

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye 164-R3701 (Rotunda)	—	—
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V	11.2L (11.9 qt)
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	—

General Specifications

Item	Specification
NOTICE: Use only MERCON® V automatic 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 mi) intervals.	
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.	
Fluid Filter	
In-Line Transmission Fluid Filter Kit 7B155	—

Assembly Weight

Description	Specification
4.0L Equipped Vehicles	87.5 kg (193 lb)
4.6L Equipped Vehicles	88.3 kg (195 lb)

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****NOTICE:** 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 Throttle Position (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**NOTICE:** 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 Throttle Position (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 (O/D) 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
9R3P-BA	F	4.0L	Mustang
9R3P-AA	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	Interme- diate 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 ((D) 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 ((D) 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)	758-1,034 kPa (110-150 psi)		
R	758-862 kPa (110-125 psi)	965-1,551 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)	758-1,045 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	2,678-3,130
Mustang	4.6L	2,556-3,014

Torque Specifications

Description	Nm	lb-ft	lb-in
Band adjustment screw ^a	—	—	—
Case-to-center support screw	11	—	97
Engine-to-transmission retaining bolts	48	35	—
Extension housing screws and studs	30	22	—
Flexplate cover	35	26	—
Fluid level indicator plug-to-drain pipe assembly	10	—	89
Fluid pan drain plug	26	19	—
Fluid pump housing screws ^a	—	—	—
Locknut for band adjustment	54	40	—
Main control valve body-to-case screws ^a	—	—	—
Manual control lever shaft nut	48	35	—
Manual control valve detent spring-to-case screw	10	—	89
Output shaft-to-flange nut	130	96	—
Pressure tap plug to case	13	—	115
Pump assembly-to-case screws ^a	—	—	—

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Reverse servo assembly-to-case screws ^a	—	—	—
Separator-to-main control screws	7	—	62
Selector lever cable bracket screws	28	21	—
Solenoid body-to-case screws ^a	—	—	—
Speed sensor-to-case screws	14	—	124
Starter motor cable	13	—	115
Starter motor flange screws	25	18	—
Starter motor wire	6	—	53
Torque converter adapter plate nuts to converter	44	32	—
Torque converter adapter plate-to-flexplate nut	44	32	—
Transmission cooler tube bracket nut	25	18	—
Transmission cooler tube fitting to case	47	35	—
Transmission cooler tube nut-to-case fitting	40	30	—
Transmission crossmember-to-floor pan screws	63	46	—
Transmission fluid filter-to-case screws	10	—	89
Transmission fluid pan-to-case screws ^a	—	—	—

SPECIFICATIONS (Continued)**Torque Specifications (Continued)**

Description	Nm	lb-ft	lb-in
Transmission insulator-to-extension housing center screw	70	52	—
Transmission output shaft flange bolts	103	76	—

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Transmission Range (TR) sensor-to-case screws ^a	—	—	—
Vehicle harness-to-solenoid body screw	5	—	44

a Refer to the procedure in this section.

DESCRIPTION AND OPERATION

Transmission Description

This transmission has:

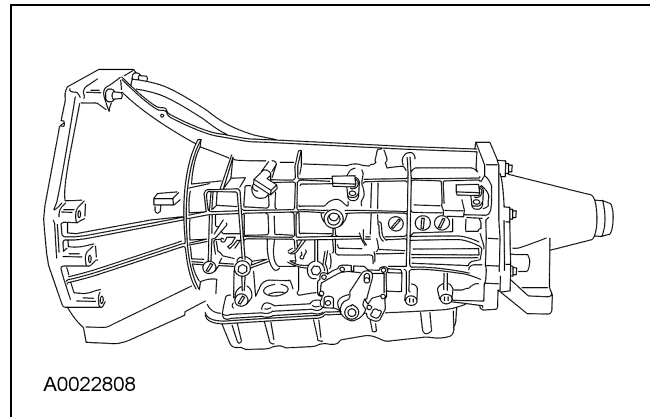
- five forward speeds.
- electronic shift, pressure and Torque Converter Clutch (TCC) controls.
- three planetary gearsets.
- three bands.
- three multi-plate clutches.
- two One-Way Clutch (OWC).

All hydraulic functions are directed by electronic solenoids. The solenoids control:

- static engagement feel.
- shift feel.
- shift scheduling.
- modulated TCC applications.

- engine braking utilizing the coast clutch and bands.
- manual first and second timing.
- reverse inhibit timing.

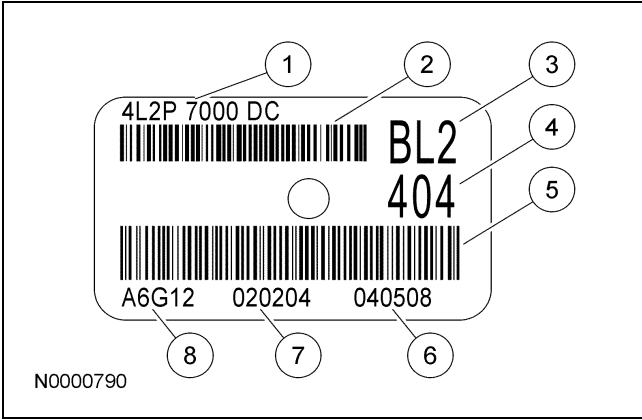
Transmission View



DESCRIPTION AND OPERATION

Identification Tags

Identification 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 (VC) label, located on the driver side door lock post. Refer to the code in the space marked TR. For model, service identification level or build date information, refer to the transmission service identification tag located on the transmission case.

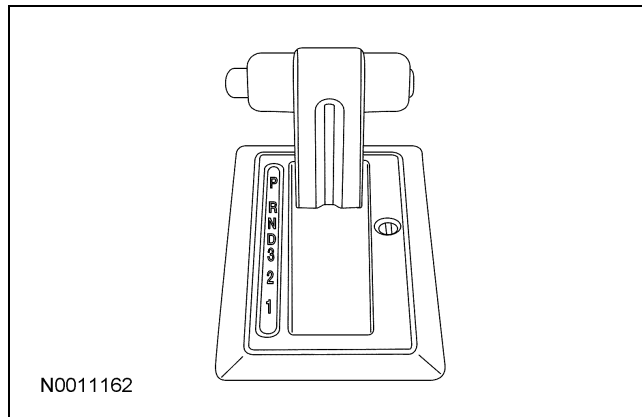
DESCRIPTION AND OPERATION

Range Selection

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

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

Transmission Selector Lever



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 — (D) 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 (TCC).
- maximum fuel economy during normal operation.
- engine braking in 5th gear.

Drive — (D) Cancelled

The D position provides:

- activated by pressing the Transmission Control Switch (TCS) on the transmission selector knob.
- automatic shifts 1-4 and 4-1.
- apply and release of the TCC.
- maximum fuel economy during normal operation.
- engine braking in 4th gear.
- for cancelling (D) through TCS.
- illuminates the (D) OFF on the Instrument Cluster (IC).

Position 3 — 3rd Gear

This position provides:

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

Position 2 — 2nd Gear

This position provides:

- second gear start and hold.
- apply and release of the TCC.
- 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.

DESCRIPTION AND OPERATION

Shift Patterns

Upshifts

Transmission upshifting is controlled by the PCM. The PCM receives inputs from various engine or vehicle sensors and driver demands to control shift scheduling, shift feel and Torque Converter Clutch (TCC) operation.

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 transmission 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.

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.
-

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 (O/D)

For component location, refer to Transmission in this section.

The planetary gear Overdrive (O/D) carrier is driven by the input shaft.

- The O/D planetary gearset carrier drives the center shaft via the O/D One-Way Clutch (OWC) in 1st, 3rd, 4th and REVERSE gears.
- In 2nd and 5th gears, the O/D sun gear is held causing the pinion gears to rotate around the O/D sun gear.
- The pinion gears, in turn, drive the O/D ring gear resulting in the 5th (O/D) gear ratio.
- The O/D 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 (OWC) 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 (O/D) 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

Apply Components

Band — Overdrive (O/D)

For component location, refer to Transmission in this section.

During 2nd and 5th gear operation, hydraulic pressure is applied to the Overdrive (O/D) servo.

- This pressure causes the piston to move and apply force to the band.
- This action causes the O/D band to hold the O/D drum.
- This causes the O/D sun gear to be held stationary through the adapter plate and the O/D 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 (O/D) drum.
- The coast clutch is applied when in manual 1st and 3rd, 4th with (D) cancelled and REVERSE positions.
- When applied, the coast clutch locks the O/D sun gear to the O/D planetary carrier, thus preventing the One-Way Clutch (OWC) from overrunning when the vehicle is coasting.

— This allows engine compression to help slow the vehicle and provide engine braking.

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

For component location, refer to Transmission in this section.

The direct OWC is a sprag-type OWC that is pressed into the center shaft.

- The direct OWC is driven by the ring gear of the O/D planetary carrier.
- The direct OWC holds and drives the outer splines of the center shaft in 1st, 3rd, 4th and REVERSE gears.
- The direct OWC overruns during all coast operations and at all times in 2nd and 5th gear.

One-Way Clutch (OWC) — Low/Reverse

For component location, refer to Transmission in this section.

The low/reverse OWC is a sprag-type OWC.

- The low/reverse OWC 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 OWC overruns.
-

One-Way Clutch (OWC) — Overdrive (O/D)

For component location, refer to Transmission in this section.

The O/D OWC is a sprag-type OWC that connects the input shaft to the center shaft during drive operation.

The O/D OWC transmits torque in REVERSE, 1st, 3rd and 4th gears, as well as in manual 1st, manual 3rd and manual 4th gears.

- The input shaft connects through the O/D planetary carrier to the inner race.
- The outer race is part of the center shaft.
- The inner race contacts the assembly of sprags, and wedges them between the inner and outer races.
- The wedging action causes the input shaft and center shaft to be connected.

DESCRIPTION AND OPERATION

Hydraulic System

Transmission Fluid Pump

For component location, refer to Transmission in this section.

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

Filter

For component location, refer to Transmission in this section.

- All transmission fluid drawn from the transmission fluid pan by the transmission fluid pump passes through the transmission fluid filter.

- The transmission fluid filter and its accompanying seals are part of the transmission fluid path from the sump (pan) to the transmission fluid pump.
 - The transmission fluid filter has a bypass section which allows transmission fluid vented at the main regulator valve to be recirculated to the transmission 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

Transmission Electronic Control System

Electronic System Description

The PCM and its input/output network control the following transmission operations:

- Shift timing
- Line pressure (shift feel)
- Torque Converter Clutch (TCC)

The transmission control 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 TCC. It will also determine the pressure needed to optimize shift feel. To accomplish this, the PCM uses 3 pressure control solenoids, 1 TCC solenoid 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.

PCM

The operation of the transmission is controlled by the PCM. Many input sensors provide information to the PCM. The PCM then controls the actuators which determine transmission operation.

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 TCC 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 Actuator (BSIA).

Engine Coolant Temperature (ECT) Sensor

The Engine Coolant Temperature (ECT) sensor detects ECT and supplies the information to the PCM. The ECT sensor is used to control TCC operation.

Cylinder Head Temperature (CHT) Sensor

The Cylinder Head Temperature (CHT) sensor is a thermistor device in which resistance changes with the temperature. The electrical resistance of a thermistor decreases as temperature increases, and the resistance increases as the temperature decreases. The varying resistance affects the voltage drop across the sensor terminals and provides electrical signals to the PCM corresponding to temperature.

Electronic Ignition (EI) System

The Electronic Ignition (EI) system consists of a Crankshaft Position (CKP) sensor, a pair of 4-tower ignition coils and the PCM. The ignition control module operates by sending CKP information from the CKP sensor to the ignition control module. The ignition control module generates a profile ignition pickup signal (engine rpm) and sends it to the PCM. The PCM uses the profile ignition pickup 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 Multi-Port Fuel Injection (SFI) system mixture temperature information. The IAT sensor is used both as a density corrector for airflow 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 fuel injector pulse width. For transmission strategies, the MAF sensor is used to regulate Electronic Pressure Control (EPC), shift and TCC scheduling.

Transmission Control Switch (TCS)

The Transmission Control Switch (TCS) is a momentary contact switch that allows the driver to cancel operation of 5th (D) gear.

The TCS is located on the end of the transmission selector lever knob.

When the driver initially presses the TCS, 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 cancelled.

When the TCS 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 TCS 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 TCIL is located in the Instrument Cluster (IC) and is labeled O/D OFF. The lamp is illuminated in conjunction with the TCS.

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 PCM. The TP sensor is used for shift scheduling, EPC and TCC control.

Transmission Range (TR) Sensor

The Transmission Range (TR) sensor is located on the outside of the transmission at the manual lever. The TR sensor completes the start circuit in PARK, NEUTRAL and the back-up lamp circuit in REVERSE. The TR sensor also opens and closes a set of 4 switches that are monitored by the PCM 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 transmission 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. The OSS sends a signal to the PCM to indicate transmission output shaft speed. The OSS sensor is mounted externally on the transmission case. The OSS is used for TCC operation, shift scheduling and EPC.

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 transmission case.

The PCM uses the sensor information to aid in determining pressure requirements.

Pressure Control Solenoids

The pressure control solenoids are a Variable Force Solenoid (VFS). The VFS solenoid is an electrohydraulic actuator combining a solenoid and a regulating valve.

The line pressure tap is used to verify output pressure from Pressure Control Solenoid A (PCA) or Pressure Control Solenoid B (PCB) 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 Pressure Control Solenoid C (PCC) solenoid.

DESCRIPTION AND OPERATION (Continued)

There are 3 pressure control solenoids located in the main control valve body used to control line pressure, band and clutch application pressure within the transmission.

The PCM varies the current to the pressure control solenoids.

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 is 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

Four ON/OFF shift solenoids allow the PCM to control shift scheduling.

- The solenoids are 3-way, normally closed style.
- The shift solenoids Shift Solenoid A (SSA), Shift Solenoid B (SSB), Shift Solenoid C (SSC) and Shift Solenoid D (SSD) provide gear selection of 1st through 5th and reverse gears by directing pressure control solenoid 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 TFT.
- The TFT is located on the solenoid body.
- The PCM uses the TFT signal to help determine shift scheduling, TCC operation and pressure control requirements.

The TFT sends a voltage signal to the PCM. The voltage signal varies with TFT. The PCM uses this signal to determine whether a cold start shift schedule is necessary. The shift schedule is compensated when the TFT is cold. The PCM also inhibits TCC operation at low TFT and determines pressure control 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 signal to the PCM. The PCM uses the APP sensor information to aid in determining shift scheduling, EPC and TCC operation.

DIAGNOSIS AND TESTING

Preliminary Inspection

Material

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

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 (EPC) short circuit can cause engine misfire. The Torque Converter Clutch (TCC) not disengaging will stall the engine.

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

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

- Upshift
- Downshift
- Coasting
- Engagement
- Noise/vibration — check for dependencies, either rpm dependent, vehicle speed dependent, shift dependent, gear dependent, range dependent or temperature dependent

Check Transmission Fluid Level and Condition

Transmission Fluid Level Check

NOTICE: The vehicle should not be driven if the transmission fluid level is low or internal failure may 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 transmission fluid must cool down 30 minutes to obtain an accurate reading.

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

High Transmission Fluid Level

A transmission fluid level that is too high can cause the transmission fluid to become aerated due to the churning action of the rotating internal parts. This will cause erratic control pressure, foaming, loss of transmission 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 Transmission Fluid Level

A low transmission 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.

DIAGNOSIS AND TESTING (Continued)**Adding Transmission Fluid**

NOTICE: The use of any type of transmission fluid other than specified may result in transmission damage.

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

Transmission Fluid Condition Check

1. Observe the color and the odor of the transmission fluid. Under normal circumstances, the color should be dark reddish, not brown or black.
2. Allow the transmission 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.

Water in Transmission Fluid

To correctly repair an automatic transmission or transaxle that has had water or coolant introduced into the system, completely disassemble, clean and replace the following parts:

- All internal and external seals
- All friction material; clutches and bands
- Torque converter
- All parts with bonded seals
- All solenoids
- All transmission fluid filters

Prior to installing the transmission or transaxle, the transmission fluid cooler(s), transmission fluid cooler tubes and transmission fluid cooler hoses need to be flushed and cleaned.

DIAGNOSIS AND TESTING

Road Testing Vehicle

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws, do not exceed posted limits.

NOTE: When the battery has been disconnected or a new battery is 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.

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

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 vehicle speed at which an upshift occurs and the Torque Converter Clutch (TCC) engages. Refer to the following Shift Speeds chart.
4. Stop the vehicle. Select the D position and cancel Overdrive (O/D) by pressing the Transmission Control Switch (TCS). Repeat Step 3. The transmission will make all upshifts except 4-5 and the 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 selector lever from the D position to the 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 the transmission fails to upshift/downshift or the TCC does not apply/release, refer to Diagnosis By Symptom in this section for possible causes.

Shift Speeds — 4.0L Engine

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all 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: Throttle Position (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**

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all 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: Throttle Position (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)

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 Operation Test; refer to Torque Converter Operation Test in this section.
4. Carry out Diagnostic Procedures.
 - Perform On-Board Diagnostic (OBD) test. Refer to Diagnostics in this section.
 - Repair all non-transmission related DTCs first.
 - Repair all transmission DTCs.
 - 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

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws, do not exceed posted limits.

This test verifies that the Torque Converter Clutch (TCC) control system and the torque converter are operating correctly.

1. Check for DTCs. Refer to the Diagnostic Trouble Code (DTC) Charts in this section.
2. Bring the engine to normal operating temperature by driving the vehicle at highway speeds for approximately 15 minutes in the (D) position.
3. 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.
4. 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 in this section.
5. If the engine stalls in the (D) or manual 2 at idle with the vehicle stopped, move the transmission selector lever to the manual 1 position. If the engine stalls, refer to Diagnosis By Symptom, Torque Converter Operation Concerns in this section. Repair as necessary. If the engine does not stall in (D), refer to Diagnosis By Symptom in this section.

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:
 - A/C.
 - generator (alternator).
 - engine turbo.
 - cellular telephone.
 - cruise control.
 - CB radio.
 - linear booster.
 - backup alarm signal.
 - computer.

- Vehicle modification:

These items, if not installed correctly, will affect the PCM or transmission function. Pay particular attention to add-on wiring splices in the PCM harness or transmission wiring harness, abnormal tire size or axle ratio changes.

- Leaks; refer to Leakage Inspection in this section.
 - Correct transmission selector lever cable adjustments; refer to Section 307-05.
-

Transmission Selector Lever Cable Check

Check for a misadjustment in the transmission selector lever cable by matching the detents in the transmission selector lever with those in the transmission. If they match, the misadjustment is in the indicator. Do not adjust the selector lever cable.

Hydraulic leakage at the manual control valve can cause delay in engagements and/or slipping while operating if the cable is not correctly adjusted.

Refer to Section 307-05.

Check TSBs

Refer to all TSBs which pertain to a transmission concern and follow the procedure as outlined.

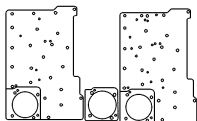
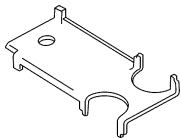
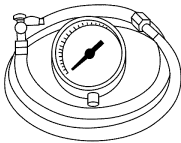
Carry Out Key ON Engine OFF (KOEO), Key ON Engine Running (KOER)

After a road test, with the vehicle warm and before disconnecting any connectors, carry out the Key ON Engine OFF (KOEO) and Key ON Engine Running (KOER) using a scan tool. Refer to the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#) for diagnosis and testing of the powertrain control system.

DIAGNOSIS AND TESTING

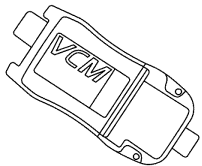
Diagnostics

Special Tool(s)

 ST1300-A	100W/12 Volt DC UV Lamp 164-R0751 or equivalent
 ST2538-A	Air Test Plate and Gaskets, Transmission 307-433-01, 307-433-02, 307-433-03
 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)

(Continued)

Special Tool(s)

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

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 self tests should be used to diagnose the PCM and should be carried out in order.

- Self Test 1.0 — Visual Inspection
- Self Test 2.0 — Set Up
- Self Test 3.0 — Key ON Engine OFF (KOEO)
- Self Test 4.0 — Continuous Memory Diagnostic Trouble Codes (CMDTCs)
- Self Test 5.0 — Key ON Engine Running (KOER)
- PCM Reset Mode
- Clearing DTCs
- On-Board Diagnostic (OBD) Drive Cycle Test

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

DIAGNOSIS AND TESTING

Diagnostic Parameters Identification (PID) Chart

PID Name	PID Description	Units
BOO	Brake On Off Switch	Mode
ECT__ACT	Engine Coolant Temperature (ECT)	Temperature
GEAR#	GEAR Commanded State (not actual)	Mode
GEAR_MAX	Highest Gear Allowed	Number
GEAR_RAT	Gear Ratio	Ratio
ISS_SRC	Unfiltered Intermediate Shaft Speed	rpm
OSSF	Output Shaft Speed (OSS) Failure Mode	Fault
OSS_SRC	Unfiltered OSS	rpm
PCA#	Pressure Control Solenoid A (PCA)	Pressure
PCAAMP	PCA	Current
PCA_F	PCA	Fault
PCB#	Pressure Control Solenoid B (PCB)	Pressure
PCBAMP	PCB	Current
PCB_F	PCB	Fault
PCC#	Pressure Control Solenoid C (PCC)	Pressure
PCCAMP	PCC	Current
PCC_F	PCC	Fault
PCFM	PCC Failure Mode	Fault
RPM#	Engine Revolutions Per Minute	rpm
SHIFT__TYP	Shift type	Mode
SSA/SS1#	Shift Solenoid A (SSA) Commanded State	Mode
SSA/SS1_F	SSA Status	Fault
SSB/SS2#	Shift Solenoid B (SSB) Commanded State	Mode
SSB/SS2_F	SSB Status	Fault
SSC/SS3#	Shift Solenoid C (SSC) Commanded State	Mode
SSC/SS3_F	SSC Status	Fault
SSD/SS4#	Shift Solenoid D (SSD) Commanded State	Mode
SSD/SS4_F	SSD Status	Fault
TCC#	Torque Converter Clutch (TCC) Solenoid Commanded State	Mode, percentage
TCCFM	TCC Unlocking Due to Slipping	Fault
TCC_F	TCC Fault	Fault
TCC_OT	Transmission Over Temperature Lockup Mode	Mode

DIAGNOSIS AND TESTING (Continued)

PID Name	PID Description	Units
TCC_RAT	Transmission Slip Ratio	Ratio
TCIL	Transmission Control Indicator Lamp (TCIL)	Mode
TCS	Transmission Control Switch (TCS)	Mode
TCSLIP_ABSL	Absolute Value of Slip	rpm
TC_SLIPACT	Torque Convertor Slip Actual	rpm
TC_SLIPDSD	Torque Convertor Slip Desired	rpm
TFT	Transmission Fluid Temperature (TFT)	Voltage, temperature
TFT_F	TFT Status	Fault
TR	Transmission Range (TR)	Mode
TR1	TR 1	Mode
TR2	TR 2	Mode
TR3	TR 3	Mode
TR3_V	TR 3	Voltage
TR4	TR 4	Mode
TRAN_OT	Transmission Over-Temperature	Fault
TRAN_RAT	Transmission Gear Ratio	Ratio
TR_F	TR Status	Fault
TSS	Turbine Shaft Speed (TSS) Sensor	rpm
TSSFM	TSS Failure Mode	Fault
TSS_SRC	Unfiltered TSS Sensor	rpm

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, do not exceed posted limits.

NOTE: The Transmission Drive Cycle Test must be followed exactly. Transmission failure must occur 4 times consecutively for a shift error DTC to be set, and 5 times consecutively for a continuous Torque Converter Clutch (TCC) DTC to set.

NOTE: When carrying out the Transmission Drive Cycle Test, use the Solenoid Operation Chart for correct solenoid operation. Refer to Pinpoint Tests — OSC Equipped Vehicle in this section.

After carrying out the Transmission Drive Cycle Test check for DTCs.

1. Check for DTCs. Refer to the Diagnostic Trouble Code (DTC) Charts in this section.
2. Warm engine to normal operating temperature.
3. Make sure transmission fluid level is correct.
4. With the transmission in the (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 steady for a minimum of 15 seconds.
5. With the transmission in 5th gear and maintaining steady speed and throttle opening, lightly apply and release the brake to operate the 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 consecutively.
8. Check for DTCs.

After On-Board Diagnostic (OBD)

NOTE: The vehicle wiring harness, PCM and non-transmission sensors may affect transmission operations. Repair these concerns first.

After the On-Board Diagnostic (OBD) 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 performing the transmission drive cycle test, 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 for transmission concerns.

DIAGNOSIS AND TESTING

Diagnostic Trouble Code (DTC) Charts

DTC 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	Mass Air Flow (MAF) Sensor	MAF concerns	MAF system inoperative which may cause a transmission concern.	High/low Electronic Pressure Control (EPC) pressure, incorrect shift schedule. Incorrect Torque Converter Clutch (TCC) engagement scheduling. Symptoms similar to a Throttle Position (TP) sensor failure.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0112	Intake Air Temperature (IAT) Sensor	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 (OBD) range	IAT higher or lower than expected during Key ON Engine OFF (KOEO) and Key ON Engine Running (KOER).	Rerun the OBD at normal operating temperature.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0117	Engine Coolant Temperature (ECT) Sensor	ECT indicates 125°C (254°F)	Voltage drop across ECT exceeds scale set for temperature 125°C (254°F) (grounded).	TCC will always be off, resulting in reduced fuel economy.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0118	ECT Sensor	ECT indicates -40°C (-40°F)	Voltage drop across ECT exceeds scale set for temperature -40°C (-40°F) (open circuit).	TCC will always be off, resulting in reduced fuel economy.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .

DIAGNOSIS AND TESTING (Continued)**DTC 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
P0121, P0122, P0123, P1120, P1121, P1125, P1124	TP Sensor	TP concern	PCM has detected an error. This error may cause a transmission concern.	Harsh engagements, firm shift feel, abnormal shift schedule, TCC does not engage. TCC cycling.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0121- P0124, P0221- P0224, P2100- P2107, P2110- P2112, P2121- P2124, P2126- P2129, P2121- P2135, P2138- P2140	Accelerator Pedal Position (APP) Sensor	APP concern	PCM has detected an error. This error may cause a transmission concern.	Harsh engagements, firm shift feel, abnormal shift schedule, TCC does not engage. TCC cycling.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0300- P0308, P0320, P0340, P1351- P1364	Electronic Ignition (EI)	EI concerns	EI system is inoperative which may cause a transmission concern.	Harsh engagements and shifts, late Wide Open Throttle (WOT) shifts, no TCC engagement.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0500, P0503, U1039	ABS	Insufficient Vehicle Speed Sensor (VSS) input from ABS through the communication link	PCM detected a loss of VSS signal through the communication link from ABS.	No transmission symptom. Instrument Cluster (IC) speedometer may be affected.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P0705	Transmission Range (TR) Sensor	TR circuit failure	TR circuits, indicating an invalid pattern in TR__V. Condition caused by a short to ground or an open in TR4, TR3, TR2 and/or TR1 circuits. This DTC cannot be set by an incorrectly adjusted TR sensor.	Harsh engagements or wrong gear commanded. Defaults to (D) or invalid position.	GO to Pinpoint Test C.

DIAGNOSIS AND TESTING (Continued)**DTC 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	TR Sensor	TR sensor circuit TR3 open	TR sensor circuit TR3 reading 2.6V-5.0V (open circuit). This DTC cannot be set by an incorrectly adjusted TR sensor.	Harsh engagements or wrong gear commanded. Defaults to (D) or invalid position.	GO to Pinpoint Test C.
P0711	Transmission Fluid Temperature (TFT) Sensor	No change in TFT	PCM has detected no TFT change during operation.	DTC set.	GO to Pinpoint Test B.
P0712	TFT Sensor	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 Sensor	-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.
P0715	Turbine Shaft Speed (TSS) Sensor	Insufficient input from TSS sensor	PCM detected a loss of TSS signal during operation.	—	GO to Pinpoint Test E.
P0717	TSS Sensor	Insufficient input from TSS sensor	PCM detected a loss of TSS signal during operation.	—	GO to Pinpoint Test E.
P0718	TSS Sensor	TSS sensor signal noisy	PCM has detected a noisy TSS signal.	—	GO to Pinpoint Test E.
P0720	Output Shaft Speed (OSS) Sensor	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 Sensor	OSS sensor signal noisy	PCM has detected an erratic OSS signal.	Abnormal shift schedule, harsh shifts.	GO to Pinpoint Test E.
P0722	OSS Sensor	Insufficient input from OSS sensor	PCM detected a loss of OSS signal during operation.	Abnormal shift schedule, harsh shifts.	GO to Pinpoint Test E.

DIAGNOSIS AND TESTING (Continued)**DTC 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
P0731**	Shift Solenoid A (SSA), Shift Solenoid B (SSB), Shift Solenoid C (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 Diagnosis By Symptom in this section.
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 Diagnosis By Symptom in this section.
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 Diagnosis By Symptom in this section.
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 Diagnosis By Symptom in this section.

DIAGNOSIS AND TESTING (Continued)**DTC 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
P0735	SSA, SSB, SSC, Shift Solenoid D (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 Diagnosis By Symptom in this section.
P0740*	TCC Solenoid	TCC solenoid circuit failure during OBD	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during OBD. May flash the Transmission Control Indicator Lamp (TCIL).	Open or short to battery power: harsh shifts or engagements, engine rpm higher than expected. Short to ground: engine stalls when in drive gear at idle, harsh shifts or engagements or engine rpm lower than expected.	GO to Pinpoint Test A.
P0741**	TCC Solenoid	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 Solenoid	TCC solenoid circuit failure during OBD	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during OBD.	Open or short to battery power: harsh shifts or engagements, engine rpm higher than expected. Short to ground: engine stalls when in drive gear at idle, harsh shifts or engagements or engine rpm lower than expected.	GO to Pinpoint Test A.
P0745	Pressure Control Solenoid A (PCA)	PCA solenoid or circuit fault	PCA functional fault-low pressure	Incorrect shift pattern indicating mechanical or hydraulic failure of the transmission.	REFER to Diagnosis By Symptom in this section.

