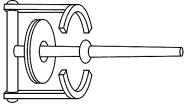
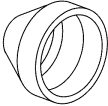
Corresponding PID	PID Description
SSC	Shift Solenoid C Commanded ON
SSD	Shift Solenoid D Commanded ON
TCC	Torque Converter Commanded Duty Cycles (%)
TCCRAT	Torque Converter Speed Ratio (RPM and/or TSS)
TFT	Transmission Fluid Temperature (degrees Fahrenheit)
VSS	Vehicle Speed (mph)

To confirm that the OSC substitution occurred, SEND the OSC value and monitor the corresponding PID value. If no ERROR MESSAGE was received and the value of the corresponding PID is the same as the value sent from OSC, then the OSC substitution was successful.

DISASSEMBLY AND ASSEMBLY
OF SUBASSEMBLIES

Overdrive Brake and Coast Clutch
Drum Assembly

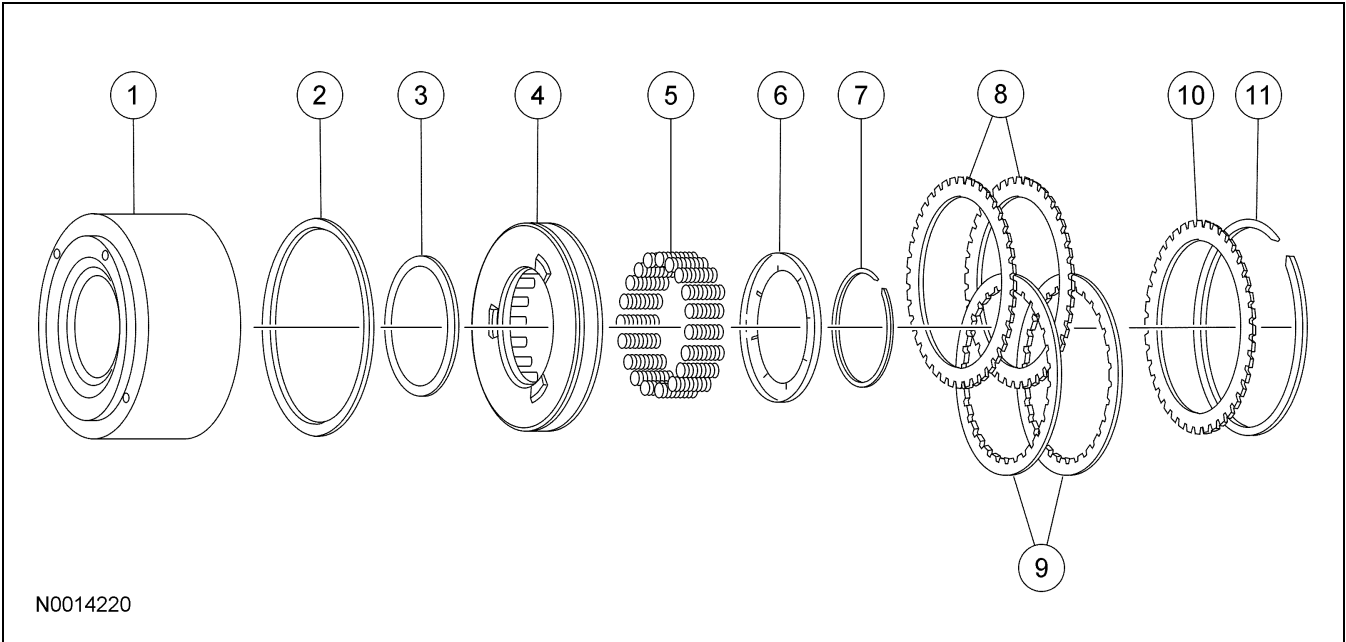
Special Tool(s)

 ST1190-A	Compressor, Clutch Spring 307-015 (T65L-77515-A)
 ST2431-A	Protector, Piston Seal 307-049 (T74P-77404-A)

Material

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

Overdrive Brake and Coast Clutch Drum Assembly

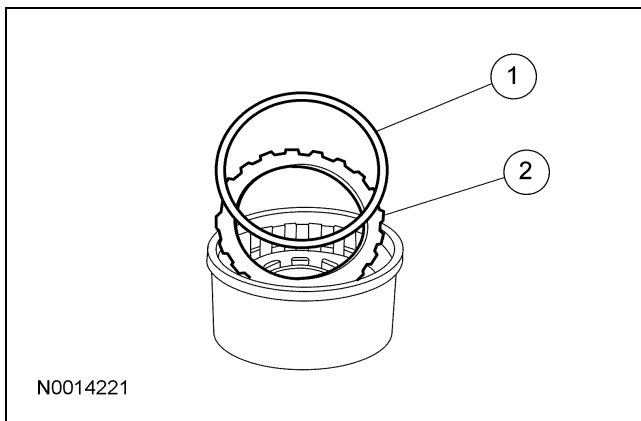


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

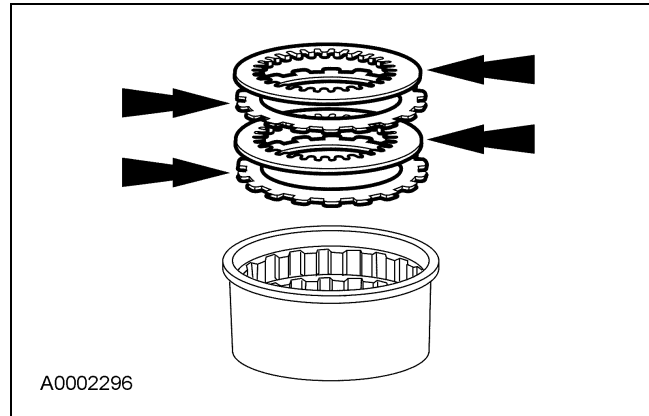
Item	Part Number	Description
1	7L669	Coast clutch drum
2	7A548	Overdrive piston outer seal ring
3	7D404	Overdrive piston inner seal ring
4	7A262	Overdrive clutch piston
5	7A480	Overdrive piston spring (20 required)
6	7A527	Coast clutch piston spring retainer
7	E860125-S	Retaining ring
8	7B442	Coast clutch external plates — steel (2 required)
9	7B164	Coast clutch internal plates — friction (2 required)
10	7B066	Coast clutch pressure plate
11	E860126S/129S	Retaining ring (select fit)

Disassembly

1. Remove the coast clutch pressure plate.
 - 1 Remove the coast clutch retaining ring.
 - 2 Remove the coast clutch pressure plate.



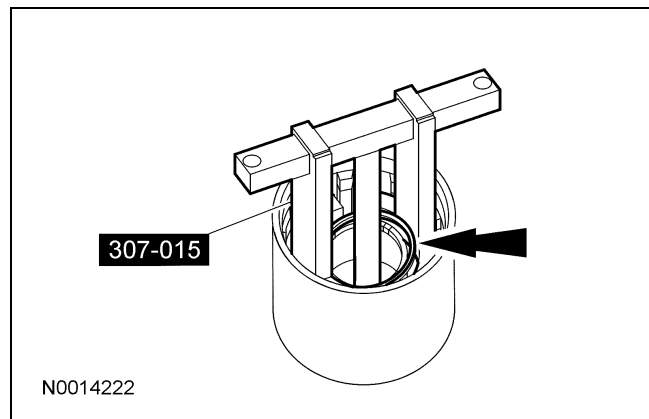
2. Remove the coast clutch disc pack.
 - Inspect for wear, install a new pack as necessary.



3. **⚠ WARNING:** Use caution when releasing tool pressure on the rear clutch piston spring. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Do not fully compress the special tool or damage to the spring retainer may occur.

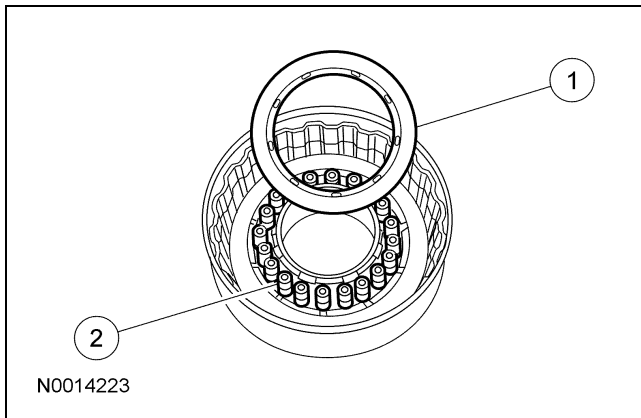
Using the special tool, remove the coast clutch piston retaining ring.



4. Relieve the coast clutch spring tension and remove the special tool.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

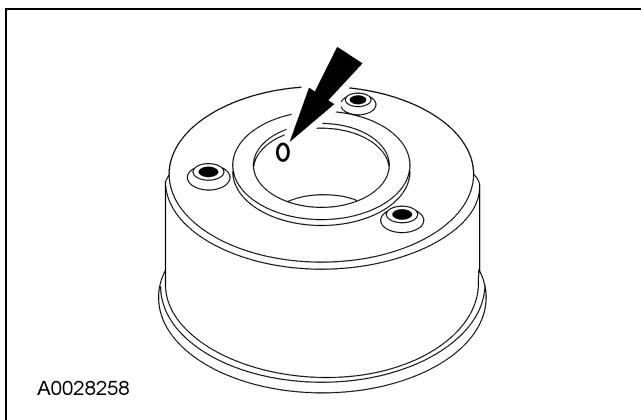
5. Remove the coast clutch piston springs.
 - 1 Remove the coast clutch piston retainer.
 - 2 Remove the clutch piston springs.



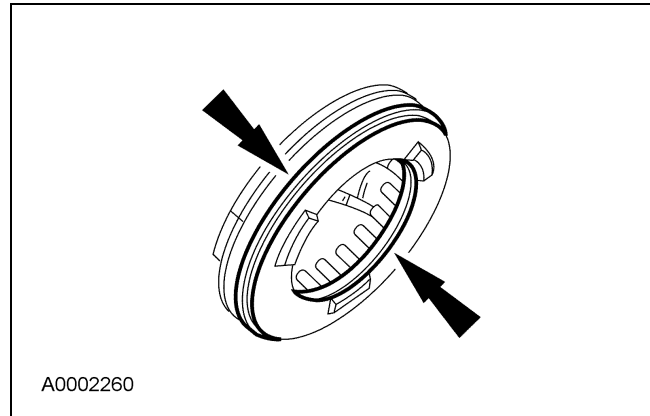
6. **WARNING:** Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air, and make sure the drum is facing down as shown. Failure to follow these instructions may result in personal injury.

Remove the coast clutch piston.

- Apply air pressure to the hole in the drum to remove the coast clutch piston while blocking the other hole with a finger.

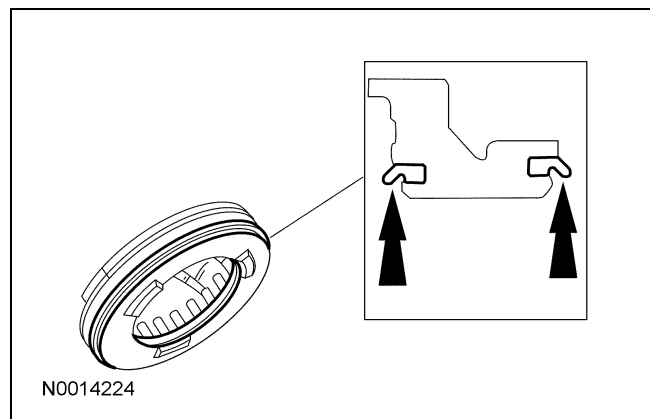


7. Remove and discard the coast clutch piston inner seal and the coast clutch piston outer seal.

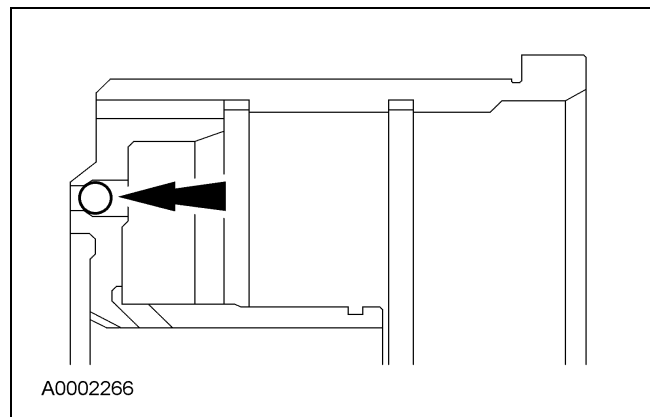
**Assembly**

1. **CAUTION:** The lip seals must be positioned as shown. Care must be taken to prevent rollover of the lip seal.

Install the new coast clutch piston inner and outer seal.



2. Verify the check ball is free to move.

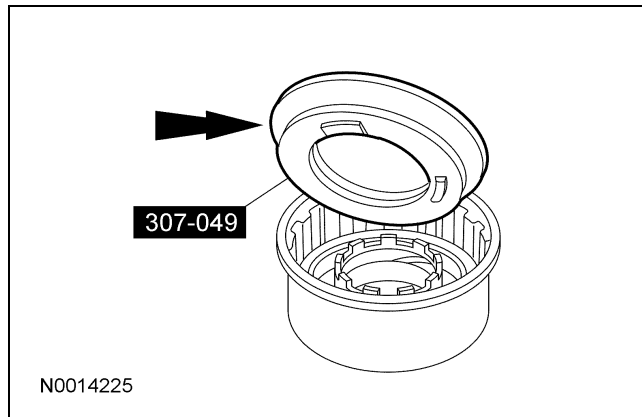


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

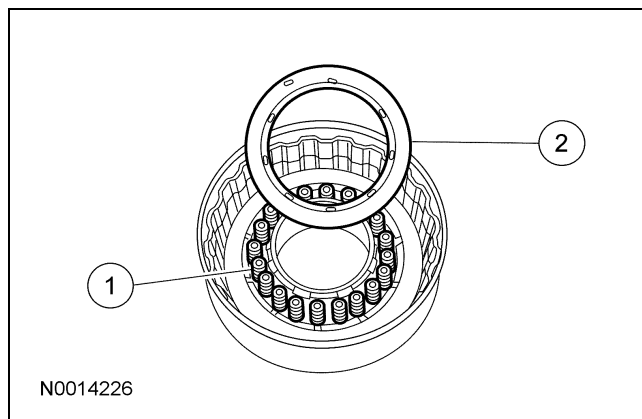
3.  **CAUTION:** Care must be taken to prevent damage to the seals during installation.

Using the special tool, install the coast clutch piston.

- Lubricate the seals with transmission fluid.

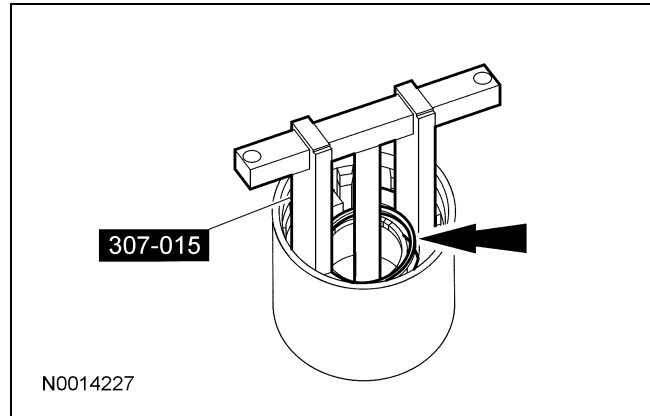


4. Install the coast clutch piston springs.
- 1 Install the coast clutch piston springs.
 - 2 Install the coast clutch spring retainer.



5.  **CAUTION:** Do not fully compress the special tool or damage to the coast clutch piston spring retainer may occur.

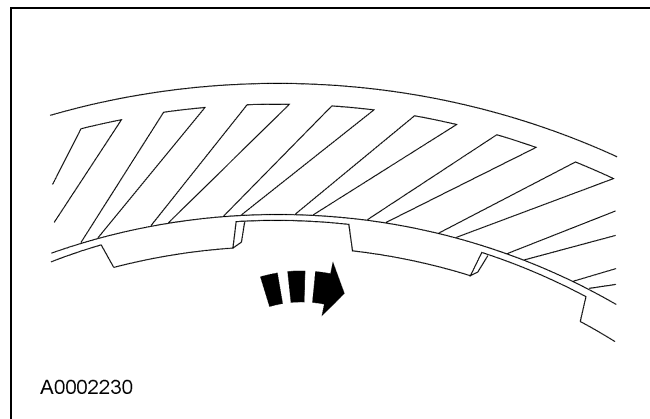
Using the special tool, install the coast clutch piston spring retainer ring.



6.  **CAUTION:** Coast clutch friction plates are directional and must be installed with grooves clockwise (I.D. to O.D.). The word TOP should face up.

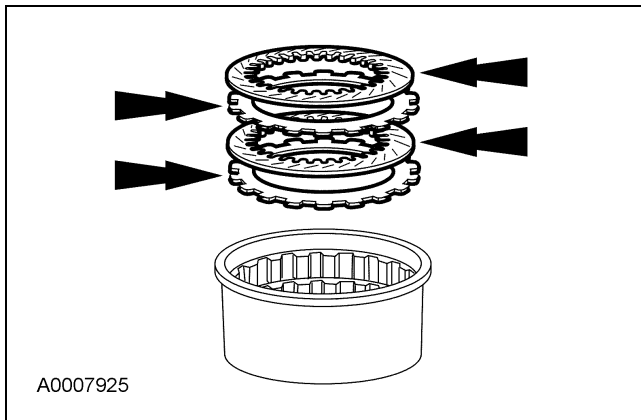
 **CAUTION:** If new clutch plates are being used, they should be soaked in clean automatic transmission fluid before assembly.

When installing friction plates, the word TOP should face up. If reusing plates, grooves must be installed clockwise. Install the coast clutch disc pack.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

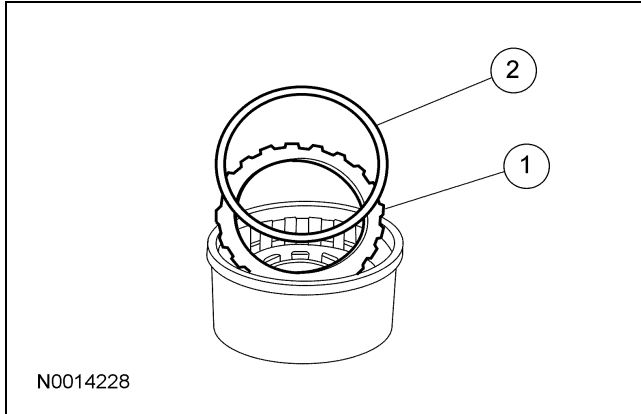
7. Install the 2 steel clutch plates and 2 friction clutch plates in alternating order starting with a steel clutch plate.



8.  **CAUTION: The retaining ring is select fit.**

Install the coast clutch pressure plate.

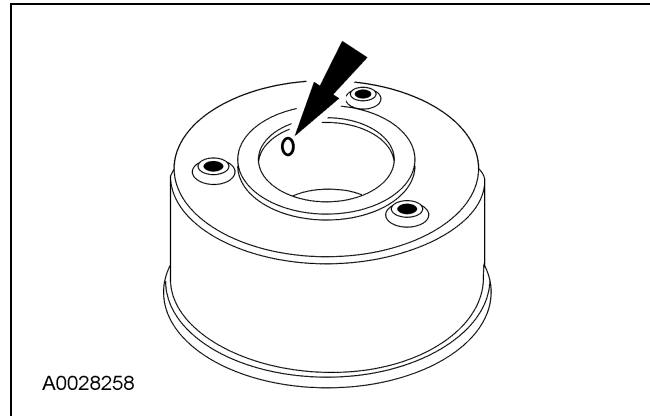
- 1 Install the coast clutch pressure plate.
- 2 Install the original coast clutch retaining ring.



9.  **WARNING: Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air, and make sure drum is facing down as shown. Failure to follow these instructions may result in personal injury.**

Air check the assembly.

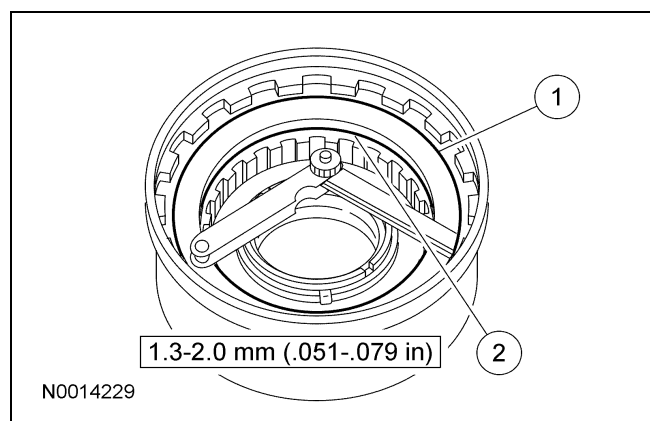
- Apply air pressure to the hole in the drum while blocking the other hole with a finger.



10. Check the coast clutch disc pack free play.

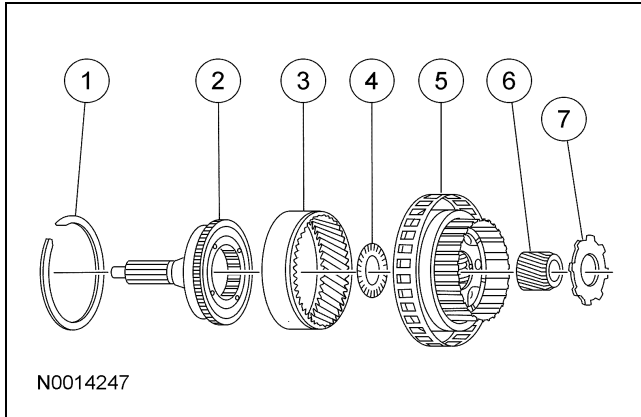
- 1 Push down on the coast pressure plate.
- 2 Check clearance between the coast clutch retaining ring and coast pressure plate. Clearance should be 1.3-2.0 mm (0.051-0.079 in). If clearance is not within the specification, install a correct coast clutch retaining ring that will provide the correct free play adjustment.

Part Number	Thickness		Diameter	
	mm	In	mm	In
E860126-S	1.37	0.0539	130.1	5.122
E860127-S	1.73	0.0681	130.1	5.122
E860128-S	2.08	0.0819	130.1	5.122
E860129-S	2.44	0.0961	130.1	5.122



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

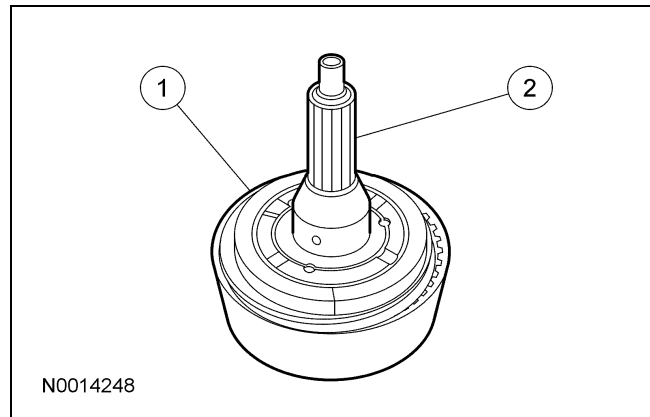
Overdrive Planetary and One-Way Clutch Assembly



Item	Part Number	Description
1	W702037	Retaining ring
2	7A658	Center shaft
3	7A153	Overdrive ring gear
4	7L495	No. 2 overdrive planetary thrust bearing
5	7B446	Overdrive planetary gear carrier assembly
6	7D063	Overdrive sun gear
7	7660	Coast clutch adapter

Disassembly

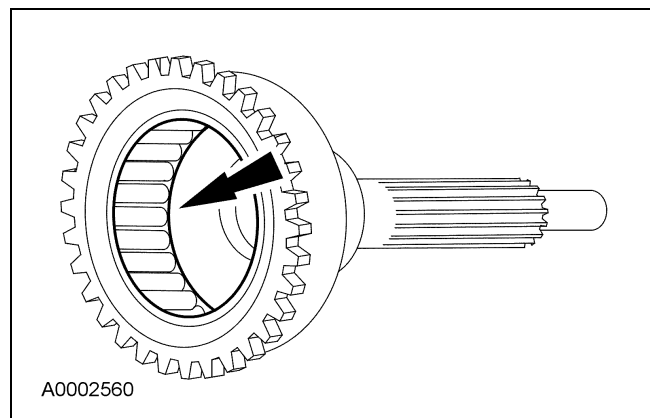
- NOTE:** The overdrive one-way clutch is serviced with the center shaft assembly.
Remove the center shaft from the overdrive ring gear.
 - Remove the overdrive center shaft retaining ring.
 - While rotating counterclockwise remove the center shaft from the ring gear.



- CAUTION:** Do not remove the overdrive one-way clutch. Damage to the clutch may occur if it is removed.

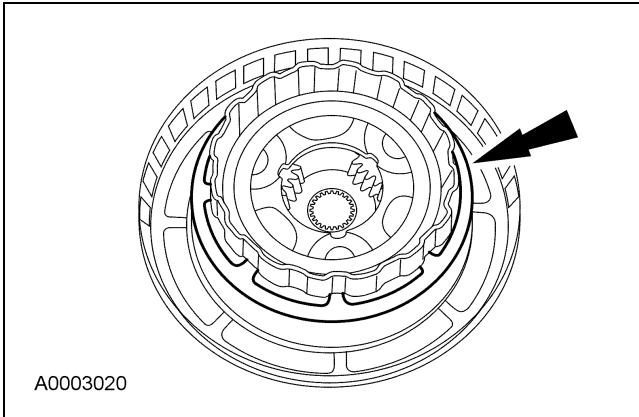
Clean and inspect the overdrive one-way clutch and center shaft.

- Inspect for cracks in the roller cage and wear on the roller clutch, and the press fit of the one-way clutch to the center shaft.

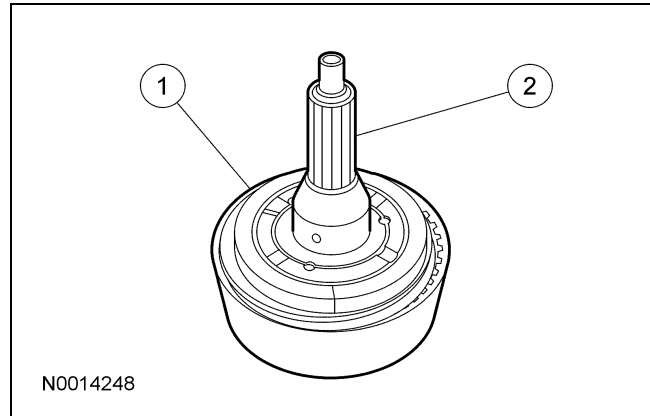


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

3. Inspect the one-way clutch.
 - Temporarily insert the overdrive planetary gear carrier assembly into the one-way clutch rollers for verification of the one-way clutch.
 - The planetary gear must rotate counterclockwise and hold when rotated clockwise.
 - Remove the planetary gear carrier assembly.

**Assembly**

1. Install the center shaft and one-way clutch.
 - 1 Install the center shaft and one-way clutch.
 - 2 Install the center shaft retaining ring.



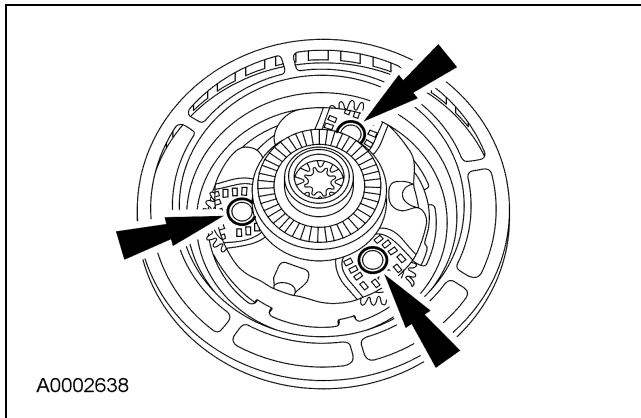
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Overdrive Planetary Gears

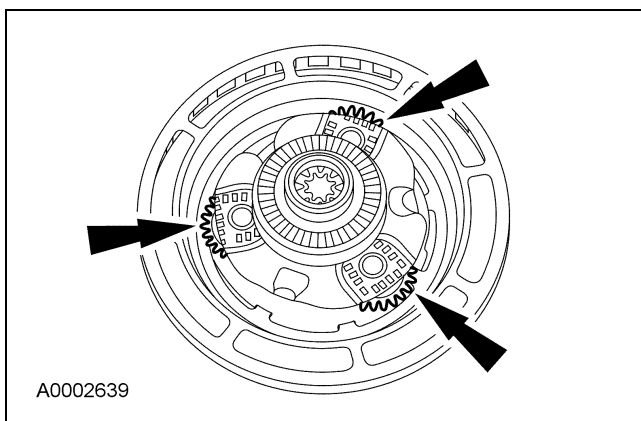
Disassembly

1. **NOTE:** Individual parts of the planetary carriers are not serviceable.

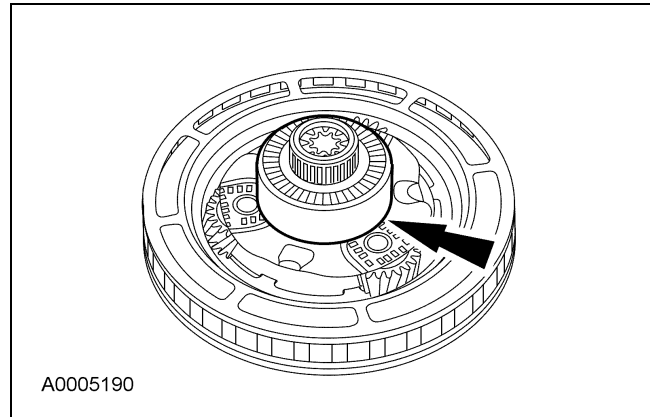
Before installing a planetary assembly, the shaft retaining pins should be checked for adequate staking. Check the pins and shafts in the planetary assemblies for loose fit and/or complete disengagement. Install a new planetary assembly if necessary.



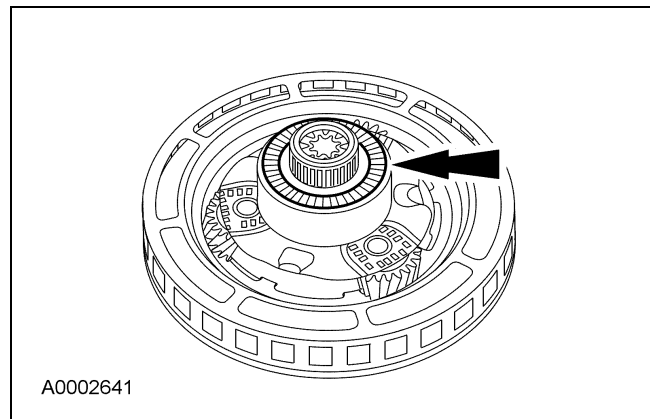
2. Inspect the pinion gears for damaged or excessively worn teeth and for free rotation.



3. Inspect the overdrive one-way clutch inner race and the inner and outer races for scored or damaged surface areas where the rollers contact the races.

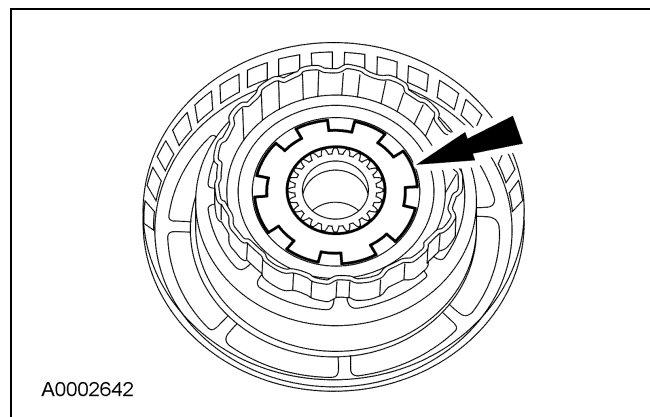


4. Remove and inspect the No. 2 overdrive planetary thrust bearing on the nose of the overdrive planetary gear carrier assembly.



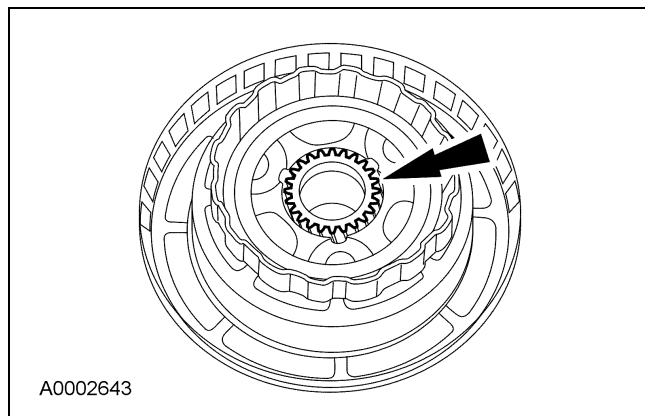
5. **NOTE:** Inspect the sun gear for damaged or worn teeth.

Remove the coast clutch-to-overdrive carrier adapter.



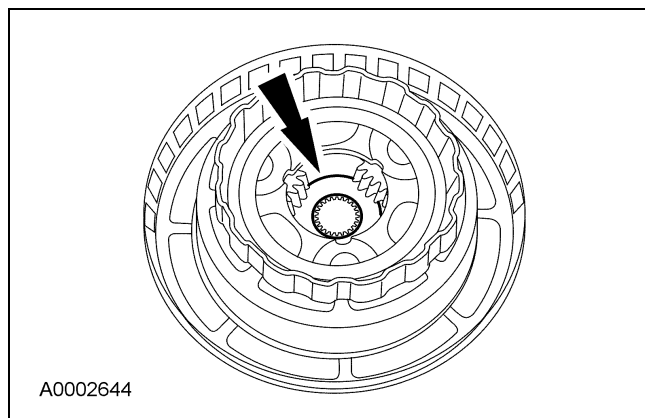
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

6. Remove and inspect the overdrive sun gear.

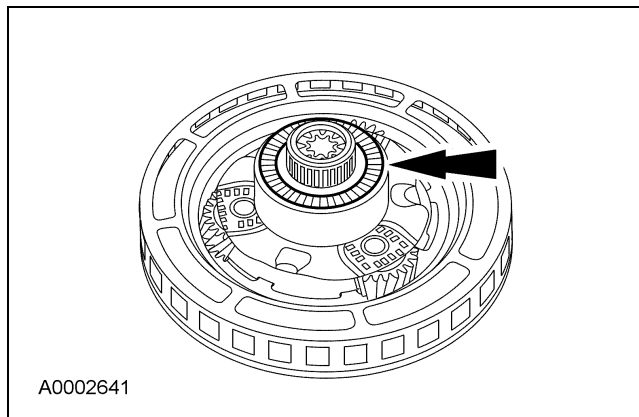


7. **CAUTION:** Do not attempt to remove the No. 12 bearing from behind the pinion gears.

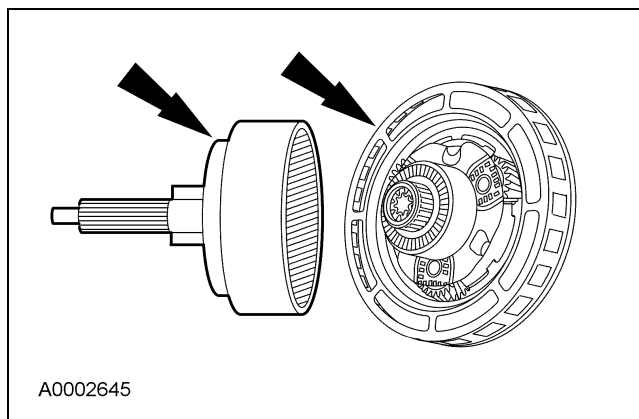
Inspect the No. 12 bearing for damage.

**Assembly**

1. **NOTE:** Thoroughly clean all parts and blow dry with moisture-free compressed air.
NOTE: Use petroleum jelly to hold the No. 2 overdrive planetary thrust bearing in place.
 Install the No. 2 overdrive planetary thrust bearing.

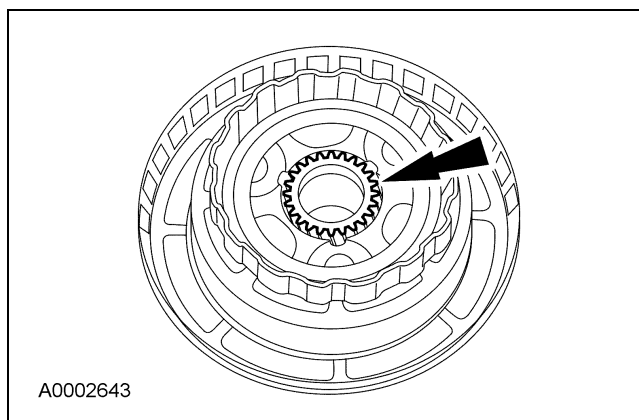


2. Install the overdrive planetary gear carrier into the center shaft and overdrive.



3. **CAUTION:** Make sure that the No. 12 bearing is in place in the overdrive planetary prior to installing the overdrive sun gear.

Install the overdrive sun gear with the recessed gear teeth facing toward the adapter.

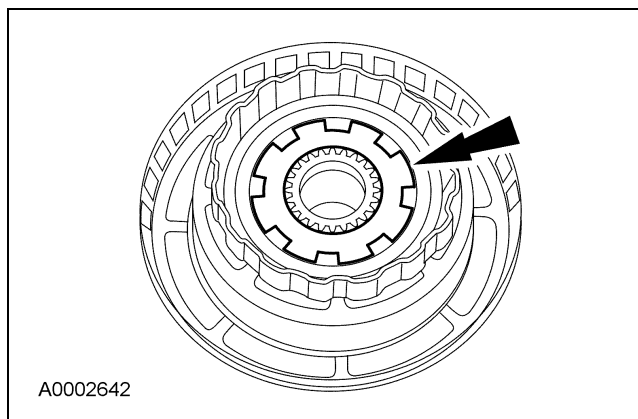


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

4.  **CAUTION:** Adapter part number must not be visible after installation.

NOTE: Inspect the sun gear for damaged or worn teeth.

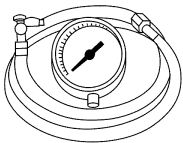
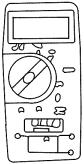
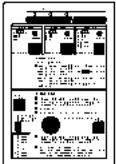
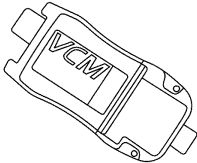
Install the coast clutch-to-overdrive carrier adapter.



DIAGNOSIS AND TESTING

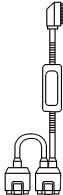
Pinpoint Tests — OSC Equipped Vehicle

Special Tool(s)

 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)
 ST1137-A	73 III Automotive Meter 105-R0057 or equivalent
 ST1761-A	Trans Tester TR/MLP Overlay and Manual 007-00131 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

(Continued)

Special Tool(s)

 ST1632-A	MLP-TR Cable 418-F107 (007-00111) or equivalent
 ST1389-A	Transmission Tester 307-F016 (007-00130) or equivalent

Shift Solenoid Pre-Diagnosis

Anytime an electrical connector or solenoid body is disconnected, inspect the connector for terminal condition, corrosion and contamination. Also inspect the connector seal for damage. Clean, repair or install new as necessary.

Use the following shift solenoid operation information when carrying out Pinpoint Test A.

Solenoid Operation Chart

Gearshift Selector Position	PCM Commanded Gear	5R55S Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
P/N	P/N	ON	OFF	OFF	ON	L	H/L	L
R	R	ON	OFF	OFF	ON	L/H	L	H
D	1	ON	OFF	OFF	ON	H	H/L	L
	2	ON	OFF	ON	ON	L/H	H	L
	3	ON	ON	OFF	ON	H	L/H	L
	4	OFF	OFF	OFF	ON	H	H/L	H
	5	OFF	OFF	ON	ON	H	H	H
D Cancelled	1	ON	OFF	OFF	ON	H	H/L	L
	2	ON	OFF	ON	ON	L/H	H	L
	3	ON	ON	OFF	ON	H	L/H	L

DIAGNOSIS AND TESTING (Continued)**Solenoid Operation Chart (Continued)**

Gearshift Selector Position	PCM Commanded Gear	5R55S Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
	4	OFF	OFF	OFF	OFF	L/H	H	H
Manual 3	3	ON	ON	OFF	OFF	H	L	H/L
Manual 2	2	ON	OFF	ON	OFF	H	L	H/L
Manual 1	1	ON	OFF	OFF	OFF	H	L	H/L

H = HIGH

L = LOW

H/L = PCM controlled

Manual = if equipped

Shift Solenoid Failure Mode Chart

Failed ON or OFF due to powertrain control module (PCM) and/or vehicle wiring concerns, solenoid electrically, mechanically or hydraulically stuck ON or OFF.

Solenoid Failure Mode Chart A — 5R55S

Gear	Actual Gear							
	SSA		SSB		SSC		SSD	
	ON	OFF	ON	OFF	ON	OFF	ON	OFF
D Position								
1	1	1	3	1	2	1	1	1/M1
2	2	2	2	2	2	1	2	M2
3	3	3	3	1	3	3	3	3/M3
4	1	4	4	4	4/5	4	4	4/M4
5	2	5	5	5	5	4	5	5
D Position — (D) Cancelled								
1M	M1	M1	M3	M1	M2	M1	1	M1
2M	M2	M2	1.1	M2	M2	M1	2	M2
3M	M3	M3	M3	M1	1.1	M3	3	M3
4M	M1	M4	M4	M4	5	M4	4	M4
R	R	R	N	R	R	R	R	R

Slip = Slip due to low line pressure

1.1 = Actual ratio with Forward Clutch, Intermediate and Overdrive Band applied.

Solenoid Failure Mode Chart B — 5R55S

Gear	Actual Gear					
	PC A		PC B		PC C	
	L	H	L	H	L	H
D Position						
1/S	1	1	1	1	1	1
2	2	2	1	2	2	2
3	1/S	3	3	3	3	3
4	4	4	4	4	1	4

DIAGNOSIS AND TESTING (Continued)**Solenoid Failure Mode Chart B — 5R55S (Continued)**

Gear	Actual Gear					
	PC A		PC B		PC C	
	L	H	L	H	L	H
5	5	5	4	5	2	5
D Position — (D) Cancelled						
1M	1	M1	1	M1	1M	M1
2M	M2	M2	1	M2	2M	M2
3M	1	M3	3	M3	3M	M3
4M	M4	M4	4	M4	1	M4
R	R/S	R	R/S	R	R	R

H = High

L = Low

Slip = Slip due to low line pressure

1.1 = Actual ratio with Forward Clutch, Intermediate and Overdrive Band applied.

Pinpoint Tests**PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS**

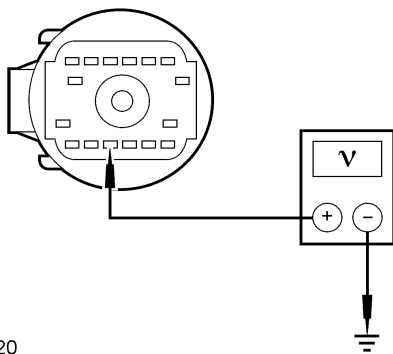
NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.

NOTE: Read and record all DTCs. All Digital TR Sensor and VSS DTCs must be repaired before entering output state control (OSC).

Test Step		Result / Action to Take
A1	ELECTRONIC DIAGNOSTICS	Yes REMAIN in Trans-Bench Mode. GO to A2. No REPEAT procedure to enter Trans-Bench Mode. If vehicle did not enter Trans-Bench Mode, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or VCM.
	- Key in OFF position. - Select PARK. - Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding. - Connect the scan tool. - Key in ON position. - Enter the following diagnostic mode on the scan tool: Diagnostic Data Link. - Enter the following diagnostic mode on the scan tool: PCM. - Enter the following diagnostic mode on the scan tool: Active Command Modes. - Enter the following diagnostic mode on the scan tool: Output State Control (OSC). - Enter the following diagnostic mode on the scan tool: Trans-Bench Mode. Does vehicle enter Trans-Bench Mode?	
A2	WIGGLE TEST	
	- Remain in Trans-Bench Mode. - Select PIDs to be monitored.	

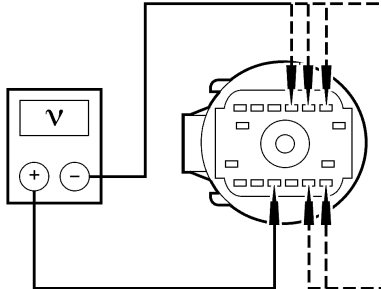
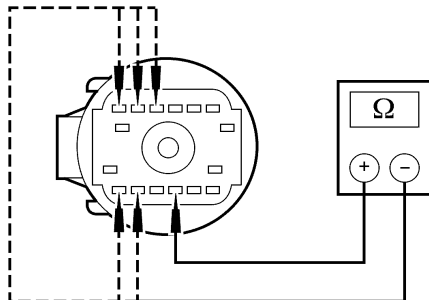
(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)**

Test Step		Result / Action to Take												
A2	WIGGLE TEST (Continued)	Yes REPAIR the circuit. TEST the system for normal operation. No GO to A3.												
<table><tr><th>PID Command</th><th>PID Actual</th></tr><tr><td>SSA</td><td>SSA</td></tr><tr><td>SSB</td><td>SSB</td></tr><tr><td>SSC</td><td>SSC</td></tr><tr><td>SSD</td><td>SSD</td></tr><tr><td>TCC</td><td>TCC</td></tr></table>			PID Command	PID Actual	SSA	SSA	SSB	SSB	SSC	SSC	SSD	SSD	TCC	TCC
PID Command	PID Actual													
SSA	SSA													
SSB	SSB													
SSC	SSC													
SSD	SSD													
TCC	TCC													
- Select "ON" to turn suspect solenoid(s) ON. - Press "SEND." - Wiggle all wiring and connectors to the transmission. Monitor the solenoid state for changes. - Select "OFF" to turn solenoid(s) OFF. - Press "SEND." - Repeat steps for each solenoid. Does the suspect solenoid(s) fault state change?														
A3	SOLENOID FUNCTIONAL CHECK	Yes GO to A4. No GO to A5.												
- Monitor each solenoid state. - Turn each solenoid ON and OFF. Does the solenoid turn ON and OFF when commanded and can solenoid activation be heard?														
A4	OSC TRANS-DRIVE MODE (GEAR OR TCC)	Yes CLEAR all DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to Diagnosis By Symptom to diagnose shift or torque converter concern. No GO to A5.												
- Carry out OSC Trans-Drive Mode. - Select GEAR for shift solenoids or follow procedures for GEAR as listed in this section. - Select TCC for torque converter clutch solenoid. Follow procedures of TCC in Drive Mode as listed in this section. Does the transmission upshift and downshift or torque converter engage/disengage when commanded?														
A5	CHECK FOR BATTERY VOLTAGE	Yes GO to A6. No REPAIR the circuit. TEST for normal operation.												
- Disconnect: Transmission Vehicle Harness Connector. - Visually inspect all wires and connectors for damage. - Key in ON position. - Measure the voltage on pin 3 harness side and ground.  N0052520 Is the voltage greater than 10 volts?														

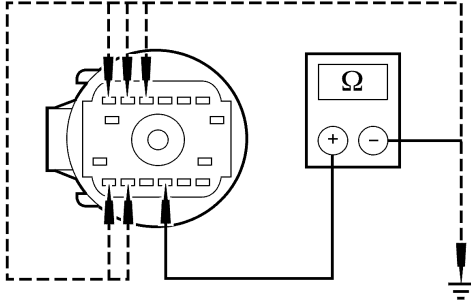
(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)**

Test Step		Result / Action to Take												
A6	ELECTRICAL SIGNAL CHECK - Leave positive lead connected to pin 3 and connect negative lead to pin 5, 6, 14, 15 and 16.  N0052521 - Enter the following diagnostic mode on the scan tool: Trans-Bench Mode. - Select Parameter SSA, SSB, SSC, SSD or TCC. - Select "ON." - Press "SEND." - Measure the voltage while cycling the solenoids ON and OFF. - Select "OFF", press "SEND." Does the voltage change? <td> Yes GO to A7. No REPAIR the circuit. TEST the system for normal operation. </td>	Yes GO to A7. No REPAIR the circuit. TEST the system for normal operation.												
A7	CHECK SOLENOID RESISTANCE AT SOLENOID - Measure the resistance between pin 3 and pin 5, 6, 14, 15 and 16 solenoid side. <table><tr><th>Solenoid</th><th>Resistance (ohms)</th></tr><tr><td>SSA</td><td>16-45</td></tr><tr><td>SSB</td><td>16-45</td></tr><tr><td>SSC</td><td>16-45</td></tr><tr><td>SSD</td><td>16-45</td></tr><tr><td>TCC</td><td>9-16</td></tr></table>  N0052522 Is the resistance within specification? <td> Yes GO to A8. No INSTALL a new solenoid body assembly. TEST the system for normal operation. </td>	Solenoid	Resistance (ohms)	SSA	16-45	SSB	16-45	SSC	16-45	SSD	16-45	TCC	9-16	Yes GO to A8. No INSTALL a new solenoid body assembly. TEST the system for normal operation.
Solenoid	Resistance (ohms)													
SSA	16-45													
SSB	16-45													
SSC	16-45													
SSD	16-45													
TCC	9-16													

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)**

Test Step		Result / Action to Take
A8	CHECK SOLENOID FOR SHORT TO GROUND	
- Measure the resistance between pin 3 and pin 5, 6, 14, 15 and 16 solenoid side and ground.  N0052523 - Is the resistance less than 5 ohms?		Yes INSTALL a new solenoid body assembly. No REFER to Diagnosis By Symptom in this section for diagnosis of shift or torque converter concerns.

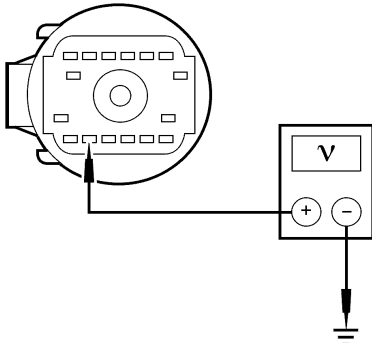
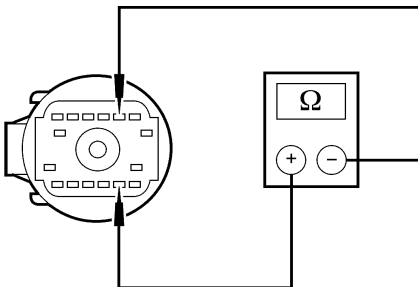
PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.

Test Step		Result / Action to Take
B1	ELECTRONIC DIAGNOSTICS	Yes REMAIN in PID/Data Control. GO to B2. No REPEAT procedure to enter PID. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM and VCM.
• Key in OFF position. • Select PARK. • Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding. • Connect the scan tool. • Key in ON position. • Select Diagnostic Data Link. • Select PCM. • Select PID/Data Monitor and Record. • Enter the following diagnostic mode on the scan tool: PIDs; TFT, TFTV. • Does the vehicle enter PID/Data Monitor and Record?		
B2	WARM-UP/COOL-DOWN CYCLE	Yes If the TFT PIDs increase as the transmission is warmed or decrease as the transmission is cooled, CLEAR all DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to Diagnosis By Symptom in this section to diagnose transmission overheating. If the TFT or TFTV drop in and out of range, INSPECT for intermittent concern in the internal/external harness, sensor or connector. No GO to B3.
• While monitoring the TFT PIDs, carry out the following test: If transmission is cold, run transmission to warm it up. If transmission is warm, allow transmission to cool down. • Do the TFT PIDs increase as the transmission is warmed up or decrease as the transmission is cooled or does the TFT or TFTV drop in and out of range?		
B3	ELECTRICAL SIGNAL CHECK	
• Disconnect: Transmission Harness Connector. • Visually inspect all wires and connectors for damage.		

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR (Continued)**

Test Step		Result / Action to Take																													
B3	ELECTRICAL SIGNAL CHECK (Continued)	Yes GO to B4. No REPAIR the circuit. TEST the system for normal operation.																													
- Measure the voltage between pin 2 harness side and ground.  N0052524 - Is the voltage between 4.5 and 5.0 volts?																															
B4	CHECK RESISTANCE OF THE TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR	Yes REFER to Diagnosis By Symptom in this section to diagnose an overheating concern. No INSTALL a new solenoid body assembly.																													
- Measure the resistance between pin 2 and 12 at the solenoid body connector.  N0052525 - Record the resistance. - Resistance should be approximately in the following ranges: Transmission Fluid Temperature <table><tr><th>°C</th><th>°F</th><th>Resistance (Ohms)</th></tr><tr><td>-40 to -20</td><td>-40 to -4</td><td>967K - 284K</td></tr><tr><td>-19 to -1</td><td>-3 - 31</td><td>284K - 100K</td></tr><tr><td>0 - 20</td><td>32 - 68</td><td>100K - 37K</td></tr><tr><td>21 - 40</td><td>69 - 104</td><td>37K - 16K</td></tr><tr><td>41 - 70</td><td>105 - 158</td><td>16K - 5K</td></tr><tr><td>71 - 90</td><td>159 - 194</td><td>5K - 2.7K</td></tr><tr><td>91 - 110</td><td>195 - 230</td><td>2.7K - 1.5K</td></tr><tr><td>111 - 130</td><td>231 - 266</td><td>1.5K - 0.8K</td></tr><tr><td>131 - 150</td><td>267 - 302</td><td>0.8K - 0.54K</td></tr></table> - Is the resistance in the range?			°C	°F	Resistance (Ohms)	-40 to -20	-40 to -4	967K - 284K	-19 to -1	-3 - 31	284K - 100K	0 - 20	32 - 68	100K - 37K	21 - 40	69 - 104	37K - 16K	41 - 70	105 - 158	16K - 5K	71 - 90	159 - 194	5K - 2.7K	91 - 110	195 - 230	2.7K - 1.5K	111 - 130	231 - 266	1.5K - 0.8K	131 - 150	267 - 302
°C	°F	Resistance (Ohms)																													
-40 to -20	-40 to -4	967K - 284K																													
-19 to -1	-3 - 31	284K - 100K																													
0 - 20	32 - 68	100K - 37K																													
21 - 40	69 - 104	37K - 16K																													
41 - 70	105 - 158	16K - 5K																													
71 - 90	159 - 194	5K - 2.7K																													
91 - 110	195 - 230	2.7K - 1.5K																													
111 - 130	231 - 266	1.5K - 0.8K																													
131 - 150	267 - 302	0.8K - 0.54K																													

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR**

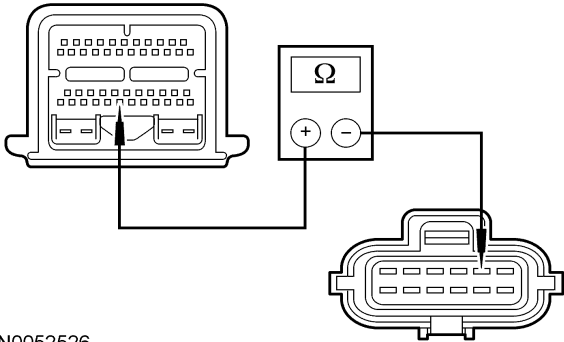
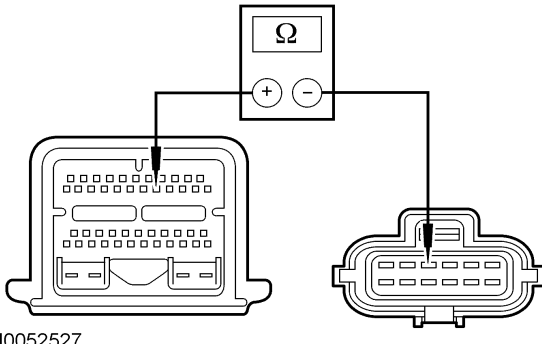
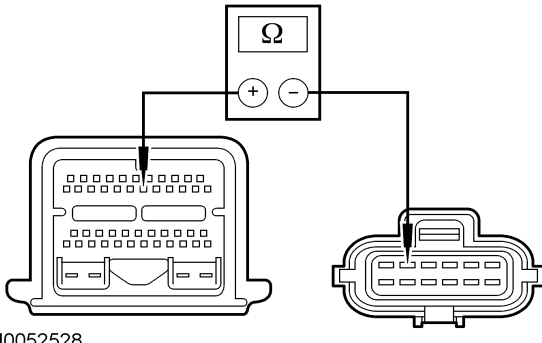
NOTE: Refer to the Digital Transmission Range (TR) Sensor Connector illustration and Digital Transmission Range (TR) Sensor Diagnosis Chart preceding these pinpoint tests.

Test Step		Result / Action to Take
C1	VERIFY DIAGNOSTIC TROUBLE CODES	Yes GO to C4 . No GO to C2 .
	- Key in OFF position. - Select PARK. - Carry out On-Board Diagnostic Test. Are only DTC codes P0705, P0708 present?	
C2	VERIFY DIGITAL TRANSMISSION RANGE SENSOR ALIGNMENT	Yes GO to C3 . No ADJUST the digital TR sensor. REFER to Digital Transmission Range (TR) Sensor in this section. PLACE transmission range selector lever into PARK and CLEAR DTCs. RERUN OBD Tests. GO to C3 .
	- Key in OFF position. - Select PARK. - Check to make sure the digital TR sensor harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding. - Apply the parking brake. - Select NEUTRAL. - Disconnect the shift cable/linkage from the manual lever. - Verify that the TR Sensor Alignment Gauge fits in the appropriate slots. Is the digital TR sensor correctly adjusted?	
C3	VERIFY SHIFT CABLE/LINKAGE ADJUSTMENT	Yes GO to C4 . No ADJUST the shift cable/linkage. REFER to Section 307-05. GO to C4 .
	- Place the range selector in D. - Connect the shift cable/linkage. - Verify that the shift cable/linkage is correctly adjusted. Refer to Section 307-05. Is the shift cable/linkage correctly adjusted?	
C4	CHECK ELECTRICAL SIGNAL OPERATION	Yes REPAIR as necessary. CLEAR DTCs and RERUN OBD Tests. No If diagnosing a DTC, GO to C5 . If diagnosing a starting concern or a backup lamp concern, GO to C10 .
	- Select PARK. - Disconnect: Digital TR Sensor.  CAUTION: Do not pry on connector. This will damage the connector and result in a transmission concern. - Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. Is there damage to the connector, pins or harness?	
C5	CHECK ELECTRICAL SYSTEM OPERATION (DIGITAL TR AND PCM)	Yes The problem is not in the digital TR sensor system. REFER to Diagnosis By Symptom in this section for further diagnosis. No If TR_D changes when wiggling harness, tapping on the sensor or driving the vehicle, the problem may be intermittent. GO to C6 .
	- Key in OFF position. - Connect the scan tool. - Connect: Digital TR Sensor. - Key in ON position. - Enter the following diagnostic mode on the scan tool: TR PIDS TR_D, TR_V. - Move transmission range selector lever into each gear and stop. - Observe the PIDs, TR_D, and TR_V (vehicle-dependent) while wiggling harness, tapping on sensor or driving the vehicle. Use PIDs TR_D for DTCs P0705, P1704 and P1705. Use PIDs TR_V for DTC P0708. - Compare the PIDs to the Digital Transmission Range (TR) Sensor Diagnosis Chart. Do the PIDs TR_D and TR_V match the Digital Transmission Range (TR) Sensor Diagnosis chart, and does the TR_D PID remain steady when the harness is wiggled, the sensor is tapped on or the vehicle driven?	
C6	CHECK DIGITAL TRANSMISSION RANGE SENSOR OPERATION	Yes Concern is not in the digital TR sensor. GO to C7 . No INSTALL a new digital TR sensor and ADJUST. REFER to Digital Transmission Range (TR) Sensor in this section. CLEAR DTCs and RERUN OBD Tests.
	- Disconnect: Digital TR Sensor. - Connect: TR-E Cable to Transmission Tester. - Connect: TR-E Cable to Digital TR Sensor. - Place the Digital TR Overlay onto the Transmission Tester. - Carry out Sensor Test as instructed on the digital TR Overlay. Does the status lamp on the tester TRS-E cable match the selected gear positions?	

(Continued)

DIAGNOSIS AND TESTING (Continued)

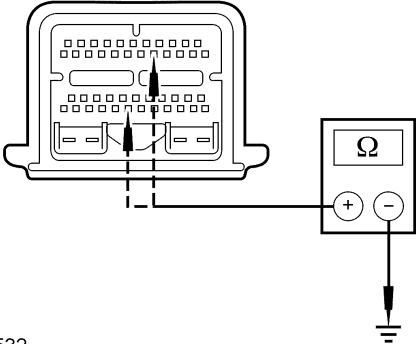
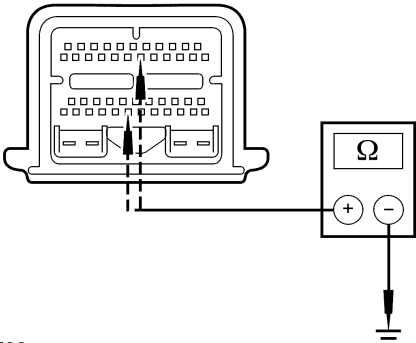
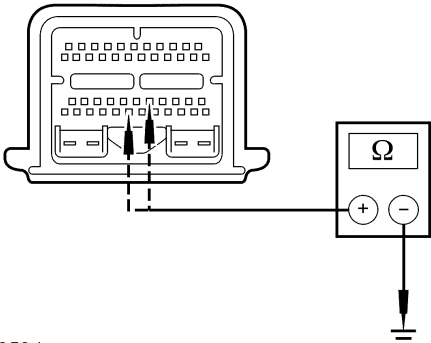
PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

Test Step		Result / Action to Take
C7	CHECK PCM HARNESS CIRCUITS FOR OPENS	
• Key in OFF position. • Disconnect: 150-Pin PTEC Module Connector B. • Inspect for damaged or pushed-out pins, corrosion or loose wires. • Disconnect: Digital TR Sensor.  CAUTION: Do not pry the connector. This will damage the connector and result in a transmission concern. • Measure the resistance between TR pin 2 harness side and signal return PCM pin 41 harness side.  N0052526 • Measure the resistance between PCM pin 16 and TR pin 4 harness side.  N0052527 • Measure the resistance between PCM pin 17 and TR pin 5 harness side.  N0052528		

(Continued)

DIAGNOSIS AND TESTING (Continued)

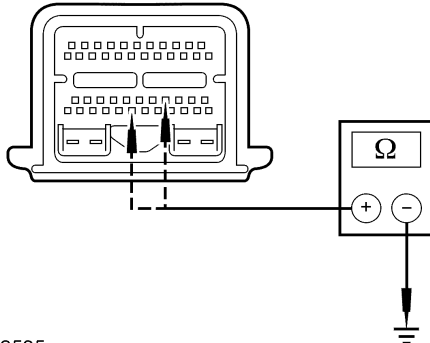
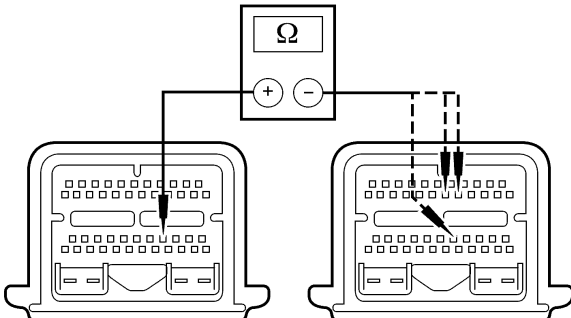
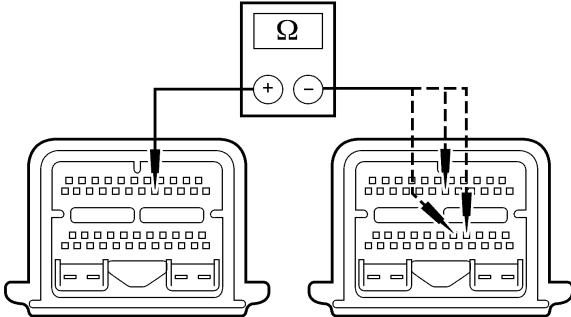
PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

Test Step		Result / Action to Take
C8	CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND OR POWER (Continued)	
- Measure the resistance between pin 16 harness side and ground; and pin 41 harness side and ground.  N0052532 - Measure the resistance between pin 17 harness side and ground; and pin 41 harness side and ground.  N0052533 - Measure the resistance between pin 28 harness side and ground; and pin 41 harness side and ground.  N0052534		

(Continued)

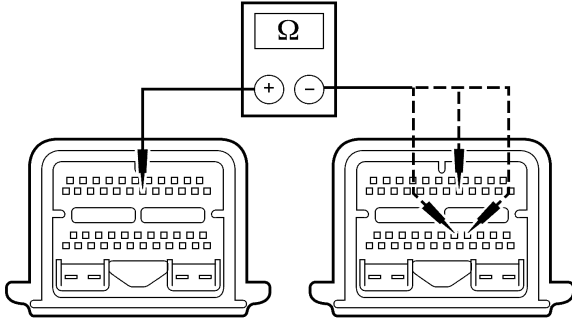
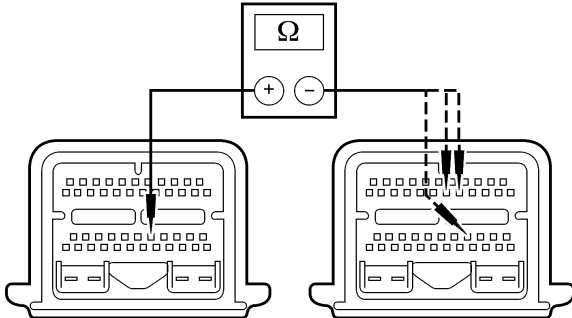
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

Test Step		Result / Action to Take
C8	CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND OR POWER (Continued)	
- Measure the resistance between pin 27 harness side and ground; and pin 41 harness side and ground.  N0052535 - Are the resistances greater than 10,000 ohms?		Yes GO to C9. No REPAIR the circuits. TEST the system for normal operation. CLEAR DTCs. RERUN OBD Tests.
C9	CHECK FOR SHORT BETWEEN TR/PCM INPUT SIGNAL CIRCUITS	
- Measure the resistance between pin 27 harness side; and between pin 16, pin 17 and pin 28 harness side.  N0052536 - Measure the resistance between pin 16 harness side; and between pin 27, pin 17 and pin 28 harness side.  N0052537		

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)**

Test Step		Result / Action to Take
C9	CHECK FOR SHORT BETWEEN TR/PCM INPUT SIGNAL CIRCUITS (Continued)	
	- Measure the resistance between pin 17 harness side; and between pin 16, pin 27; pin 28 harness side.  N0052538 - Measure the resistance between pin 28 harness side; and between pin 16, pin 17; pin 27 harness side.  N0052539 Are the resistances greater than 10,000 ohms?	Yes INSTALL a new PCM. TEST the system for normal operation. No REPAIR the circuit. TEST the system for normal operation.
C10	CHECK THE NON-PCM INTERNAL CIRCUITS OR SENSOR	
	- Connect: TRS-E Cable to Transmission. - Connect: TRS-E Cable to Digital TR Sensor. - Place the Digital TR Overlay onto the Transmission Tester. - Carry out Switch Test as instructed on the Digital TR Overlay. Does the status lamp on the tester indicate RED for the correct gear position?	Yes Concern is not in the digital TR sensor. For backup lamp concerns, REFER to Section 417-01. No INSTALL a new digital TR sensor and ADJUST. REFER to Digital Transmission Range (TR) Sensor in this section. CLEAR DTCs and RERUN OBD Tests.

PINPOINT TEST D: PRESSURE CONTROL (PC) SOLENOIDS (PCA, PCB, PCC)

NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.

NOTE: Read and record all DTCs. All digital TR Sensor and VSS DTCs must be repaired before entering output state control (OSC).

Test Step		Result / Action to Take
D1	ELECTRONIC DIAGNOSTICS	
	- Key in OFF position. - Select PARK. - Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in the connector and in good condition before proceeding.	

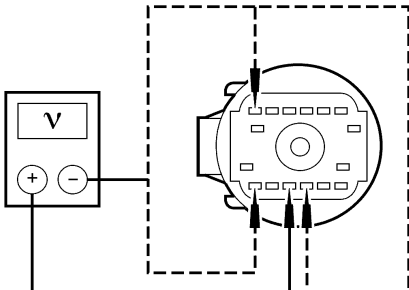
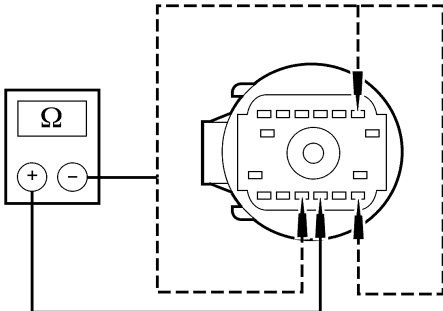
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DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST D: PRESSURE CONTROL (PC) SOLENOIDS (PCA, PCB, PCC) (Continued)**

Test Step		Result / Action to Take
D1	ELECTRONIC DIAGNOSTICS (Continued)	Yes REMAIN in Trans-Bench Mode. GO to D2. No REPEAT procedure to enter Trans-Bench Mode. If vehicle did not enter OSC, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or VCM.
	- Install 300 psi pressure gauges into Line and PC C tap. - Connect the scan tool. - Key in ON position. - Enter the following diagnostic mode on the scan tool: Diagnostic Data Link. - Enter the following diagnostic mode on the scan tool: PCM. - Enter the following diagnostic mode on the scan tool: Active Command Modes. - Enter the following diagnostic mode on the scan tool: Output State Control (OSC). - Enter the following diagnostic mode on the scan tool: Trans-Bench Mode. Does the vehicle enter the Trans-Bench Mode?	
D2	SOLENOID FUNCTIONAL TEST	Yes CLEAR DTCs. No GO to D3.
	- Monitor pressure gauges. - Enter the following diagnostic mode on the scan tool: Parameter; PCx. NOTE: Make sure that the solenoids not being tested are off or at zero. - Select PC A, PC B or PC C. - Select value - 15, 30, 45, 60, 70 or 90 psi. - Press "SEND." - Select another value "0-90 psi." - Press "SEND." - Enter the following diagnostic mode on the scan tool: XXX. - Press "SEND." For PC A and PC B: Does the pressure reading for A or B follow the commanded pressure (actual A and B pressures will be higher than the commanded pressure)? For PC C: Does the pressure reading match the commanded pressure?	
D3	CHECK FOR BATTERY VOLTAGE	Yes GO to D4. No REPAIR the circuit. TEST the system for normal operation.
	- Disconnect: Transmission Harness Connector. - Visually inspect all wires and connectors for damage. - Key in ON position. - Measure the voltage between pin 3 harness side and ground. N0052520 Is the voltage greater than 10 volts?	

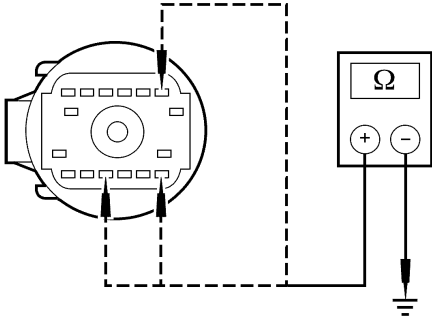
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DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST D: PRESSURE CONTROL (PC) SOLENOIDS (PCA, PCB, PCC) (Continued)**

	Test Step	Result / Action to Take
D4	ELECTRICAL SIGNAL CHECK	
	- Leave positive lead connected to pin 3 and connect negative lead to pin 1, 4 and 11 harness side.  N0052540 - Activate solenoids (ON and OFF) while monitoring the voltage reading. - Enter the following diagnostic mode on the scan tool: Trans-Bench Mode. - Enter the following diagnostic mode on the scan tool: Parameter; PCx. - Select a value "0-90 psi." - Press "SEND." - Select another value "0-90 psi." - Press "SEND." - Enter the following diagnostic mode on the scan tool: XXX. - Press "SEND". Does the voltage and solenoid state change?	Yes GO to D5. No CHECK for open or short circuit in harness or PCM.
D5	CHECK SOLENOID RESISTANCE AT SOLENOID	
	- Measure and record the resistance between PC solenoid pin 3 and pins 1, 4 and 11. Resistance should be between 3.3 and 7.5 ohms.  N0052541 Is the resistance within specifications?	Yes GO to D6. No INSTALL a new solenoid body assembly.