DIAGNOSIS AND TESTING (Continued)**DTC 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
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.
P0750*	SSA	SSA solenoid circuit failure	SSA circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during OBD.	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 OBD.	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.
P0755*	SSB	SSB solenoid circuit failure	SSB circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during OBD.	Open or short to battery power: no 3rd gear. Short to ground: no 1st gear.	GO to Pinpoint Test A.
P0758*	SSB	SSB solenoid circuit failure	SSB circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during OBD.	Open or short to battery power: no 3rd gear. Short to ground: no 1st gear.	GO to Pinpoint Test A.
P0760*	SSC	SSC solenoid circuit failure	SSC circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during OBD.	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 OBD.	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.

DIAGNOSIS AND TESTING (Continued)**DTC 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
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.
P0775	Pressure Control Solenoid B (PCB)	PCB solenoid or circuit fault	PCB functional fault — low pressure.	Incorrect shift pattern indicating mechanical or hydraulic failure of the transmission.	REFER to Diagnosis By Symptom in this section.
P0778	PCB	PCB solenoid inoperative	Electrical failure of the solenoid detected.	No 2nd and 5th gear.	GO to Pinpoint Test D.
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.
P0795	Pressure Control Solenoid C (PCC)	PCC solenoid or circuit fault	PCC functional fault — low pressure.	Incorrect shift pattern indicating mechanical or hydraulic failure of the transmission.	REFER to Diagnosis By Symptom in this section.
P0798	PCC	PCC solenoid inoperative	Electrical failure of the solenoid detected.	Incorrect gear ratio in 4th and 5th gear.	GO to Pinpoint Test D.
P0960	Pressure Control Solenoid A (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)**DTC 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
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.
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.
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.
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.
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.
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.
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.

DIAGNOSIS AND TESTING (Continued)**DTC 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
P1116	ECT Sensor	ECT out of OBD range	ECT temperature higher or lower than expected during KOEO and KOER.	Rerun OBD at normal operating temperature.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P1124	TP Sensor	TP sensor voltage high/low for OBD	TP sensor was not in the correct position for on-board diagnostic.	Rerun at appropriate TP per application.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual .
P1460	A/C	A/C clutch cycling pressure switch error	A/C or defrost ON condition may result from A/C clutch being ON during OBD.	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 .
P1572	Brake Pedal Position (BPP) Switch	BPP switch circuit failed	Brake ON circuit failure during normal operation.	Failed ON or not connected — TCC will not engage at less than one-third throttle. Failed OFF or not connected — TCC will not disengage when brake is applied.	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	Transmission	Transmission indeterminate failure	Internal component failure. Direct One-Way Clutch (OWC) failure.	Failure Mode Effects Management 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 OWC. REPAIR as required. CLEAR DTC. DRIVE vehicle and VERIFY repair.

DIAGNOSIS AND TESTING (Continued)**DTC 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
P1702	TR Sensor	TR signal intermittent, code P0705, P0708 are set	See P0705, P0708 conditions.	See P0705, P0708 symptoms.	GO to Pinpoint Test C.
P1703	BPP Switch	Brake not actuated during OBD KOER	Brake not cycled during KOER.	Failed ON or not connected — TCC will not engage at less than one-third throttle. Failed OFF or not connected — TCC will not disengage when brake is applied.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1703	BPP Switch	BPP switch circuit failed	Brake ON circuit failure during KOEO.	Failed ON or not connected — TCC will not engage at less than one-third throttle. Failed OFF or not connected — TCC will not disengage when brake is applied.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1704	TR Sensor	TR not in P or N positions during KOEO/KOER	TR sensor or transmission selector lever cable incorrectly adjusted or TR circuit failure.	DTC is set.	GO to Pinpoint Test C.
P1705	TR Sensor	TR not in P or N during KOEO/KOER	KOEO/KOER not run in park or neutral, or TR circuit failure.	DTC is set.	RERUN KOEO/KOER in P or N or GO to Pinpoint Test C.
P1711	TFT Sensor	TFT out of OBD range	Transmission not at operating temperature during OBD.	DTC set — vehicle cold or overheated.	Warm or cool vehicle to normal operating temperature. GO to Pinpoint Test B.
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 Malfunction Indicator Lamp (MIL). Stuck ON. No 4th or 5th gear.	GO to Pinpoint Test F.

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

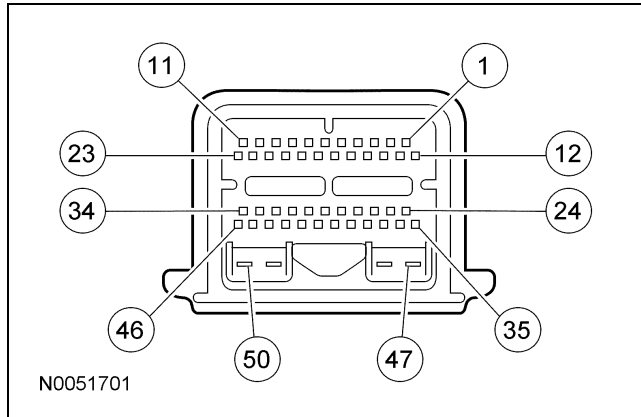
**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P1715	SSB	SSB inoperative	Mechanical failure of the solenoid detected.	Stuck OFF: 3rd gear ratio incorrect, no 3rd gear. Stuck ON: 1st gear ratio incorrect or no 1st gear.	GO to Pinpoint Test F.
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.
P1717	SSD	SSD inoperative	Mechanical failure of the solenoid detected.	Stuck ON: no engine braking.	GO to Pinpoint Test F.
P1740**	TCC Solenoid	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: engine stalls when in drive gear at idle, harsh shifts or engagements or engine rpm lower than expected.	GO to Pinpoint Test F.
P1780	Transmission Control Switch (TCS)	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 OBD and cycle switch. REFER to Section 307-05 for further diagnosis and repair.
P1783	TFT Sensor	Transmission overtemp condition indicated	TFT exceeded 127°C (270°F).	Increase in control pressure.	GO to Pinpoint Test B.

DIAGNOSIS AND TESTING

Transmission Connector Layouts

Connector Reference and Terminal Readings

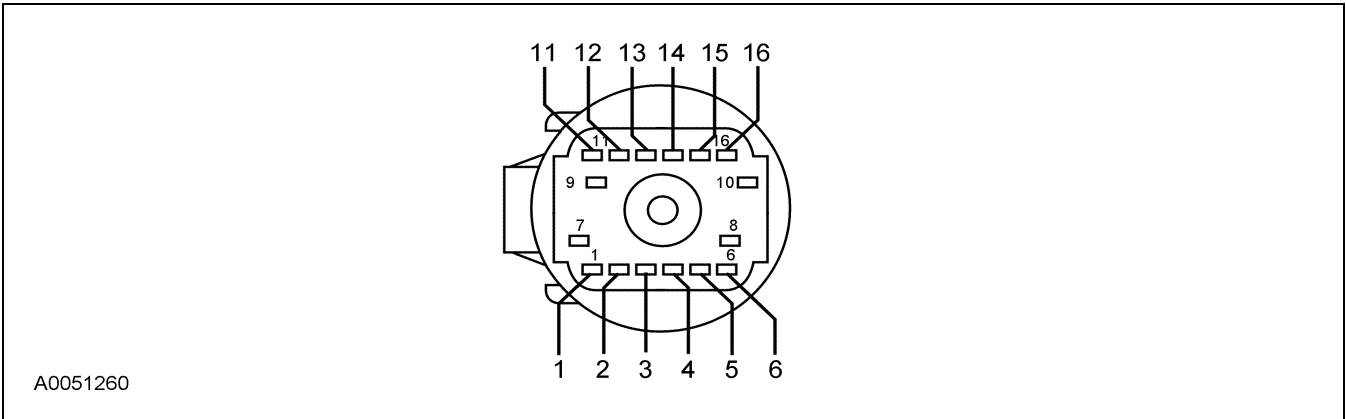
PCM — C175T



Pin Number	Circuit Description
3	Output Shaft Speed (OSS) sensor signal input
4	Intermediate shaft speed sensor signal input
11	Pressure Control Solenoid A (PCA)
15	Turbine Shaft Speed (TSS) sensor signal input
16	Transmission Range (TR)1 sensor to PCM
17	TR2 sensor to PCM
23	Pressure Control Solenoid B (PCB)
27	TR3 sensor to PCM
28	TR4 sensor to PCM
29	Transmission Fluid Temperature (TFT) sensor signal
34	Pressure Control Solenoid C (PCC)
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

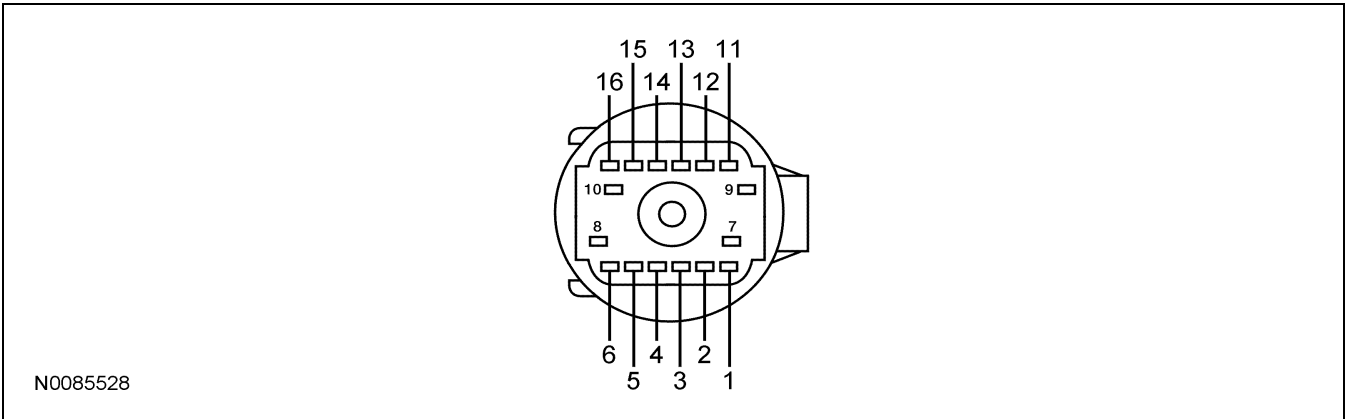
DIAGNOSIS AND TESTING (Continued)

Transmission Vehicle Harness — C199



Pin Number	Circuit Description
1	Pressure Control Solenoid B (PCB)
2	Transmission Fluid Temperature (TFT) sensor input
3	Solenoid power
4	Pressure Control Solenoid C (PCC)
5	Shift Solenoid D (SSD)
6	Shift Solenoid C (SSC)
11	Pressure Control Solenoid A (PCA)
12	Signal return
14	Torque Converter Clutch (TCC) solenoid
15	Shift Solenoid B (SSB)
16	Shift Solenoid A (SSA)

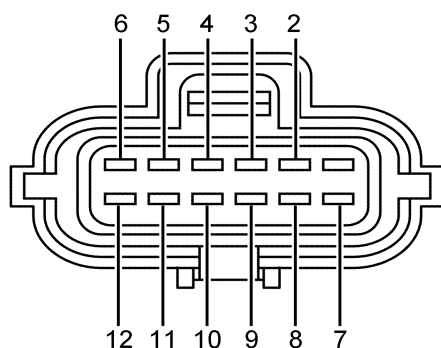
Transmission Internal Harness



Pin Number	Circuit Description
1	Pressure Control Solenoid B (PCB)
2	Transmission Fluid Temperature (TFT) sensor input
3	Solenoid power
4	Pressure Control Solenoid C (PCC)
5	Shift Solenoid D (SSD)

DIAGNOSIS AND TESTING (Continued)

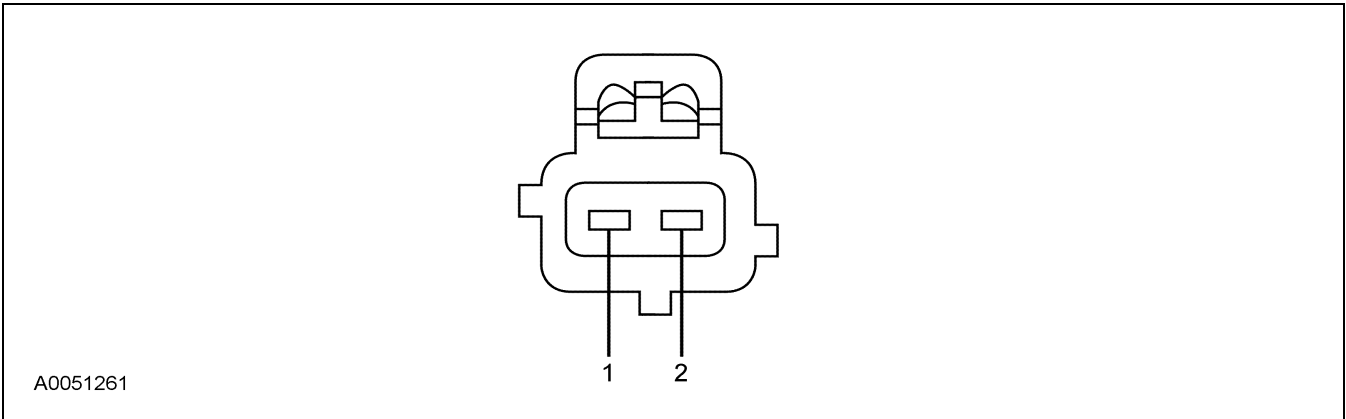
Pin Number	Circuit Description
6	Shift Solenoid C (SSC)
11	Pressure Control Solenoid A (PCA)
12	Signal return
14	Torque Converter Clutch (TCC) solenoid
15	Shift Solenoid B (SSB)
16	Shift Solenoid A (SSA)

Transmission Range (TR) Sensor — C167

Pin Number	Circuit Description
2	Signal return
3	Transmission Range (TR)3 sensor
4	TR1 sensor
5	TR2 sensor
6	TR4 sensor
7	Ground
8	Neutral switch sense input
9	Not used
10	Starter solenoid central power
11	Not used
12	Starter relay (overload protected)

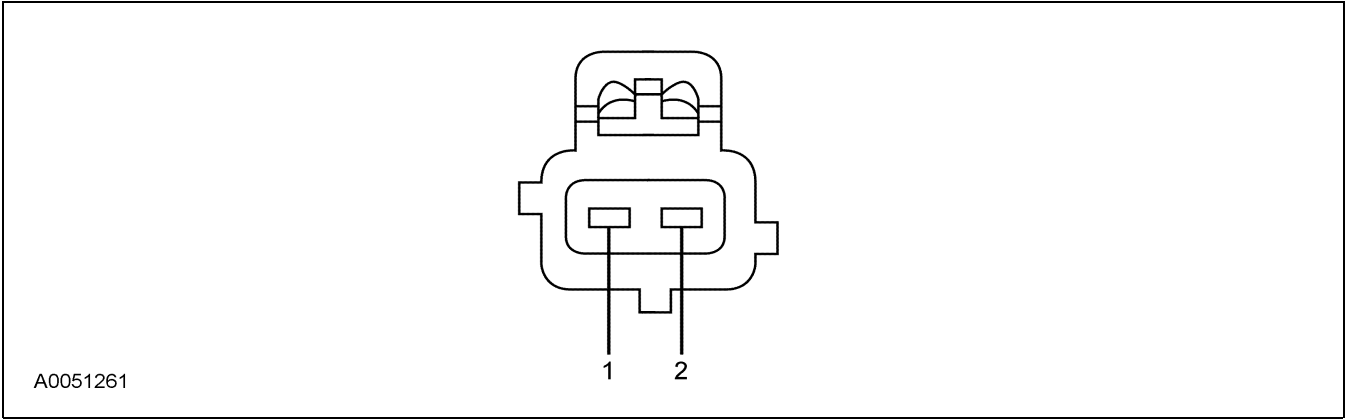
DIAGNOSIS AND TESTING (Continued)

Turbine Shaft Speed (TSS) Sensor — C143



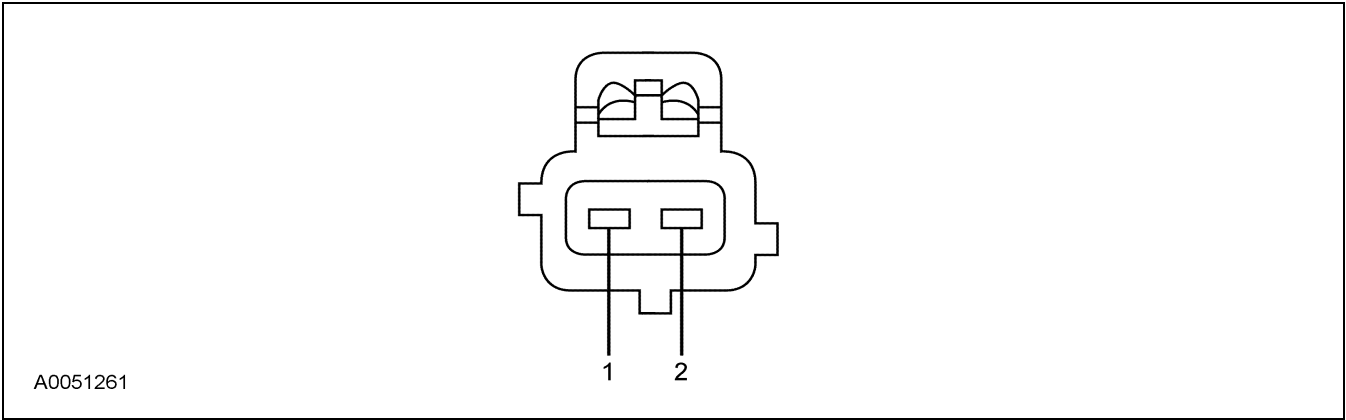
Pin Number	Circuit Description
1	Turbine Shaft Speed (TSS) sensor signal
2	Signal return

Output Shaft Speed (OSS) Sensor — C193



Pin Number	Circuit Description
1	Output Shaft Speed (OSS) sensor signal
2	Signal return

Intermediate Shaft Speed Sensor Harness — C164



DIAGNOSIS AND TESTING (Continued)

Pin Number	Circuit Description
1	Intermediate shaft speed sensor signal
2	Signal return

Transmission Range (TR) Sensor Diagnosis Chart

Selector Lever Position	PID: TR	TR4	TR3	TR2	TR1	TR3__V PCM pin 27 to signal return
Park	P	Closed	Closed	Closed	Closed	0.0 volt
Reverse	R	Open	Open	Closed	Closed	1.3-1.8 volts
Neutral	N	Closed	Open	Open	Closed	1.3-1.8 volts
(D)	D	Open	Open	Open	Open	1.3-1.8 volts
Manual 3	3	Open	Closed	Open	Closed	0.0 volt
Manual 2	2	Open	Closed	Closed	Open	0.0 volt
Manual 1	1	Closed	Closed	Open	Open	0.0 volt

A. TR3__V is the voltage at the PCM **C175T-27** Circuit VET55(BN) to signal return.

•**Voltages for TR1, TR2 and TR4:**

•0 = 0.0 volt.

•1 = 9.0-14.0 volts.

•**Voltage for TR3A:**

•0 = 0.0 volt.

•1 = 1.3-1.8 volts.

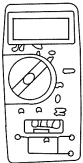
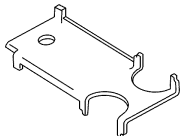
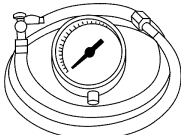
Wiggle Test Information for Open/Shorts

- A. TR4, TR3, TR2 and TR1 are all closed in PARK. PARK is a good position to check for intermittent open circuits.
- B. TR4, TR3, TR2 and TR1 are all open in (D), so (D) is a good position to check for shorts to ground. To determine the shorted components while observing the TR PIDs, unplug the TR sensor **C167** and see if the short goes away. If the short is still present, unplug the transmission **C199** 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 PCM **C175T**. If the short is still present, then the PCM has an internal failure; otherwise the failure is in the vehicle harness.

DIAGNOSIS AND TESTING

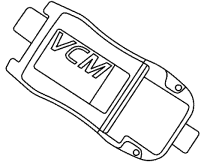
Pinpoint Tests — OSC Equipped Vehicle

Special Tool(s)

 ST1137-A	73 III Automotive Meter 105-R0057 or equivalent
 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)

(Continued)

Special Tool(s)

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

Shift Solenoid Pre-Diagnosis

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

DIAGNOSIS AND TESTING (Continued)

H = HIGH

L = LOW

H/L = PCM controlled

Manual = if equipped

Shift Solenoid Failure Mode Chart

Failed ON or OFF due to PCM and/or vehicle wiring concerns, solenoid electrically, mechanically or hydraulically stuck ON or OFF.

Solenoid Failure Mode Chart A

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 (O/D) Band applied.

Solenoid Failure Mode Chart B

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
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

DIAGNOSIS AND TESTING (Continued)

H = High

L = Low

Slip = Slip due to low line pressure

1.1 = Actual ratio with Forward Clutch, Intermediate and Overdrive (O/D) Band applied.

Pinpoint Tests

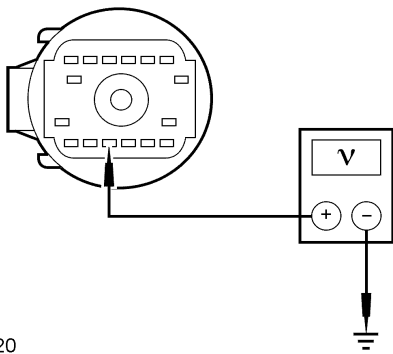
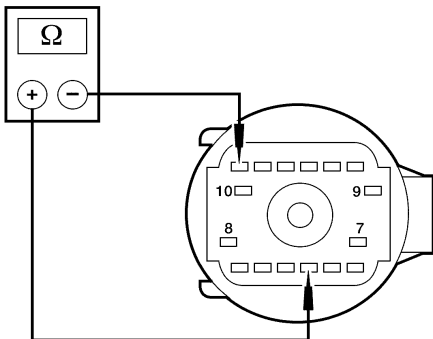
Refer to Wiring Diagrams Cell 29 for schematic and connector information.

PINPOINT TEST A: SHIFT AND Torque Converter Clutch (TCC) SOLENOIDS**NOTE:** Refer to the Transmission Vehicle Harness illustration Transmission Connector Layouts in this section.**NOTE:** Refer to the Transmission Internal Harness illustration Transmission Connector Layouts in this section.**NOTE:** Read and record all DTCs. All Transmission Range (TR) sensor and Vehicle Speed Sensor (VSS) DTCs must be repaired before entering output state control.

Test Step		Result / Action to Take
A1	ELECTRONIC DIAGNOSTICS	Yes GO to A2 . No REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission PIDs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.
	- Select PARK. - Ignition OFF. - Check to make sure the transmission harness C175T is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding. - Connect the scan tool. - Ignition ON. - Access the transmission PIDs. Is the scan tool able to access the transmission PIDs?	
A2	SOLENOID FUNCTIONAL CHECK	Yes GO to A3 . No GO to A4 .
	- Select PIDs to be monitored. — Shift Solenoid A (SSA) — Shift Solenoid B (SSB) — Shift Solenoid C (SSC) — Shift Solenoid D (SSD) — Torque Converter Clutch (TCC) - Select ON to turn suspect solenoid(s) ON. - Select OFF to turn solenoid(s) OFF. - Repeat steps for each solenoid. Does the suspect solenoid turn ON and OFF when commanded?	
A3	OSC TRANS-DRIVE MODE (GEAR OR TCC)	Yes CLEAR the 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 shift or torque converter concern. No GO to A4 .
	- Select GEAR for shift solenoids. - Select TCC for torque converter clutch solenoid. Does the transmission upshift and downshift or torque converter engage/disengage when commanded?	
A4	CHECK CIRCUIT 1862 (VT/WH) FOR BATTERY VOLTAGE	
	- Ignition OFF. - Disconnect: Transmission Vehicle Harness C199. - Visually inspect all wires and connectors for damage. - Ignition ON.	

(Continued)

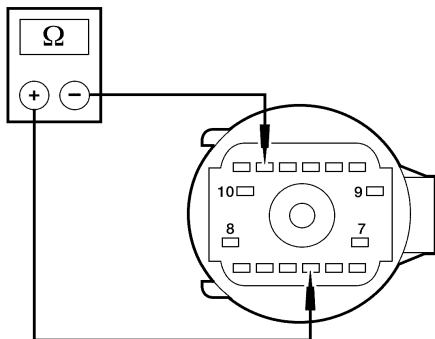
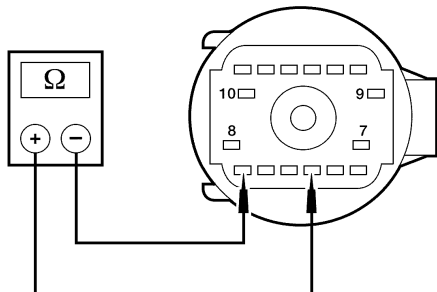
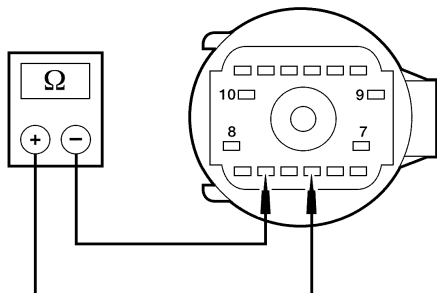
DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST A: SHIFT AND Torque Converter Clutch (TCC) SOLENOIDS (Continued)**

Test Step		Result / Action to Take																		
A4	CHECK CIRCUIT 1862 (VT/WH) FOR BATTERY VOLTAGE (Continued)																			
- Measure the voltage from the vehicle harness C199-3, circuit 1862 (VT/WH), harness side to ground.  N0052520 - Is the voltage greater than 10 volts?		Yes GO to A5. No REPAIR circuit 1862 (VT/WH). CLEAR the DTCs. TEST the system for normal operation.																		
A5	ELECTRICAL SIGNAL CHECK																			
- Measure the voltage between the vehicle harness C199-3, circuit 1862 (VT/WH) and vehicle harness C199 signal pin, vehicle harness side. - Access the transmission PIDs and measure the voltage while cycling the solenoids ON and OFF using the following chart. <table border="1"> <thead> <tr> <th>Connector Pin</th><th>Circuit</th><th>Connector Signal Pin</th></tr> </thead> <tbody> <tr> <td>C199-3</td><td>Circuit 237 (OG/YE)</td><td>C199-16</td></tr> <tr> <td>C199-3</td><td>Circuit 315 (VT/OG)</td><td>C199-15</td></tr> <tr> <td>C199-3</td><td>Circuit 971 (PK/BK)</td><td>C199-6</td></tr> <tr> <td>C199-3</td><td>Circuit 236 (BK/LG)</td><td>C199-5</td></tr> <tr> <td>C199-3</td><td>Circuit 126 (VT/YE)</td><td>C199-14</td></tr> </tbody> </table> - Does the voltage change?		Connector Pin	Circuit	Connector Signal Pin	C199-3	Circuit 237 (OG/YE)	C199-16	C199-3	Circuit 315 (VT/OG)	C199-15	C199-3	Circuit 971 (PK/BK)	C199-6	C199-3	Circuit 236 (BK/LG)	C199-5	C199-3	Circuit 126 (VT/YE)	C199-14	Yes GO to A6. No REPAIR the faulty circuit. CLEAR the DTCs. TEST the system for normal operation.
Connector Pin	Circuit	Connector Signal Pin																		
C199-3	Circuit 237 (OG/YE)	C199-16																		
C199-3	Circuit 315 (VT/OG)	C199-15																		
C199-3	Circuit 971 (PK/BK)	C199-6																		
C199-3	Circuit 236 (BK/LG)	C199-5																		
C199-3	Circuit 126 (VT/YE)	C199-14																		
A6	CHECK THE TRANSMISSION INTERNAL HARNESS/COMPONENT FOR AN OPEN																			
For SSA, measure the resistance between C199-3 and C199-16, component side.  N0085529																				

(Continued)

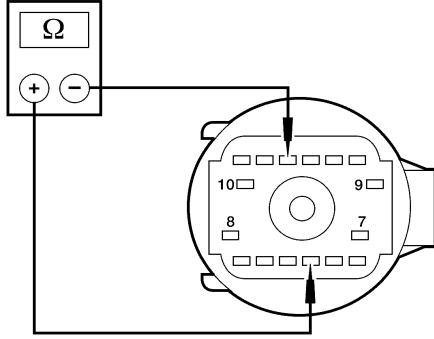
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: SHIFT AND Torque Converter Clutch (TCC) SOLENOIDS (Continued)

Test Step		Result / Action to Take
A6	CHECK THE TRANSMISSION INTERNAL HARNESS/COMPONENT FOR AN OPEN (Continued)	
- For SSB, measure the resistance between C199-3 and C199-15, component side.  N0085530 - For SSC, measure the resistance between C199-3 and C199-6, component side.  N0085531 - For SSD, measure the resistance between C199-3 and C199-5, component side.  N0085532 - For TCC, measure the resistance between C199-3 and C199-14, component side.		

(Continued)

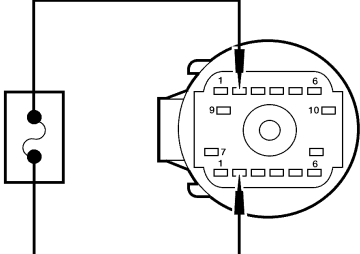
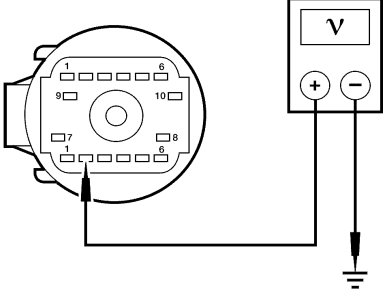
DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST A: SHIFT AND Torque Converter Clutch (TCC) SOLENOIDS (Continued)**

Test Step		Result / Action to Take																				
A6	CHECK THE TRANSMISSION INTERNAL HARNESS/COMPONENT FOR AN OPEN (Continued)																					
<table><tr><th>Component</th><th>Resistance</th></tr><tr><td>SSA</td><td>16-45 ohms</td></tr><tr><td>SSB</td><td>16-45 ohms</td></tr><tr><td>SSC</td><td>16-45 ohms</td></tr><tr><td>SSD</td><td>16-45 ohms</td></tr><tr><td>TCC</td><td>9-16 ohms</td></tr></table>  N0085533 Is the resistance within specification?			Component	Resistance	SSA	16-45 ohms	SSB	16-45 ohms	SSC	16-45 ohms	SSD	16-45 ohms	TCC	9-16 ohms								
Component	Resistance																					
SSA	16-45 ohms																					
SSB	16-45 ohms																					
SSC	16-45 ohms																					
SSD	16-45 ohms																					
TCC	9-16 ohms																					
A7	CHECK THE INTERNAL HARNESS FOR A SHORT TO GROUND																					
- Measure the resistance between the transmission internal harness C199 component side and ground using the following chart. <table><tr><th>Transmission Connector</th><th>Component</th><th>Ground</th></tr><tr><td>C199-3</td><td>Power feed</td><td>Ground</td></tr><tr><td>C199-16</td><td>SSA</td><td>Ground</td></tr><tr><td>C199-15</td><td>SSB</td><td>Ground</td></tr><tr><td>C199-6</td><td>SSC</td><td>Ground</td></tr><tr><td>C199-5</td><td>SSD</td><td>Ground</td></tr><tr><td>C199-14</td><td>TCC</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?			Transmission Connector	Component	Ground	C199-3	Power feed	Ground	C199-16	SSA	Ground	C199-15	SSB	Ground	C199-6	SSC	Ground	C199-5	SSD	Ground	C199-14	TCC
Transmission Connector	Component	Ground																				
C199-3	Power feed	Ground																				
C199-16	SSA	Ground																				
C199-15	SSB	Ground																				
C199-6	SSC	Ground																				
C199-5	SSD	Ground																				
C199-14	TCC	Ground																				
		Yes GO to A7. No INSPECT the transmission internal harness for an open. If no open is found, REPLACE the faulty component. CLEAR the DTCs. TEST the system for normal operation.																				
		Yes INSTALL a new transmission internal harness. CLEAR the DTCs. TEST the system for normal operation. No REFER to Diagnosis By Symptom in this section for diagnosis of shift or torque converter concerns.																				

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST B: Transmission Fluid Temperature (TFT) SENSOR**

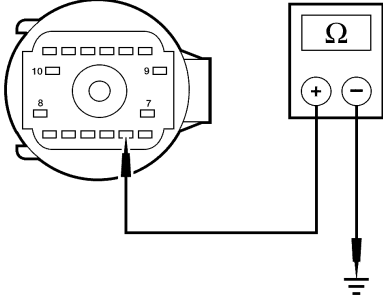
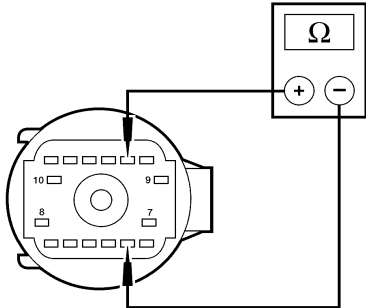
NOTE: Refer to the Transmission Vehicle Harness illustration Transmission Connector Layouts in this section.

NOTE: Refer to the Transmission Internal Harness illustration Transmission Connector Layouts in this section.

Test Step	Result / Action to Take
B1 ELECTRONIC DIAGNOSTICS - Select PARK. - Ignition OFF. - Check to make sure the transmission vehicle harness C199 is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding. - Connect the scan tool. - Ignition ON. - Access the transmission PIDs. Is the scan tool able to access the transmission PIDs?	Yes GO to B2 . No REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission PIDs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.
B2 ELECTRICAL SIGNAL CHECK - Ignition OFF. - Disconnect: Transmission Vehicle Harness C199. - Ignition ON. - Access the TFT PID. Does the scan tool display 145°C-151°C (293°F-302°F)?	Yes GO to B3 . No REPAIR the transmission vehicle harness circuit 923 (OG/BK) for a short to ground. CLEAR the DTCs. TEST the system for normal operation.
B3 CHECK THE VEHICLE HARNESS SIGNAL CIRCUIT - Connect a fused jumper between C199-12, circuit 359 (GY/RD), harness side and C199-2, circuit 923 (OG/BK), harness side.  N0085912 Does the scan tool display -40°C (-40°F)?	Yes GO to B5 . No GO to B4 .
B4 CHECK THE TFT INPUT CIRCUIT - Measure the voltage between C199-2, circuit 923 (OG/BK), harness side and ground.  N0085913 Is the voltage between 4.8 and 5.1 volts?	Yes GO to B5 . No INSPECT the transmission vehicle harness circuit 923 (OG/BK) for an open. If an open circuit is not found, REPLACE the PCM. REFER to Section 303-14. TEST the system for normal operation.

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST B: Transmission Fluid Temperature (TFT) SENSOR (Continued)**

Test Step		Result / Action to Take																														
B5	CHECK THE RESISTANCE OF THE TRANSMISSION INTERNAL HARNESS - Measure the resistance between the transmission internal harness C199-2, component side and ground.  N0085914 - Is the resistance greater than 10,000 ohms?	Yes GO to B6. No REPLACE the transmission internal harness. CLEAR the DTCs. TEST the system for normal operation.																														
B6	CHECK RESISTANCE OF THE TRANSMISSION INTERNAL HARNESS/TFT SENSOR - Measure the resistance between the transmission internal harness C199-2, and C199-12, component side using the following chart. Transmission Fluid Temperature (TFT) <table border="1"> <thead> <tr> <th>°C</th><th>°F</th><th>Resistance (Ohms)</th></tr> </thead> <tbody> <tr> <td>-40 to -20</td><td>-40 to -4</td><td>967K-284K</td></tr> <tr> <td>-19 to -1</td><td>-3 to 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> </tbody> </table>  N0085915 - Is the resistance value correct?	°C	°F	Resistance (Ohms)	-40 to -20	-40 to -4	967K-284K	-19 to -1	-3 to 31	284K-100K	0-20	32-68	100K-37K	21-40	69-104	37K-16K	41-70	105-158	16K-5K	71-90	159-194	5K-2.7K	91-110	195-230	2.7K-1.5K	111-130	231-266	1.5K-0.8K	131-150	267-302	0.8K-0.54K	Yes REFER to Diagnosis By Symptom in this section to diagnose an overheating concern. No REPLACE the TFT sensor. CLEAR the DTCs. TEST the system for normal operation.
°C	°F	Resistance (Ohms)																														
-40 to -20	-40 to -4	967K-284K																														
-19 to -1	-3 to 31	284K-100K																														
0-20	32-68	100K-37K																														
21-40	69-104	37K-16K																														
41-70	105-158	16K-5K																														
71-90	159-194	5K-2.7K																														
91-110	195-230	2.7K-1.5K																														
111-130	231-266	1.5K-0.8K																														
131-150	267-302	0.8K-0.54K																														

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST C: Transmission Range (TR) SENSOR**

NOTE: Refer to the Transmission Range (TR) Sensor illustration in Transmission Connector Layouts in this section.

NOTE: Refer to the TR Sensor Diagnosis Chart Transmission Connector Layouts in this section.

Test Step		Result / Action to Take
C1	VERIFY DTCs	Yes GO to C4. No GO to C2.
- Select PARK. - Ignition OFF. - Check to make sure the transmission vehicle harness C199 is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding. - Connect the scan tool. - Ignition ON. NOTE: DTCs P0705 and P0708 cannot be set by an incorrectly adjusted TR sensor. - Retrieve DTCs. Are only DTCs P0705, P0708 present?		
C2	VERIFY TR SENSOR ALIGNMENT	Yes GO to C3. No ADJUST the TR sensor. REFER to Transmission Range (TR) Sensor Adjustment in this section. PLACE selector lever in PARK. CLEAR the DTCs. TEST the system for normal operation. GO to C3.
- Select PARK. - Ignition OFF. - Check to make sure the TR sensor C167 is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding. - Apply the parking brake. - Select NEUTRAL. - Disconnect the selector lever cable from the manual control lever. - Verify that the TR Sensor Alignment Gauge fits in the appropriate slots. Is the TR sensor correctly adjusted?		
C3	VERIFY SELECTOR LEVER CABLE ADJUSTMENT	Yes GO to C4. No ADJUST the selector lever cable. REFER to Section 307-05.
- Place the transmission manual lever in the (D) position. - Re-connect the selector lever cable. - Verify that the selector lever cable is adjusted OK. Refer to Section 307-05. Is the selector lever cable adjusted OK?		
C4	CHECK ELECTRICAL SIGNAL OPERATION	Yes REPAIR as necessary. CLEAR the DTCs. TEST the system for normal operation. No If diagnosing a DTC, GO to C5. If diagnosing a starting concern, GO to C10.
- Select PARK. - Disconnect: TR Sensor C167. NOTICE: Do not pry on connector. This will damage the connector and result in a transmission concern. - Inspect both ends of C167 for damage or pushed-out terminals, corrosion, loose wires and missing or damaged seals. Is there damage to the connector, terminals or harness?		
C5	CHECK ELECTRICAL SYSTEM OPERATION (TR AND PCM)	Yes The problem is not in the TR sensor system. REFER to Diagnosis By Symptom in this section for further diagnosis. No If the PIDs change when wiggling harness, tapping on the sensor or driving the vehicle, the problem may be intermittent. GO to C6.
- Connect the scan tool. - Ignition ON. - Access the transmission PIDs. - Move transmission selector lever into each gear position and stop. - Observe the following PIDs, TR, TR1, TR2, TR3, TR3_V and TR4 while wiggling harness, tapping on sensor or driving the vehicle. - Compare the PIDs to the TR Sensor Diagnosis Chart. Do the PIDs TR, TR1, TR2, TR3, TR3_V and TR4 match the TR Sensor Diagnosis chart, and do the PIDs remain steady when the harness is wiggled, the sensor is tapped on or the vehicle driven?		
C6	CHECK TR SENSOR OPERATION	
- Ignition OFF. - Disconnect: TR Sensor C167.		

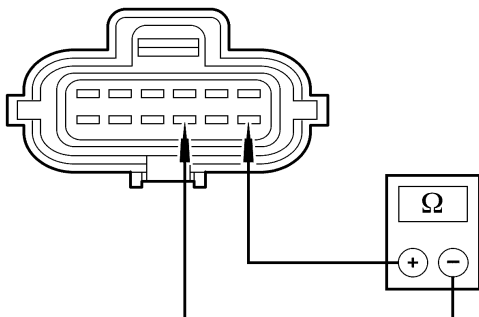
(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST C: Transmission Range (TR) SENSOR (Continued)**

Test Step		Result / Action to Take															
C6	CHECK TR SENSOR OPERATION (Continued)	Yes Concern is not in the TR sensor, GO to C7. No INSTALL a new TR sensor. CLEAR the DTCs. TEST the system for normal operation.															
NOTICE: Do not pry on connector. This will damage the connector and result in a transmission concern. Using the TR Sensor Diagnosis Chart, measure the resistance of the TR sensor with the selector lever in each range position using the following chart. Compare the measurements to the TR Sensor Diagnosis Chart. TR Sensor <table><tr><th>Pin Number</th><th>Range Position</th><th>Pin Number</th></tr><tr><td>2</td><td>TR3</td><td>3</td></tr><tr><td>2</td><td>TR1</td><td>4</td></tr><tr><td>2</td><td>TR2</td><td>5</td></tr><tr><td>2</td><td>TR4</td><td>6</td></tr></table> - Do the measurements match the TR Sensor Diagnosis Chart?			Pin Number	Range Position	Pin Number	2	TR3	3	2	TR1	4	2	TR2	5	2	TR4	6
Pin Number	Range Position		Pin Number														
2	TR3	3															
2	TR1	4															
2	TR2	5															
2	TR4	6															
C7	CHECK TRANSMISSION VEHICLE HARNESS CIRCUITS FOR OPENS																
- Disconnect: PCM C175T. NOTICE: Do not pry the connector. This will damage the connector and result in a transmission concern. - Measure the resistance between TR C167 and PCM C175T, harness side using the following chart. <table><tr><th>TR Connector</th><th>Circuit</th><th>PCM</th></tr><tr><td>C167-3</td><td>1268 (RD/BK)</td><td>C175T-27</td></tr><tr><td>C167-4</td><td>1144 (YE/BK)</td><td>C175T-16</td></tr><tr><td>C167-5</td><td>1145 (LB/BK)</td><td>C175T-17</td></tr><tr><td>C167-6</td><td>1143 (WH/BK)</td><td>C175T-28</td></tr></table> - Are the resistances less than 5 ohms?		TR Connector	Circuit	PCM	C167-3	1268 (RD/BK)	C175T-27	C167-4	1144 (YE/BK)	C175T-16	C167-5	1145 (LB/BK)	C175T-17	C167-6	1143 (WH/BK)	C175T-28	Yes GO to C8. No REPAIR the vehicle transmission harness circuit which is open. CLEAR the DTCs. TEST the system for normal operation
TR Connector	Circuit	PCM															
C167-3	1268 (RD/BK)	C175T-27															
C167-4	1144 (YE/BK)	C175T-16															
C167-5	1145 (LB/BK)	C175T-17															
C167-6	1143 (WH/BK)	C175T-28															
C8	CHECK TRANSMISSION VEHICLE HARNESS CIRCUITS FOR SHORT TO GROUND	Yes GO to C9. No REPAIR the vehicle transmission harness circuit shorted to ground. CLEAR the DTCs. TEST the system for normal operation.															
- Measure the resistance between the TR C167, harness side and ground using the following chart. <table><tr><th>TR Connector</th><th>Circuit</th><th>Ground</th></tr><tr><td>C167-3</td><td>1268 (RD/BK)</td><td>Ground</td></tr><tr><td>C167-4</td><td>1144 (YE/BK)</td><td>Ground</td></tr><tr><td>C167-5</td><td>1145 (LB/BK)</td><td>Ground</td></tr><tr><td>C167-6</td><td>1143 (WH/BK)</td><td>Ground</td></tr></table> - Are the resistances greater than 10,000 ohms?			TR Connector	Circuit	Ground	C167-3	1268 (RD/BK)	Ground	C167-4	1144 (YE/BK)	Ground	C167-5	1145 (LB/BK)	Ground	C167-6	1143 (WH/BK)	Ground
TR Connector	Circuit		Ground														
C167-3	1268 (RD/BK)	Ground															
C167-4	1144 (YE/BK)	Ground															
C167-5	1145 (LB/BK)	Ground															
C167-6	1143 (WH/BK)	Ground															
C9	CHECK FOR SHORT BETWEEN TR AND PCM INPUT SIGNAL CIRCUITS																
Measure the resistance between the TR sensor C167 pins, harness side using the following chart.																	

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST C: Transmission Range (TR) SENSOR (Continued)**

Test Step			Result / Action to Take														
C9	CHECK FOR SHORT BETWEEN TR AND PCM INPUT SIGNAL CIRCUITS (Continued)		Yes REPLACE the PCM. REFER to Section 303-14. RECONNECT all components. CLEAR the DTCs. TEST the system for normal operation. No REPAIR circuits having less than 10,000 ohms between other TR/PCM input signal circuits that are shorted together. RECONNECT all components. CLEAR the DTCs. TEST the system for normal operation.														
<table><tr><th>TR Sensor Pin</th><th>Circuit</th><th>TR Sensor Pins</th></tr><tr><td>2</td><td>359 (GY/RD)</td><td>3, 4, 5, 6</td></tr><tr><td>3</td><td>1268 (RD/BK)</td><td>4, 5, 6</td></tr><tr><td>4</td><td>1144 (YE/BK)</td><td>5, 6</td></tr><tr><td>5</td><td>1145 (LB/BK)</td><td>6</td></tr></table> Are the resistances greater than 10,000 ohms?				TR Sensor Pin	Circuit	TR Sensor Pins	2	359 (GY/RD)	3, 4, 5, 6	3	1268 (RD/BK)	4, 5, 6	4	1144 (YE/BK)	5, 6	5	1145 (LB/BK)
TR Sensor Pin	Circuit	TR Sensor Pins															
2	359 (GY/RD)	3, 4, 5, 6															
3	1268 (RD/BK)	4, 5, 6															
4	1144 (YE/BK)	5, 6															
5	1145 (LB/BK)	6															
C10	CHECK TR SENSOR OPERATION																
- Disconnect: TR Sensor C167. NOTICE: Do not pry on connector. This will damage the connector and result in a transmission concern. Measure the resistance between TR sensor C167-10 and C167-12, component side, with the selector lever in PARK and then NEUTRAL.  N0072490 - Are all the resistances less than 5 ohms?																	

PINPOINT TEST D: PRESSURE CONTROL SOLENOIDS

NOTE: Refer to the Transmission Vehicle Harness illustration Transmission Connector Layouts in this section.

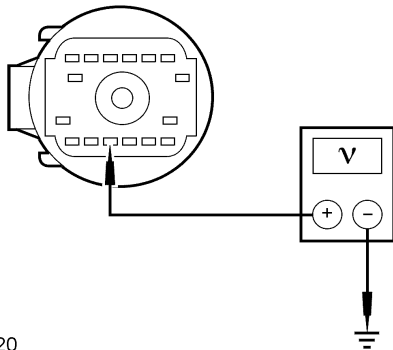
NOTE: Refer to the Transmission Internal Harness illustration Transmission Connector Layouts in this section.

NOTE: Read and record all DTCs. All Transmission Range (TR) sensor and Vehicle Speed Sensor (VSS) DTCs must be repaired before entering output state control.

Test Step		Result / Action to Take
D1	ELECTRONIC DIAGNOSTICS	Yes GO to D2. No REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission PIDs, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.
	- Select PARK. - Ignition OFF. - Check to make sure the transmission harness C199 is fully seated, the terminals are fully engaged in the connector and are in good condition before proceeding. - Install pressure gauges into the Line and Pressure Control Solenoid C (PCC) tap. - Connect the scan tool. - Ignition ON. - Access the transmission PIDs. - Is the scan tool able to access the transmission PIDs?	
D2	SOLENOID FUNCTIONAL TEST	
	Monitor the pressure gauges.	

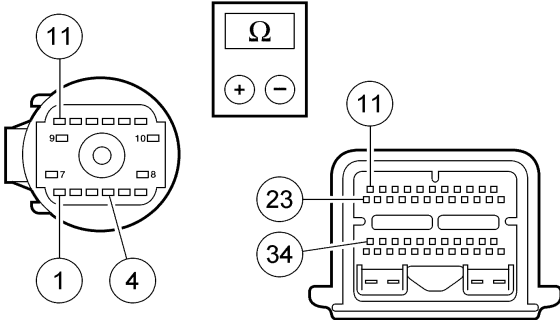
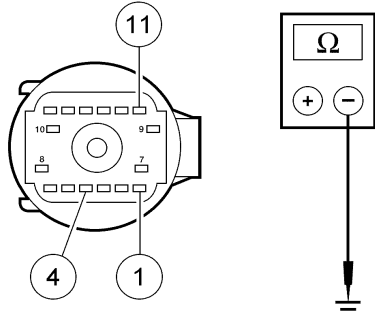
(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST D: PRESSURE CONTROL SOLENOIDS (Continued)**

Test Step		Result / Action to Take												
D2	SOLENOID FUNCTIONAL TEST (Continued)	Yes REFER to Diagnosis By Symptom in this section for diagnosis of pressure concerns. TEST the system for normal operation. No GO to D3 .												
NOTE: Make sure that the solenoids not being tested are off or at zero. - With the engine running, command the Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB) and PCC solenoids to change the pressure. For PCA and PCB: Does the pressure reading for PCA or PCB follow the commanded pressure (actual PCA and PCB pressures will be higher than the commanded pressure)? For PCC: Does the pressure reading match the commanded pressure?														
D3	CHECK FOR BATTERY VOLTAGE	Yes GO to D4 . No REPAIR circuit 1862 (VT/WH). CLEAR the DTCs. TEST the system for normal operation.												
- Ignition OFF. - Disconnect: Transmission Vehicle Harness C199. - Ignition ON. - Measure the voltage between C199-3, circuit 1862 (VT/WH), harness side and ground.  N0052520 Is the voltage greater than 10 volts?														
D4	ELECTRICAL SIGNAL CHECK													
- Ignition OFF. - Disconnect: PCM C175T. - Measure the resistance between PCM C175T, harness side and transmission vehicle harness C199, harness side using the following chart. <table><tr><th>PCM Connector</th><th>Circuit</th><th>Transmission Connector</th></tr><tr><td>C175T-11</td><td>925 (WH/YE)</td><td>C199-11</td></tr><tr><td>C175T-23</td><td>966 (LB/PK)</td><td>C199-1</td></tr><tr><td>C175T-34</td><td>923 OG/BK)</td><td>C199-4</td></tr></table>			PCM Connector	Circuit	Transmission Connector	C175T-11	925 (WH/YE)	C199-11	C175T-23	966 (LB/PK)	C199-1	C175T-34	923 OG/BK)	C199-4
PCM Connector	Circuit	Transmission Connector												
C175T-11	925 (WH/YE)	C199-11												
C175T-23	966 (LB/PK)	C199-1												
C175T-34	923 OG/BK)	C199-4												

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST D: PRESSURE CONTROL SOLENOIDS (Continued)**

Test Step		Result / Action to Take											
D4	ELECTRICAL SIGNAL CHECK (Continued)	Yes GO to D5. No CHECK the transmission vehicle harness circuit which has high resistance for an open. CLEAR the DTCs. TEST the system for normal operation.											
 N0085916 Is the resistance less than 5 ohms?													
D5	CHECK SOLENOID RESISTANCE AT SOLENOID	Yes GO to D6. No REPLACE the transmission internal harness for an open. If no open is found, REPLACE the appropriate solenoid. CLEAR the DTCs. TEST the system for normal operation.											
- Measure the resistance between the transmission vehicle harness C199, component side power and C199, component side control using the following chart. <table><tr><th>Transmission Connector</th><th>Component</th><th>Transmission Connector</th></tr><tr><td>C199-3</td><td>PCA</td><td>C199-11</td></tr><tr><td>C199-3</td><td>PCB</td><td>C199-1</td></tr><tr><td>C199-3</td><td>PCC</td><td>C199-4</td></tr></table> - Is the resistance within 3.3 ohms and 7.5 ohms?			Transmission Connector	Component	Transmission Connector	C199-3	PCA	C199-11	C199-3	PCB	C199-1	C199-3	PCC
Transmission Connector	Component	Transmission Connector											
C199-3	PCA	C199-11											
C199-3	PCB	C199-1											
C199-3	PCC	C199-4											
D6	CHECK TRANSMISSION INTERNAL HARNESS/SOLENOID FOR SHORT TO GROUND	Yes REPLACE the transmission internal harness for a short to ground. If no short to ground is found, REPLACE the appropriate solenoid. CLEAR the DTCs. TEST the system for normal operation. No REPLACE the PCM. REFER to Section 303-14. TEST the system for normal operation.											
- Measure the resistance between the transmission vehicle harness C199, component side and ground using the following chart. <table><tr><th>Transmission Connector</th><th>Component</th><th>Ground</th></tr><tr><td>C199-11</td><td>PCA</td><td>Ground</td></tr><tr><td>C199-1</td><td>PCB</td><td>Ground</td></tr><tr><td>C199-4</td><td>PCC</td><td>Ground</td></tr></table>  N0085917 - Is the resistance less than 10,000 ohms?			Transmission Connector	Component	Ground	C199-11	PCA	Ground	C199-1	PCB	Ground	C199-4	PCC
Transmission Connector	Component	Ground											
C199-11	PCA	Ground											
C199-1	PCB	Ground											
C199-4	PCC	Ground											

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST E: Turbine Shaft Speed (TSS), INTERMEDIATE SHAFT SPEED AND Output Shaft Speed (OSS) SENSORS**

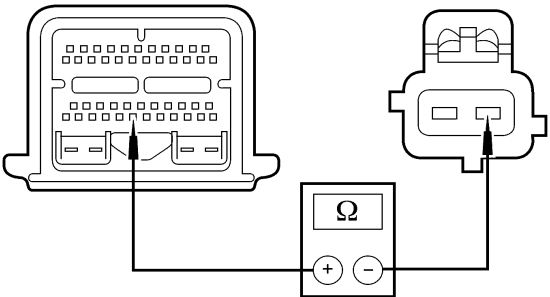
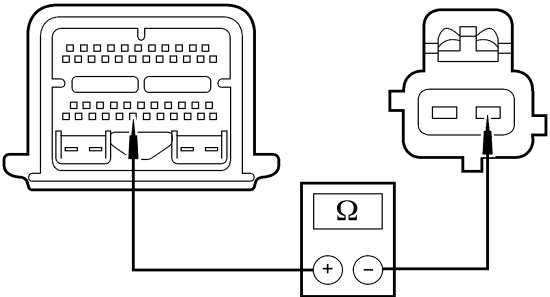
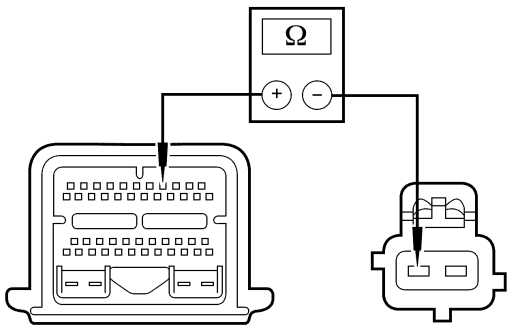
NOTE: Refer to the Turbine Shaft Speed (TSS), Intermediate Shaft Speed and Output Shaft Speed (OSS) Sensor illustrations Transmission Connector Layouts in this section.

Test Step		Result / Action to Take
E1	ELECTRONIC DIAGNOSTICS	Yes GO to E2 . No REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission PIDs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.
	- Select PARK. - Ignition OFF. - Check to make sure the transmission vehicle harness C199, TSS C143, intermediate shaft speed sensor C164 and OSS C193 are fully seated, the terminals are fully engaged in connector and are in good condition before proceeding. - Connect the scan tool. - Ignition ON. - Access the transmission PIDs. Is the scan tool able to access the transmission PIDs?	
E2	DRIVE CYCLE TEST	Yes GO to E3 . No If the TSS, intermediate shaft speed or OSS PID rpm does not increase and decrease with engine and vehicle speed, 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 rpm 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 the DTCs. TEST the system for normal operation.
	- 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 rpm signal erratic (drop to zero or near zero and return to normal operation)?	
E4	CHECK TRANSMISSION VEHICLE HARNESS CIRCUITS FOR OPENS	
	- Ignition OFF. - Disconnect: PCM C175T. - Inspect for damaged or pushed-out pins, corrosion or loose wires. - Lower the rear of the transmission to gain access to the sensors. - Disconnect: TSS Sensor C143. - Disconnect: Intermediate Shaft Speed Sensor C164. - Disconnect: OSS Sensor C193. - For OSS, measure the resistance between PCM C175T-41, circuit 359 (GY/RD), harness side and the OSS sensor C193-2, circuit 359 (GY/RD), harness side. N0052544	

(Continued)

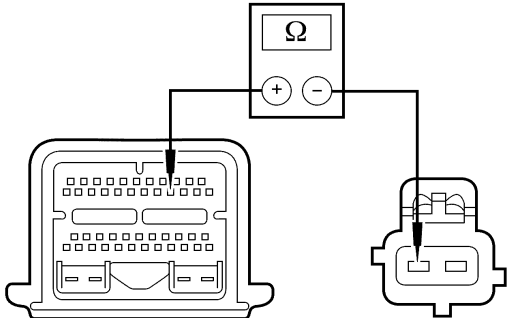
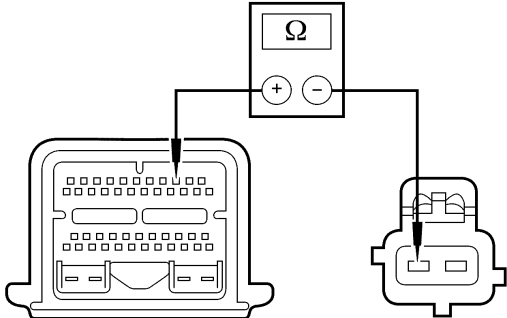
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: Turbine Shaft Speed (TSS), INTERMEDIATE SHAFT SPEED AND Output Shaft Speed (OSS) SENSORS (Continued)

Test Step		Result / Action to Take
E4	CHECK TRANSMISSION VEHICLE HARNESS CIRCUITS FOR OPENS (Continued)	
- For intermediate shaft speed, measure the resistance between PCM C175T-41, circuit 359 (GY/RD), harness side and the intermediate shaft speed sensor C164-2, circuit 359 (GY/RD), harness side.  N0052544 - For TSS, measure the resistance between PCM C175T-41, circuit 359 (GY/RD), harness side and the TSS sensor C143-2, circuit 359 (GY/RD), harness side.  N0052544 - For intermediate shaft speed, measure the resistance between PCM C175T-4, circuit 134 (GY/OG), harness side and the intermediate shaft speed sensor C164-1, circuit 134 (GY/OG), harness side.  N0052545		

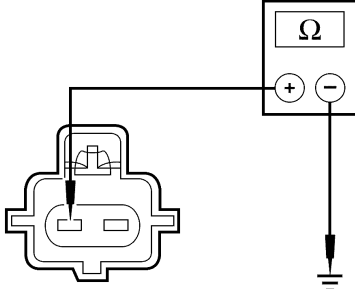
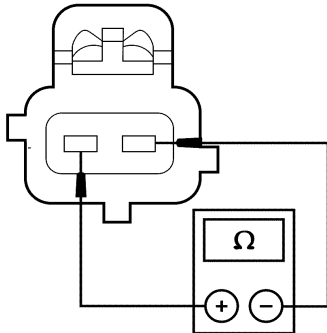
(Continued)

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												
E4	CHECK TRANSMISSION VEHICLE HARNESS CIRCUITS FOR OPENS (Continued) - For TSS, measure the resistance between PCM C175T-15, circuit 970 (DG/WH), harness side and the TSS sensor C143-1, circuit 970 (DS/WH), harness side.  N0052546 - For OSS, measure the resistance between PCM C175T-3, circuit 136 (DB/YE), harness side and the OSS sensor C193-1, circuit 136 (DB/YE), harness side.  N0052547 Are all resistances less than 5 ohms?	Yes GO to E5. No REPAIR circuits having more than 5 ohms. CLEAR the DTCs. TEST the system for normal operation.												
E5	CHECK TRANSMISSION VEHICLE HARNESS CIRCUITS FOR SHORT TO GROUND For the TSS, intermediate shaft speed and OSS measure the resistance between the component connector harness side and ground using the following chart. <table border="1"> <thead> <tr> <th>Connector Number</th><th>Circuit Number</th><th>Ground</th></tr> </thead> <tbody> <tr> <td>C143-1</td><td>970 (DG/WH)</td><td>Ground</td></tr> <tr> <td>C164-1</td><td>134 (GY/OG)</td><td>Ground</td></tr> <tr> <td>C193-1</td><td>136 (DB/YE)</td><td>Ground</td></tr> </tbody> </table>	Connector Number	Circuit Number	Ground	C143-1	970 (DG/WH)	Ground	C164-1	134 (GY/OG)	Ground	C193-1	136 (DB/YE)	Ground	
Connector Number	Circuit Number	Ground												
C143-1	970 (DG/WH)	Ground												
C164-1	134 (GY/OG)	Ground												
C193-1	136 (DB/YE)	Ground												

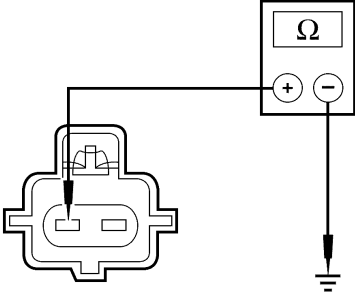
(Continued)

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 TRANSMISSION VEHICLE HARNESS CIRCUITS FOR SHORT TO GROUND (Continued)	Yes GO to E6. No REPAIR circuits having less than 10,000 ohms. CLEAR the DTCs. TEST the system for normal operation.							
 N0085932 Are the resistances greater than 10,000 ohms?									
E6	CHECK RESISTANCE OF TSS, INTERMEDIATE SHAFT SPEED OR OSS SENSOR	Yes GO to E7. No INSTALL a new sensor.							
- Measure the resistance between terminal 1 and terminal 2 of the speed sensor using the following chart. <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>  A0005211 - Is the resistance within specification?			Resistance (ohms)	Temperature	266-390	-20°C (4°F)	325-485	21°C (70°F)	492-738
Resistance (ohms)	Temperature								
266-390	-20°C (4°F)								
325-485	21°C (70°F)								
492-738	150°C (302°F)								

(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
E7	CHECK SENSORS FOR SHORT TO GROUND	
- Measure the resistance between terminal 1, component side and ground.  N0085932 - Is the resistance less than 10,000 ohms?		Yes INSTALL a new sensor. No REFER to Diagnosis By Symptom in this section for diagnosis of shift or torque converter concerns.