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST D: PRESSURE CONTROL (PC) SOLENOIDS (PCA, PCB, PCC) (Continued)**

Test Step		Result / Action to Take
D6	CHECK SOLENOID FOR SHORT TO GROUND	
- Measure and record the resistance between the PC solenoid pins 1, 4, 11 and ground solenoid side.  N0052542 - Is the resistance less than 10,000 ohms?		
		Yes INSTALL a new solenoid body assembly. TEST the system for normal operation. No REFER to Diagnosis By Symptom in this section for diagnosis of pressure concerns. TEST the system for normal operation.

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED AND OUTPUT SHAFT SPEED (OSS) SENSORS

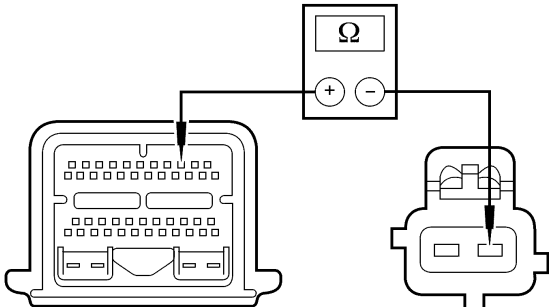
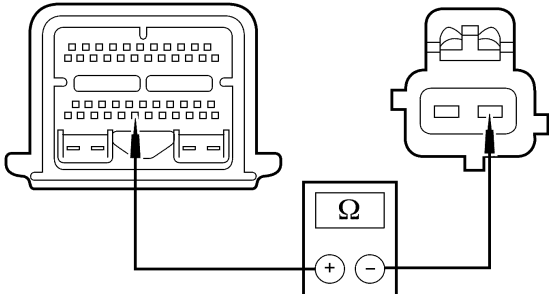
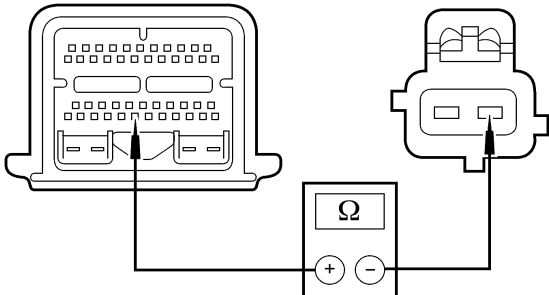
NOTE: Refer to the Turbine Shaft Speed (TSS), Intermediate Shaft Speed and Output Shaft Speed (OSS) Sensor Connector illustrations preceding these pinpoint tests.

Test Step		Result / Action to Take
E1	ELECTRONIC DIAGNOSTICS	Yes REMAIN in PID/Data. GO to E2 . No REPEAT procedure to ENTER PID. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or VCM.
- Check to make sure the transmission harness connectors are fully seated, terminals are fully engaged in connector and in good condition before proceeding. - Connect the scan tool. - Key in ON position. - Enter the following diagnostic mode on the scan tool: Diagnostic Data Link. - Enter the following diagnostic mode on the scan tool: PCM. - Select PID/Data Monitor and Record. - Select the following PIDs: TSS, intermediate shaft speed or OSS. Does vehicle enter PID/Data Monitor and Record?		
E2	DRIVE CYCLE TEST	Yes GO to E3 . No If the TSS, intermediate shaft speed or OSS PID does not increase and decrease with engine and vehicle speed, INSPECT for open or short in vehicle harness, sensor a PCM concern or internal hardware concern. GO to E4 .
- While monitoring the appropriate sensor PID, drive the vehicle so that the transmission upshifts and downshifts through all gears. Does the TSS, intermediate shaft speed or OSS PID increase and decrease with engine and vehicle speed?		
E3	DRIVE CYCLE TEST ERRATIC	Yes If the sensor signal is erratic, INSPECT for intermittent concern in the harness, sensor or connector. GO to E4 . No CLEAR all DTCs. RERUN OBD.
- While monitoring the appropriate sensor PID, drive the vehicle so that the transmission upshifts and downshifts through all gears. Is the TSS, intermediate shaft speed or OSS PID signal erratic (drop to zero or near zero and return to normal operation)?		
E4	CHECK PCM HARNESS CIRCUITS FOR OPENS	
- Key in OFF position. - Disconnect: 150-Pin PTEC Module Connector B. - Inspect for damaged or pushed-out pins, corrosion or loose wires.		

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DIAGNOSIS AND TESTING (Continued)

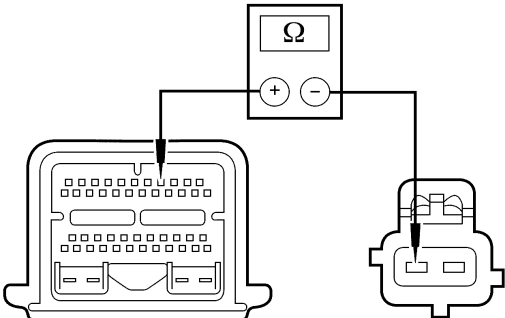
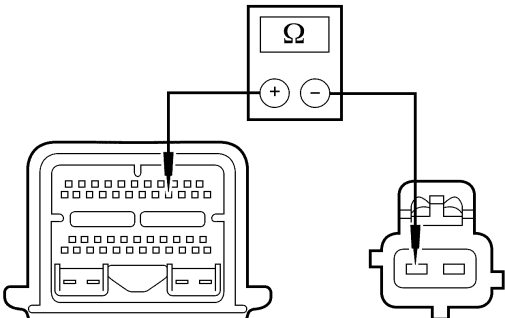
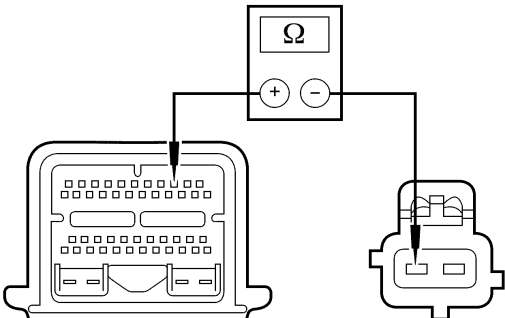
PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

Test Step		Result / Action to Take
E4	CHECK PCM HARNESS CIRCUITS FOR OPENS (Continued)	
For OSS, measure the resistance between pin 3 and the appropriate sensor connector pin 2 harness side.		
		
N0052543		
For intermediate shaft speed, measure the resistance between pin 41 and the appropriate sensor connector pin 2 harness side.		
		
N0052544		
For TSS, measure the resistance between pin 41 and the appropriate sensor connector pin 2 harness side.		
		
N0052544		

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DIAGNOSIS AND TESTING (Continued)

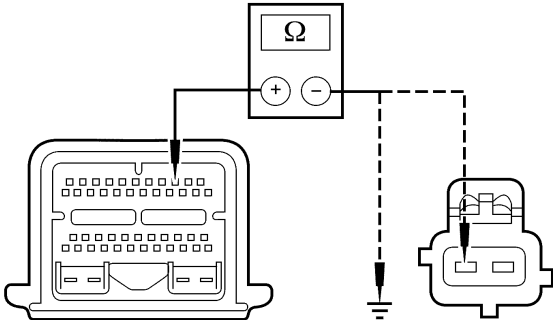
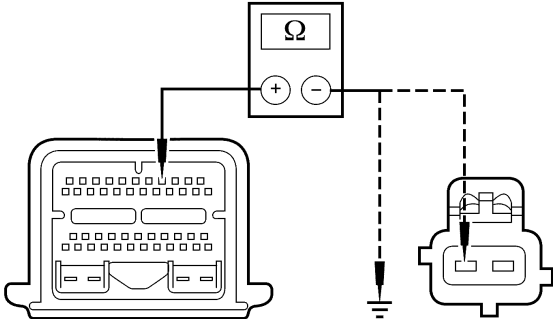
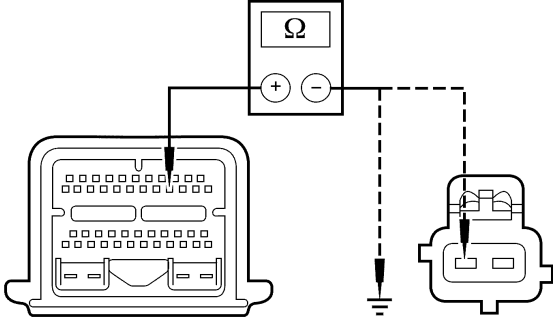
PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

Test Step		Result / Action to Take
E4	CHECK PCM HARNESS CIRCUITS FOR OPENS (Continued)	
- For intermediate shaft speed, measure the resistance between pin 4 and the appropriate sensor connector pin 1 harness side.  N0052545 - For TSS, measure the resistance between pin 15 and the appropriate sensor connector pin 1 harness side.  N0052546 - For OSS, measure the resistance between pin 3 and the appropriate sensor connector pin 1 harness side.  N0052547 - Are all resistances less than 5 ohms?		Yes GO to E5. No REPAIR the circuit. TEST the system for normal operation.

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

Test Step		Result / Action to Take
E5	CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND	
- For OSS, measure the resistance between pin 3 and sensor connector pin 1 harness side and ground.  N0052548 - For intermediate shaft speed, measure the resistance between PCM pin 4 and sensor connector pin 1 harness side and ground.  N0052549 - For TSS, measure the resistance between PCM pin 15 and sensor connector pin 1 harness side and ground.  N0052550 - Are the resistances greater than 10,000 ohms?		Yes GO to E6. No REPAIR the circuits. TEST the system for normal operation. CLEAR DTCs. RERUN OBD Tests.
E6	CHECK RESISTANCE OF TSS, INTERMEDIATE SHAFT SPEED OR OSS SENSOR	
Disconnect the appropriate vehicle harness connector from the TSS, intermediate shaft speed or OSS sensor.		

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

Test Step		Result / Action to Take								
E6	CHECK RESISTANCE OF TSS, INTERMEDIATE SHAFT SPEED OR OSS SENSOR (Continued) - Connect ohmmeter negative lead to one pin of the sensor and the positive lead to the other pin on the sensor. A0005211 - Record the resistance. Resistance should be as follows: <table><tr><th>Resistance (ohms)</th><th>Temperature</th></tr><tr><td>266-390</td><td>-20°C (4°F)</td></tr><tr><td>325-485</td><td>21°C (70°F)</td></tr><tr><td>492-738</td><td>150°C (302°F)</td></tr></table> - Is the resistance within specification for the appropriate sensor?	Resistance (ohms)	Temperature	266-390	-20°C (4°F)	325-485	21°C (70°F)	492-738	150°C (302°F)	Yes GO to E7. No INSTALL a new sensor.
Resistance (ohms)	Temperature									
266-390	-20°C (4°F)									
325-485	21°C (70°F)									
492-738	150°C (302°F)									
E7	CHECK SENSORS FOR SHORT TO GROUND - Measure the resistance between pin 1 and 2 of each sensor and ground. A0005501 - Is the resistance less than 10,000 ohms?	Yes INSTALL a new sensor. No REFER to Diagnosis By Symptom for diagnosis of shift or torque converter concerns in this section.								

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST F: SOLENOID MECHANICAL FAILURE**

NOTE: Repair all other DTCs before repairing the following DTCs: P1714, P1715, P1716, P1717 and P1740.

Test Step		Result / Action to Take
F1	ELECTRONIC DIAGNOSIS	
	- Connect the scan tool. - Select PARK. - Key in ON position. - Carry out Key ON Engine OFF (KOEO) Test until continuous DTCs have been displayed. - If any of the following DTCs are present, continue with this test: P1714, P1715, P1716, P1717 and P1740. Are other DTCs present for TFT or shift solenoids?	Yes REPAIR the DTCs for TFT or shift solenoids first. CLEAR DTCs and CARRY OUT transmission Drive Cycle test. RERUN Quick Test. No INSTALL a new solenoid and/or body. REFER to the Diagnostic Trouble Code (DTC) Charts for code description. GO to F2.
F2	TRANSMISSION DRIVE CYCLE TEST	
	- Carry out Transmission Drive Cycle Test. Refer to Transmission Drive Cycle Test in this section. Does the vehicle upshift and downshift OK?	Yes GO to F3. No REFER to Diagnosis By Symptom in this section to diagnose shift concerns.
F3	RETRIEVE DTCs	
	- Connect the scan tool. - Select PARK. - Key in ON position. - Carry out KOEO Test until continuous DTCs have been displayed. Are DTCs P1714, P1715, P1716, P1717 and P1740 still present?	Yes INSTALL a new PCM. ROAD TEST and RERUN Quick Test. No Testing completed. If a concern still exists, REFER to Diagnosis By Symptom in this section for concern diagnosis.

DIAGNOSIS AND TESTING

Preliminary Inspection

The following items must be checked prior to beginning the diagnostic procedures:

Know and Understand the Concern

In order to correctly diagnose a concern, first understand the customer concern or condition. Customer contact may be necessary in order to begin to verify the concern. Understand the condition as to when the concern occurs, for example:

- hot or cold vehicle temperature.
- hot or cold ambient temperature.
- vehicle driving conditions.
- vehicle loaded/unloaded.

After understanding when and how the concern occurs, proceed to verify the concern.

Verification of Condition

This section provides information that must be used in both determining the actual cause of customer concerns and executing the appropriate procedures.

The following procedures must be used when verifying customer concerns for the engine.

Determine Customer Concern

NOTE: Some transmission conditions can cause engine concerns. An electronic pressure control short circuit can cause engine misfiring. The torque converter clutch not disengaging will stall the engine.

Determine customer concerns relative to vehicle use and dependent driving conditions, paying attention to the following items:

- Hot or cold vehicle operating temperature
- Hot or cold ambient temperatures
- Type of terrain
- Vehicle loaded/unloaded
- City/highway driving
- Upshift
- Downshift
- Coasting
- Engagement

- Noise/vibration — check for dependencies, either rpm dependent, vehicle speed dependent, shift dependent, gear dependent, range dependent or temperature dependent.

Check Fluid Level and Condition

Fluid Level Check

 **CAUTION: The vehicle should not be driven if the fluid level is low or internal failure could result.**

NOTE: If the vehicle has been operated for an extended period of time at highway speeds, in city traffic, in hot weather, or pulling a trailer, the fluid must cool down 30 minutes to obtain an accurate reading.

This vehicle is not equipped with a fluid level indicator. An incorrect level may affect the transmission operation and can result in transmission damage. To correctly check and add fluid to the transmission, refer to Transmission Fluid Level Check in this section.

High Fluid Level

A fluid level that is too high can cause the fluid to become aerated due to the churning action of the rotating internal parts. This will cause erratic control pressure, foaming, loss of fluid from the vent tube and possible transmission damage. If an overfill reading is indicated, refer to Transmission Fluid Level Check in this section.

Low Fluid Level

A low fluid level can result in poor transmission engagement, slipping or damage. It can also indicate a leak in one of the transmission seals or gaskets.

Adding Fluid

 **CAUTION: The use of any type of transmission fluid other than specified can result in transmission damage.**

If fluid must be added, add fluid in 0.25L (0.5 pint) increments through the fluid pan level check screw opening. Do not overfill the fluid, refer to Transmission Fluid Level Check in this section. For fluid type, refer to the General Specification chart in this section.

DIAGNOSIS AND TESTING (Continued)**Fluid Condition Check**

1. Observe the color and the odor of the fluid.
Under normal circumstances, the color should be dark reddish, not brown or black.
 2. Allow the fluid to drip onto a facial tissue and examine the stain.
 3. If evidence of solid material is found, the transmission fluid pan should be removed for further inspection.
 4. If fluid contamination or transmission failure is confirmed by the sediment in the bottom of the transmission fluid pan, the transmission must be disassembled and completely cleaned.
 5. Carry out diagnostic checks and adjustments.
Refer to Diagnosis By Symptom in this section.
-

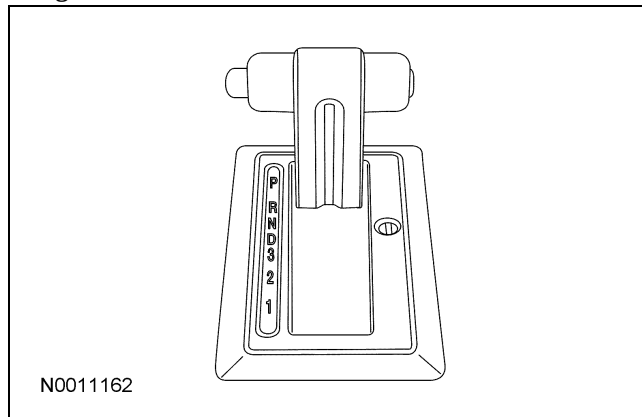
DESCRIPTION AND OPERATION

Range Selection

Depending on the vehicle options selected, the transmission range selector may have different range positions.

The standard range selector has 7 positions: P, R, N, D, 3, 2 and 1.

Range Shifter



Park

In the PARK position:

- there is no power flow through the transmission.
- the parking pawl locks the output shaft to the case.
- the engine may be started.
- the ignition key may be removed.

Reverse

In the REVERSE position:

- the vehicle may be operated in a rearward direction, at a reduced gear ratio.
- backup lamps are illuminated.

Neutral

In the NEUTRAL position:

- there is no power flow through the transmission.
- the output shaft is not held and is free to turn.
- the engine may be started.

Drive — Overdrive Enabled

D is the normal position for most forward driving.

The D position provides:

- automatic shifts 1-5 and 5-1.
- apply and release of the torque converter clutch.
- maximum fuel economy during normal operation.
- engine braking in 5th gear.

Drive — Overdrive Canceled

The D position provides:

- activated by pressing the TC switch on the shifter handle.
- automatic shifts 1-4 and 4-1.
- apply and release of the torque converter clutch.
- maximum fuel economy during normal operation.
- engine braking in 4th gear.
- for cancelling overdrive through TC switch.
- illuminates the Overdrive OFF on the I.P.

Position 3 — 3rd Gear

The position provides:

- third gear start and hold.
- apply and release of the torque converter clutch.
- improved traction on slippery roads.
- engine braking.

Position 2 — 2nd Gear

The position provides:

- second gear start and hold.
- apply and release of the torque converter clutch.
- improved traction on slippery roads.
- engine braking.

Position 1 — 1st Gear

If this position is selected at normal road speeds, the transmission will downshift into the next lower gear and continue downshifting until the vehicle reaches 1st gear.

This position provides:

- first gear operation only.
- engine braking for descending steep grades.

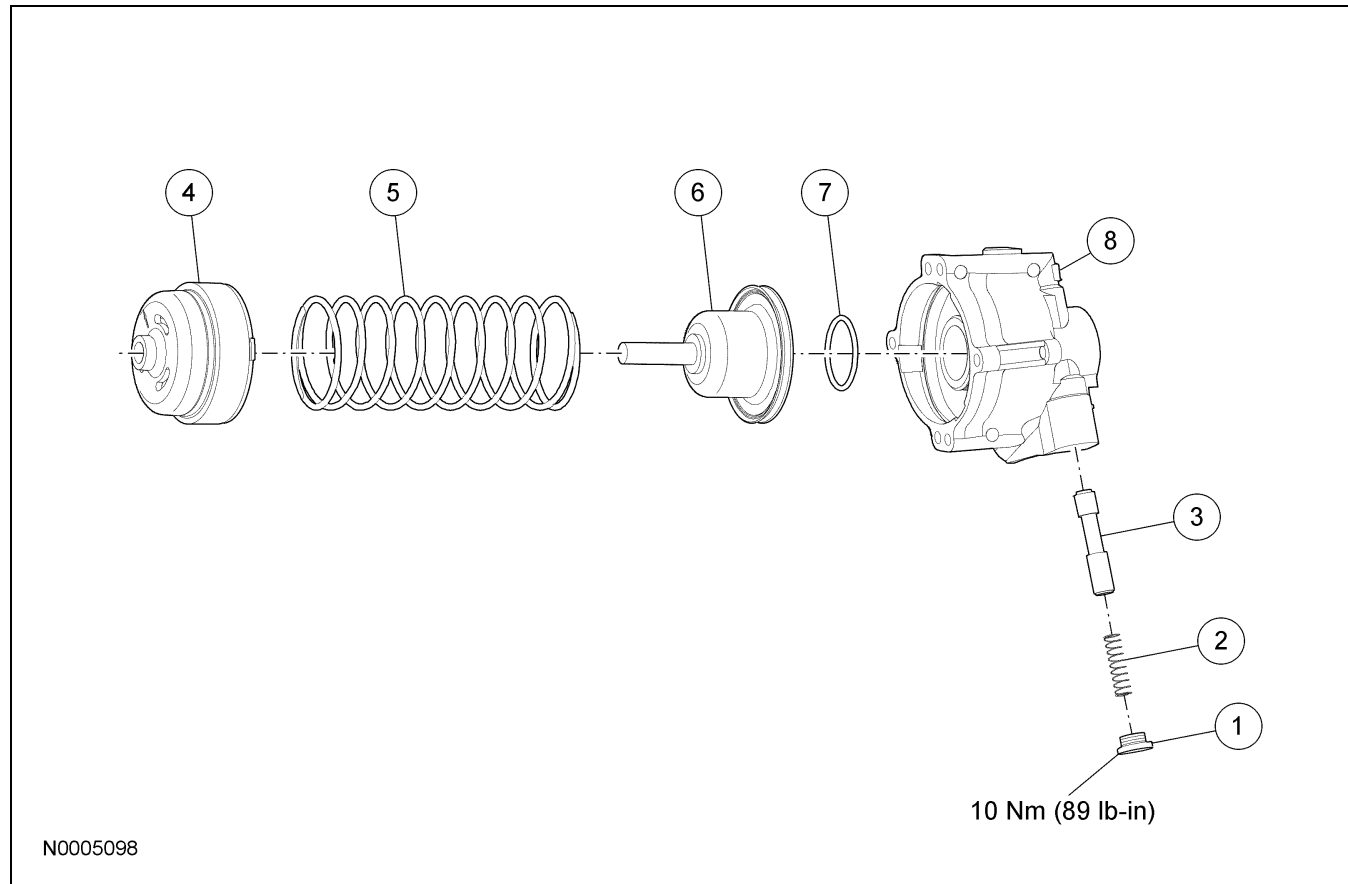
DESCRIPTION AND OPERATION (Continued)**Electronic Transmission Error Indicator**

The vehicle is equipped with a redundant electronic gearshift indicator. This character appears with the key in the run position and displays the same gear selection as shown on the range selector floor console next to the range selector lever. A transmission malfunction is indicated if an “E” character flashes or remains on.

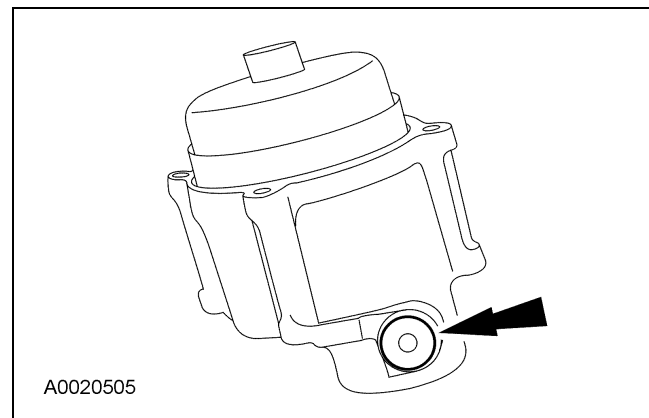
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Reverse Servo Assembly

Disassembly



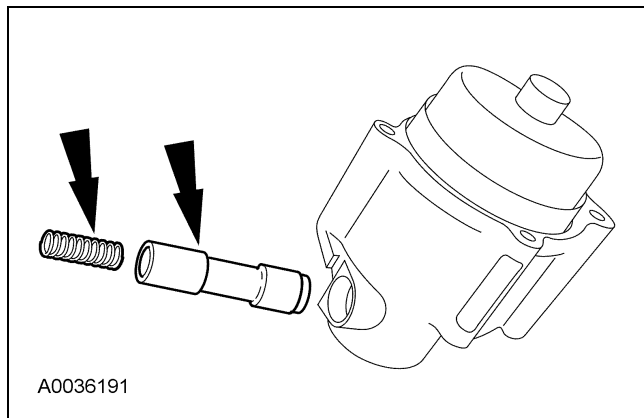
Item	Part Number	Description
1	7D321	Control valve spring retainer
2	7A270	Fluid pressure regulator valve spring
3	7D488	Reverse servo check valve
4	7D372	Reverse servo plate
5	7D466	Reverse servo accumulator spring
6	7D189	Reverse servo piston and seal
7	7423	Reverse servo piston O-ring
8	7D036	Reverse servo cover



1. Remove the control valve spring retainer.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

2. Remove the reverse servo spring and check valve.

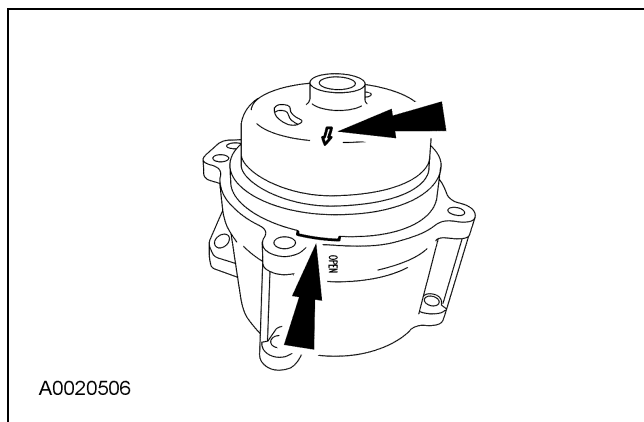


3.  **WARNING:** The upper and lower servo covers are under spring tension. Use care when separating the two halves. Failure to follow these instructions can result in personal injury.

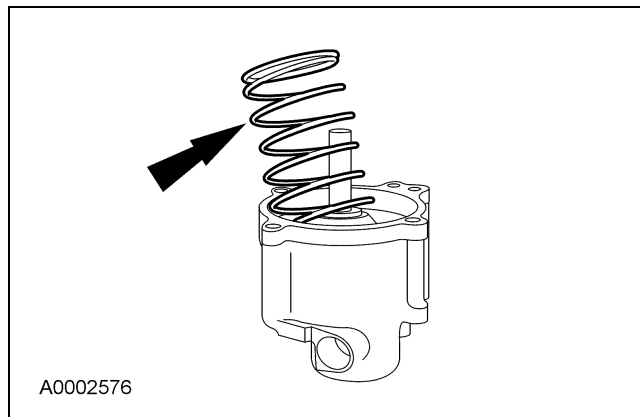
NOTE: Tabs on servo plate mate with slots on cover every 120 degrees.

Remove the reverse servo plate by turning in either direction to release.

- Align the arrow on the servo plate with any slot on the cover.

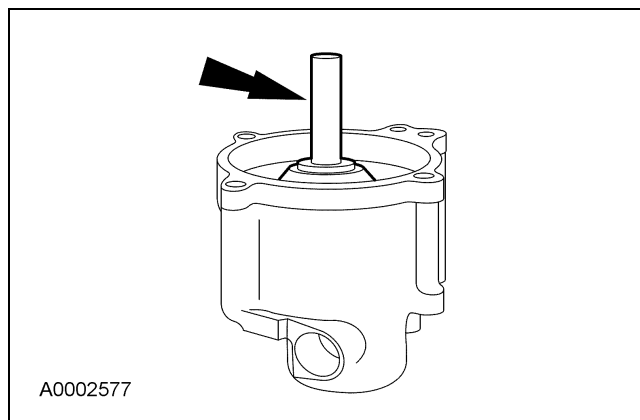


4. Remove the reverse servo spring.

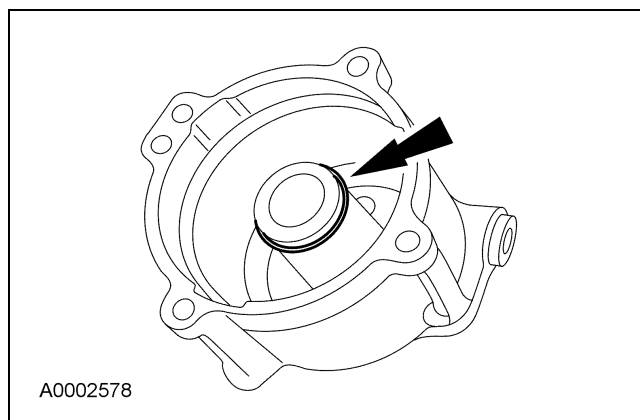


5. Remove the reverse servo piston and seal assembly.

- Inspect the seal for damage, install a new reverse servo piston if necessary.



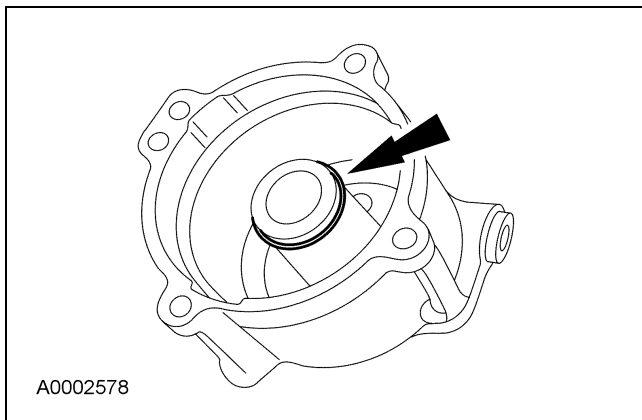
6. Remove and discard the reverse servo piston seal.



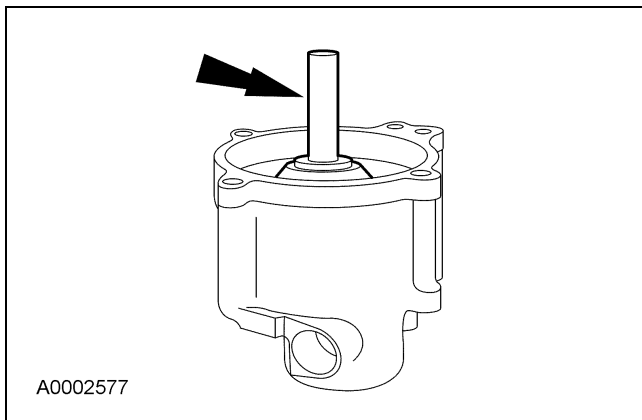
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)**Assembly**

1. **NOTE:** Try not to roll the seal onto the housing when installing the seal, or damage to the seal can occur.

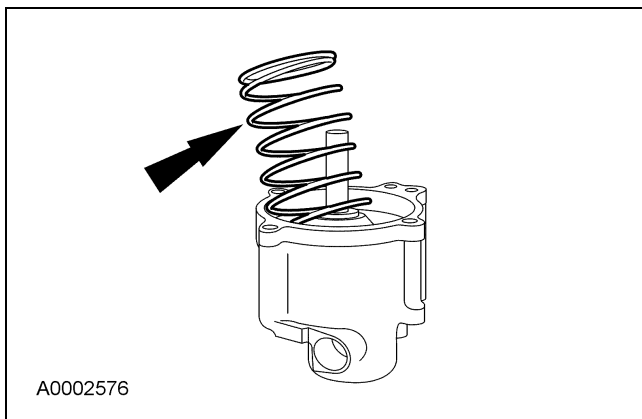
Lubricate and install a new reverse servo piston seal.



2. Lubricate and install the reverse servo piston and seal assembly.



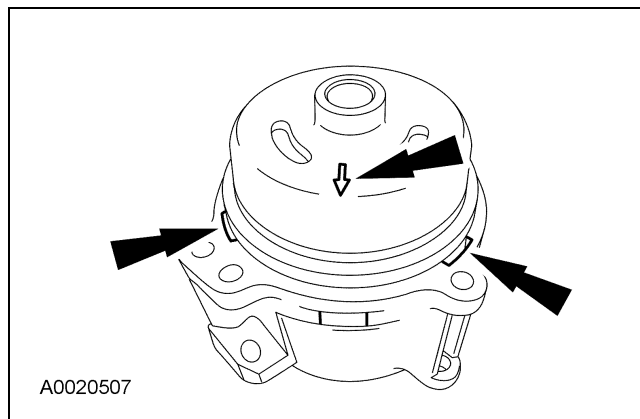
3. Install the reverse servo spring.



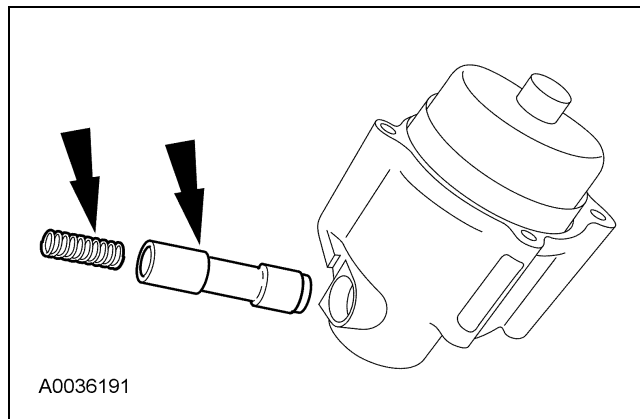
4. **⚠ WARNING:** The upper and lower servo covers are under spring tension. Use care when assembling the 2 halves. Failure to follow these instructions can result in personal injury.

⚠ CAUTION: The arrow on the servo plate must be aligned evenly between any 2 slots on the cover.

Install the reverse servo plate.

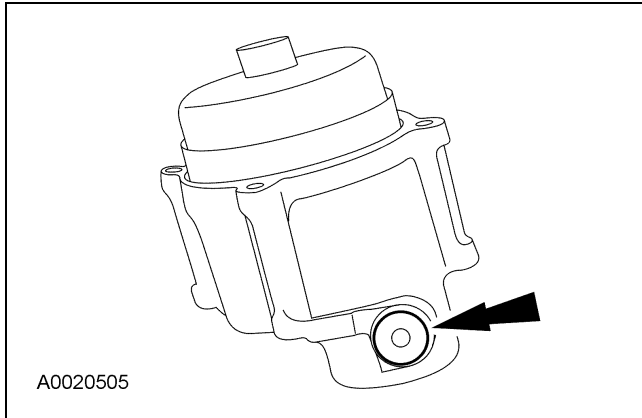


5. Install the reverse servo spring and check valve.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

6. Install the control valve spring retainer.
 - Tighten to 10 Nm (89 lb-in).



DIAGNOSIS AND TESTING

Road Testing Vehicle

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

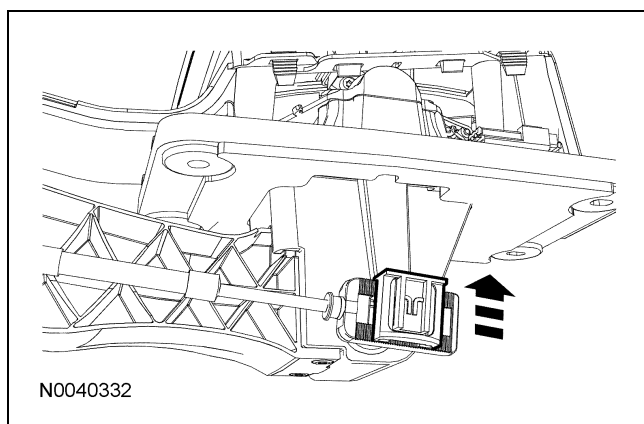
NOTE: When the battery has been disconnected or a new battery installed, certain transmission operating parameters may be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process you may experience slightly firm shifts, delayed or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

The Shift Point Road Test and Torque Converter Operation Test provide diagnostic information on transmission shift controls and torque converter operation.

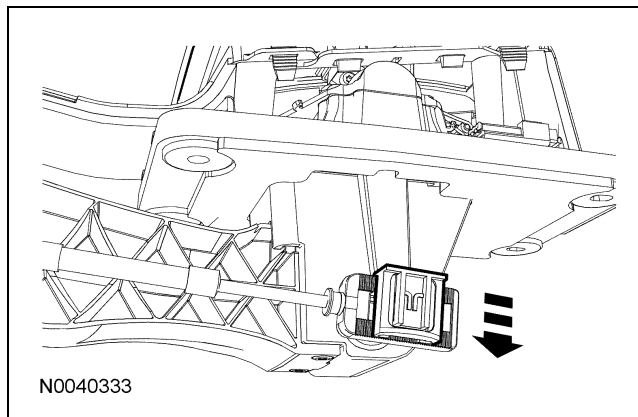
GENERAL PROCEDURES

Selector Lever Cable Adjustment

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Place the transmission range selector lever in the D position.
3. Lift the lock upward on the transmission selector cable lock and remove the cable from the selector lever.



5. Install the transmission selector lever cable on the selector lever and push the lock downward to lock the selector lever cable adjustment lock.

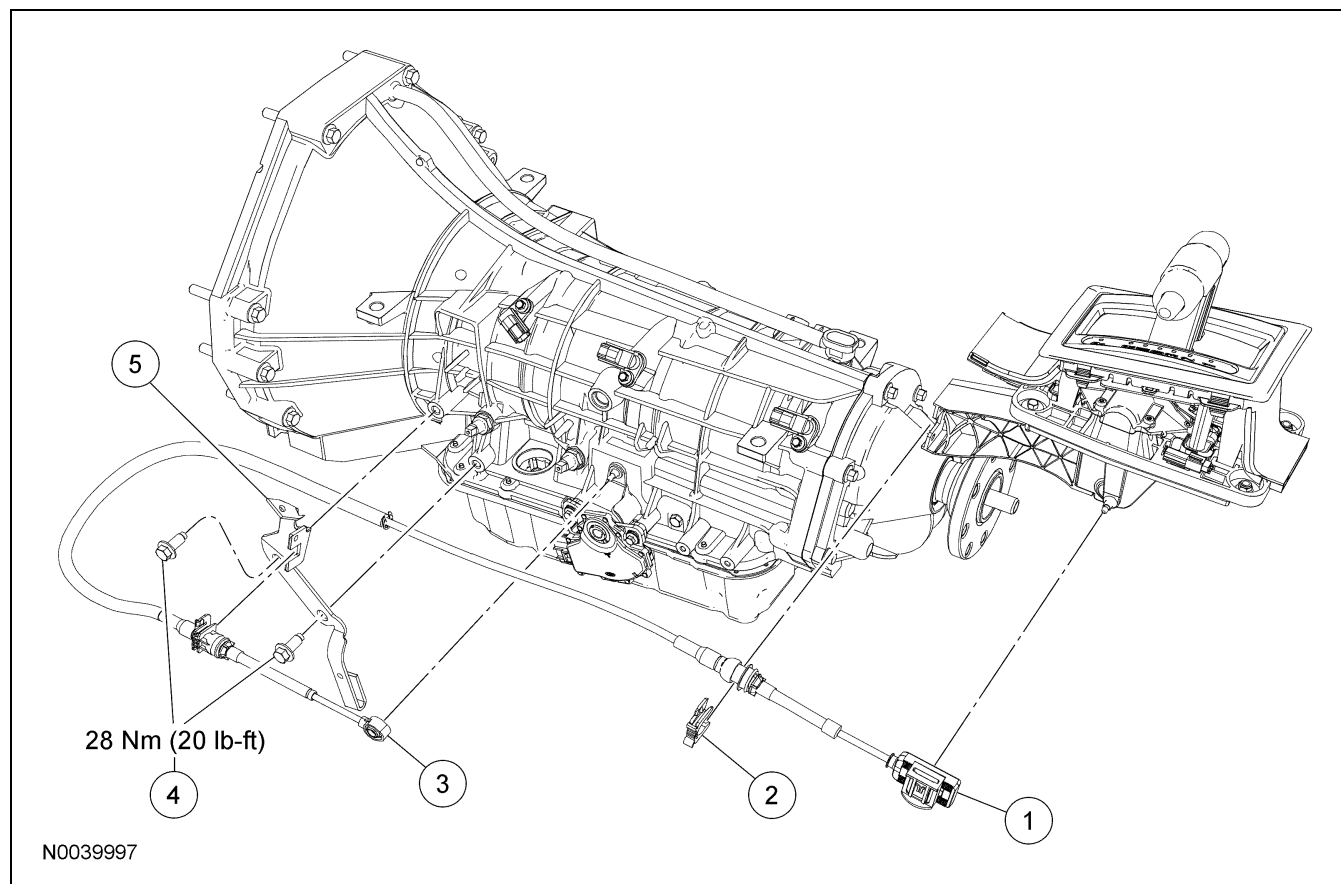


4. Place the transmission manual control lever in the D position by rotating the manual lever clockwise to the extent of travel, then rotate counterclockwise 3 detents.

REMOVAL AND INSTALLATION

Selector Lever Cable and Bracket

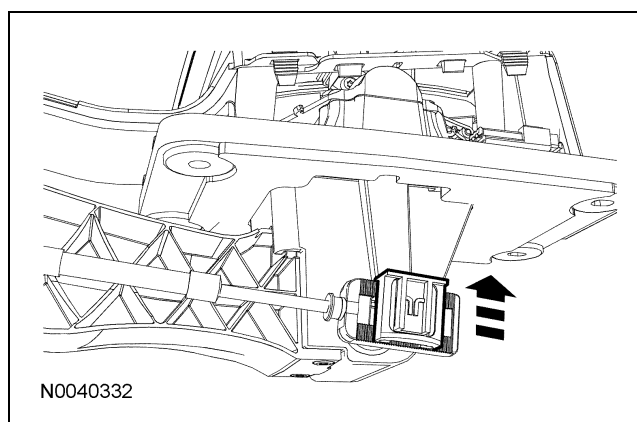
Removal



Item	Part Number	Description
1	—	Transmission selector lever cable
2	—	Transmission selector lever cable retaining clip
3	—	Transmission selector lever cable
4	—	Transmission selector lever cable bracket bolts
5	—	Transmission selector lever cable bracket

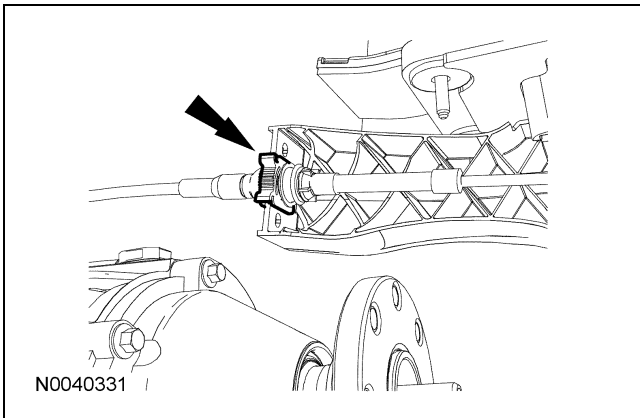
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

2. Remove the selector lever cable from the selector lever.

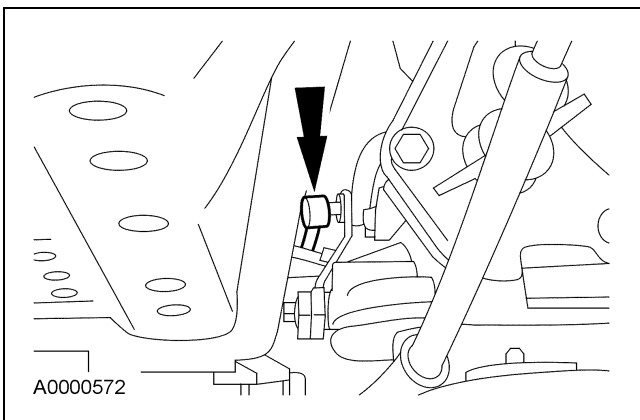


REMOVAL AND INSTALLATION (Continued)

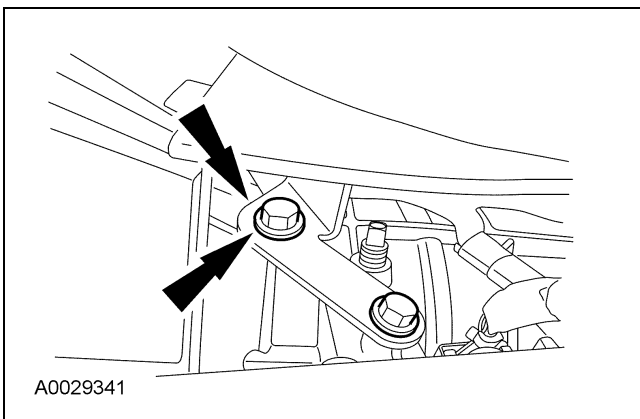
3. Remove the selector lever cable from the bracket and discard the clip.



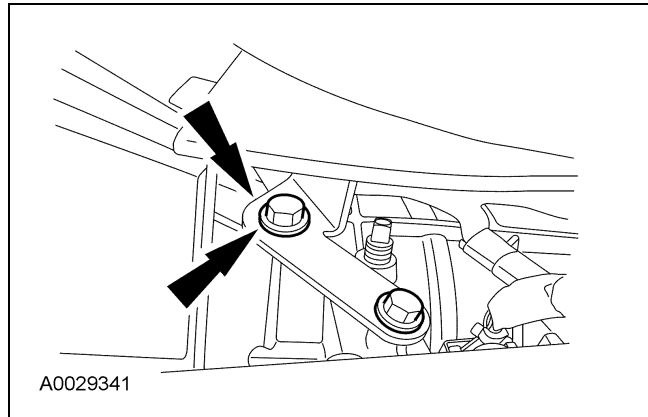
4. Remove the selector lever cable from the transmission manual lever.



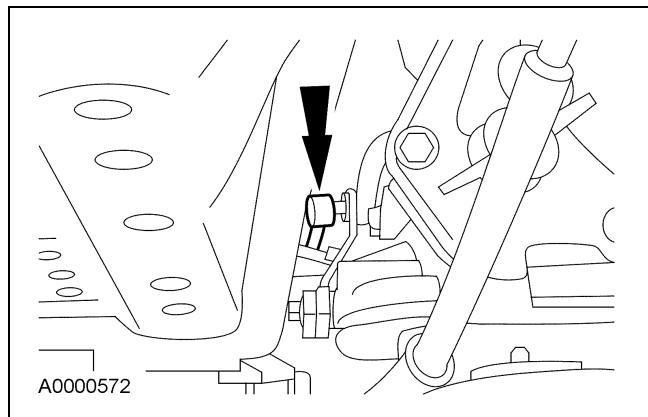
5. Remove the 2 transmission selector lever cable bracket bolts from the transmission and remove the bracket.

**Installation**

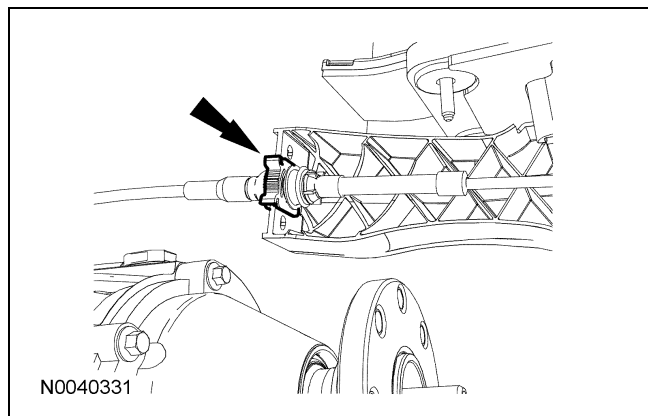
1. Install the selector lever cable bracket and install the 2 bolts.
 - Tighten to 28 Nm (20 lb-ft).



2. Install the selector lever cable eyelet onto the transmission manual lever.

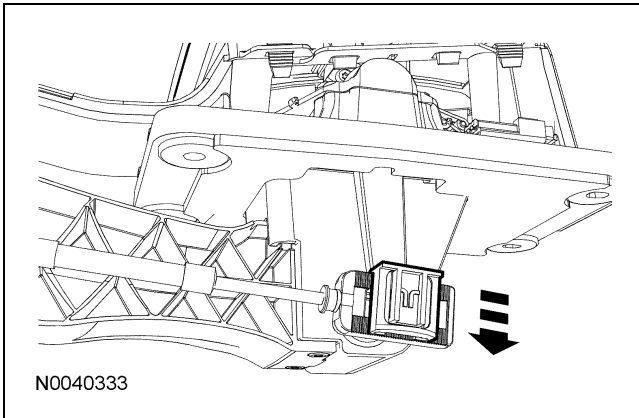


3. **NOTE:** It is necessary to install a new plastic clip prior to installation.
Install the selector lever cable into the selector lever cable bracket.



REMOVAL AND INSTALLATION (Continued)

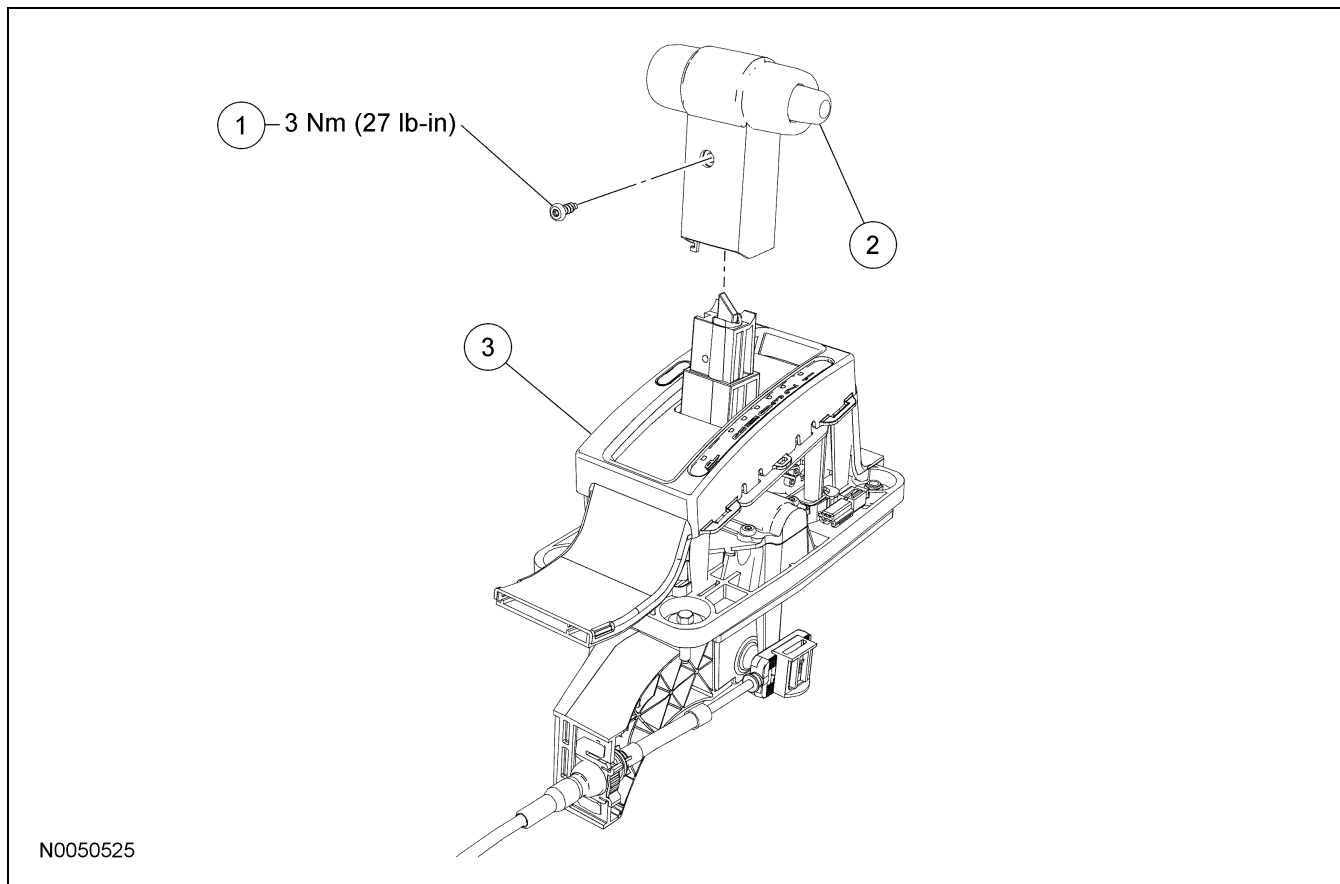
4. Install the selector lever cable onto the selector lever and lock the selector lever cable adjustment lock.
5. Verify the selector lever cable is adjusted correctly. For additional information, refer to Selector Lever Cable Adjustment in this section.



REMOVAL AND INSTALLATION

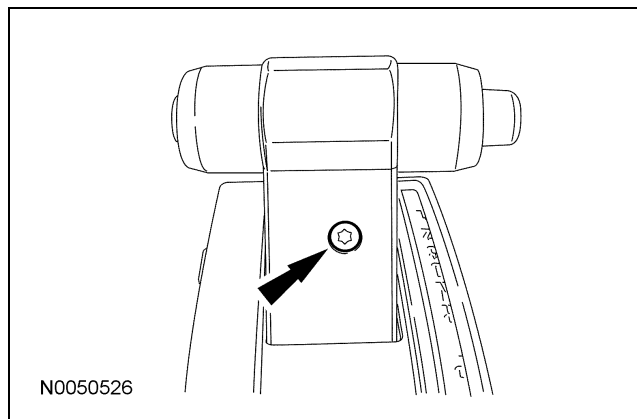
Selector Lever Knob

Removal



Item	Part Number	Description
1	—	Transmission selector lever knob screw
2	—	Transmission selector lever knob
3	—	Transmission selector lever

1. Remove the transmission selector lever assembly. For additional information, refer to Selector Lever in this section.
2. With the selector lever knob pulled to the rear, remove the screw from the knob base.



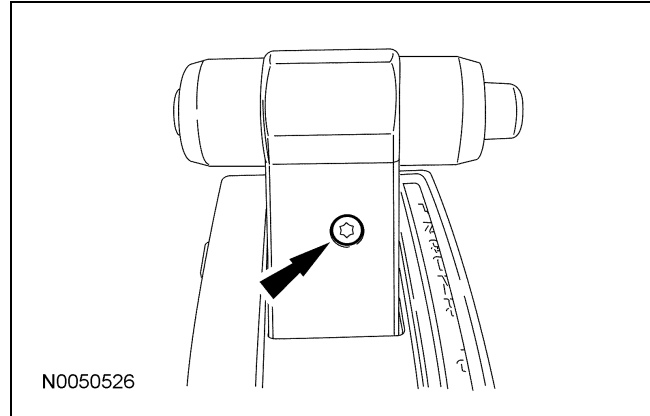
3. Slide the knob up and off the selector shaft. Disconnect the transmission control switch electrical connector.

REMOVAL AND INSTALLATION (Continued)**Installation**

1. Connect the transmission control switch electrical connector.
2. Fold the transmission control switch wire into the selector shaft channel to keep the harness from contacting the sliding mechanisms.
3.  **CAUTION: Tightening the screw over 3 Nm (27 lb-in) may damage the selector lever assembly.**

Align the selector lever knob base screw hole with the selector shaft and install the screw.

- Tighten to 3 Nm (27 lb-in).

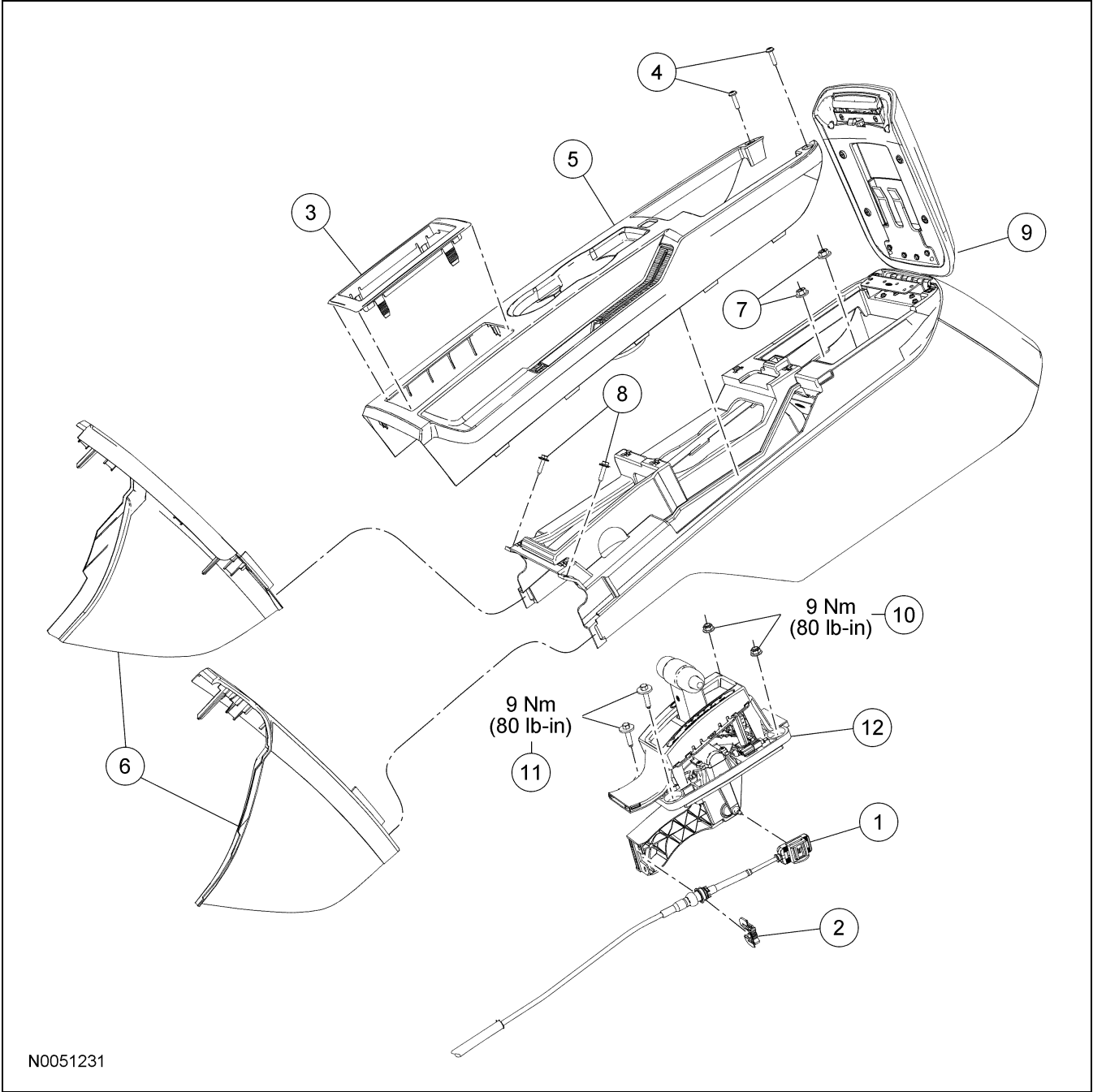


4. Install the transmission selector lever assembly in the vehicle. For additional information, refer to Selector Lever in this section.

REMOVAL AND INSTALLATION

Selector Lever

Removal



Item	Part Number	Description
1	—	Transmission selector lever cable
2	—	Transmission selector lever cable retaining clip

(Continued)

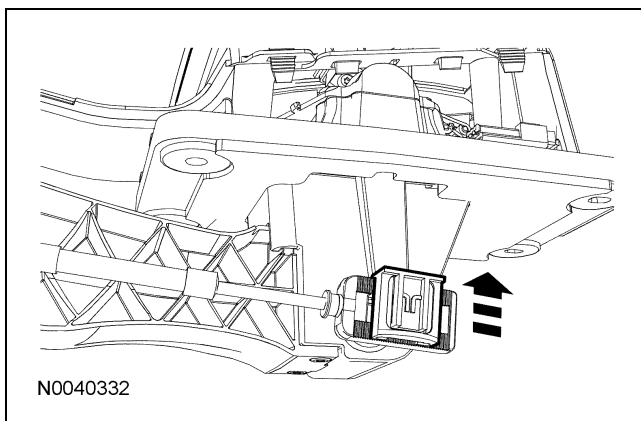
Item	Part Number	Description
3	—	Selector lever trim
4	—	Center console finish panel screws
5	—	Center console finish panel

(Continued)

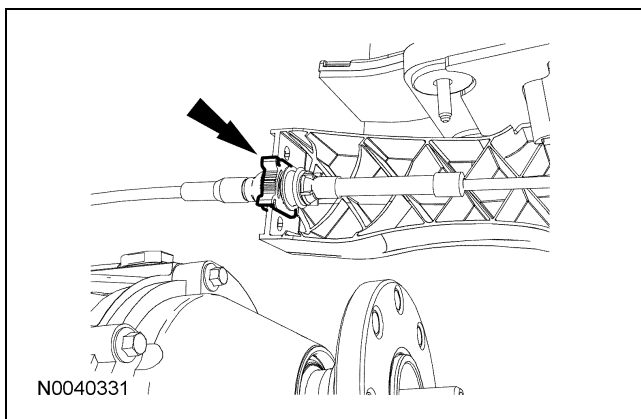
REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
6	—	Center stack kick panels
7	—	Center console nuts
8	—	Center console screws
9	—	Center console
10	—	Transmission selector lever housing nuts
11	—	Transmission selector lever housing screws
12	—	Transmission selector lever

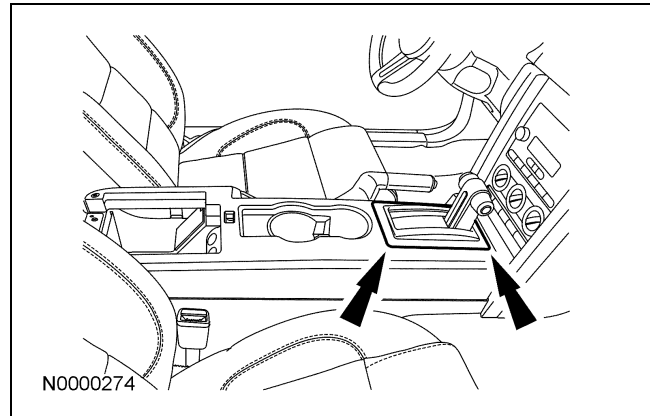
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the selector lever cable from the selector lever.



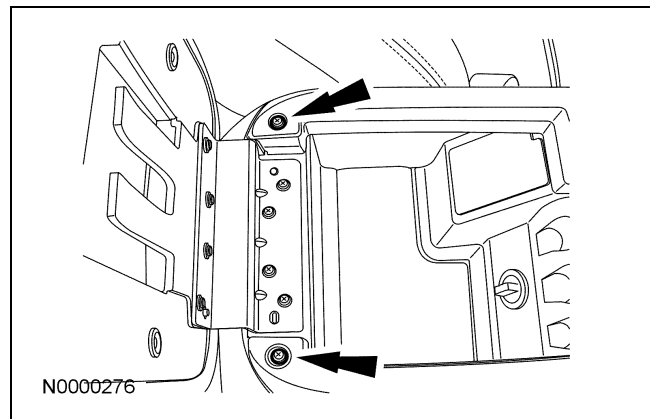
3. Remove the selector lever cable from the bracket and discard the clip.



4. Remove the center console selector lever trim.

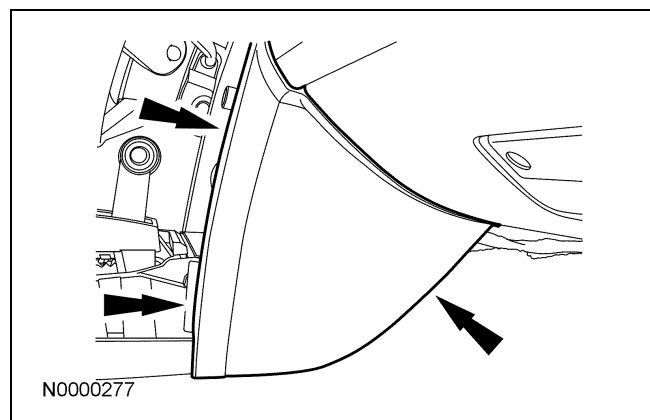


5. Remove the 2 screws and the center console top finish panel.



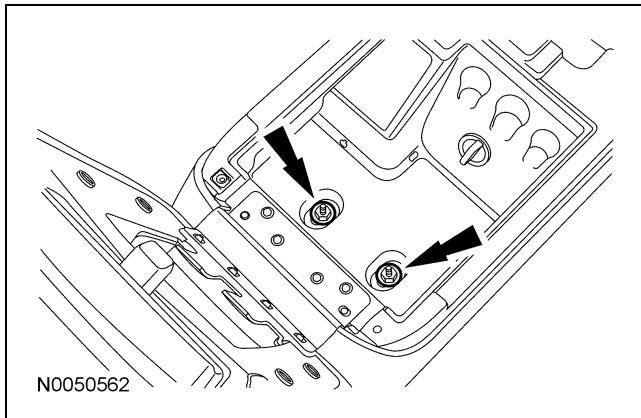
6. **NOTE:** Passenger side center console kick panel shown, driver side similar.

Remove the driver and passenger center console kick panels.

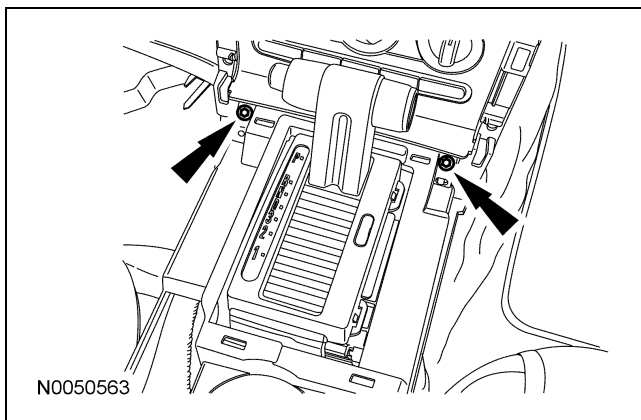


REMOVAL AND INSTALLATION (Continued)

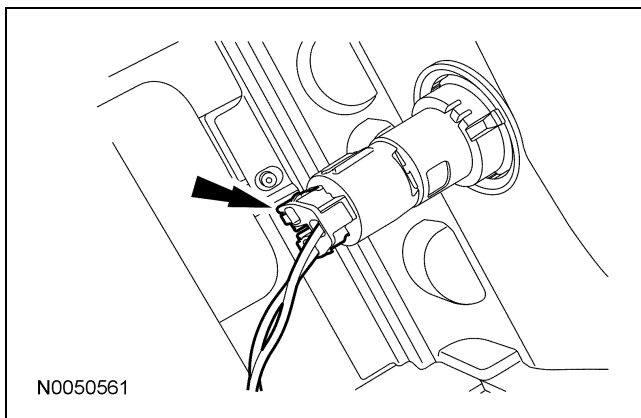
7. Remove the 2 screws in the bottom of the console bin.



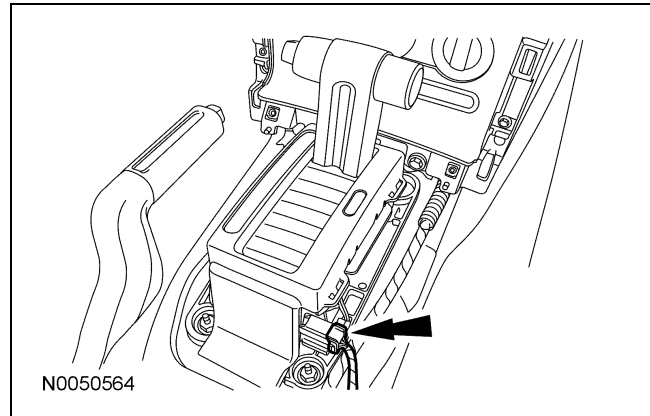
8. Remove the 2 screws from the front of the console.



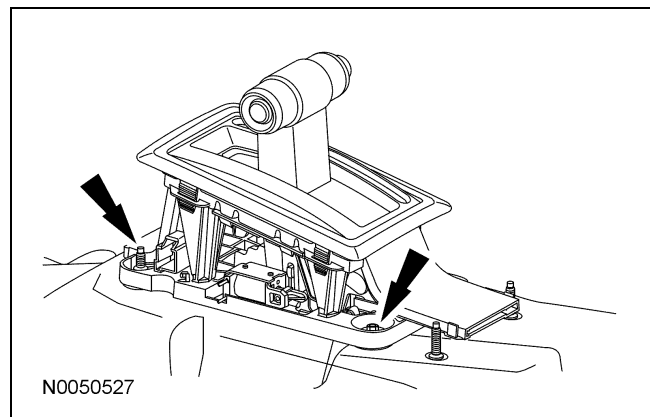
9. Lift up the console, disconnect the power point electrical connector and remove the console.



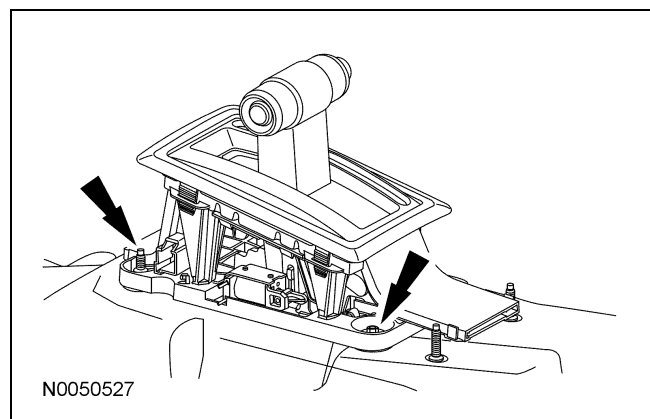
10. Disconnect the selector lever electrical connector.



11. Remove the 2 nuts and the 2 screws and carefully lift the transmission selector lever assembly from the vehicle.

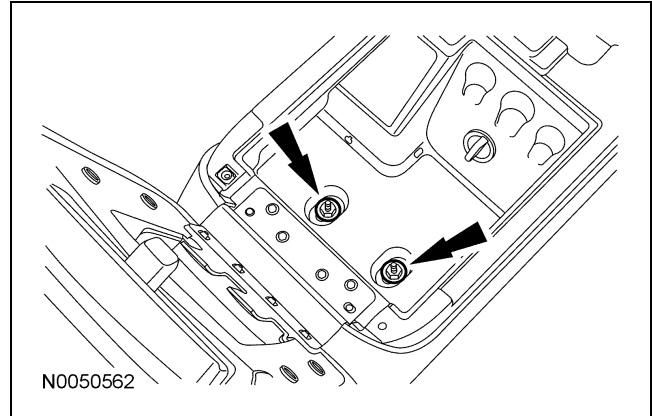
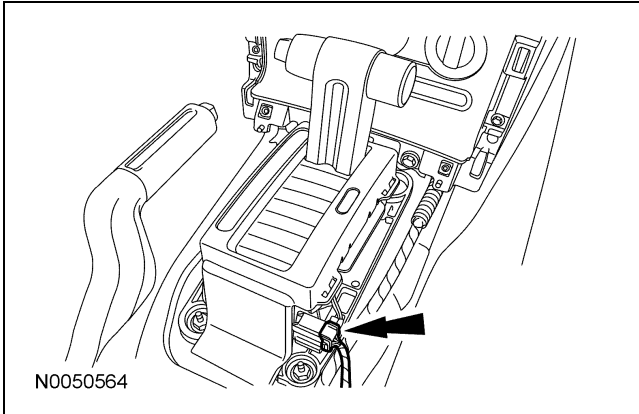
**Installation**

1. Position the transmission selector lever assembly in the vehicle and install the 2 nuts and the 2 screws.
- Tighten to 9 Nm (80 lb-in).