PINPOINT TEST F: SOLENOID MECHANICAL FAILURE

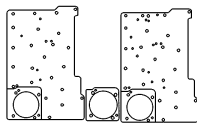
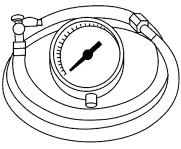
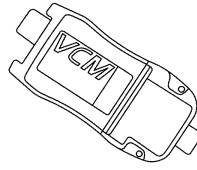
NOTE: Repair all other DTCs before repairing the following DTCs: P1714, P1715, P1716, P1717 and P1740.

Test Step		Result / Action to Take
F1	ELECTRONIC DIAGNOSIS	
- Select PARK. - Connect the scan tool. - Ignition ON. - Carry out Key ON Engine OFF (KOEO) test until DTCs are displayed. - If any of the following DTCs are present, P1714, P1715, P1716, P1717 and P1740, continue with this test. Are other DTCs present for Transmission Fluid Temperature (TFT) or shift solenoids?		Yes REPAIR the DTCs for TFT or shift solenoids first. CLEAR the DTCs and CARRY OUT transmission Drive Cycle test. RERUN Key ON Engine OFF (KOEO) test. No INSTALL a new solenoid and/or body. REFER to the Diagnostic Trouble Code (DTC) Charts in this section 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. - Ignition ON. - Carry out KOEO test until DTCs are displayed. Are DTCs P1714, P1715, P1716, P1717 and P1740 still present?		Yes INSTALL a new PCM. ROAD TEST the vehicle. RERUN the Key ON Engine OFF (KOEO) test. No Testing completed. If a concern still exists, REFER to Diagnosis By Symptom in this section.

DIAGNOSIS AND TESTING

Special Testing Procedures

Special Tool(s)

 ST2538-A	Air Test Plate and Gaskets, Transmission 307-433-01, 307-433-02, 307-433-03
 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

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

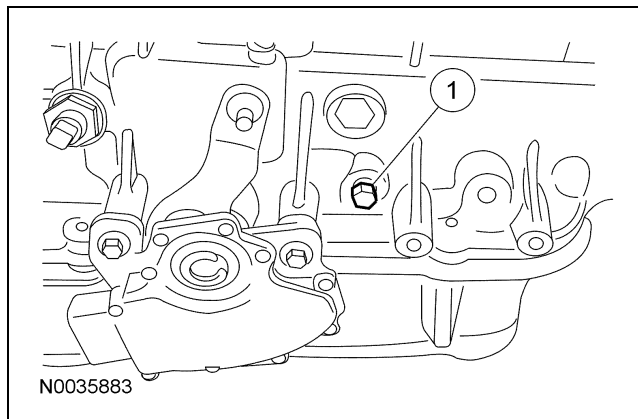
NOTICE: Carry out Line Pressure Test prior to carrying out Stall Speed Test. If line pressure is low at stall, do not carry out the Stall Speed Test or further transmission damage will occur. Do not maintain Wide Open Throttle (WOT) in any gear range for more than 5 seconds.

NOTE: Certain sensor failures may cause high line pressure, Failure Mode Effect Management actions. Be sure that the self test and electrical repairs have been completed or test results may be incorrect.

NOTE: The line pressure tap is used to verify output pressure from Pressure Control Solenoid A (PCA) or Pressure Control Solenoid B (PCB) by turning one solenoid off, while verifying the output from the other solenoid. The second pressure tap is used to verify the output from Pressure Control Solenoid C (PCC).

This test verifies that the line pressure is within specification.

1. Connect the Transmission Fluid 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.

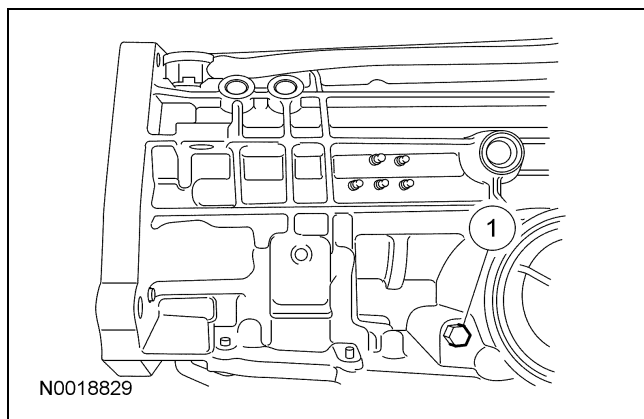


Item	Part Number	Description
1	—	Line pressure tap

DIAGNOSIS AND TESTING (Continued)**Line Pressure Chart — 4.0L and 4.6L Engines**

Range	Idle Pressure		WOT Stall Pressure	
	PCC	Line	PCC	Line
N	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)		
R	758-862 kPa (110-125 psi)	965-1,551 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)	758-1,045 kPa (110-150 psi)	0-103 kPa (0-15 psi)	1,448-1,793 kPa (210-260 psi)

3. If the line pressure is not within specification, check the PCC pressure.
4. Connect the Transmission Fluid Pressure Gauge to the PCC pressure tap.
5. Start the engine and check the PCC pressure. Refer to Line Pressure Diagnosis Chart in this section for specification.
6. If the PCC pressure is not within specification, [GO to Pinpoint Test D](#) to diagnose PCC operation. If PCC operation is OK, refer to Line Pressure Diagnosis Chart in this section for line pressure concern causes.
7. When pressure tests are complete, install the pressure tap plugs.
 - Tighten to 13 Nm (115 lb-in).



Item	Part Number	Description
1	—	Pressure Control Solenoid C (PCC) tap

Line Pressure Diagnosis Chart

Test Results	Possible Source
High at Idle — All Ranges	• Wiring harnesses • Pressure Control Solenoid C (PCC) boost valve • PCC solenoid • Main regulator valve
Low at Idle — All Ranges	• Low transmission fluid level • Transmission fluid inlet filter/seal • Main control body • Cross leaks • Gaskets • Pump • Separator plate
Low — All Forward Ranges	• Forward clutch • Main control • Overdrive (O/D) servo • Intermediate servo
Low in PARK Only	• Valve body

DIAGNOSIS AND TESTING (Continued)**Line Pressure Diagnosis Chart (Continued)**

Test Results	Possible Source
Low in REVERSE Only	• Separator plate • Rear servo piston, cover seal • Reverse clutch • O/D servo • Intermediate servo • Valve body • Forward clutch
Low in NEUTRAL Only	• Valve body • O/D servo • Intermediate servo
Low in D Only	• Forward clutch • O/D servo • Intermediate servo • Valve body
Low in D Only ((D) Cancelled)	• Forward clutch • O/D servo • Intermediate servo • Valve body
Low in 1st Position	• Forward clutch • Valve body
Low in 2nd Position	• Intermediate servo • O/D servo • Intermediate servo • Forward clutch
Low in 3rd Position	• Intermediate servo • O/D servo • Forward clutch

Stall Speed Test

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

NOTICE: 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.

NOTICE: After testing each of the following range D, 3, 2, 1 and R, move the transmission selector lever to N and run the engine at 1,000 rpm to allow the torque converter to cool before testing the next range, otherwise transmission damage can occur.

NOTICE: Do not maintain Wide Open Throttle (WOT) in any range for more than 5 seconds, otherwise transmission damage can occur.

NOTICE: If the engine rpm recorded by the scan tool exceeds maximum specified rpm, release the accelerator pedal immediately, otherwise transmission damage can occur. Clutch or band slippage is indicated.

NOTE: Prolonged use of this procedure may set DTC P0712, P1783. After carrying out Stall Speed Test, run Key ON Engine OFF (KOEO) test. Clear the DTCs.

NOTE: The Stall Speed Test should be carried out with the engine and transmission at normal operating temperatures.

This test checks the operation of the following items:

- Torque Converter Clutch (TCC)
- Forward clutch
- Low One-Way Clutch (OWC) assembly
- Engine operation
- Overdrive (O/D) OWC assembly

1. Connect a scan tool to the vehicle.

DIAGNOSIS AND TESTING (Continued)

2. 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	2,678-3,130

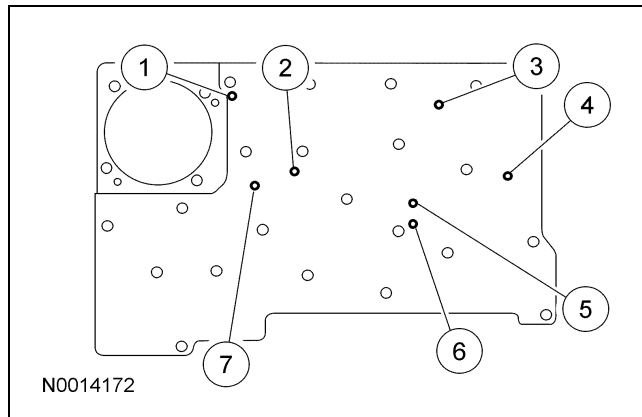
Stall Speed Chart (Continued)

Vehicle	Engine	rpm
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 OWC for slippage.

Stall Speed Diagnosis Chart

Selector Lever Position	Stall Speeds High	Stall Speeds Low
D, D ((D) cancelled) and 1	O/D OWC, rear OWC	—
D ((D) cancelled), 2 and 1	Forward clutch, O/D OWC	—
D	Forward clutch, O/D OWC	—
D, D ((D) cancelled), 3, 2, 1 and R	General pressure concerns, forward clutch, O/D OWC	Converter OWC 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	—	O/D 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 pressure 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 Air Test Plate and Gasket. Tighten to 10 Nm (89 lb-in).

3. **NOTE:** Do not apply air to the Transmission Air 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 Transmission Air Test Plate and Gasket and proceed with any repairs that are needed.

DIAGNOSIS AND TESTING (Continued)

5. After the repairs are completed, install the main control valve body. Refer to Main Control Valve Body in this section.

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 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.

DIAGNOSIS AND TESTING

Leakage Inspection

Special Tool(s)

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

Material

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

Leak Check Test with a Black Light

Dye-Lite® ATF/Power Steering Fluid Leak

Detection Dye 164-R3701 (Rotunda) is used to detect a transmission fluid leak.

1. Add dye to the transmission fluid. Use one 30.0 mL (1 oz) of dye solution for every 3.8L (4 qt) of transmission fluid.
2. Start and run the engine until the transmission 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 a fast idle, then at a normal idle, occasionally shifting to the DRIVE and REVERSE position to increase pressure within the transmission. 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 transmission fluid pan to case	• Transmission fluid pan bolts not tightened to specification. • Transmission fluid pan gasket damaged. • Transmission case pan rail damaged.
Transmission fluid cooler tubes or fittings leaking	• Transmission fluid cooler tube(s), cooler tube fitting(s) damaged. Refer to Section 307-02. • Transmission fluid cooler tube nut-to-case fitting damaged. Refer to Section 307-02. • Transmission case damage at cooler tube fitting.
Transmission fluid cooler tube nut-to-case fitting leaking	• Damaged or missing O-ring seals. Refer to Section 307-02. • Transmission fluid cooler tube fitting(s) not tightened to specifications. Refer to Section 307-02.
Leaks at the transmission fluid cooler	• Transmission fluid cooler damage. Refer to Section 307-02. • Transmission fluid cooler tube 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 control 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.
Transmission fluid leakage in torque converter area	• For possible sources, refer to Fluid Leakage in Torque Converter Area Chart.

DIAGNOSIS AND TESTING (Continued)

External Sealing

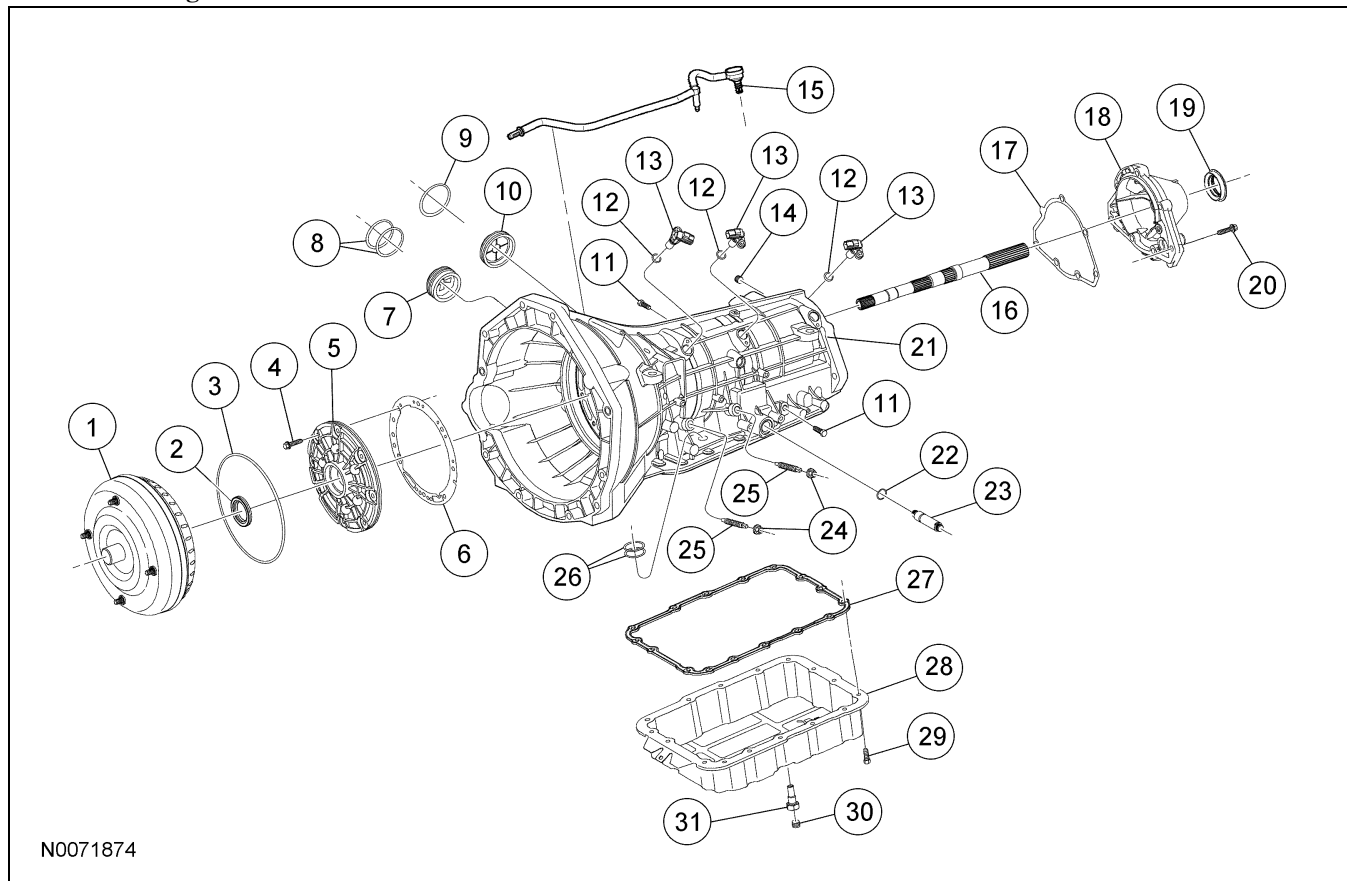
NOTICE: Do not try to stop a transmission fluid leak by increasing the torque of bolts and screws beyond specification. This may cause damage to the transmission case threads.

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



Item	Part Number	Description
1	7902	Torque converter assembly
2	7A248	Seal assembly — front transmission fluid pump
3	7A248	Seal — front transmission fluid pump
4	W704892-S300	Screw and washer assembly (8 required)
5	7G187	Transmission fluid pump
6	7A136	Gasket — transmission fluid pump

(Continued)

Item	Part Number	Description
7	7D027	Cover — Overdrive (O/D) servo
8	W703119-S300	Seals — O/D servo cover (2 required)
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)

(Continued)

DIAGNOSIS AND TESTING (Continued)

Item	Part Number	Description
13	7H103	Sensor assemblies — (3 required)
14	6026	Plug — case
15	7034	Vent assembly
16	7060	Shaft — output
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	Transmission case assembly
22	7B498	Seal — manual control lever
23	7A256	Manual control lever
24	7C492	Screws — band adjuster (2 required)
25	71000-S100	Nuts — band adjuster (2 required)
26	W705928-S300	O-ring seals (2 required)
27	7A191	Gasket — transmission fluid pan
28	7A194	Transmission fluid pan
29	W500213-S309	Screw — fluid pan (16 required)
30	W704999	Plug — short hex
31	7A101	Plug — fluid drain

External Sealing

NOTICE: Do not try to stop a fluid leak by increasing the torque of bolts and screws beyond specification. This may cause damage to the transmission case threads.

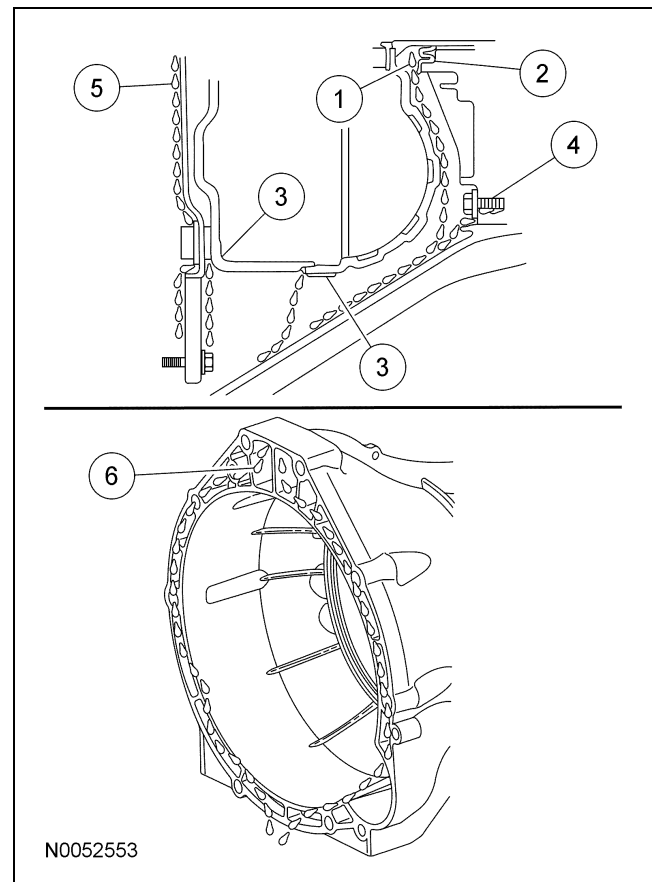
The transmission has the following parts to prevent external fluid leakage:

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

Fluid Leakage in Torque Converter Area

Fluid 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 6 numbers in the illustration correspond with the 6 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)

DIAGNOSIS AND TESTING (Continued)

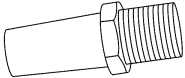
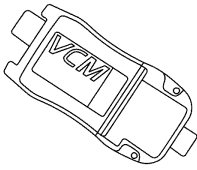
Leak Path	Symptom	Possible Source
1, 2 and 4	Leak at the front of the transmission	Pump-to-case screws
1, 2 and 4	Leak at the front of the transmission	Pump gasket
3	Leak at the front of the transmission	Torque converter seal weld
3	Leak at the front of the transmission	Torque converter stud
5	Leak at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

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

DIAGNOSIS AND TESTING

Transmission Fluid Cooler

Special Tool(s)

 ST2581-A	Transmission Fluid Fill Tool 307-437
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

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

NOTICE: 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 or auxiliary, will need to be installed, otherwise transmission damage can occur.

NOTICE: Use only 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.

NOTICE: 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 transmission fluid cooler lines. If installing a new transmission fluid cooler, use only factory-approved components.

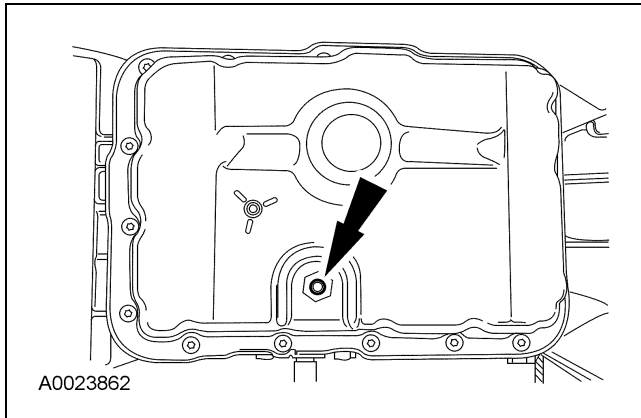
NOTICE: The transmission fluid must be at normal operating temperature 85°-93°C (185°-200°F) to make sure that the cooler bypass is open. The cooler bypass is located in the main control valve body. The transmission fluid at normal operating temperature will be hot.

NOTE: The engine idle, selector lever cable adjustment, transmission fluid level and line pressure must be within specification before carrying out this test. Refer to Section 307-05 for selector lever cable adjustments. For information on engine idle diagnosis, refer to the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#). For information on transmission 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.

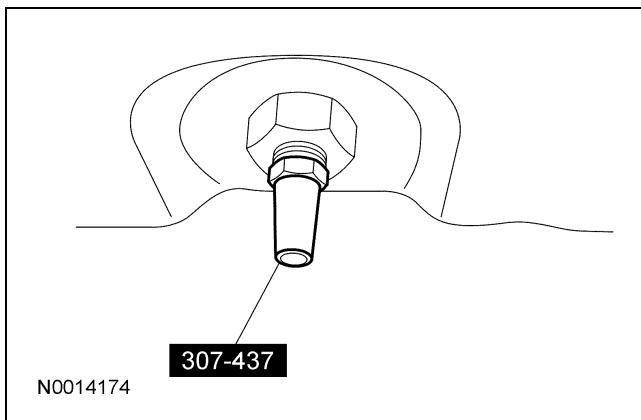
1. Place the selector lever in PARK.
2. Raise the vehicle on a hoist and place suitable safety stands under the vehicle. Refer to Section 100-02.

DIAGNOSIS AND TESTING (Continued)

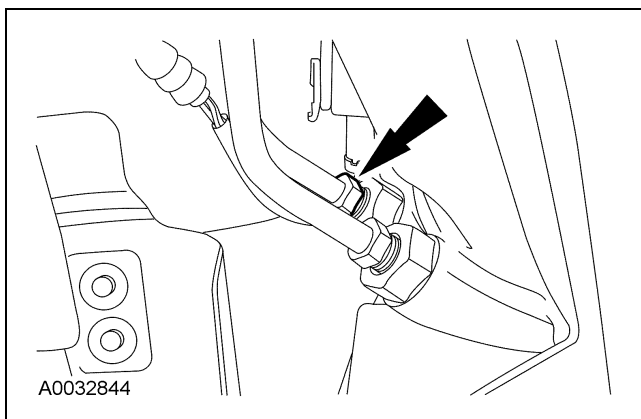
3. Hold the large fluid drain plug with a wrench, and remove the small (center) fluid level indicating plug using a 3/16-inch Allen key.



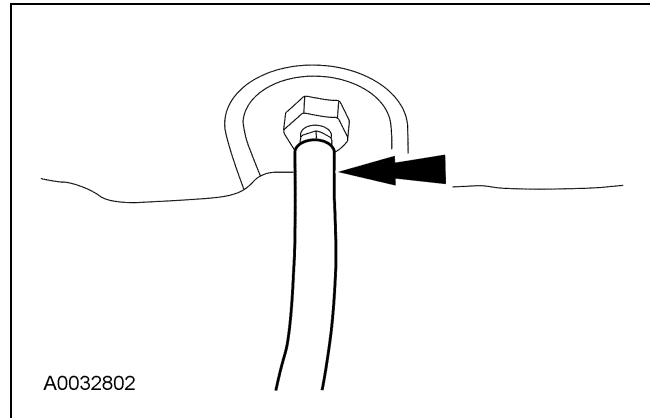
4. Install the Transmission Fluid Fill Tool into the pan.



5. Remove the transmission cooler return tube (upper tube) from the fitting on the transmission case.



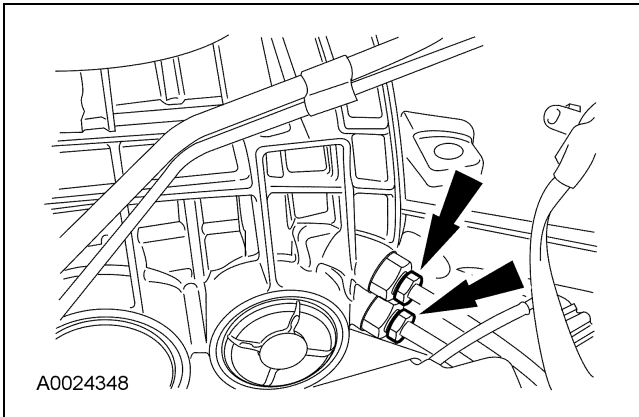
6. Connect one end of a clear hose to the cooler return tube and route the other end of the hose to the Transmission Fluid Fill Tool in the pan.



7. Remove the safety stands and lower the vehicle.
8. Install a scan tool.
9. Start the engine and run at idle.
10. With the engine running, raise the vehicle on a hoist and place suitable safety stands under the vehicle. Refer to Section 100-02.
11. Monitor the TFT PID to verify that the transmission fluid is at normal operating temperature 85°C-93°C (185°F-200°F).
12. Once a steady flow of transmission fluid (without air bubbles) is observed, remove the hose from the Transmission Fluid Fill Tool and place the hose in a measuring container for 15 seconds. After 15 seconds, place the hose back onto the Transmission Fluid Fill Tool. Lower the vehicle and turn the engine OFF. Measure the amount of transmission 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 tube and install the fluid fill plug.

DIAGNOSIS AND TESTING (Continued)

13. If the flow is not liberal, disconnect the hose from the cooler return tube and connect the hose to the cooler inlet (lower tube) on the transmission case. Reconnect the cooler return tube to the transmission cooler tube fitting-to-case (upper fitting) and tighten the transmission cooler tube nut-to-case fitting.
- Tighten to 40 Nm (30 lb-ft).

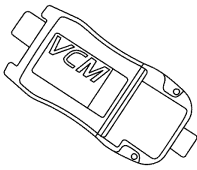


14. Repeat Steps 9 through 12. If flow is now approximately 208 ml (7 oz) in 15 seconds, the cooler tubes and auxiliary cooler must be cleaned. Refer to Transmission Fluid Cooler Backflushing and Cleaning in this section. Carry out this entire test after the Transmission Fluid Cooler Backflushing and Cleaning procedure. If, after carrying out the Transmission Fluid Cooler Backflushing and Cleaning procedure, the flow is still not adequate, new cooler tubes and/or an auxiliary cooler must be installed. If the flow from the case is still not adequate after the installation of new cooler tubes 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.

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

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 transmission fluid level.
- d. carrying out other test procedures as directed.

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

NOTE: When the battery is disconnected or a new battery is 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.

Begin with the ROUTINE, if indicated. Follow the reference or action statements. Always carry out the On-Board Diagnostic (OBD) test 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 • No 1-2 Shift 220 • No 2-3 Shift 221 • No 3-4 Shift 222 • No 4-3 Shift 223 • No 3-2 Shift 224 • No 2-1 Shift 225 • Soft/Slipping 1-2 Shift 226 • Soft/Slipping 2-3 Shift 227 • Soft/Slipping 3-4 Shift 228 • Soft/Slipping 4-3 Shift 229 • Soft/Slipping 3-2 Shift 230 • Soft/Slipping 2-1 Shift 231 • Harsh 1-2 Shift 232 • Harsh 2-3 Shift 233 • Harsh 3-4 Shift 234 • Harsh 4-3 Shift 235 • Harsh 3-2 Shift 236 • Harsh 2-1 Shift 237 • No 4-5 Shift 270 • No 5-4 Shift 271 • Soft/Slipping 4-5 Shift 272 • Soft/Slipping 5-4 Shift 273 • Harsh 4-5 Shift 274 • Harsh 5-4 Shift 275	
Torque Converter Clutch (TCC) Operation Concerns:	
• Does Not Apply 240 • Always Applied/Stalls Vehicle 241 • Cycling/Shudder/Chatter 242	
Other Concerns:	
• Selector Lever Efforts High 251	

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

5R55S	Routines
• 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
• Transmission Fluid Venting or Foaming	261
• Vehicle Movement with Selector Lever 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 • PCM, vehicle wiring harnesses, Pressure Control Solenoid B (PCB)	• Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Main Control • Main control body-to-case 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 valve 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 (Continued)**Engagement Concern: No Forward in D or D ((D) Cancelled) Only (Continued)**

Possible Component	Reference/Action
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.
Overdrive (O/D) Servo - O/D servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D Band - O/D 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 Forward

Possible Component	Reference/Action
201B — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out the Transmission 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	

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: No Forward (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.
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 Planetary Assembly Planetary damage	Inspect for damage. Repair as necessary.
Low One-Way Clutch (OWC) Worn, damaged or assembled incorrectly	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 (PCC), Shift Solenoid B (SSB)	- Carry out OBD 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 the DTCs, road test the vehicle and rerun the OBD 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.
Torque Converter Assembly	

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

Possible Component	Reference/Action
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.
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 (OWC) damaged - Bearing damaged	- Inspect for damage. Install a new drum assembly. - Inspect for damage. Install a new drum assembly.