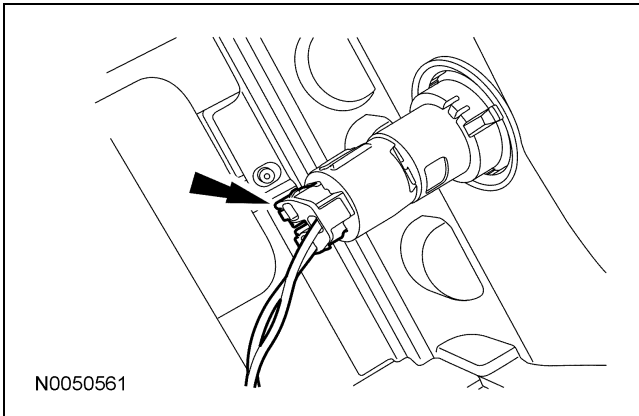


REMOVAL AND INSTALLATION (Continued)

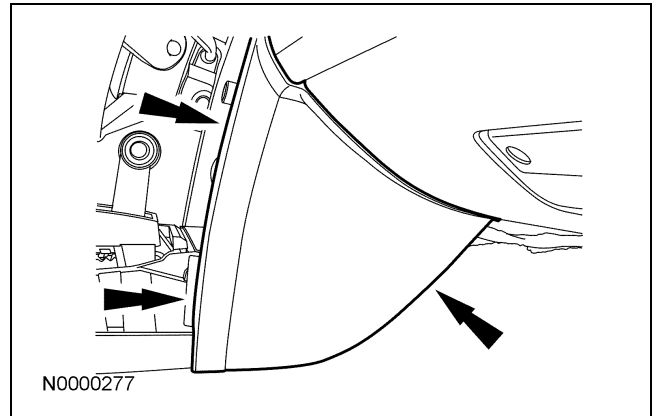
2. Connect the selector lever electrical connector.



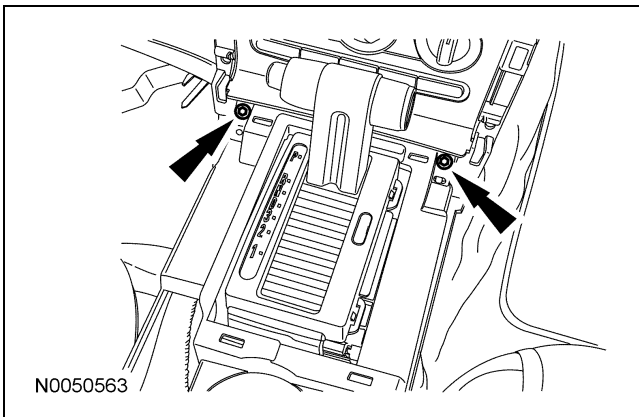
3. Connect the power point electrical connector and install the console.



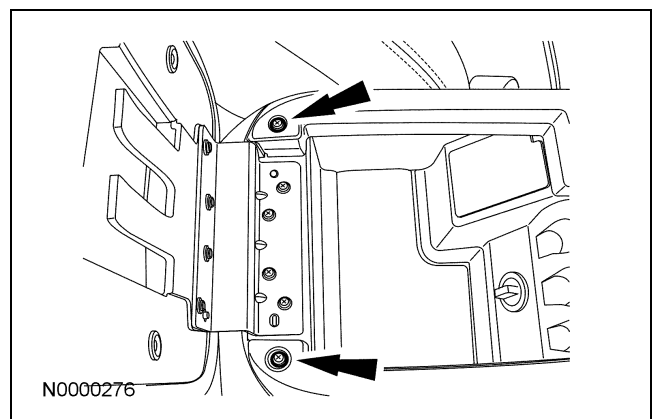
6. Install the driver and passenger side center console kick panels.



4. Install the 2 screws into the front of the console.



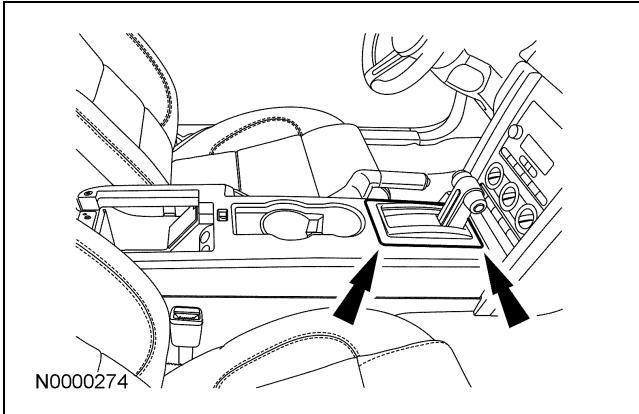
7. Install the center console top finish panel and the 2 screws.



5. Install the 2 screws into the bottom of the console bin.

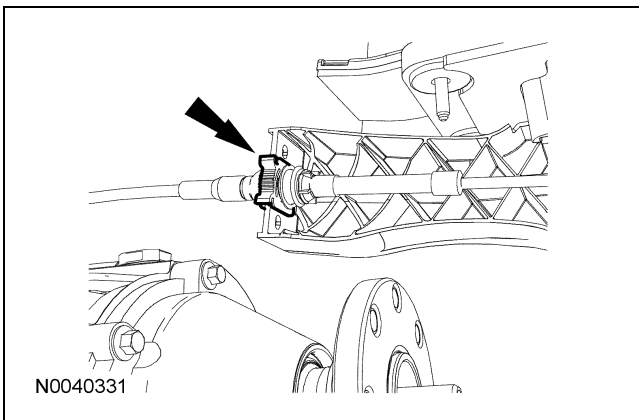
REMOVAL AND INSTALLATION (Continued)

8. Install the center console selector lever trim.

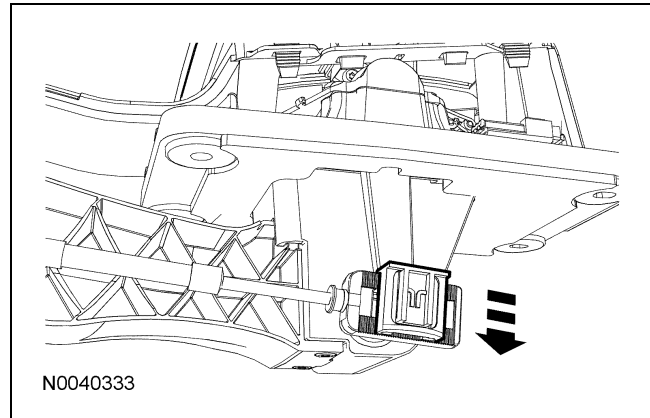


9. **NOTE:** It is necessary to install a new plastic clip prior to installation.

Install the selector lever cable into the bracket.



10. Install the selector lever cable onto the selector lever and lock the selector lever cable adjustment lock.



11. Verify the selector lever cable is adjusted correctly. For additional information, refer to Selector Lever Cable Adjustment in this section.

DESCRIPTION AND OPERATION

Shift Patterns

Upshifts

Transmission upshifting is controlled by the powertrain control module (PCM). The PCM receives inputs from various engine or vehicle sensors and driver demands to control shift scheduling, shift feel and torque converter clutch (TCC) operation.

The PCM has an adaptive learn strategy to electronically control the transmission which will automatically adjust the shift feel. When the battery has been disconnected or a new battery installed, certain transmission operating parameters may be lost. The PCM must relearn these parameters. During this learning process you may experience slightly firm shifts, delayed or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Downshifts

Under certain conditions the transmission will downshift automatically to a lower gear range (without moving the range selector lever). There are 3 categories of automatic downshifts: coastdown, torque demand and forced (or kickdown) shifts.

Coastdown

The coastdown downshift occurs when the vehicle is coasting down to a stop.

Torque Demand

The torque demand downshift occurs (automatically) during part throttle acceleration when the demand for torque is greater than the engine can provide at that gear ratio. If applied, the transmission will disengage the TCC to provide added acceleration.

Kickdown

For maximum acceleration, the driver can force a downshift by pressing the accelerator pedal to the floor. A forced downshift into a lower gear is possible below calibrated speeds. Specifications for downshift speeds are subject to variations due to tire size and engine and transmission calibration requirements.

DIAGNOSIS AND TESTING

Shift Point Road Test

This test verifies that the shift control system is operating correctly.

1. Bring the engine and transmission up to normal operating temperature.
2. Operate the vehicle with the selector lever in the D position.
3. Apply minimum throttle and observe the speeds at which upshift occurs and the torque converter engages. Refer to the following Shift Speeds chart.
4. Stop the vehicle. Select the D position and cancel overdrive by pressing the transmission control (TC) switch. Repeat Step 3. The transmission will make all upshifts except 4-5 and the torque converter clutch (TCC) should apply above 46 km/h (27 mph).
5. Press the accelerator pedal to the floor, wide open throttle (WOT). The transmission should shift from 3rd to 2nd, or 3rd to 1st, depending on vehicle speed, and the TCC should release.
6. With the vehicle speed above 48 km/h (30 mph), move the transmission range selector lever from D4 position to manual 1 position and release the accelerator pedal. The transmission should immediately downshift to 3rd gear. When vehicle speed drops below 32 km/h (20 mph), the transmission should downshift into 1st gear.
7. If transmission fails to upshift/downshift or the TCC does not apply/release, refer to Diagnosis By Symptom for possible causes.

Shift Speeds — 4.0L Engine

 **CAUTION:** Always obey local traffic laws, do not exceed posted limits.

Throttle Position	Overdrive Position "D"	Axle Ratio
	Shift	Shift Speed
Closed	5-4	37-42 km/h (23-26 mph)
	4-1	16-19 km/h (10-12 mph)
Minimum Monitor PID: TP Volt 1.25	1-2	19-21 km/h (12-13 mph)
	2-3	27-31 km/h (17-19 mph)
	3-4	34-35 km/h (21-22 mph)
	4-5	39-43 km/h (24-27 mph)
Wide Open	1-2	64-68 km/h (40-42 mph)
	2-3	93-101 km/h (58-63 mph)
	3-4	140-145 km/h (87-90 mph)
	4-5	171-174 km/h (106-108 mph)

DIAGNOSIS AND TESTING (Continued)**Shift Speeds — 4.6L Engine**

 **CAUTION:** Always obey local traffic laws, do not exceed posted limits.

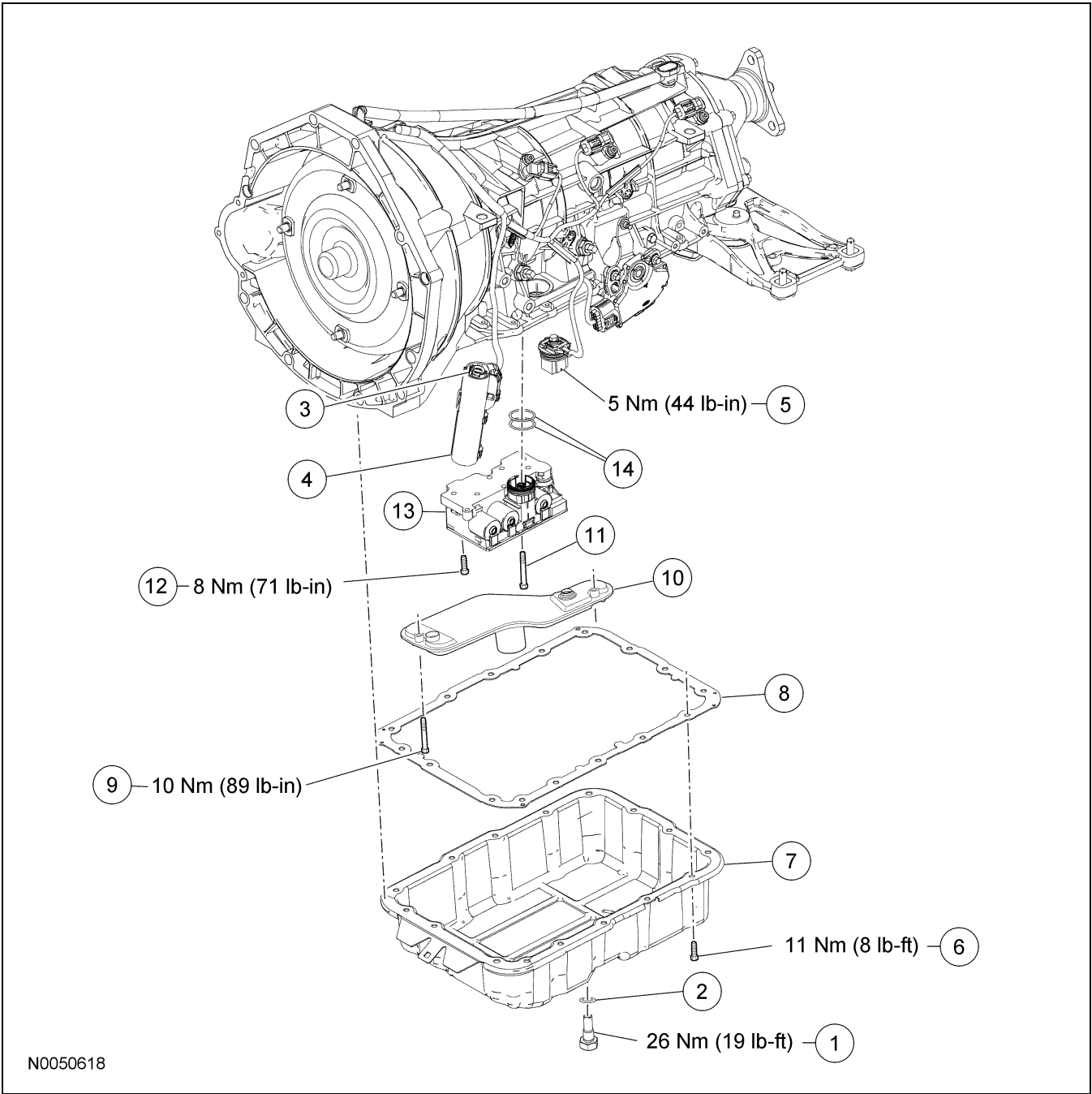
Throttle Position	Overdrive Position "D"	Axle Ratio
	Shift	Shift Speed
Closed	5-4	39 km/h (24 mph)
	4-1	16 km/h (10 mph)
Minimum Monitor PID: TP Volt 1.25	1-2	18 km/h (11 mph)
	2-3	27 km/h (17 mph)
	3-4	35 km/h (22 mph)
	4-5	39 km/h (24 mph)
Wide Open	1-2	68 km/h (42 mph)
	2-3	106 km/h (66 mph)
	3-4	148 km/h (92 mph)
	4-5	217 km/h (135 mph)

IN-VEHICLE REPAIR

Solenoid Body Assembly

Material

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

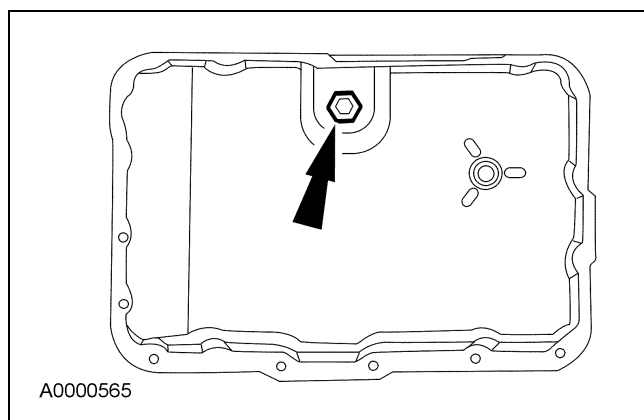


IN-VEHICLE REPAIR (Continued)

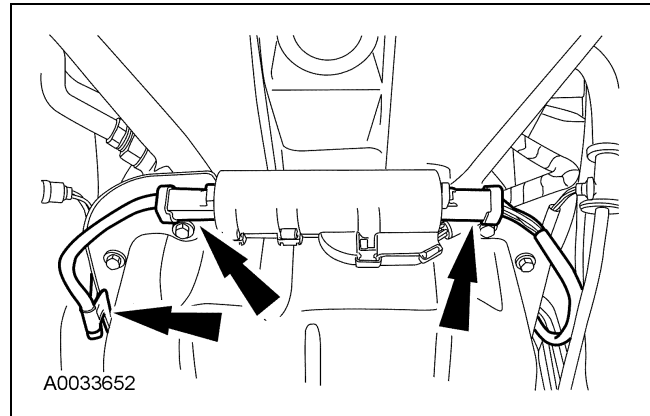
Item	Part Number	Description
1	7A010	Transmission fluid pan drain plug assembly
2	6734	Transmission fluid pan drain plug gasket
3	—	Heated oxygen sensor (HO2S) electrical connector (part of 9F472)
4	—	HO2S electrical connector retainer
5	7E395	Solenoid body harness electrical connector
6	W500213	Transmission fluid pan screws
7	7A194	Transmission fluid pan
8	7A191	Transmission fluid pan gasket
9	W70559	Transmission fluid pan filter screws
10	7A098	Transmission fluid pan filter
11	W703189	Solenoid body screws
12	W702921	Solenoid body screw
13	7G391	Solenoid body
14	W705928	Solenoid body O-ring seals

Removal

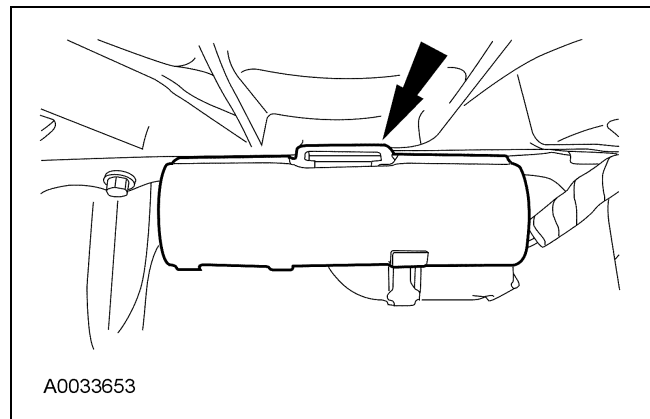
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the drain plug and drain the transmission fluid.
 - Discard the drain plug gasket.



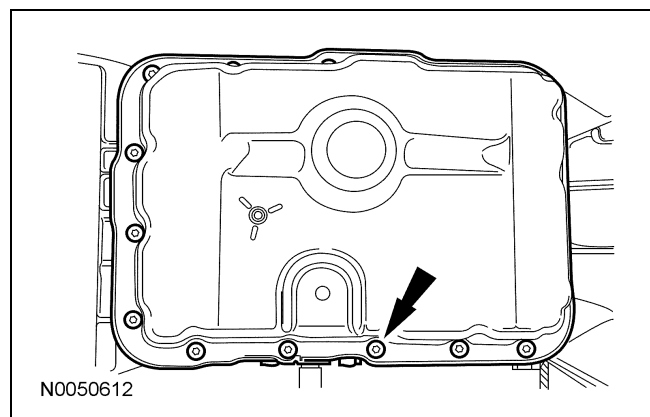
3. Disconnect the heated oxygen sensor (HO2S) connectors and retaining clip from the RH pan rail and then position the connectors aside.



4. Remove the HO2S connector from the front of the transmission pan rail.

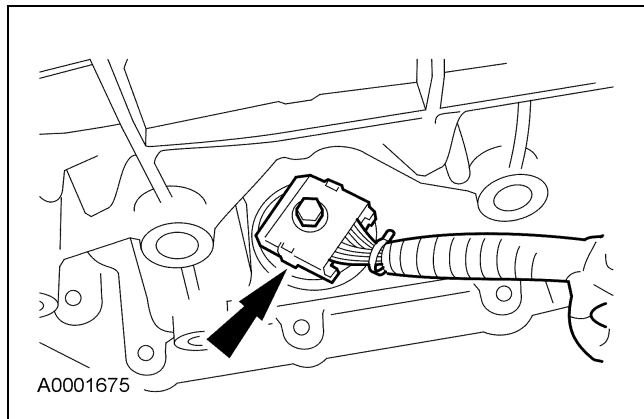


5. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the gasket should be reused.
Remove the transmission fluid pan screws, gasket and fluid pan.

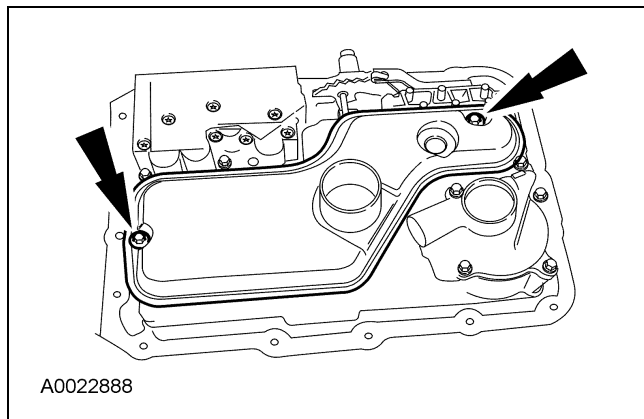


IN-VEHICLE REPAIR (Continued)

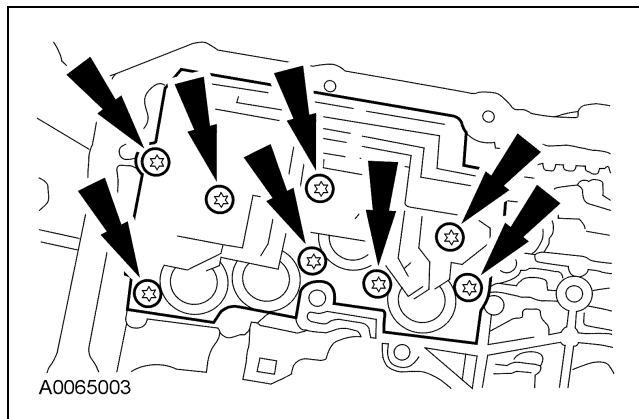
6. **NOTE:** Clean the area around the solenoid body connector to prevent contamination.
Disconnect the solenoid body harness electrical connector.



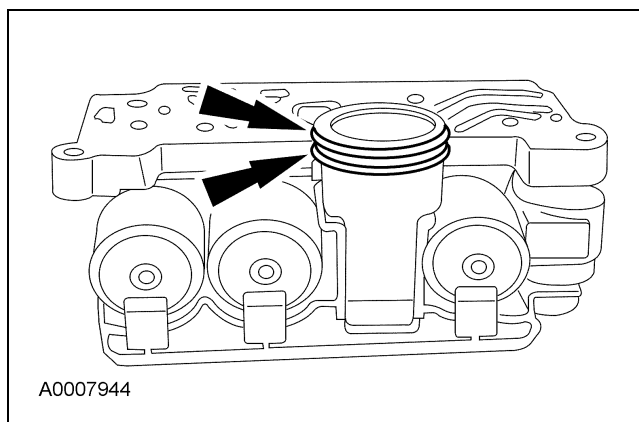
7. Remove the screws and the transmission fluid filter.



8. **⚠ CAUTION: Do not damage the solenoid body connector pins.**
Remove the solenoid body screws and remove the solenoid body by lifting on the body and pushing the connector from the other side of the case.

**Installation**

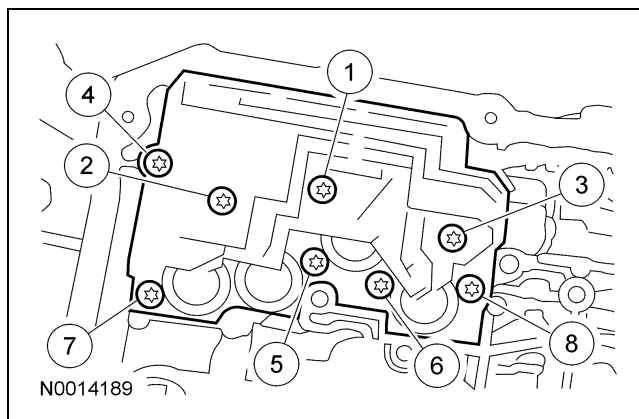
1. Install new O-ring seals on the solenoid body connector. Lubricate the O-ring seals with clean automatic transmission fluid.



2. **⚠ CAUTION: Inspect the transmission case bore to make sure it is free of foreign material and not damaged. If it is damaged, transmission leaks may occur.**

Install the solenoid body. Tighten the screws in the sequence shown.

- Tighten to 8 Nm (71 lb-in).



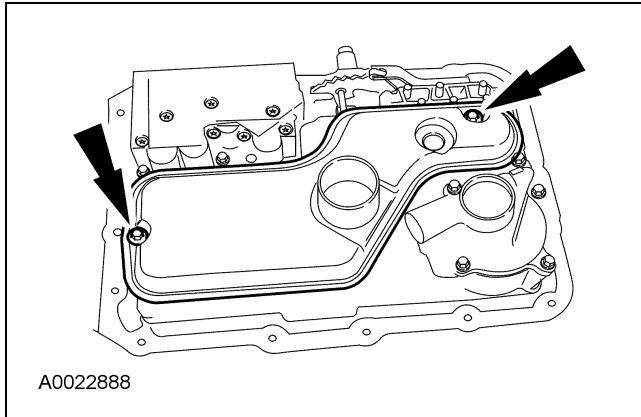
IN-VEHICLE REPAIR (Continued)

3.  **CAUTION:** Lubricate the fluid filter seals with clean automatic transmission fluid or they may be damaged.

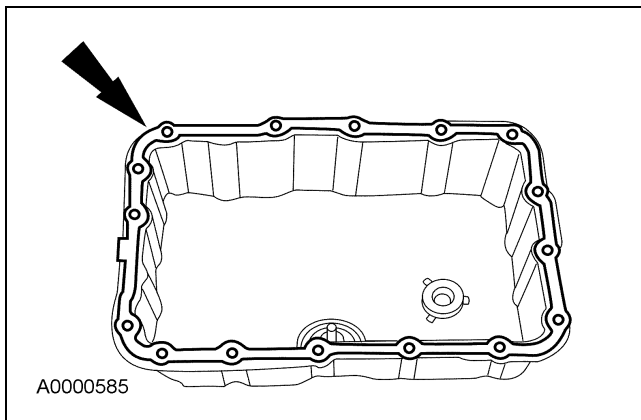
NOTE: Make sure the fluid filter seals are correctly seated on the filter.

Lubricate the seals and install the transmission fluid filter.

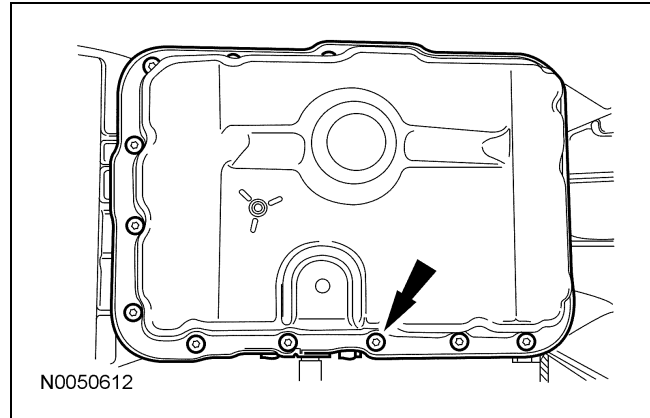
- Tighten to 10 Nm (89 lb-in).



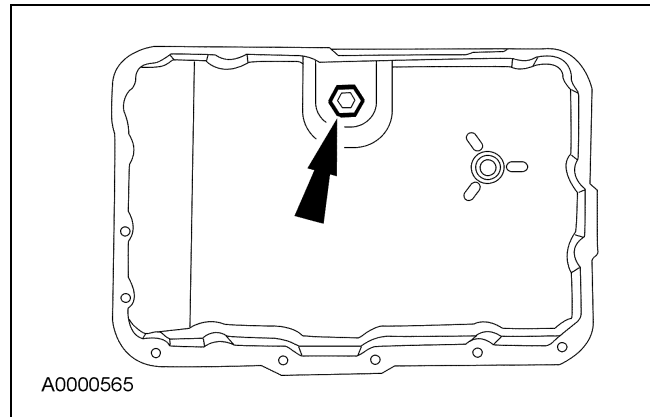
4. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the gasket should be reused.
- Install the transmission fluid pan and gasket and loosely install the screws.



5. Tighten the screws in a crisscross sequence.
- Tighten to 11 Nm (8 lb-ft).



6. Install the drain plug.
- Install a new gasket onto the drain plug assembly.
 - Tighten to 26 Nm (19 lb-ft).



IN-VEHICLE REPAIR (Continued)

7.  **CAUTION:** Damage will occur to the solenoid body assembly if the screw is tightened above specification.

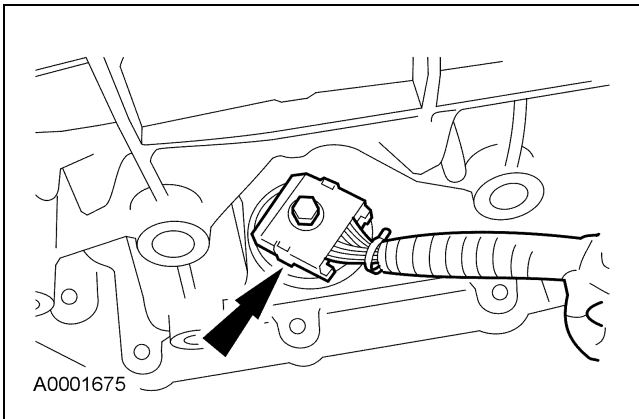
NOTE: Always install new O-ring seals on the vehicle harness connector.

NOTE: Clean the area around the connector to prevent contamination of the solenoid body connector.

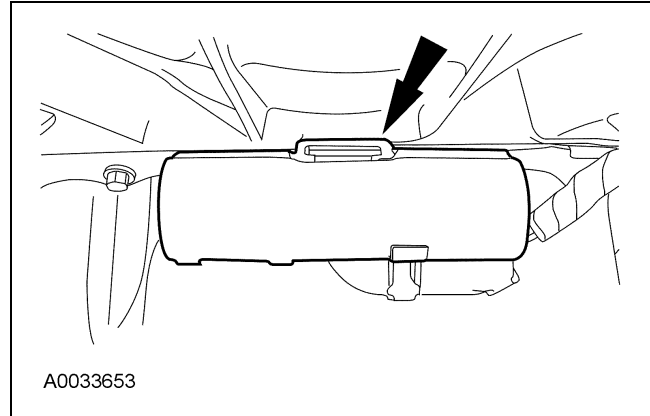
NOTE: Use petroleum jelly to lubricate the O-ring seals to aid in the installation process.

Install and lubricate new O-ring seals on the transmission connector and connect the connector.

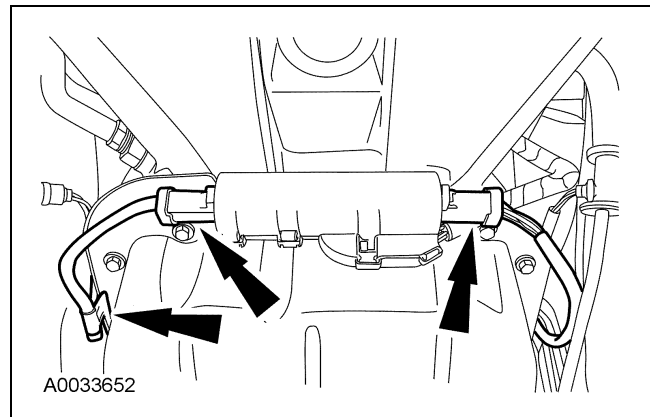
- Tighten to 5 Nm (44 lb-in).



8. Install the HO2S connector to the front of the transmission pan rail.



9. Connect the HO2S connector and install the sensor wire retaining clip to the RH side of the transmission pan rail.

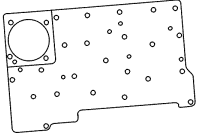
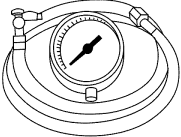


10. Fill the transmission. For additional information, refer to Transmission Fluid Drain and Refill — Automated Equipment or Transmission Fluid Level Check in this section.

DIAGNOSIS AND TESTING

Special Testing Procedures

Special Tool(s)

 ST2408-A	Air Test Plate, Transmission 307-405
 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)

The special tests are designed to aid the technician in diagnosing the hydraulic and mechanical portion of the transmission.

Engine Idle Speed Check

Refer to the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#) for diagnosis and testing of the engine idle speed.

Line Pressure Test

⚠ CAUTION: Carry out Line Pressure Test prior to carrying out Stall Speed Test. If line pressure is low at stall, do not carry out the Stall Speed Test or further transmission damage will occur. Do not maintain wide open throttle (WOT) in any gear range for more than 5 seconds.

NOTE: Certain sensor failures may cause high PC, FMEM (failure mode effect management) actions. Be sure that self-test and electrical repairs have been carried out or test results may be incorrect.

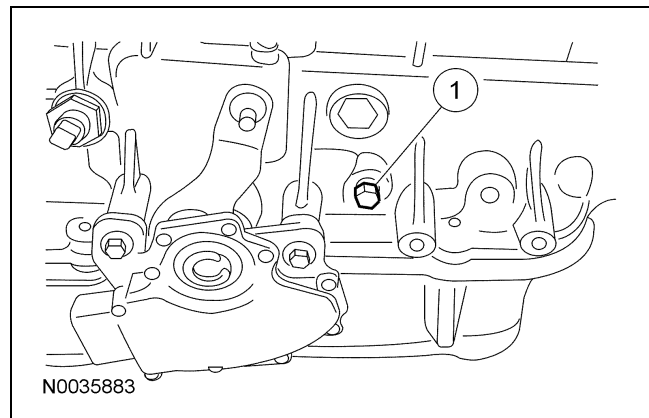
Line Pressure Chart — 4.0L and 4.6L Engines

Range	Idle Pressure		WOT Stall Pressure	
	PC C	Line	PC C	Line
N	0-103 kPa (0-15 psi)	758-1034 kPa (110-150 psi)		
R	758-862 kPa (110-125 psi)	965-1551 kPa (140-225 psi)	758-862 kPa (110-125 psi)	2,000-2,482 kPa (290-360 psi)
(D), 2, 1	0-103 kPa (0-15 psi)	758-1045 kPa (110-150 psi)	0-103 kPa (0-15 psi)	1,448-1,793 kPa (210-260 psi)

NOTE: The line pressure tap is used to verify output pressure from PC A or PC B by turning either one off, while verifying the output from the other solenoid. The second pressure tap is used to verify the output from the PC C solenoid.

This test verifies that the line pressure is within specification.

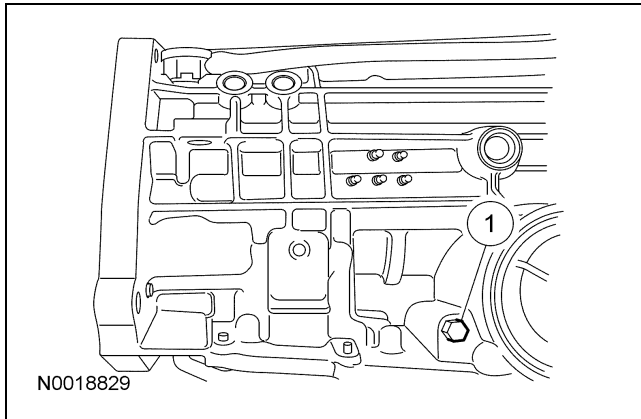
1. Connect the pressure gauge to the line pressure tap.
2. Start the engine and check line pressures. Refer to the following Line Pressure Chart to determine if line pressure is within specifications.



Item	Part Number	Description
1	—	Line pressure tap

DIAGNOSIS AND TESTING (Continued)

3. If the line pressure is not within specification, check the PC C pressure.
4. Connect the pressure gauge to the PC C pressure tap.



Item	Part Number	Description
1	—	Pressure control (PC C) tap

5. Start the engine and check the PC C pressure. Refer to Line Pressure Diagnosis Chart in this section for specification.
6. If the PC C pressure is not within specification, [GO to Pinpoint Test D](#) to diagnose PC C operation. If PC C operation is OK, refer to Line Pressure Diagnosis Chart in this section for line pressure concern causes.

Line Pressure Diagnosis Chart

Test Results	Possible Source
High at Idle — All Ranges	• Wiring harnesses • PC C boost valve • PC C solenoid • Main regulator valve
Low at Idle — All Ranges	• Low fluid level • Fluid inlet filter/seal • Main control body • Cross leaks • Gaskets • Pump • Separator plate
Low — All Forward Ranges	• Forward clutch • Main control • Overdrive servo • Intermediate servo
Low in Park Only	• Valve body
Low in Reverse Only	• Separator plate • Rear servo piston, cover seal • Reverse clutch • Overdrive servo • Intermediate servo • Valve body • Forward clutch
Low in Neutral Only	• Valve body • Overdrive servo • Intermediate servo
Low in D Only	• Forward clutch • Overdrive servo • Intermediate servo • Valve body

DIAGNOSIS AND TESTING (Continued)**Line Pressure Diagnosis Chart (Continued)**

Test Results	Possible Source
Low in D Only (O/D Cancelled)	• Forward clutch • Overdrive servo • Intermediate servo • Valve body
Low in 1st Position	• Forward clutch • Valve body
Low in 2nd Position	• Intermediate servo • Overdrive servo • Intermediate servo • Forward clutch
Low in 3rd Position	• Intermediate servo • Overdrive servo • Forward clutch

Stall Speed Test

This test checks operation of the following items:

- Torque converter clutch
- Forward clutch
- Low-one way clutch (OWC) assembly
- Engine operation
- Overdrive one-way clutch assembly

⚠ WARNING: Apply the parking brake firmly while carrying out each stall test.

⚠ CAUTION: Always carry out the Line Pressure Test procedures prior to carrying out the Stall Speed Test. If line pressure is low at stall, do not carry out the Stall Speed Test or further transmission damage will occur.

NOTE: The Stall Speed Test should be carried out with the engine and transmission at normal operating temperatures.

1. Connect a tachometer to the engine.

2. **⚠ CAUTION:** After testing each of the following ranges D, 3, 2, 1 and R, move the transmission range selector lever to N and run the engine at 1,000 rpm for about 15 seconds to allow the torque converter to cool before testing the next range.

⚠ CAUTION: Do not maintain wide open throttle (WOT) in any range for more than 5 seconds.

⚠ CAUTION: If the engine rpm recorded by the tachometer exceeds maximum specified rpm, release the accelerator pedal immediately. Clutch or band slippage is indicated.

NOTE: Prolonged use of this procedure may set Diagnostic Trouble Code (DTC) P0712, P1783. After carrying out Stall Speed Test, run OBD Test and clear DTCs from memory.

Press the accelerator pedal to the floor WOT in each range. Record rpm reached in each range. Stall speeds should be as follows:

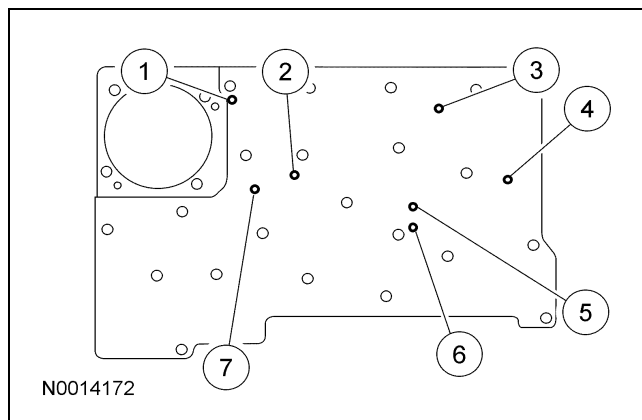
Stall Speed Chart

Vehicle	Engine	RPM
Mustang	4.0L	2,290-2,705
Mustang	4.6L	2,556-3,014

If the stall speeds were too high, refer to the following Stall Speed Diagnosis Chart. If the stall speeds were too low, first check the engine idle speed. If the engine idle is OK, remove the torque converter and check the torque converter one-way clutch for slippage.

DIAGNOSIS AND TESTING (Continued)**Stall Speed Diagnosis Chart**

Transmission Range Selector Lever Position	Stall Speeds High	Stall Speeds Low
D, D ((D) cancelled) and 1	Overdrive one-way clutch, rear one-way clutch	—
D ((D) cancelled), 2 and 1	Forward clutch, overdrive one-way clutch	—
D	Forward clutch, overdrive one-way clutch	—
D, D ((D) cancelled), 3, 2, 1 and R	General pressure concerns, forward clutch, overdrive one-way clutch	Converter one-way clutch or engine driveability concerns
R Only	High/reverse, high clutch, low and reverse band/servo	—
2 Only	Intermediate band/servo	—
1 Only	Low/reverse band/servo	—

Air Pressure Tests

Item	Part Number	Description
1	—	Reverse servo
2	—	Intermediate servo
3	—	Overdrive servo
4	—	Coast clutch
5	—	Forward clutch
6	—	Direct clutch
7	—	Reverse servo modulator

A no-drive or erratic shift condition may be due to inoperative bands and clutches. To diagnose these conditions a series of checks can be made by substituting air pressure for fluid to determine the location of the damaged or obstructed component.

Follow the procedure to determine the location of the inoperative clutch or band by substituting air pressure into the various test plate passages.

NOTE: Use only dry, regulated 276 kPa (40 psi) maximum air pressure.

1. Remove the main control valve body. Refer to Main Control Valve Body in this section.
2. Install the transmission test plate and gasket. Tighten to 10 Nm (89 lb-in).
3. **NOTE:** Do not apply air to the test plate vent hole.

Apply air to the appropriate clutch or servo port (refer to plate layout diagram). Refer to the Air Pressure Test Diagnostic Chart for conditions, possible causes and actions.

4. After the testing is completed, remove the air test plate and gasket and proceed with any repairs that are needed.
5. After the repairs are completed, install the main control valve body. Refer to Main Control Valve Body in this section.

DIAGNOSIS AND TESTING (Continued)**Air Pressure Test Diagnostic Chart**

Condition	Possible Causes	Actions
Dull thud heard or movement felt when air is applied and released	Clutches, bands and fluid passages are OK.	Concerns may not be in the transmission. Check the Powertrain Control module (PCM), wiring harness and non-transmission related components.
No drive	Clutches and bands inoperative.	Disassemble the transmission, clean and inspect to locate area of concern.
Erratic shifts	Clutches and bands inoperative due to incorrect pressures.	Disassemble the transmission, clean and inspect to locate area of concern.
No dull thud heard	Clutches, bands and fluid passages may be damaged or obstructed.	Disassemble the transmission, clean and inspect to locate area of concern.
No movement felt	Clutches, bands and fluid passages may be damaged or obstructed.	Disassemble the transmission, clean and inspect to locate area of concern.
Hissing sound heard	Clutch seals or check ball may be damaged or leaking.	Disassemble the transmission, clean and inspect to locate area of concern.
Servos do not operate	Seals and pistons may be damaged. Supply and release ports may be obstructed. Spring may be broken.	Disassemble the transmission, clean and inspect to locate area of concern.
Multiple clutches are applied	Fluid passages in the center support or the clutch cylinders may be obstructed.	Disassemble the transmission, clean and inspect to locate area of concern. Check fluid passages in the center support for obstructions.

SPECIFICATIONS

General Specifications

Item	Specification
Fluid	
CAUTION: Use only MERCON® V transmission fluid. Use of any other fluids may result in transmission failure. - Normal maintenance - Fluid change not necessary, filled for life. - Severe duty maintenance - Change the fluid at 48,000 km (30,000 miles) intervals.	
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Fluid Capacity	
NOTE: Approximate dry capacity includes cooler and tubes. Fluid level procedures in this section should be used to determine actual fluid requirements and fluid specification. DO NOT OVERFILL. If it is necessary to add or change fluid, use only fluid which has been certified by the supplier as meeting the Ford Motor Company specification shown.	

General Specifications (Continued)

Item	Specification
All engines	11.2L (11.9 qts)
Fluid Filter	
In-Line Transmission Fluid Filter Kit 7B155	—
In-Line Transmission Fluid Filter 7B155	—
Lubricant	
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B
Automatic Transmission/Power Steering Dye 164-R3701 or equivalent	—

End Play Specifications

Transmission Overdrive End Play Dimension D	Select Thrust Washer (No. 1 Nylon)		ID: Color
	Part Number	Thickness	
38.05-38.13 mm (1.498-1.501 in)	F7TZ-TA	1.55-1.60 mm (0.061-0.063 in)	White
38.14-38.23 mm (1.50-1.51 in)	F7TZ-MA	1.75-1.80 mm (0.069-0.071 in)	Green
38.29-38.42 mm (1.507-1.513 in)	F7TZ-NA	1.85-1.90 mm (0.073-0.075 in)	Red
38.43-38.61 mm (1.51-1.52 in)	F7TZ-RA	2.05-2.10 mm (0.081-0.083 in)	Black
38.62-38.74 mm (1.52-1.53 in)	F7TZ-SA	2.15-2.20 mm (0.095-0.097 in)	Yellow

End Play Specifications

Rear (No. 4) Dimension E	Selective Needle Bearings (No. 4)		ID: Notches
	Part Number	Thickness	
1.67-1.85 mm (0.066-0.073 in)	XW4Z-7D014-CA	2.65-2.80 mm (0.104-0.110 in)	0
1.86-2.04 mm (0.073-0.080 in)	XW4Z-7D014-DA	2.80-2.95 mm (0.110-0.116 in)	1
2.05-2.23 mm (0.081-0.088 in)	XW4Z-7D014-EA	3.00-3.15 mm (0.118-0.124 in)	2
2.25-2.43 mm (0.089-0.096 in)	XW4Z-7D014-FA	3.20-3.35 mm (0.126-0.132 in)	3

SPECIFICATIONS (Continued)**Shift Speeds — 4.0L Engine**

 **CAUTION:** Always obey local traffic laws, do not exceed posted limits.

Throttle Position	Overdrive Position "D"	Axle Ratio
	Shift	Shift Speed
Closed	5-4	37-42 km/h (23-26 mph)
	4-1	16-19 km/h (10-12 mph)
Minimum Monitor PID: TP Volt 1.25	1-2	19-21 km/h (12-13 mph)
	2-3	27-31 km/h (17-19 mph)
	3-4	34-35 km/h (21-22 mph)
	4-5	39-43 km/h (24-27 mph)
Wide Open	1-2	64-68 km/h (40-42 mph)
	2-3	93-101 km/h (58-63 mph)
	3-4	140-145 km/h (87-90 mph)
	4-5	171-174 km/h (106-108 mph)

Shift Speeds — 4.6L Engine

 **CAUTION:** Always obey local traffic laws, do not exceed posted limits.

Throttle Position	Overdrive Position "D"	Axle Ratio
	Shift	Shift Speed
Closed	5-4	39 km/h (24 mph)
	4-1	16 km/h (10 mph)
Minimum Monitor PID: TP Volt 1.25	1-2	18 km/h (11 mph)
	2-3	27 km/h (17 mph)
	3-4	35 km/h (22 mph)
	4-5	39 km/h (24 mph)
Wide Open	1-2	68 km/h (42 mph)
	2-3	106 km/h (66 mph)
	3-4	148 km/h (92 mph)
	4-5	217 km/h (135 mph)

Band Adjustment and Torque Chart

Description	Number of Turns to Back Off	Locknut		Adjusting Screw	
		Nm	Lb-Ft	Nm	Lb-Ft
Intermediate Band	1.5	54	40	14	10
Overdrive Band	1.5	54	40	14	10

SPECIFICATIONS (Continued)**Selective Snap Rings**

Coast and Direct Clutch Drum				
Part Number	Thickness		Diameter	
	mm	Inch	mm	Inch
E860126-S	1.37	0.0539	130.1	5.122
E860127-S	1.73	0.0681	130.1	5.122
E860128-S	2.08	0.0819	130.1	5.122
E860129-S	2.44	0.0961	130.1	5.122

Selective Snap Rings

Forward Clutch Cylinder				
Part Number	Thickness		Diameter	
	mm	Inch	mm	Inch
XW4Z-7D483-AB	1.73	0.0681	141.45	5.56
XW4Z-7D483-AC	2.08	0.0819	141.45	5.56
XW4Z-7D483-AD	2.44	0.0961	141.45	5.56

Service Identification Model Chart

Vehicle Application			
7000 Prefix and Suffix	C=Column F=Floor	Engine Displacement	Vehicle Application
7R3P-BA	F	4.0L	Mustang
6R3P-AC	F	4.6L	Mustang

Solenoid Operation Chart

Gearshift Selector Position	PCM Commanded Gear	5R55S Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
P	P	ON	OFF	OFF	ON	L	H/L	L
N	N	ON	OFF	OFF	ON	L	H/L	L
R	R	ON	OFF	OFF	ON	L/H	L	H
D	1	ON	OFF	OFF	ON	H	H/L	L
	2	ON	OFF	ON	ON	L/H	H	L
	3	ON	ON	OFF	ON	H	L/H	L
	4	OFF	OFF	OFF	ON	H	H/L	H
	5	OFF	OFF	ON	ON	H	H	H
D (D) Cancelled	1	ON	OFF	OFF	ON	H	H/L	L
	2	ON	OFF	ON	ON	L/H	H	L
	3	ON	ON	OFF	ON	H	L/H	L
	4	OFF	OFF	OFF	OFF	L/H	H	H
Manual 3	3	ON	ON	OFF	OFF	H	L	H/L
Manual 2	2	ON	OFF	ON	OFF	H	L	H/L
Manual 1	1	ON	OFF	OFF	OFF	H	L	H/L

SPECIFICATIONS (Continued)

H = HIGH

L = LOW

H/L = PCM controlled

Manual = if equipped

Band/Clutch Application Chart A

	Overdrive Band	Intermed-iate Band	Reverse Band	Forward Clutch	Direct Clutch	Coast Clutch
Reverse			A ^a		A ^a	
1st				A ^a		
2nd	A			A ^a		
3rd		A ^a		A ^a		
4th				A ^a	A ^a	
5th	A ^a			A ^a	A ^a	
1st ^b				A ^a		
2nd ^b	A ^a			A ^a		
3rd ^b		A ^a		A ^a		
4th ^b				A ^a	A ^a	Ac ^c
Manual 3rd		Ac ^c		A ^a		Ac ^c
Manual 2nd	A ^a		Ac ^c	A ^a		
Manual 1st			Ac ^c	A ^a		Ac ^c

a A = Applied

b D Position (overdrive cancelled)

c Ac = Applied to carry coast torque

Band/Clutch Application Chart B

	Direct One-Way Clutch		Low One-Way Clutch		Engine Braking
	Drive	Coast	Drive	Coast	
Reverse	H ^a	NE ^b	NE ^b	NE ^b	NO
1st	H ^a	NE ^b	H ^a	NE ^b	NO
2nd	OR ^c	OR ^c	H ^a	NE ^b	NO
3rd	H ^a	NE ^b	OR ^c	OR ^c	NO
4th	H ^a	NE ^b	OR ^c	OR ^c	NO
5th	OR ^c	OR ^c	OR ^c	OR ^c	YES
1st ^d	H ^a	NE ^b	H ^a	NE ^b	YES
2nd ^d	OR ^c	OR ^c	H ^a	NE ^b	YES
3rd ^d	H ^a	NE ^b	OR ^c	OR ^c	YES
4th ^d	H ^a	NE ^b	OR ^c	OR ^c	YES
Manual 3rd	H ^a	NE ^b	OR ^c	OR ^c	YES
Manual 2nd	OR ^c	OR ^c	H ^a	NE ^b	YES
Manual 1st	H ^a	NE ^b	H ^a	NE ^b	YES

a H = Hold

b NE = No effect

c OR = Overrunning

d D Position (overdrive cancelled)

SPECIFICATIONS (Continued)**Line Pressure Chart — 4.0L and 4.6L Engines**

Range	Idle Pressure		WOT Stall Pressure	
	PC C	Line	PC C	Line
N	0-103 kPa (0-15 psi)	758-1034 kPa (110-150 psi)		
R	758-862 kPa (110-125 psi)	965-1551 kPa (140-225 psi)	758-862 kPa (110-125 psi)	2,000-2,482 kPa (290-360 psi)
(D), 2, 1	0-103 kPa (0-15 psi)	758-1045 kPa (110-150 psi)	0-103 kPa (0-15 psi)	1,448-1,793 kPa (210-260 psi)

Stall Speed Chart

Vehicle	Engine	RPM
Mustang	4.0L	2,290-2,705
Mustang	4.6L	2,556-3,014

Torque Specifications

Description	Nm	lb-ft	lb-in
Case-to-center support screw	11	8	—
Digital transmission range (TR) sensor-to-case screws	8	—	71
Transmission output shaft flange bolts	103	73	—
Extension housing screws and studs	30	22	—
Fluid level indicator plug-to-drain pipe assembly	10	—	89
Fluid pan drain plug	26	19	—
Fluid pump housing screws	22	16	—
Heat shield screws	10	—	89
Locknut for band adjustment	54	40	—
Main control valve body-to-case screws ^a	—	—	—
Manual control valve detent spring-to-case screw	10	—	89
Manual control lever shaft nut	48	35	—
Output shaft-to-flange nut	130	96	—
Band adjustment screw	14	10	—

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Pressure tap plug to case	13	10	—
Pump assembly-to-case screws	25	18	—
Reverse servo assembly-to-case screws (Stage 1) ^a	—	—	—
Reverse servo assembly-to-case screws (Stage 2) ^a	—	—	—
Separator-to-main control screws	7	—	62
Shift cable bracket screws	28	21	—
Solenoid body-to-case screws ^a	—	—	—
Speed sensor-to-case screws	14	10	—
Torque converter adapter plate nuts to converter	44	32	—
Torque converter adapter plate-to-flexplate nut	44	32	—
Transmission cooler tube fitting to case	47	35	—
Transmission cooler tube nut-to-case fitting	40	30	—
Transmission fluid filter-to-case screws	10	—	89
Transmission fluid pan-to-case screws	11	8	—
Transmission crossmember-to-floor pan screws	63	46	—

SPECIFICATIONS (Continued)**Torque Specifications (Continued)**

Description	Nm	lb-ft	lb-in
Transmission insulator-to-extension housing center screw	70	52	—
Vehicle harness-to-solenoid body screw	5	—	44

- a Refer to the procedure in this section
-

SPECIFICATIONS

General Specifications

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

Torque Specifications

Description	Nm	lb-ft	lb-in
Cooler line bracket to engine nut	48	35	—
Fluid cooler tube nut at transmission	40	30	—
Fluid cooler mounting screws	10	—	89

SPECIFICATIONS

Torque Specifications

Description	Nm	lb-ft	lb-in
Selector lever assembly to floor	9	—	80
Selector lever cable bracket bolts	28	20	—
Selector lever knob screw	3	—	27

GENERAL PROCEDURES

Torque Converter Contamination Inspection

 **CAUTION:** Do not use water-based cleaners or mineral spirits to clean or flush the torque converter or transmission damage will occur. Use only clean automatic transmission fluid designated for the transmission and converter being serviced.

 **CAUTION:** The torque converter drain plug and seal are not reusable. If equipped, discard the drain plug and seal, then install a new drain plug assembly.

1. If a new or remanufactured torque converter is not being installed, the following steps must be completed.
 2. With the torque converter on a bench, pour a small amount of transmission fluid from the torque converter onto an absorbent white tissue or through a paper filter and examine the fluid.
 3. Observe the color and odor of the fluid. The fluid should be red, not brown or black. Odor may indicate an overheating condition such as clutch disc or band failure.
 4. Examine the stain on the tissue for evidence of particles (spec of any kind). Examine the fluid level indicator for signs of antifreeze (gum or varnish). If particles are present in the fluid or there is evidence of engine coolant or water, a new torque converter must be installed.
 5. If there are no particles or contamination present, drain the remainder of the transmission fluid from the torque converter.
 6. Add 1.9 liter (2 qt) of clean automatic transmission fluid into the converter and agitate by hand.
 7. Thoroughly drain the fluid.
-

DIAGNOSIS AND TESTING

Torque Converter Diagnosis

Prior to installing a new torque converter, all diagnostic procedures must be followed. This is to prevent the unnecessary installation of good torque converters. Only after a complete diagnostic evaluation can the decision be made to install a new or remanufactured torque converter.

Begin with the normal diagnostic procedures as follows:

1. Preliminary Inspection.
2. Know and Understand the Customer Concern.
3. Verify the Concern — Carry out the Torque Converter Clutch Operation Test; refer to Torque Converter Operation Test in this section.
4. Carry out Diagnostic Procedures.
 - Run on-board diagnostics. See On-Board Diagnostics with scan tool. Refer to Diagnostics in this section.
 - Repair all non-transmission related DTCs first.
 - Repair all transmission DTCs.
 - Rerun on-board diagnostics to verify repair.
 - Carry out the Line Pressure Test. Refer to Special Testing Procedures in this section.
 - Carry out the Stall Speed Test. Refer to Special Testing Procedures in this section.
 - Carry out the Diagnosis by Symptom Index. Refer to Diagnosis By Symptom in this section.
 - Use the index to locate the appropriate routine that best describes the symptom(s). The routine will list all possible components that may cause or contribute to the symptom. Check each component listed, diagnose and service as necessary before servicing the torque converter.

Torque Converter Operation Test

This test verifies that the torque converter clutch control system and the torque converter are operating correctly.

1. Carry out the Quick Test. See On-Board Diagnostics with scan tool. Refer to Diagnostics in this section. Check for DTCs. Refer to the Diagnostic Trouble Code (DTC) Charts in this section.
2. Connect a tachometer to the engine.
3. Bring the engine to normal operating temperature by driving the vehicle at highway speeds for approximately 15 minutes in (D) position.
4. After normal operating temperature is reached, maintain a constant vehicle speed of about 80 km/h (50 mph) and tap the brake pedal with the left foot.
5. The engine rpm should increase when the brake pedal is tapped, and decrease about 5 seconds after the pedal is released. If this does not occur, refer to Torque Converter Operation Concerns in Diagnosis By Symptom.
6. If the vehicle stalls in (D) or manual 2 at idle with vehicle at a stop, move the transmission range selector lever to manual 1 position. If the vehicle stalls, refer to Diagnosis By Symptom, Torque Converter Operation Concerns in this section. Repair as necessary. If the vehicle does not stall in (D), refer to Diagnosis By Symptom in this section.

GENERAL PROCEDURES

Torque Converter

1. A new or remanufactured torque converter must be installed if one or more of the following statements is true:
 - A torque converter malfunction has been determined based on complete diagnostic procedures.
 - Converter stud or studs, impeller hub or bushing are damaged.
 - Discoloration (due to overheating).
 - Evidence of transmission assembly or fluid contamination due to the following transmission or converter failure Modes:
 - Major metallic failure.
 - Multiple clutches or clutch plate failures.
 - Sufficient component wear which results in metallic contamination.
 - Internal torque converter contamination present. For additional information, refer to Torque Converter Contamination Inspection in this section.
-

DESCRIPTION AND OPERATION

Torque Converter

The torque converter transmits and multiplies torque. The torque converter is a 4-element device:

- Impeller assembly
- Turbine and damper assembly
- Reactor assembly
- Clutch

The standard torque converter components operate as follows:

- Rotation of the converter housing and impeller sets the fluid in motion.

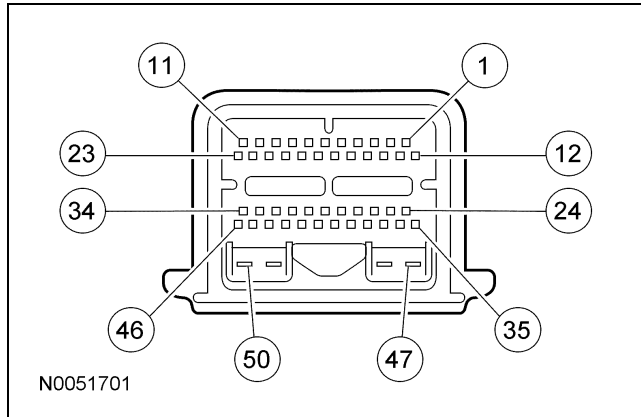
- The turbine reacts to the fluid motion from the impeller, transferring rotation to the geartrain through the input shaft.
 - The reactor redirects fluid going back into the impeller, allowing for torque multiplication.
 - The clutch and damper assembly dampens powertrain torsional vibration and provides a direct mechanical connection for improved efficiency.
 - Power is transmitted from the torque converter to the planetary gearsets and other components through the input shaft.
-

DIAGNOSIS AND TESTING

Transmission Connector Layouts

Connector Reference and Terminal Readings

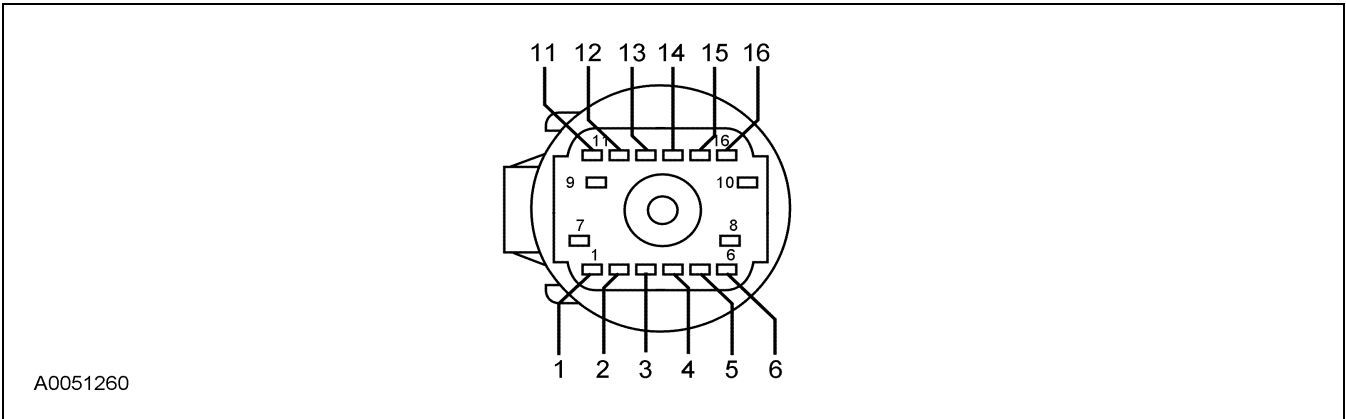
Powertrain Control module (PCM)



Pin Number	Circuit Description
3	Output shaft speed (OSS) sensor signal input
4	Intermediate shaft speed sensor signal input
11	Pressure control solenoid A (PC A)
15	Turbine shaft speed (TSS) sensor signal input
16	Digital transmission range sensor TR1 to PCM
17	Digital transmission range sensor TR2 to PCM
23	Pressure control solenoid B (PC B)
27	Digital transmission range sensor TR3A to PCM
28	Digital transmission range sensor TR4 to PCM
29	Transmission fluid temperature (TFT) sensor
34	Pressure control solenoid C (PC C)
41	Signal return
42	Shift solenoid A (SSA)
43	Shift solenoid B (SSB)
44	Shift solenoid C (SSC)
45	Shift solenoid D (SSD)
46	Torque converter clutch (TCC) solenoid

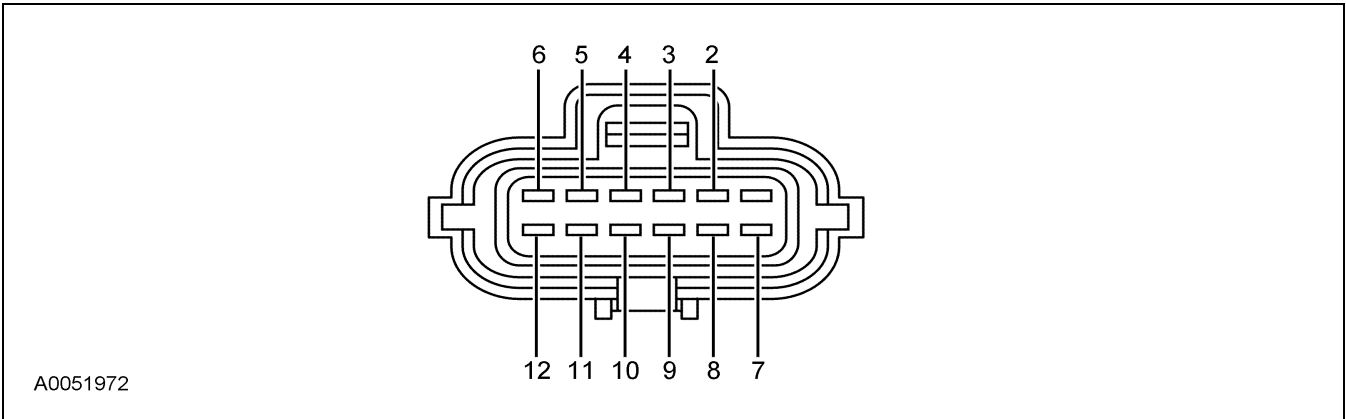
DIAGNOSIS AND TESTING (Continued)

Transmission Vehicle Harness



Pin Number	Circuit Description
1	Pressure control solenoid B (PC B)
2	Transmission fluid temperature (TFT) sensor input
3	Solenoid power
4	Pressure control solenoid C (PC C)
5	Shift solenoid D (SSD)
6	Shift solenoid C (SSC)
11	Pressure control solenoid A (PC A)
12	Signal return
14	Torque converter clutch (TCC) solenoid
15	Shift solenoid B (SSB)
16	Shift solenoid A (SSA)

Digital Transmission Range (TR) Sensor

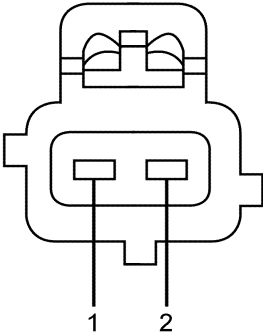


Pin Number	Circuit Description
2	Signal return
3	Digital transmission range (TR) sensor TR3A
4	Digital transmission range (TR) sensor TR1
5	Digital transmission range (TR) sensor TR2
6	Digital transmission range (TR) sensor TR4

DIAGNOSIS AND TESTING (Continued)

Pin Number	Circuit Description
7	Ground
8	Neutral switch sense input
9	Fused power feed
10	Starter solenoid central power
11	Reverse lamps
12	Starter relay (overload protected)

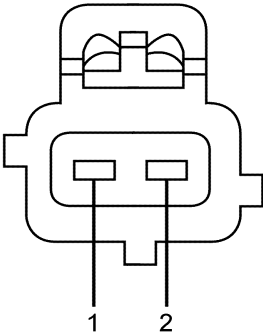
Turbine Shaft Speed (TSS) Sensor



A0051261

Pin Number	Circuit Description
1	Turbine shaft speed (TSS) sensor signal
2	Signal return

Output Shaft Speed (OSS) Sensor

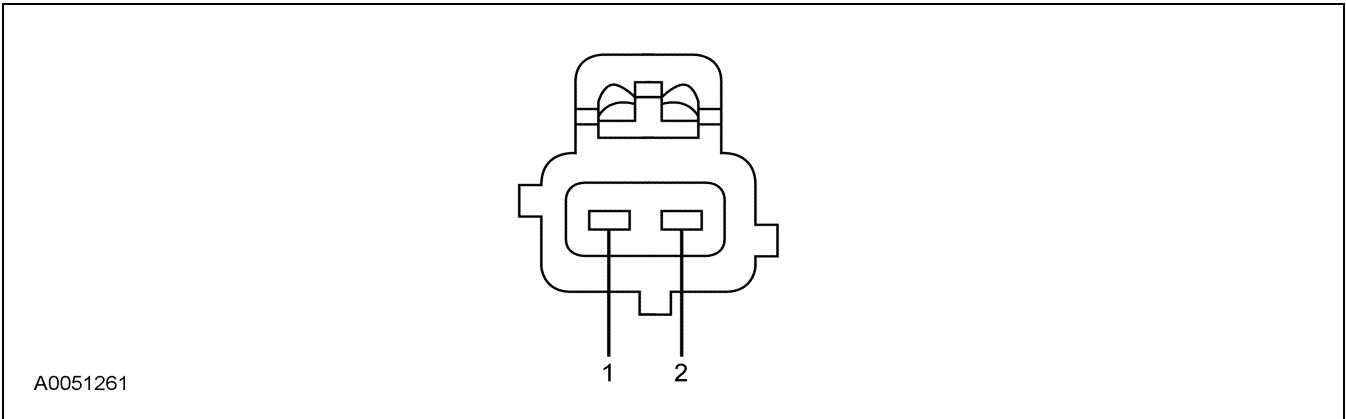


A0051261

Pin Number	Circuit Description
1	Output shaft speed (OSS) sensor signal
2	Signal return

DIAGNOSIS AND TESTING (Continued)

Intermediate Shaft Speed Sensor Harness Connector



Pin Number	Circuit Description
1	Intermediate shaft speed sensor signal
2	Signal return

Digital Transmission Range (TR) Sensor Diagnosis Chart

Selector Position	Shift Lever Indicator	PID: TR_D				PID: TR_V (volts)
		TR4	TR3A	TR2	TR1	TR3A (PCM pin 27 to signal return)
Park	P	0	0	0	0	0.0 volts
Reverse	R	1	1	0	0	1.3 - 1.8 volts
Neutral	N	0	1	1	0	1.3 - 1.8 volts
Overdrive	D	1	1	1	1	1.3 - 1.8 volts
Manual 3	3	1	0	1	0	0.0 volts

DIAGNOSIS AND TESTING (Continued)**Digital Transmission Range (TR) Sensor Diagnosis Chart (Continued)**

Selector Position	Shift Lever Indicator	PID: TR__D				PID: TR__V (volts)
		TR4	TR3A	TR2	TR1	TR3A (PCM pin 27 to signal return)
Manual 2	2	1	0	0	1	0.0 volts
Manual 1	Man 1	0	0	1	1	0.0 volts

- A. TR__V is the voltage at the PCM pin 27 (TR3A Circuit) to signal return.
- B. TR__D: 1= Open digital TR switch, 0= Closed digital TR switch.
- C. EEC-V Control System Breakout Box Readings: Taken from PCM signal pins for TR1, TR2, TR3A and TR4 to signal return.

•Voltages for TR1, TR2 and TR4:

- 0 = 0.0 volts.
- 1 = 9.0-14.0 volts.

•Voltage for TR3A:

- 0 = 0.0 volts.
- 1 = 1.3-1.8 volts.

Wiggle Test Information for Open/Shorts

- A. TR4, TR3A, TR2 and TR1 are all closed in PARK. PARK is a good position to check for intermittent open circuits (with scan tool monitoring TR__D).
- B. TR4, TR3A, TR2 and TR1 are all open in OVERDRIVE, so OVERDRIVE is a good position to check for shorts to ground. To determine the shorted components while observing TR__D, unplug the TR and see if the short goes away. If the short is still present, unplug the transmission harness and see if the short goes away. If the short is still present, then the short is in the PCM or vehicle harness. Remove the suspect circuit(s) wire terminal from the PCM connector. If the short is still present, then the PCM has an internal failure; otherwise the failure is in the vehicle harness.

REMOVAL AND INSTALLATION

Transmission Control (TC) Switch

Removal and Installation

NOTE: The transmission control (TC) switch is not serviced separately. If a new TC switch is required, install a new transmission selector knob assembly. For additional information, refer to Selector Lever Knob in this section.