Engagement Concern: Harsh Reverse ONLY

Possible Component	Reference/Action
203 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Pressure Control Solenoid C (PCC)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Incorrect Pressures High pressures	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	- 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: Harsh Reverse ONLY (Continued)**

Possible Component	Reference/Action
Filter damaged, missing	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 (OWC) damaged - Bearing damaged	- Inspect for damage. Install a new drum assembly. - Inspect for damage. Install a new drum assembly.

Engagement Concern: Harsh Forward ONLY

Possible Component	Reference/Action
204A — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Pressure Control Solenoid A (PCA), Pressure Control Solenoid C (PCC)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Incorrect Pressures High pressures	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 ONLY (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 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 (PCB), Turbine Shaft Speed (TSS)	- Carry out On-Board Diagnostic (OBD) tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM. GO to Pinpoint Test D and GO to Pinpoint Test E. - Repair as necessary. Clear the DTCs, road test the vehicle and rerun OBD 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 (PCC)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Incorrect Pressures	

DIAGNOSIS AND TESTING (Continued)**Engagement Concern: Delayed or Soft Reverse ONLY (Continued)**

Possible Component	Reference/Action
Low pressure	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.

Engagement Concern: Delayed/Soft Forward ONLY

Possible Component	Reference/Action
206 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Incorrect Pressures Low pressures	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: Delayed/Soft Forward ONLY (Continued)**

Possible Component	Reference/Action
- Contamination - Valves, spring damaged, misassembled, missing, stuck or bore damaged - Filter damaged, missing	- 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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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.

Engagement Concern: No Forward and No Reverse

Possible Component	Reference/Action
207 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.

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

Possible Component	Reference/Action
Selector Lever Cable/Transmission Range (TR) Sensor Cable system or 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.
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 (O/D) Planetary Assembly Planetary damaged	Inspect for damage. Repair as necessary.
Center Shaft Assembly One-Way Clutch (OWC) damaged	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 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	

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

Possible Component	Reference/Action
- 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 OWC 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, Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures High pressures	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	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary.

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

Possible Component	Reference/Action
- Return springs damaged - Bronze seal ring or bearing damaged	- 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, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures High pressures	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 - 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.
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)**Shift Concern: Some/All Shifts Missing (Automatic Mode Only)**

Possible Component	Reference/Action
210 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Shift Solenoid B (SSB), Shift Solenoid C (SSC), Torque Converter Clutch (TCC) solenoid, Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB), Pressure Control Solenoid C (PCC), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor, Intake Air Temperature (IAT) sensor, Vehicle Speed Sensor (VSS) input	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
Selector Lever Cable/TR Sensor Cable system or TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
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 - 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: Some/All Shifts Missing (Automatic Mode Only) (Continued)**

Possible Component	Reference/Action
- Valve, 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.
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 (O/D) 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 PCM, vehicle wiring harnesses, Output Shaft Speed (OSS) sensor, Intake Air Temperature (IAT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Some Shifts Early/Late ONLY	If only some shifts are early/late, determine which shift(s) is missing.

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

Possible Component	Reference/Action
	- 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
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission 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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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: Timing Concerns — Erratic/Hunting (Some/All)

Possible Component	Reference/Action
212 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Output Shaft Speed (OSS) sensor, Intake Air Temperature (IAT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.

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

Possible Component	Reference/Action
Transmission Fluid • Incorrect transmission fluid level • Transmission fluid condition	• Adjust the transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. • Carry out Transmission 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 (O/D) Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
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

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

Possible Component	Reference/Action
213 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Shift Solenoid B (SSB), Shift Solenoid C (SSC), Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB), Pressure Control Solenoid C (PCC), intermediate shaft speed sensor, Transmission Fluid Temperature (TFT) sensor, Intake Air Temperature (IAT) sensor, Vehicle Speed Sensor (VSS) input	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Some Shifts Soft/Slipping ONLY	- If only some of the shifts are soft/slipping, determine which shift(s) is missing. - 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
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
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 - 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.
Torque Converter Assembly	

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

Possible Component	Reference/Action
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.
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 - Seal rings or bearings damaged - 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.
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.

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

Possible Component	Reference/Action
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.

Shift Concern: Feel — Harsh (Some/All)

Possible Component	Reference/Action
214— ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Shift Solenoid B (SSB), Shift Solenoid C (SSC), Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB), Pressure Control Solenoid C (PCC), intermediate shaft speed sensor, Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor, Intake Air Temperature (IAT) sensor, Vehicle Speed Sensor (VSS) input	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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
Transmission Fluid Incorrect transmission fluid level	Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section.
Incorrect Pressures High/low pressures	Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.

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

Possible Component	Reference/Action
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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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 (OWC) 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	Inspect for damage. Repair as necessary.

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

Possible Component	Reference/Action
Seals (piston and cover) damaged	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 PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Shift Solenoid B (SSB), Shift Solenoid C (SSC), Transmission Range (TR) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 (O/D) 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 (OWC) Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
Low OWC Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

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

Possible Component	Reference/Action
216 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Shift Solenoid B (SSB), Pressure Control Solenoid B (PCB), Pressure Control Solenoid C (PCC)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 (O/D) Planetary Assembly Planetary damaged	Inspect for damage. Repair as necessary.
Direct One-Way Clutch (OWC) Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
Low OWC 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 Solenoid A (SSA), Shift Solenoid B (SSB), Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Incorrect Pressures High/low pressures	Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.

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

Possible Component	Reference/Action
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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged - Not adjusted correctly	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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 (OWC) Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
Low OWC Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Shift Concern: No 1-2 Shift

Possible Component	Reference/Action
220 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor, Vehicle Speed Sensor (VSS) input	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid Incorrect transmission fluid level	Adjust transmission fluid to correct level. Refer to Transmission Fluid Level Check in this section.
Incorrect Pressures High/low pressures	Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Main Control	

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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.
O/D 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 PCM, vehicle wiring harnesses, Shift Solenoid B (SSB), Torque Converter Clutch (TCC) solenoid, Pressure Control Solenoid A (PCA), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 2-3 Shift (Continued)**

Possible Component	Reference/Action
- Valve/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.
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 PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Pressure Control Solenoid C (PCC), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 3-4 Shift (Continued)**

Possible Component	Reference/Action
- Valve/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.
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.

Shift Concern: No 4-3 Shift

Possible Component	Reference/Action
223 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Shift Solenoid B (SSB), Pressure Control Solenoid A (PCA), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Incorrect Pressures	

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

Possible Component	Reference/Action
High/low pressures	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.
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 (SSC), Pressure Control Solenoid B (PCB), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 3-2 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.
Overdrive (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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.

Shift Concern: No 2-1 Shift

Possible Component	Reference/Action
225 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 2-1 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.
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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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 (SSC), Pressure Control Solenoid B (PCB), Transmission Fluid Temperature (TFT) sensor, Vehicle Speed Sensor (VSS) input	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
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)**Shift Concern: Soft/Slipping 1-2 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 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 (O/D) Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
O/D 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 (SSA), Pressure Control Solenoid A (PCA), intermediate shaft speed sensor, Transmission Fluid Temperature (TFT) sensor	• Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 • 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	

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

Possible Component	Reference/Action
- 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 (OWC) Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 3-4 Shift

Possible Component	Reference/Action
228 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Pressure Control Solenoid C (PCC), Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder.

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

Possible Component	Reference/Action
• Friction elements damaged or worn • Return springs damaged	• 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: Feel — Soft/Slipping 4-3 Shift

Possible Component	Reference/Action
229 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Pressure Control Solenoid A (PCA), Transmission Fluid Temperature (TFT) sensor	• Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 • 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.
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)**Shift Concern: Soft/Slipping 3-2 Shift**

Possible Component	Reference/Action
230 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB), intermediate shaft speed sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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 (OWC) 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 (SSC), Pressure Control Solenoid B (PCB), Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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.

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

Possible Component	Reference/Action
	Repair as required. Clear the DTCs, road test the vehicle and rerun OBD 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 - 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.

Shift Concern: Harsh 1-2 Shift

Possible Component	Reference/Action
232 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB), Turbine Shaft Speed (TSS) sensor, Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 (O/D) Servo	

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

Possible Component	Reference/Action
• Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
O/D 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 Solenoid B (SSB), Pressure Control Solenoid A (PCA), Turbine Shaft Speed (TSS) sensor, intermediate shaft speed sensor, Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	• Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 • 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 (O/D) Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
O/D 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	

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

Possible Component	Reference/Action
- 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 (OWC) 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 Solenoid A (SSA), Pressure Control Solenoid C (PCC), Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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. - 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	Tighten to specification.

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

Possible Component	Reference/Action
- Seal rings or bearing damaged - Outside diameter of case bore damaged - Support damaged or leaking	- 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 Concern: Harsh 4-3 Shift

Possible Component	Reference/Action
235 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Pressure Control Solenoid A (PCA), Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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	- Inspect for damage. Repair as necessary. - Inspect for mislocation, poor seating, damage. Install a new cylinder. - Inspect for damage. Repair as necessary.

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

Possible Component	Reference/Action
Return springs 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 3-2 Shift

Possible Component	Reference/Action
236 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB), Turbine Shaft Speed (TSS) sensor, intermediate shaft speed sensor, Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D Band - Band damaged - Servo worn or 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
Not adjusted correctly	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 2-1 Shift

Possible Component	Reference/Action
237 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB), Turbine Shaft Speed (TSS) sensor, Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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: Harsh 2-1 Shift (Continued)**

Possible Component	Reference/Action
Direct Clutch One-Way Clutch (OWC) 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, Torque Converter Clutch (TCC) solenoid, Transmission Fluid Temperature (TFT) sensor and Engine Coolant Temperature (ECT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 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.
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 Concern: Always Applied/Stalls Vehicle**

Possible Component	Reference/Action
241 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Torque Converter Clutch (TCC) solenoid	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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.
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.
Low One-Way Clutch (OWC) Worn, damaged or assembled incorrectly.	Inspect for damage. Repair as necessary.

Torque Converter Operation Concern: Cycling/Shudder/Chatter

Possible Component	Reference/Action
242 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Torque Converter Clutch (TCC) solenoid	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid	

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

Possible Component	Reference/Action
Transmission fluid condition — contaminated, degraded	Carry out Transmission 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 transmission 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: Selector Lever Efforts High

Possible Component	Reference/Action
251 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Transmission Range (TR) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Selector Lever Cable, TR Sensor Selector lever cable system or TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section or Section 307-05.
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)**Other Concerns: Selector Lever Efforts High (Continued)**

Possible Component	Reference/Action
- Valve/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.
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 Output Shaft Speed (OSS) sensor, intermediate shaft speed, Turbine Shaft Speed (TSS) sensor, Transmission Range (TR) sensor	Inspect for leakage. If areas around sensor show signs of leakage, install a new sensor O-ring seal. If area behind TR sensor shows signs of a leak, a new manual lever shaft seal may need to be installed.
Transmission Fluid Incorrect transmission fluid level	Adjust transmission fluid 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 the Leakage Check with a Black Light, refer to Leakage Inspection in this section. Repair as necessary.
Vents Transmission fluid leakage through the vent system into the bellhousing	- Incorrect transmission 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. - Verify the transmission operating temperature by monitoring the Transmission Fluid Temperature (TFT) while driving the vehicle for 32 km (20 mi) 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.

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

Possible Component	Reference/Action
	- Remove all traces of transmission 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 damaged or obstructed, repair as necessary.

Other Concern: Noise/Vibration — Forward or Reverse

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

Possible Component	Reference/Action
254 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Torque Converter Clutch (TCC) solenoid, Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB), Pressure Control Solenoid C (PCC)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Selector Lever Cable/Transmission Range (TR) Sensor Selector lever cable or TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section or Section 307-05.
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.
Torque Converter Assembly Torque converter hub damaged	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.

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

Possible Component	Reference/Action
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 (OWC) Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
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.

Other Concern: Engine Will Not Crank

Possible Component	Reference/Action
255 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Transmission Range (TR) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Selector Lever Cable/TR Sensor Selector lever cable or TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section or Section 307-05.
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 Gauge. Tighten the TR sensor screws alternating sequence until correct tightening specification is obtained. Remove the TR Sensor Alignment Gauge. 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.

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

Possible Component	Reference/Action
Flexplate or Adapter Plate Damaged	Inspect for damage. Repair as necessary.
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.

Other Concern: No Park Range

Possible Component	Reference/Action
256 — ROUTINE	
Selector Lever Cable/Transmission Range (TR) Sensor Selector lever cable system or TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section or Section 307-05.
Case - Manual control lever assembly damaged, 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, Torque Converter Clutch (TCC) solenoid, Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB), Pressure Control Solenoid C (PCC), Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid	

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

Possible Component	Reference/Action
Incorrect transmission fluid level	Adjust transmission fluid to correct level. Refer to Transmission Fluid Level Check in this section.
Hydraulic/Mechanical 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 mi) 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	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.
Torque Converter Assembly - Seized torque converter One-Way Clutch (OWC) - 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.
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.
Other Restriction in the transmission cooling system	Refer to Section 307-02 for information and diagnosis of cooling system.

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

Possible Component	Reference/Action
- Excessive trailer tow load - Engine driveability concerns	- Refer to the Owner's Literature for specifications on trailer towing. - Check engine. Refer to Section 303-00.

Other Concerns: No Engine Braking in Manual 2nd Position

Possible Component	Reference/Action
258 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Shift Solenoid C (SSC), Shift Solenoid D (SSD), Pressure Control Solenoid A (PCA)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid Incorrect transmission fluid level	Adjust transmission fluid to correct level. Refer to Transmission Fluid Level Check in this section.
Incorrect Pressures High/low pressures	Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Overdrive (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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 Solenoid A (SSA), Shift Solenoid C (SSC), Shift Solenoid D (SSD), Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid Incorrect transmission fluid level	Adjust transmission fluid to the correct level, refer to Transmission Fluid Level Check in this section.

DIAGNOSIS AND TESTING (Continued)**Other Concern: No Engine Braking in Manual 1st Position (Continued)**

Possible Component	Reference/Action
Incorrect pressures High/low pressures	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: Transmission Fluid Venting/Foaming

Possible Component	Reference/Action
261 — ROUTINE	
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
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	
Transmission Fluid Incorrect transmission fluid level	Adjust transmission fluid to correct level. Refer to Transmission Fluid Level Check in this section.
Selector Lever Cable/Transmission Range (TR) Sensor Cable system or TR sensor damaged, misaligned	Inspect and repair as necessary. Refer to Transmission Range (TR) Sensor Adjustment in this section.
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)**Other Concern: Vehicle Movement with Gear Selector in N Position (Continued)**

Possible Component	Reference/Action
• Separator plate damaged • Contamination • Valve/springs damaged, misassembled, missing, stuck or bore damaged	• 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 • 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.

Other Concern: Slips/Chatters in Manual 1st Position

Possible Component	Reference/Action
263 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB)	• Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid • Incorrect transmission fluid level • Transmission fluid condition	• Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. • Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
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 • Separator plate damaged • Contamination	• Tighten to specification. • Inspect for damage. If damaged, install a new separator plate. • Disassemble and clean.

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

Possible Component	Reference/Action
- Valve/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.
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 - 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.
Direct One-Way Clutch (OWC) 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 Solenoid A (PCA), Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid Incorrect transmission fluid level	Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section.

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

Possible Component	Reference/Action
Transmission fluid condition	Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures High/low pressures	Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Overdrive (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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.
O/D Planetary Assembly Planetary damaged	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 4-5 Shift

Possible Component	Reference/Action
270 — ROUTINE	
Powertrain Control System - PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor - Transmission Control Switch (TCS)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test. - For TCS diagnosis, refer to Section 307-05.
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 - Separator plate damaged	- Tighten to specification. - Inspect for damage. If damaged, install a new separator plate.

DIAGNOSIS AND TESTING (Continued)**Shift Concern: No 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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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 (SSC), Pressure Control Solenoid C (PCC), Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor - Transmission Control Switch (TCS)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test. - For TCS diagnosis, refer to Section 307-05.
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 - 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 (O/D) Servo Servo retaining screws damaged	Inspect for damage. Repair as necessary.

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

Possible Component	Reference/Action
Seals (piston and cover) damaged	Inspect for damage. Repair as necessary.
O/D 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 4-5 Shift

Possible Component	Reference/Action
272 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid B (PCB), Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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: Feel — Soft/Slipping 5-4 Shift**

Possible Component	Reference/Action
273 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid C (SSC), Pressure Control Solenoid C (PCC), Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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 (OWC) Worn, damaged or assembled incorrectly	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 (SSC), Pressure Control Solenoid B (PCB), Turbine Shaft Speed (TSS) sensor, Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.

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

Possible Component	Reference/Action
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 - 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. - 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 (O/D) Servo - Servo retaining screws damaged - Seal (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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 Solenoid C (SSC), Pressure Control Solenoid C (PCC), Turbine Shaft Speed (TSS) sensor, Transmission Range (TR) sensor, Transmission Fluid Temperature (TFT) sensor	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 - 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: Harsh 5-4 Shift (Continued)**

Possible Component	Reference/Action
- Valve/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.
Overdrive (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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 (OWC) Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.

Other Concern: No Engine Braking in Manual 3rd Position

Possible Component	Reference/Action
280 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Shift Solenoid A (SSA), Shift Solenoid B (SSB), Shift Solenoid C (SSC), reverse pressure switch, Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid Incorrect transmission fluid level	Adjust transmission fluid to correct level. Refer to Transmission Fluid Level Check in this section.
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 - 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)**Other Concern: No Engine Braking in Manual 3rd Position (Continued)**

Possible Component	Reference/Action
Filter damaged, missing	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 - 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.
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.

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 (SSD), reverse pressure switch, Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid Incorrect transmission fluid level	Adjust transmission 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	- Tighten to specification. - Inspect for damage. Repair as necessary. - Inspect for damage. If damaged, install a new separator plate. - Disassemble and clean.

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

Possible Component	Reference/Action
Valve/springs damaged, misassembled, missing, stuck or bore damaged	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 Concern: Slip/Chatters in Manual 3rd Position

Possible Component	Reference/Action
282 — ROUTINE	
Powertrain Control System PCM, vehicle wiring harnesses, Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Transmission Fluid - Incorrect transmission fluid level - Transmission fluid condition	- Adjust transmission fluid to the correct level. Refer to Transmission Fluid Level Check in this section. - Carry out Transmission Fluid Condition Check. Refer to Preliminary Inspection in this section.
Incorrect Pressures High/low pressures	Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
Overdrive (O/D) Servo - Servo retaining screws damaged - Seals (piston and cover) damaged	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.
O/D 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	- Inspect for damage. Repair as necessary. - Inspect for damage. Repair as necessary.

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

Possible Component	Reference/Action
Not adjusted correctly	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.
Direct One-Way Clutch (OWC) Worn, damaged or assembled incorrectly	Inspect for damage. Repair as necessary.
Low OWC 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 (SSD)	- Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD 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 Solenoid B (PCB), Pressure Control Solenoid C (PCC)	Carry out On-Board Diagnostic (OBD) tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.

DIAGNOSIS AND TESTING (Continued)**Other Concern: No 2nd and 5th Gears (Manual 2nd is Ok) (Continued)**

Possible Component	Reference/Action
	• GO to Pinpoint Test D. • Repair as required. Clear the DTCs, road test the vehicle and rerun OBD test.

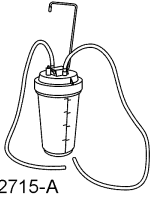
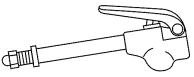
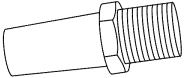
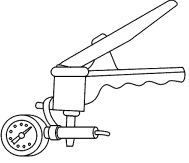
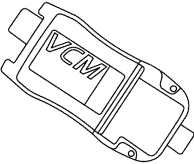
Other Concern: No 3rd, 4th and 5th Gears

Possible Component	Reference/Action
285 — ROUTINE	
Powertrain Control System • PCM, vehicle wiring harnesses, Pressure Control Solenoid A (PCA), Pressure Control Solenoid B (PCB)	• Carry out On-Board Diagnostic (OBD) 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 the DTCs, road test the vehicle and rerun OBD test.
Overdrive (O/D) Servo • Servo retaining screws damaged • Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary. • Inspect for damage. Repair as necessary.
O/D 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.
O/D 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.

GENERAL PROCEDURES

Transmission Fluid Level Check

Special Tool(s)

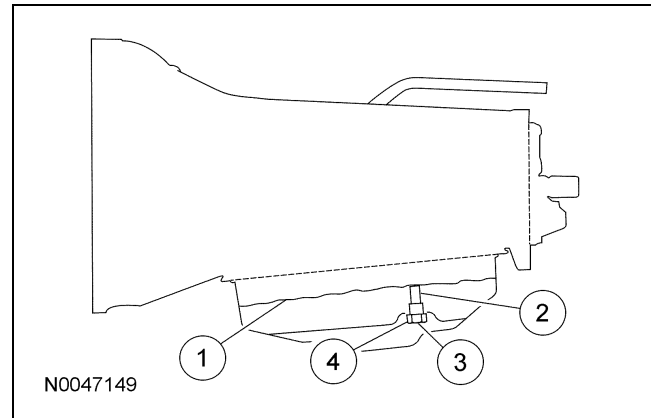
 ST2715-A	Fluid Transporter/Evacuator/Injector 307-D465
 ST2467-A	Rubber Tip Air Nozzle 100-D009 (D93L-7000-A)
 ST2581-A	Transmission Fluid Fill Tool 307-437
 ST1269-A	Vacuum Pump Kit 416-D002 (D95L-7559-A)
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Material

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

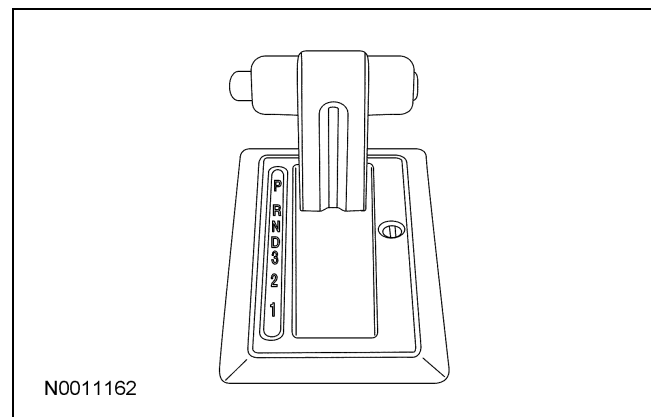
Fluid Fill Reference

NOTE: Left side of case shown.



Item	Part Number	Description
1	—	Fluid level
2	7A010	Fluid level tube
3	W704999-S309	Transmission fluid pan drain plug (short hex)
4	7A010	Transmission fluid pan drain plug

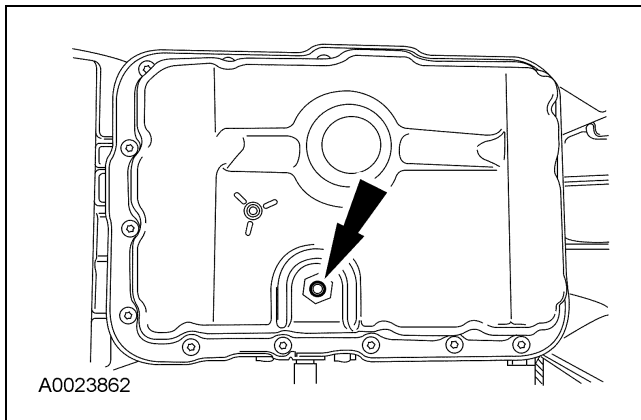
1. Using the scan tool, monitor the TFT PID.
2. Start the vehicle.
3. **NOTE:** Engine idle speed is approximately 650 rpm.
Run the engine until the Transmission Fluid Temperature (TFT) is between 27°-49°C (80°-120°F).
4. Move the selector lever slowly through each gear, stopping in each position and allowing the transmission to engage.



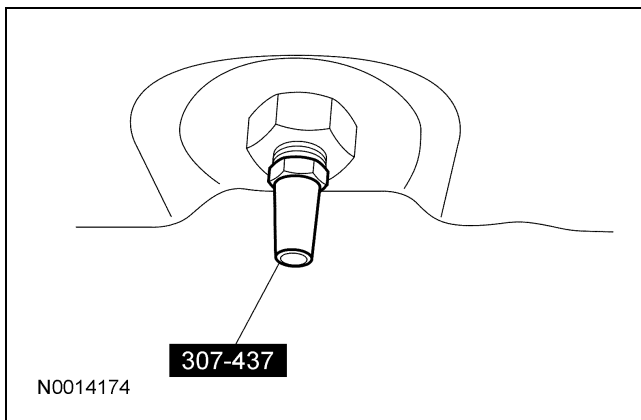
5. Place the selector lever in the PARK position.

GENERAL PROCEDURES (Continued)

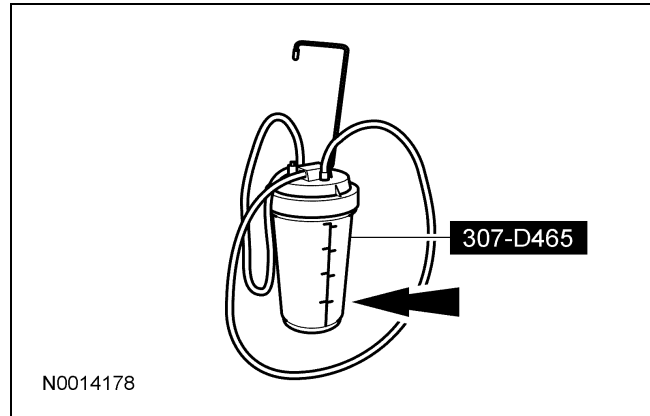
6. With the engine running, position the vehicle on a hoist and set it as close to level as possible. For additional information, refer to Section 100-02.
7. Hold the transmission fluid pan drain plug with a wrench and remove the transmission fluid pan drain plug (short hex).



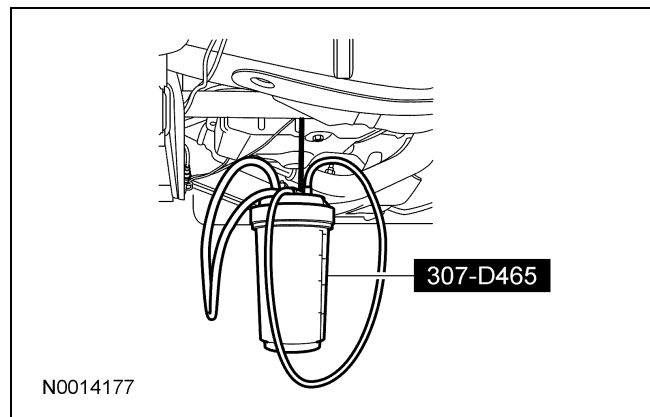
8. Install the Transmission Fluid Fill Tool into the pan.



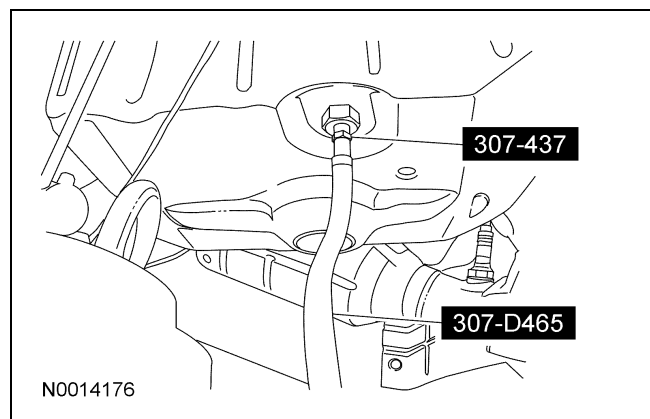
9. **NOTE:** Prior to filling the Fluid Transporter/Evacuator/Injector with transmission fluid, make sure that the canister is clean. Fill the Fluid Transporter/Evacuator/Injector with automatic transmission fluid.



10. Hang the Fluid Transporter/Evacuator/Injector under the vehicle. Position it upright and close to the transmission.

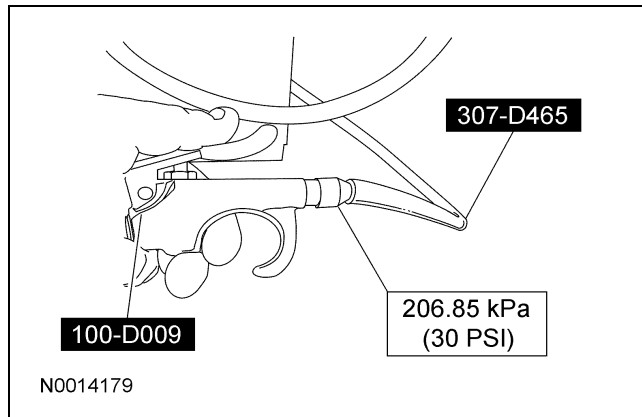


11. Connect the Transmission Fluid Fill Tool and the Fluid Transporter/Evacuator/Injector.
 - Connect the open end of the fluid hose from the Fluid Transporter/Evacuator/Injector to the Transmission Fluid Fill Tool at the bottom of the transmission fluid pan.

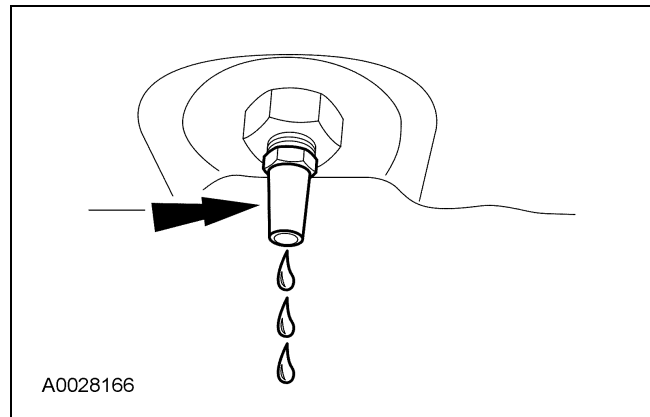


GENERAL PROCEDURES (Continued)

12. Apply a maximum of 206.85 kPa (30 psi) to the open end of the vacuum/pressure hose from the Rubber Tip Air Nozzle. Transmission fluid will immediately start flowing out of the Fluid Transporter/Evacuator/Injector into the transmission fluid pan.