DESCRIPTION AND OPERATION

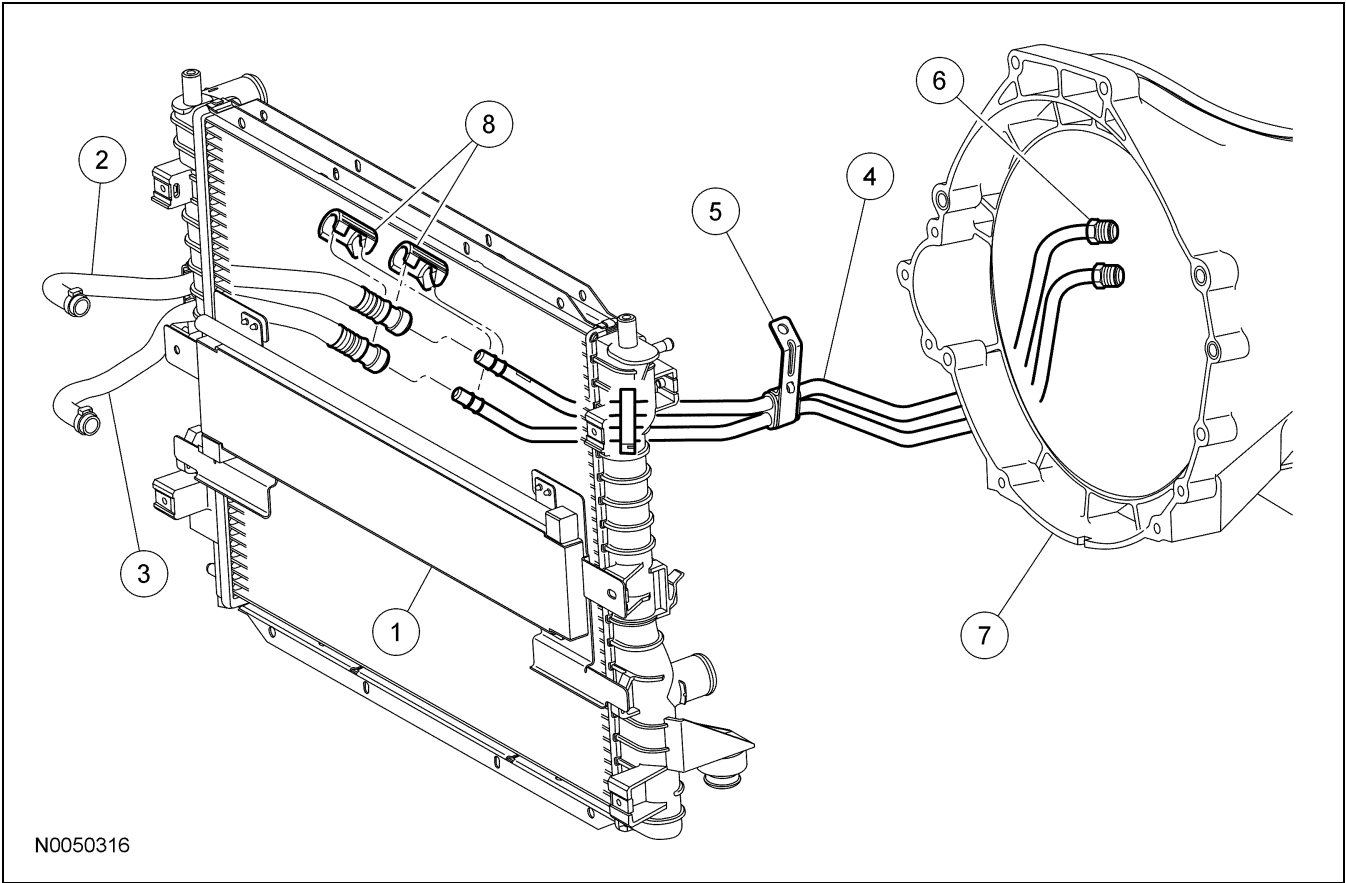
Transmission Cooling

This vehicle with an automatic transmission is equipped with an auxiliary transmission fluid cooler. The cooler transfers heat from the transmission fluid to the ambient air.

For transmission fluid cooler flow test, refer to Section 307-01.

For transmission fluid cooler backflushing and cleaning, refer to Section 307-01.

Transmission Fluid Cooler Tubes (4.6L engine)



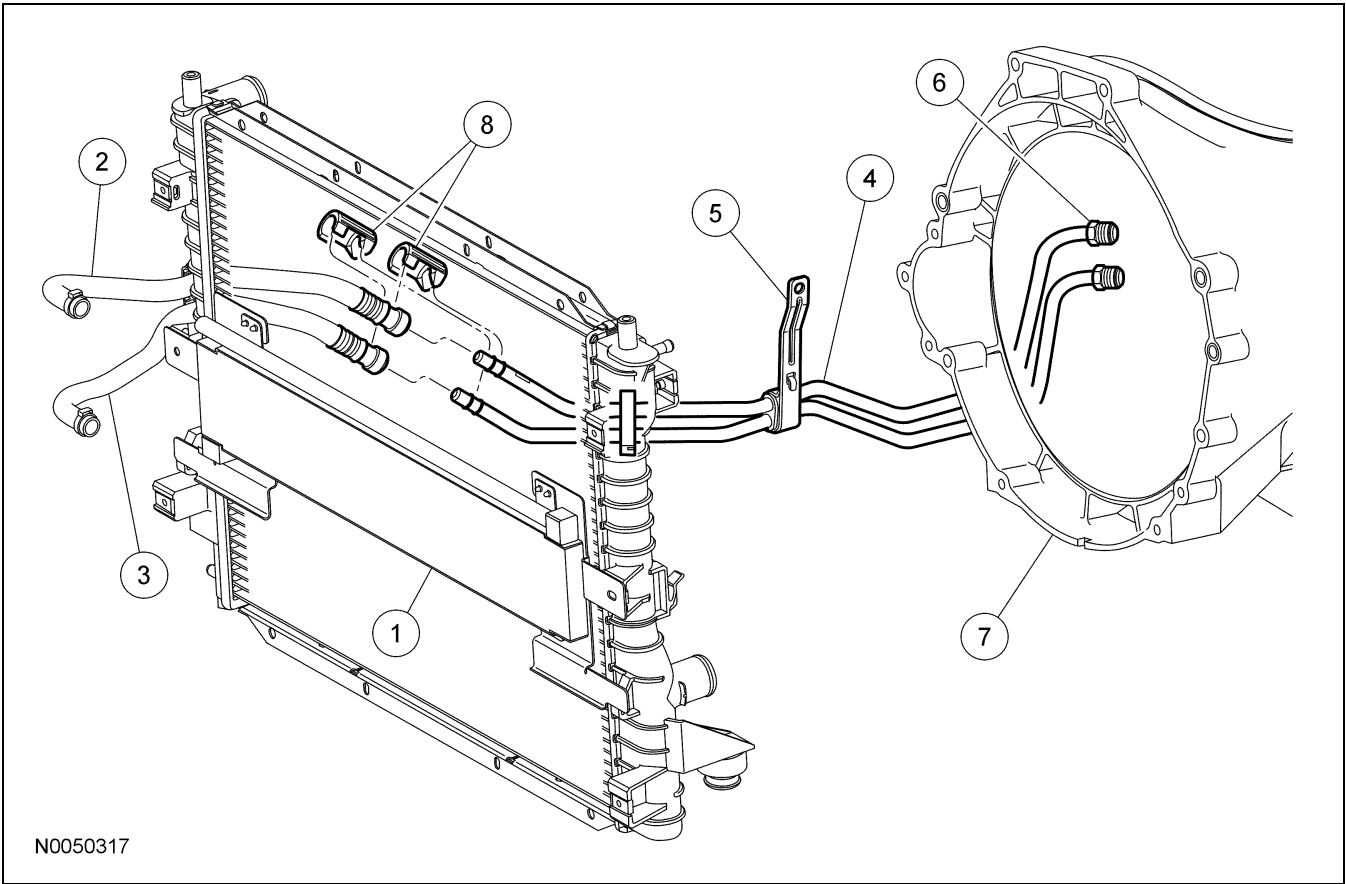
Item	Part Number	Description
1	7A095	Auxiliary oil cooler
2	7W064	Fluid cooler outlet hose
3	7W063	Fluid cooler inlet hose
4	7H420	Fluid cooler tube assembly
5	—	Fluid cooler tube assembly bracket (part of 7H420)

(Continued)

Item	Part Number	Description
6	—	Fluid cooler tube assembly nuts (part of 7H420)
7	7005	Transmission case
8	7J081	Transmission fluid cooler tube quick connect secondary latch

DESCRIPTION AND OPERATION (Continued)

Transmission Fluid Cooler Tubes (4.0L engine)



Item	Part Number	Description
1	7A095	Auxiliary oil cooler
2	7W064	Fluid cooler outlet hose
3	7W063	Fluid cooler inlet hose
4	7H420	Fluid cooler tube assembly
5	—	Fluid cooler tube assembly bracket (part of 7H420)

Item	Part Number	Description
6	—	Fluid cooler tube assembly nuts (part of 7H420)
7	7005	Transmission case
8	7J081	Transmission fluid cooler tube quick connect secondary latch

(Continued)

DIAGNOSIS AND TESTING

Transmission Cooling

 **CAUTION:** Whenever a transmission has been disassembled to install new parts, a new transmission fluid cooler must be installed and the transmission fluid cooler tubes must be cleaned and backflushed.

NOTE: Cleaning and backflushing the transmission fluid cooling system, along with normal cleaning and inspection procedures as outlined in this section during disassembly and reassembly, will keep contamination from re-entering the transmission and causing a repeat repair.

When internal wear or damage has occurred in the transmission, metal particles, clutch plate material or band material may have been carried into the torque converter and transmission fluid cooler. These contaminants are a major cause of recurring transmission troubles and must be removed from the system before the transmission is put back in use.

Inspection and Verification

When fluid leakage is found in the fluid cooler, install a new fluid cooler.

When there is evidence of transmission assembly or fluid contamination due to the following transmission failure modes, install a new fluid cooler.

- Major metallic failure
- Multiple clutches or clutch plate failure
- Sufficient component wear which result in metallic contamination

DIAGNOSIS AND TESTING (Continued)**Symptom Chart****SYMPTOM CHART**

Condition	Possible Sources	Action
Transmission overheating	- System leaks - Incorrect fluid level - Fluid condition - Damaged, blocked, reversed, leaking or restricted cooler lines or cooler tubes - Engine concerns causing transmission to overheat - Excessive towing loads - Incorrect idle or performance	- INSPECT for leaks. REPAIR as necessary. - ADJUST to proper level. - INSPECT according to instructions under Fluid Condition Check. REFER to Section 307-01. - INSPECT cooler lines and tubes. REPAIR or flush as necessary. - INSPECT engine cooling system. For additional information, REFER to Section 303-03A. - CHECK gross vehicle weight. - REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

DESCRIPTION AND OPERATION

Transmission Description

This transmission has:

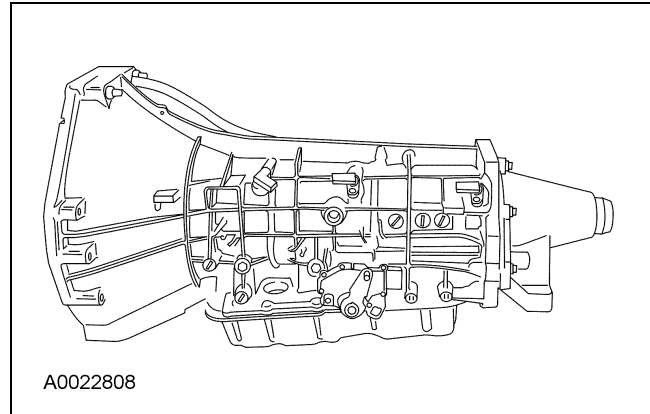
- five forward speeds.
- electronic shift, pressure and torque converter clutch controls.
- three compound planetary gearsets.
- three bands.
- three multi-plate clutches.
- two one-way clutches.

All hydraulic functions are directed by electronic solenoids. The solenoids control:

- static engagement feel.
- shift feel.
- shift scheduling.

- modulated torque converter clutch (TCC) applications.
- engine braking utilizing the coast clutch and band.
- manual first and second timing.
- reverse inhibit timing.

Transmission View



DIAGNOSIS AND TESTING

Transmission Drive Cycle Test

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

NOTE: The Transmission Drive Cycle Test must be followed exactly. Transmission failure must occur four times consecutively for shift error DTC code to be set, and 5 times consecutively for continuous torque converter clutch code to set.

NOTE: When carrying out the Transmission Drive Cycle Test, use the Solenoid Operation Chart for proper solenoid operation. Refer to Pinpoint Tests — OSC Equipped Vehicle in this section.

After carrying out the Quick Test, use the Transmission Drive Cycle Test for checking continuous codes.

1. Record and then erase Quick Test codes.
2. Warm engine to normal operating temperature.
3. Make sure transmission fluid level is correct.
4. With transmission in (D) position, Moderately accelerate from stop to 80 km/h (50 mph). This allows the transmission to shift into 5th gear. Hold speed and throttle open steady for a minimum of 15 seconds.
5. With transmission in 5th gear and maintaining steady speed and throttle opening, lightly apply and release brake to operate stop lamps. Then hold speed and throttle steady for a minimum of 5 seconds.
6. Brake to a stop and remain stopped for a minimum of 20 seconds.
7. Repeat steps 4 through 6 at least 5 times.
8. Carry out the Quick Test and record continuous DTCs.

After On-Board Diagnostics

NOTE: The vehicle wiring harness, powertrain control module (PCM) and non-transmission sensors may affect transmission operations. Repair these concerns first.

After the on-board diagnostic procedures are completed, repair all DTCs.

Begin with non-transmission related DTCs, then repair any transmission related DTCs. Refer to the Diagnostic Trouble Code (DTC) Charts in this section for information on condition and symptoms. This chart will be helpful in referring to the correct manual(s) and aids in diagnosing internal transmission concerns and external non-transmission inputs. The pinpoint tests are used in diagnosing transmission electrical concerns. Make sure that the vehicle wiring harness and the PCM are diagnosed as well. The [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#) will aid in diagnosing non-transmission electronic components.

Before Pinpoint Tests

NOTE: Prior to entering pinpoint tests, check the PCM wiring harness for correct connections, bent or broken pins, corrosion, loose wires, correct routing, correct seals and their condition. Check the PCM, sensors and actuators for damage. Refer to the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#).

NOTE: If a concern still exists after electrical diagnosis, refer to Diagnosis By Symptom in this section.

If DTCs appear while carrying out the on-board diagnostics, refer to the Diagnostic Trouble Code (DTC) Charts in this section for the appropriate repair procedure. Prior to entering pinpoint tests, refer to any TSBs and OASIS messages for transmission concerns.

DESCRIPTION AND OPERATION

Transmission Electronic Control System

Electronic System Description

The powertrain control module (PCM) and its input/output network control the following transmission operations:

- Shift timing
- Line pressure (shift feel)
- Torque converter clutch

The transmission control strategy combined with the engine control provides optimum powertrain operation under all conditions. When determining the best operating strategy for transmission operation, the PCM uses input information from certain engine-related and driver-demand-related sensors and switches.

In addition, the PCM receives input signals from certain transmission-related sensors and switches. The PCM also uses these signals when determining transmission operating strategy.

Using all of these input signals, the PCM can determine when the time and conditions are right for a shift, or when to apply or release the torque converter clutch. It will also determine the pressure needed to optimize shift feel. To accomplish this, the PCM uses 3 pressure controls, 1 torque converter clutch and 4 shift solenoids to control transmission operation.

The following provides a brief description of each of the sensors and actuators used to control transmission operation.

Powertrain Control Module (PCM)

The operation of the transmission is controlled by the powertrain control module (PCM). Many input sensors provide information to the powertrain control module. The powertrain control module then controls the actuators which determine transmission operation.

Air Conditioning (A/C) Clutch

An electromagnetic clutch is energized when the clutch cycling pressure switch closes. The switch is located on the suction accumulator/drier. The closing of the switch completes the circuit to the clutch and draws it into engagement with the compressor driveshaft. When the A/C is engaged, operating pressures are adjusted to compensate for additional load on the engine.

Brake Pedal Position (BPP) Switch

The brake pedal position (BPP) switch tells the PCM when the brakes are applied. The torque converter clutch disengages when the brakes are applied. The BPP switch closes when the brakes are applied and opens when they are released. The BPP is also used to disengage the brake shift interlock.

Engine Coolant Temperature (ECT) Sensor

The engine coolant temperature (ECT) sensor detects engine coolant temperature and supplies the information to the PCM. The ECT sensor is used to control torque converter clutch (TCC) operation.

Electronic Ignition (EI) System

The electronic ignition (EI) consists of a crankshaft position sensor, a pair of 4-tower ignition coils and the PCM. The ignition control module operates by sending crankshaft position information from the crankshaft position sensor to the ignition control module. The ignition control module generates a profile ignition pickup (PIP) signal (engine rpm) and sends it to the PCM. The PCM uses PIP signal in the transmission strategy, wide-open throttle (WOT) shift control, TCC control and operating pressures.

Intake Air Temperature (IAT) Sensor

The intake air temperature (IAT) sensor provides the sequential fuel injection (SFI) system mixture temperature information. The IAT sensor is used both as a density corrector for air flow calculation and to proportion cold enrichment fuel flow. The IAT sensor is installed in the air cleaner outlet tube. The IAT sensor is also used in determining control pressures.

DESCRIPTION AND OPERATION (Continued)**Mass Air Flow (MAF) Sensor**

The mass air flow (MAF) sensor measures the mass of air flowing into the engine. The MAF sensor output signal is used by the PCM to calculate injector pulse width. For transmission strategies, the MAF sensor is used to regulate electronic pressure control, shift and torque converter clutch scheduling.

Transmission Control (TC) Switch

The transmission control (TC) switch is a momentary contact switch that allows the driver to cancel operation of 5th (D) gear.

The TC switch is located on the end of the selector lever.

When the driver initially presses the TC switch, a signal is sent to the PCM.

The PCM uses the shift solenoids to disengage/disable 5th gear operation and activate the coast clutch.

At the same time, the PCM illuminates the transmission control indicator lamp (TCIL) to notify the driver that 5th gear is canceled.

When the TC switch is pressed again, 5th (D) gear operation is enabled, the coast clutch is released and the TCIL is turned OFF.

Whenever the ignition is cycled (vehicle shut OFF, then started again), the TC switch is turned OFF and 5th gear will be enabled, even if the TCS had been on when the ignition was shut off.

Transmission Control Indicator Lamp (TCIL)

The transmission control indicator lamp (TCIL) is located in the instrument panel and is labeled Overdrive OFF. It is illuminated in conjunction with the TC switch.

The TCIL will flash if a fault has been detected in a monitored sensor or solenoid used for transmission operation.

Throttle Position (TP) Sensor

The throttle position (TP) sensor is a potentiometer mounted on the throttle body. The TP sensor detects the position of the throttle plate and sends this information to the powertrain control module. The TP sensor is used for shift scheduling, electronic pressure control and TCC control.

Digital Transmission Range (TR) Sensor

The digital transmission range (TR) sensor is located on the outside of the transmission at the manual lever. The digital TR sensor completes the start circuit in PARK, NEUTRAL and the back-up lamp circuit in REVERSE. The digital TR sensor also opens and closes a set of 4 switches that are monitored by the powertrain control module to determine the position of the manual lever (P, R, N, D, 3, 2, 1).

Turbine Shaft Speed (TSS) Sensor

The turbine shaft speed (TSS) sensor is a magnetic pickup that sends the PCM the torque converter turbine speed information.

The TSS sensor is mounted externally on the case.

The PCM uses TSS information to help determine appropriate operating pressures and TCC operation.

Output Shaft Speed (OSS) Sensor

The output shaft speed (OSS) sensor is a magnetic pickup, located at the park gear, that sends a signal to the powertrain control module to indicate transmission output shaft speed. The OSS sensor is mounted externally on the case. The OSS is used for torque converter clutch control, speed scheduling and to determine electronic pressure control.

Intermediate Shaft Speed Sensor

The intermediate shaft speed sensor is a magnetic pickup that sends planetary sun gear speed information to the PCM. The sensor is mounted externally on the center of the case.

The PCM uses the sensor information to aid in determining pressure requirements.

Pressure Control Solenoids (PCA, PCB, PCC)

The pressure control (PC) solenoids are a variable-force style (VFS) solenoid. The VFS-type solenoid is an electrohydraulic actuator combining a solenoid and a regulating valve.

The line pressure tap is used to verify output pressure from PC A or PC B by turning either one off while verifying the output from the other solenoid. The second pressure tap is used to verify the output from the PC C solenoid.

DESCRIPTION AND OPERATION (Continued)

There are 3 PC solenoids located in the solenoid body assembly used to control line pressure, band and clutch application pressure within the transmission.

The PCM varies the current to the PC solenoid.

The PCM has an adaptive learn strategy to electronically control the transmission which will automatically adjust the shift feel. When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The PCM must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Torque Converter Clutch (TCC) Solenoid

The torque converter clutch (TCC) solenoid is a pulse width modulating-type solenoid that is used to control the apply and release of the TCC.

Shift Solenoids — (SSA, SSB, SSC, SSD)

Four ON/OFF shift solenoids allow the powertrain control module to control shift scheduling.

- The solenoids are 3-way, normally open style.
- The shift solenoids SSA, SSB, SSC and SSD provide gear selection of 1st through 5th and reverse gears by directing PC pressures to the appropriate elements.

Coast braking and manual gears are also controlled by the shift solenoids.

Transmission Fluid Temperature (TFT) Sensor

- The transmission fluid temperature (TFT) sensor is a thermistor-type sensor that varies a reference voltage signal. The resistance in the TFT varies with temperature. The PCM monitors the voltage signal across the TFT, and uses this information to determine the transmission fluid temperature.
- The TFT is located on the solenoid body.
- The PCM uses the TFT signal to help determine shift scheduling, torque converter clutch operation and pressure control requirements.

It sends a voltage signal to the PCM. The voltage signal varies with transmission fluid temperature. The PCM uses this signal to determine whether a cold start shift schedule is necessary. The shift schedule is compensated when the transmission fluid temperature is cold. The PCM also inhibits torque converter clutch operation at low transmission fluid temperatures and determines PC solenoid operations.

Accelerator Pedal Position (APP) Sensor

The accelerator pedal position (APP) sensor is mounted on the accelerator pedal. The APP detects the position of the accelerator pedal and inputs this information as a voltage to the PCM. The PCM uses the APP sensor information to aid in determining shift scheduling, electronic pressure control (EPC) and torque converter control.

IN-VEHICLE REPAIR

Transmission Filter — In Line

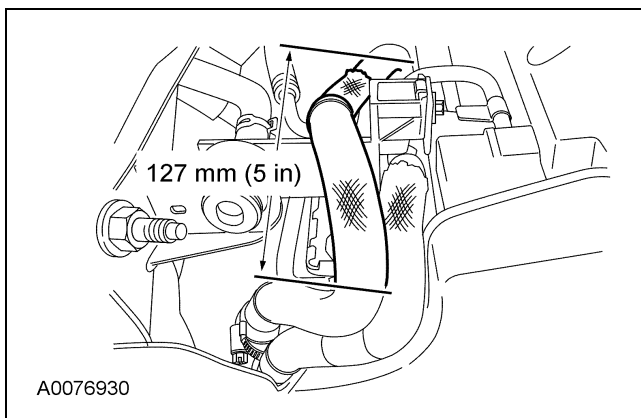
Material

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

NOTE: Use the following guidelines for installing the transmission fluid in-line filter:

- If the transmission was overhauled and the vehicle was equipped with an in-line fluid filter, install a new in-line fluid filter.
- If the transmission was overhauled and the vehicle was not equipped with an in-line fluid filter, install a new in-line fluid filter kit.
- If the transmission is being installed for a non-internal repair, do not install an in-line filter or filter kit.
- If installing a new or a Ford-authorized remanufactured transmission, install the in-line transmission fluid filter that is supplied.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Cut a section of the upper transmission fluid cooler hose to allow installation of the transmission fluid in-line filter.

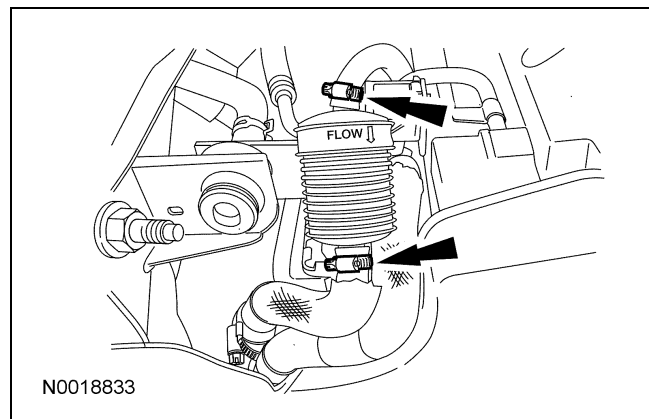


3. **CAUTION:** The filter has a bypass valve in it. The red arrow on the filter indicates the direction of the fluid flow through the filter. The filter must be installed in the fluid cooler return line with the red arrow on the filter pointing away from the transmission fluid cooler and toward the transmission (the return line has fluid coming out of the cooler going to the transmission). If the fluid filter is not installed correctly, it will cause internal transmission damage.

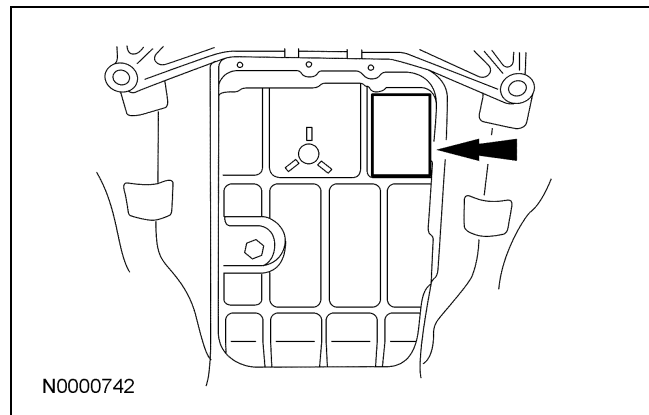
CAUTION: Do not install any rubber hoses or steel tubing with a bend entering the filter greater than 60 degrees.

Install the one end of the filter into the rubber hose with a clamp, then install the other end of the filter into the rubber hose.

- Install and tighten the 2 hose clamps.



4. Clean a visible section of the transmission fluid pan and install the sticker indicating that the vehicle is equipped with an in-line filter.



IN-VEHICLE REPAIR (Continued)

5. Fill the transmission with clean automatic transmission fluid.
 - Verify for correct operation.
 - Check the filter for leaks.
-

GENERAL PROCEDURES

Transmission Fluid Cooler — Backflushing and Cleaning

1. Refer to Section 307-01.
-

GENERAL PROCEDURES

Transmission Fluid Cooler — Backflushing and Cleaning

Material

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

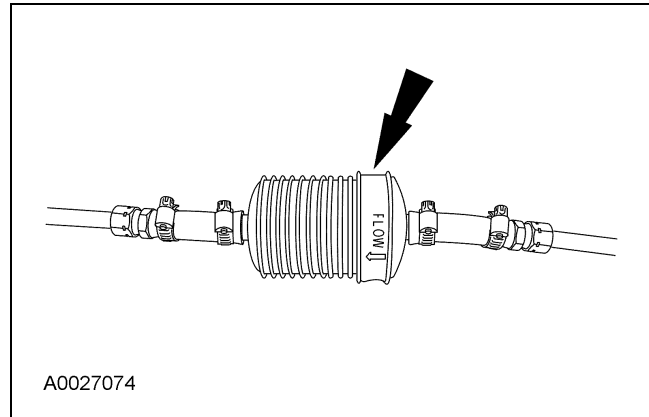
⚠ CAUTION: Whenever a transmission has been disassembled to install new parts or a new or remanufactured transmission has been installed, a new transmission fluid cooler, either in-tank, auxiliary or oil to air (OTA), if equipped will need to be installed. Using a suitable torque converter/fluid cooler cleaner, clean and backflush the transmission fluid cooler tubes.

⚠ CAUTION: Use only clean automatic transmission fluid specified for this transmission. Do not use supplemental fluid additives, treatments or cleaning agent. The use of these materials may affect transmission operation and result in internal damage to the transmission.

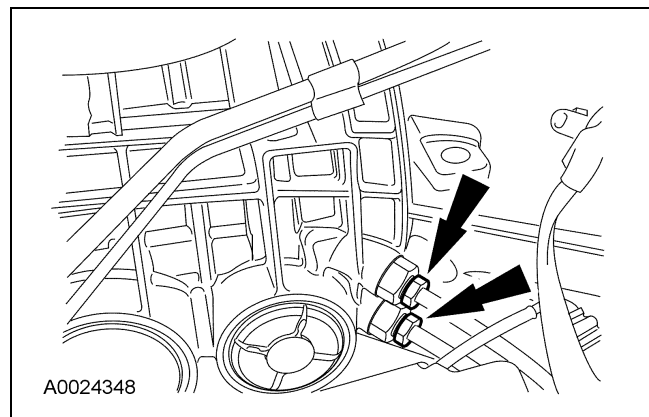
When internal wear or damage has occurred in the transmission, metal particles, clutch plate material or band material may have been carried into the transmission fluid cooler. These contaminants are a major cause of recurring transmission concerns and must be removed from the system before the transmission is put back in use.

NOTE: Do not use any solvents while carrying out this procedure. Only use clean automatic transmission fluid.

1. Conduct backflushing with a suitable torque converter/transmission fluid cooler cleaner. Test the equipment to make sure that a vigorous fluid flow is present before proceeding. Install a new system filter if flow is weak or contaminated.
2. Remove and discard the in-line transmission fluid filter, if equipped.



3. To aid in attaching the cleaner to the transmission steel cooler lines, connect 2 additional rubber hoses to the transmission end of the steel transmission cooler lines as described.
 - Connect the cleaner tank pressure line to the steel transmission cooler return line (transmission case upper fitting).
 - Connect a tank return hose to the steel transmission cooler pressure line (transmission case lower fitting). Place the outlet end of this hose in the solvent tank reservoir.



4. Turn on the pump and allow the transmission fluid to circulate a minimum of 5 minutes (cycling switch on and off will help dislodge contaminants in the cooler system).
5. Switch off the pump and disconnect the pressure hose from the transmission cooler return line.

GENERAL PROCEDURES (Continued)

6. Use compressed air to blow out the cooler(s) and lines (blow air into the transmission cooler return line) until all the fluid is removed.
 7. Remove the rubber return hose from the remaining steel cooler line.
-

GENERAL PROCEDURES

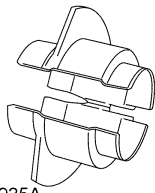
Transmission Fluid Cooler Flow Test

1. Refer to Section 307-01.
-

REMOVAL AND INSTALLATION

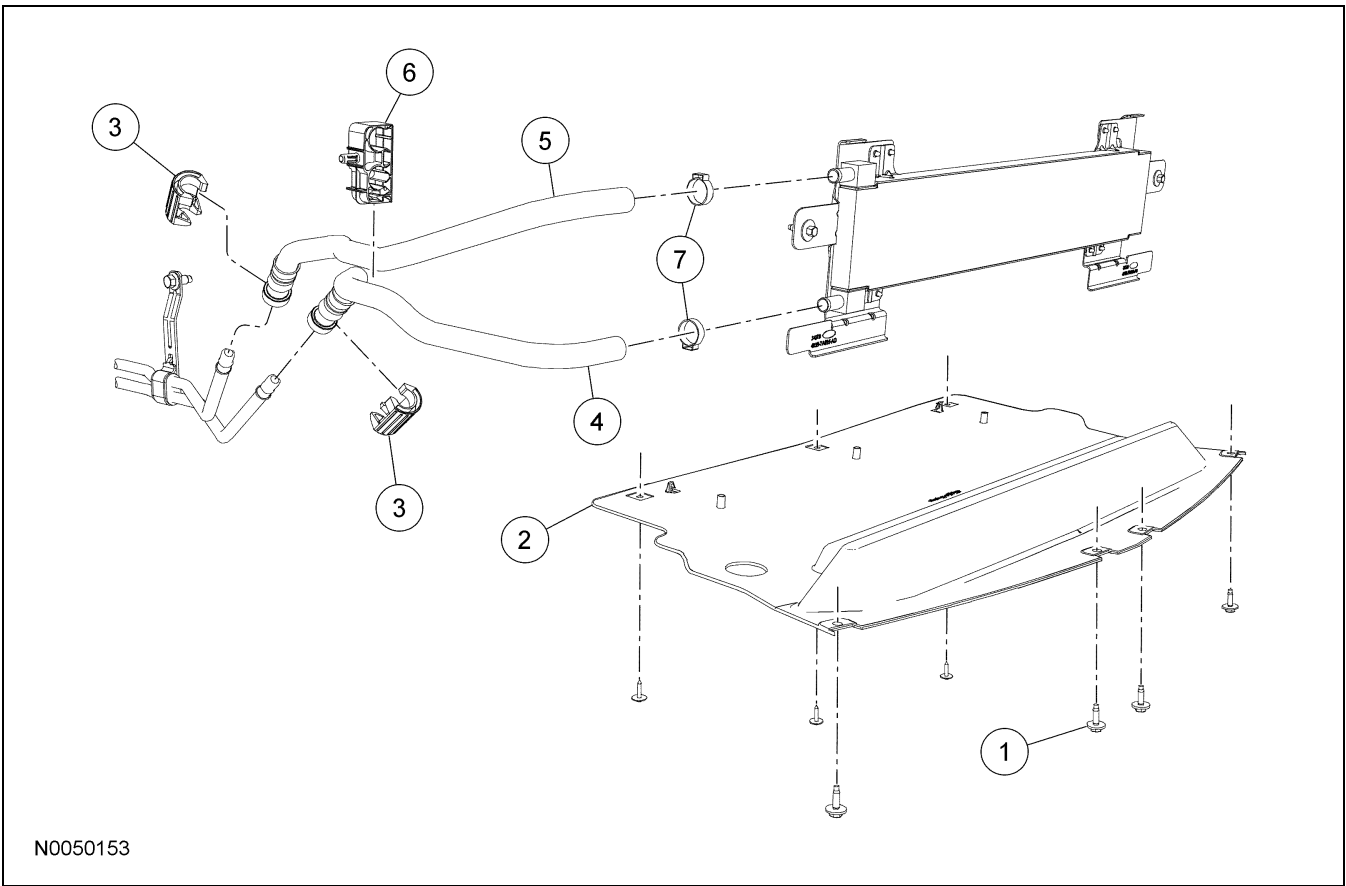
Transmission Fluid Cooler Hoses

Special Tool(s)

 ST2935A	Disconnect Tool, Transmission Cooler Line 307-569
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Material

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



Item	Part Number	Description
1	—	Lower air deflector screws (7 required)
2	—	Lower air deflector

(Continued)

Item	Part Number	Description
3	7J081	Transmission fluid cooler tube quick connect secondary latches

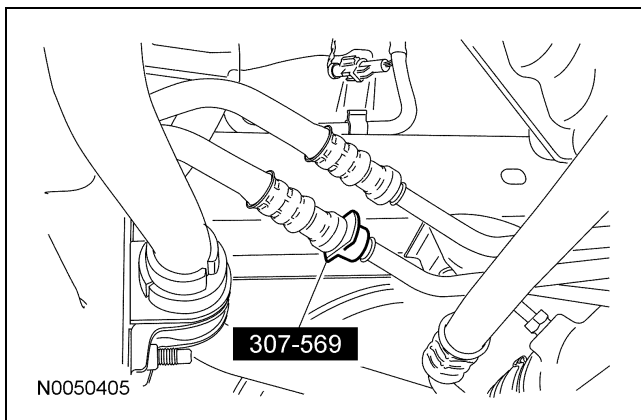
(Continued)

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
4	7W063	Transmission fluid cooler inlet hose
5	7W064	Transmission fluid cooler outlet hose
6	—	Transmission fluid cooler hose retainer
7	376240	Transmission fluid cooler hose-to-cooler clamps

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the lower air deflector.
3. Remove the transmission fluid cooler tube quick connect secondary latches.
4. Using the special tool, disconnect the transmission fluid cooler hoses from the tubes.



5. Remove and discard the transmission fluid cooler hose-to-cooler clamps.
6. Disconnect the transmission fluid cooler hoses from the cooler.
7. Remove the transmission fluid cooler hoses from the retainer.

Installation

1. Install the transmission fluid cooler hoses into the retainer.
2. Connect the transmission fluid cooler hoses to the cooler.
3. Install 2 new transmission fluid cooler hose-to-cooler clamps.
4. **NOTE:** When connecting the cooler hoses to the cooler lines the white mark on the cooler tube must be aligned with the H mark on the hose.

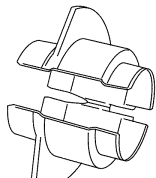
Connect the transmission fluid cooler hoses to the cooler tubes.

5. Install the transmission fluid cooler tube quick connect secondary latches.
6. Fill the transmission with clean automatic transmission fluid and verify correct operation.
7. Install the lower air deflector.

REMOVAL AND INSTALLATION

Transmission Fluid Cooler Tubes

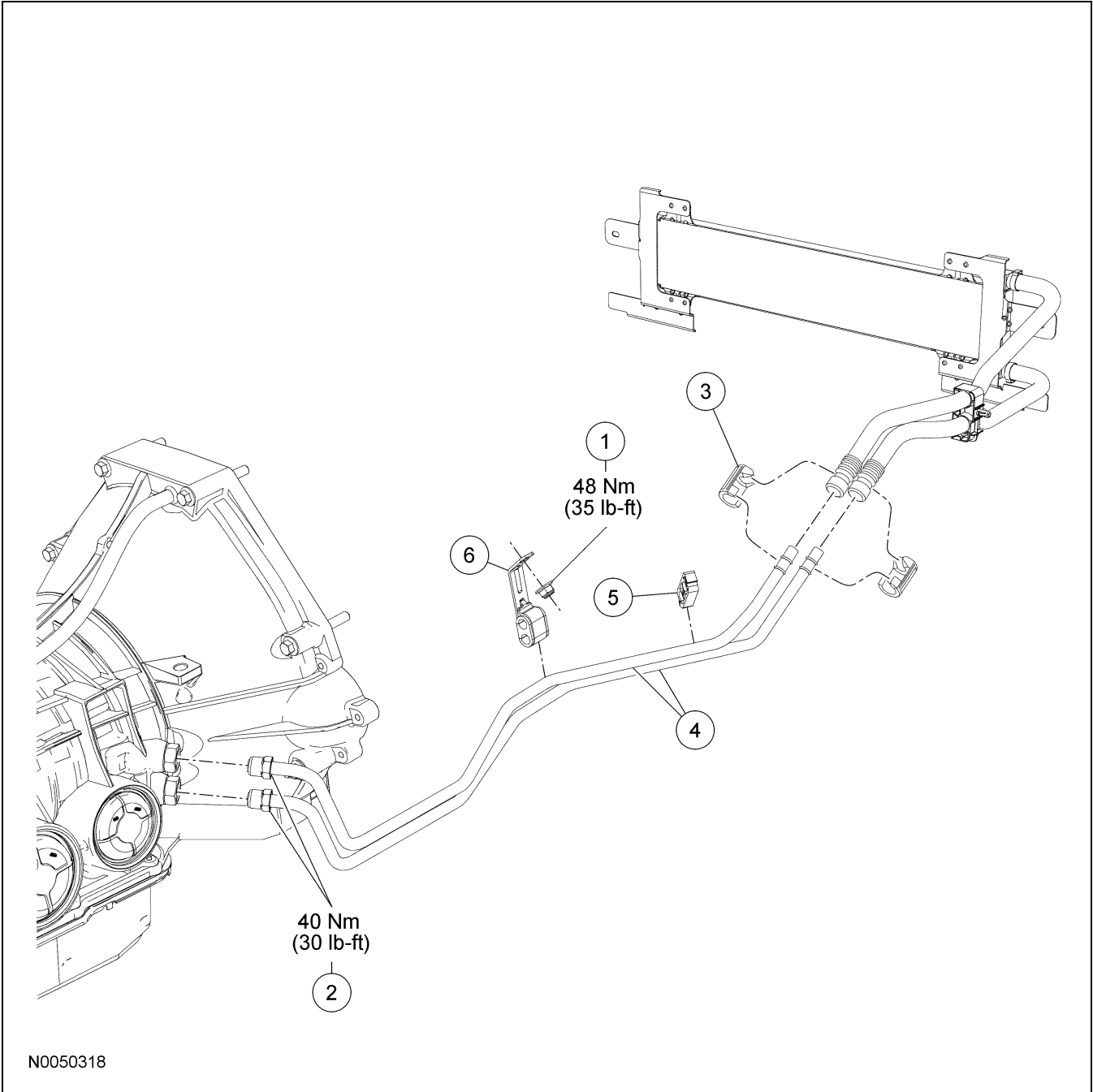
Special Tool(s)

 ST2935A	Disconnect Tool, Transmission Cooler Line 307-569
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Material

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

REMOVAL AND INSTALLATION (Continued)



Item	Part Number	Description
1	—	Transmission fluid cooler tube bracket nut
2	—	Transmission fluid cooler tube nuts (part of 7H420)
3	7J081	Transmission fluid cooler tube quick connect secondary latch
4	7H420	Transmission fluid cooler tubes
5	—	Transmission fluid cooler tube retainer (part of 7H420)

(Continued)

Item	Part Number	Description
6	—	Transmission fluid cooler tube bracket (part of 7H420)

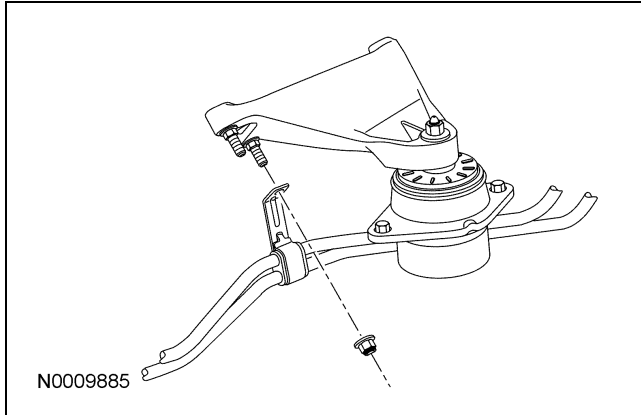
Removal

All vehicles

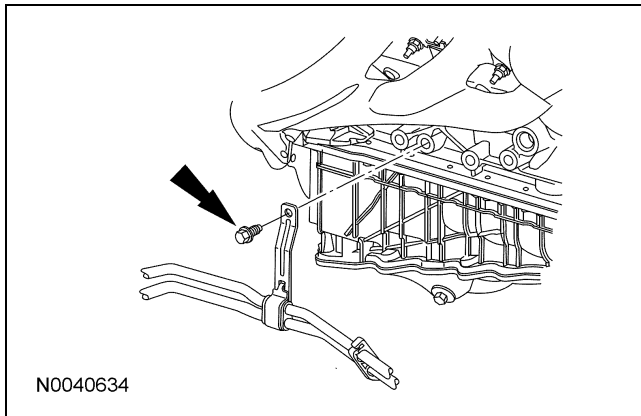
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

REMOVAL AND INSTALLATION (Continued)**4.6L engines**

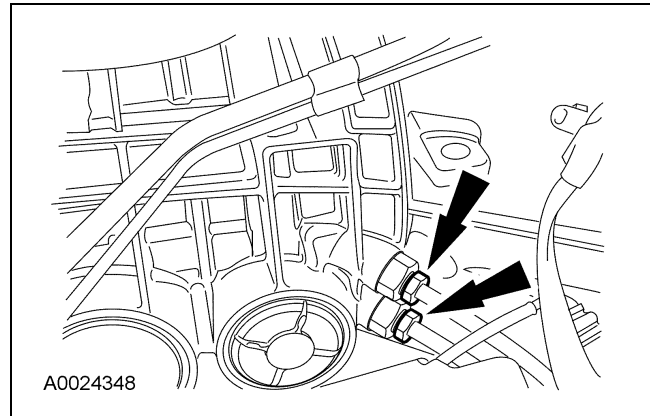
2. Remove the fluid cooler tube bracket at the engine.

**4.0L engines**

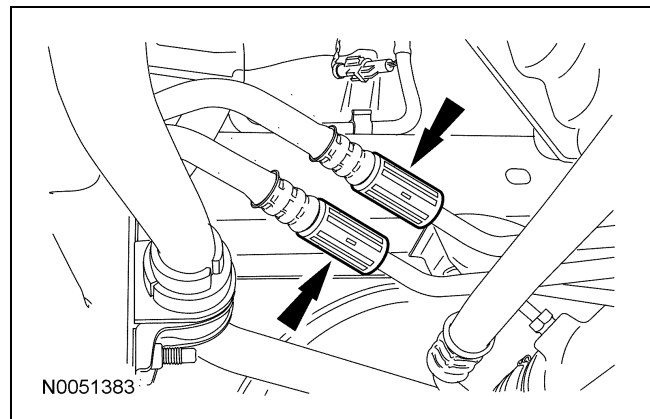
3. Remove the fluid cooler tube bracket at the engine.

**All vehicles**

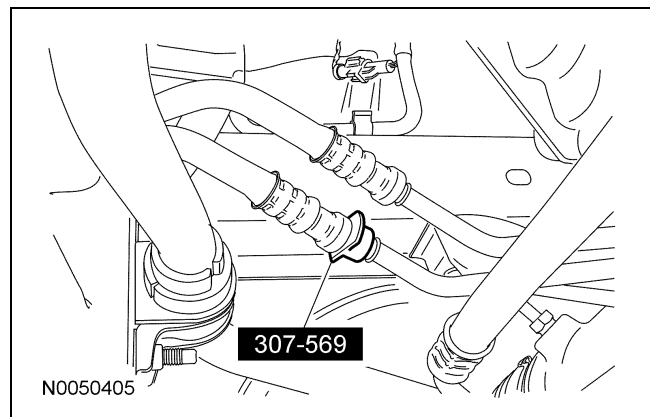
4. **NOTE:** Use a backup wrench to hold the case fitting secure.
Remove the fluid cooler tubes at the transmission.



5. Remove both transmission cooler tubes quick connect secondary latches.



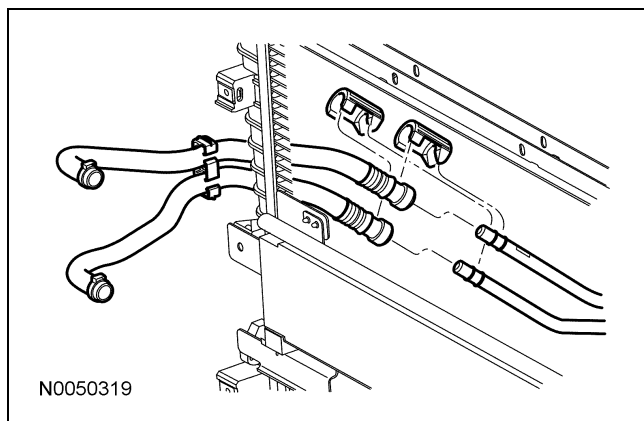
6. Using the special tool, disconnect both transmission cooler tubes from the transmission cooler hoses.



REMOVAL AND INSTALLATION (Continued)**Installation****All vehicles**

1. **NOTE:** When connecting the cooler hoses to the cooler lines the white mark on the cooler tube must be aligned with the H mark on the hose.

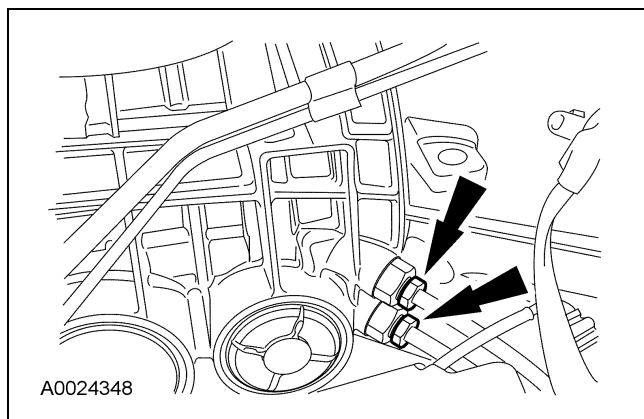
Install the fluid cooler hoses on the fluid cooler tubes and install the secondary latches.



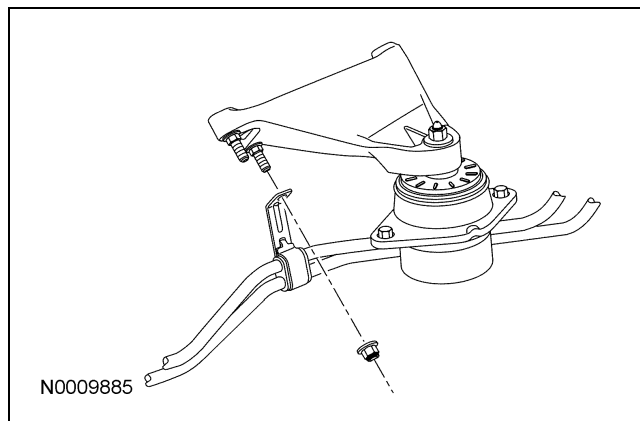
2. **NOTE:** Use a backup wrench to hold the case fitting secure.

Install the fluid cooler tubes at the transmission.

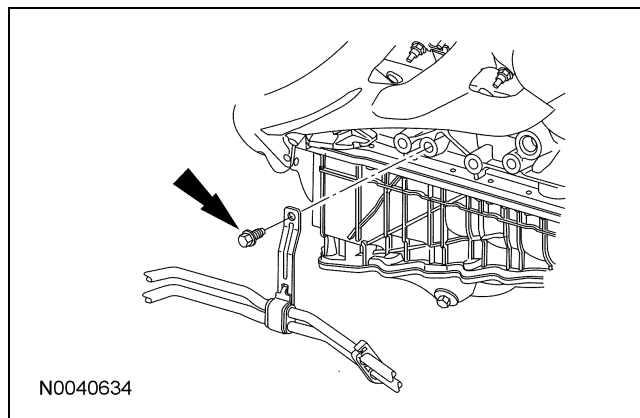
- Tighten to 40 Nm (30 lb-ft).

**4.6L engines**

3. Install the fluid cooler tube bracket at the engine.
 - Tighten to 48 Nm (35 lb-ft).

**4.0L engines**

4. Install the fluid cooler tube bracket at the engine.
 - Tighten to 48 Nm (35 lb-ft).

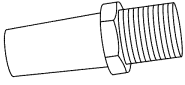
**All vehicles**

5. Fill the transmission with clean automatic transmission fluid and verify correct operation.

DIAGNOSIS AND TESTING

Transmission Fluid Cooler

Special Tool(s)

 ST2581-A	Transmission Fluid Fill Tool 307-437
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Material

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

Transmission Fluid Cooler Flow Test

⚠ CAUTION: Whenever a transmission has been disassembled to install new parts or a new or remanufactured transmission has been installed, a new transmission fluid cooler (either in-tank, auxiliary or OTA) if equipped, will need to be installed. Using a suitable torque converter/fluid cooler cleaner, clean and backflush the transmission fluid cooler tubes.

⚠ CAUTION: Use only clean automatic transmission fluid specified for this transmission. Do not use supplemental fluid additives, treatments or cleaning agents. The use of these materials may affect transmission operation and result in internal damage to the transmission.

⚠ CAUTION: When internal wear or damage has occurred in the transmission, metal particles, clutch plate material or band material may have been carried into the transmission fluid cooler. These contaminants are a major cause of recurring transmission concerns and must be removed from the system before the transmission is put back into use.

When evidence of transmission fluid contamination (such as metal particles, clutch plate material or band material) is found in the cooling system, the transmission fluid cooler flow test should be carried out.

If the transmission cooling system fails the transmission fluid cooler flow test, install a new transmission fluid cooler and flush out the fluid cooler lines. If installing a new transmission fluid cooler, use only factory approved components.

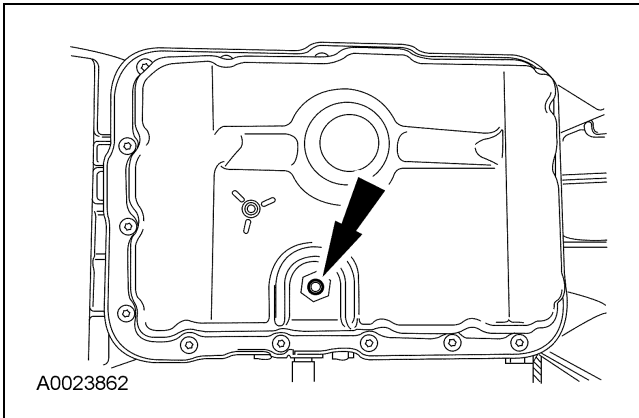
⚠ CAUTION: The transmission fluid must be at normal operating temperature 85°C - 93°C (185°F - 200°F) to make sure that the cooler bypass is open. The cooler bypass is located in the main control valve body. The transmission fluid at normal operating temperature will be hot.

NOTE: The engine idle, transmission linkage/cable adjustment, fluid level and line pressure must be within specification before carrying out this test. Refer to Section 307-05 for adjustments. For information on engine idle diagnosis, refer to the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#). For information on fluid level check, refer to Transmission Fluid Level Check in this section. For information on line pressure, refer to Special Testing Procedures in this section.

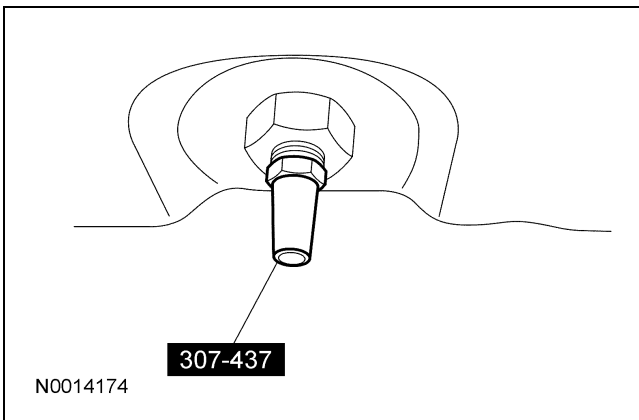
1. Place the transmission range selector lever into PARK.
2. Raise the vehicle on a hoist and place suitable safety stands under the vehicle. Refer to Section 100-02.

DIAGNOSIS AND TESTING (Continued)

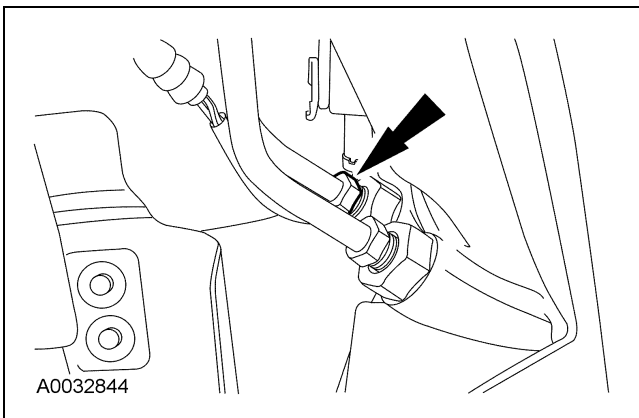
3. Hold the large drain plug with a wrench, and remove the small (center) fluid level indicating plug using a 3/16-inch Allen key.



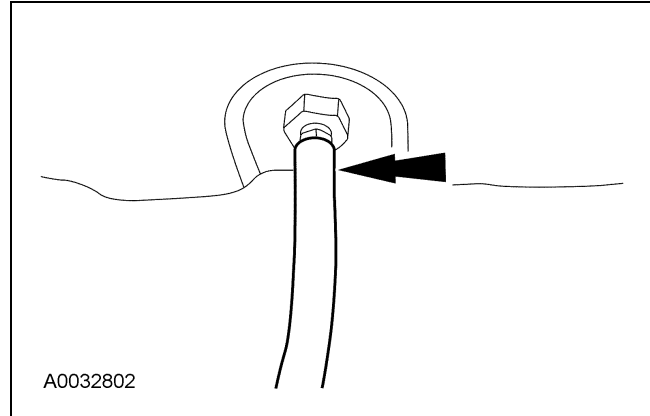
4. Install the special tool into the pan.



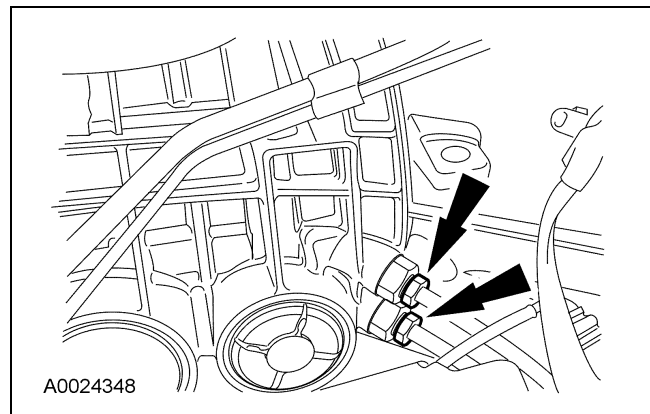
5. Remove the cooler return line (upper line) from the fitting on the transmission case.



6. Connect one end of a clear hose to the cooler return line and route the other end of the hose to the special tool in the pan.



7. Remove the safety stands and lower the vehicle.
8. Start the engine and run at idle.
9. With the engine running, raise the vehicle on a hoist and place suitable safety stands under the vehicle. Refer to Section 100-02.
10. Monitor the transmission fluid temperature to make sure that the transmission fluid is at normal operating temperature 85°C - 93°C (185°F - 200°F).
11. Once a steady flow of fluid (without air bubbles) is observed, remove the hose from the special tool and place the hose in a measuring container for 15 seconds. After 15 seconds, place the hose back onto the special tool. Lower the vehicle and turn the engine OFF. Measure the amount of fluid in the container. If adequate flow was observed, approximately 208 ml (7 oz) will be in the measuring container. The test is complete. Reconnect the cooler line and install the fluid fill plug.
12. If the flow is not liberal, disconnect the hose from the cooler return line and connect the hose to the cooler inlet (lower fitting) on the transmission case. Reconnect the cooler return line to the case (upper fitting).
 - Tighten to 40 Nm (30 lb-ft).



DIAGNOSIS AND TESTING (Continued)

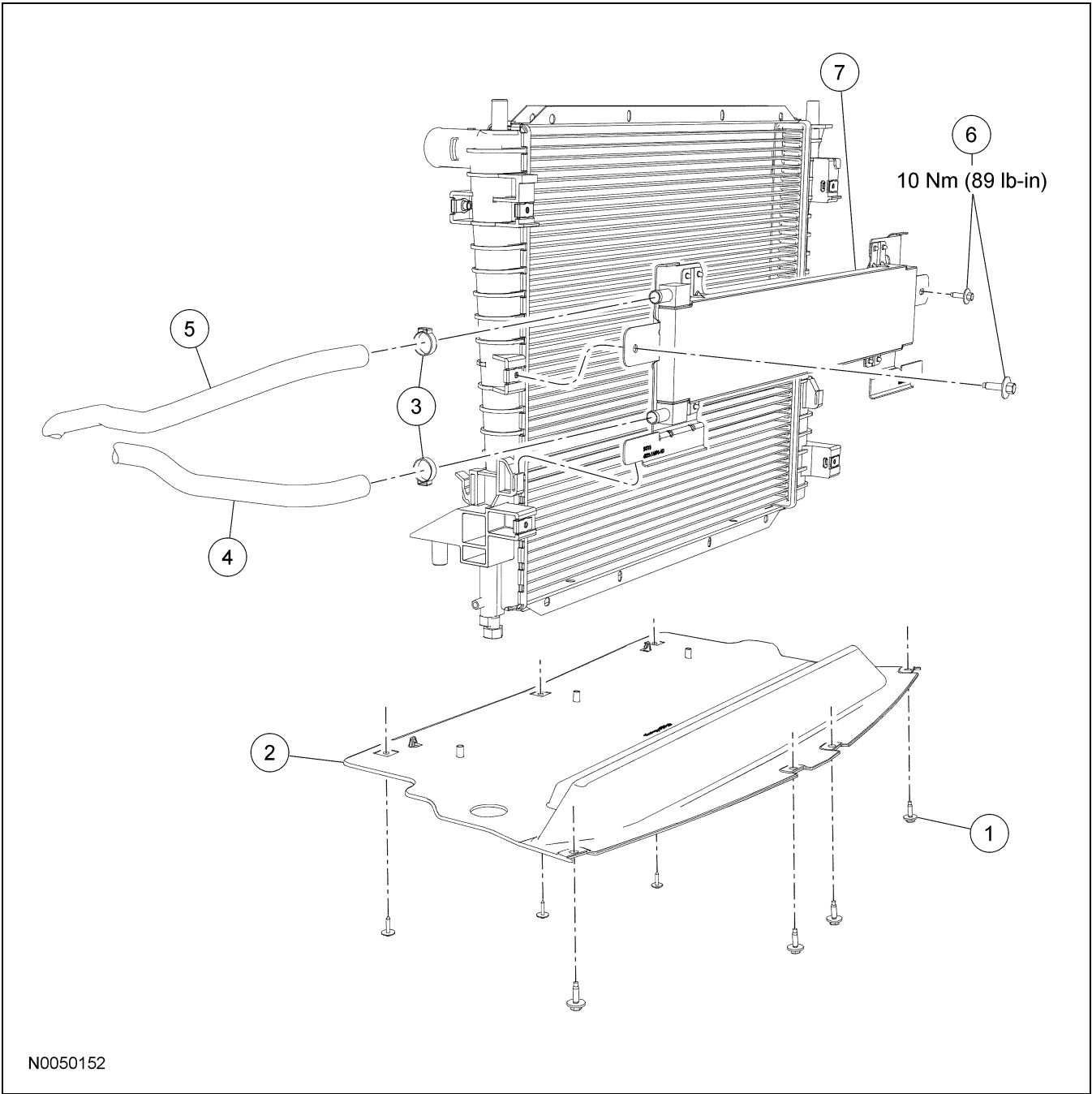
13. Repeat Steps 8 through 11. If flow is now approximately 208 ml (7 oz) in 15 seconds, the cooler lines and auxiliary cooler must be cleaned. Refer to Transmission Fluid Cooler — Backflushing and Cleaning in this section. Carry out this entire test after the backflushing and cleaning procedure. If, after carrying out the backflushing and cleaning procedure, the flow is still not adequate, new cooler lines and/or an auxiliary cooler must be installed. If the flow from the case is still not adequate after the installation of new cooler lines and/or an auxiliary cooler (208 ml [7 oz] in 15 seconds), the pump and/or torque converter may be at fault. Carry out the appropriate procedures for diagnosis and repair in this section.
-

REMOVAL AND INSTALLATION

Transmission Fluid Cooler

Material

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



N0050152

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	—	Lower air deflector screws (7 required)
2	—	Lower air deflector
3	376240	Transmission fluid cooler-to-hose clamps
4	7W063	Transmission fluid cooler inlet hose
5	7W064	Transmission fluid cooler outlet hose
6	HS1	Transmission fluid cooler screws
7	7A095	Transmission fluid cooler

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the lower air deflector.
3. Remove and discard the 2 transmission fluid cooler-to-hose clamps.
4. Remove the transmission fluid cooler inlet hose from the cooler.

5. Remove the transmission fluid cooler outlet hose from the cooler.
6. Remove the 2 transmission fluid cooler retaining screws.
7. Lift and remove the transmission fluid cooler from the retaining pockets.

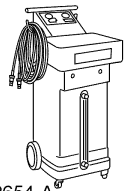
Installation

1. Position the transmission fluid cooler in the retaining pockets.
2. Install the transmission fluid cooler screws.
 - Tighten to 10 Nm (89 lb-in).
3. Connect the transmission fluid cooler hoses to the cooler.
4. Install new transmission cooler-to-hose clamps.
5. Fill the transmission with clean automatic transmission fluid and verify correct operation.
6. Install the lower air deflector.

GENERAL PROCEDURES

Transmission Fluid Drain and Refill — Automated Equipment

Special Tool(s)

 ST2654-A	Automatic Transmission Flush and Fill Machine 211-00018 Automatic Transmission Flush and Fill Machine 199-00010 or equivalent
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Material

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

Draining

⚠ CAUTION: Use only clean automatic transmission fluid specified for this transmission. Do not use supplemental transmission fluid additives, treatments or clean agents. The use of these materials can affect transmission operation and result in damage to internal transmission components.

⚠ CAUTION: Always refer to the instructions supplied with the flush and fill machine.

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

2. Use a suitable flush and fill machine to change the fluid.
3. When connecting the flush and fill machine, connect the machine to the fluid cooler tube after the fluid cooler on the cooler return line. This will help remove any foreign material trapped in the fluid coolers.

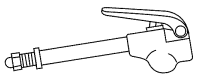
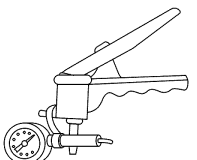
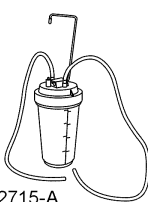
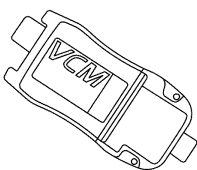
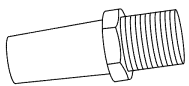
Refill

1. Use only clean automatic transmission fluid.
2. Once the fluid exchange has been completed, disconnect the flush and fill machine. Reconnect any disconnected fluid cooler tubes.
3. With the engine running, check and adjust the transmission fluid level, and check for any leaks. If fluid is needed, add fluid in increments of 0.24 liter (0.5 pint) until the correct level is achieved. For additional information, refer to Transmission Fluid Level Check in this section.

GENERAL PROCEDURES

Transmission Fluid Level Check

Special Tool(s)

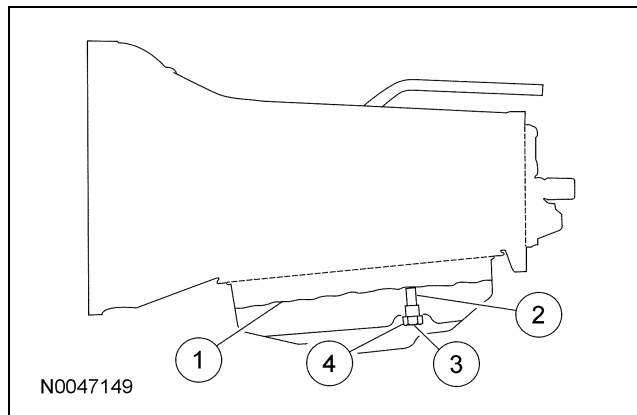
 ST2467-A	Rubber Tip Air Nozzle 100-D009 (D93L-7000-A)
 ST1269-A	Vacuum Pump Kit 416-D002 (D95L-7559-A)
 ST2715-A	Fluid Transporter/Evacuator/Injector 307-D465
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2581-A	Transmission Fluid Fill Tool 307-437

Material

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

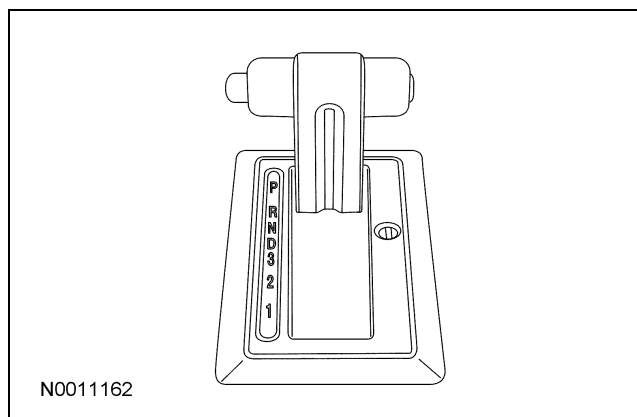
Fluid Fill Reference

NOTE: Left side of case shown.



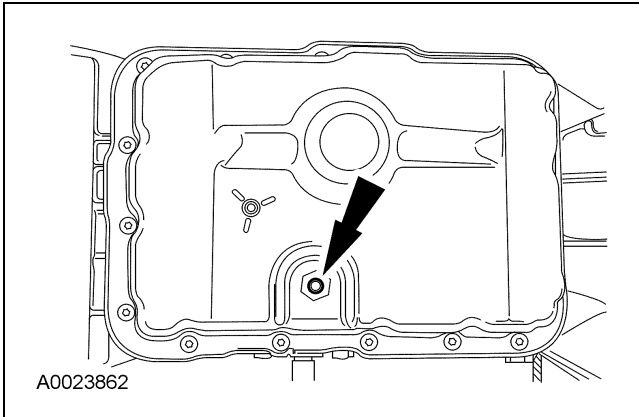
Item	Part Number	Description
1	—	Fluid level
2	7A010	Fluid level tube
3	W704999-S309	Fluid level and fill plug (small) (in-vehicle)
4	7A010	Fluid drain plug (large)

- Using the scan tool, monitor the transmission fluid temperature (TFT) using PID: TFT.
- Start the vehicle.
- NOTE:** Engine idle speed is approximately 650 rpm.
While proceeding with this procedure, run the engine until the transmission fluid temperature is between 27°-49°C (80°-120°F).
- Move the range selector lever slowly through each gear, stopping in each position and allowing the transmission to engage.

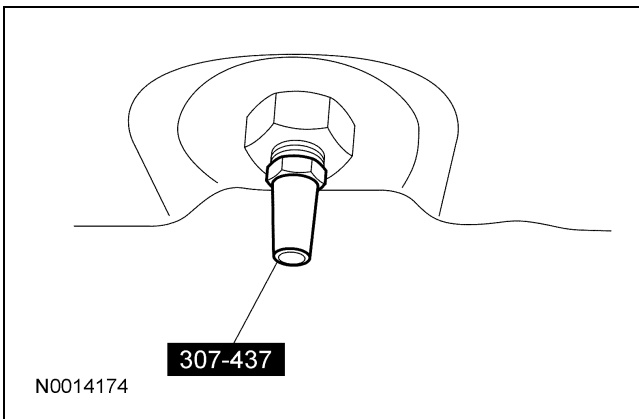


GENERAL PROCEDURES (Continued)

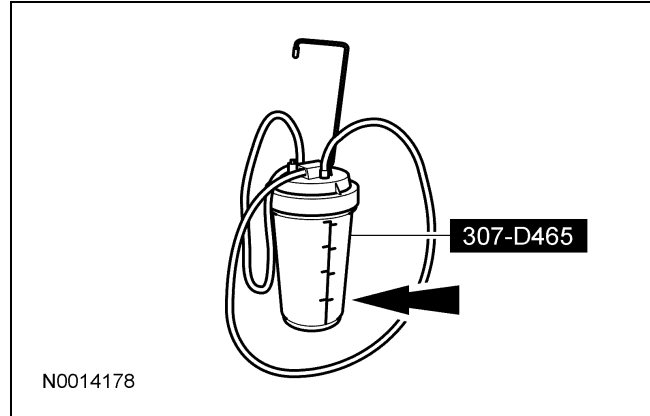
5. Place the range selector lever in the PARK position.
6. With the engine running, position the vehicle on a hoist and set it as close to level as possible. For additional information, refer to Section 100-02.
7. Hold the larger drain plug with a wrench and remove the small (center) fluid level indicating plug.



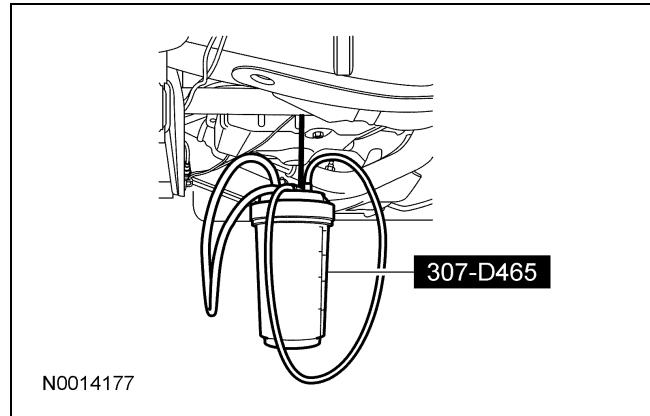
8. Install the special tool into the pan.



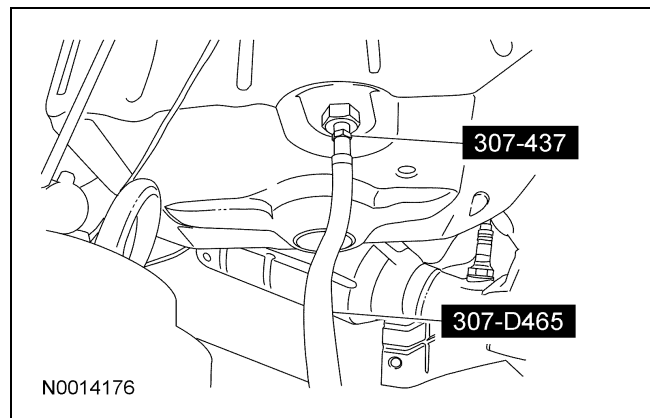
9. **NOTE:** Prior to filling the special tool with clean transmission fluid, make sure that the canister is clean.
Fill the special tool with clean automatic transmission fluid.



10. Hang the special tool under the vehicle.
Position it upright and close to the transmission.

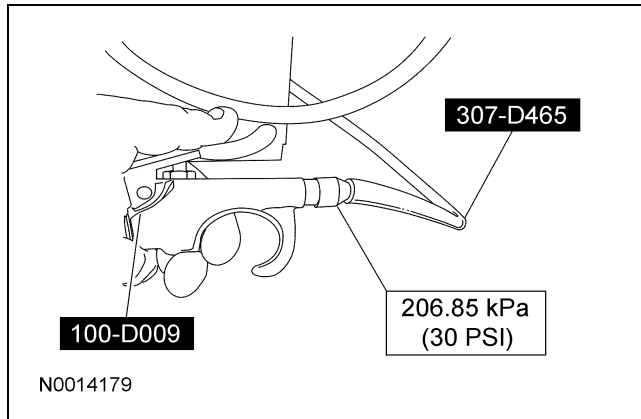


11. Connect the special tools.
 - Connect the open end of the fluid hose from the Fluid Transporter/Evacuator/Injector to the Fluid Level and Fill Plug Adapter at the bottom of the transmission fluid pan.