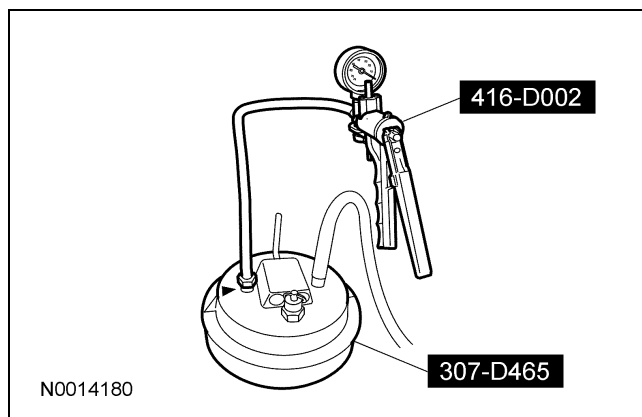
16. Allow the transmission fluid to drain. Make sure that the transmission fluid temperature is between 27°-49°C (80°-120°F). When the transmission fluid comes out as a thin stream or drip, the transmission fluid is at the correct level.



13. Add one pint of transmission fluid into the transmission fluid pan. Stop the process by releasing the air pressure and removing the Rubber Tip Air Nozzle from the end of the hose.

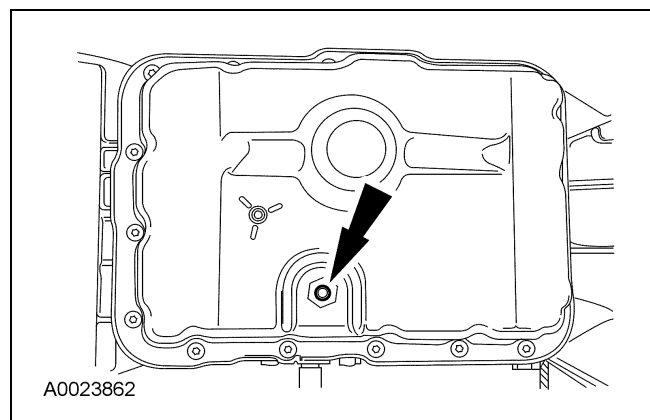
14. Inspect the transmission fluid level in the Fluid Transporter/Evacuator/Injector. If the transmission fluid drains back into the canister, the transmission is full. If no transmission fluid drains back, more transmission fluid will need to be added. Repeat Steps 12 and 13.

15. Once the transmission is full, place a hand vacuum pump from the Vacuum Pump Kit on the open end of the vacuum/pressure hose of the Fluid Transporter/Evacuator/Injector and apply vacuum to the system. This will pull out any extra transmission fluid trapped in the system and direct it into the container.



17. Reinstall the transmission fluid pan drain plug (short hex).

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



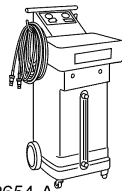
GENERAL PROCEDURES (Continued)

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 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

Material

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

Draining

NOTICE: Use only automatic transmission fluid specified for this transmission. Do not use supplemental transmission fluid additives, treatments or clean agents. The use of these materials may affect transmission operation and result in damage to internal transmission components.

NOTICE: Always refer to the instructions supplied with the Automatic Transmission Flush and Fill Machine or transmission damage can occur.

1. With the vehicle in PARK, position it on a hoist. For additional information, refer to Section 100-02.
2. Use a suitable Automatic Transmission Flush and Fill Machine to change the transmission fluid.

3. When connecting the Automatic Transmission Flush and Fill Machine, connect the machine to the transmission fluid cooler tube after the transmission fluid cooler on the transmission fluid cooler return tube. This will help remove any foreign material trapped in the transmission fluid coolers.

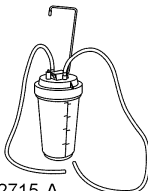
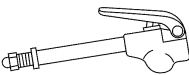
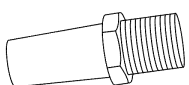
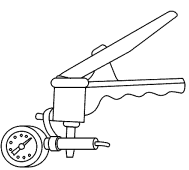
Refill

1. Use only automatic transmission fluid.
2. Once the transmission fluid exchange has been completed, disconnect the Automatic Transmission 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 transmission fluid is needed, add transmission fluid in increments of 0.24L (0.5 pt) until the correct level is achieved. For additional information, refer to Transmission Fluid Level Check in this section.

GENERAL PROCEDURES

Transmission Fluid Drain and Refill — Without Torque Converter Drain Plug

Special Tool(s)

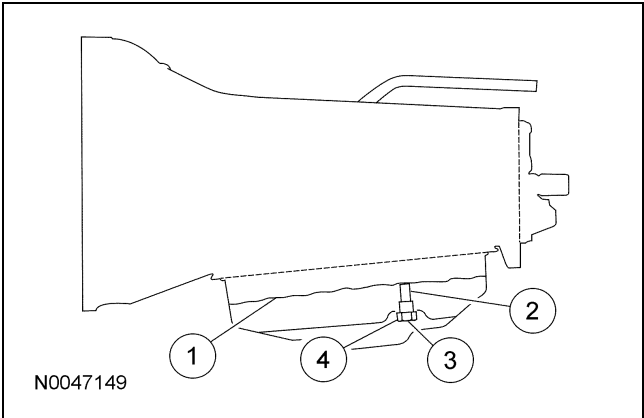
 ST2715-A	Fluid Transporter/Evacuator/Injector 307-D465
 ST2467-A	Rubber Tip Air Nozzle 100-D009 (D93L-7000-A)
 ST2581-A	Transmission Fluid Fill Tool 307-437
 ST1269-A	Vacuum Pump Kit 416-D002 (D95L-7559-A)

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

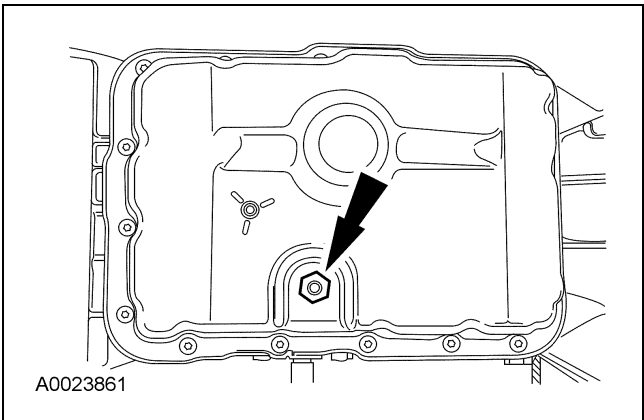
NOTE: Left side of case is shown.



Item	Part Number	Description
1	—	Fluid level
2	7A010	Fluid level tube
3	W704999-S309	Transmission fluid pan drain plug (short hex)
4	7A010	Transmission fluid pan drain plug

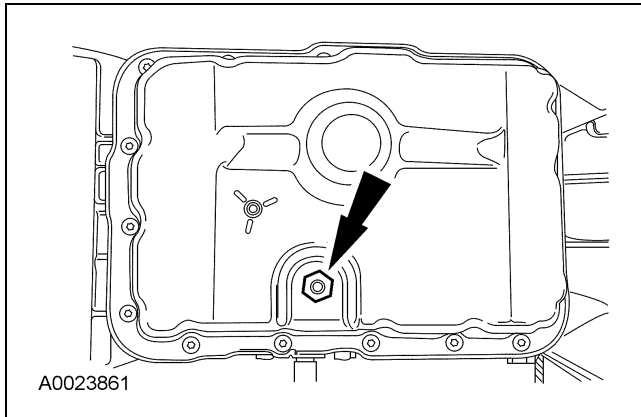
Draining

1. With the vehicle in NEUTRAL, position it on a hoist. Set the vehicle as close to level as possible. For additional information, refer to Section 100-02.
2. Remove the transmission fluid pan drain plug and allow the transmission fluid to drain.

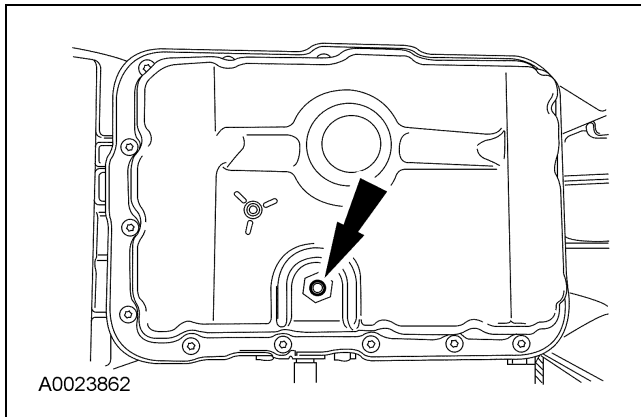


GENERAL PROCEDURES (Continued)**Filling**

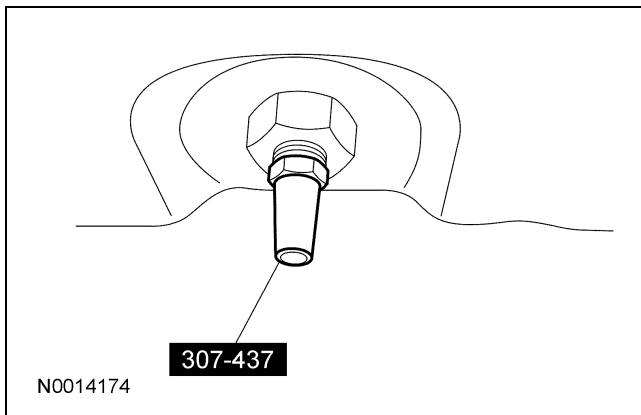
1. Install the transmission fluid pan drain plug.
 - Tighten to 26 Nm (19 lb-ft).



2. Hold the transmission fluid pan drain plug with a wrench and remove the transmission fluid pan drain plug (short hex).

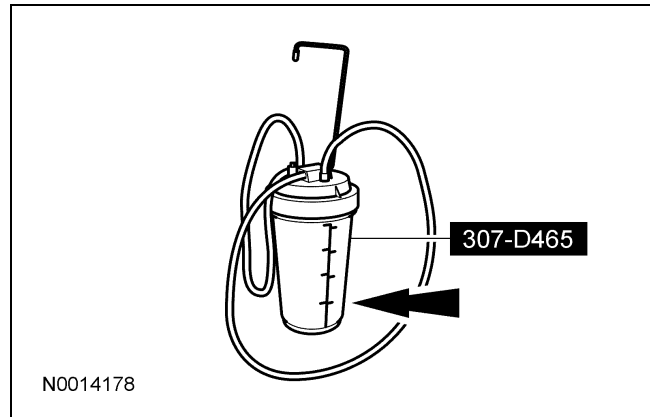


3. Install the Transmission Fluid Fill Tool into the pan.

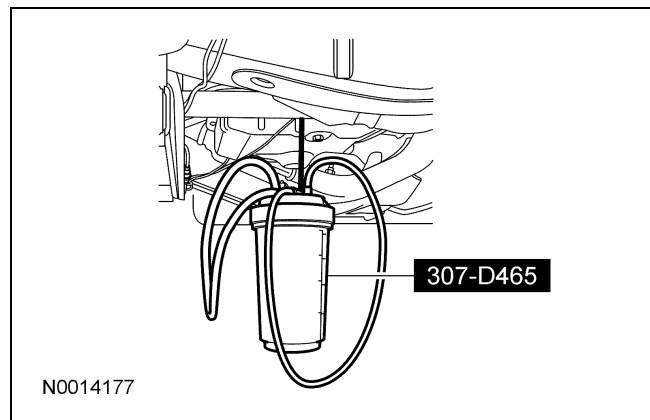


4. **NOTE:** Prior to filling the Fluid Transporter/Evacuator/ Injector with transmission fluid, make sure that the canister is clean.

Fill the Fluid Transporter/Evacuator/Injector with automatic transmission fluid.

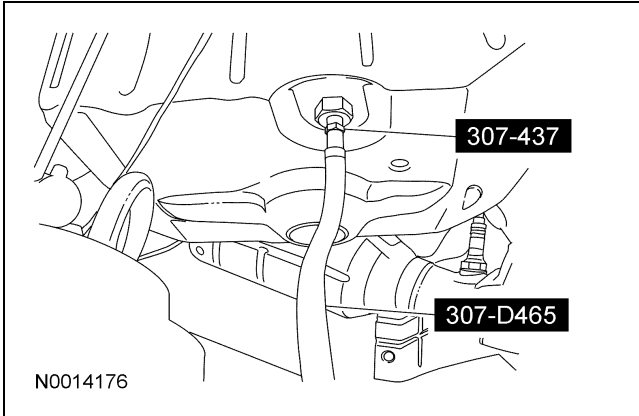


5. Hang the Fluid Transporter/Evacuator/Injector under the vehicle, upright and close to the transmission.

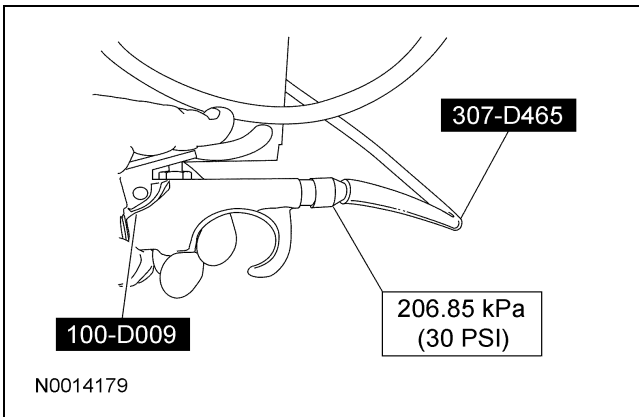


GENERAL PROCEDURES (Continued)

6. Connect the Transmission Fluid Fill Tool and the Fluid Transporter/Evacuator/Injector.
 - Connect the open end of the fluid hose from the Fluid Transporter/Evacuator/Injector to the Transmission Fluid Fill Tool at the bottom of the transmission fluid pan.



7. Apply a maximum of 206.85 kPa (30 psi) to the open end of the vacuum/pressure hose from the Rubber Tip Air Nozzle. Fluid will immediately start flowing out of the Fluid Transporter/Evacuator/Injector into the transmission fluid pan.



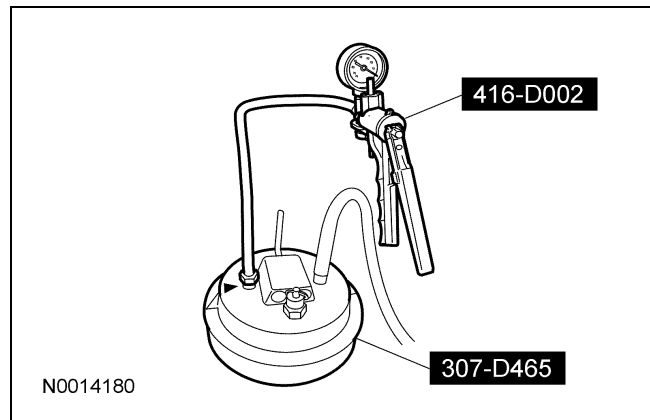
8. Add 2 or 3 quarts of transmission fluid into the transmission fluid pan. Stop the process by releasing the air pressure and removing the Rubber Tip Air Nozzle from the end of the hose.

9. **NOTE:** Engine idle speed is approximately 650 rpm.

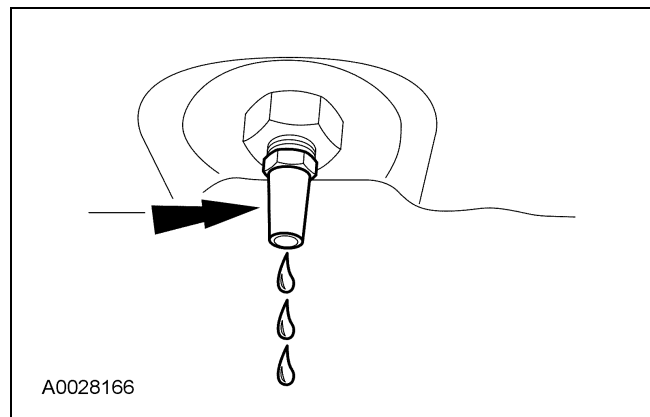
Start and run the engine until the Transmission Fluid Temperature (TFT) is between 27°-49°C (80°-120°F).

10. Inspect the transmission fluid level in the Fluid Transporter/Evacuator/Injector. If the transmission fluid drains back into the canister, the transmission is full. If no transmission fluid drains back, more transmission fluid will need to be added. Repeat Steps 8 and 9.

11. Once the transmission is full, place a hand vacuum pump from the Vacuum Pump Kit on the open end of the vacuum/pressure hose of the Fluid Transporter/Evacuator/Injector and apply vacuum to the system. This will pull out any extra transmission fluid trapped in the system and direct it into the container.

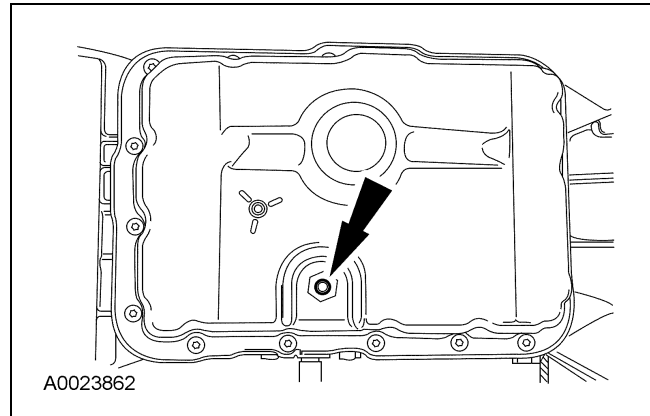


12. Allow the transmission fluid to drain. When the transmission fluid comes out as a thin stream or drip, the transmission fluid is at the correct level.



GENERAL PROCEDURES (Continued)

13. Reinstall the transmission fluid pan drain plug (short hex).
- Tighten to 10 Nm (89 lb-in).



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

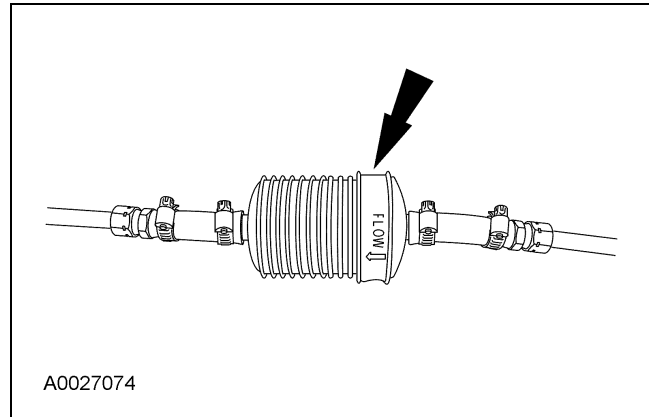
NOTICE: Whenever a transmission has been disassembled to install new parts or a new or remanufactured transmission has been installed, a new transmission fluid cooler, either in-tank, auxiliary or Oil-To-Air (OTA), if equipped will need to be installed, otherwise transmission damage can occur. Using a suitable torque converter/fluid cooler cleaner, clean and backflush the transmission fluid cooler tubes.

NOTICE: Use only 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.

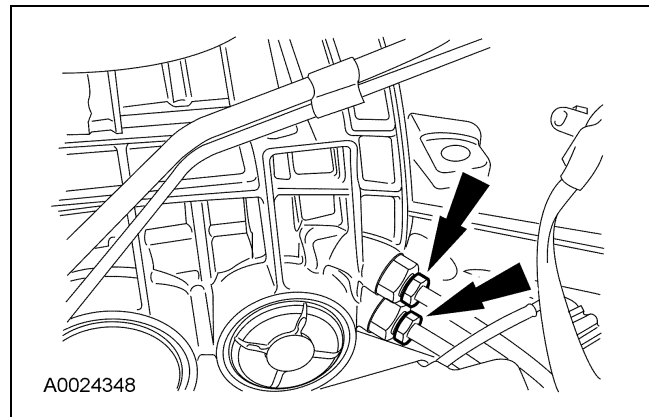
When internal wear or damage has occurred in the transmission, metal particles, clutch plate material or band material may have been carried into the transmission fluid cooler. These contaminants are a major cause of recurring transmission concerns and must be removed from the system before the transmission is put back in use.

NOTE: Do not use any solvents while carrying out this procedure. Only use automatic transmission fluid.

1. Conduct transmission fluid cooler backflushing and cleaning 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 tubes, connect 2 additional rubber hoses to the transmission end of the steel transmission cooler tubes as described.
 - Connect the cleaner tank pressure line to the steel transmission cooler return tube (transmission case upper fitting).
 - Connect a tank return hose to the steel transmission cooler pressure tube (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 transmission fluid cooler system).
5. Switch off the pump and disconnect the pressure hose from the transmission cooler return tube.

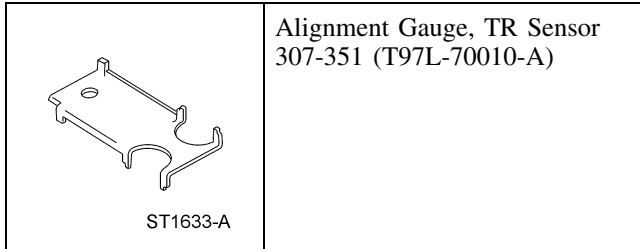
GENERAL PROCEDURES (Continued)

6. Use compressed air to blow out the cooler(s) and tubes (blow air into the transmission cooler return tube) until all the fluid is removed.
 7. Remove the rubber return hose from the remaining steel cooler tubes.
-

GENERAL PROCEDURES

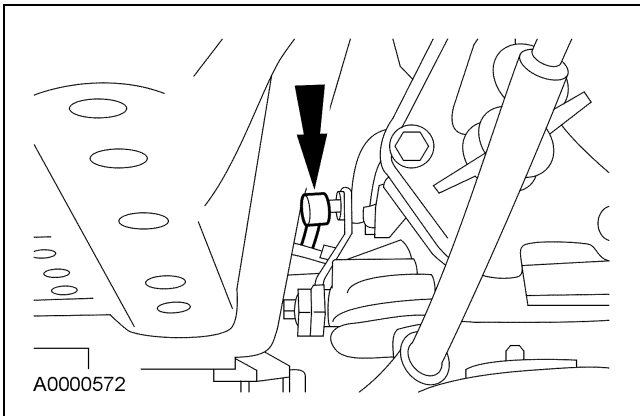
Transmission Range (TR) Sensor Adjustment

Special Tool(s)

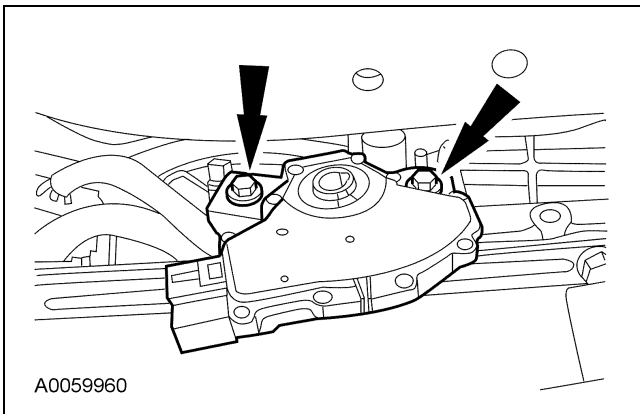


Adjust

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



3. Loosen the Transmission Range (TR) sensor screws.

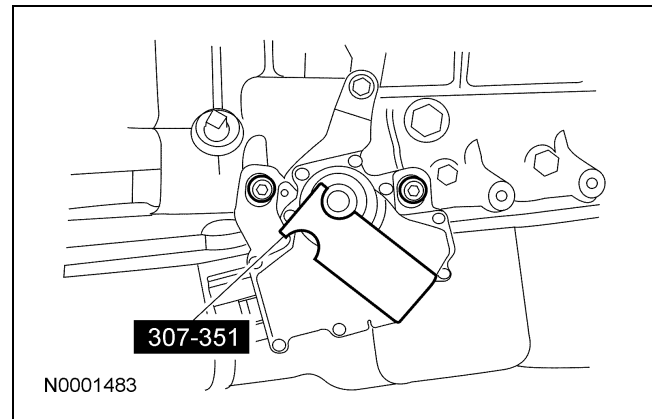


4. **NOTICE:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

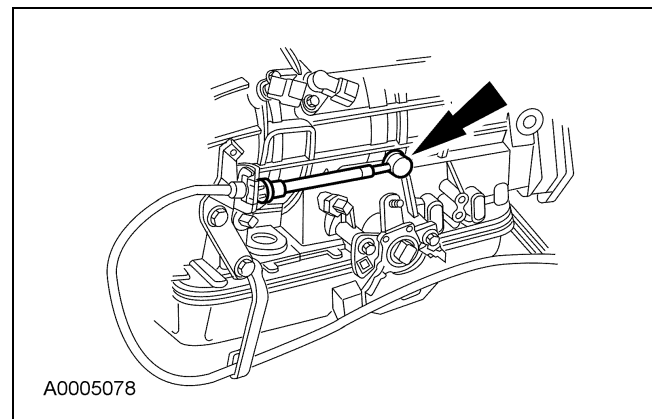
NOTE: The manual control lever must be in the NEUTRAL position.

Using the TR Sensor Alignment Gauge, align the TR sensor and tighten the screws in an alternating sequence.

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



5. Install the selector lever cable to the manual control lever.



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

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 transmission 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.
-

GENERAL PROCEDURES

Torque Converter Contamination Inspection

Material

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

NOTICE: Do not use water-based cleaners or mineral spirits to clean or flush the torque converter or transmission damage will occur. Use only automatic transmission fluid designated for the transmission and converter being serviced.

NOTE: 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.

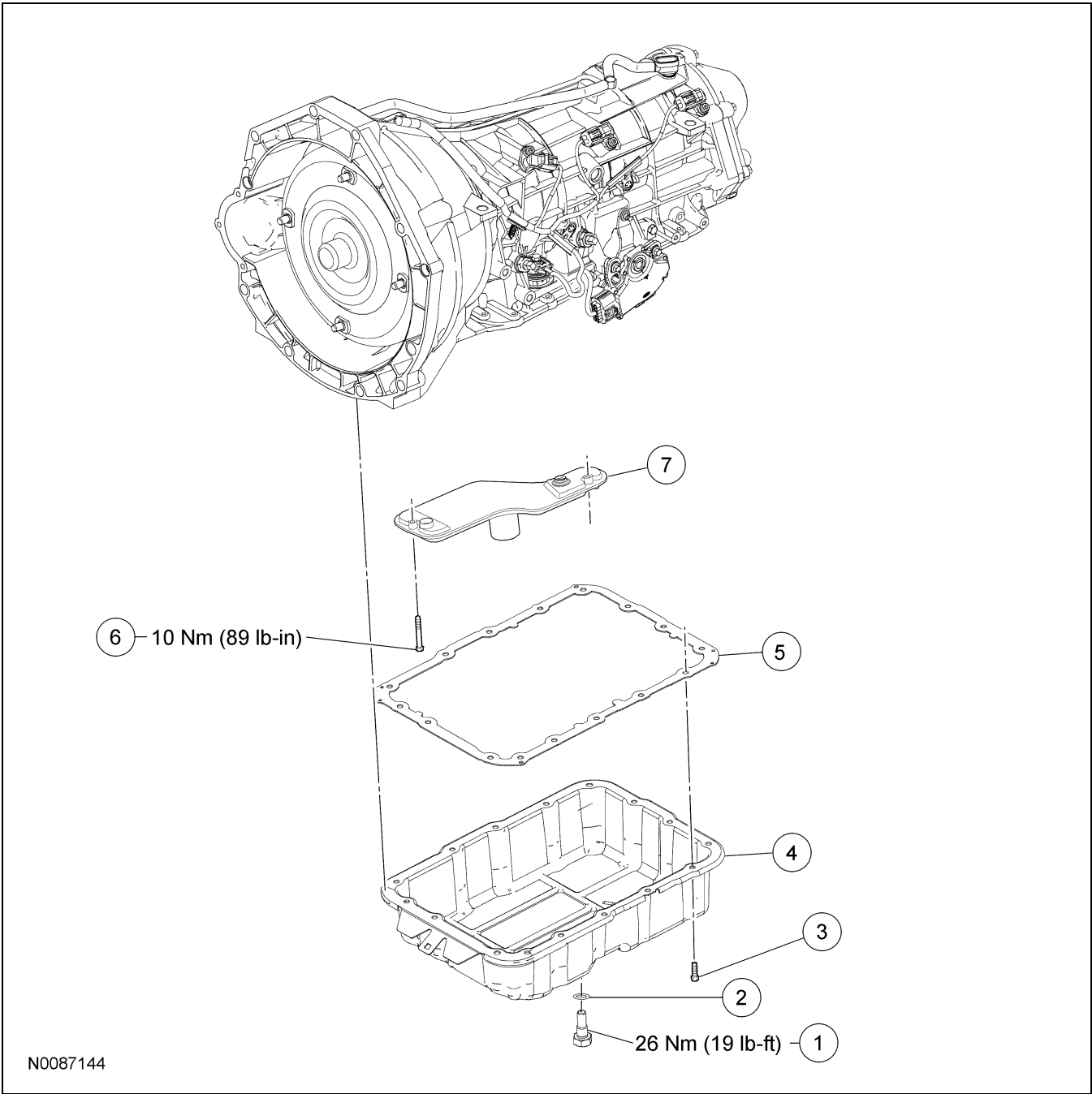
1. If a new or remanufactured torque converter is not being installed, the following steps must be completed.
2. With the torque converter on a bench, pour a small amount of transmission fluid from the torque converter onto an absorbent white tissue or through a paper filter and examine the transmission fluid.
3. Observe the color and odor of the transmission fluid. The transmission 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 transmission fluid level indicator for signs of antifreeze (gum or varnish). If particles are present in the transmission 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 1.9L (2 qt) of automatic transmission fluid into the converter and agitate by hand.
7. Thoroughly drain the transmission fluid.

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

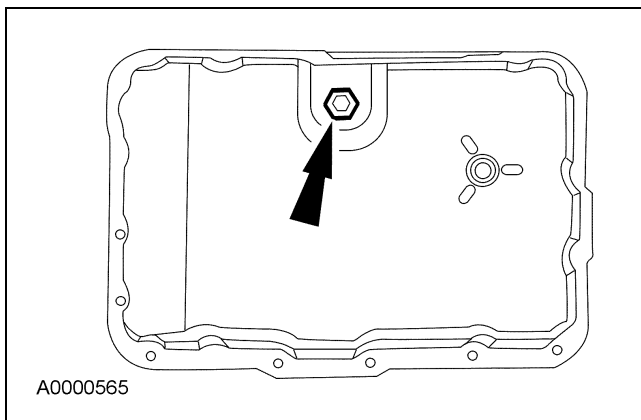


IN-VEHICLE REPAIR (Continued)

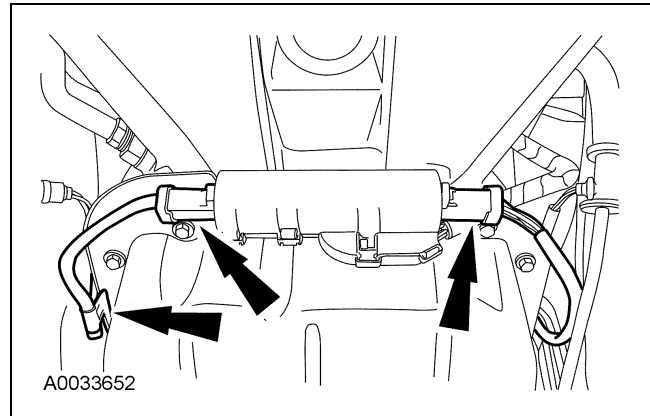
Item	Part Number	Description
1	7A010	Transmission fluid pan drain plug
2	6734	Transmission fluid pan drain plug gasket
3	W500213	Transmission fluid pan screw (16 required)
4	7A194	Transmission fluid pan
5	7A191	Transmission fluid pan gasket
6	W705559	Transmission fluid pan filter screw (2 required)
7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

Removal

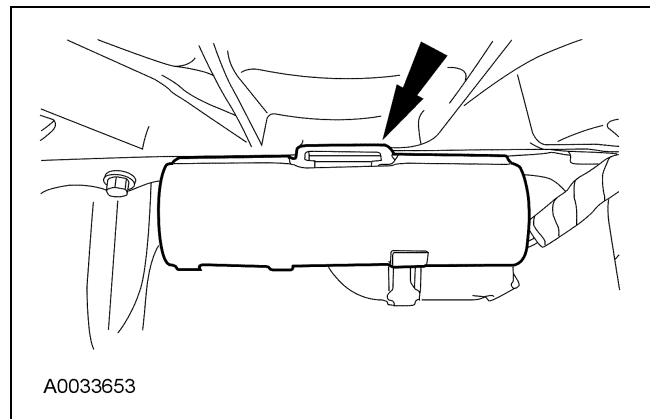
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the transmission fluid pan drain plug and drain the transmission fluid.
 - Discard the transmission fluid pan gasket.



3. Disconnect the Heated Oxygen Sensor (HO2S) connectors and retaining clip from the RH transmission fluid pan rail and then position the connectors aside.

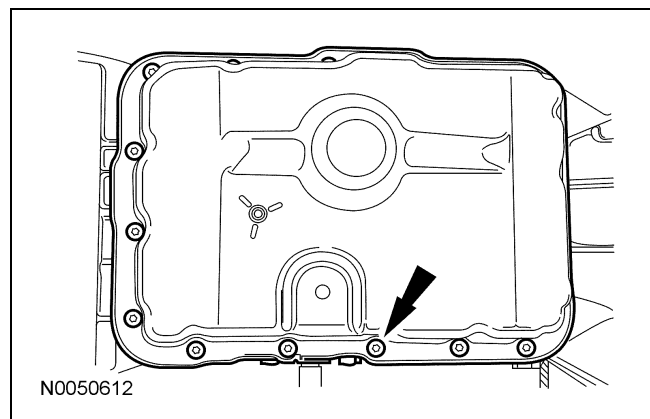


4. Remove the HO2S connector from the front of the transmission fluid pan rail.



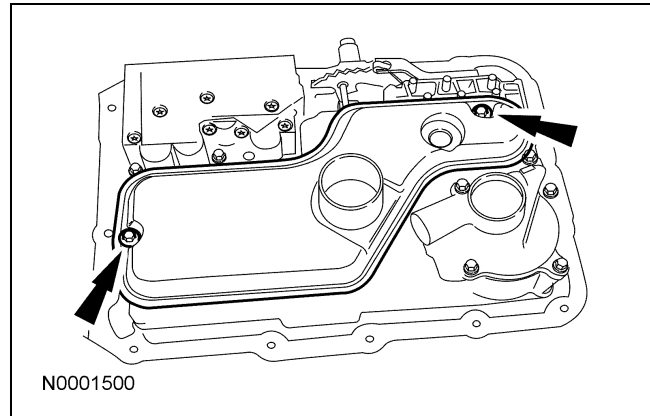
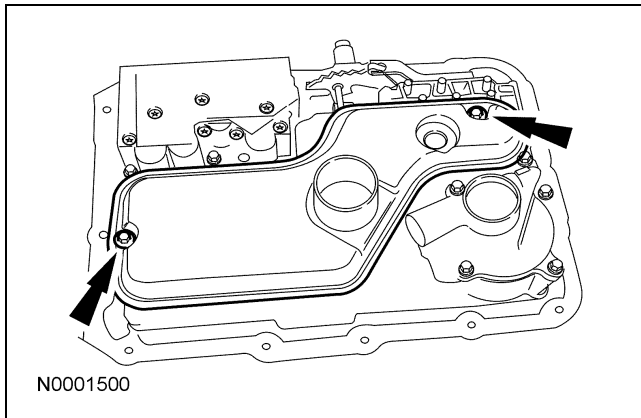
5. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the transmission fluid pan gasket should be reused.

Remove the transmission fluid pan and transmission fluid pan gasket.

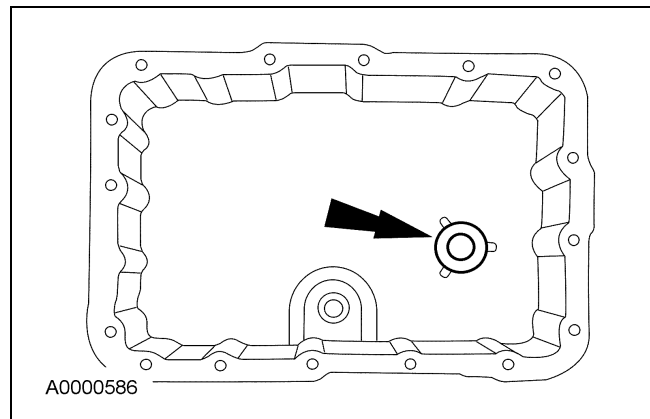
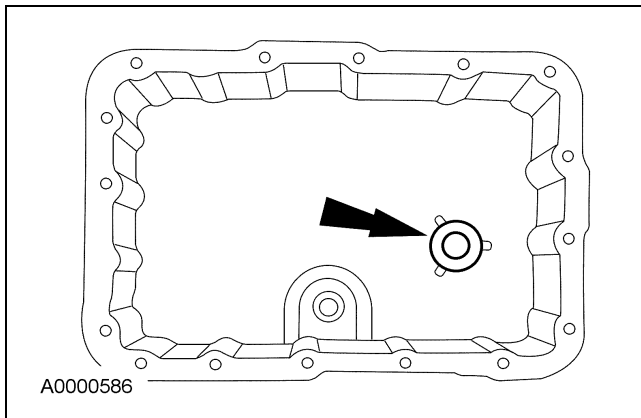


IN-VEHICLE REPAIR (Continued)

6. Remove and discard the transmission fluid filter.

**Installation**

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



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

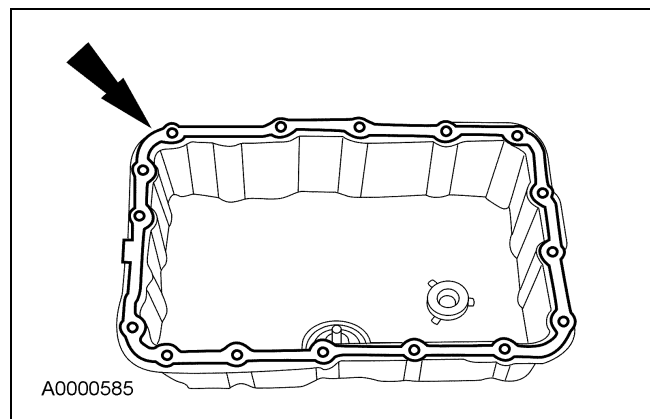
NOTE: Make sure the transmission fluid filter O-ring seals are correctly seated on the transmission fluid filter.

Lubricate the transmission fluid filter O-ring seals and install the transmission fluid filter and screws.

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

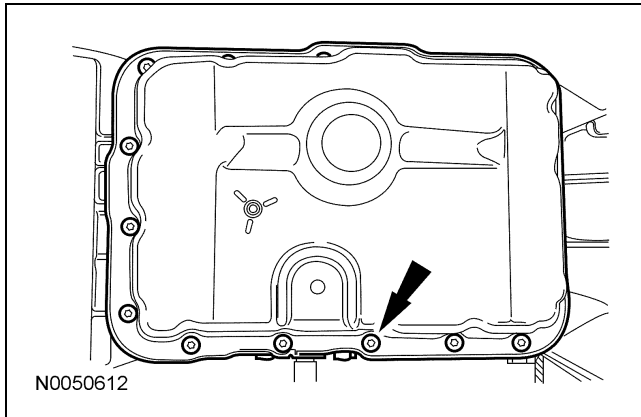
4. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the transmission fluid pan gasket should be reused.

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

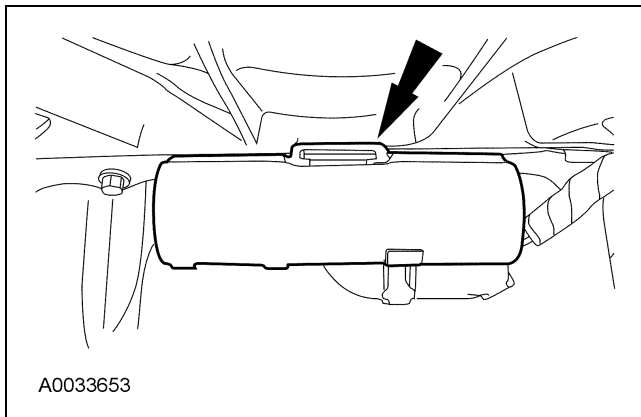


IN-VEHICLE REPAIR (Continued)

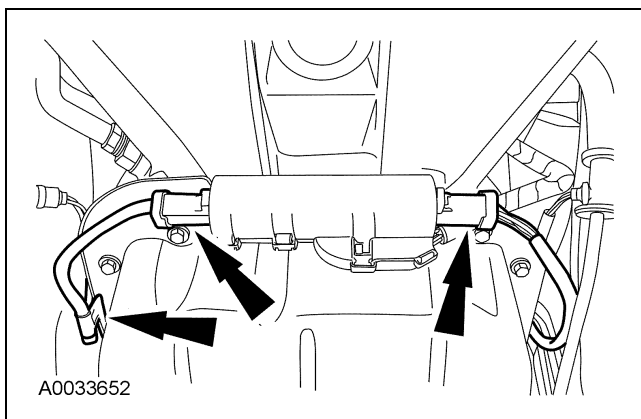
5. Install the transmission fluid pan and tighten the screws in a crisscross sequence.
 - Tighten to 11 Nm (71 lb-in).



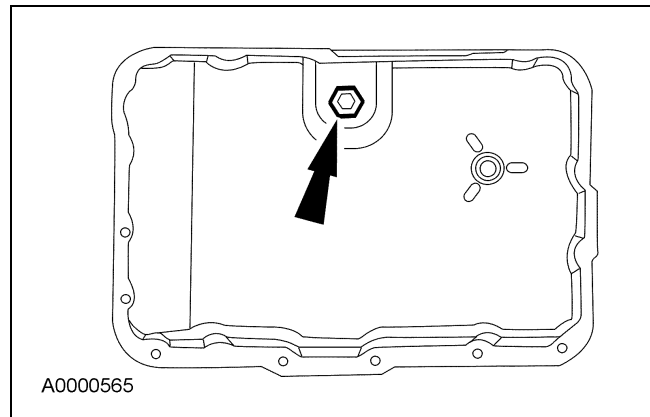
6. Install the HO2S connector to the front of the transmission fluid pan rail.



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



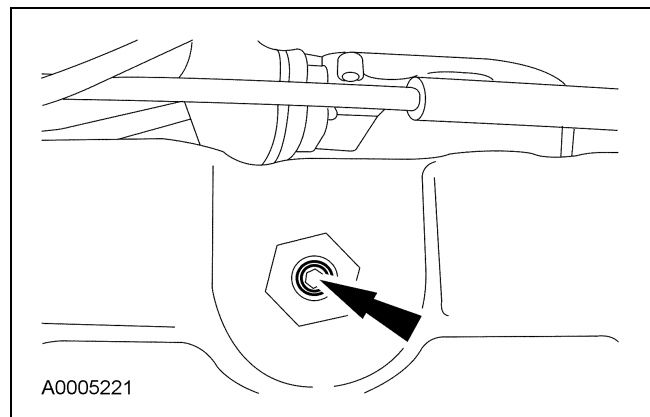
8. Install the transmission fluid pan drain plug.
 - Install a new transmission fluid pan drain gasket onto the transmission fluid pan drain plug assembly.
 - Tighten to 26 Nm (19 lb-ft).



9. **NOTE:** It will be necessary to hold the transmission fluid pan drain plug with a wrench when removing the transmission fluid pan drain plug (short hex).

NOTE: Use a 3/16-inch Allen key to remove the transmission fluid pan drain plug (short hex).

Remove the transmission fluid pan drain plug (short hex).



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

IN-VEHICLE REPAIR

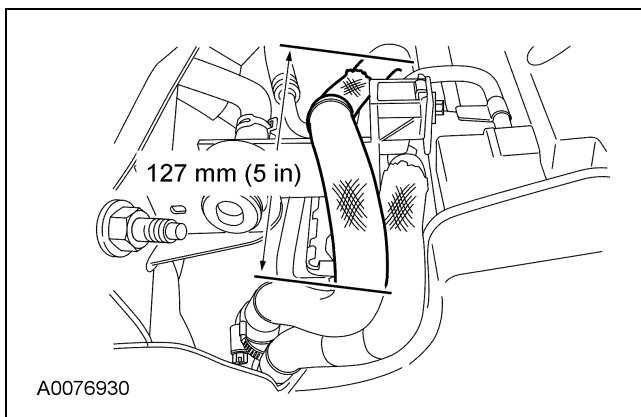
Transmission Filter — In Line

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 transmission fluid filter, install a new in-line transmission fluid filter.
 - If the transmission was overhauled and the vehicle was not equipped with an in-line transmission fluid filter, install a new in-line transmission fluid filter kit.
 - If the transmission is being installed for a non-internal repair, do not install an in-line transmission fluid filter or in-line transmission fluid filter kit.
 - If installing a new or a Ford-authorized remanufactured transmission, install a new in-line transmission fluid filter or an in-line transmission fluid filter kit.
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 in-line transmission fluid filter.

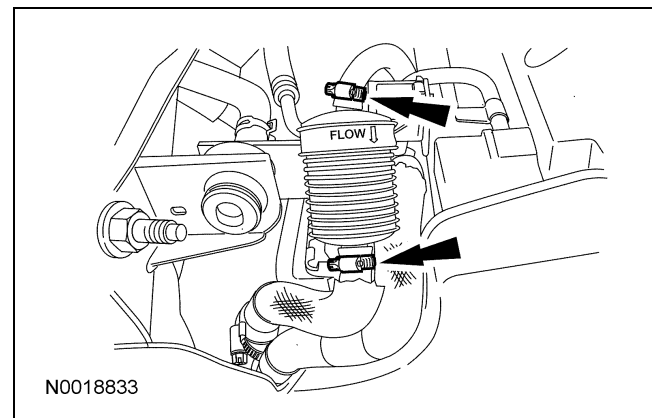


3. **NOTICE:** The in-line transmission fluid filter has a bypass valve in it. The red arrow on the in-line transmission fluid filter indicates the direction of the in-line transmission fluid filter fluid flow through the in-line transmission fluid filter. The in-line transmission fluid filter must be installed in the fluid cooler return tube with the red arrow on the in-line transmission fluid filter pointing away from the transmission fluid cooler and toward the transmission (the return tube has in-line transmission fluid filter fluid coming out of the cooler going to the transmission). If the in-line transmission fluid filter is not installed correctly, it will cause internal transmission damage.

NOTICE: Do not install any rubber hoses or steel tubing with a bend entering the filter greater than 60 degrees.

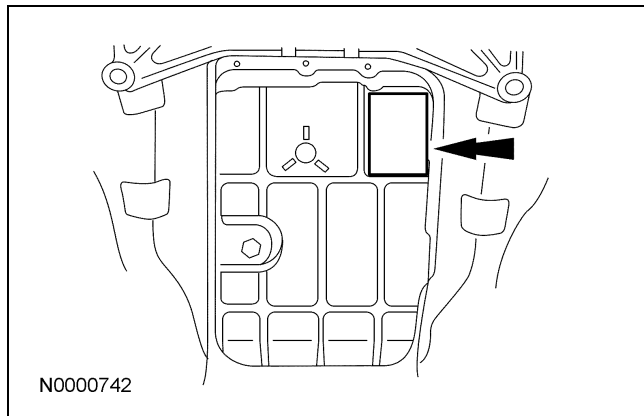
Install the one end of the in-line transmission fluid filter into the rubber hose with a clamp, then install the other end of the in-line transmission fluid filter into the rubber hose.

- Install and tighten the 2 hose clamps.



IN-VEHICLE REPAIR (Continued)

4. Clean a visible section of the transmission fluid pan and install the sticker indicating that the vehicle is equipped with an in-line transmission fluid filter.



5. Fill the transmission with automatic transmission fluid.
- Verify for correct operation.
 - Check the filter for leaks.

IN-VEHICLE REPAIR

Main Control Valve Body

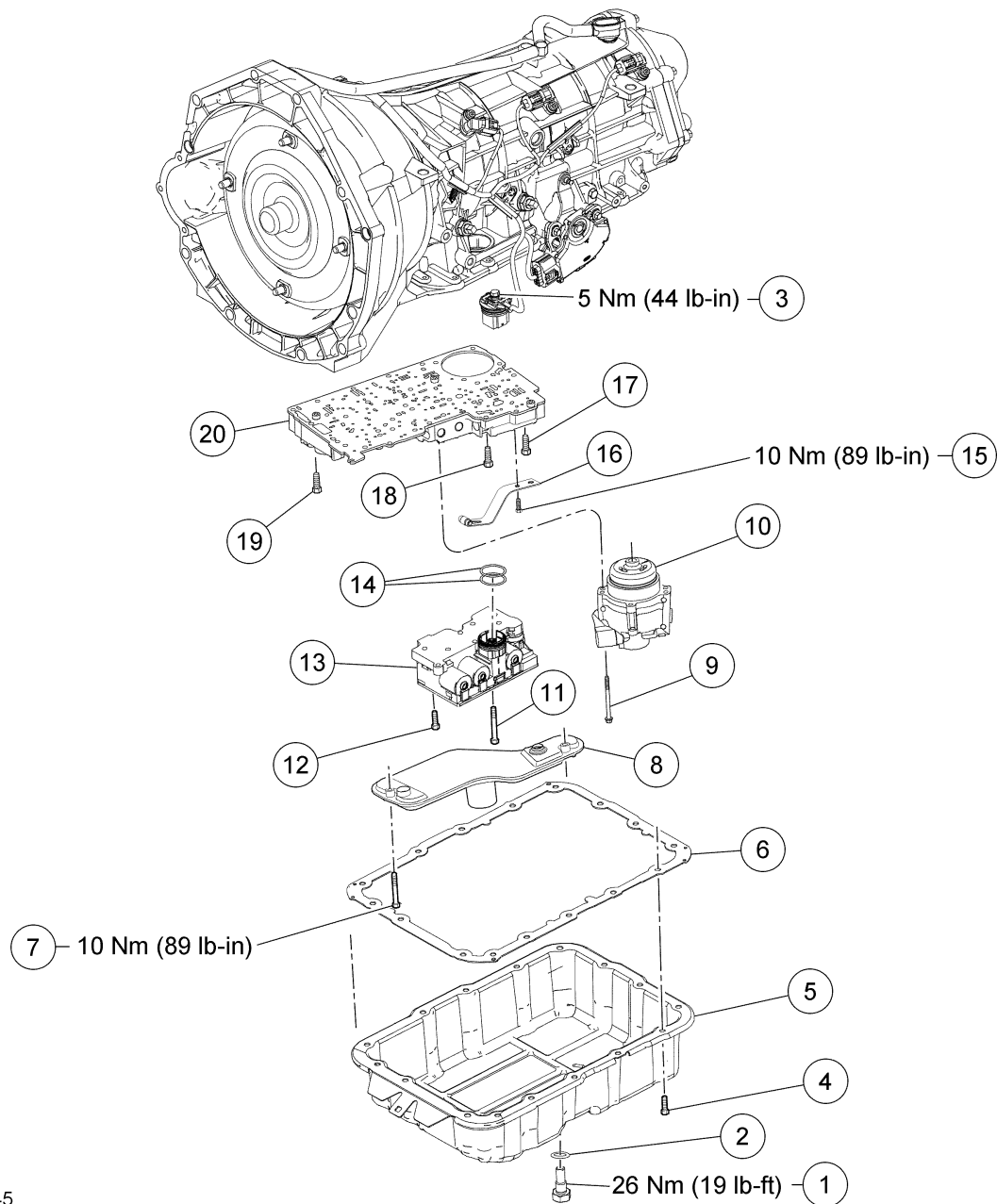
Special Tool(s)

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

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)



N0087145

Item	Part Number	Description
1	7A010	Transmission fluid pan drain plug
2	6734	Transmission fluid pan drain plug gasket
3	—	Transmission vehicle harness connector screw
4	W500213	Transmission fluid pan screw (16 required)
5	7A194	Transmission fluid pan
6	7A191	Transmission fluid pan gasket

(Continued)

Item	Part Number	Description
7	W705559	Transmission fluid pan filter screw (2 required)
8	7A098	Transmission fluid pan filter
9	W702359	Reverse servo piston-to-case screw (4 required)
10	7B193	Reverse servo assembly
11	W703189	Transmission control solenoid body screw (7 required)
12	W702921	Transmission control solenoid body screw

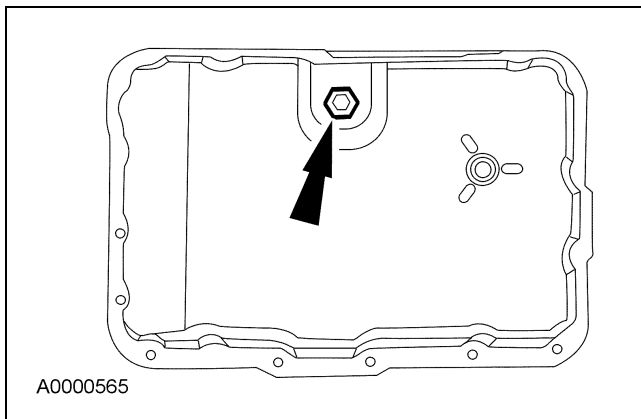
(Continued)

IN-VEHICLE REPAIR (Continued)

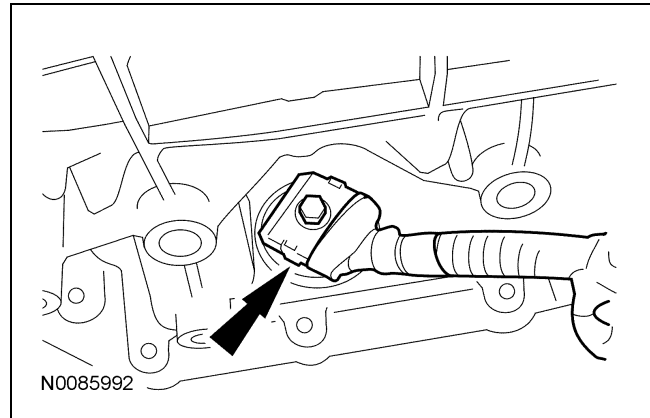
Item	Part Number	Description
13	7G391	Transmission control solenoid body
14	W705928	Solenoid body connector O-ring seals
15	W500100	Manual valve detent spring screw
16	7E332	Manual valve detent spring
17	W500102	Main control valve body screw (18 required)
18	W702791	Main control valve body screw
19	W706672	Main control valve body screw
20	7A100	Lower main control valve body assembly

Removal

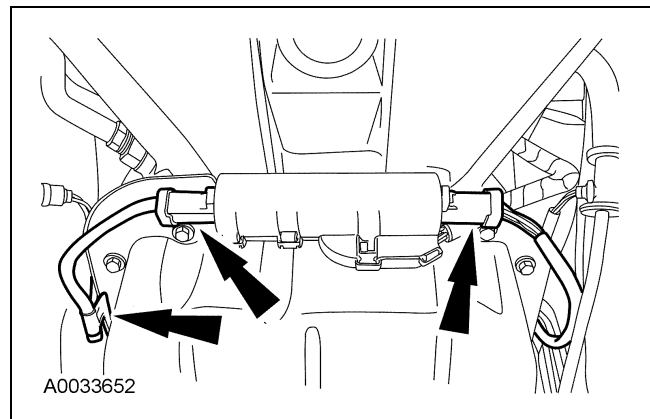
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the transmission fluid pan drain plug and drain the transmission fluid.
 - Discard the transmission fluid pan drain plug gasket.



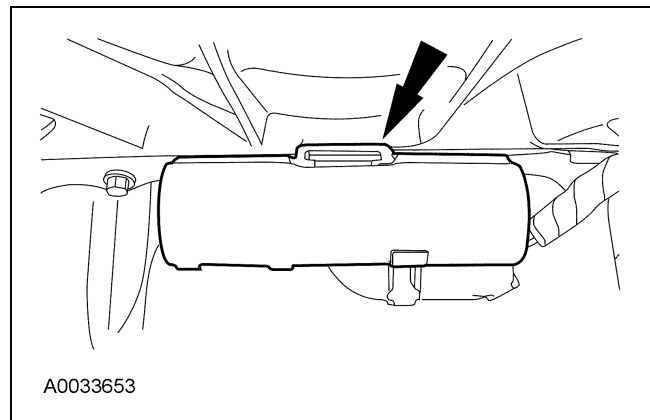
3. **NOTE:** Clean the area around the solenoid body connector to prevent contamination. Disconnect the transmission vehicle harness connector.



4. Disconnect the Heated Oxygen Sensor (HO2S) connectors and retaining clip from the RH transmission fluid pan rail and then position the connectors aside.



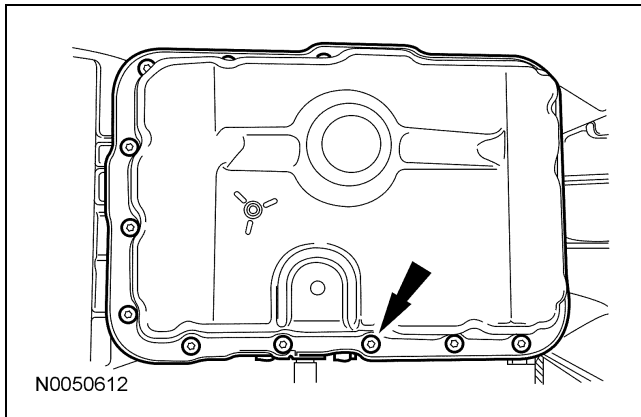
5. Remove the HO2S connector from the front of the transmission fluid pan rail.



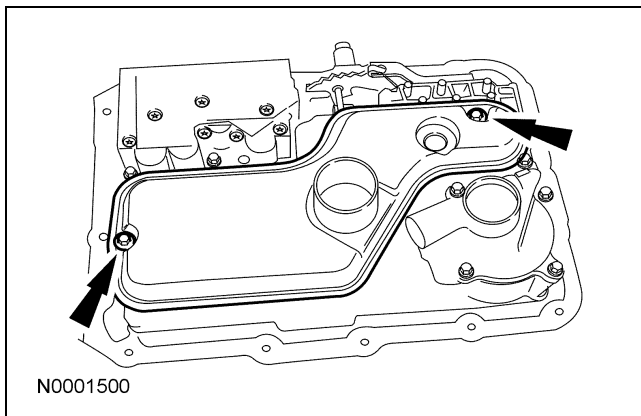
IN-VEHICLE REPAIR (Continued)

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

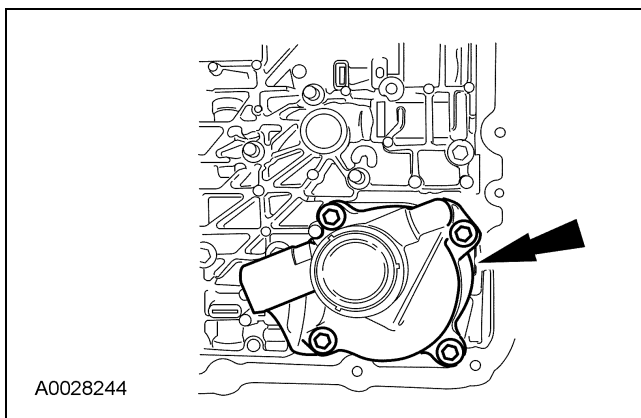
Remove the transmission fluid pan and transmission fluid pan gasket.