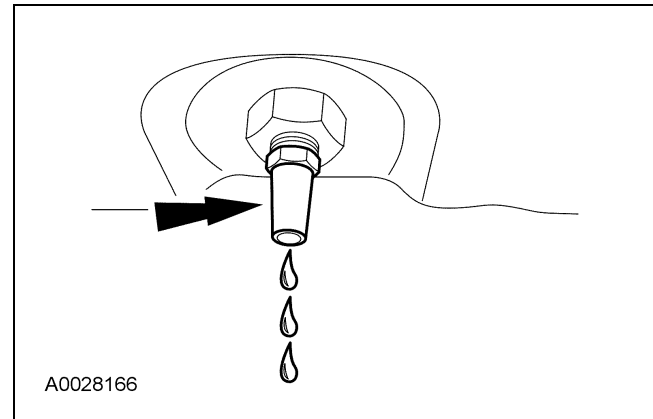


GENERAL PROCEDURES (Continued)

12. Apply a maximum of 206.85 kPa (30 psi) to the open end of the vacuum/pressure hose from the special tool. Fluid will immediately start flowing out of the special tool into the transmission fluid pan.



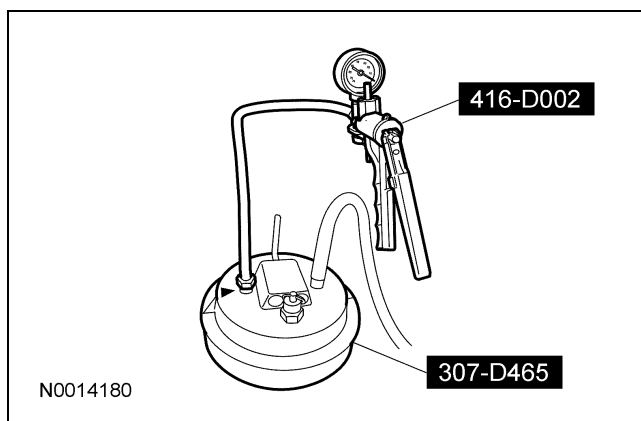
16. Allow the fluid to drain. Make sure that the fluid temperature is between 27°-49°C (80°-120°F). When the fluid comes out as a thin stream or drip, the fluid is at the correct level.



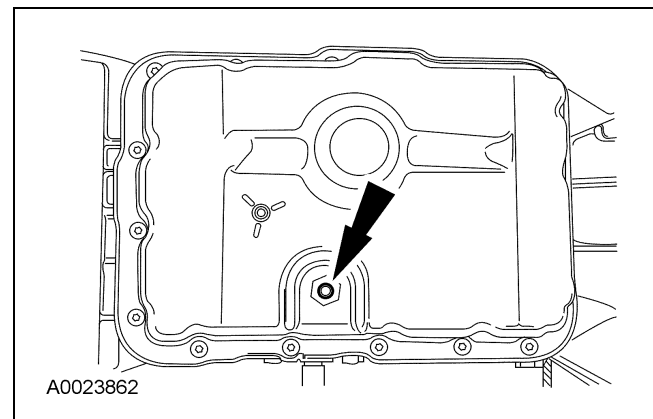
13. Add one pint of transmission fluid into the fluid pan. Stop the process by releasing the air pressure and removing the air nozzle from the end of the hose.

14. Inspect the fluid level in the special tool. If the fluid drains back into the canister, the transmission is full. If no fluid drains back, more fluid will need to be added. Repeat Steps 12 and 13.

15. Once the transmission is full, place a hand vacuum pump on the open end of the vacuum/pressure hose of the special tool and apply vacuum to the system. This will pull out any extra fluid trapped in the system and direct it into the container.



17. Reinstall the small (center) fluid level indicating plug and tighten to 10 Nm (89 lb-in).

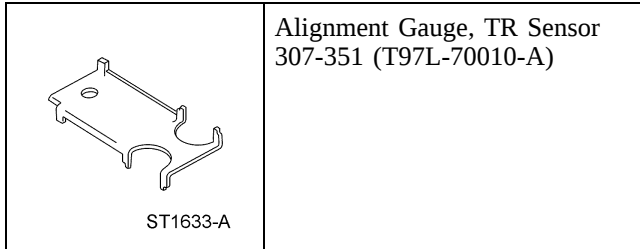


18. Check the operation of the transmission by moving the range selector lever slowly through each gear, stopping in each position and allowing the transmission to engage.

GENERAL PROCEDURES

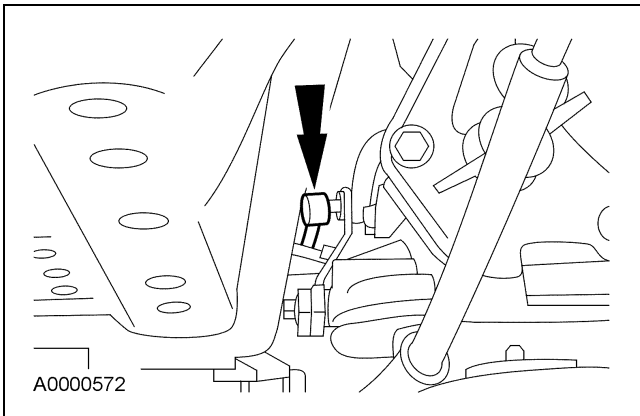
Transmission Range (TR) Sensor Adjustment

Special Tool(s)

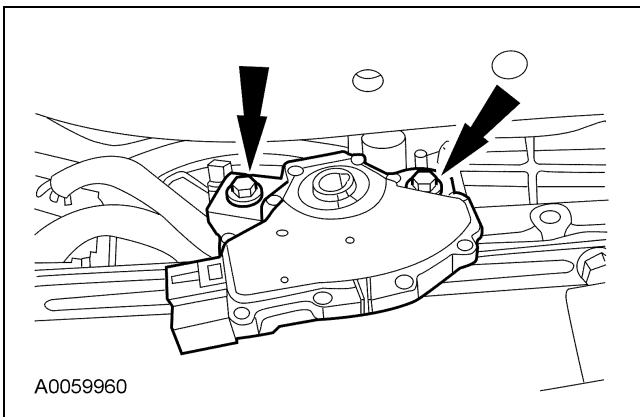


Adjust

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Disconnect the shift cable from the manual control lever.



3. Loosen the screws.

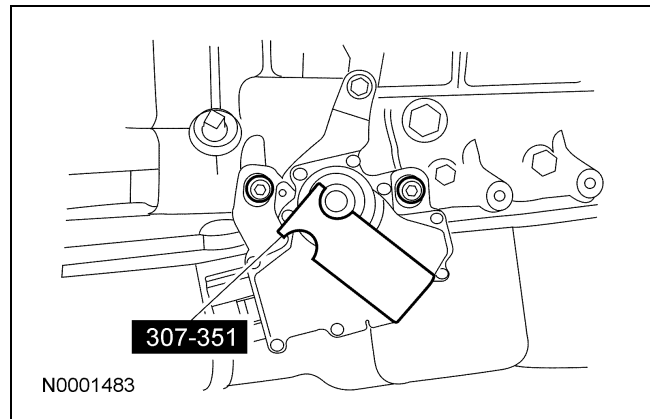


4.  **CAUTION:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

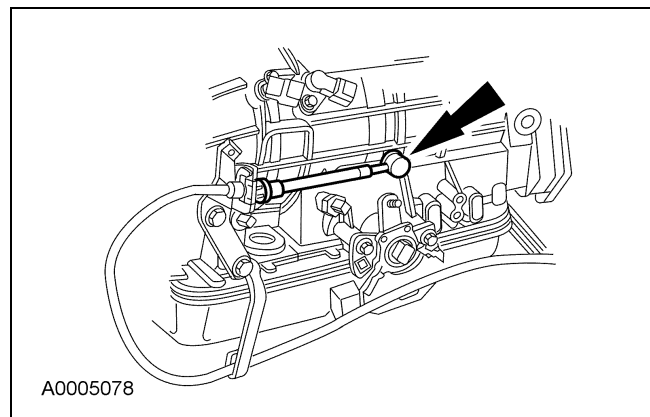
NOTE: The manual lever must be in the NEUTRAL position.

Using the special tool, align the digital TR sensor and tighten the screws in an alternating sequence.

- Tighten 8 Nm (71 lb-in).



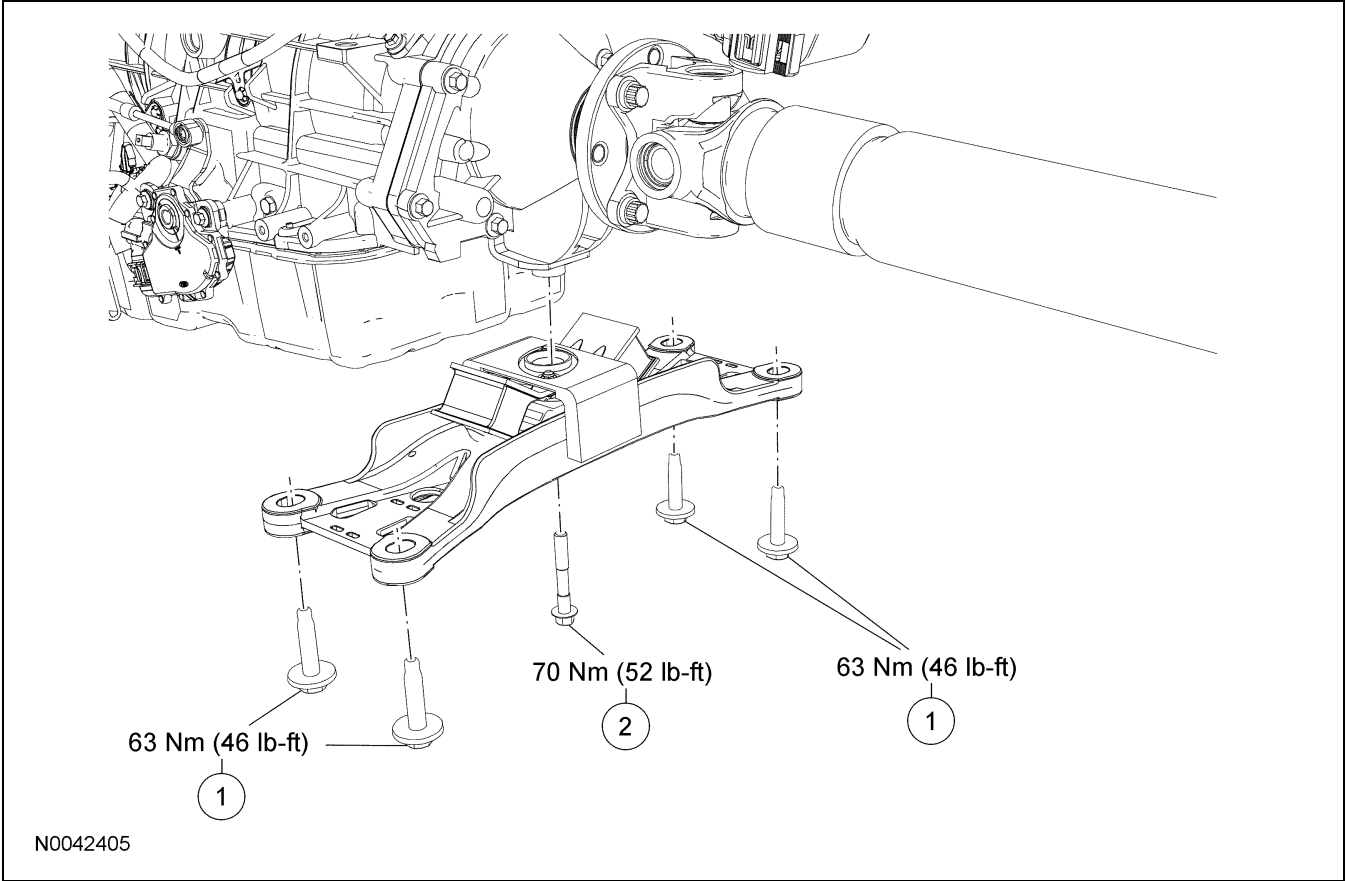
5. Install the shift cable to the manual control lever.



6. Verify that the shift cable is adjusted correctly. For additional information, refer to Section 307-05.

IN-VEHICLE REPAIR

Transmission Support Crossmember

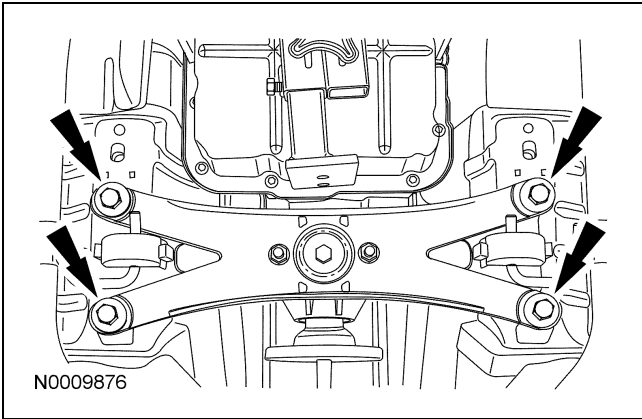


Item	Part Number	Description
1	—	Transmission crossmember-to-floor pan screws
2	—	Transmission insulator-to-extension housing center screw

Removal

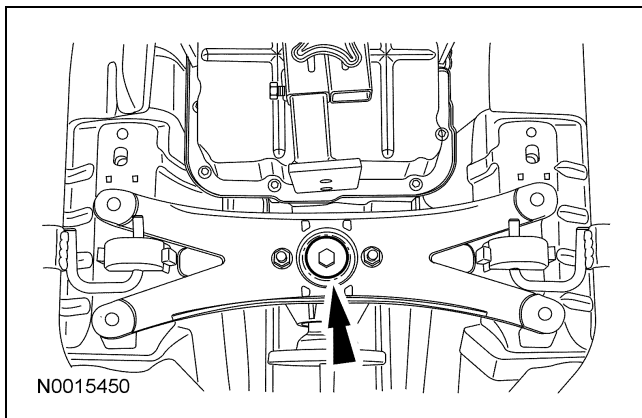
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the catalytic converter. For additional information, refer to Section 309-00.
3. Support the transmission with a transmission jack.

4. Remove the transmission crossmember-to-floor pan screws.



IN-VEHICLE REPAIR (Continued)

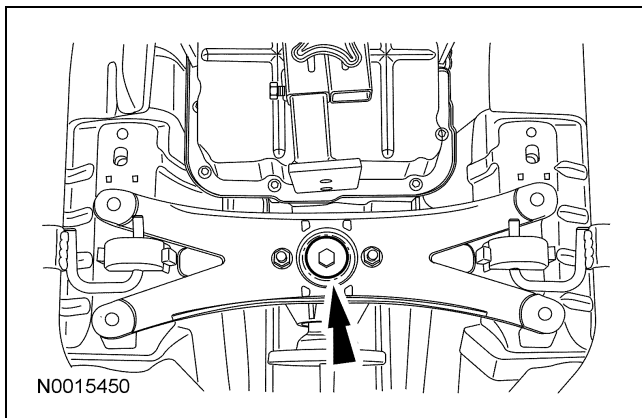
5. Remove the transmission insulator-to-extension housing center screw.



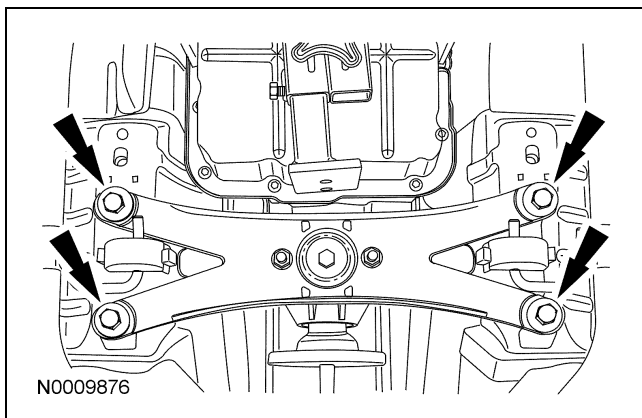
6. Remove the transmission crossmember.

Installation

1. Position the transmission crossmember in the vehicle and loosely install the transmission insulator-to-extension housing center screw.



2. Loosely install the transmission crossmember-to-floor pan screws.

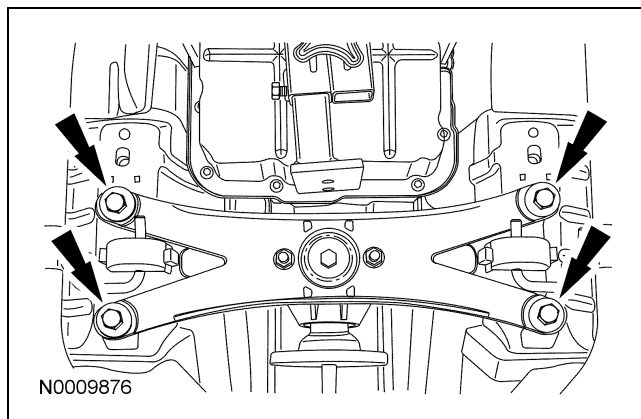


3. **NOTE:** The transmission support insulator must be neutralized.

Slide the transmission support insulator forward, rearward and side-to-side until the gaps between the transmission support insulator snubber and crossmember are equal.

4. With the transmission support insulator neutralized, tighten the transmission crossmember-to-floor pan screws.

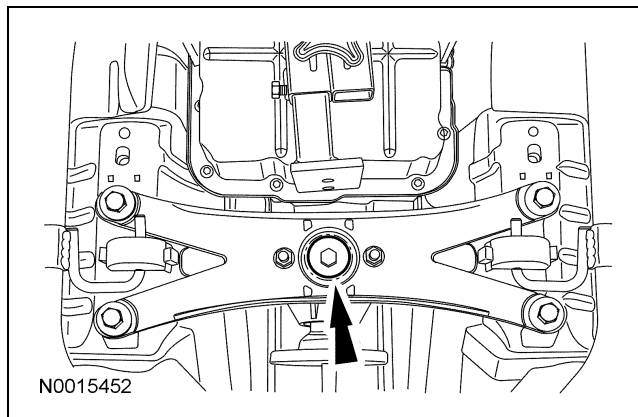
- Tighten to 63 Nm (46 lb-ft).



5. Install the catalytic converter. For additional information, refer to Section 309-00.

IN-VEHICLE REPAIR (Continued)

6. With the transmission support insulator neutralized, tighten the transmission insulator-to-extension housing center screw.
 - Tighten to 70 Nm (52 lb-ft).



INSTALLATION

Transmission

All vehicles

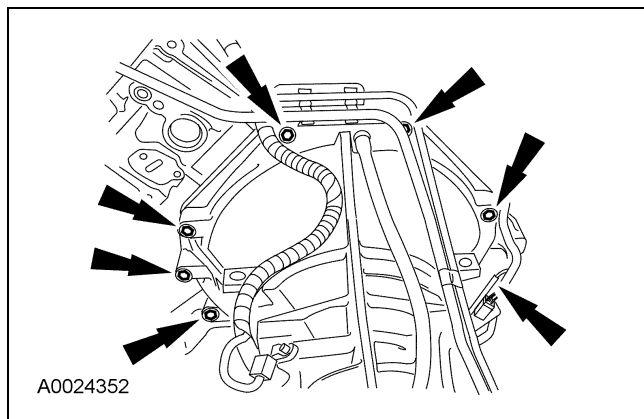
1.  **WARNING:** Secure the transmission to the transmission jack with a safety chain. Failure to follow these instructions can result in personal injury.

Secure the transmission to the transmission jack with a safety chain.

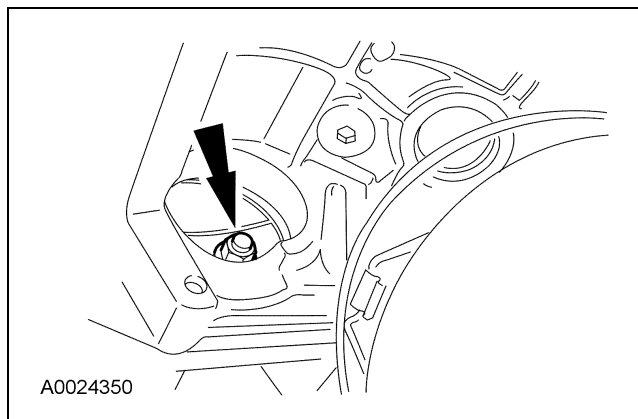
2. Rotate the torque converter and adapter plate so the orange or green paint daub on the torque converter is in the 12 o'clock location.
3. Raise and position the transmission to the back of the engine.

4.6L engine

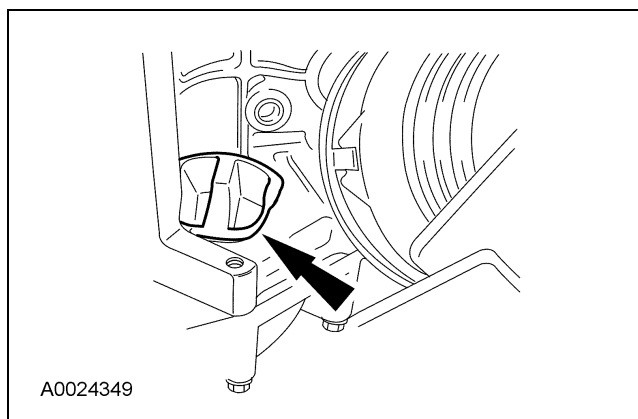
4. Install the 7 engine-to-transmission retaining bolts.
 - Tighten to 48 Nm (35 lb-ft).



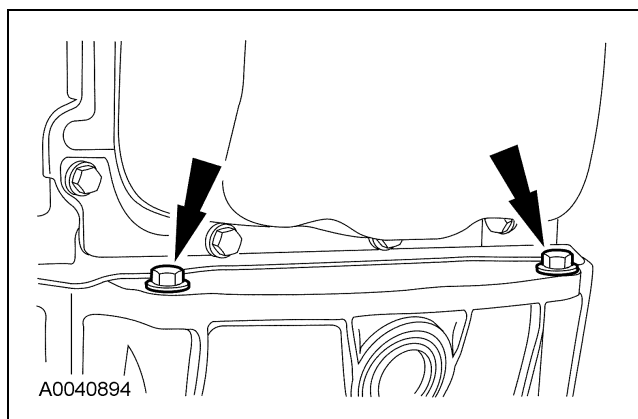
5. Install the 4 new torque converter nuts.
 - Tighten to 44 Nm (32 lb-ft).



6. Install the access cover.



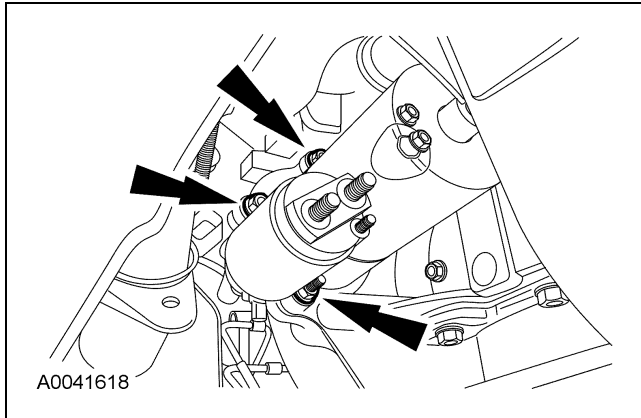
7. Install the flexplate cover.
 - Tighten to 35 Nm (26 lb-ft).



INSTALLATION (Continued)

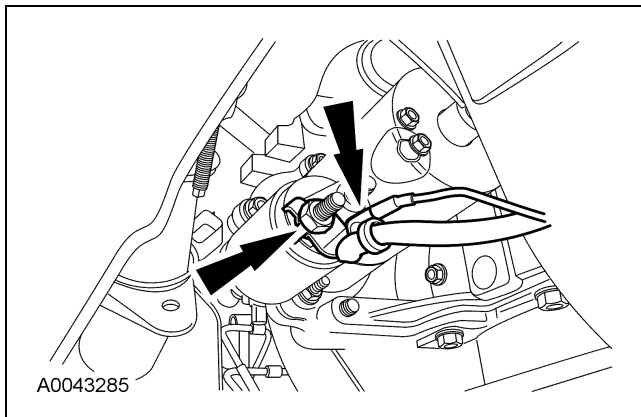
8. Install the starter.

- Tighten to 25 Nm (18 lb-ft).

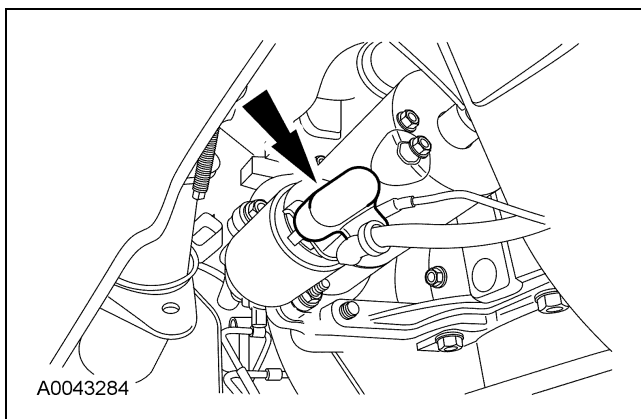


9. Install the starter motor electrical connectors.

- Tighten the cable to 13 Nm (10 lb-ft).
- Tighten the wire to 6 Nm (53 lb-in).

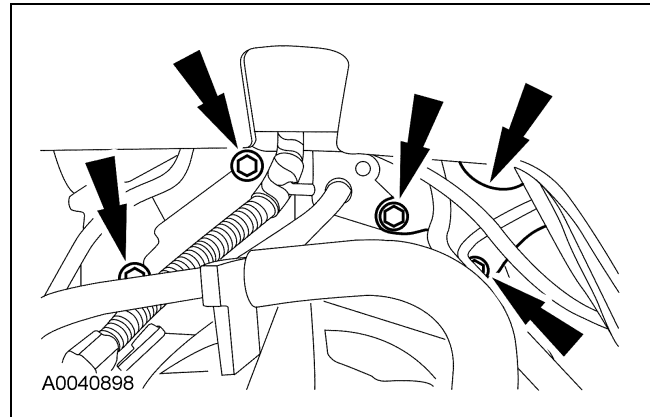


10. Install the starter motor electrical connector cover.

**4.0L engine**

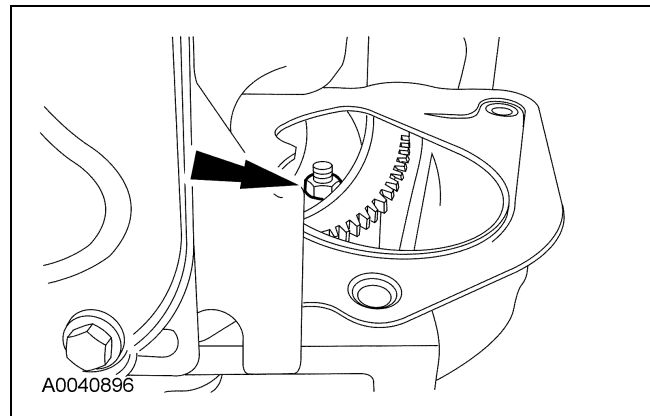
11. Position the fuel line bracket in place and install the 6 retaining bolts.

- Tighten to 48 Nm (35 lb-ft).



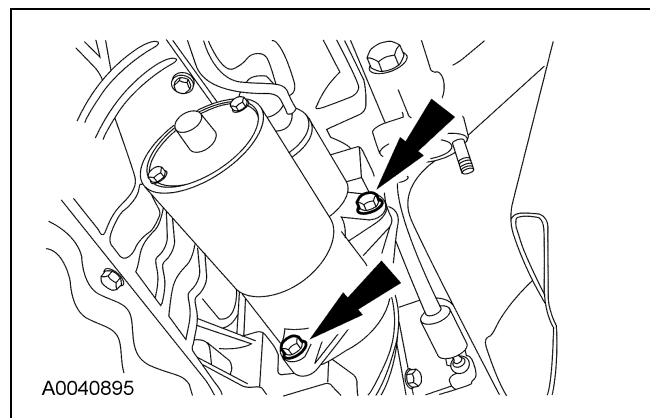
12. Install the 4 new torque converter nuts.

- Tighten to 44 Nm (32 lb-ft).



13. Install the starter motor.

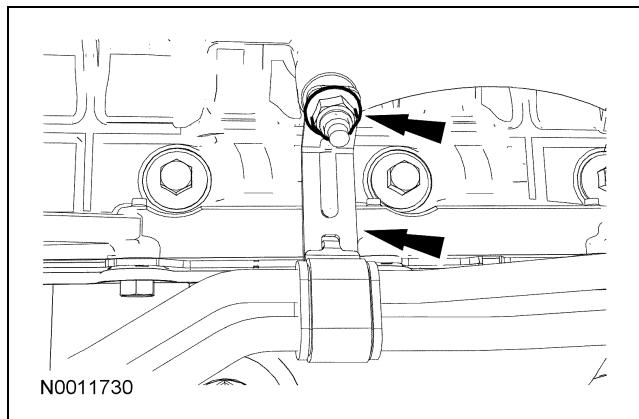
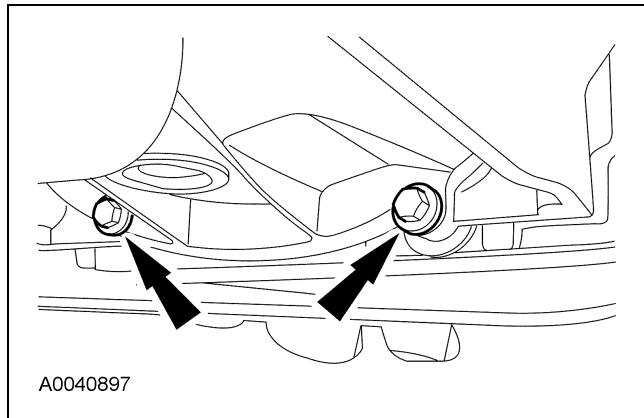
- Tighten to 25 Nm (18 lb-ft).



INSTALLATION (Continued)

14. Install the lower transmission retaining bolts.

- Tighten to 48 Nm (35 lb-ft).



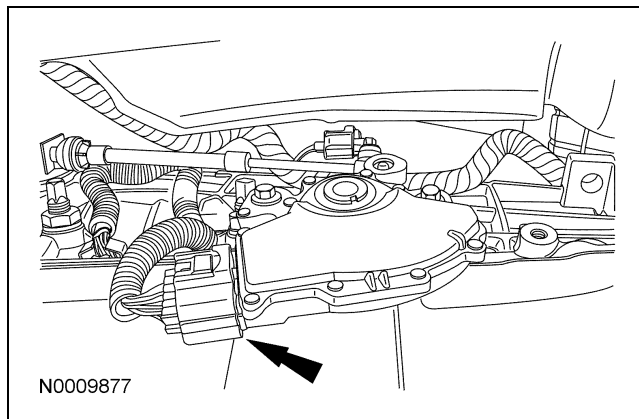
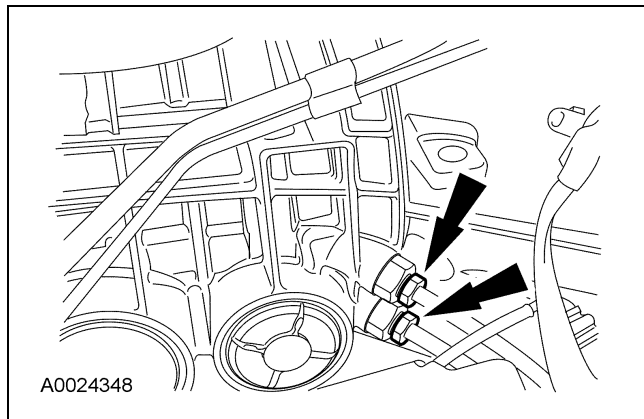
17. Connect the digital transmission range (TR) sensor connector.

All vehicles

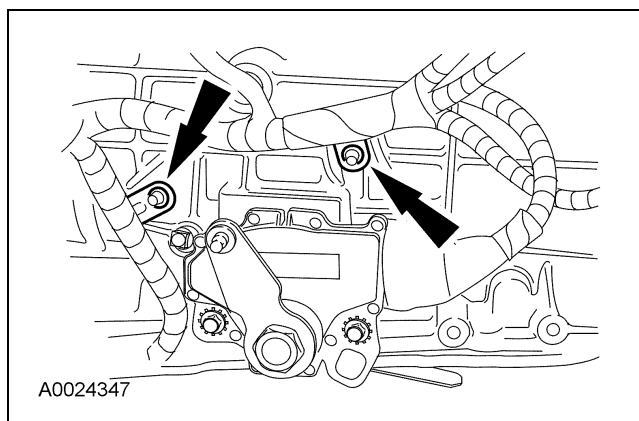
15.  **CAUTION:** Use care not to bend or force the cooler tubes otherwise damage to the cooler tubes and the transmission can result.

Install the transmission fluid cooler tubes.

- Tighten to 40 Nm (30 lb-ft).



18. Position the wire harness and install the retainers.



16. Install the transmission cooler tube bracket and nut.

- Tighten to 25 Nm (18 lb-ft).

INSTALLATION (Continued)

19.  **CAUTION:** Damage will occur to the solenoid body assembly if the screw is tightened above the specification.

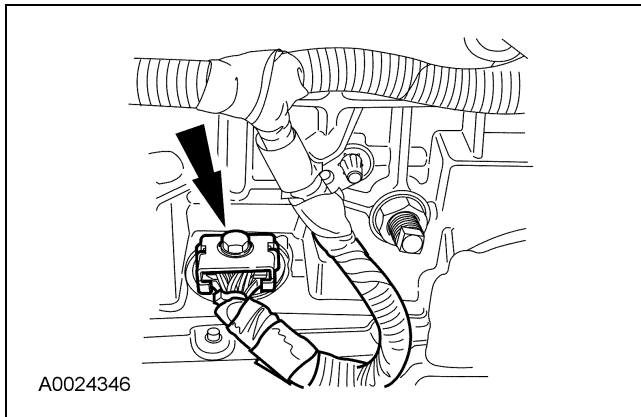
NOTE: Always install new O-ring seals on the vehicle harness connector.

NOTE: Clean the area around the connector to prevent contamination of the solenoid body connector.

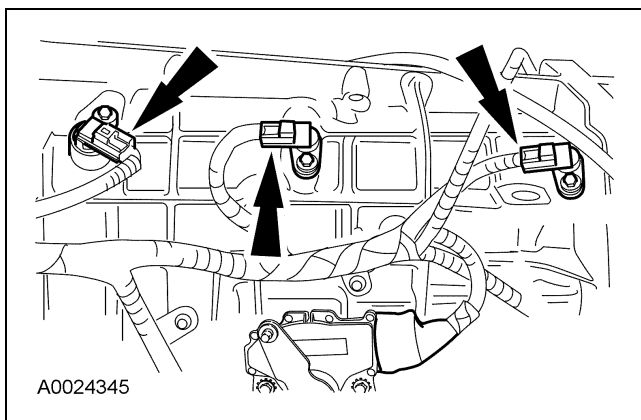
NOTE: Use petroleum jelly to lubricate the O-ring seals to aid in the installation process.

Install and lubricate new O-ring seals on the transmission connector and connect the connector.

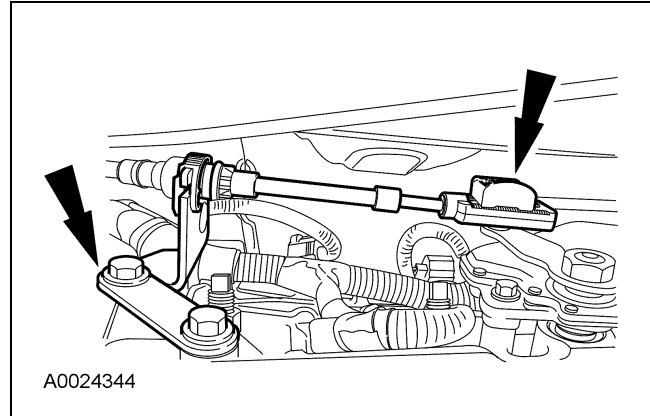
- Tighten to 5 Nm (44 lb-in).



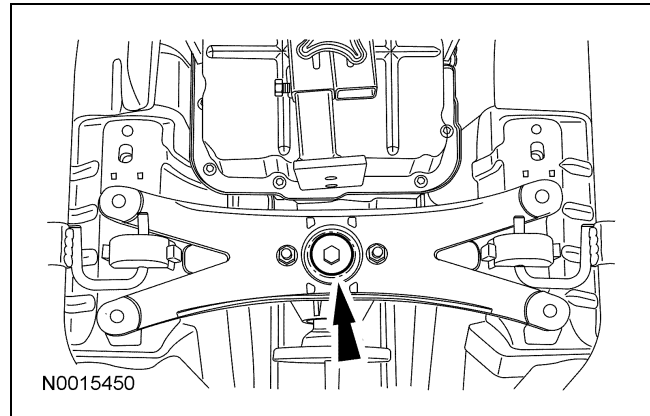
20. Connect the turbine shaft speed (TSS) sensor, output shaft speed (OSS) sensor and intermediate shaft speed sensor electrical connectors.



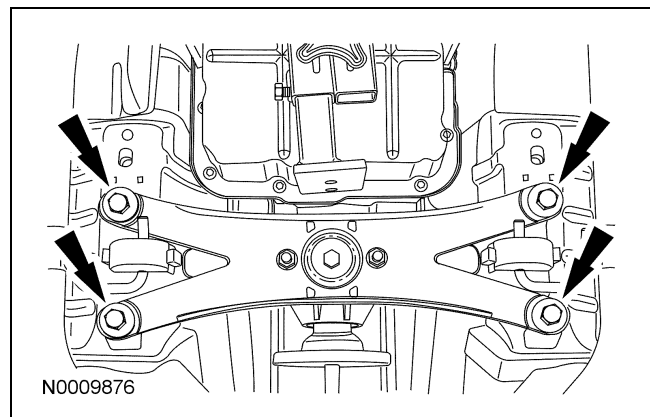
21. Install the shift cable and bracket.
- Tighten to 28 Nm (21 lb-ft).



22. Loosely install the transmission insulator-to-extension housing center screw.



23. Position the transmission crossmember in the vehicle and loosely install the transmission crossmember-to-floor pan screws.



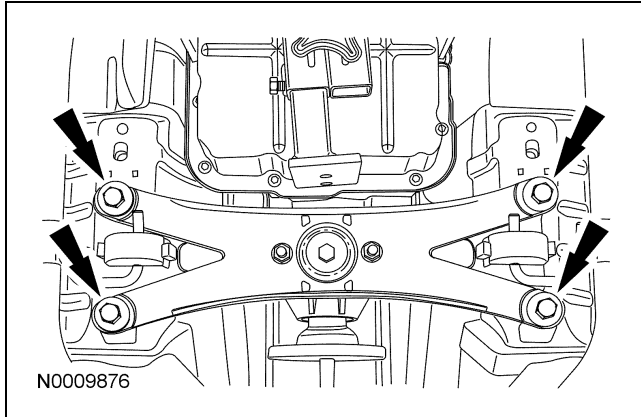
24. **NOTE:** The transmission support insulator must be neutralized.

Slide the transmission support insulator forward, rearward and side-to-side until the gaps between the transmission support insulator snubber and crossmember are equal.

INSTALLATION (Continued)

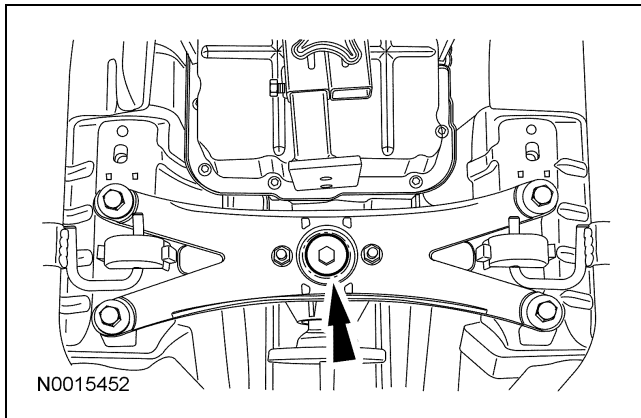
25. With the transmission support insulator neutralized, tighten the transmission crossmember-to-floor pan screws.

- Tighten to 63 Nm (46 lb-ft).

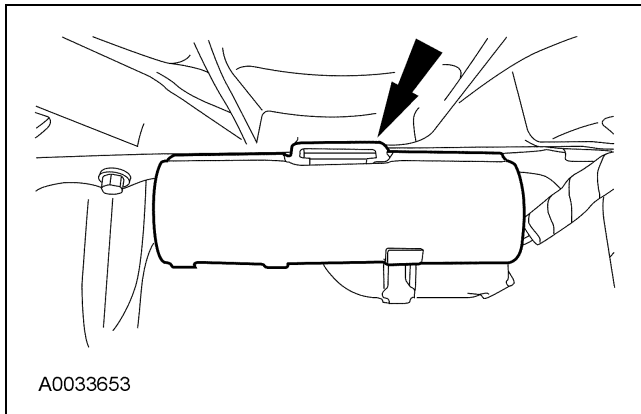


26. With the transmission support insulator neutralized, tighten the transmission insulator-to-extension housing center screw.

- Tighten to 70 Nm (52 lb-ft).



27. Install the heated oxygen sensor (HO2S) connector to the front of the transmission pan rail.



28. Install the driveshaft. For additional information, refer to Section 205-01.

29. Install the catalytic converter. For additional information, refer to Section 309-00.

30. Use the following guidelines for installing the in-line transmission fluid filter:

- If the transmission was overhauled and the vehicle was equipped with an in-line fluid filter, install a new in-line fluid filter.
- If the transmission was overhauled and the vehicle was not equipped with an in-line fluid filter, install a new in-line fluid filter kit.
- If the transmission is being installed for a non-internal repair, do not install an in-line filter or filter kit.
- If installing a new or a Ford-authorized remanufactured transmission, install the in-line transmission fluid filter that is supplied.

- Prior to lowering the vehicle, install a new in-line transmission filter or a filter kit. For additional information, refer to Transmission Filter — In Line in this section.

31. **NOTE:** When the battery has been disconnected and reconnected, some abnormal drive symptoms can occur while the vehicle relearns its adaptive strategy. The customer needs to be notified that they can experience slightly different upshifts (either soft or firm) and that this is a temporary condition and will eventually return to normal operating condition. Connect the battery ground cable. For additional information, refer to Section 414-01.

32. Carry out the fluid level check. For additional information, refer to Transmission Fluid Level Check in this section.

33. Verify that the shift cable is correctly adjusted. For additional information, refer to Section 307-05.

INSTALLATION (Continued)

34. Check the operation of the transmission and inspect for leaks.
-

REMOVAL

Transmission

Special Tool(s)

 ST1636-A	Retainer, Torque Converter 307-346 (T97T-7902-A)
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All vehicles

⚠ WARNING: Secure the transmission to the transmission jack with a safety chain. Failure to follow these instructions can result in personal injury.

NOTE: When the battery has been disconnected and reconnected, some abnormal drive symptoms can occur while the vehicle relearns its adaptive strategy. The customer needs to be notified that they can experience slightly different upshifts (either soft or firm) and that this is a temporary condition and will eventually return to normal operating condition.

NOTE: If transmission disassembly or installation of a new transmission is necessary, drain the transmission fluid. Install the drain plug when finished.

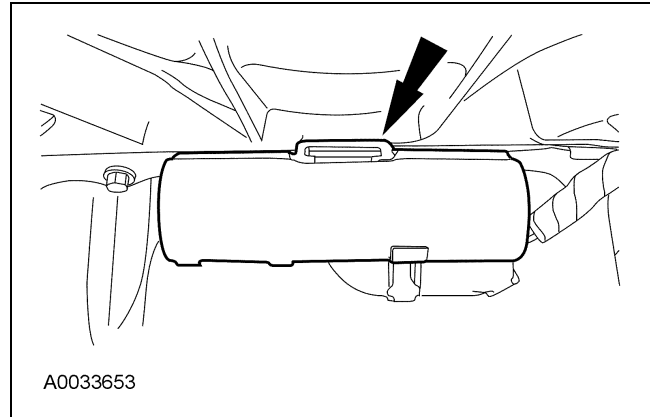
NOTE: If the transmission is to be removed for an extended period of time, support the engine with a safety stand and a wood block.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Disconnect the battery ground cable. For additional information, refer to Section 414-01.
3. Remove the catalytic converter. For additional information, refer to Section 309-00.
4. Remove the driveshaft. For additional information, refer to Section 205-01.

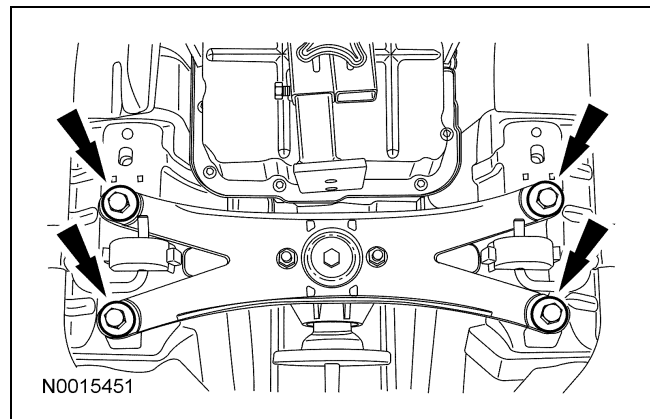
5. **⚠ WARNING:** Secure the transmission to the transmission jack with a safety chain. Failure to follow these instructions may result in personal injury.

Using a suitable transmission jack, support the transmission.

6. Remove the HO2S connector from the front of the transmission pan rail.

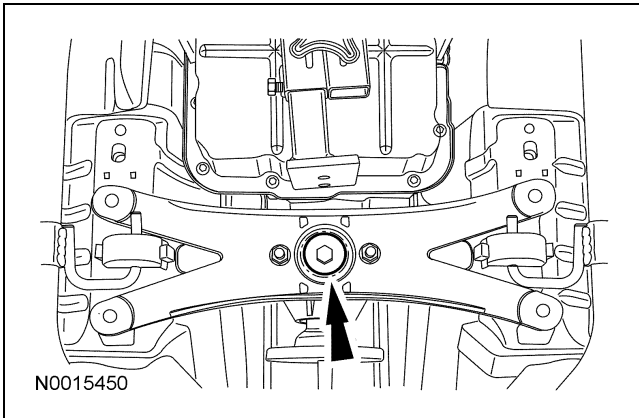


7. Remove the rear transmission crossmember-to-floor pan screws.



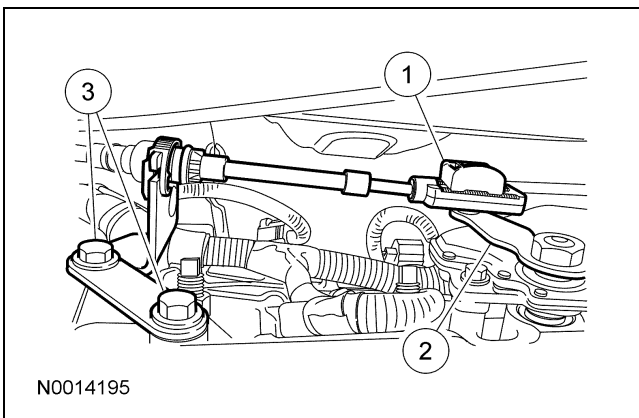
REMOVAL (Continued)

8. Remove the rear transmission insulator-to-extension housing center screw and remove the transmission crossmember.

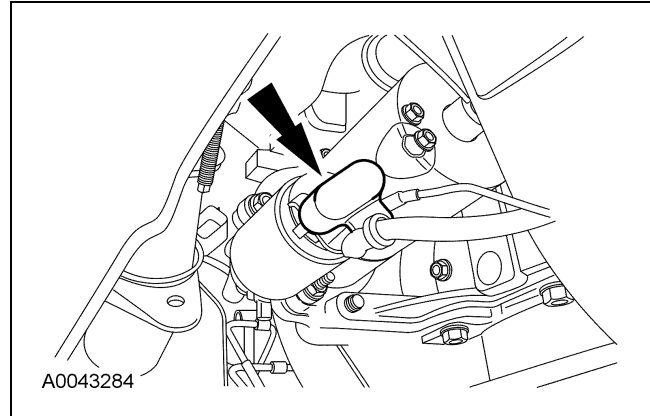


9. Remove the shift cable and bracket and position out of PARK.

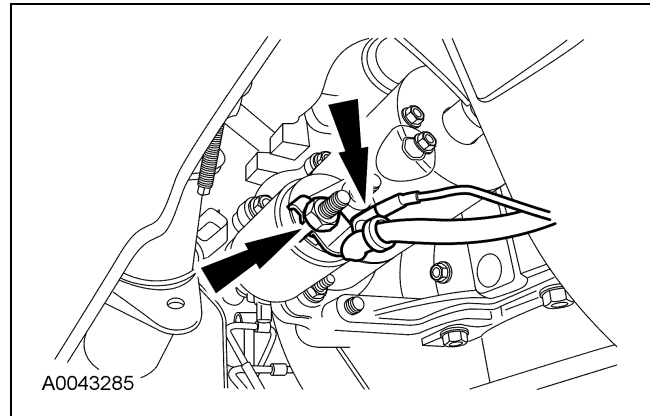
- 1 Disconnect the cable from the lever.
- 2 Position the manual lever out of PARK.
- 3 Remove the bolts and the shift cable and bracket, and position aside.

**4.6L engine**

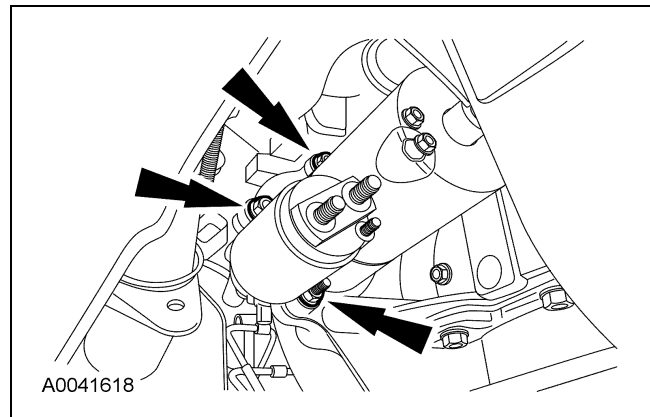
10. Remove the electrical connector cover.



11. Remove the starter wire and positive battery cable.

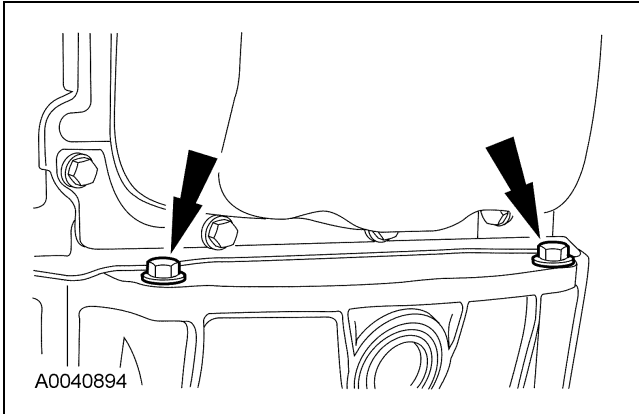


12. Remove the starter motor bolts and starter.

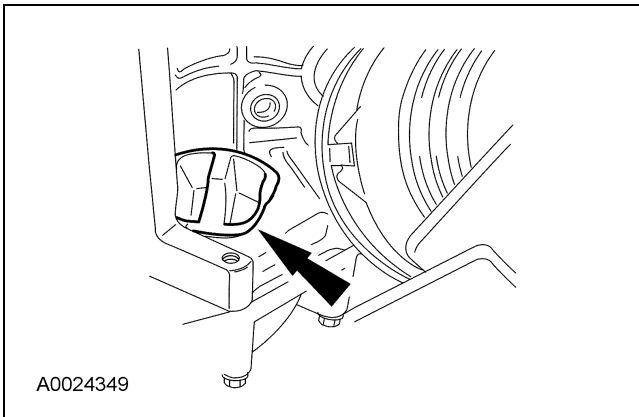


REMOVAL (Continued)

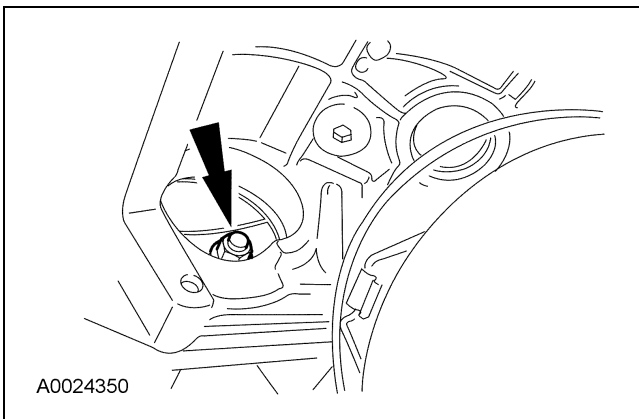
13. Remove the flexplate cover.



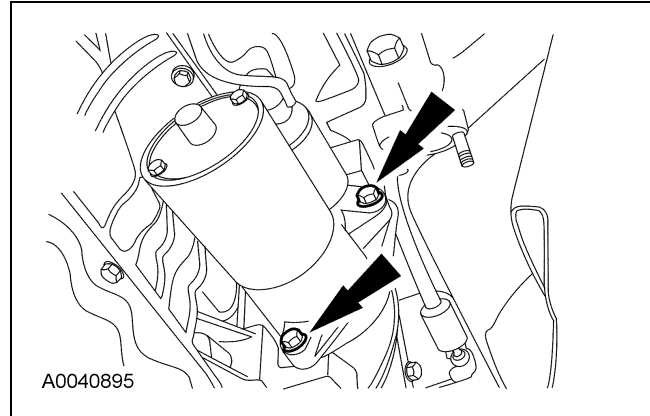
14. Remove the access cover.



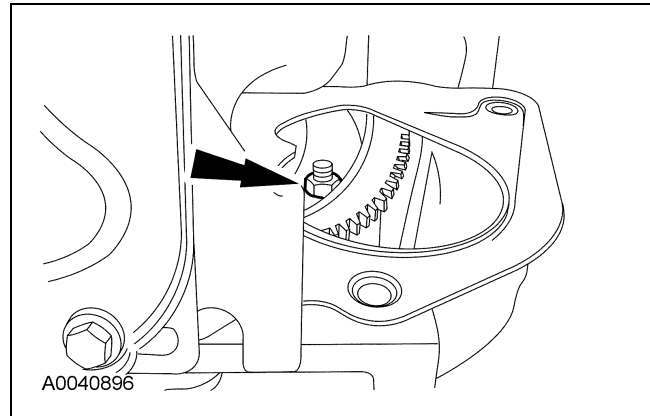
15. Remove the 4 torque converter nuts.

**4.0L engine**

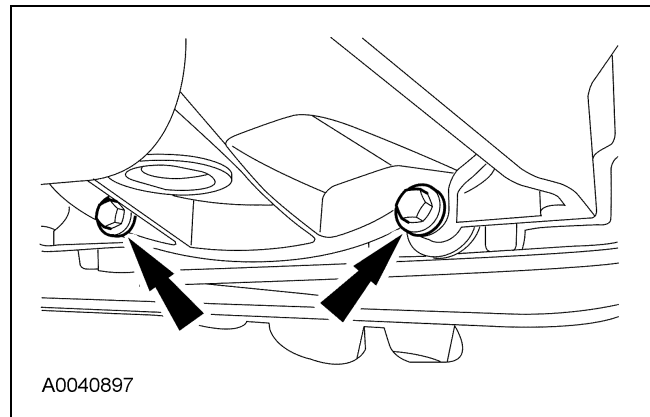
16. Remove the starter and position aside.



17. Remove and discard the 4 torque converter nuts.



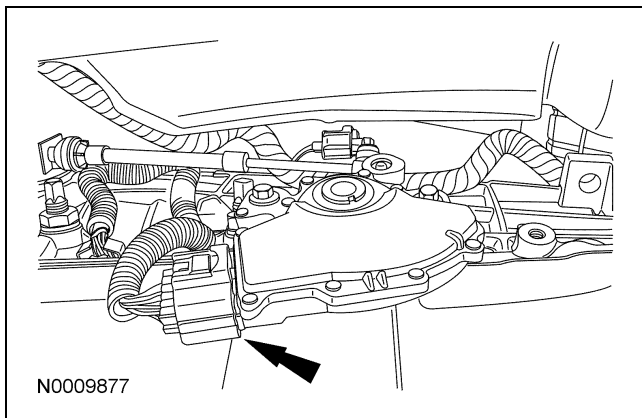
18. Remove the lower transmission retaining bolts.

**All vehicles**

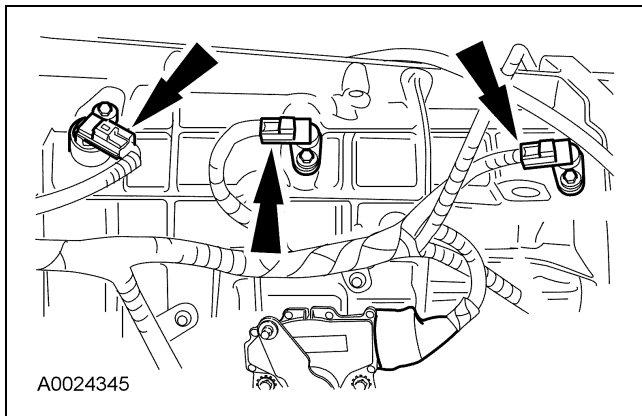
19. Lower the transmission to gain access to the sensor connectors and the transmission bolts.

REMOVAL (Continued)

20. Disconnect the digital transmission range (TR) sensor connector.

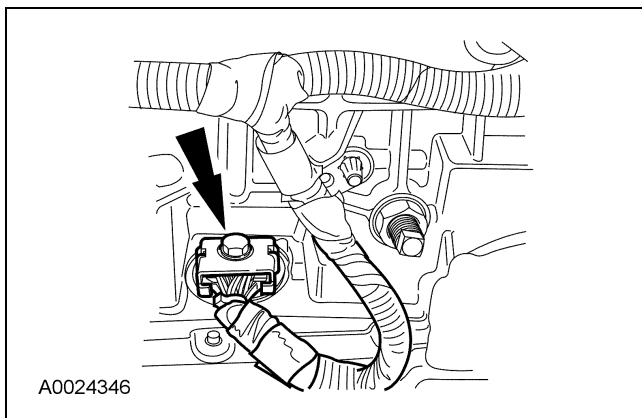


21. Disconnect the turbine shaft speed (TSS) sensor, output shaft speed (OSS) sensor and intermediate shaft speed sensor electrical connectors.

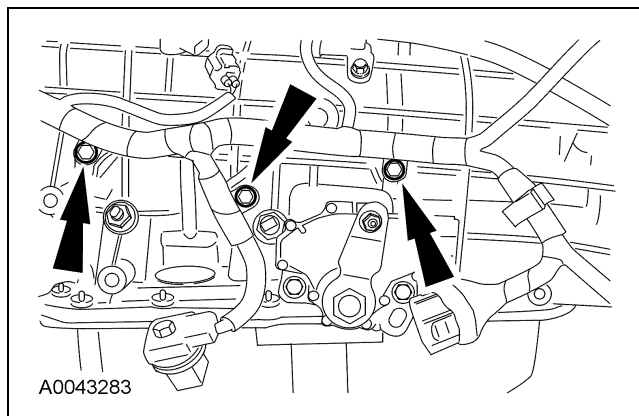


22. **NOTE:** Clean the area around the connector to prevent contamination of the solenoid body connector.

Remove the screw from the solenoid body connector and disconnect the connector.

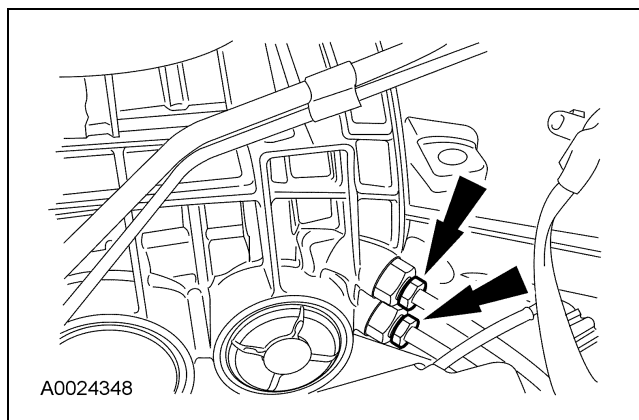


23. Disconnect the harness retainers.

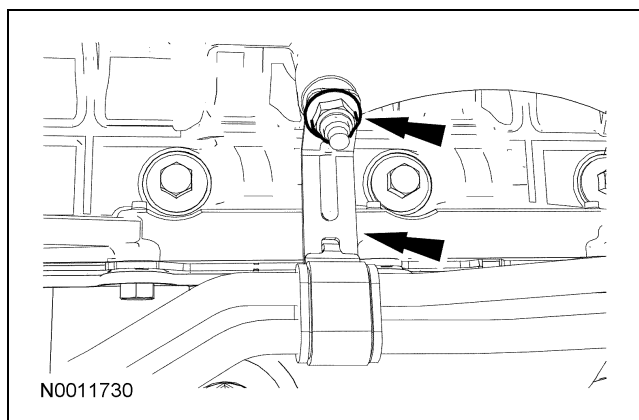


24. **⚠ CAUTION: Do not damage the cooler tubes.**

Disconnect the transmission cooler tubes.

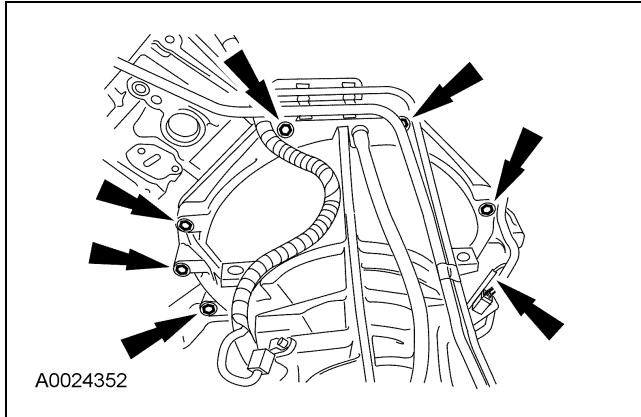


25. Remove the nut and position aside the transmission cooler tube bracket.

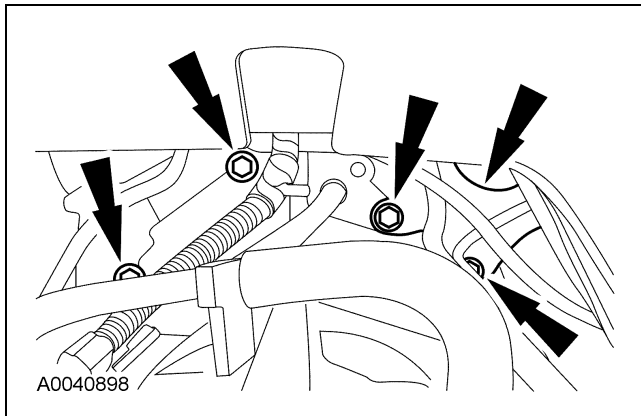


REMOVAL (Continued)**4.6L engine**

26. Remove the 7 engine-to-transmission retaining bolts.

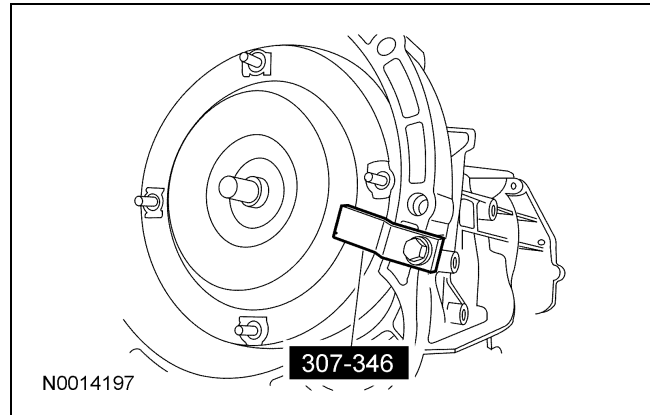
**4.0L engine**

27. Remove the 6 engine-to-transmission retaining bolts and position the fuel line bracket aside.

**All vehicles**

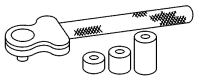
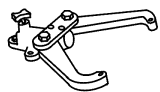
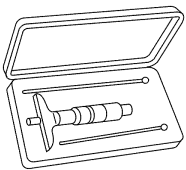
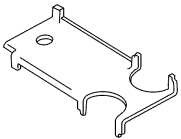
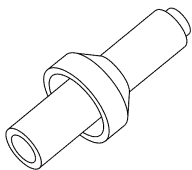
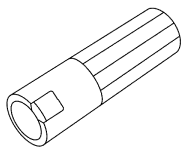
28. Lower the transmission assembly from the vehicle.

29. Install the special tool.



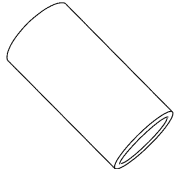
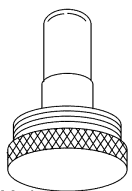
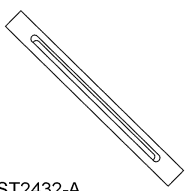
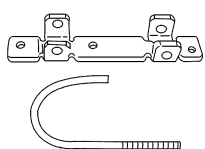
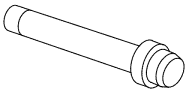
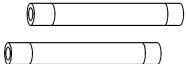
30. Carry out the transmission fluid cooler backflushing and cleaning if the transmission is being overhauled or installing a new or remanufactured transmission. For additional information, refer to Transmission Fluid Cooler — Backflushing and Cleaning in this section.

ASSEMBLY**Transmission****Special Tool(s)**

 ST1792-A	Adjustment Set, Transmission Band 307-S022 (T71P-77370-A)
 ST1186-A	Holding Fixture, Transmission 307-003 (T57L-500-B)
 ST1274-A	Depth Micrometer 303-D026 (D80P-4201-A) or equivalent
 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
 ST1188-A	Installer, Transmission Extension Housing Oil Seal 307-038 (T74P-77052-A)
 ST1826-A	Sizer, Piston Seal 307-338 (T95L-70010-G)

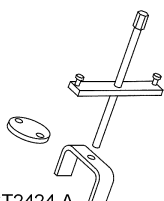
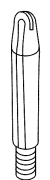
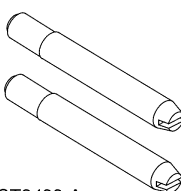
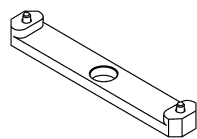
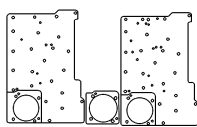
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Special Tool(s)

 ST1817-A	Alignment Set, Fluid Pump 307-S039 (T74P-77103-X)
 ST2532-A	Aligner, Fluid Pump Handle 307-431
 ST2533-A	Aligner, Fluid Pump Pilot 307-432
 ST2432-A	Gauge Bar 307-400
 ST2393-A	Compressor, Servo Cover 307-402
 ST1199-A	Installer, Shift Shaft Fluid Seal 307-050 (T74P-77498-A)
 ST1631-A	Handle, Torque Converter 307-091 (T81P-7902-C)

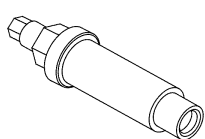
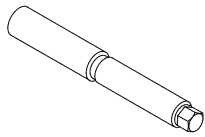
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ASSEMBLY (Continued)**Special Tool(s)**

 ST2424-A	Compressor, Cushion Spring 307-401
 ST1639-A	Aligner, Valve Body 307-334 (T95L-70010-C)
 ST2433-A	Alignment Pins, Transmission Pump 307-399
 ST2426-A	Aligner, Flex Plate 307-403
 ST2538-A	Air Test Plate and Gaskets, Transmission 307-433-01, 307-433-2, 307-433-3

(Continued)

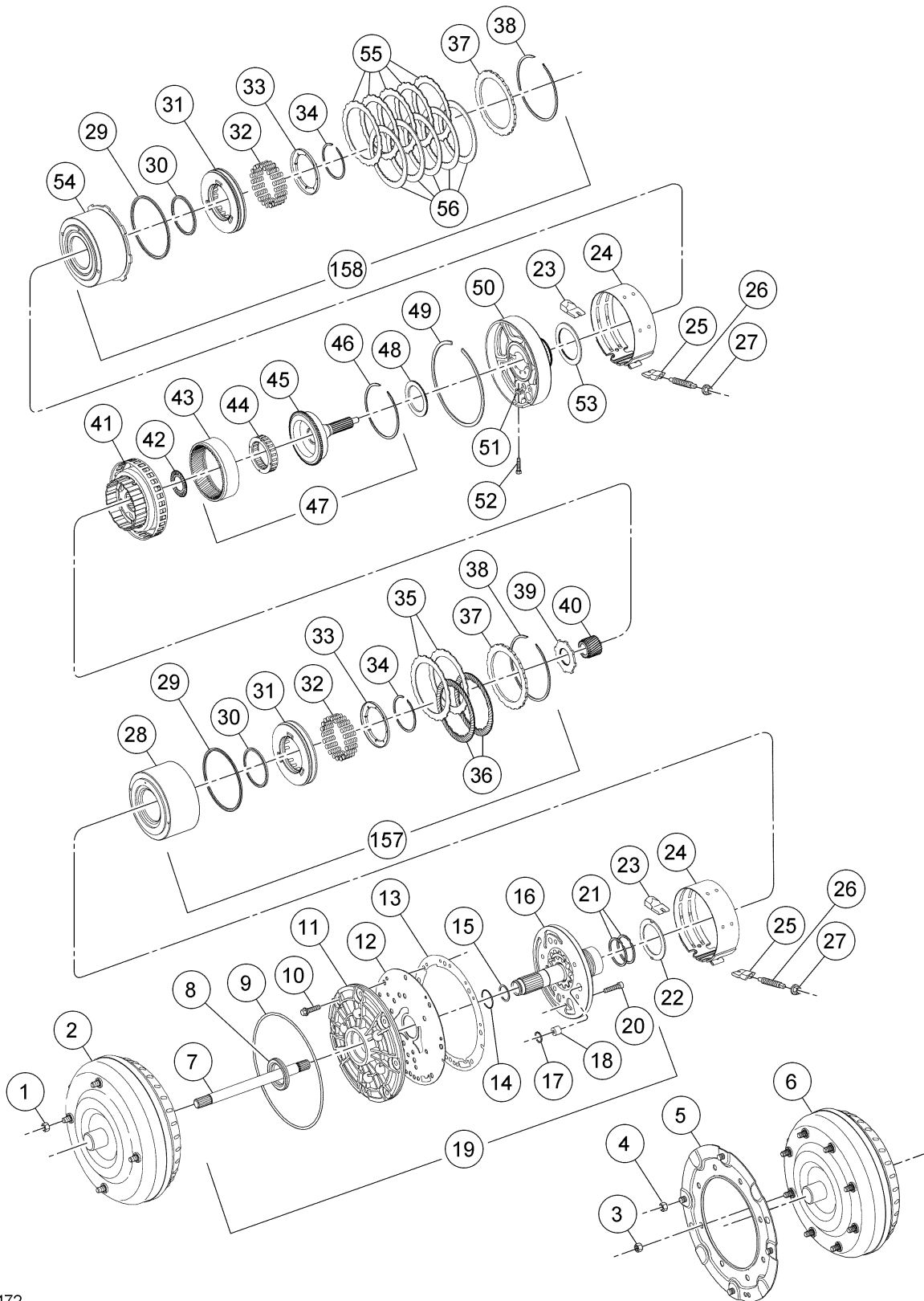
Special Tool(s)

 ST2440-A	Installer, Drive Pinion flange 205-479
 ST2416-A	Installer, Output Shaft Flange 307-404

Material

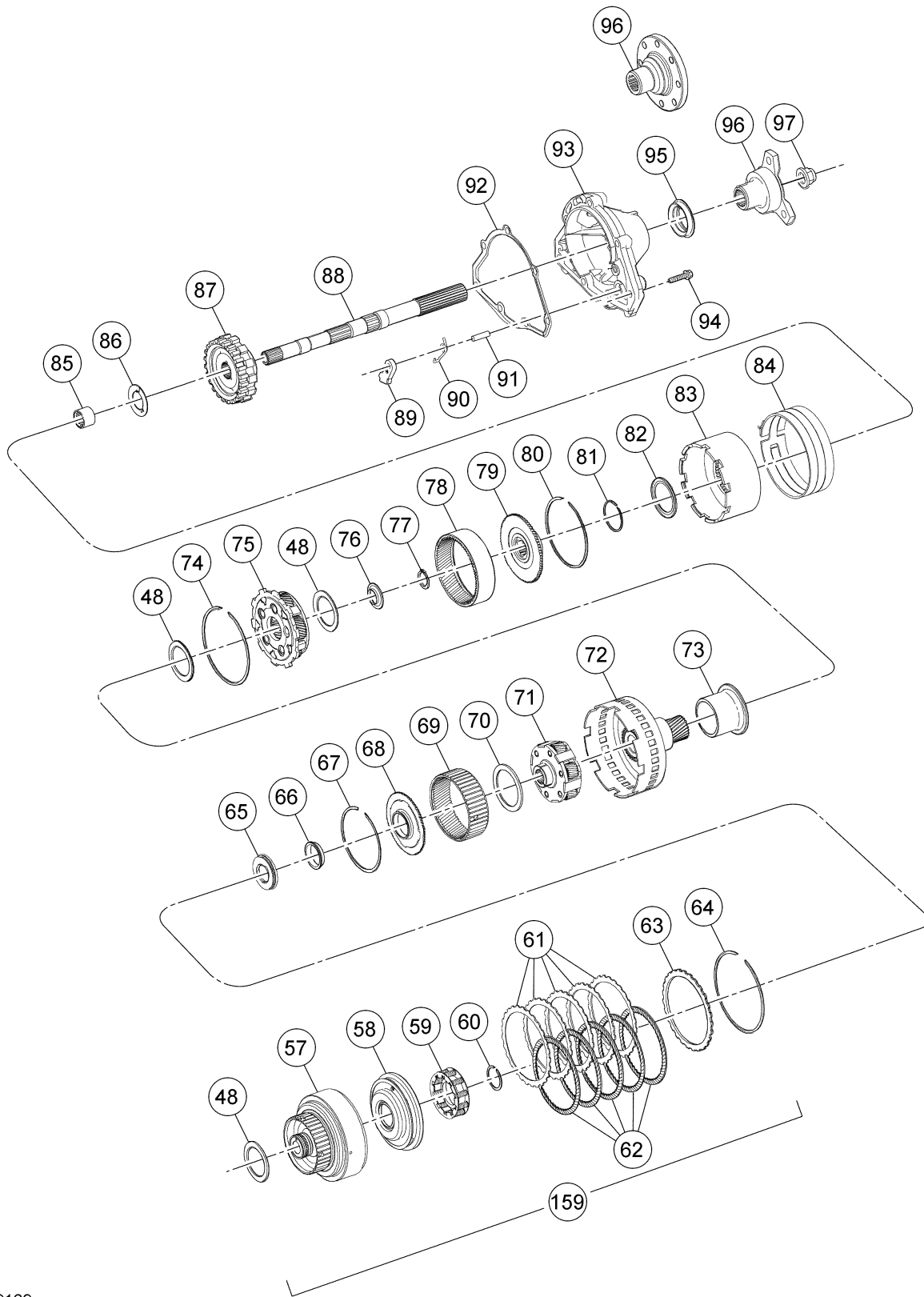
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

ASSEMBLY (Continued)



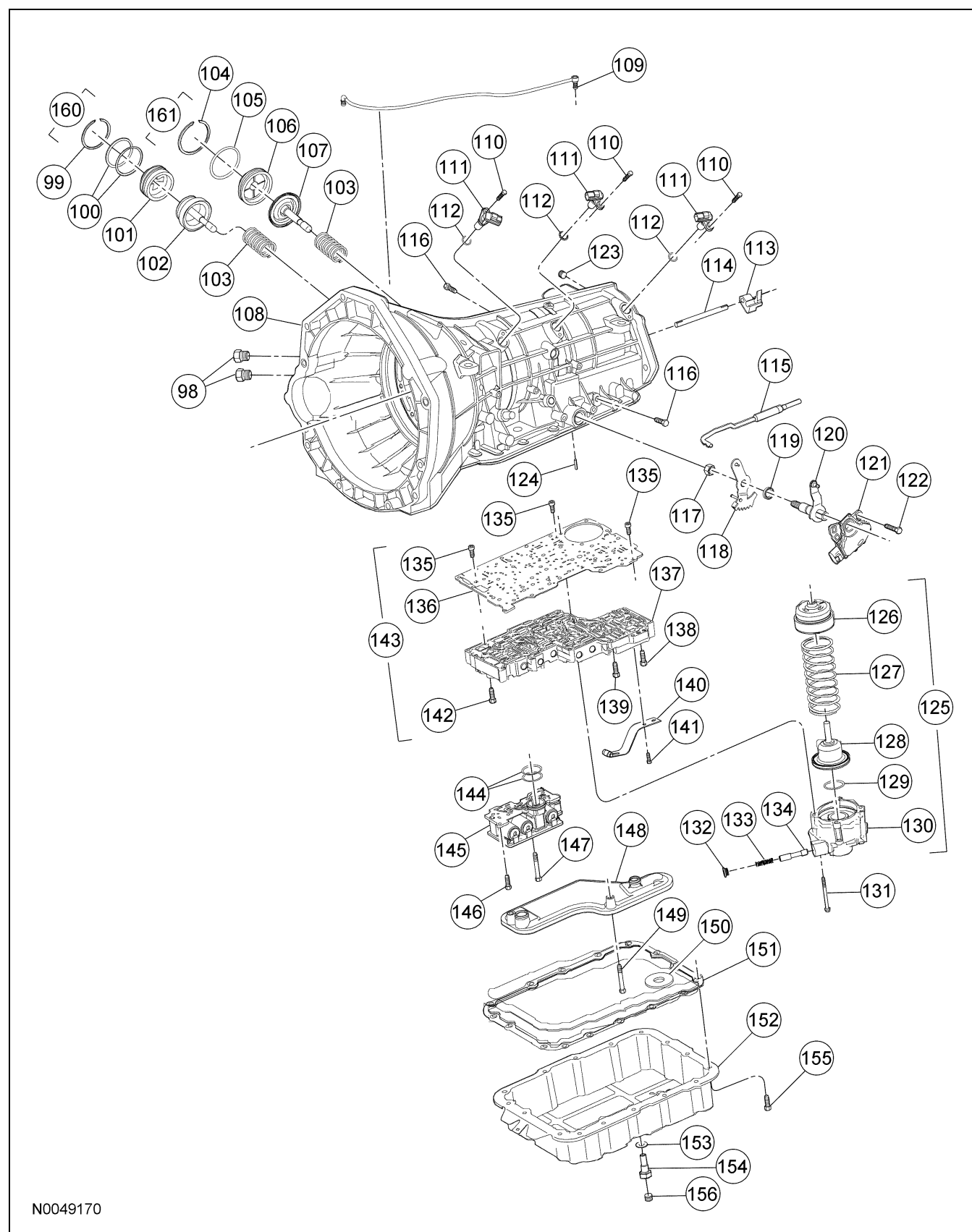
N0051472

ASSEMBLY (Continued)



N0049169

ASSEMBLY (Continued)



ASSEMBLY (Continued)

Item	Part Number	Description
1	7045	Converter-to-flexplate nut (attaches the converter assembly to the flexplate) (4.0L only)
2	7902	Converter assembly
3	N800750	Converter-to-adapter plate nut (attaches the converter assembly to the adapter plate) (8 required) (4.6L only)
4	N800750	Adapter plate-to-flexplate nut (attaches adapter plate to the flexplate) (4 required) (4.6L only)
5	6K374	Adapter plate assembly (4.6L only)
6	7902	Converter assembly
7	7017	Input shaft
8	7A248	Front fluid pump seal assembly
9	7A248	Front fluid pump seal
10	W704892	Screw and washer assembly — M8 x 35 internal lobe (attaches pump to case) (8 required)
11	7G178	Fluid pump cover assembly
12	7B472	Fluid pump adapter plate
13	7A136	Front fluid pump gasket
14	W701431	Fluid pump shaft-to-inner gear O-ring seal (also in pump assembly)
15	7L323	Stator support seal
16	7A108	Front pump support assembly
17	7H416	O-ring
18	7H411	Fluid pump control valve
19	7A103	Fluid pump assembly
20	W701429	M8 x 1 x 35 internal lobe screw (attaches pump support to pump assembly) (6 required)
21	7D025	Overdrive brake drum seal
22	7D014	Fluid pump input thrust washer No. 1
23	7D029	Intermediate and overdrive brake band anchor strut (2 required)
24	7D034	Intermediate and overdrive brake band (2 required)
25	7D029	Intermediate and overdrive brake band apply strut (2 required)

(Continued)

Item	Part Number	Description
26	7C492	Overdrive/intermediate band adjusting screw
27	71000	Overdrive/intermediate locking nut
28	7L669	Overdrive brake band drum assembly
29	7A548	Direct and overdrive piston outer seal
30	7D404	Direct and overdrive piston inner seal
31	7A262	Direct and overdrive clutch piston
32	7A480	Direct and overdrive clutch piston spring
33	7A527	Clutch piston spring retainer (2 required)
34	E860125	Retaining ring (retains 7D041 to drum) (2 required)
35	7B442	Coast clutch external splined plate (steel) (2 required)
36	7B164	Coast clutch internal splined friction plate (2 required)
37	7B066	Coast and direct clutch pressure plate (2 required)
38	E860126 — E860129	Coast and direct clutch plates retaining ring (select fit) (2 required)
39	7660	Coast clutch to overdrive carrier adapter
40	7D063	Overdrive sun gear
41	7B446	Overdrive planetary gear carrier (with trigger wheel)
42	7L495	Overdrive planet thrust bearing No. 2
43	7A153	Overdrive ring gear
44	7A089	Center shaft one-way clutch assembly
45	7A658	Overdrive center shaft
46	W702037	Retaining ring (retains 7686 to 7653)
47	7L678	Hub and ring gear assembly (includes 7C109, 7A153, 7A658, W702037)
48	7M153	Center shaft and forward clutch cylinder bearing assembly No. 3, No. 5, No. 8 and No. 9 (4 required)
49	W702465	Retaining ring
50	7A130	Center support assembly

(Continued)

ASSEMBLY (Continued)

Item	Part Number	Description
51	E826160	Nut and cage assembly (attaches center support to case)
52	W705407	Bolt
53	7D014	Intermediate clutch drum bearing No. 4
54	7D044	Intermediate brake drum assembly
55	7B442	Direct clutch external splined steel plates (5 required)
56	7B164	Direct clutch internal splined friction plates (5 required)
57	7A360	Forward clutch cylinder
58	7A262	Forward clutch piston assembly
59	7G299	Forward clutch support and spring assembly
60	E860109	Forward clutch piston and spring retaining ring in forward clutch cylinder
61	7B442	Forward clutch external spline steel plate (5 required)
62	7B164	Forward clutch internally spline friction plate (5 required)
63	7B066	Forward clutch pressure plate
64	7D483	Retaining ring 141.45 x 1.37 internal (select fit)
65	7D234	Forward ring gear hub thrust bearing No. 6A
66	7D090	Forward clutch thrust washer No. 6B
67	7G375	Forward clutch hub retainer ring
68	7B067	Forward ring gear hub
69	7D392	Forward ring gear
70	7F374	Forward planet thrust bearing No. 7
71	7A398	Forward planetary
72	7A019	Shell and sun gear assembly
73	7C167	Low and reverse spacer gear
74	W702775	Reverse carrier drum snap ring
75	7D006	Reverse planet assembly
76	7B176	Output shaft sleeve
77	E860527	External retainer ring
78	7A153	Output shaft ring gear
79	7D164	Output shaft hub

(Continued)

Item	Part Number	Description
80	7C122	Output shaft ring gear retaining ring
81	7D019	Output shaft hub seal
82	7H027	Low/intermediate sun gear bearing assembly
83	7C498	Reverse brake drum and clutch assembly (includes OWC)
84	7D095	Low/reverse band assembly
85	7R205	Output shaft bearing
86	7B368	Output shaft thrust washer No.11
87	7A233	Transmission parking gear assembly
88	7060	Output shaft
89	7A441	Parking pawl
90	7D070	Parking pawl return spring
91	7D071	Parking pawl shaft
92	7086	Extension housing gasket
93	7A039	Extension housing
94	W500311	M8 x 1.25 extension housing-to-case screw (5 required)
95	7052	Extension housing seal
96	7089	Output shaft flange
97	W701357	Output shaft flange nut
98	7D273	Fluid tube connector assembly (2 required)
99	7H074	Ring overdrive servo retainer
100	W703119	Overdrive servo cover seal (2 required)
101	7D027	Overdrive servo cover
102	7D021	Overdrive servo piston and rod
103	7D028	Intermediate/overdrive servo piston spring (2 required)
104	W702777	Ring intermediate servo retainer
105	W702969	Intermediate servo cover seal
106	7D027	Intermediate servo cover
107	7D021	Intermediate servo piston and rod
108	7005	Case assembly
109	7034	Case vent assembly
110	W708389	Speed sensor-to-case screw (M6 x 19)

(Continued)

ASSEMBLY (Continued)

Item	Part Number	Description
111	7H103	Output shaft speed, turbine shaft speed and intermediate shaft speed sensors
112	W702981	Speed sensor-to-case O-ring seal
113	7A179	Reverse brake drum lever
114	7D433	Reverse band actuating lever shaft
115	7A232	Parking pawl actuating rod
116	390318	Pipe plug
117	W703001	Manual lever shaft outer and inner nut
118	7A115	Manual valve inner lever
119	7B498	Manual control lever seal
120	7A256	Manual control lever
121	7F293	Digital transmission range (TR) sensor
122	W500015	Digital TR sensor screw and washer (2 required)
123	6026	Fluid fill plug
124	7B210	Manual lever shaft pin retainer
125	7B193	Reverse servo assembly
126	7D372	Reverse servo plate
127	7D466	Reverse servo accumulator spring
128	7D189	Reverse servo piston and seal
129	7423	Reverse servo piston O-ring seal
130	7D036	Reverse servo cover
131	W702359	Reverse servo piston-to-case screw (4 required)
132	7D321	Control valve spring retainer
133	7A270	Main fluid pressure spring regulator valve
134	7D488	Reverse servo check valve
135	W701099	Main control valve body separating plate screw
136	7Z490	Main control valve body separating plate (bonded)
137	7A101	Lower main control valve body

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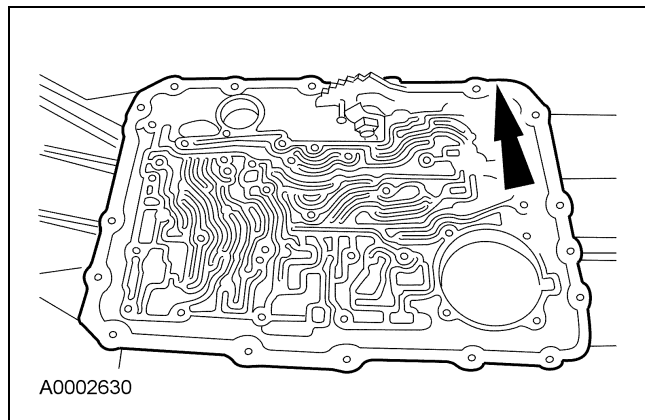
Item	Part Number	Description
138	W500102	Main control valve body screws (18 required)
139	W702791	Main control valve body screw
140	7E332	Manual valve detent spring
141	W500100	Screw detent spring
142	W706672	Main control valve body screw
143	7A100	Main control valve body
144	W705928	Solenoid body connector O-ring seal
145	7G391	Transmission control solenoid body
146	W702921	Transmission control solenoid body screw
147	W703189	Transmission control solenoid body screws (7 required)
148	7A098	Transmission fluid pan filter
149	W705559	Transmission fluid pan filter screws
150	7L027	Transmission fluid pan magnet
151	7A191	Transmission fluid pan gasket
152	7A194	Transmission fluid pan
153	6734	Transmission fluid pan drain plug gasket
154	7A010	Transmission fluid pan drain plug
155	W500213	Transmission fluid pan screw
156	W707919	Transmission fluid pan drain tube plug (short hex)
157	—	Overdrive/coast clutch assembly
158	—	Direct clutch assembly
159	—	Forward clutch assembly
160	—	Overdrive servo
161	—	Intermediate servo

1. Thoroughly clean the transmission case and extension housing in solvent and blow dry with compressed air.

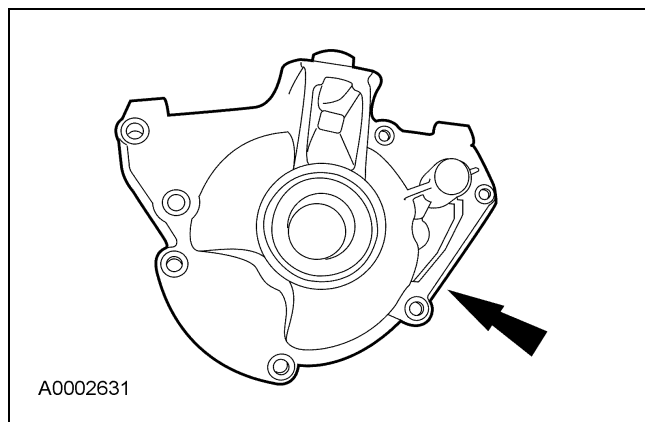
ASSEMBLY (Continued)

2. Inspect the transmission case for the following:

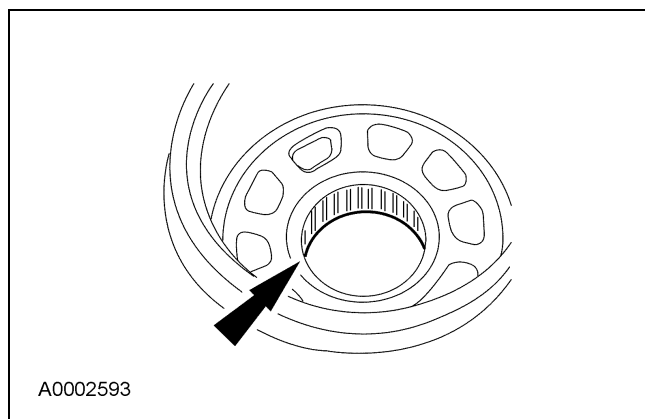
- Stripped bolt hole threads.
- Gasket and mating surfaces for burrs or nicks.
- Obstructions to vent and fluid passages.
- Cracks or warpage.



3. Inspect the extension housing for cracks, burrs or warpage.

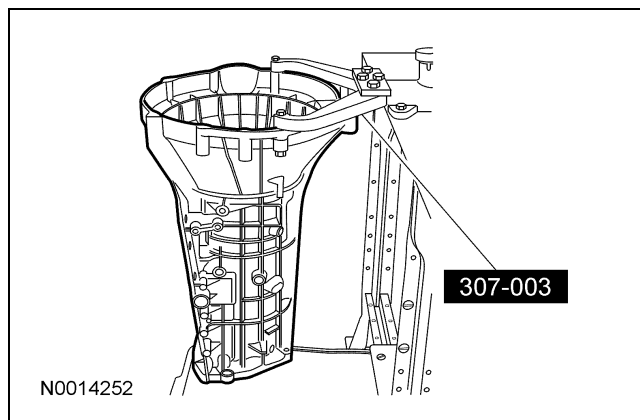


4. Inspect the case bearing for damage. If damage to the case bearing is indicated, install a new case.

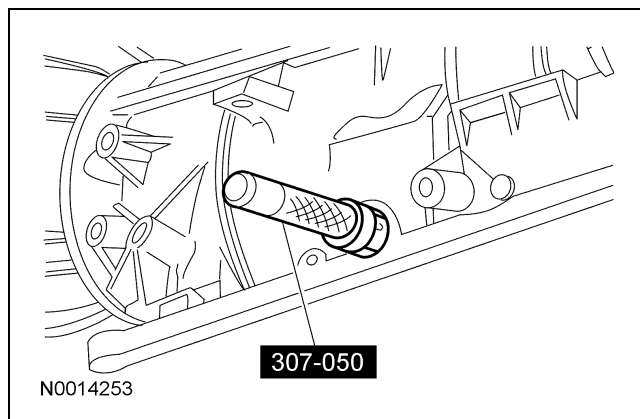


5. **⚠ WARNING: Make sure the lockpin on bench-mounted holding fixture is secure. Failure to follow these instructions may result in personal injury.**

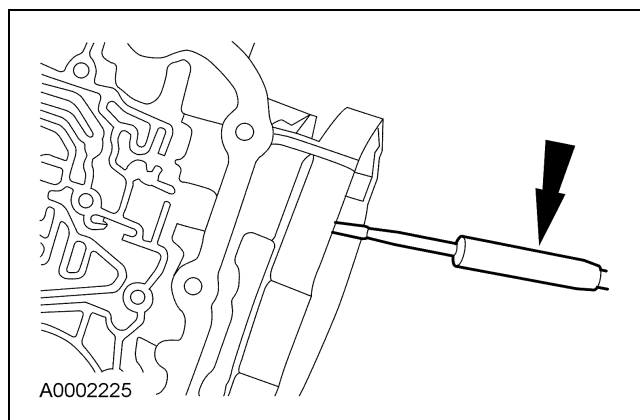
Using the special tool, install the transmission into the bench with the converter housing facing up.



6. Using the special tool, install the manual control lever shaft seal and lubricate it with petroleum jelly.

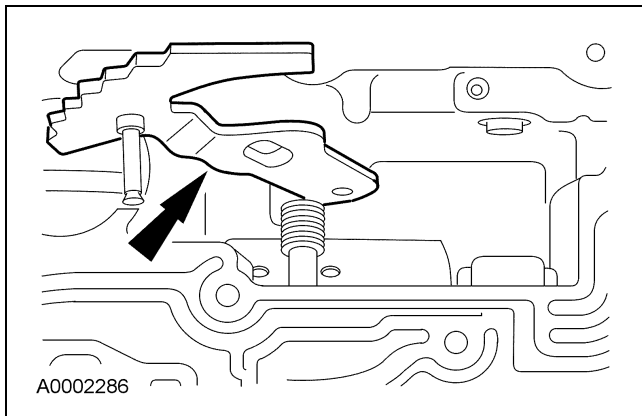


7. Install the parking lever rod.

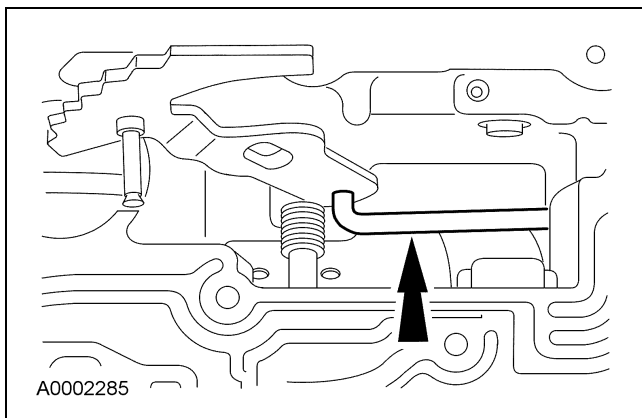


ASSEMBLY (Continued)

8. Install the manual control lever.

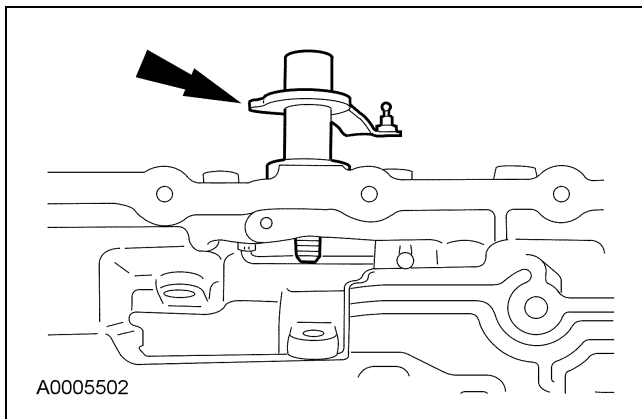


9. Assemble the manual valve inner lever and parking lever actuating rod as shown.

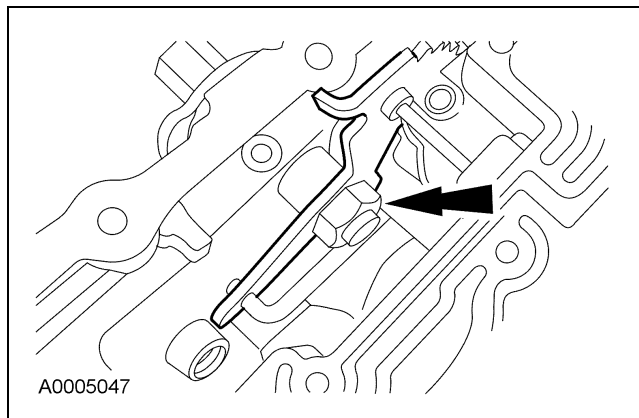


10. **⚠ CAUTION:** Align the flats on the manual valve inner lever with the flats on the manual control lever shaft.

Install the manual control lever shaft.



11. Install the manual valve inner lever onto the manual shaft and loosely install the nut.

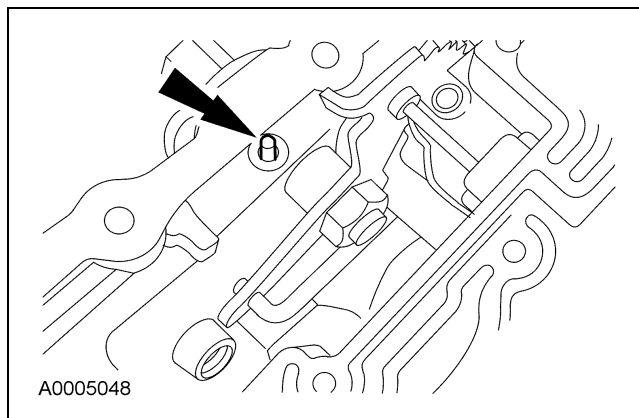


12. **⚠ CAUTION:** Use care not to damage the fluid pan rail surface when installing the retaining pin.

NOTE: Align the manual control lever shaft alignment groove with the manual control lever shaft spring pin bore in the transmission case.

Install the manual control lever shaft spring pin.

- Tap the manual control lever shaft spring pin into the transmission case.

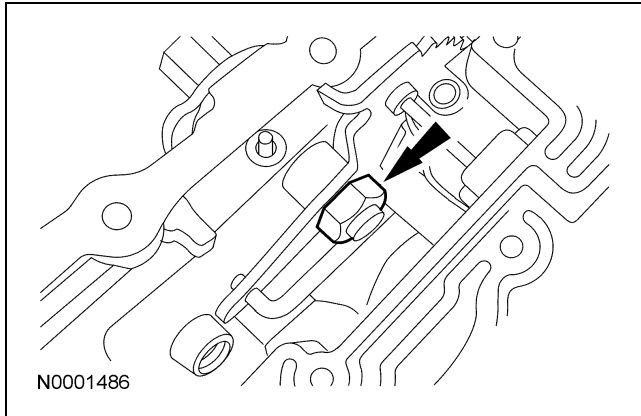


ASSEMBLY (Continued)

13.  **CAUTION:** To avoid damage, do not allow the wrench to strike the manual valve inner lever pin.

Tighten the nut.

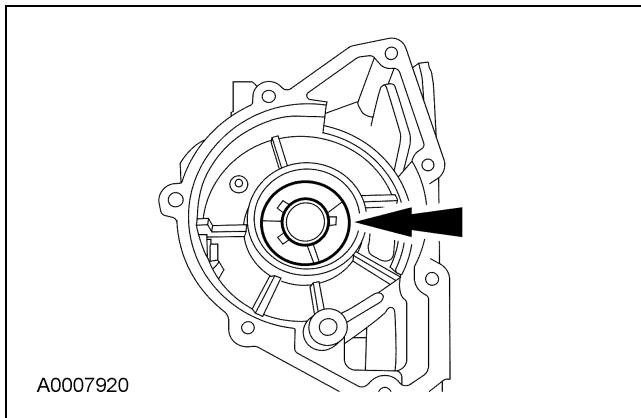
- Tighten to 48 Nm (35 lb-ft).



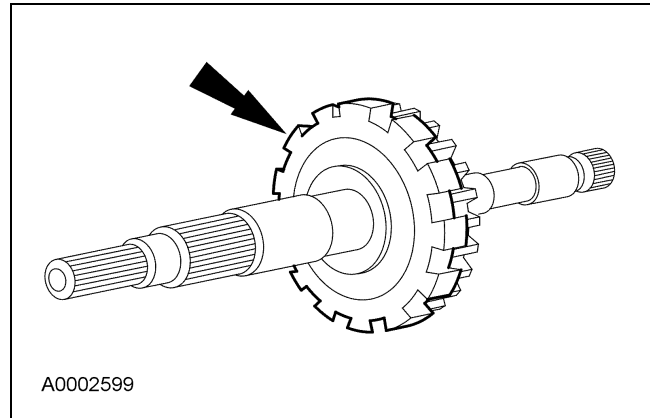
14.  **CAUTION:** The tabs on the output shaft thrust washer (No. 11) point into the case. Make sure the thrust washer is correctly seated.

Install the output shaft thrust washer (No. 11).

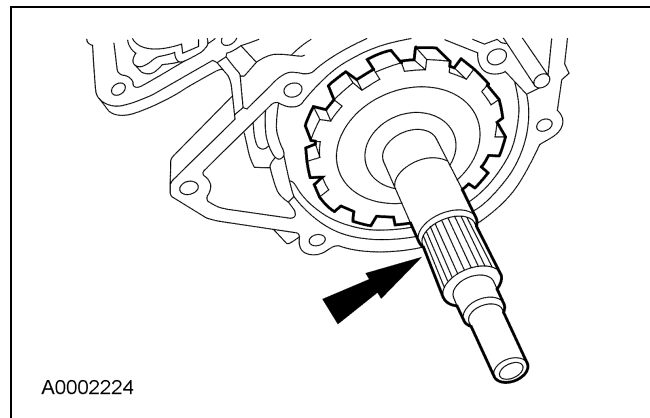
- Coat the output shaft thrust washer with petroleum jelly.



15. Install the park gear on the output shaft.

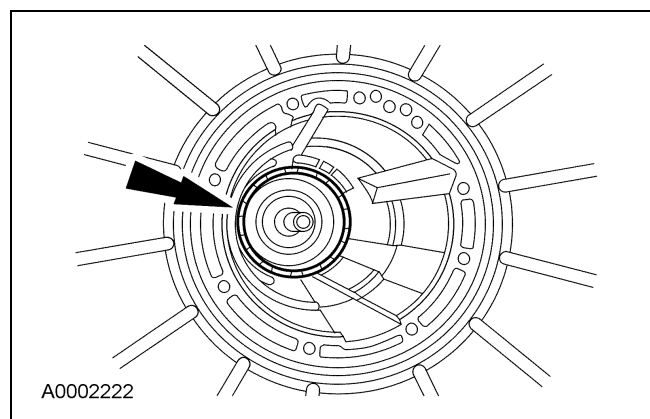


16. Install the output shaft and park gear.



17. Install the low/reverse brake drum.

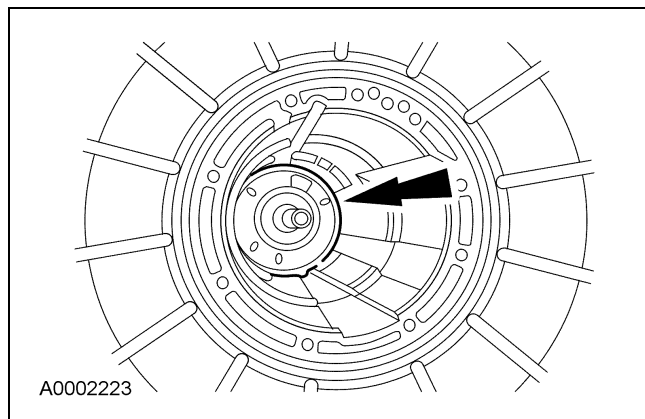
- Rotate the low/reverse brake drum clockwise to install.



ASSEMBLY (Continued)

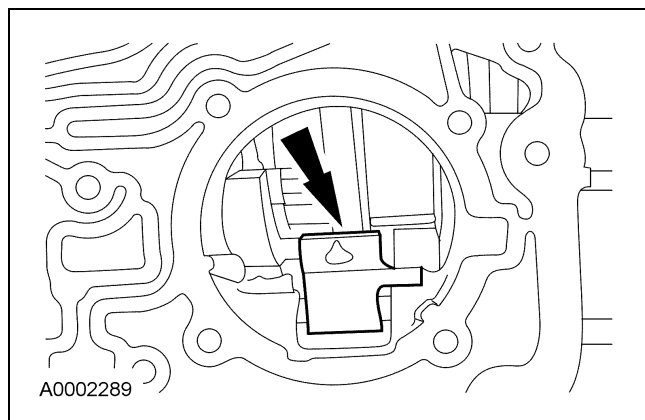
18.  **CAUTION:** Make sure band is resting on the 2 anchor pins in the case.

Install the low/reverse band over the reverse drum.

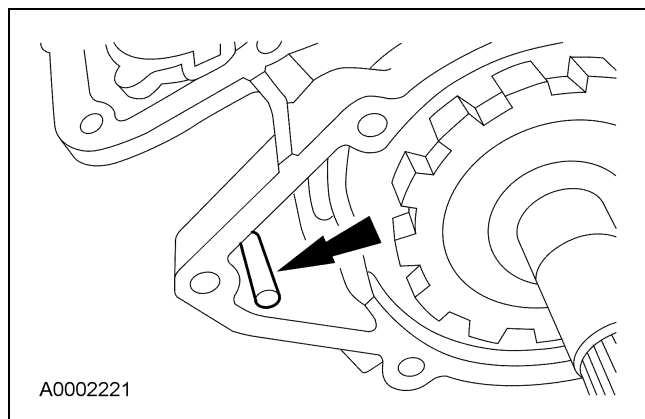


19. **NOTE:** The reverse band actuating lever must fit into the notches in the band.

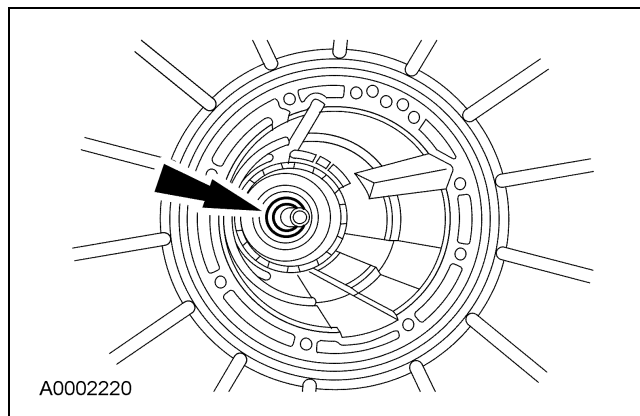
Install the reverse band actuating lever into the reverse band.



20. Install the reverse band actuating lever shaft into the case and into the reverse band actuating lever.

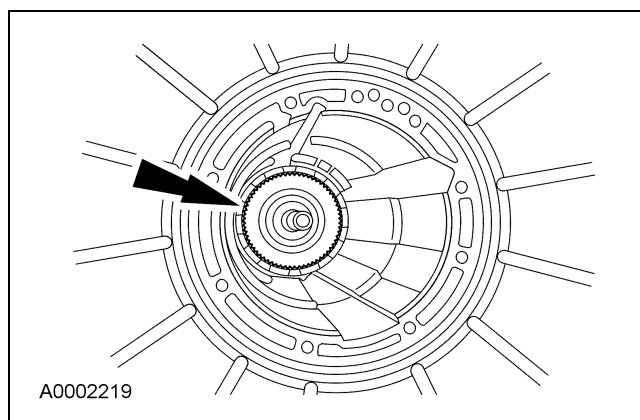


21. Install the No. 10 needle bearing into the case.



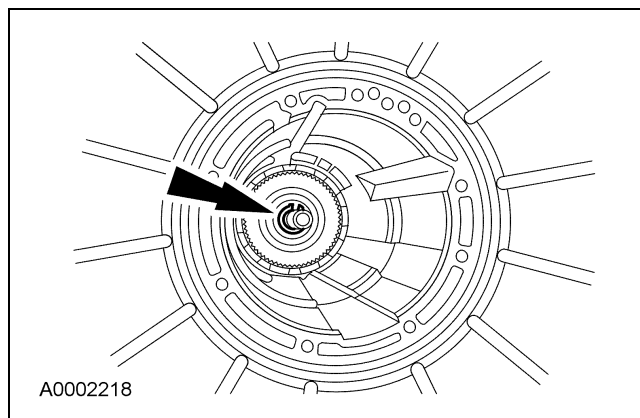
22.  **CAUTION:** Do not damage the seal against the case during assembly.

Install the output shaft ring gear, hub and seal.



23.  **CAUTION:** Always install a new output shaft retaining ring.

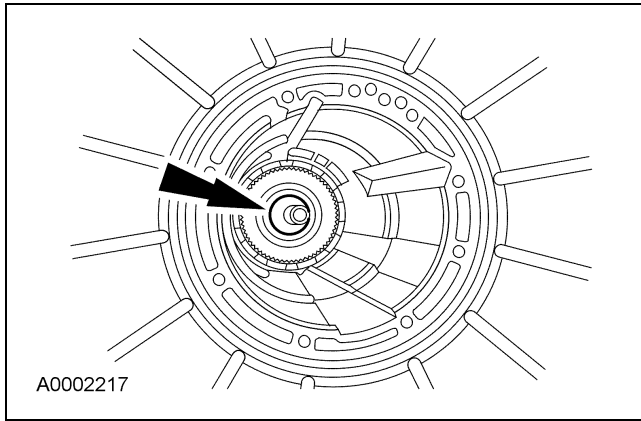
Install a new output shaft retaining ring.



ASSEMBLY (Continued)

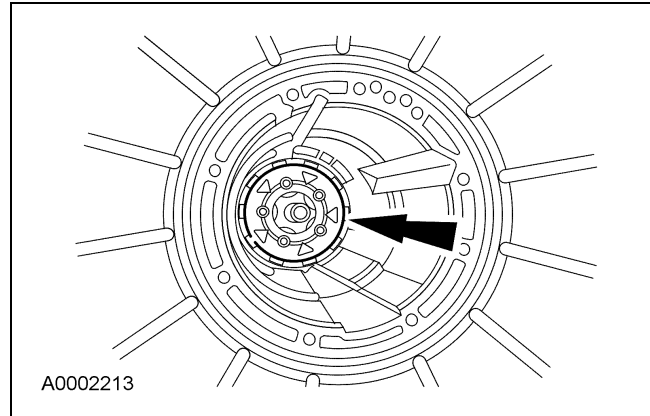
24. **NOTE:** Install the output shaft sleeve with the cone facing up. This sleeve will snap into place when correctly installed.

Install the output shaft sleeve.

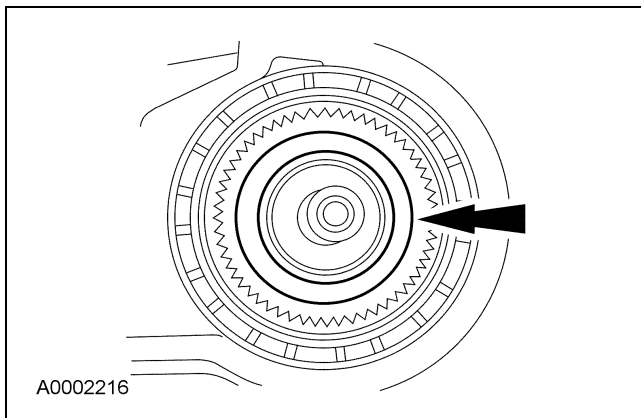


27. **⚠ CAUTION:** The low/reverse brake drum must be pulled forward to install the low/reverse planet retaining ring.

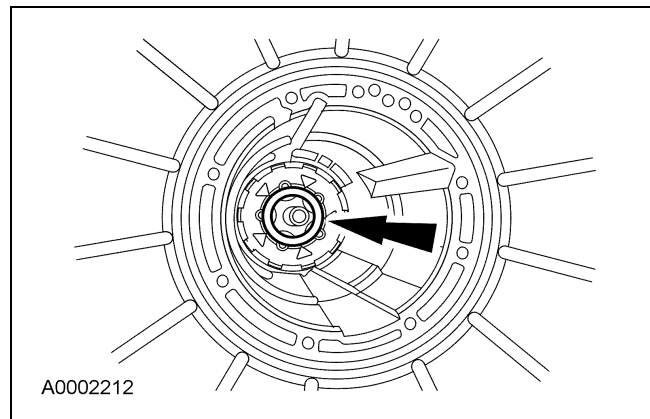
Install the retaining ring.



25. Install low/reverse planetary carrier needle bearing (No. 9) onto the output shaft ring gear and hub assembly.

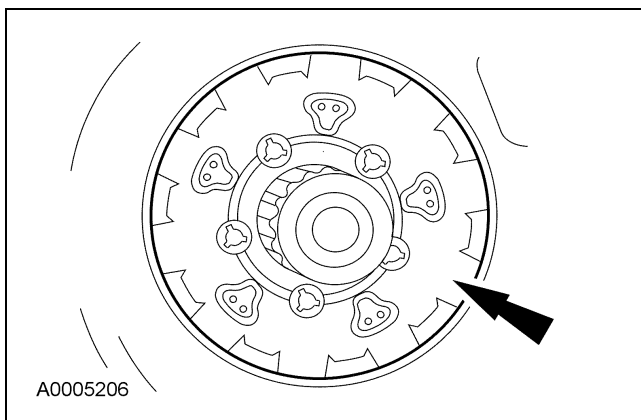


28. Install the No. 8 thrust bearing.

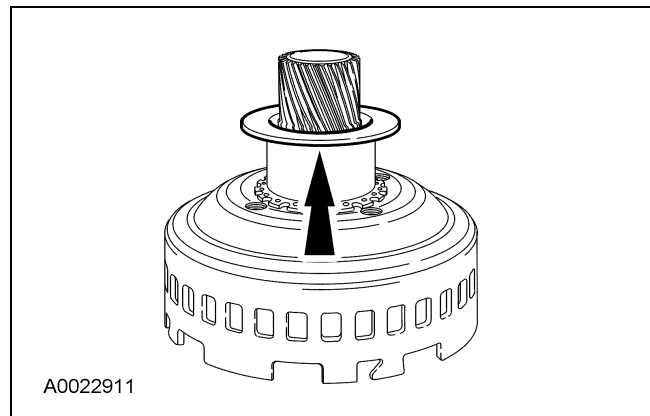


26. **⚠ CAUTION:** Make sure the needle bearings stay in place.

Install the low/reverse planetary assembly.

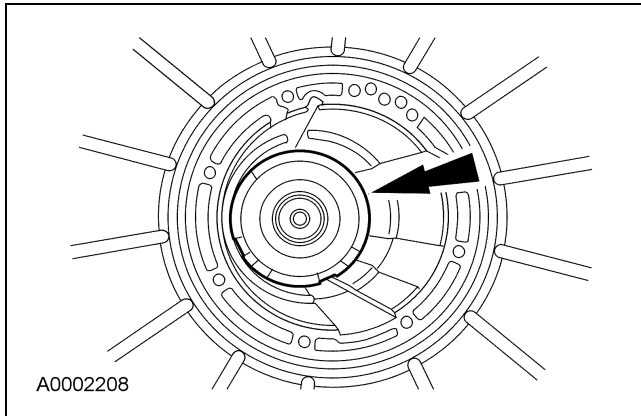


29. Install the spacer on the input shell, using petroleum jelly to hold it in place.



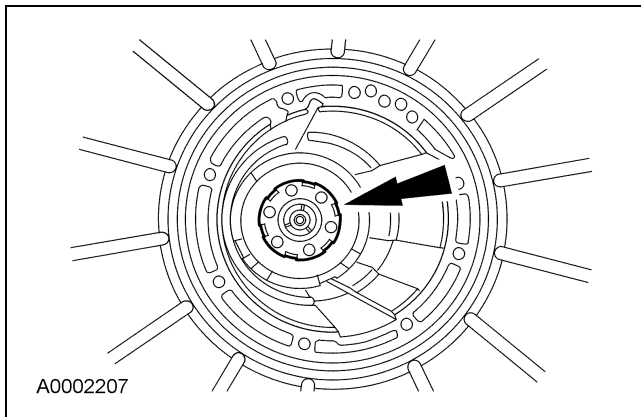
ASSEMBLY (Continued)

30. Install the input shell and sun gear assembly.

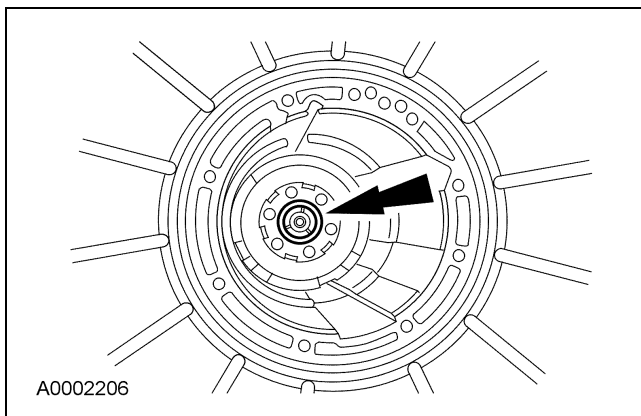


31. **NOTE:** The No. 13 bearing must be correctly seated in the forward planet assembly so the sun gear can be installed correctly.

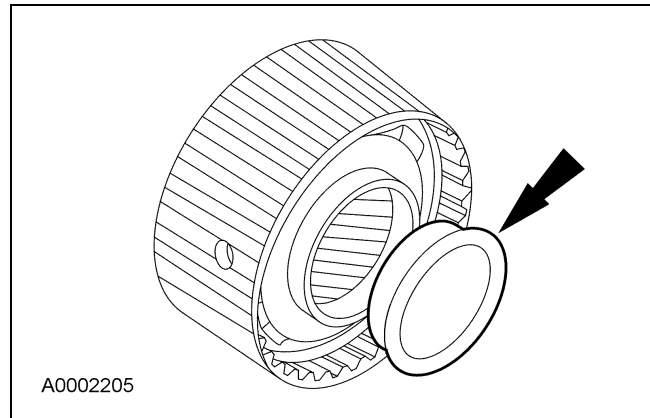
Install the forward planetary assembly.



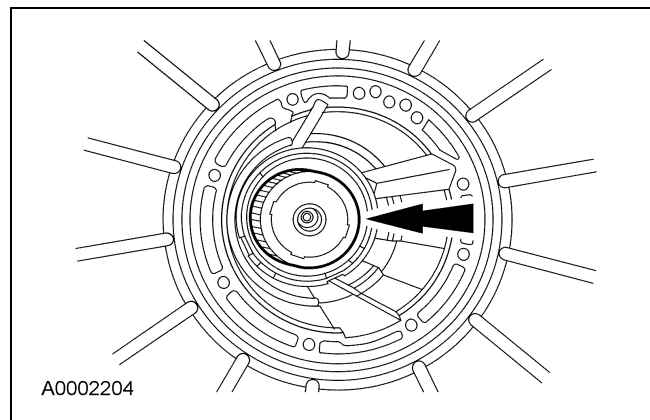
32. Install the No. 7 forward planet thrust bearing into the forward ring gear and hub assembly. Use petroleum jelly to hold the bearing in place.



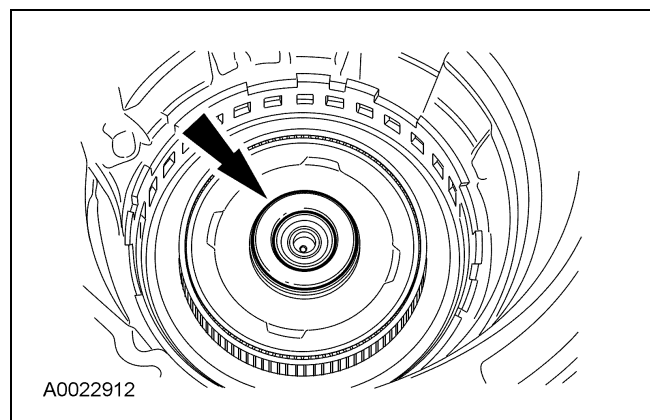
33. Install the No. 6B forward clutch thrust washer onto the forward ring gear hub.



34. Install the forward ring gear and hub as an assembly.

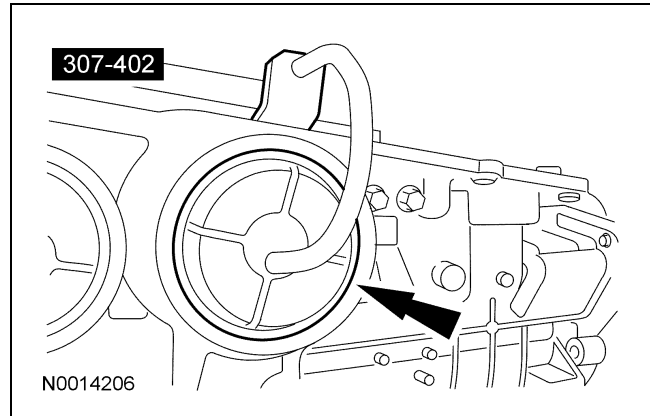
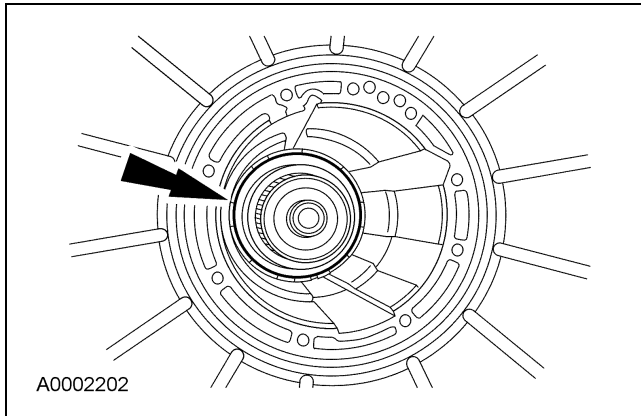


35. Install the No. 6A forward ring gear hub thrust bearing into the forward ring gear and hub.

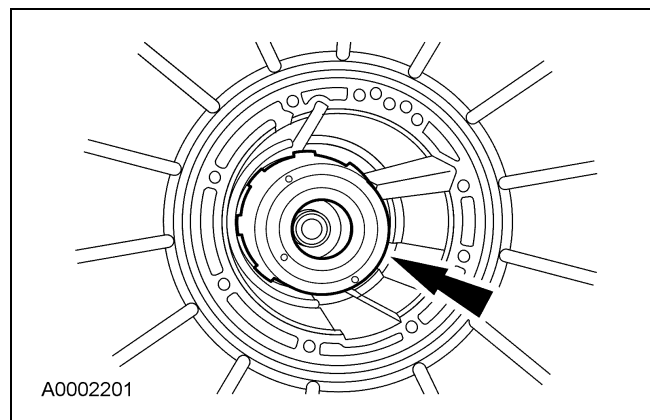
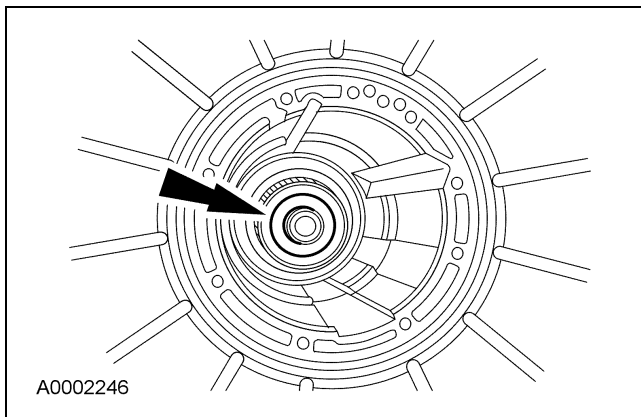


ASSEMBLY (Continued)

36. Install the forward clutch cylinder.

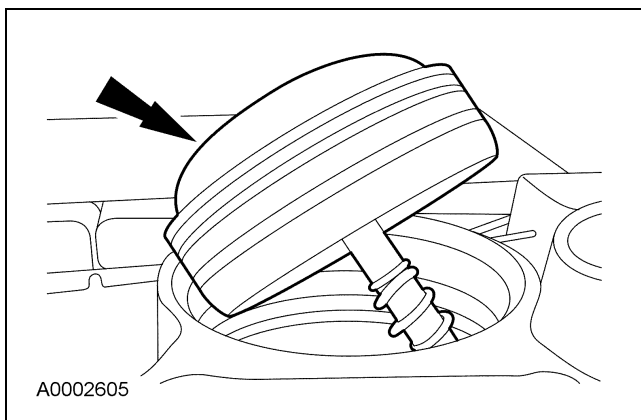


37. Install the No. 5 thrust bearing.

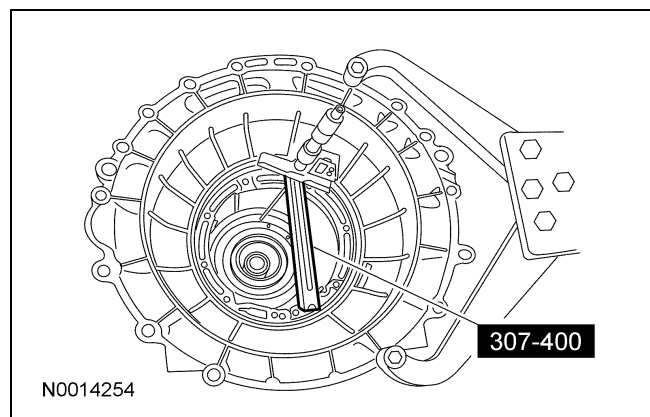


38. Install the intermediate servo piston and spring.

- Lubricate the servo bore with clean automatic transmission fluid.



41. Using a depth micrometer with an 8-inch extension, measure from the top of the gauge bar to center support ledge in the case at 4 places 90 degrees apart.
- Add the 4 measurements, divide by 4, and record as dimension A.



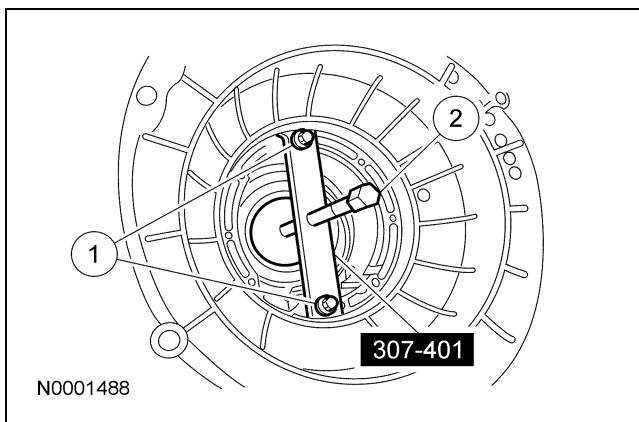
39. Using the special tool, install the retaining ring.

ASSEMBLY (Continued)

42.  **CAUTION:** The torque specifications are critical for this procedure. Failure to use the correct torque specifications may cause transmission damage.

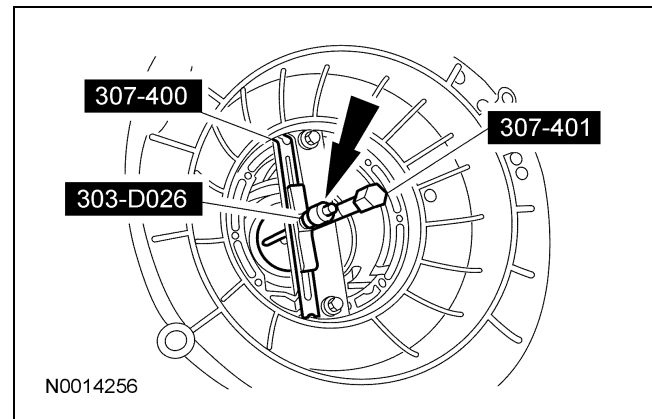
Install the special tool.

- 1 Install the special tool and the bolts using the 2 pump screw locations at approximately 6 and 12 o'clock positions.
 - Tighten to 15 Nm (11 lb-ft).
- 2 Tighten the center screw.
 - Tighten to 1.13 Nm (10 lb-in).



43. **NOTE:** Align the disc holes on special tool with the slot in gauge bar for correct measurement.

Measure the distance from the top of the gauge bar to the drum bearing surface through the hole in the disc and record as dimension B. Repeat the measurement 180 degrees on the opposite side of the special tool and record as dimension C.



44. Add dimension B to C, divide by 2, and record as dimension D.
45. Subtract A from D and record as dimension E.
46. Select bearing from the following chart, using dimension E.

Dimension E	Service Part Number (7D014)	Bearing Thickness	Identification (Notches)
1.69-1.87 mm (0.066-0.074 in)	XW4Z-CA	2.65-2.80 mm (0.104-0.110 in)	None
1.88-2.04 mm (0.073-0.080 in)	XW4X-DA	2.83-2.98 mm (0.111-0.116 in)	One
2.05-2.22 mm (0.081- 0.088 in)	XW4Z-EA	3.01-3.16 mm (0.118-0.124 in)	Two
2.23-2.43 mm (0.088-0.096 in)	XW4Z-FA	3.21-3.36 mm (0.126-0.132 in)	Three

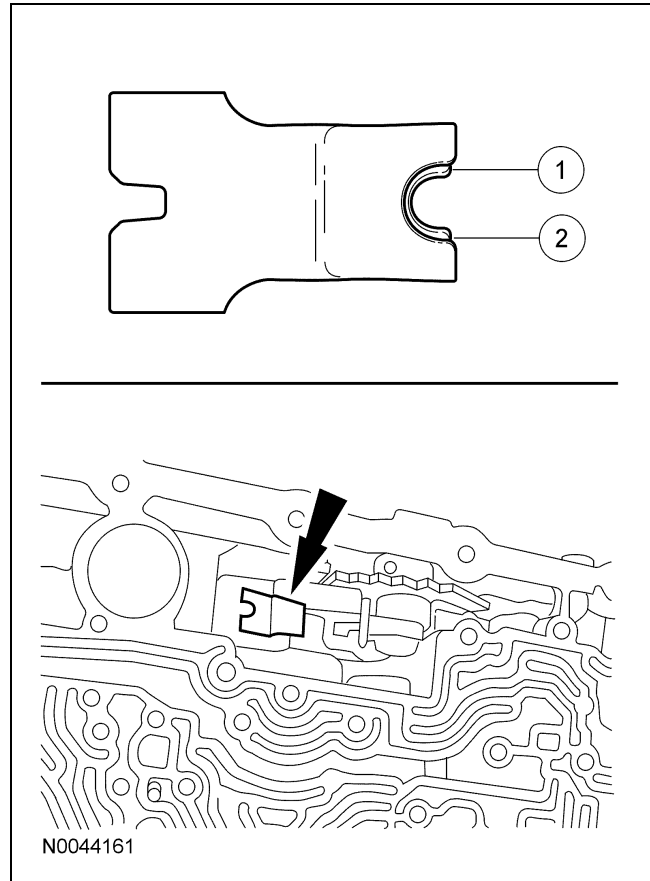
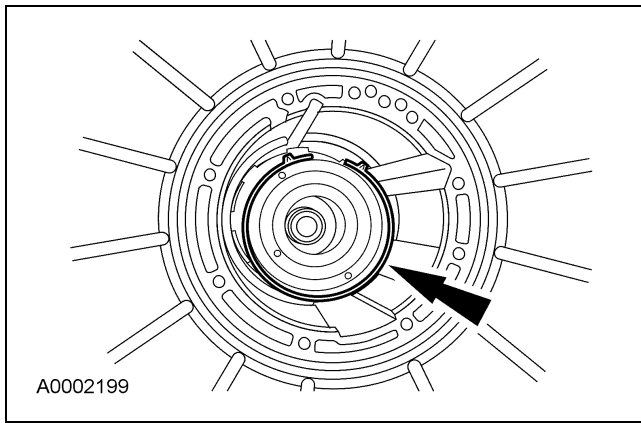
ASSEMBLY (Continued)

47. **NOTE:** Make sure that the intermediate band apply strut is aligned with the band notch.

NOTE: If the intermediate band is reused, it must be installed in the same position as when removed.

NOTE: The new intermediate band is dark in color. This is a normal condition of the band. Hairline cracks in the band are also considered normal. Do not install a new band based solely on the color.

Install the intermediate band.



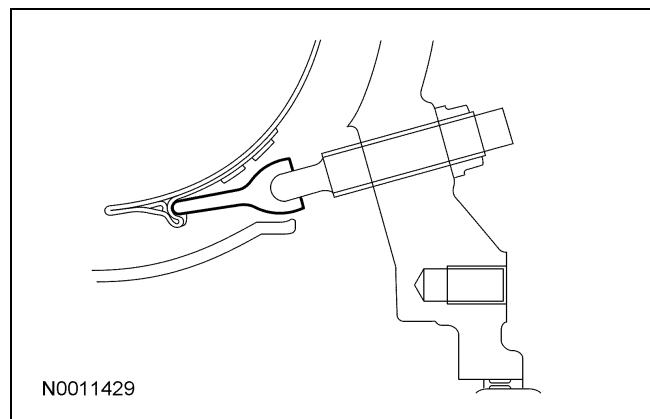
48. **CAUTION:** To avoid a “fall-out” condition of the strut from the screw during assembly and function, the small “U” shaped notch should be toward the band/case side and the large “U” shaped notch toward the main control side.

Install the intermediate band anchor strut.

- 1 Band/case side of the anchor (small U notch).
- 2 Main control side of the anchor (large U notch).

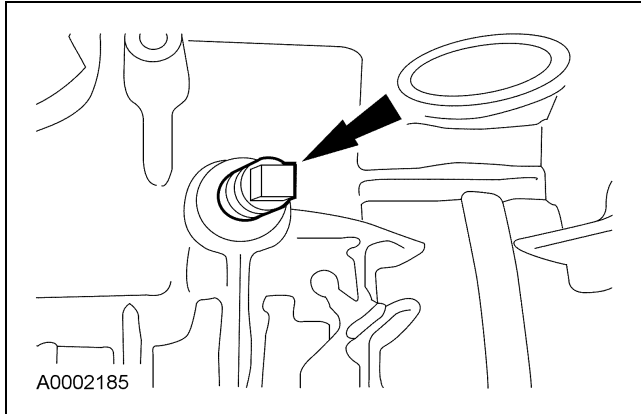
49. **CAUTION:** If the strut is installed incorrectly, transmission damage will occur.

Check to make sure that the intermediate band anchor strut is installed in the correct orientation to the case and adjustment screw.

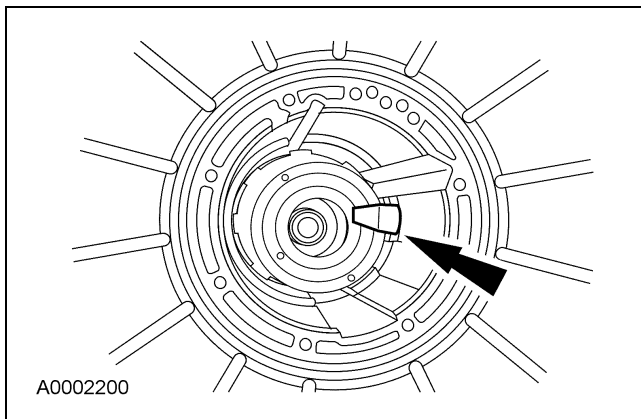


ASSEMBLY (Continued)

50. Loosely install the screw.

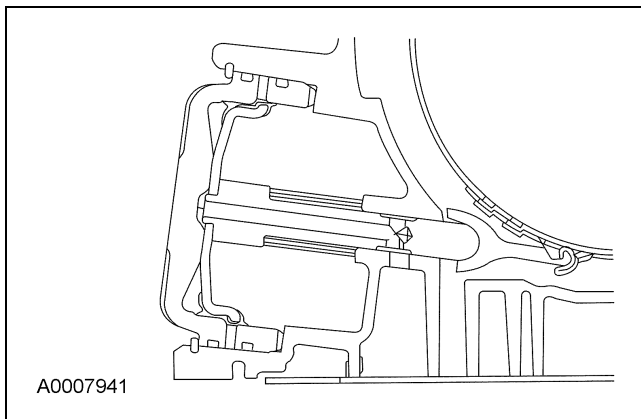


51. Install the intermediate band apply strut.



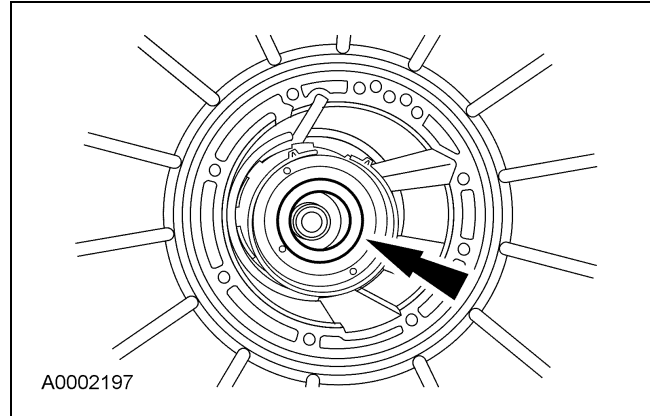
52. **CAUTION: If the strut is installed incorrectly, transmission damage will occur.**

Check to make sure that the intermediate band apply strut is installed in the correct orientation to the case and piston rod.



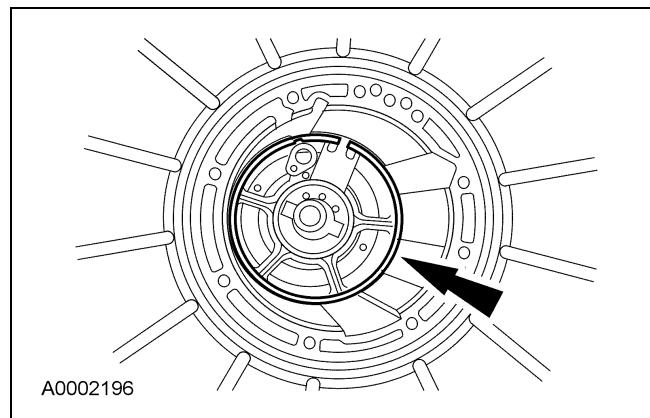
53. Install the selected No. 4 thrust washer on the direct clutch drum.

- Coat the thrust washer with petroleum jelly.

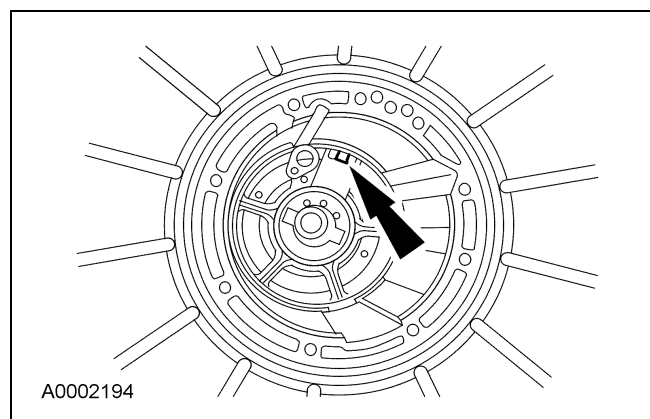


54. **NOTE:** Align the center support screw hole with correct case hole.

Install the center support.

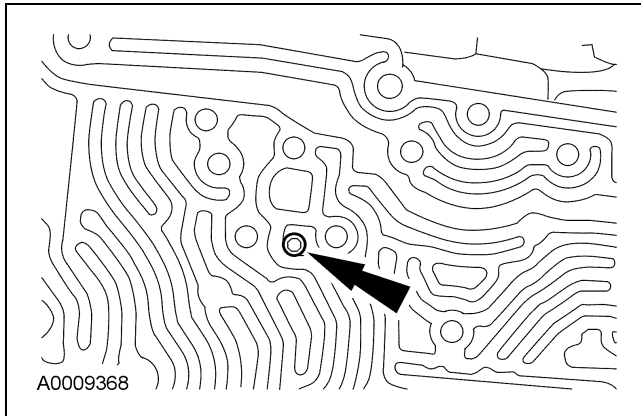


55. Install the center support locknut and cage.



ASSEMBLY (Continued)

56. Loosely install the screw.

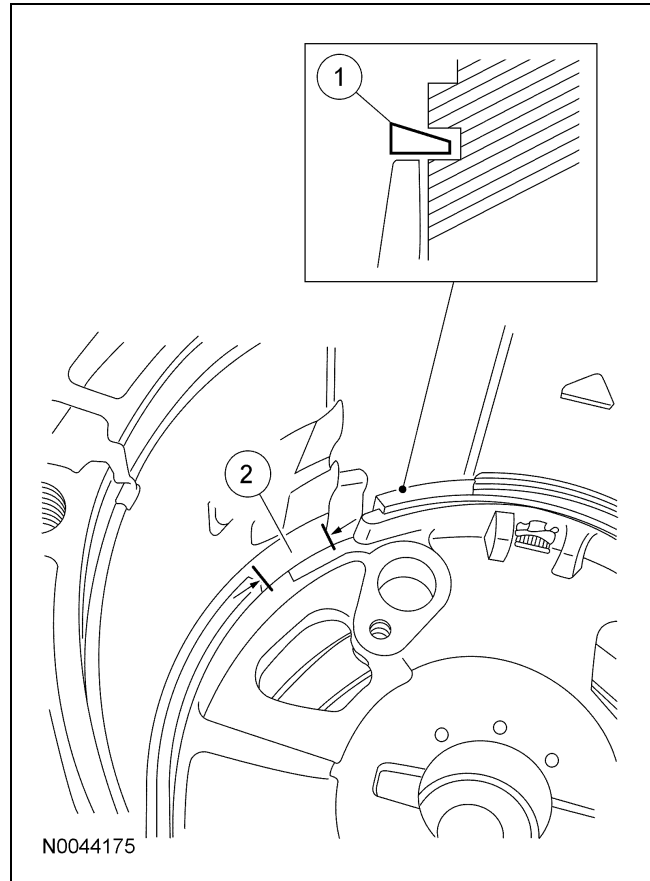


57.  **CAUTION:** Install the center support retaining ring with the tapered side facing up.

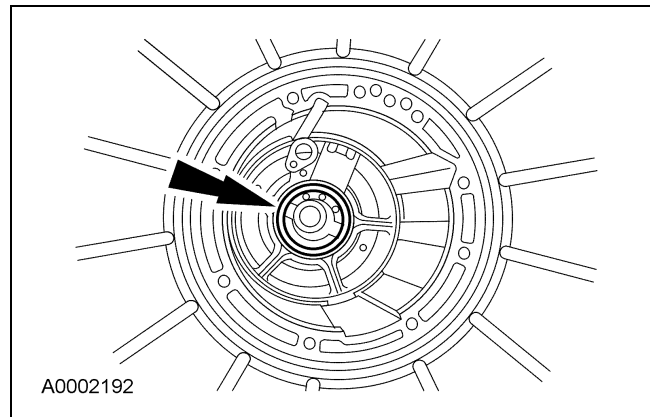
 **CAUTION:** Make sure the notch opening is not obstructed by the center support retaining ring.

Install the center support retaining ring.

- 1 Make sure the center support retaining ring is installed with the tapered side facing up.
- 2 Make sure the opening of the center support retaining ring is positioned correctly.

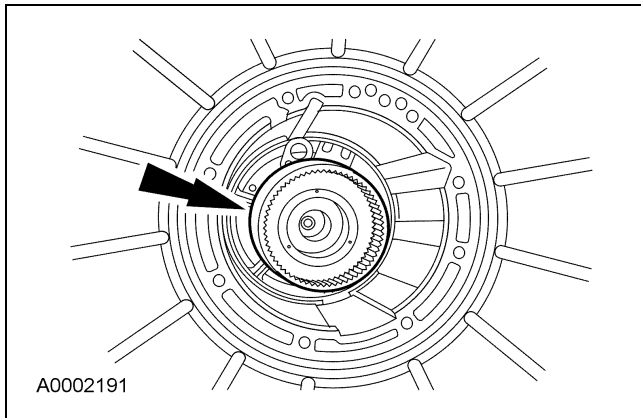


58. Install the center shaft thrust bearing (No. 3).



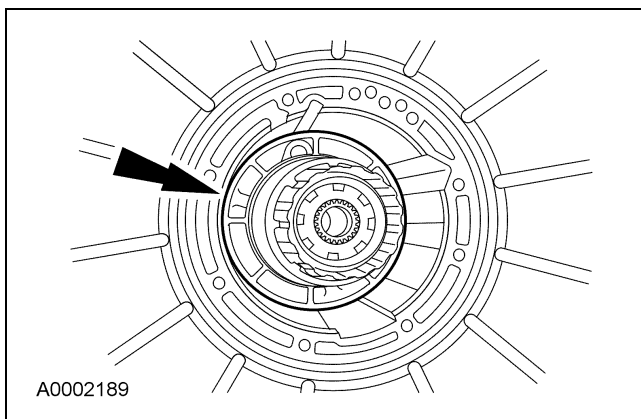
ASSEMBLY (Continued)

59. Install the overdrive ring gear, overdrive one-way clutch and center shaft assembly.

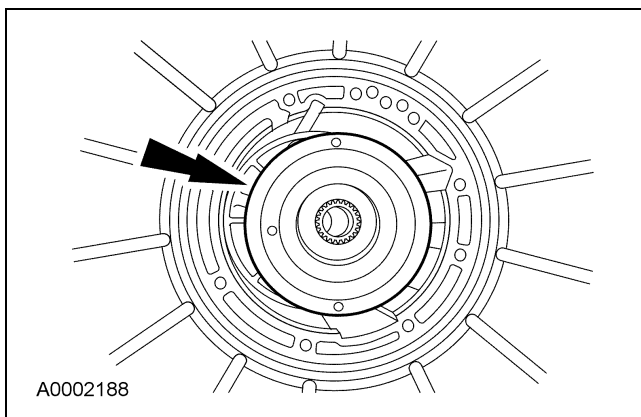


60.  **CAUTION: Do not bend the trigger wheel. Make sure that the No. 2 thrust bearing is in this assembly.**

Install the planetary gear overdrive carrier.

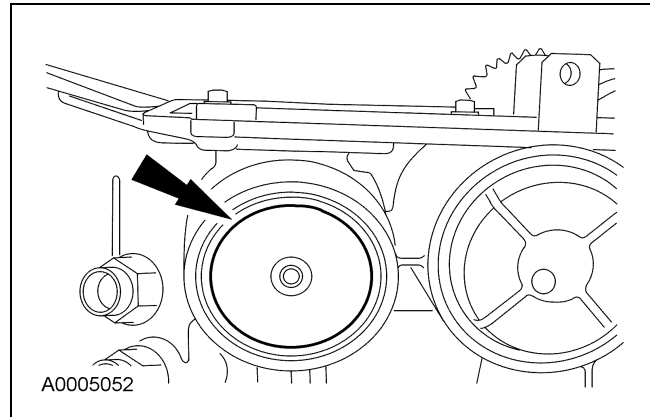


61. Install the overdrive brake drum and coast clutch drum assembly.

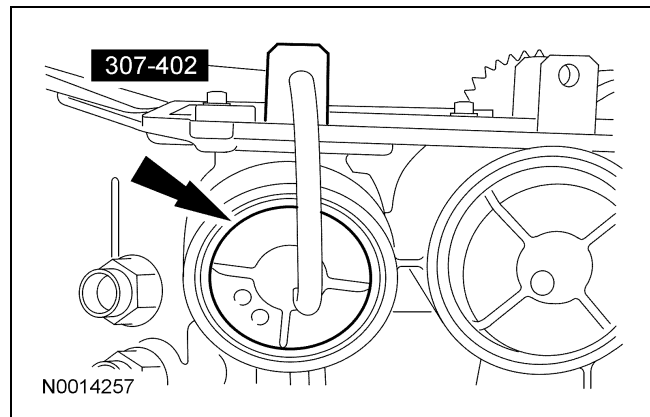


62. Install the overdrive band servo piston and spring.

- Lubricate the servo bore with clean automatic transmission fluid.



63. Using the special tools, install the retaining ring.



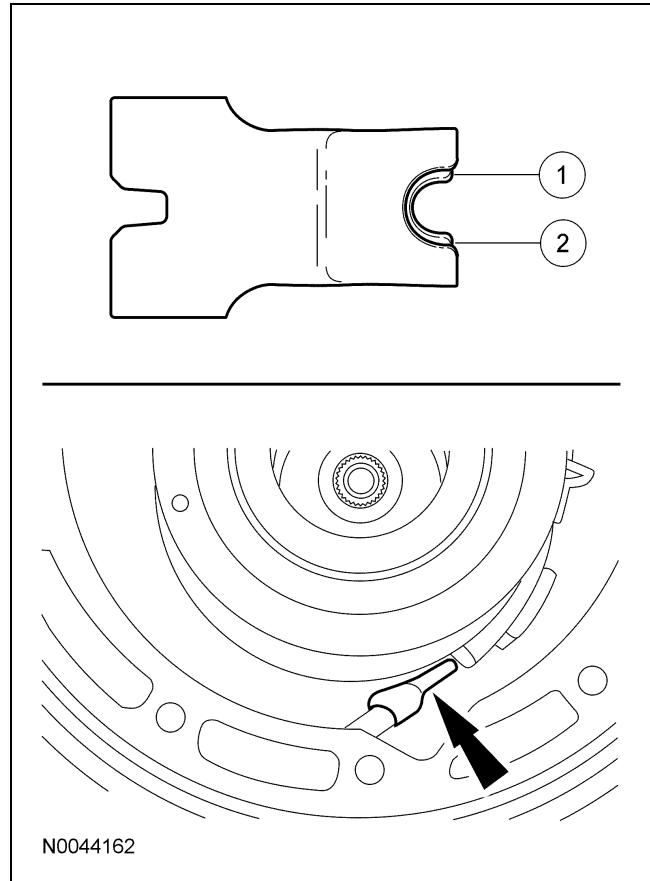
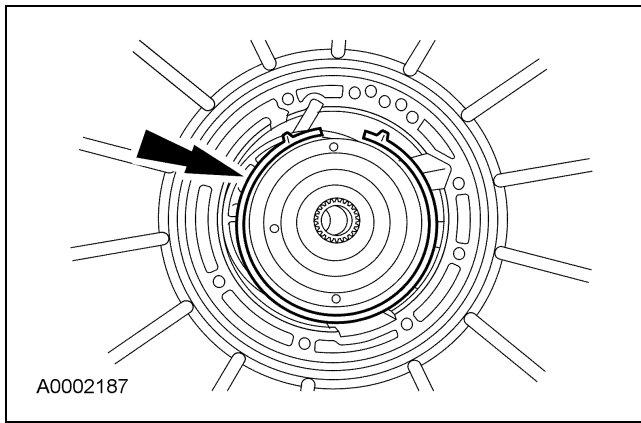
ASSEMBLY (Continued)

64. **NOTE:** If the overdrive band is reused, it must be installed in the same position as when removed.

NOTE: Make sure that the overdrive band apply strut is aligned with the band notch.

NOTE: The new overdrive band is dark in color. This is a normal condition of the band. Hairline cracks in the band are also considered normal. Do not install a new band based solely on the color.

Install the overdrive band.



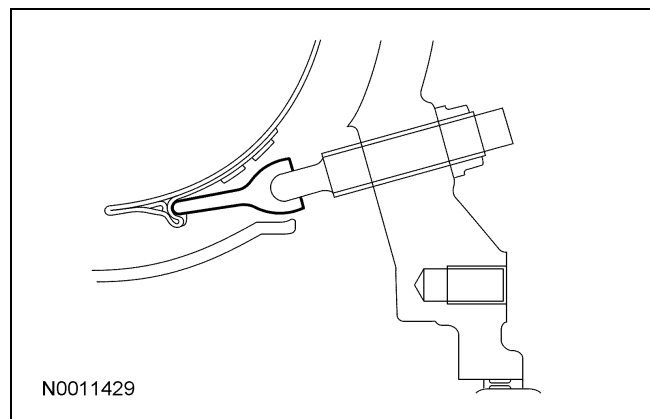
65. **CAUTION:** To avoid a “fall-out” condition of the strut from the screw during assembly and function, the small “U” shaped notch should be toward the band/case side and the large “U” shaped notch toward the main control side.

Install the overdrive band anchor strut.

- 1 Band/case side of the anchor (small U notch).
- 2 Main control side of the anchor (large U notch).

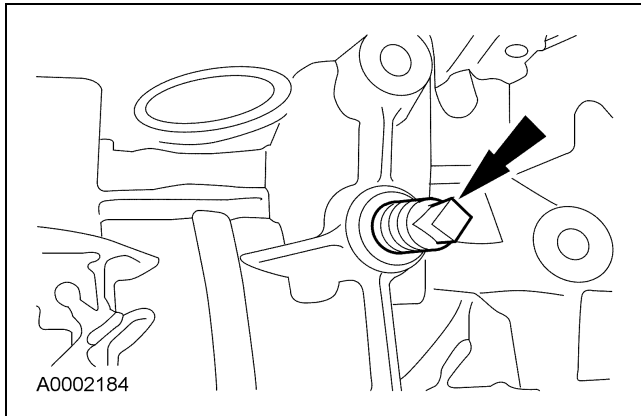
66. **CAUTION:** If the strut is installed incorrectly, transmission damage will occur.

Check to make sure that the intermediate band anchor strut is installed in the correct orientation to the case and adjustment screw.

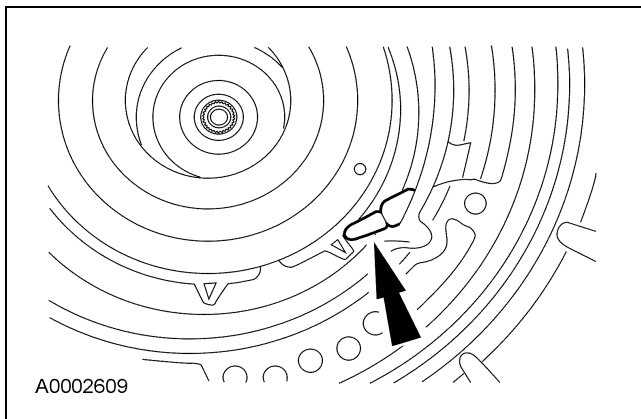


ASSEMBLY (Continued)

67. Loosely install the screw.

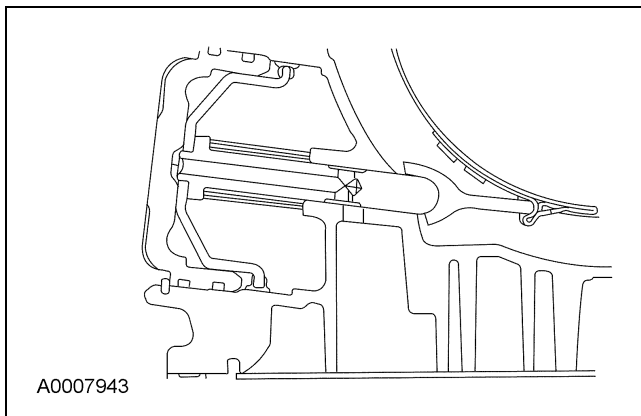


68. Install the overdrive apply strut.



69. **CAUTION:** If the strut is installed incorrectly, transmission damage will occur.

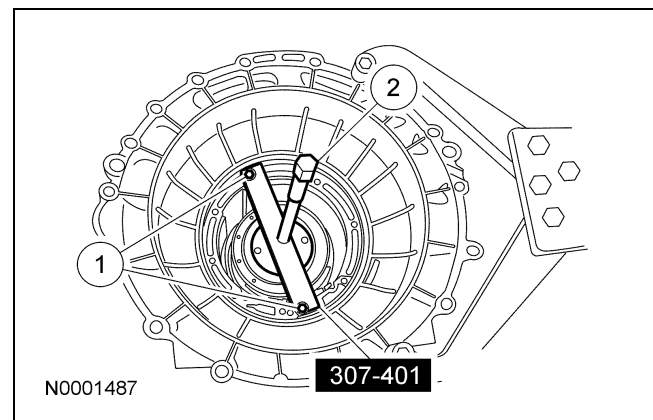
Check to make sure that the overdrive band apply strut is installed in the correct orientation to the case and piston rod.



70. **CAUTION:** The torque specifications are critical for this procedure. Failure to use the correct torque specifications may cause transmission damage.

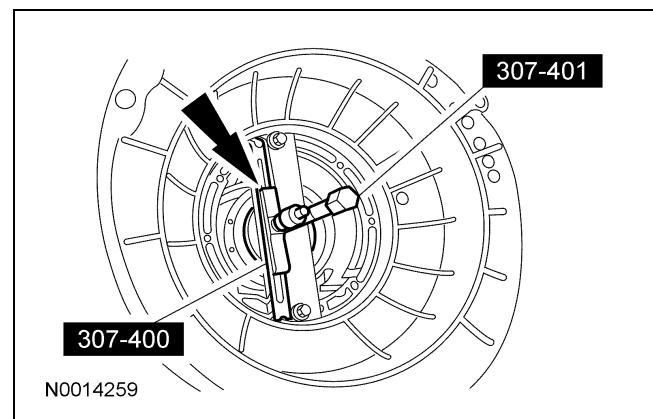
Install the special tool.

- 1 Install the special tool and the bolts using the 2 pump screw locations at approximately 6 and 12 o'clock positions.
 - Tighten to 15 Nm (11 lb-ft).
- 2 Tighten the center screw.
 - Tighten to 1 Nm (9 lb-in).



71. **NOTE:** Align the disc holes on special tool with the slot in gauge bar for correct measurement.

Measure the distance from the top of the gauge bar to the drum bearing surface through the hole in the disc and record as dimension A. Repeat the measurement 180 degrees on the opposite side of the special tool and record as dimension B.



72. Add dimension A to B, divide by 2, and record as dimension C.

ASSEMBLY (Continued)

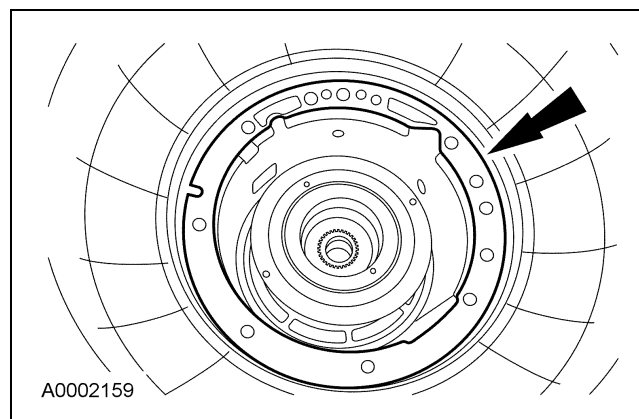
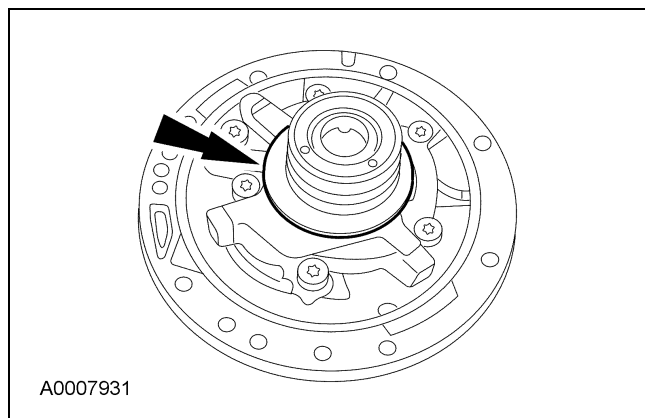
73. Subtract the thickness of the gauge bar 17.78 mm (0.70 in) from dimension C and record as dimension D.

74. Select the No. 1 thrust bearing from the following chart using dimension D.

Dimension D	Service Part Number (7D014)	Bearing Thickness	Identification (Color/ID)
38.05-38.13 mm (1.498-1.501 in)	F7TZ-TA	1.55-1.60 mm (0.061-0.063 in)	White
38.14-38.28 mm (1.50-1.51 in)	F7TZ-MA	1.75-1.80 mm (0.069-0.071 in)	Green
38.29-38.42 mm (1.507-1.513 in)	F7TZ-NA	1.85-1.90 mm (0.073-0.075 in)	Red
38.43-38.61 mm (1.51-1.52 in)	F7TZ-RA	2.05-2.10 mm (0.081-0.083 in)	Black
38.62-38.74 mm (1.52-1.53 in)	F7TZ-SA	2.15-2.20 mm (0.095-0.097 in)	Yellow

75. Install the selected No. 1 fluid pump input thrust washer.

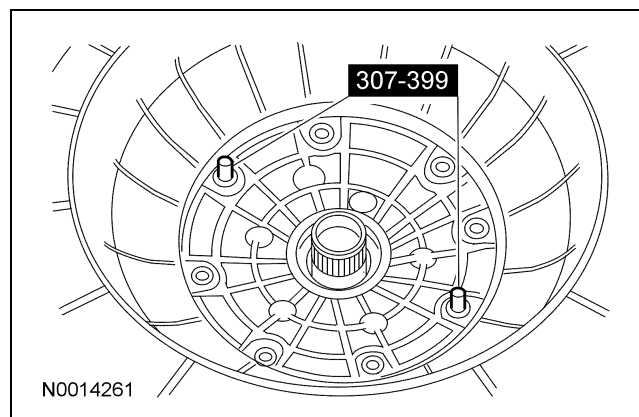
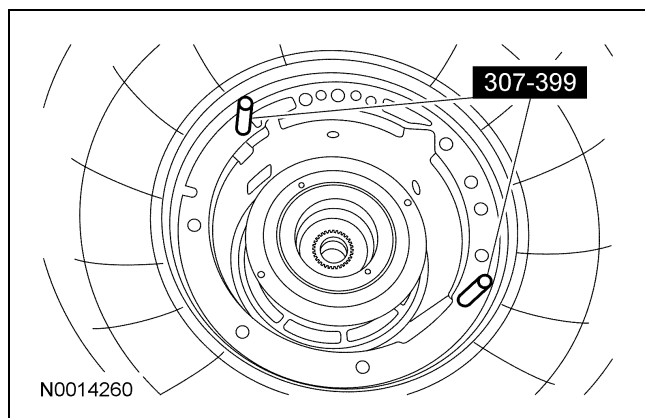
- Coat the fluid pump input thrust washer with petroleum jelly.



78. **⚠ CAUTION:** Make sure that the fluid pump inlet thrust washer (No. 1), selective thrust washer, fluid pump gasket and the fluid pump-to-case O-ring seal remain in the correct position throughout this step.

Install the fluid pump.

76. Install the special tools into the transmission case.

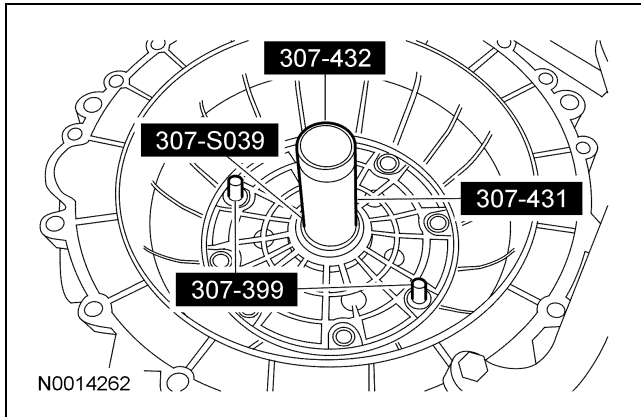


77. Install the pump gasket.

ASSEMBLY (Continued)

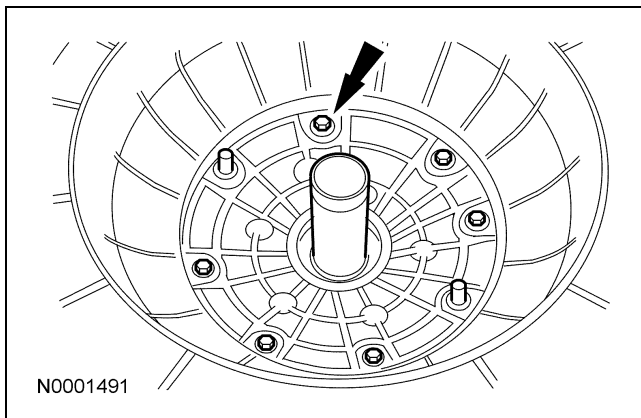
79.  **CAUTION:** The special tools must be used to correctly align the pump with the adapter plate to reduce gear noise, bushing failure and leakage.

Using the special tool, align the fluid pump to the adapter plate.



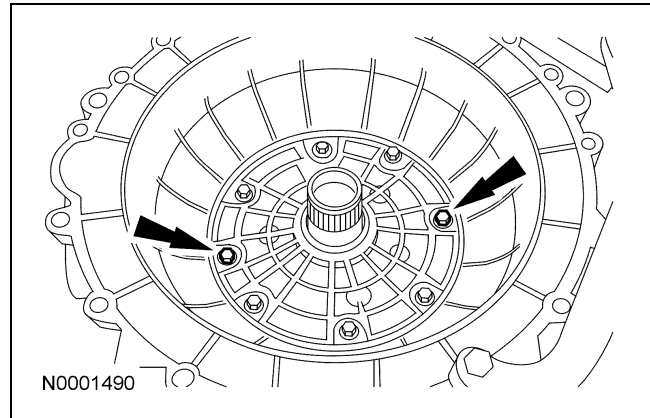
80. Install screws. Tighten the screws in a star pattern.

- Tighten to 25 Nm (18 lb-ft).



81. Remove the special tools and install the 2 remaining screws.

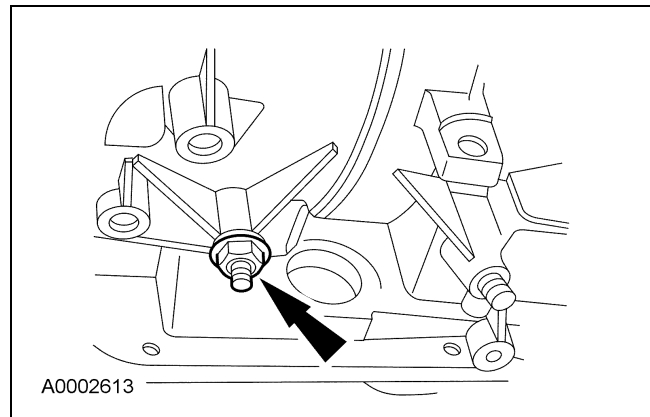
- Tighten to 25 Nm (18 lb-ft).



82.  **CAUTION:** Do not allow overdrive band adjustment screw to back out. Band strut could fall out of position.

 **CAUTION:** Install, but do not tighten, a new locknut on the band adjustment screw. Apply petroleum jelly to the locknut seal.

Install a new locknut on the band adjustment screw.

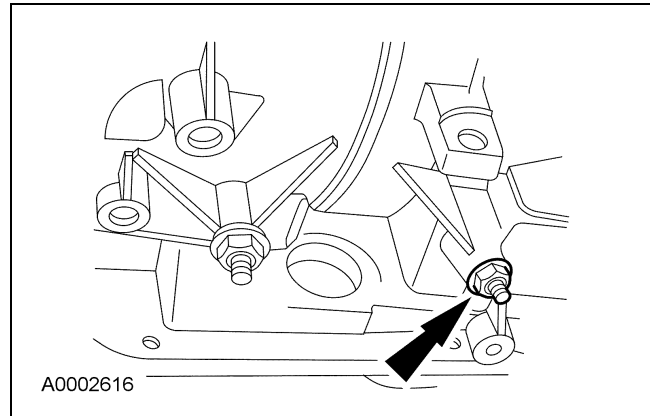
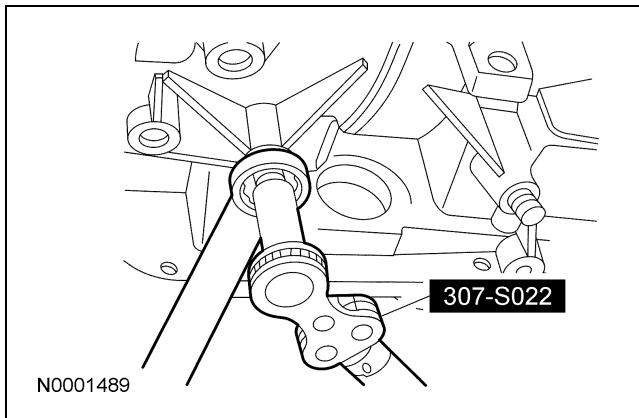


ASSEMBLY (Continued)

83.  **CAUTION: The overdrive servo must be installed prior to band adjustment.**

Using the special tool, tighten the overdrive band adjustment screw.

- Tighten to 14 Nm (10 lb-ft).
- Then back off the screw exactly 1.5 turns and hold that position.



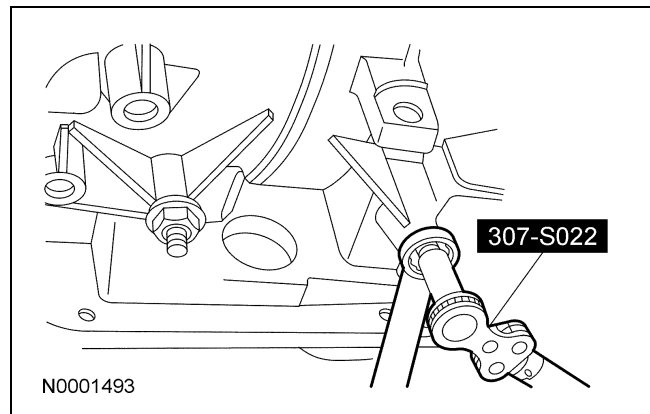
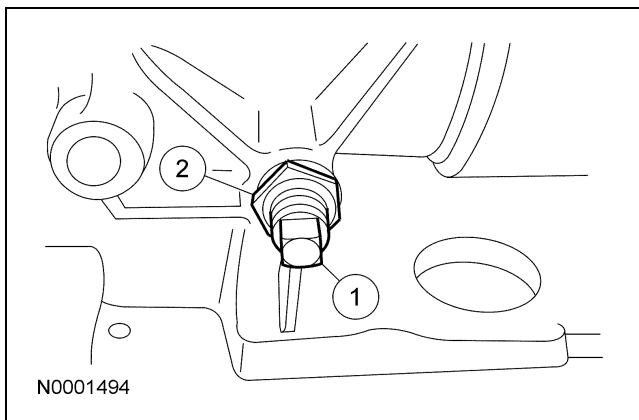
86.  **CAUTION: The intermediate servo must be installed prior to band adjustment.**

Using the special tool, tighten the intermediate band adjustment screw.

- Tighten to 14 Nm (10 lb-ft).
- Then back off the screw exactly 1.5 turns and hold that position.

84. Tighten the overdrive band locknut.

- 1 Hold the overdrive band adjustment screw stationary.
- 2 Tighten the overdrive band locknut.
 - Tighten to 54 Nm (40 lb-ft).



85.  **CAUTION: Do not allow the intermediate band adjusting screw to back out. Band strut could fall out of position.**

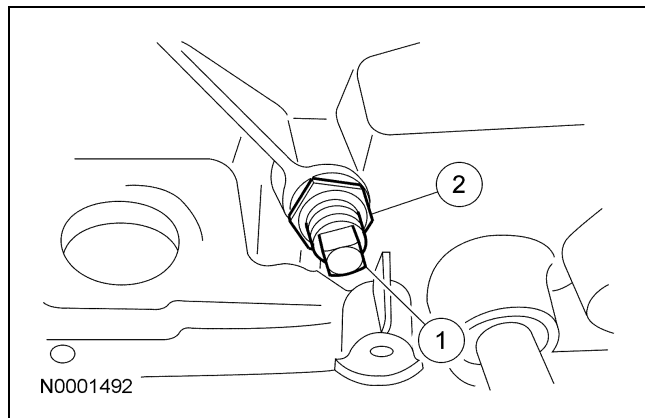
 **CAUTION: Install, but do not tighten, a new locknut on the band adjustment screw. Apply petroleum jelly to the locknut seal.**

Install new nut on the band adjustment screw.

ASSEMBLY (Continued)

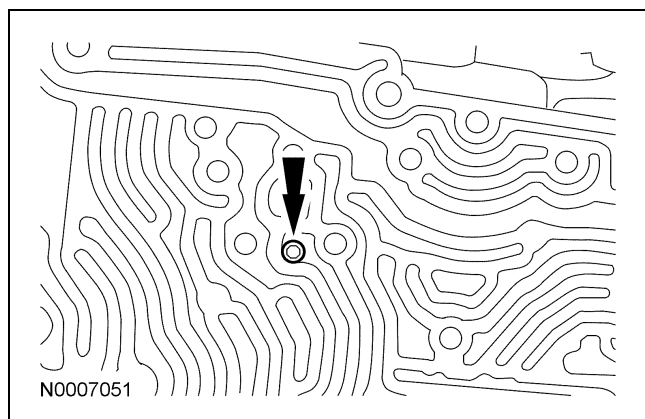
87. Tighten the intermediate band locknut.

- 1 Hold the intermediate band adjustment screw stationary.
 - 2 Tighten the intermediate band locknut.
- Tighten to 54 Nm (40 lb-ft).

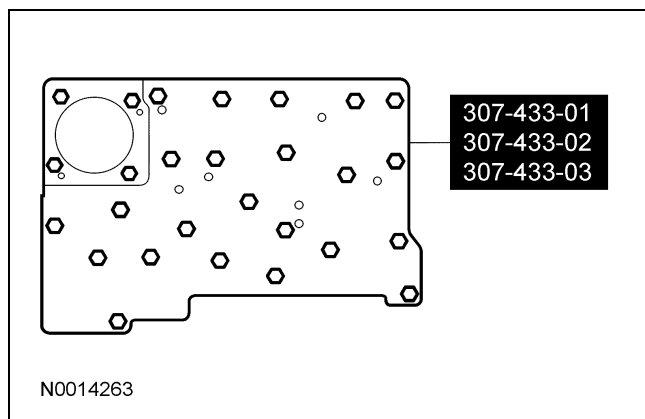


88. Tighten the center support screw.

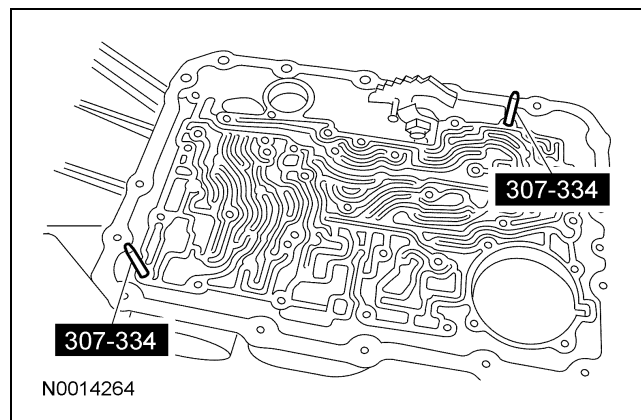
- Tighten to 11 Nm (8 lb-ft).



89. Using the special tools, carry out the air pressure test procedure. For additional information, refer to Special Testing Procedures in this section.

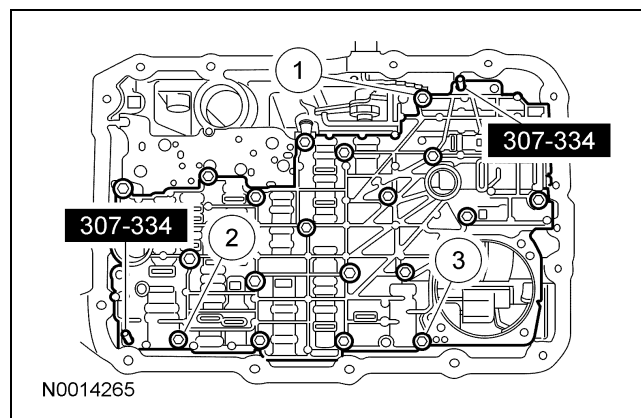


90. Install the special tools into the transmission case.

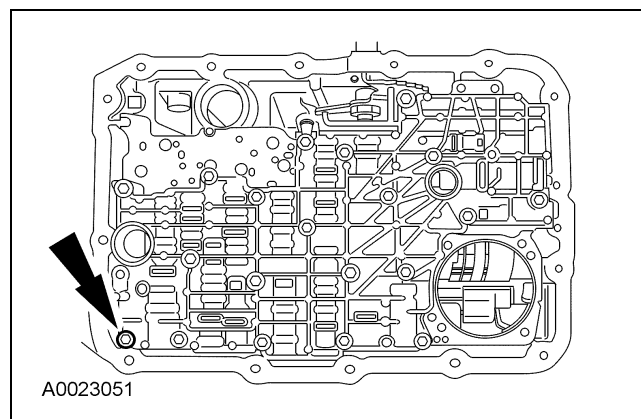


91. Using the special tools, install the main control valve body and loosely install the screws.

- 1 Install the short screw.
- 2 Install the screw with the larger head.
- 3 Install the remaining screws.



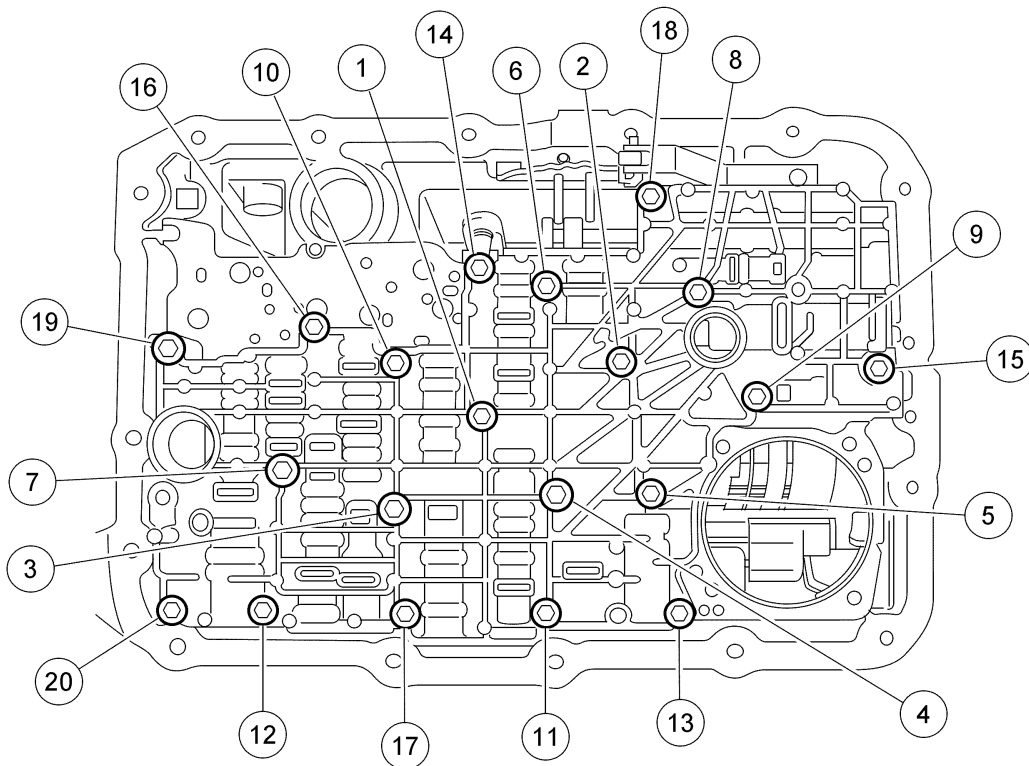
92. Remove the special tools, and loosely install the screw.



ASSEMBLY (Continued)

93. Tighten the screws in the sequence shown.

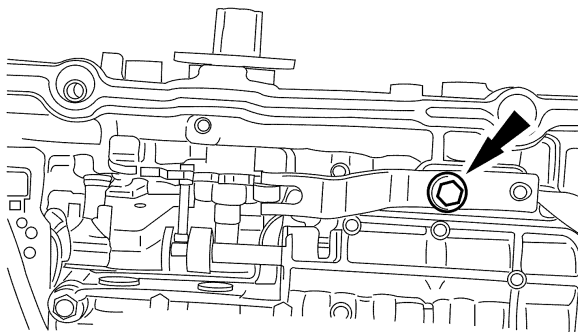
- Tighten to 10 Nm (89 lb-in).



N0014183

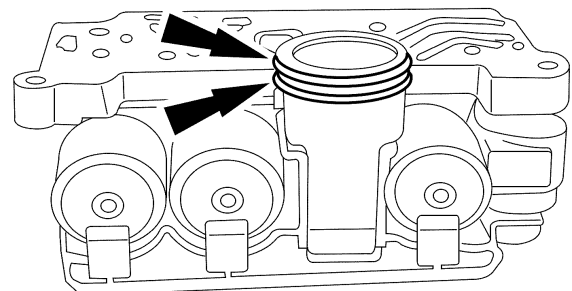
94. With the manual lever in the NEUTRAL position, install the manual valve detent spring.

- Tighten to 10 Nm (89 lb-in).



N0001496

95. Install new O-ring seals on the solenoid body connector. Lubricate the O-ring seals with clean automatic transmission fluid.



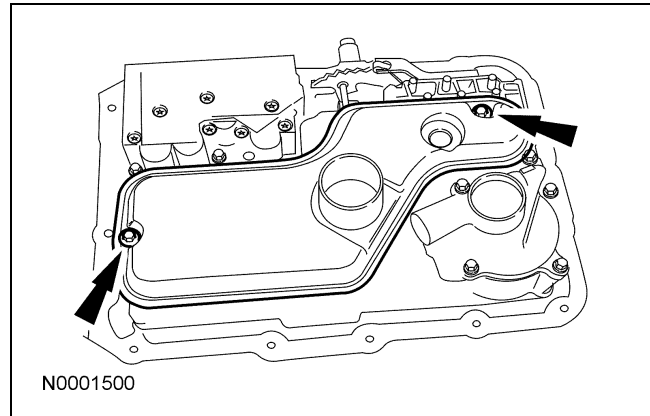
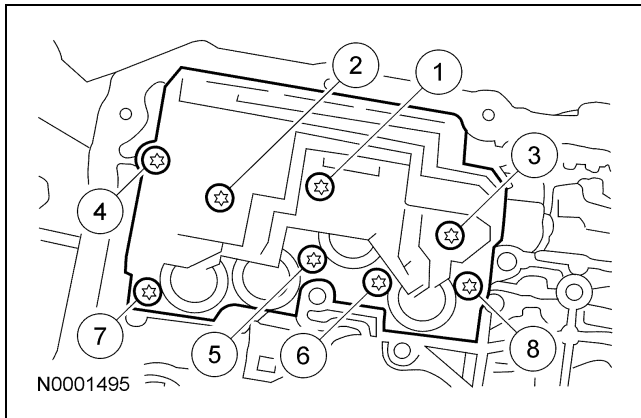
A0007944

ASSEMBLY (Continued)

96.  **CAUTION:** Inspect the transmission case bore to make sure it is free of foreign material and not damaged. If damaged, transmission leak may occur.

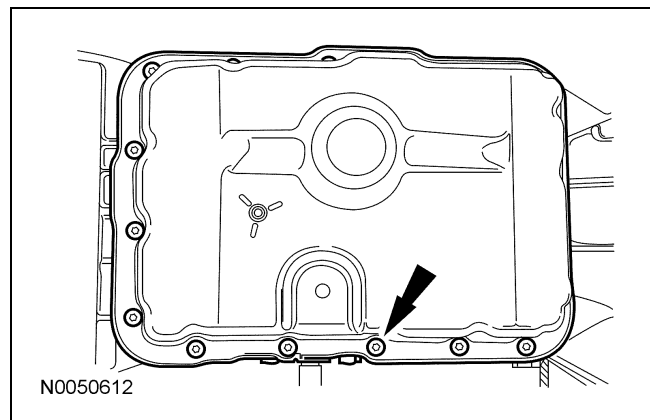
Install the solenoid body. Tighten the screws in the sequence shown.

- Tighten to 8 Nm (71 lb-in).



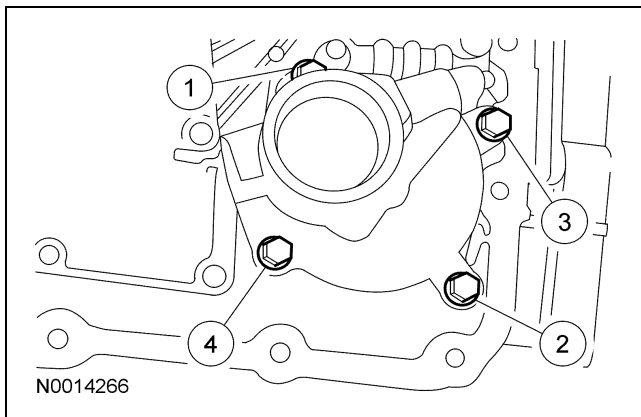
99. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

Install the transmission fluid pan and gasket and loosely install the screws.



97. Install the reverse servo. Tighten the bolts in the sequence shown in 2 stages.

- Stage 1: Tighten to 5 Nm (44 lb-in).
- Stage 2: Tighten to 11 Nm (8 lb-ft).



98.  **CAUTION:** Lubricate the fluid filter seals with clean automatic transmission fluid or they may be damaged.

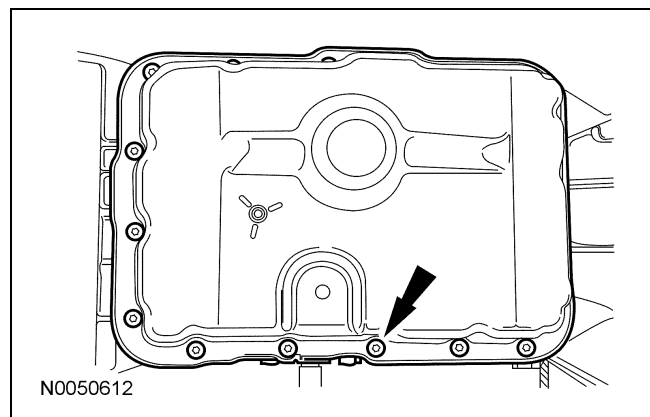
NOTE: Make sure that the fluid filter seals are correctly seated on the filter.

Lubricate the seals and install the transmission fluid filter.

- Tighten to 10 Nm (89 lb-in).

100. Tighten the 16 screws in a crisscross sequence.

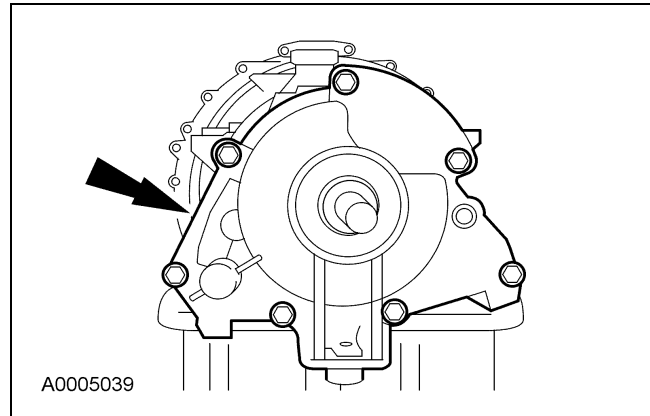
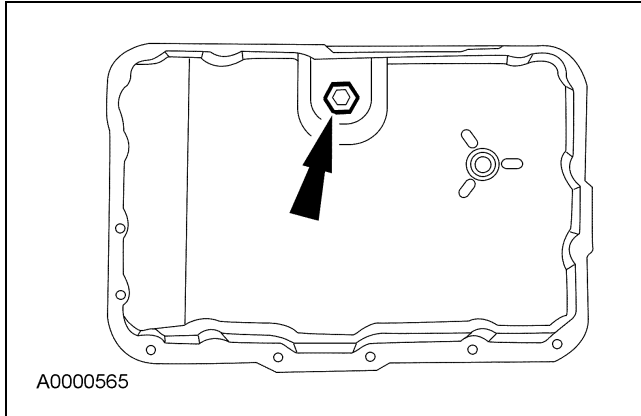
- Tighten to 11 Nm (8 lb-ft).



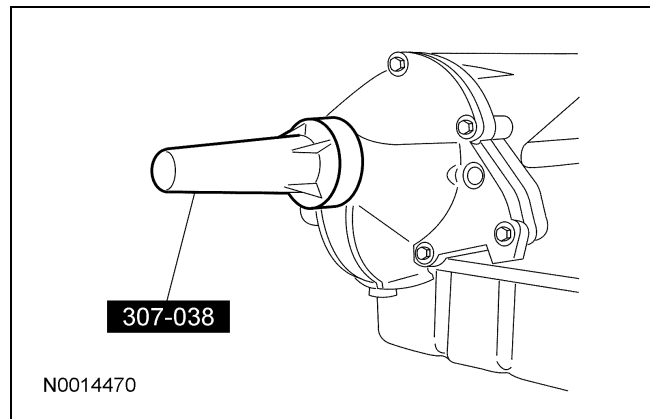
ASSEMBLY (Continued)

101. Install the drain plug.

- Install a new gasket onto the drain plug assembly.
- Tighten to 26 Nm (19 lb-ft).

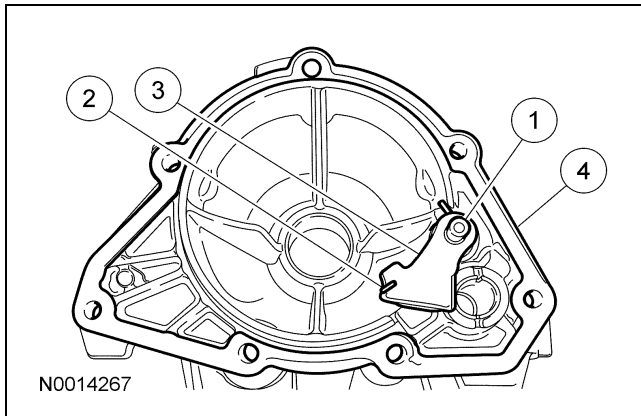


104. Using the special tool, install the extension housing seal.



102. Install the parking pawl assembly and gasket.

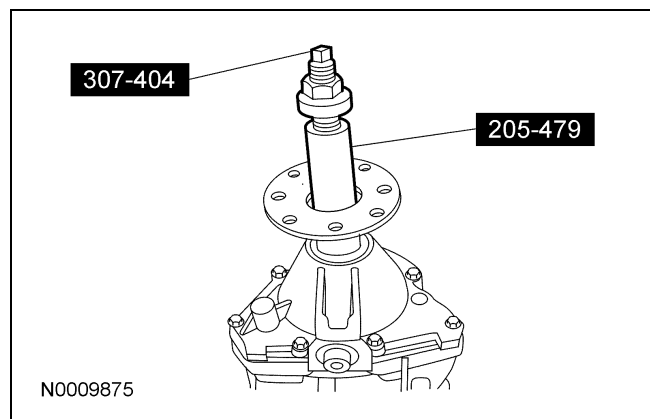
- 1 Install the parking pawl shaft.
- 2 Install the parking pawl return spring.
- 3 Install the parking pawl.
- 4 Install a new gasket.



103. Install the extension housing.

- Tighten to 30 Nm (22 lb-ft).

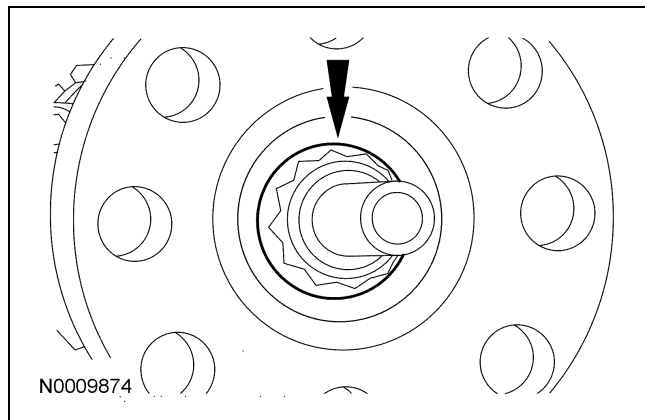
105. Using the special tools, install the output shaft flange.



ASSEMBLY (Continued)

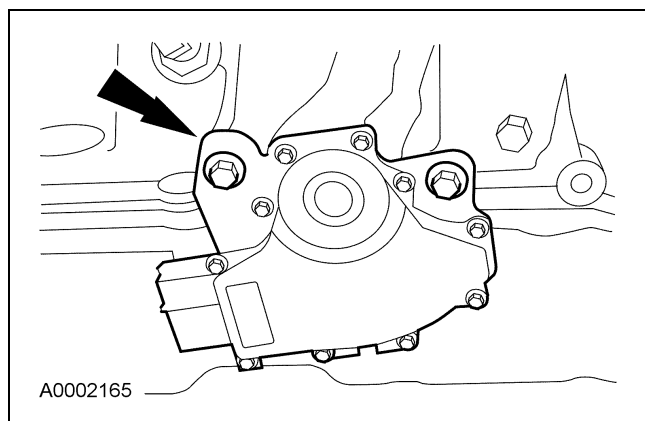
106. Install a new nut.

- Tighten to 130 Nm (96 lb-ft).



107. **CAUTION:** The digital TR sensor must fit flush against the boss on the case to prevent damage to the sensor.

Install the digital TR sensor and loosely install the screws.

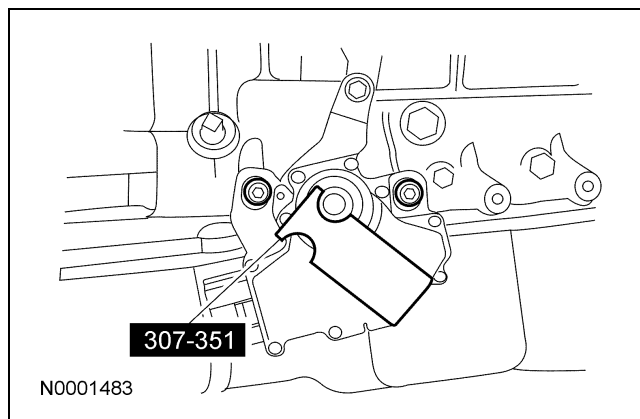


108. **CAUTION:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

NOTE: The manual lever must be in the NEUTRAL position.

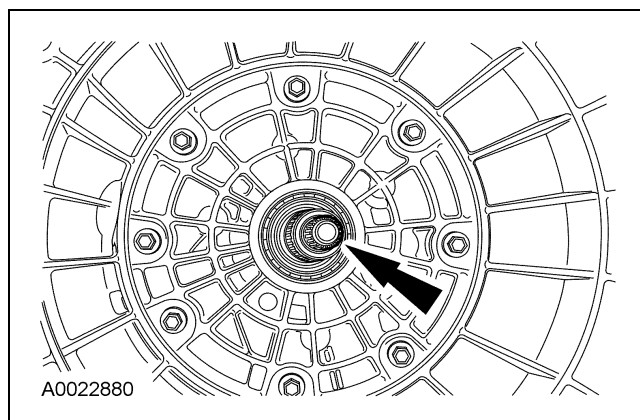
Using the special tool, align the digital TR sensor and tighten the screws in an alternating sequence.

- Tighten 8 Nm (71 lb-in).

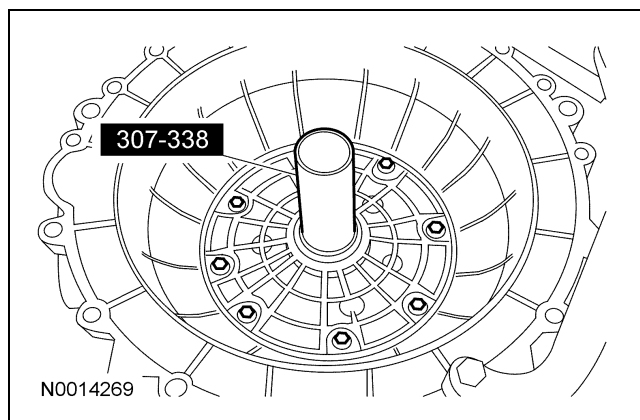


109. **CAUTION:** The splines of the input shaft are not the same length on both ends. The shaft end with the shorter splines goes into the fluid pump.

Install the input shaft.

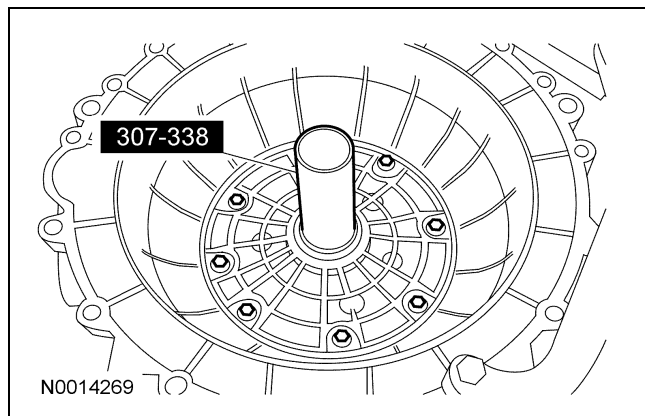


110. Using the special tool, make sure that the fluid pump gear seal ring is fully seated.



ASSEMBLY (Continued)

111. Remove the special tool.

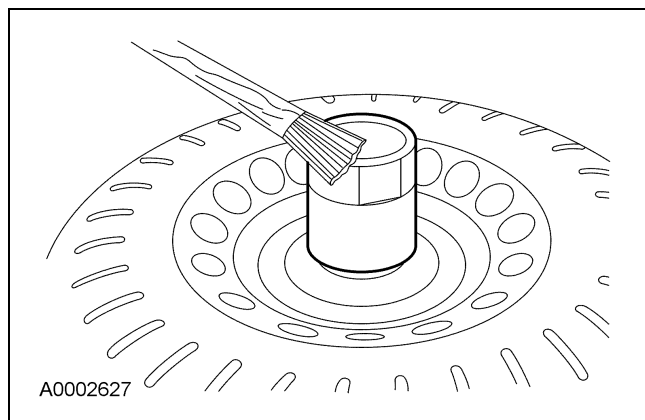


112. **CAUTION:** Do not damage the fluid pump gear O-ring seal when installing torque converter.

CAUTION: Make sure the converter hub is fully engaged in the pump support and gear and rotates freely. Do not damage the hub seal.

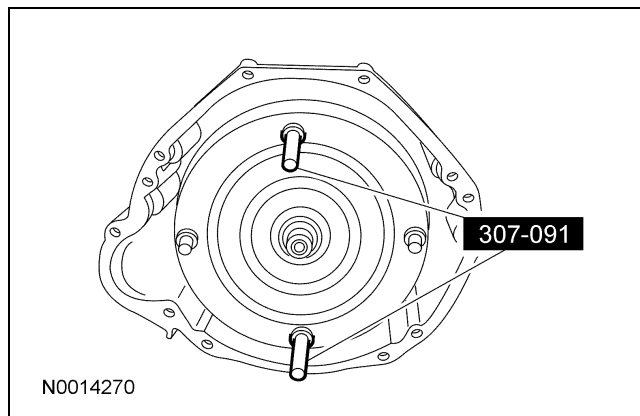
CAUTION: If the torque converter slides out, the hub seal may be damaged.

Lubricate the converter hub with clean automatic transmission fluid.

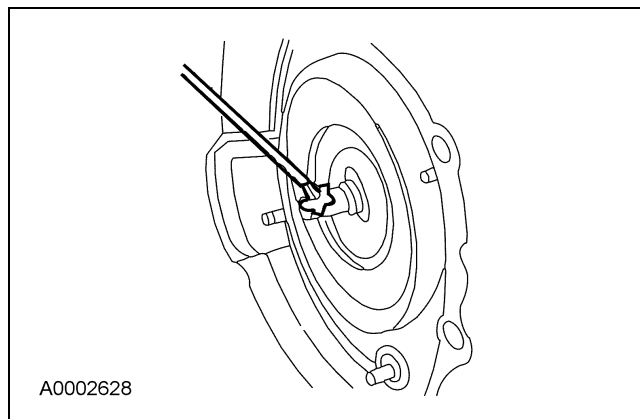


113. **WARNING:** The torque converter can fall out if the transmission is tipped. Failure to follow these instructions may cause personal injury.

Using the special tools, install the torque converter by pushing and rotating.



114. Lubricate the torque converter pilot hub with multi-purpose grease.



ASSEMBLY (Continued)

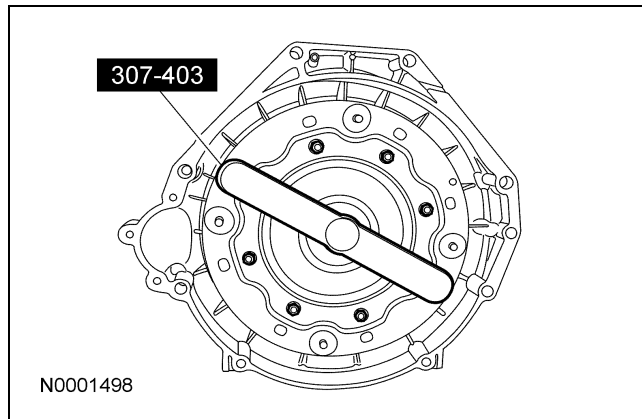
115.  **CAUTION:** The special tool must be used to correctly align the adapter plate to the converter or transmission damage could occur.

In order to correctly install the special service tool, it must be installed using 1 round and 1 oblong hole. Using 2 oblong holes will cause damage to the transmission.

NOTE: Position the adapter plate on the torque converter and identify the position of the orange or green paint daub on the converter face.

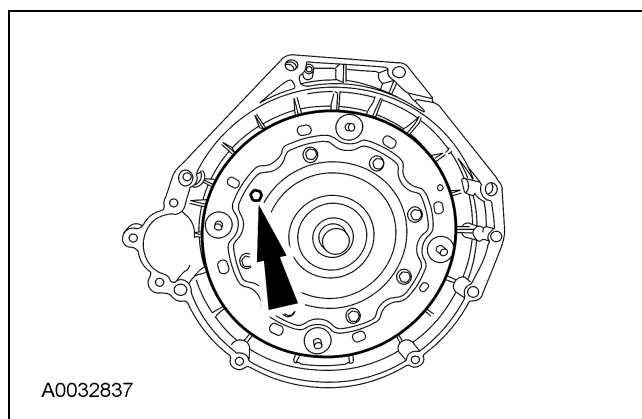
If the vehicle is equipped, use the special tool to install the torque converter flexplate adapter assembly and 8 nuts.

- Tighten to 44 Nm (32 lb-ft).

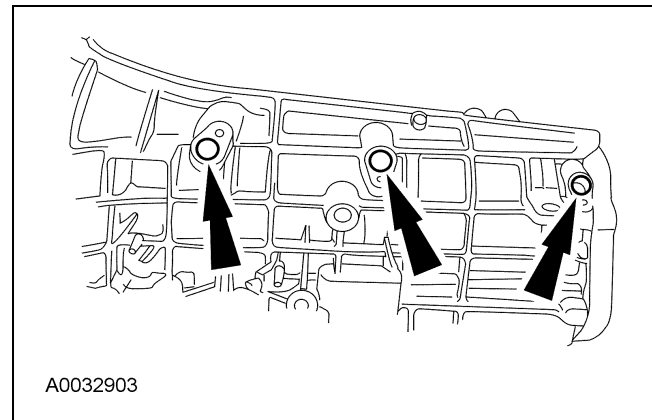


116. Remove the special tool and install the remaining torque converter flexplate adapter nuts.

- Tighten to 44 Nm (32 lb-ft).



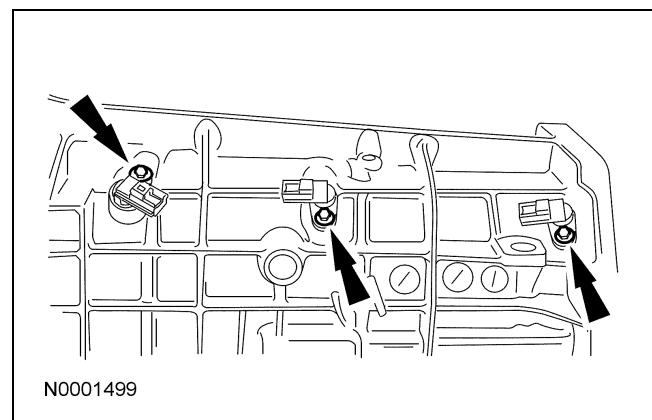
117. Using one of the speed sensor holes, fill the transmission with 8.5L (9 qts) of automatic transmission fluid.



118. **NOTE:** Inspect O-ring seals for damage. Install new O-ring seals if damaged. Lubricate the O-ring seals with petroleum jelly to prevent damage to the O-ring seals.

Install the sensors.

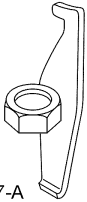
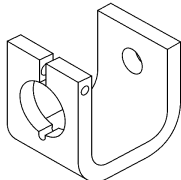
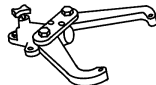
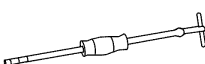
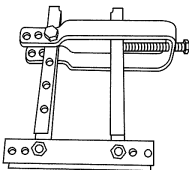
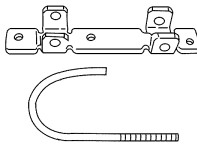
- Tighten to 14 Nm (10 lb-ft).



DISASSEMBLY

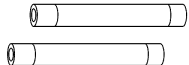
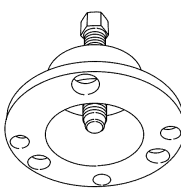
Transmission

Special Tool(s)

 ST2417-A	Remover, Input Shaft Oil Seal 308-375
 ST2418-A	Remover, Transmission Fluid Pump 307-397
 ST1186-A	Holding Fixture, Transmission 307-003 (T57L-500-B)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST1758-A	Remover, Torque Converter Fluid Seal 307-309 (T94P-77001-BH)
 ST2393-A	Compressor, Servo Cover 307-402

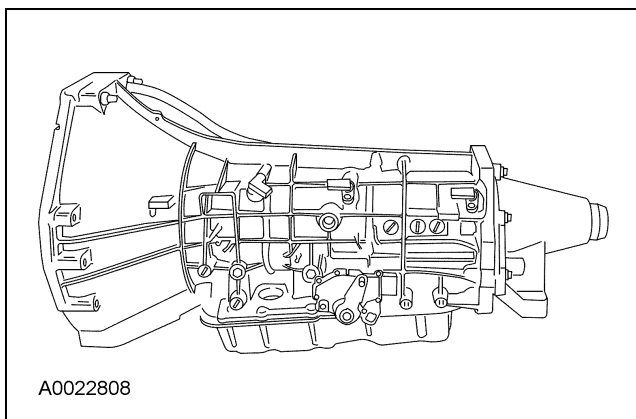
(Continued)

Special Tool(s)

 ST1631-A	Handle, Torque Converter 307-091 (T81P-7902-C)
 ST2937A	Remover, Output Shaft Flange 307-523

- NOTE:** Tag and identify all parts for reassembly.

Place the transmission on a bench.

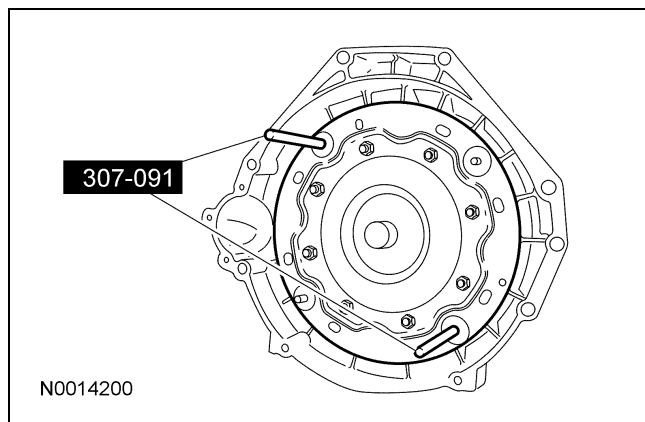


DISASSEMBLY (Continued)

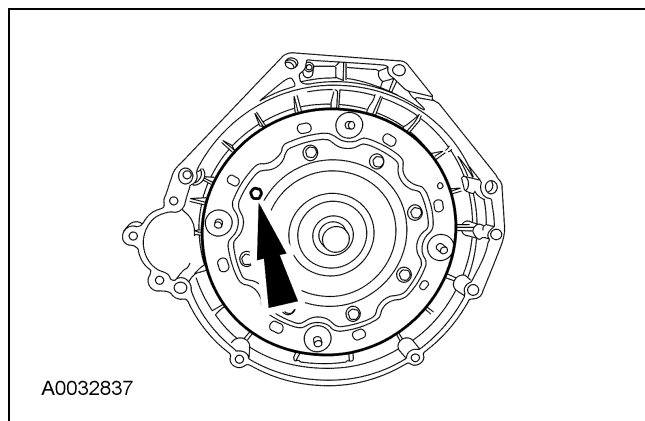
2.  **WARNING:** The torque converter is heavy, especially when full of fluid.

NOTE: If not installing a new torque converter, leave the adapter plate screwed to the torque converter.

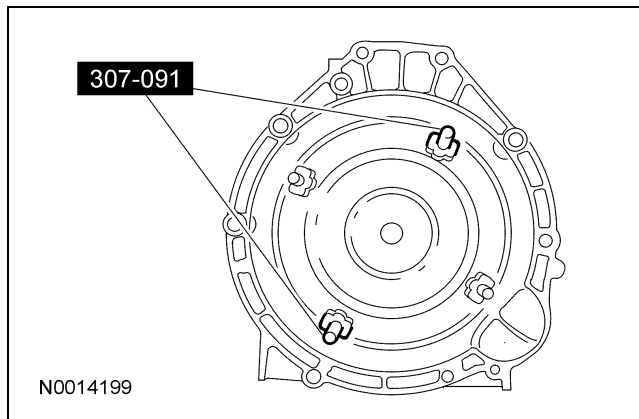
Using the special tools, remove the torque converter and adapter plate as an assembly.



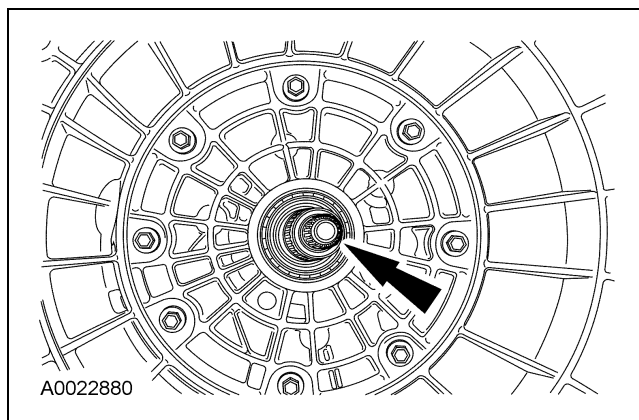
3. If the vehicle is equipped, and installation of a new or remanufactured torque converter is necessary, remove the torque converter adapter plate.



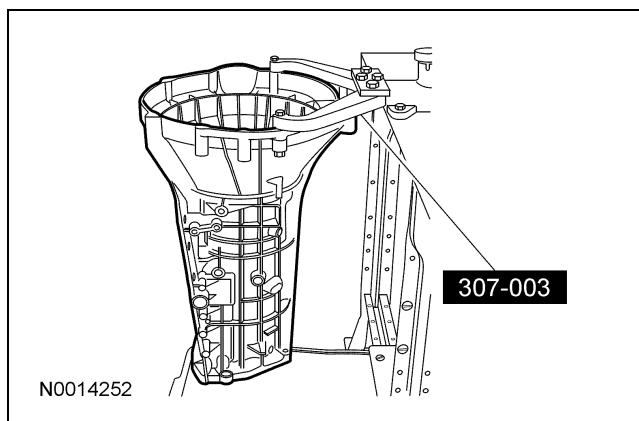
4. If the adapter plate has been removed, use the special tools to remove the torque converter.



5. Remove the input shaft.

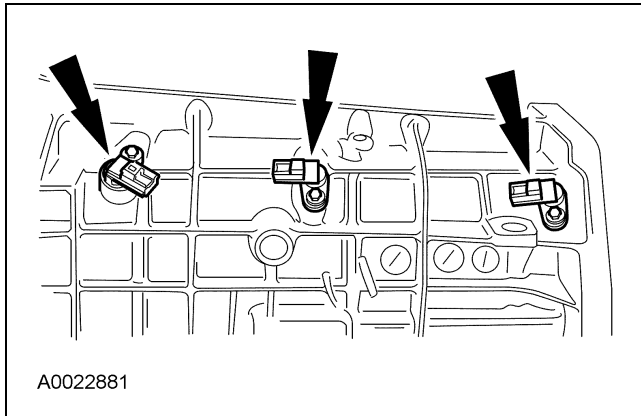


6. Using the special tool, install the transmission into the bench with the torque converter housing facing up.

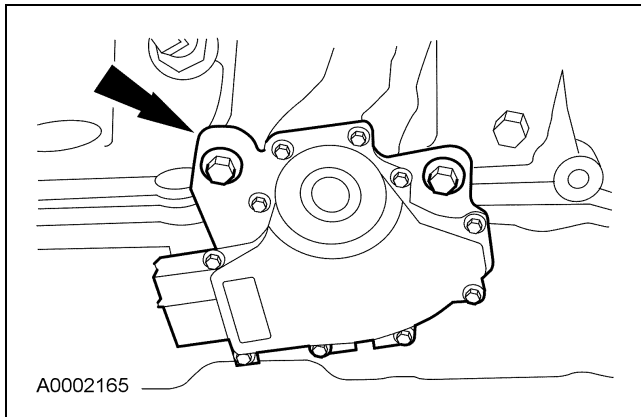


DISASSEMBLY (Continued)

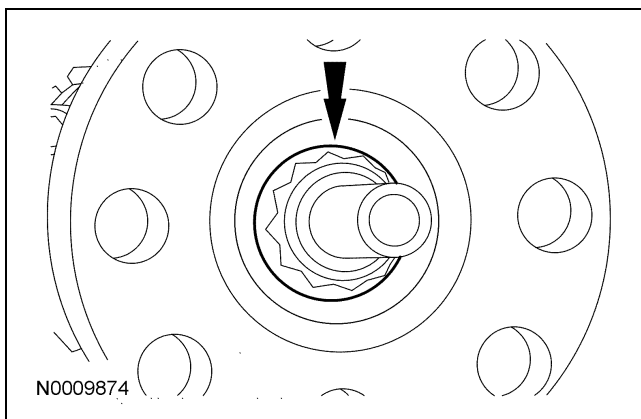
7. Remove the transmission sensors.



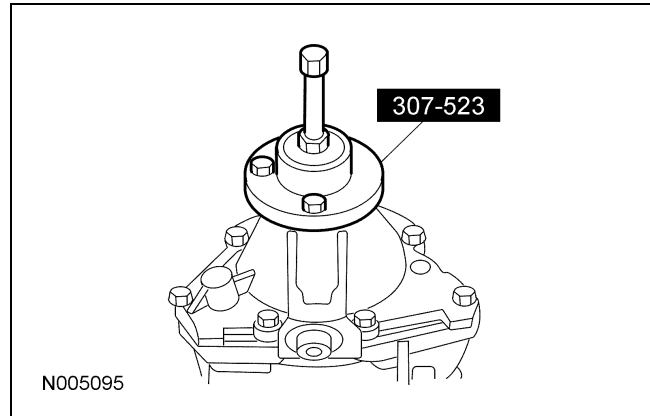
8. Remove the transmission range (TR) sensor.



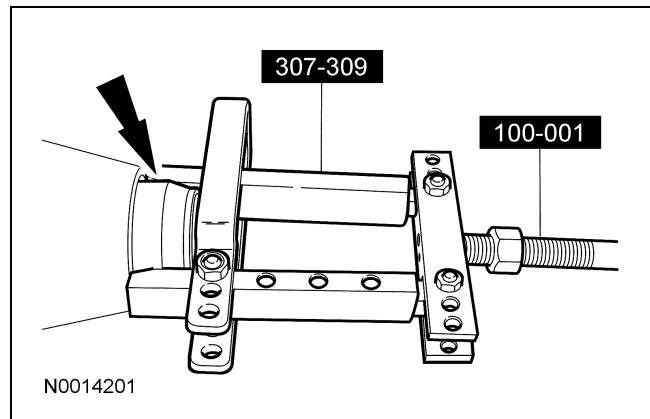
9. Remove and discard the nut.



10. Using the special tool, remove the output shaft flange.

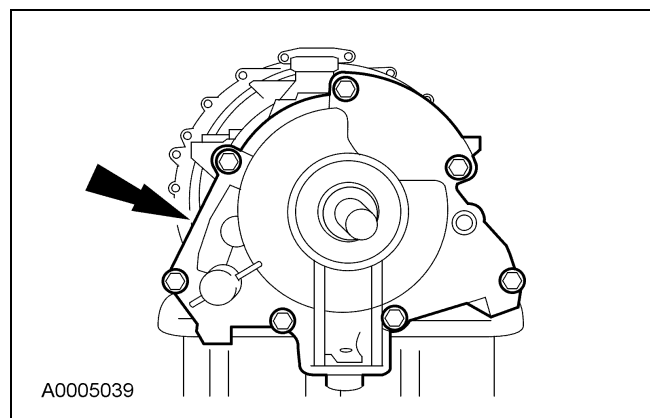


11. Using the special tools, remove the extension housing seal.



12. **⚠ CAUTION: The parking pawl, parking pawl return spring and parking pawl shaft could fall out during removal of the extension housing.**

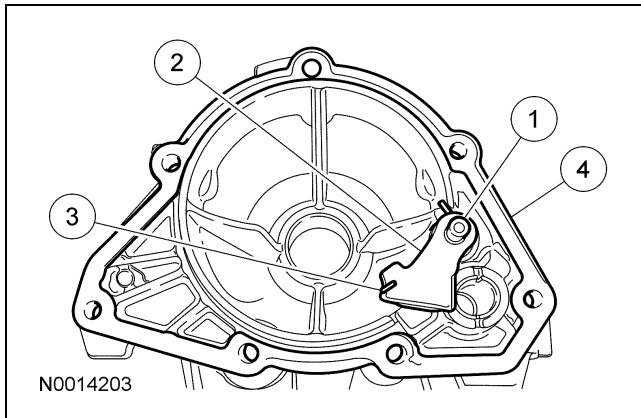
Remove the extension housing.



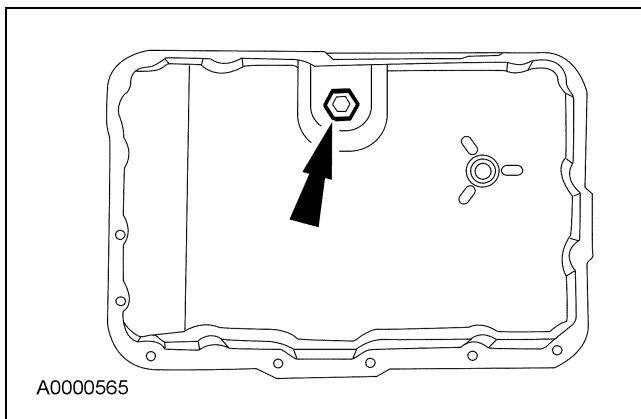
DISASSEMBLY (Continued)

13. Remove the parking pawl assembly and discard the gasket.

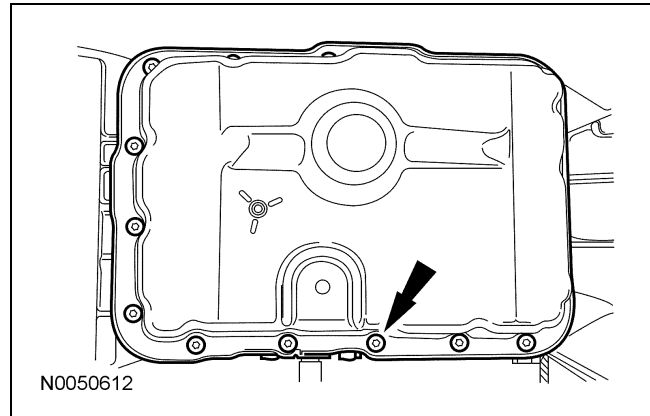
- 1 Remove the parking pawl shaft.
- 2 Remove the parking pawl.
- 3 Remove the parking pawl return spring.
- 4 Remove and discard the gasket.



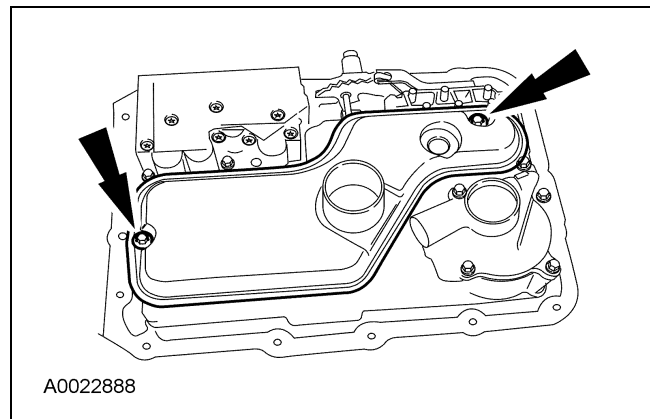
14. Remove the drain plug and discard the gasket



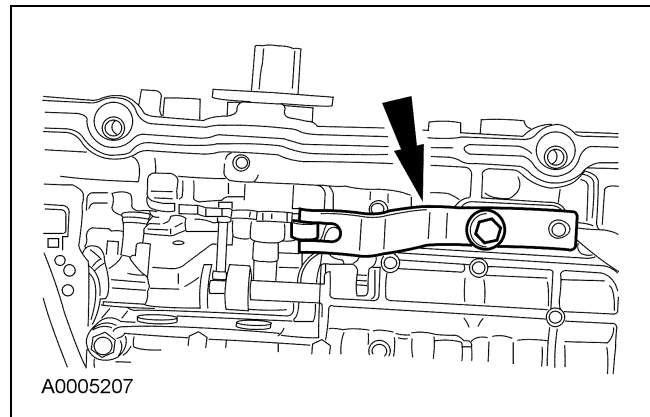
15. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect the gasket for damage. If the gasket is not damaged, the gasket should be reused.
- Remove the 16 transmission fluid pan screws, transmission fluid pan and gasket.



16. Remove the transmission fluid filter and discard.



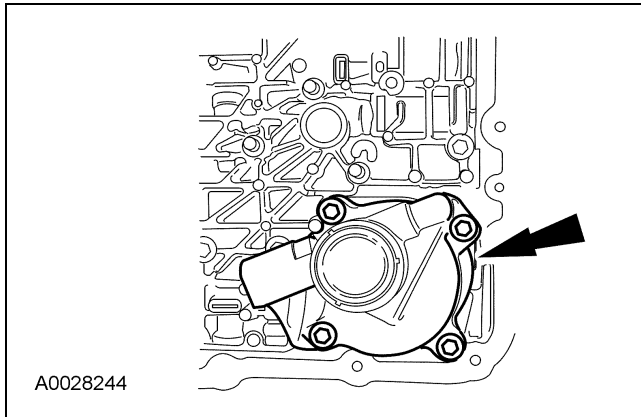
17. Remove the manual control valve detent spring.



DISASSEMBLY (Continued)

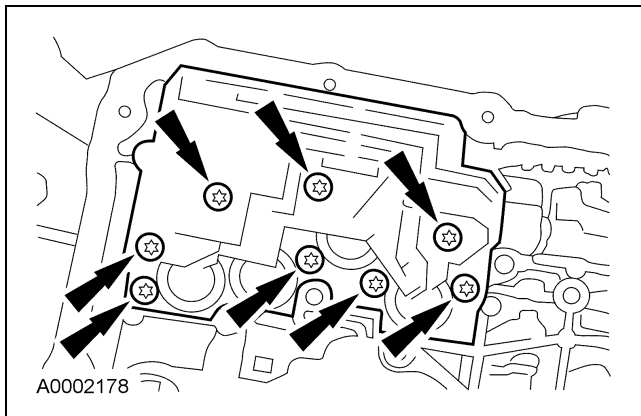
18.  **WARNING:** The upper and lower servo covers are under spring tension. Use care when removing the piston and cover assembly. Failure to follow these instructions may result in personal injury.

Remove the reverse servo assembly.

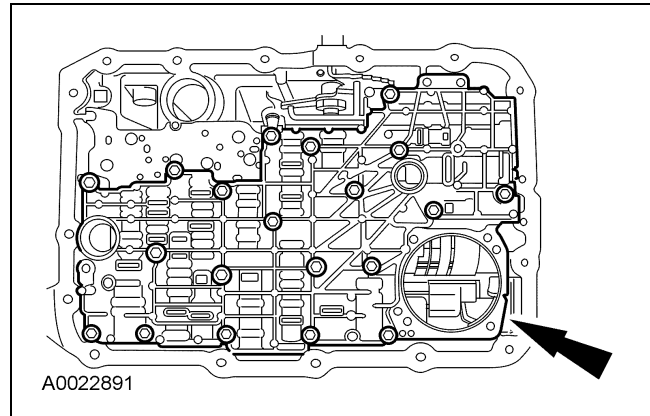


19.  **CAUTION:** Do not damage solenoid body connector pins.

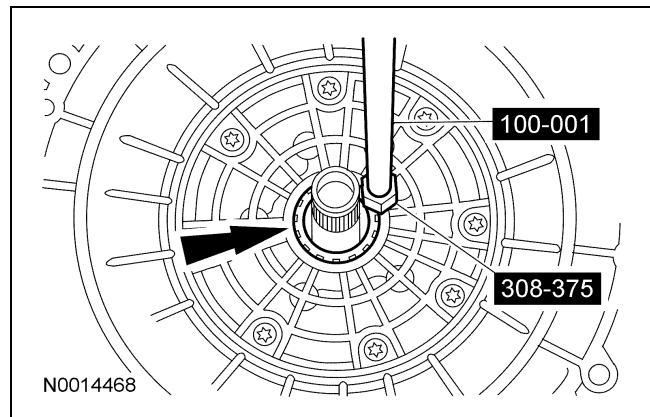
Remove the solenoid body assembly by lifting on the body and pushing the connector from the other side of the case.



20. Remove the main control valve body, separator plate and gasket.



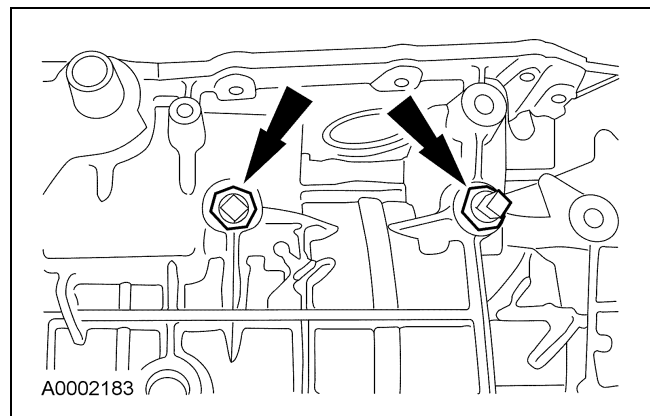
21. Using the special tools, remove the converter hub seal.



22.  **CAUTION:** Failure to loosen the overdrive band adjusting screw prior to pump removal may cause damage to the pump and overdrive band.

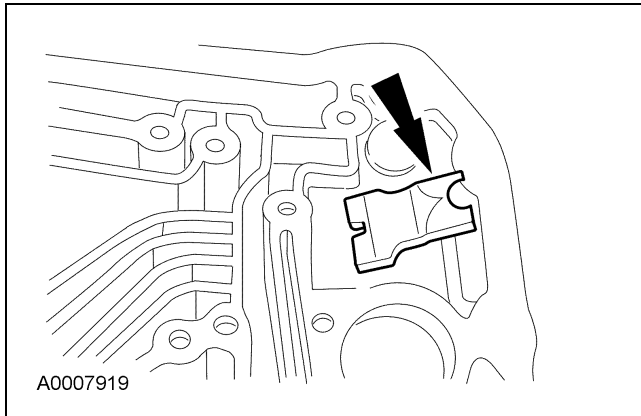
 **CAUTION:** Throw the locknuts away. The locknuts are not reusable for assembly.

Remove and discard the locknuts, and loosen the overdrive/intermediate band adjusting screw.

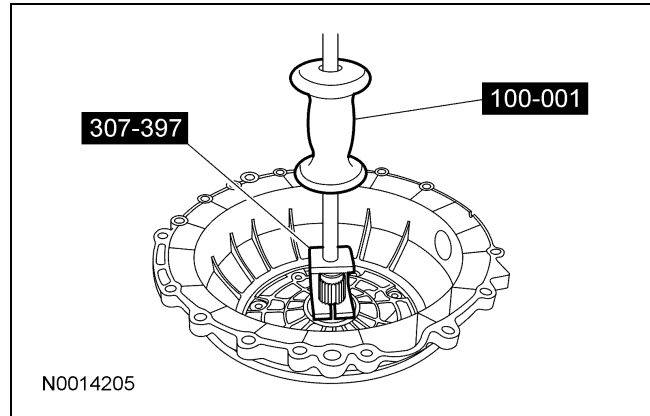


DISASSEMBLY (Continued)

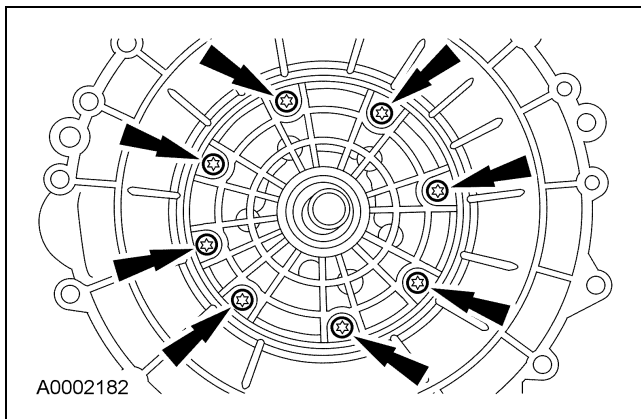
23. Remove and tag part for assembly.



26. Using the special tools, remove the pump.

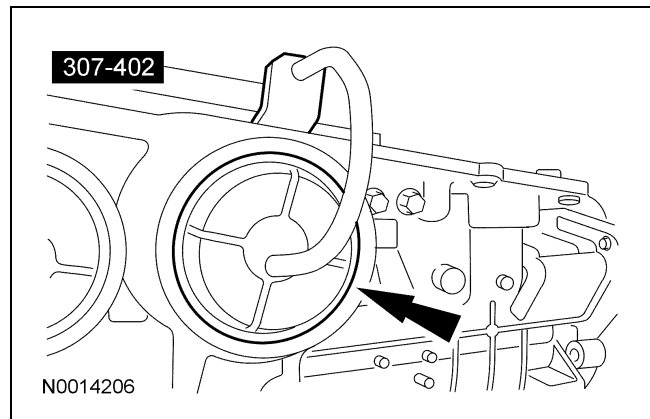


24. **CAUTION:** The screws are not reusable for assembly. Discard the screws. If the screws are reused, the housing may become separated from the transmission. Remove and discard the screws.

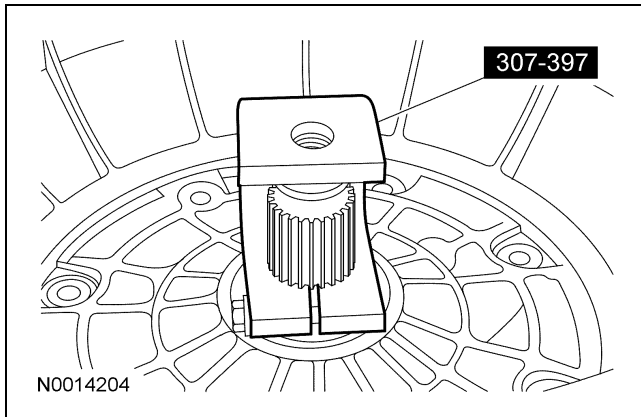


27. **CAUTION:** Servo cover is under spring tension.

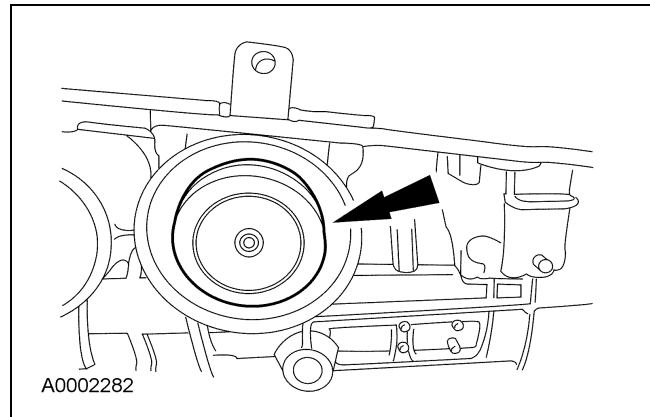
Using the special tool, remove the intermediate servo cover retaining ring.



25. Install the special tool.



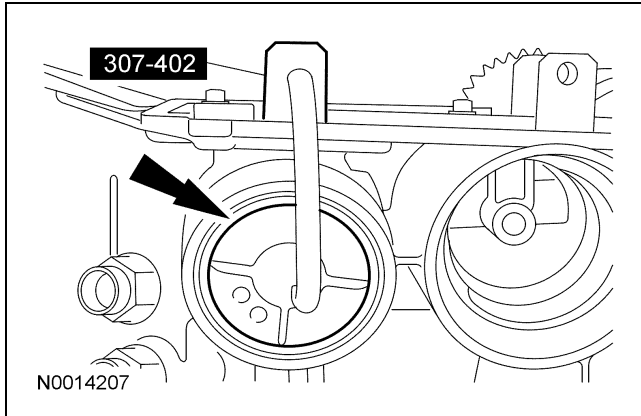
28. Remove the intermediate band servo piston and spring.



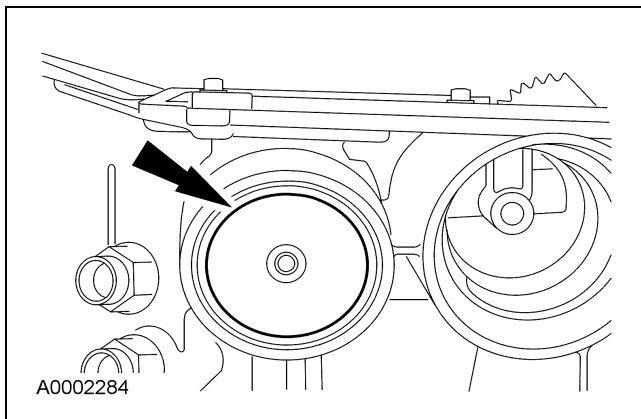
DISASSEMBLY (Continued)

29.  **CAUTION:** Servo cover is under spring tension.

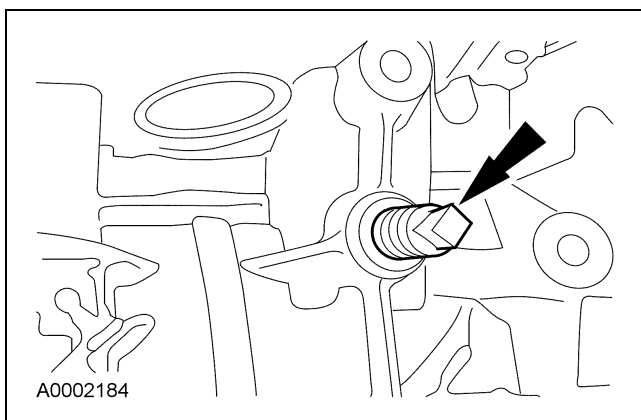
Using the special tool, remove the overdrive servo cover retaining ring and cover.



30. Remove the front band servo piston and spring.

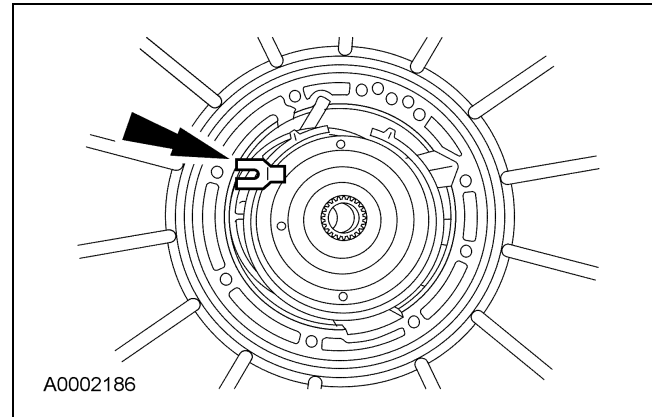


31. Remove the screw.



32. **NOTE:** Tag and identify parts for reassembly.

Compress the overdrive band and remove the apply strut.

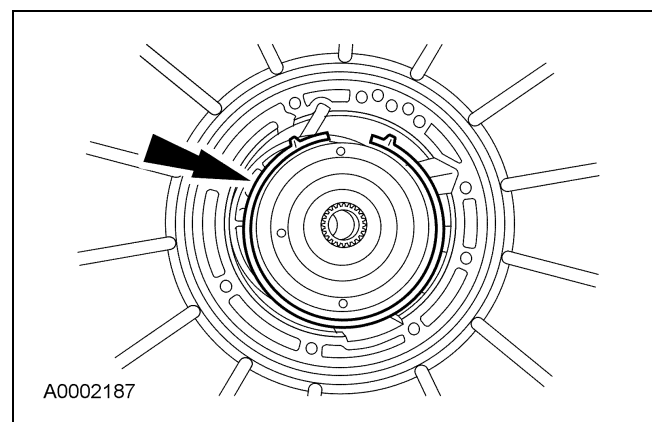


33.  **CAUTION:** Identify the anchor and apply ends of the overdrive band.

NOTE: The new overdrive band is dark in color. This is a normal condition of the band. Hairline cracks in the band are also considered normal. Do not install a new band based solely on the color.

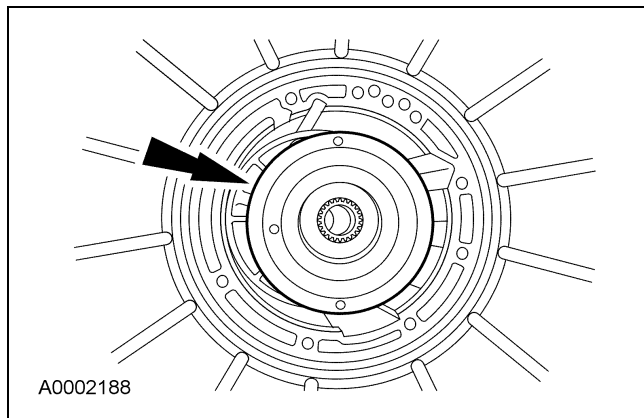
Remove and inspect the overdrive band. Check the following conditions for installing a new band:

- Inspect for glazing.
- Inspect for missing friction material.
- Inspect for material flaking.
- Inspect for damage to the anchor pins.



DISASSEMBLY (Continued)

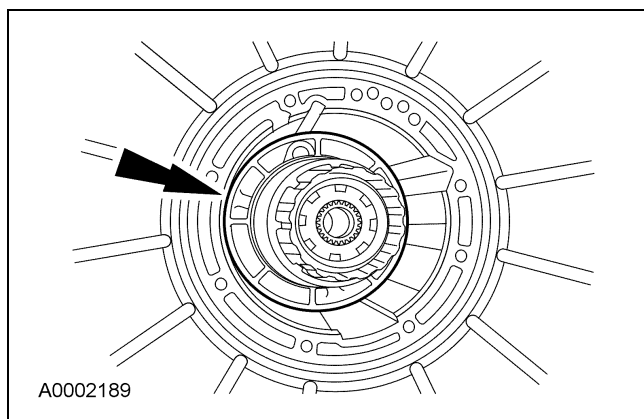
34. Remove the overdrive brake and coast clutch drum.



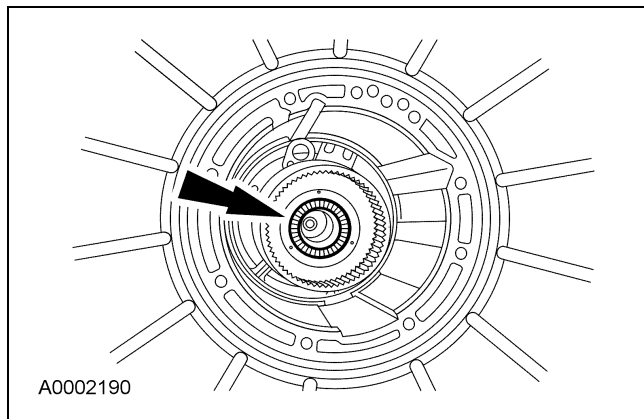
35. **CAUTION: Do not bend the trigger wheel.**

NOTE: The No. 12 thrust bearing is in this assembly.

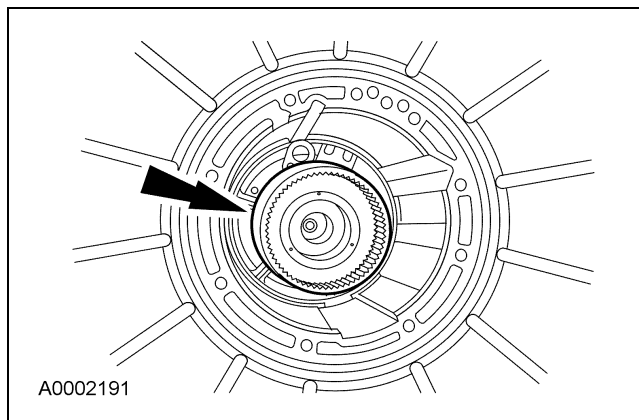
Remove the planetary gear overdrive carrier.



36. Remove the No. 2 overdrive planet thrust bearing.

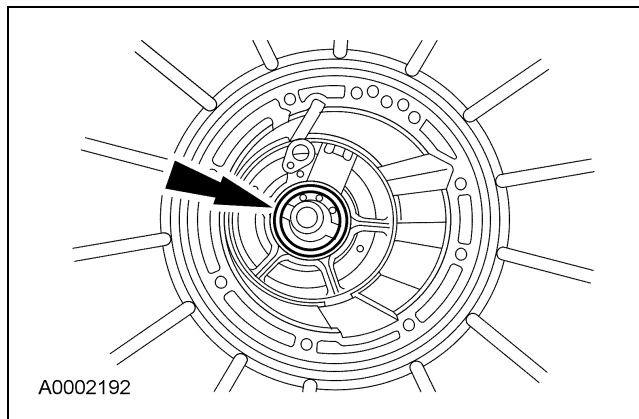


37. Remove the overdrive ring gear, overdrive one-way clutch assembly and center shaft as an assembly.



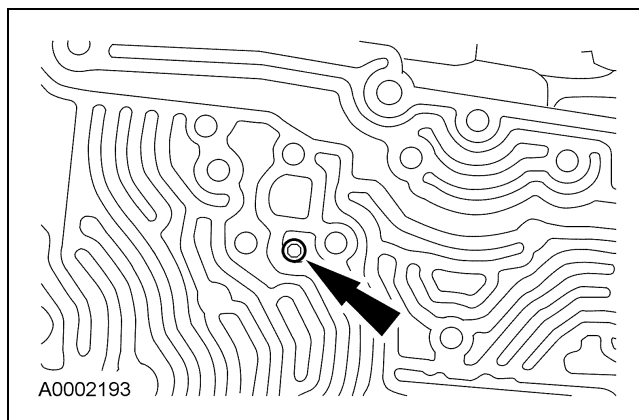
38. **NOTE:** Tag and identify the center shaft thrust bearing No. 3 for reassembly.

Remove the No. 3 center shaft thrust bearing.



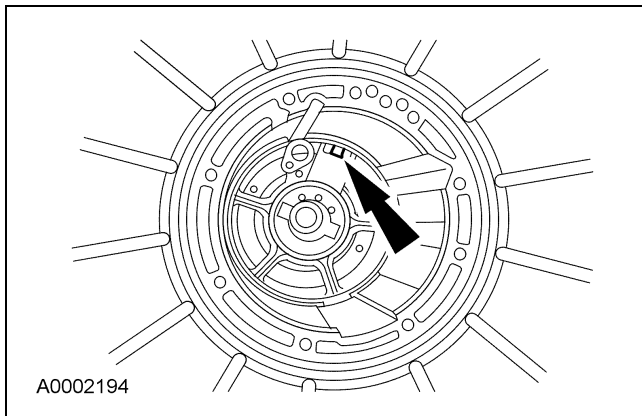
39. **CAUTION: The center support locknut could fall into the remaining assembly if not removed.**

Remove the bolt.

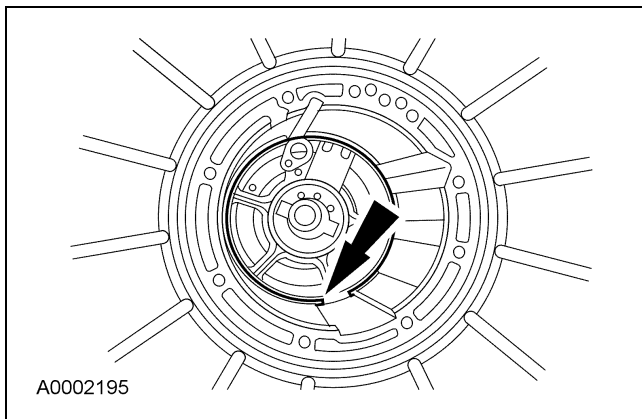


DISASSEMBLY (Continued)

40. Remove the locknut and cage.



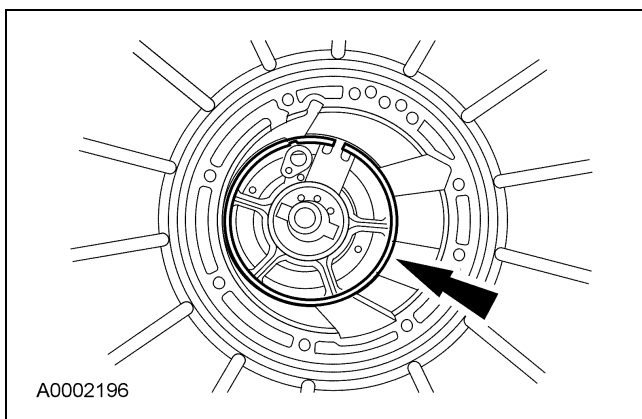
41. Remove the center support retaining ring.



42. **NOTE:** The center support is repaired as an assembly. Any damage requires installing a new component.

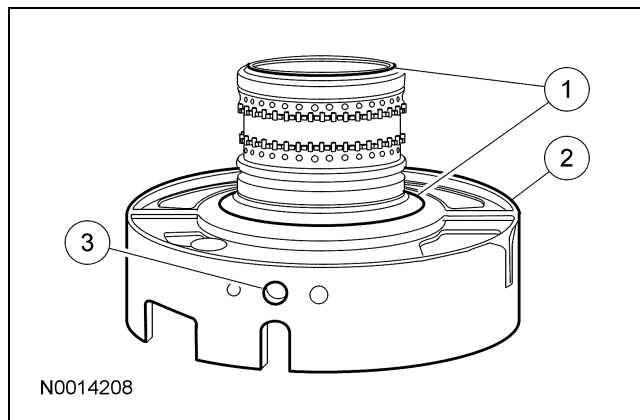
NOTE: When removing the center support, pull evenly around the center support web.

Remove the center support.

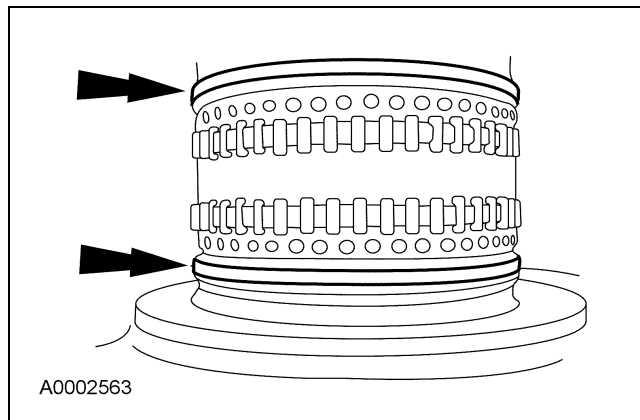


43. Inspect the center support assembly for wear or damage.

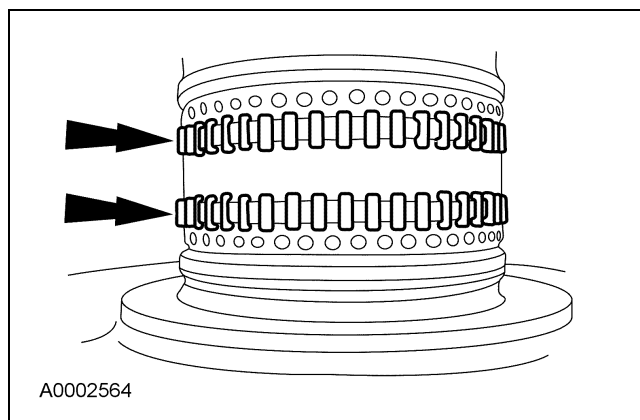
- 1 Inspect the thrust surfaces for wear or damage.
- 2 Inspect the center support sealing surface.
- 3 Inspect the fluid passage for blockage or damage.



44. Inspect the seal rings for damage.



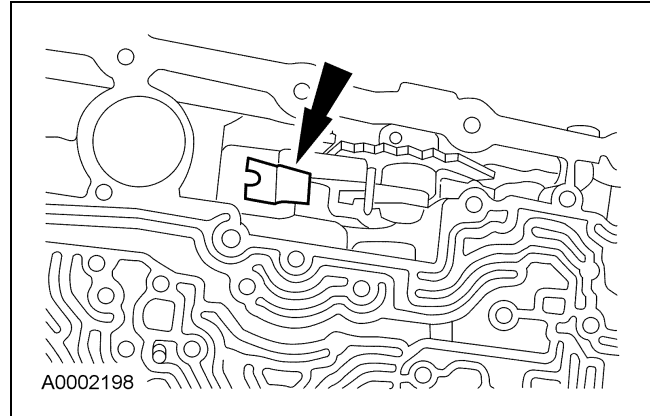
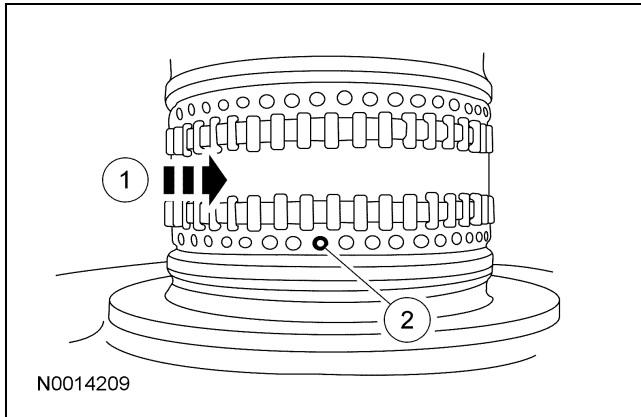
45. Inspect the bearing for missing rollers or damage.



DISASSEMBLY (Continued)

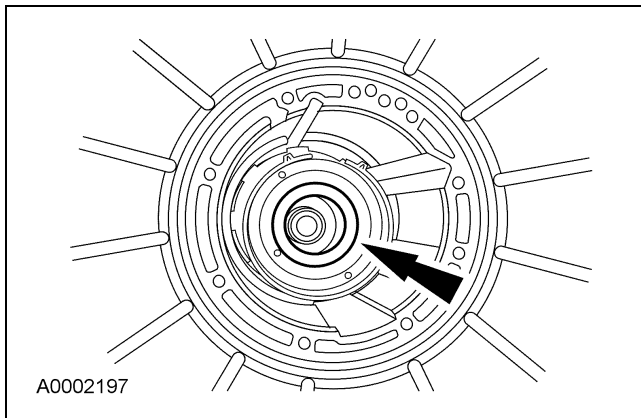
46. Inspect the direct clutch feed hole for blockage or damage.

- 1 Rotate the center support bearing to locate the direct clutch feed hole.
- 2 Inspect the direct clutch feed hole for blockage or damage.



47. **NOTE:** Tag and identify the No. 4 intermediate clutch drum thrust bearing.

Remove the intermediate brake drum thrust bearing (No. 4).



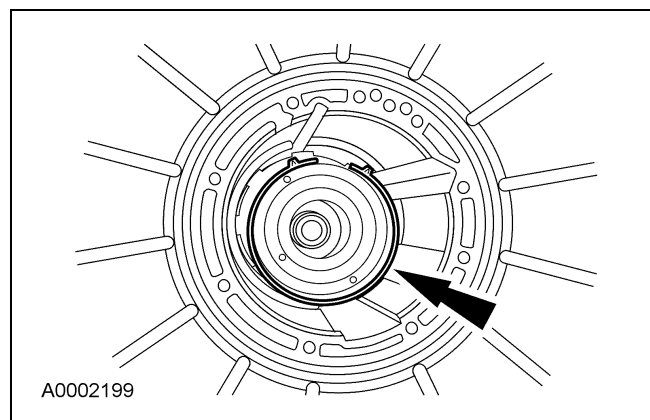
48. Remove, tag and identify the band anchor strut for assembly.

49. **CAUTION:** Identify the anchor and apply ends of the intermediate band.

NOTE: The new intermediate band is dark in color. This is a normal condition of the band. Hairline cracks in the band are also considered normal. Do not install a new band based solely on the color.

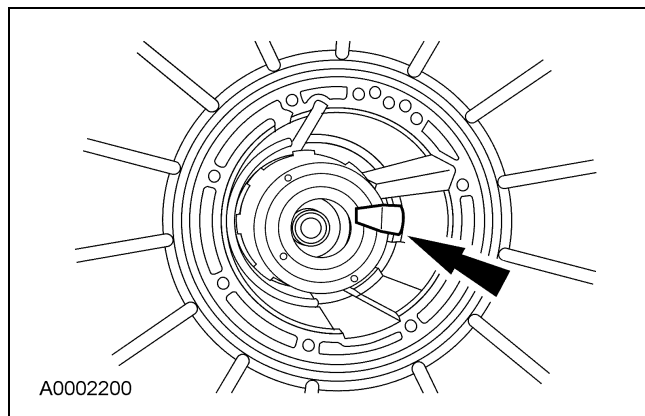
Remove and inspect the intermediate band. Check the following conditions when installing a new band:

- Inspect for glazing.
- Inspect for missing friction material.
- Inspect for material flaking.
- Inspect for damage to the anchor pins.

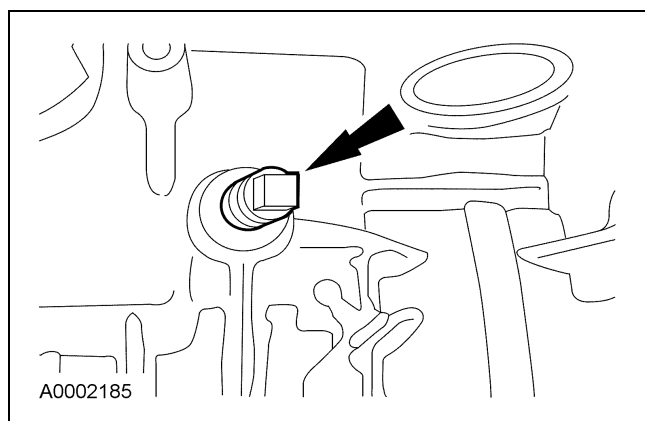


DISASSEMBLY (Continued)

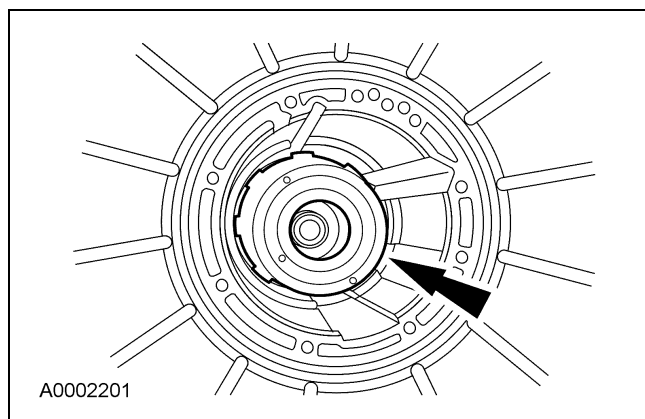
50. Remove, tag and identify the band apply strut.



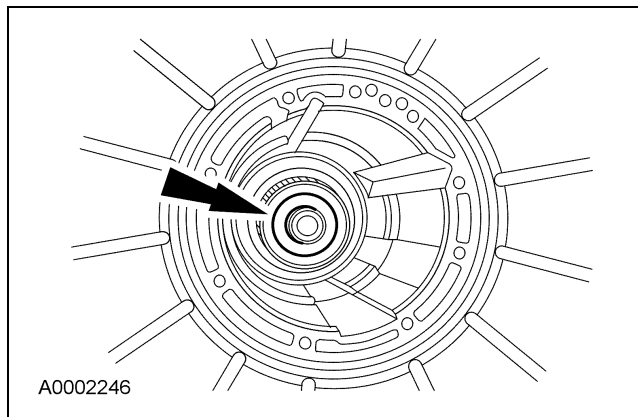
51. Remove the screw.



52. **NOTE:** The No. 5 forward clutch cylinder thrust bearing may come out with the intermediate brake and direct clutch drum.
Remove the direct clutch drum.

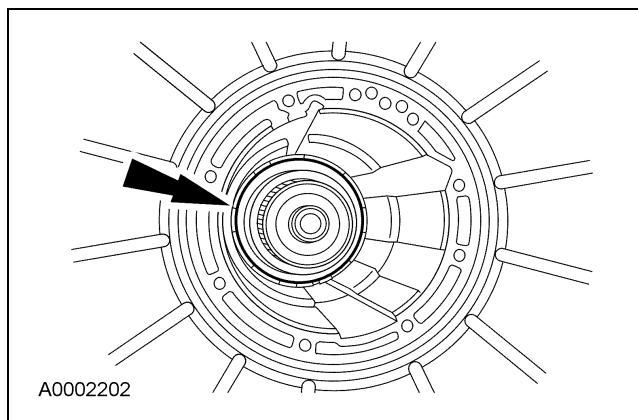


53. Remove the No. 5 forward clutch cylinder thrust bearing, tag and identify.



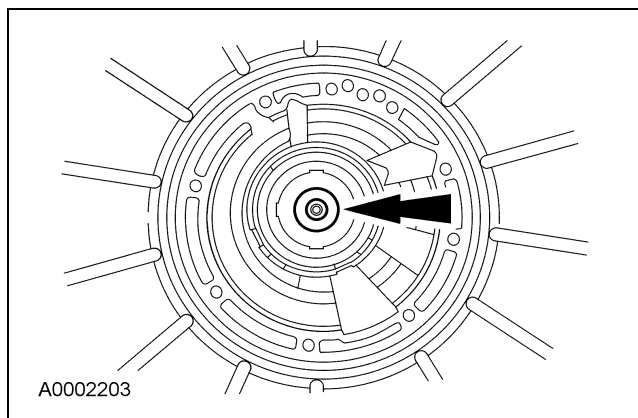
54. **NOTE:** The No. 6A thrust bearing may come out with the cylinder. Tag and identify for reassembly.

Remove the forward clutch cylinder.



55. **NOTE:** The No. 6A forward ring gear hub thrust bearing may have come out with the forward clutch cylinder.

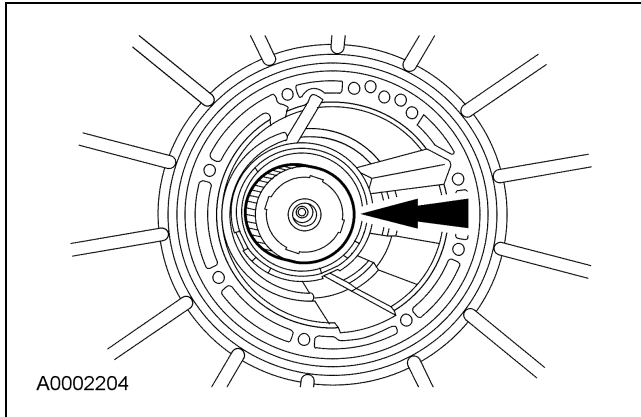
Remove the No. 6A forward ring gear hub thrust bearing.



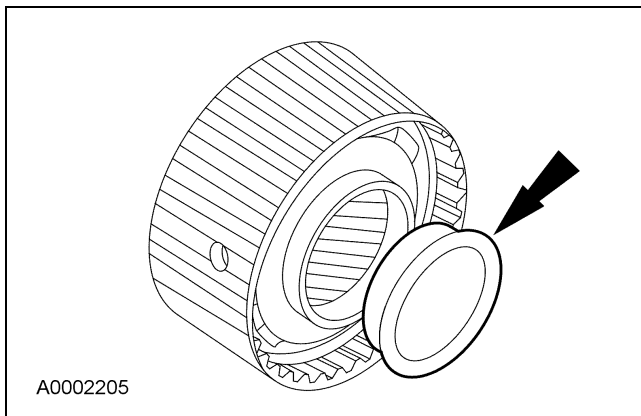
DISASSEMBLY (Continued)

56. **NOTE:** The No. 7 forward planet thrust bearing may come out with the forward ring gear and hub assembly.

Remove the forward ring gear and hub as an assembly.

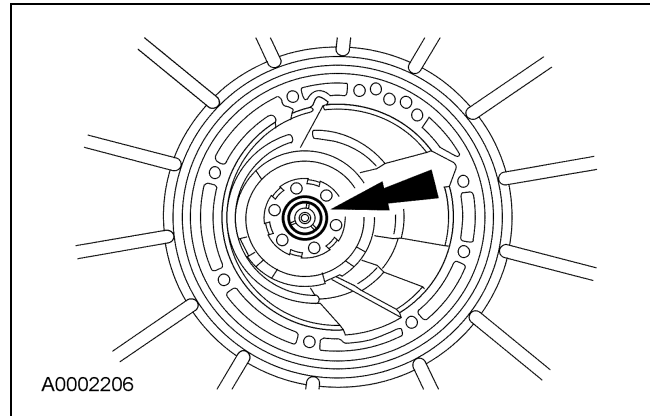


57. Remove the No. 6B forward clutch thrust washer from the forward ring gear hub.

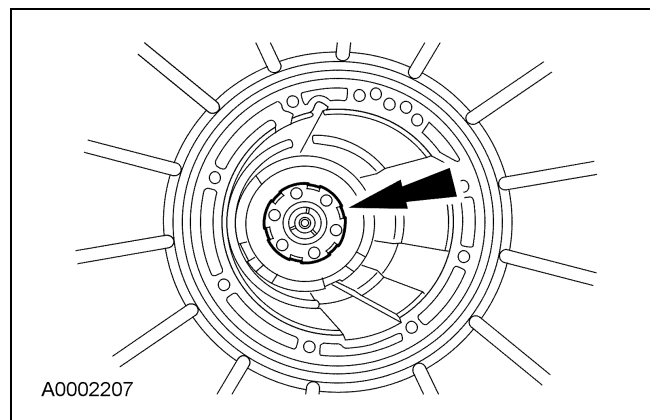


58. **NOTE:** The No. 7 forward planet thrust bearing may come out with the forward ring gear and hub assembly.

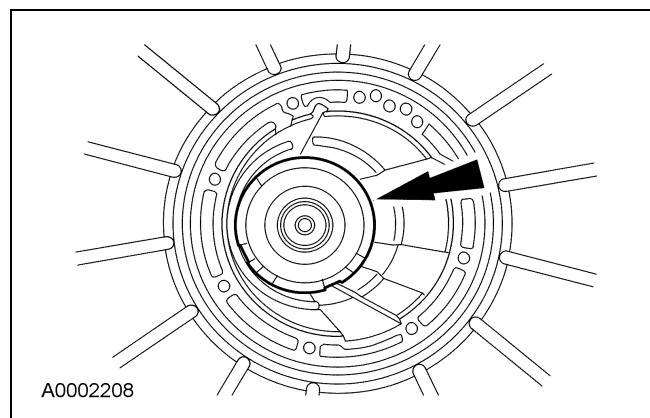
Remove the No. 7 forward planet thrust bearing.



59. Remove the forward planetary assembly.

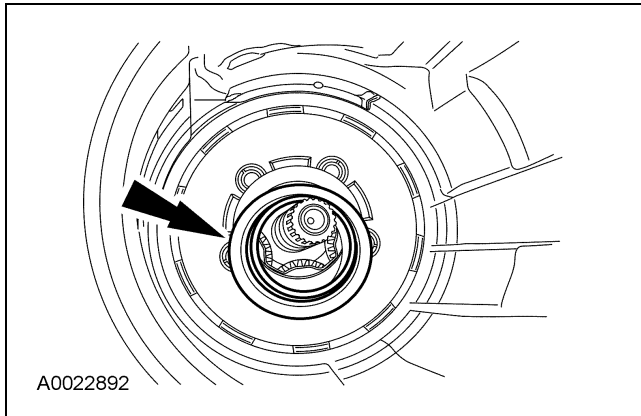


60. Remove the input shell and sun gear assembly.

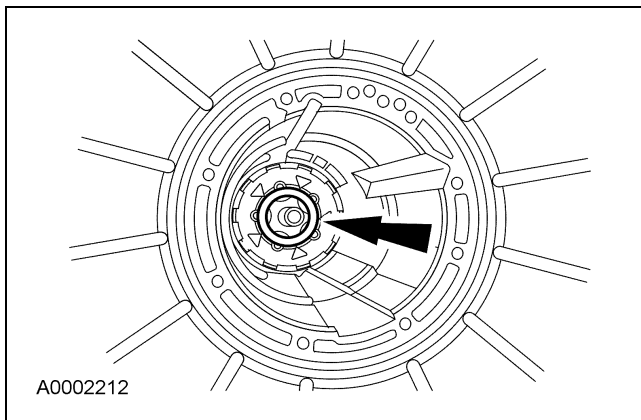


DISASSEMBLY (Continued)

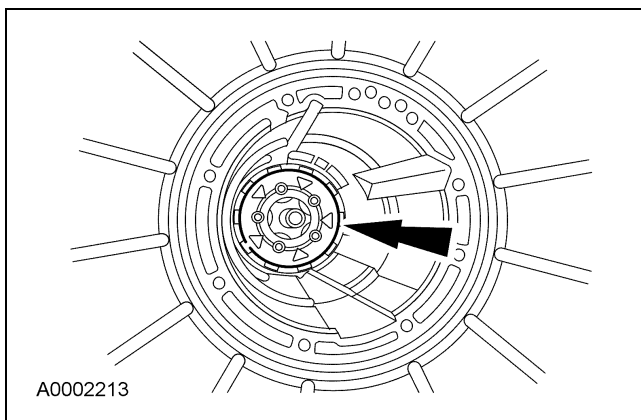
61. Remove the spacer.



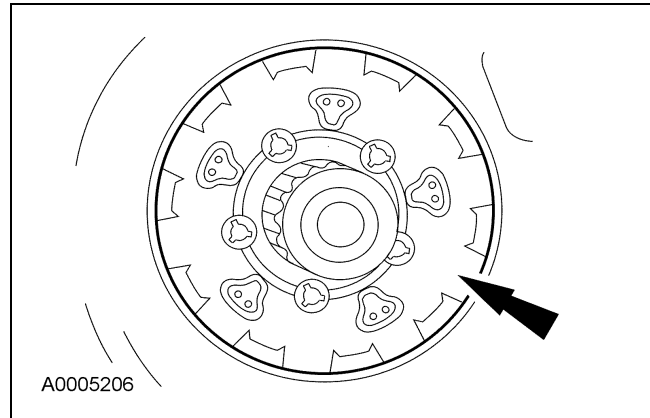
62. **NOTE:** Tag and identify the No. 8 low/reverse planetary carrier thrust bearing.
Remove the thrust bearing.



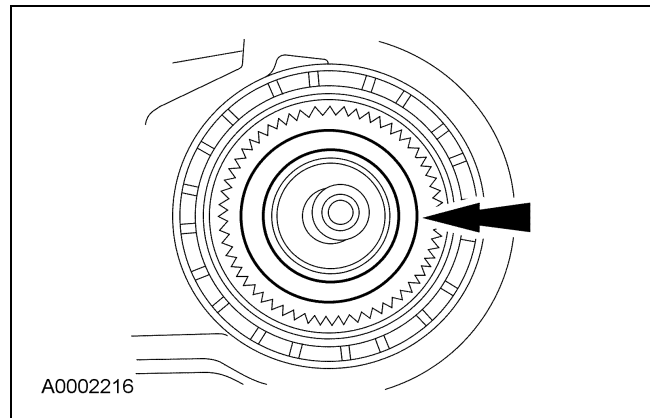
63. Remove the retaining ring.



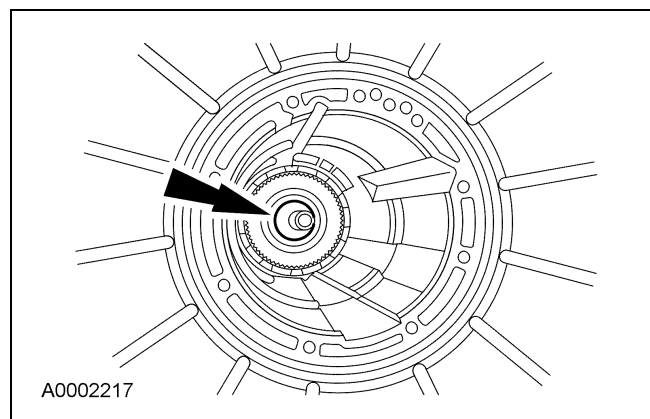
64. Remove the low/reverse planetary assembly.



65. **NOTE:** Tag and identify the No. 9 low/reverse planetary carrier thrust bearing.
Remove the thrust bearing.



66. **NOTE:** Use slots located around the outside of the sleeve.
Using a small pick, remove the output shaft sleeve.

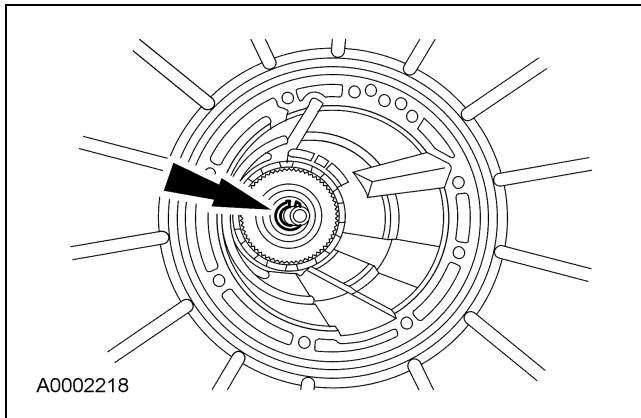


DISASSEMBLY (Continued)

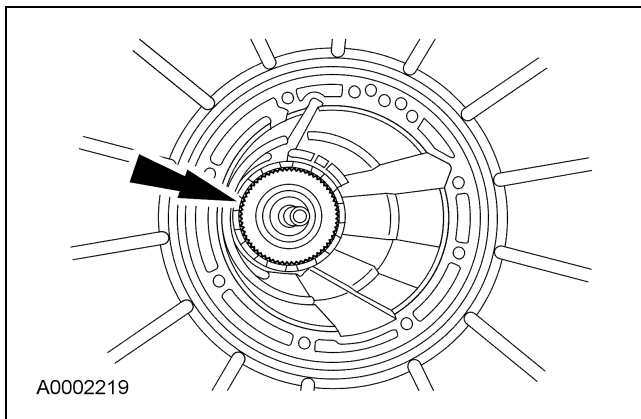
67.  **WARNING:** The output shaft may fall out after removing the snap ring. Failure to follow these instructions may result in personal injury.

 **CAUTION:** Discard the output shaft retaining ring. A new retaining ring must be used for assembly.

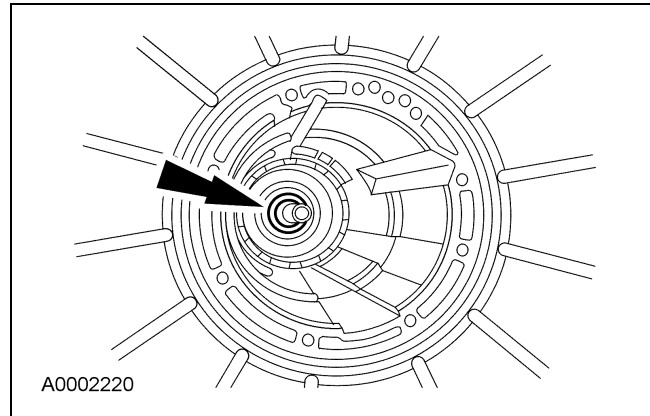
While holding the output shaft, remove and discard the output shaft retaining ring.



68. Remove the output shaft ring gear and hub.



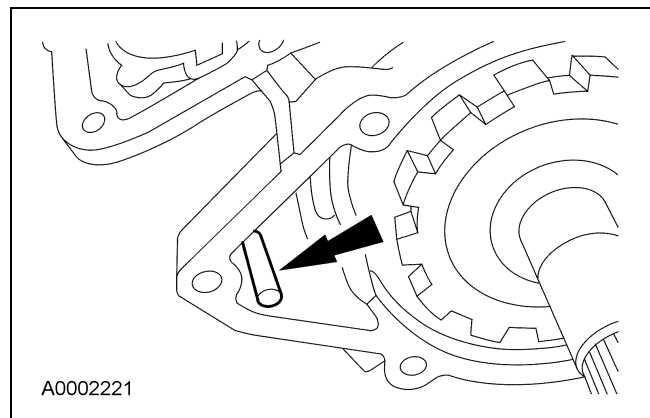
69. Remove the No. 10 low/intermediate sun gear bearing.



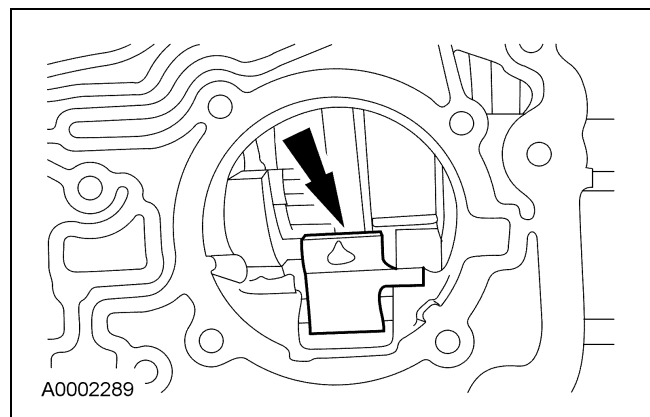
70.  **CAUTION:** Do not pry on the outer edge of the case. Damage to the gasket sealing surface could occur.

NOTE: It may be necessary to grind flat spots on the edges of the reverse band actuating lever shaft in order to remove it.

Using a pair of vise grips, hold the flat spots on the reverse band actuating lever shaft, wiggle it back and forth and remove the reverse band actuating lever shaft.



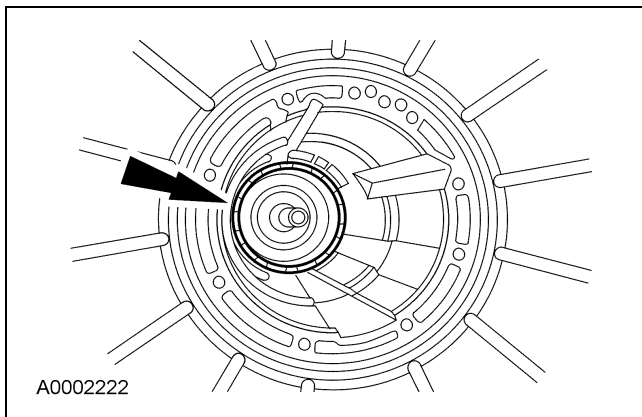
71. Remove the reverse band actuating lever assembly.



DISASSEMBLY (Continued)

72. **NOTE:** The inner race of the rear one-way clutch is not removable. It is repaired in the case.

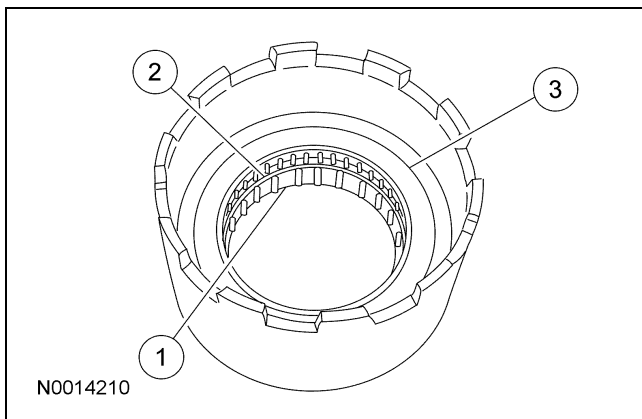
Remove the low/reverse brake drum and one-way clutch assembly by rotating it clockwise.



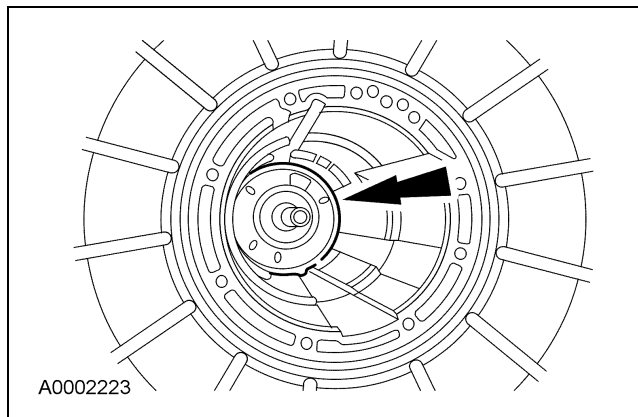
73. **NOTE:** The reverse one-way clutch is part of the reverse brake drum assembly. Install a new reverse brake drum as an assembly only.

Inspect the reverse brake drum assembly and install a new reverse brake drum assembly if damaged.

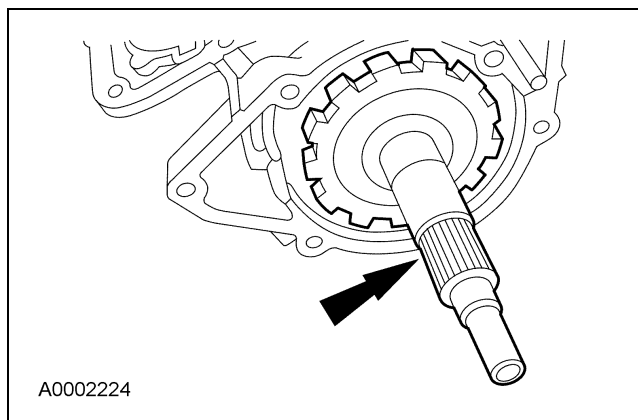
- 1 Inspect the reverse brake drum sprags.
- 2 Inspect the reverse brake drum rollers.
- 3 Inspect the reverse brake drum.



74. Remove the reverse band.

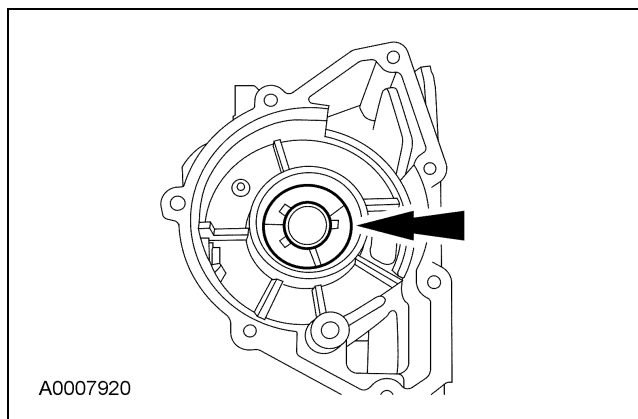


75. Remove the output shaft and park gear.



76. **NOTE:** Tag and identify the No. 11 output shaft thrust washer.

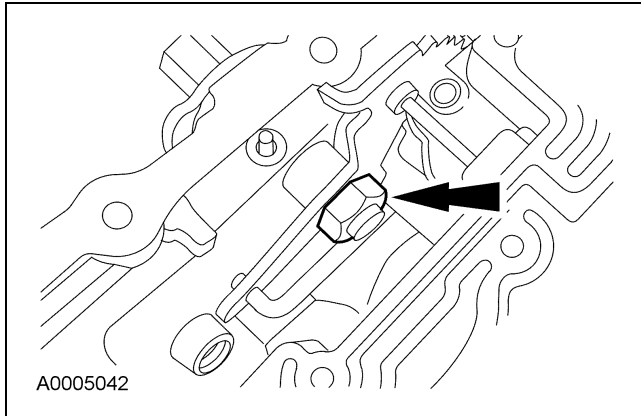
Remove the output shaft thrust washer.



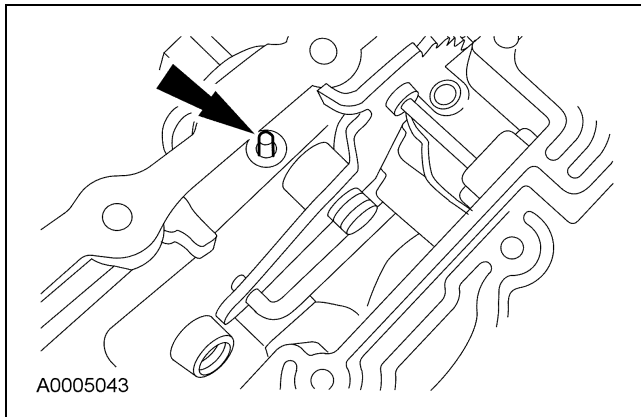
DISASSEMBLY (Continued)

77.  **CAUTION:** To avoid damage, make sure the wrench does not strike the manual valve inner lever pin.

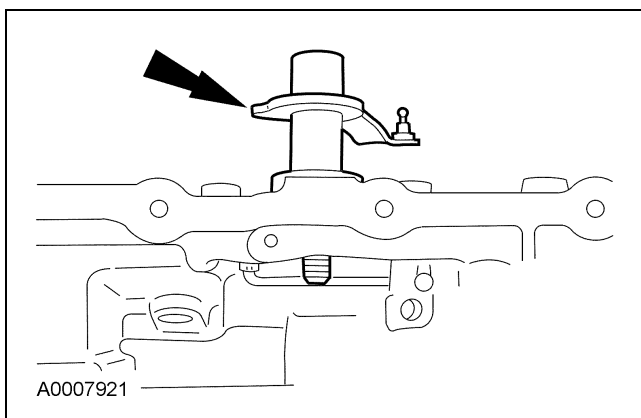
Remove the nut.



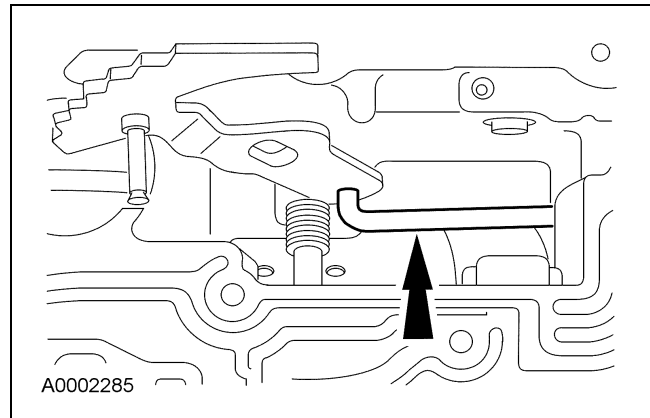
78. Remove the manual shaft retaining pin.



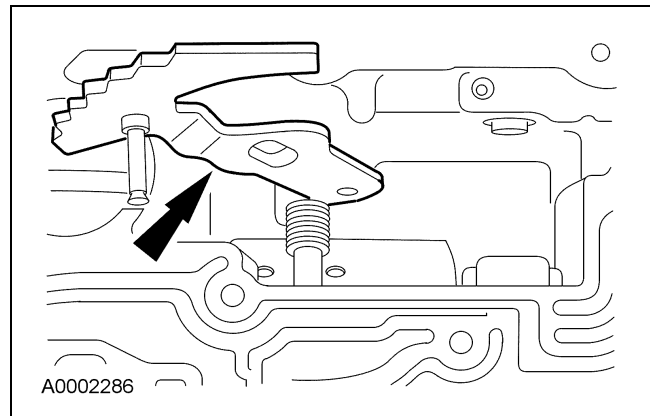
79. Remove the manual control lever shaft.



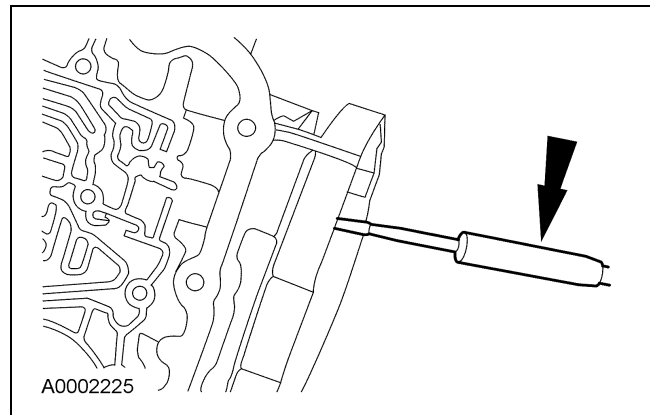
80. Disconnect the manual valve inner lever from the parking lever actuating rod.



81. Remove the manual valve inner lever.

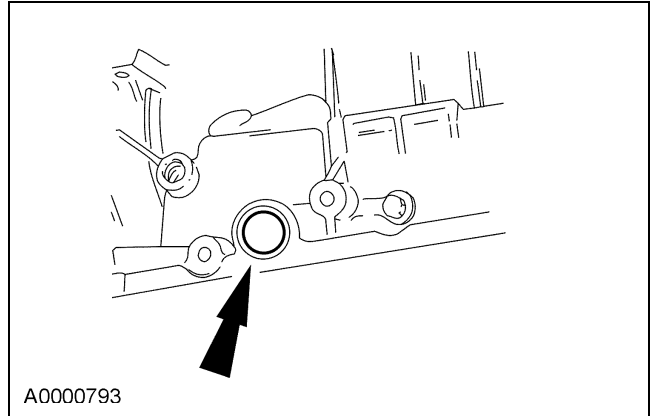


82. Remove the parking lever actuating rod.



DISASSEMBLY (Continued)

83.  **CAUTION: Do not damage the bore.**
Remove the manual control lever seal.



DIAGNOSIS AND TESTING

Visual Inspection

This inspection will identify modifications or additions to the vehicle operating system that may affect diagnosis. Inspect the vehicle for non-Ford factory add-on devices such as:

- Electronic add-on items:
 - air conditioning.
 - generator (alternator).
 - engine turbo.
 - cellular telephone.
 - cruise control.
 - CB radio.
 - linear booster.
 - backup alarm signal.
 - computer.
- Vehicle modification:

These items, if not installed correctly, will affect the powertrain control module (PCM) or transmission function. Pay particular attention to add-on wiring splices in the PCM harness or transmission wiring harness, abnormal tire size, or axle ratio changes.

- Leaks; refer to Leakage Inspection in this section.
 - Correct linkage adjustments; refer to Section 307-05.
-

Shift Linkage Check

Check for a misadjustment in shift linkage by matching the detents in the transmission range selector lever with those in the transmission. If they match, the misadjustment is in the indicator. Do not adjust the shift linkage.

Hydraulic leakage at the manual control valve can cause delay in engagements and/or slipping while operating if the linkage is not correctly adjusted. Refer to Section 307-05.

Check TSBs and OASIS

Refer to all Technical Service Bulletins (TSBs) and OASIS messages which pertain to the transmission concern and follow the procedure as outlined.

Carry Out On-Board Diagnostics (KOEO, KOER)

After a road test, with the vehicle warm and before disconnecting any connectors, carry out the Quick Test using a suitable diagnostic scan tool. Refer to the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#) for diagnosis and testing of the powertrain control system.