7. Remove the transmission fluid filter.

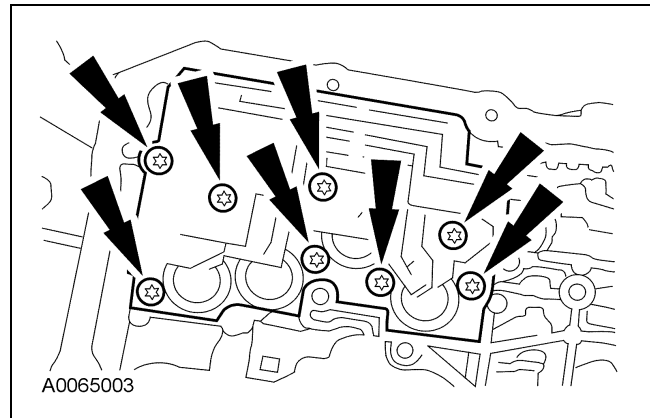


8. Remove the 4 screws attaching the reverse servo to the transmission case and remove the servo.

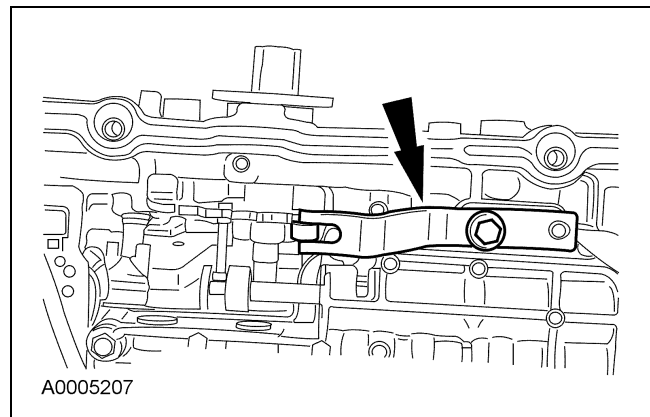


9. **NOTICE:** Do not damage the transmission control solenoid body connector pins.

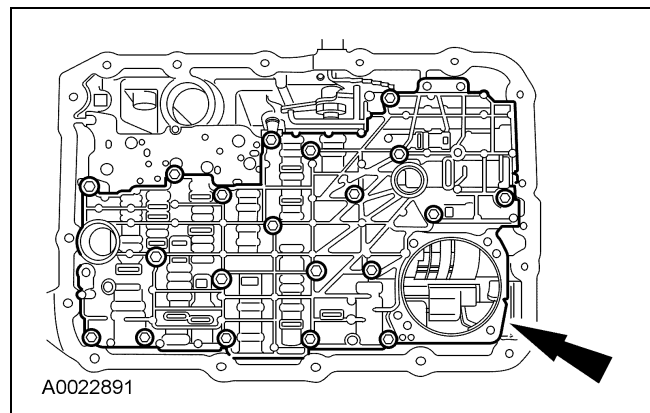
Remove the transmission control solenoid body screws and remove the transmission control solenoid body by lifting on the body and pushing the connector from the other side of the case.



10. Remove the manual valve detent spring.

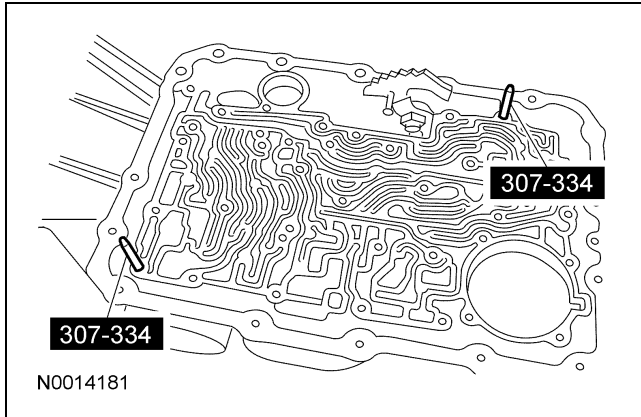


11. Remove the main control valve body screws and the lower main control valve body assembly.

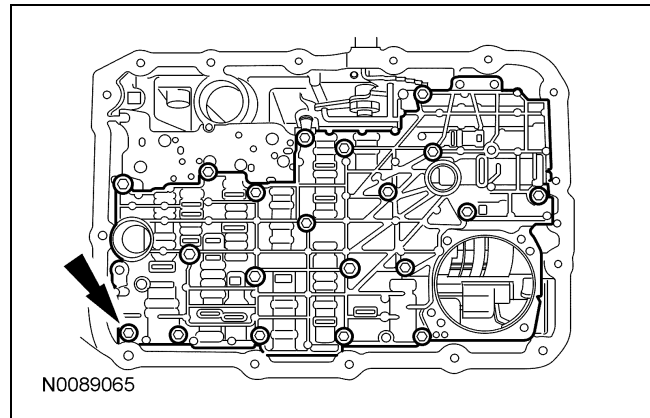


IN-VEHICLE REPAIR (Continued)**Installation**

1. Install the Valve Body Aligners into the transmission case.

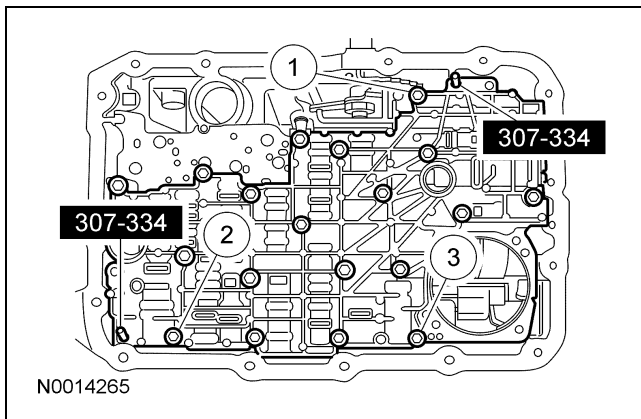


3. Remove the Valve Body Aligners and loosely install one screw.



2. Using the Valve Body Aligners, install the lower main control valve body and loosely install the screws.

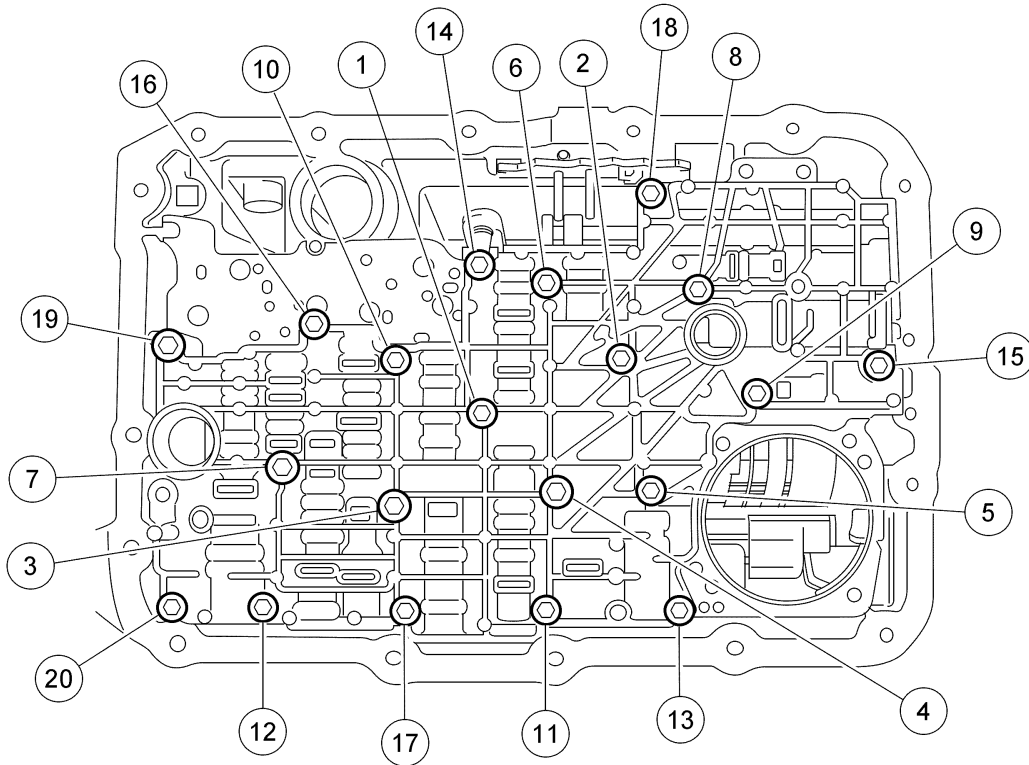
- 1 Install the short screw.
- 2 Install the screw with the larger head.
- 3 Install the remaining screws.



IN-VEHICLE REPAIR (Continued)

4. Tighten the screws in the sequence shown.

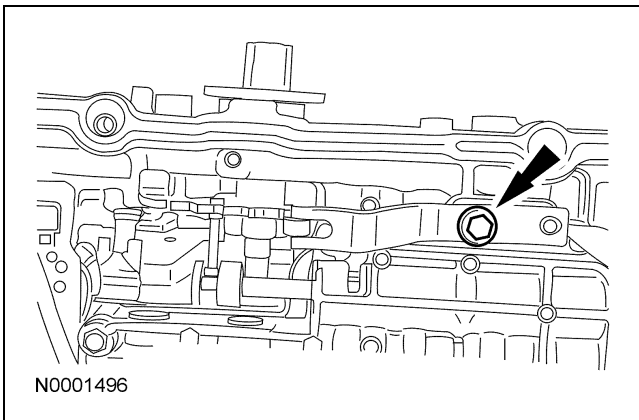
- Tighten to 10 Nm (89 lb-in).



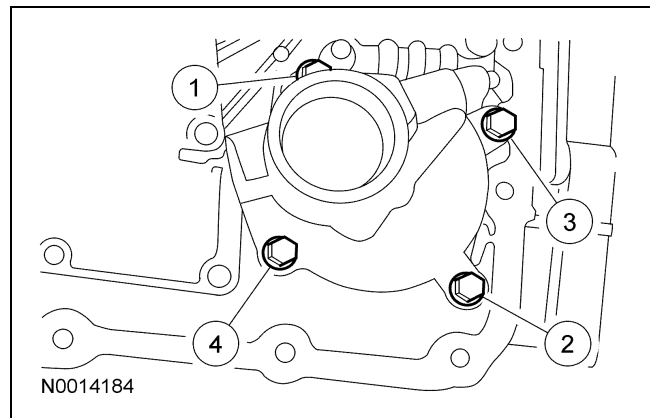
N0089067

5. Install the manual valve detent spring and screw.

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



N0001496



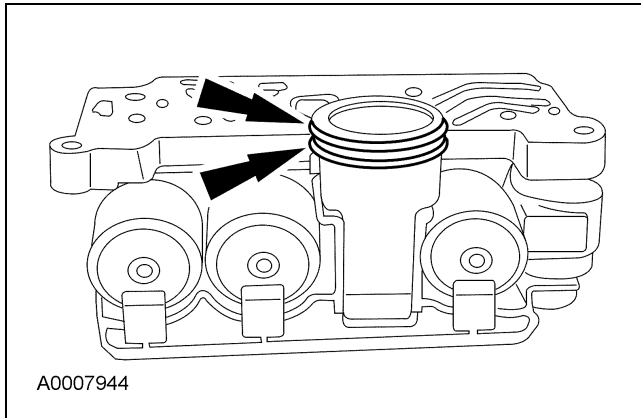
N0014184

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 (97 lb-in).

IN-VEHICLE REPAIR (Continued)

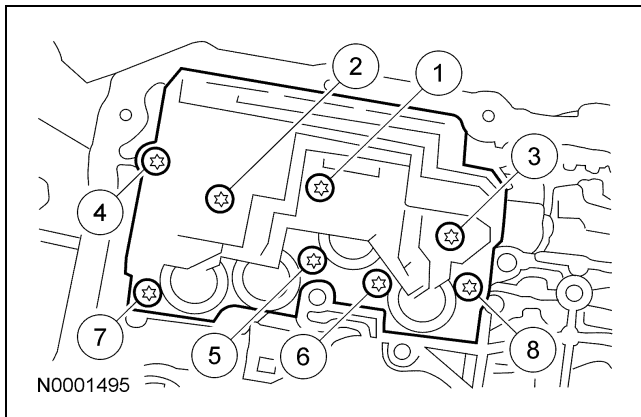
7. Install new O-ring seals on the transmission control solenoid body connector. Lubricate the O-ring seals with automatic transmission fluid.



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

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

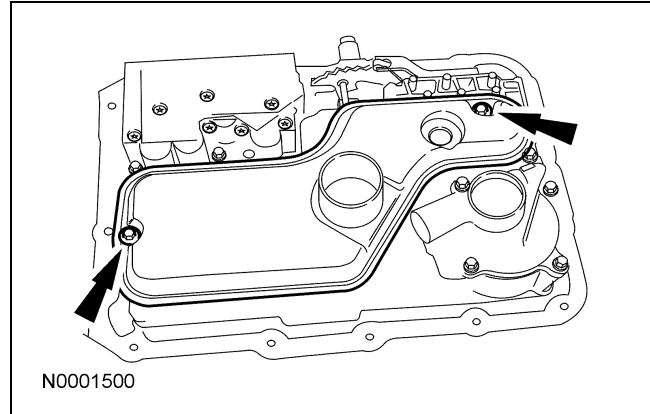
- Tighten to 8 Nm (71 lb-in).



9. **NOTICE:** Lubricate the transmission fluid pan filter seals with automatic transmission fluid or they may be damaged.

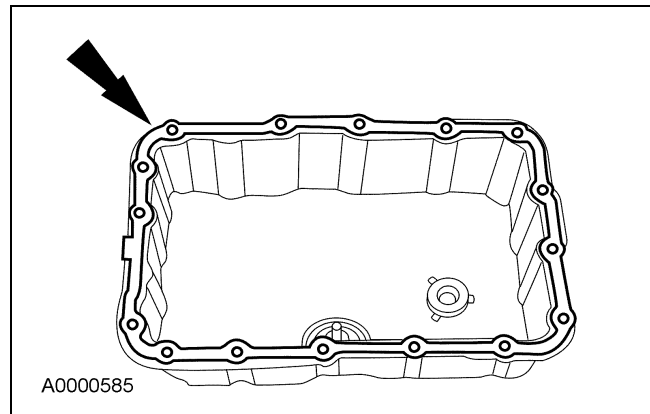
NOTE: Make sure that the transmission fluid pan filter seals are correctly seated on the filter. Lubricate the transmission fluid pan filter seals and install the transmission fluid filter.

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



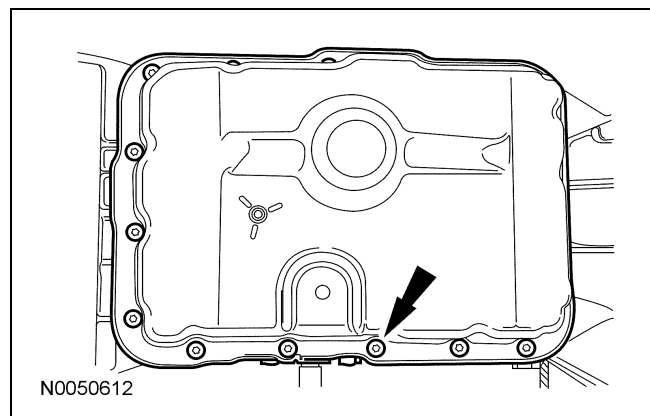
10. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the transmission fluid pan gasket should be reused.

Install the transmission fluid pan gasket on the transmission fluid pan.



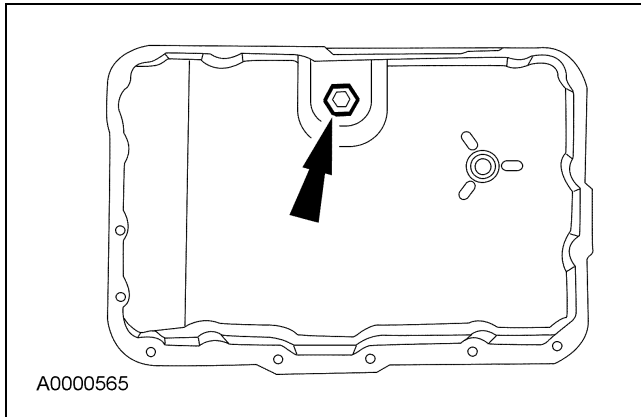
11. Install the transmission fluid pan and tighten the screws in a crisscross sequence.

- Tighten to 11 Nm (97 lb-in).

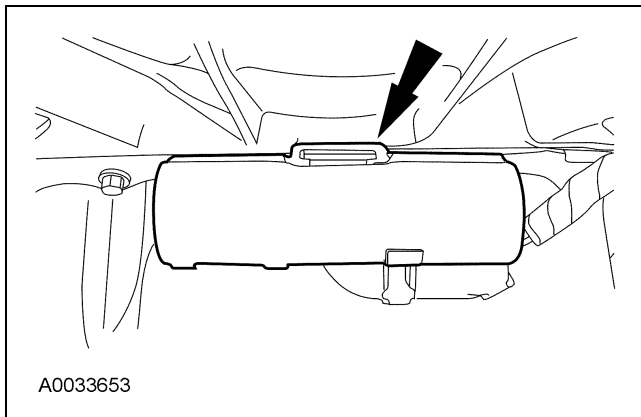


IN-VEHICLE REPAIR (Continued)

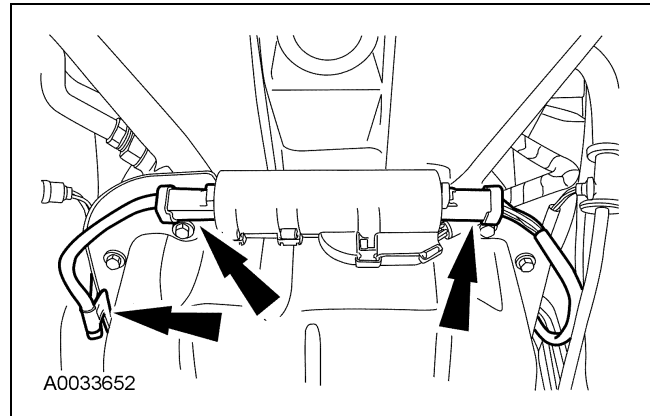
12. Install the transmission fluid pan drain plug.
 - Install a new transmission fluid pan drain plug gasket onto the transmission fluid pan drain plug.
 - Tighten to 26 Nm (19 lb-ft).



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



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



15. **NOTICE:** Damage will occur to the transmission vehicle harness connector if the screw is tightened above specification.

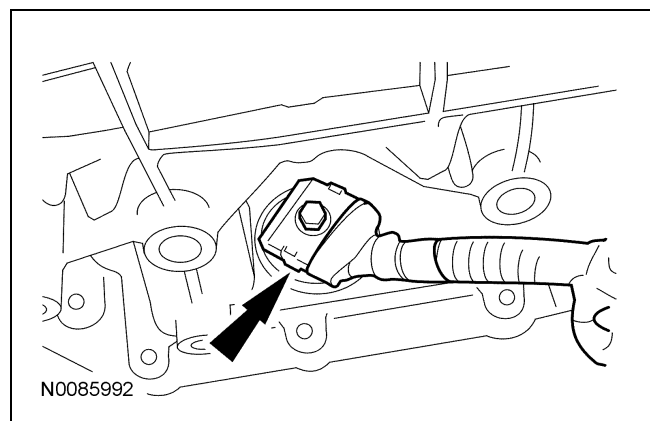
NOTE: Always install new O-ring seals on the transmission vehicle harness connector.

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 vehicle harness connector and connect the connector.

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

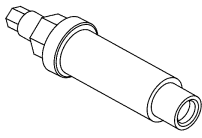
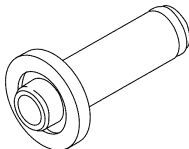
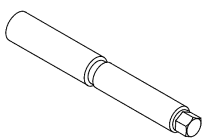
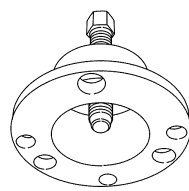
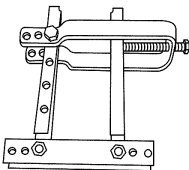
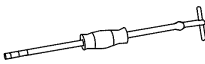


16. Fill the transmission to the correct level. For additional information, refer to Transmission Fluid Drain and Refill — Without Torque Converter Drain Plug in this section.

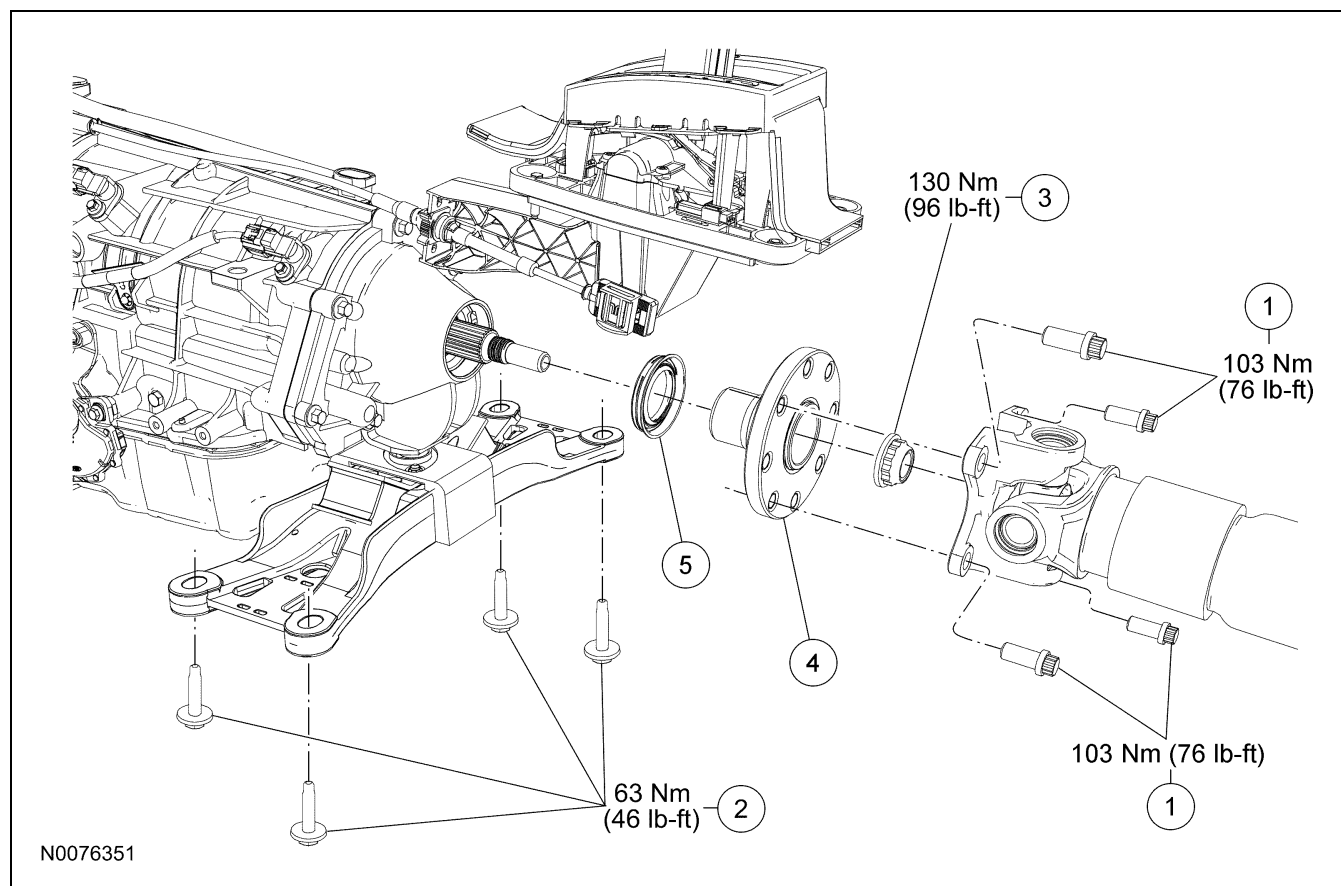
IN-VEHICLE REPAIR

Extension Housing Seal

Special Tool(s)

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

IN-VEHICLE REPAIR (Continued)

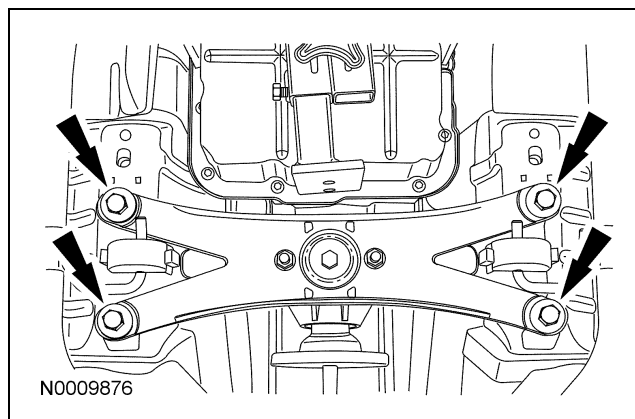


Item	Part Number	Description
1	W701357	Transmission output shaft flange coupler bolts (4 required)
2	W704971	Transmission crossmember-to-floor pan screws
3	W701357	Transmission output shaft flange nut
4	7089	Transmission output shaft flange
5	7052	Extension housing seal

Removal

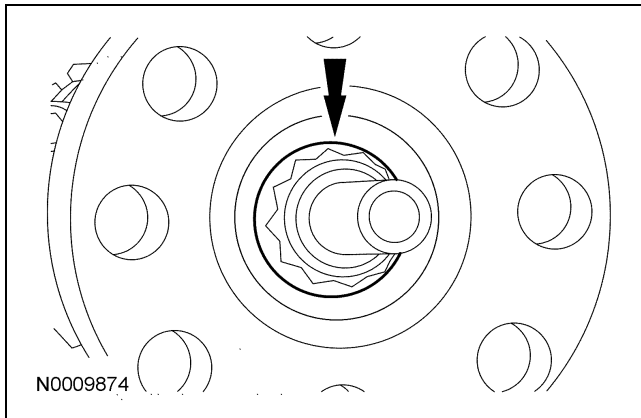
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the driveshaft. For additional information, refer to Section 205-01.

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.

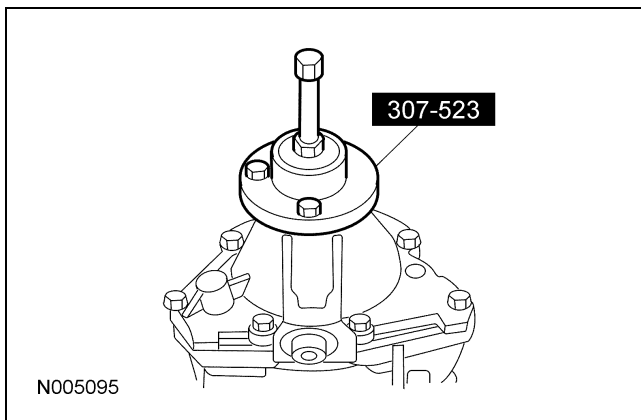


IN-VEHICLE REPAIR (Continued)

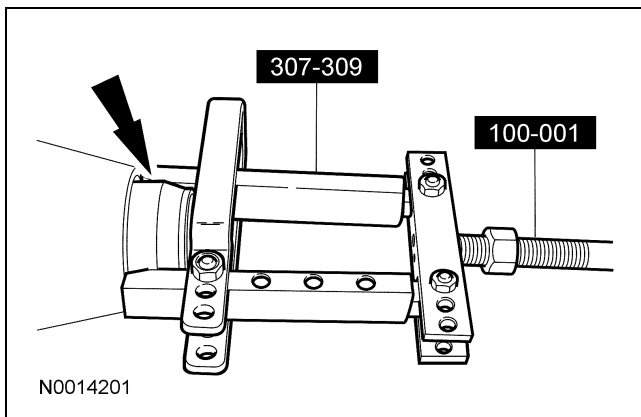
5. Remove and discard the transmission output shaft flange nut.



6. Using the Output Flange Remover, remove the output shaft flange.

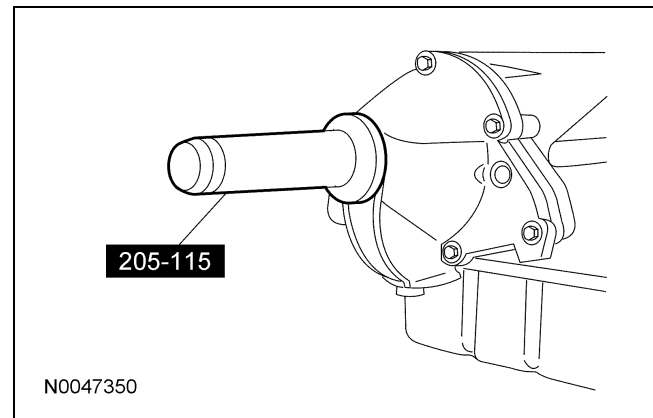


7. Using the Torque Converter Fluid Seal Remover and Slide Hammer, remove and discard the extension housing seal.

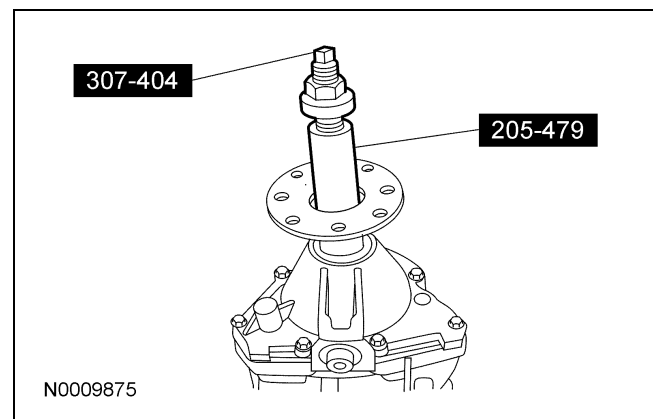
**Installation**

1. **NOTE:** Make sure the extension housing seal is correctly installed onto the Drive Pinion Oil Seal Installer and the garter spring is in the correct position.

Using the Drive Pinion Oil Seal Installer, install the new extension housing seal.

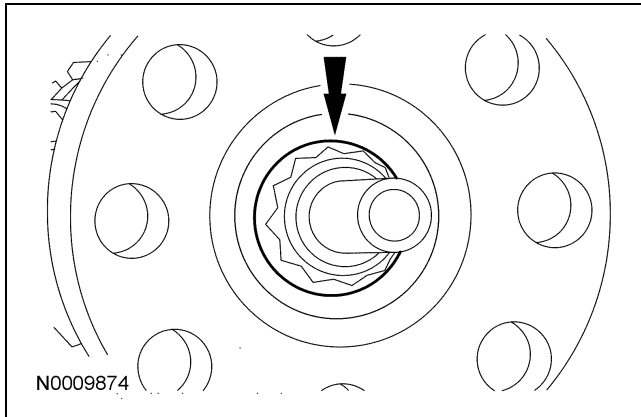


2. Using the Output Shaft Flange Installer and the Drive Pinion Flange Installer, install the output flange.

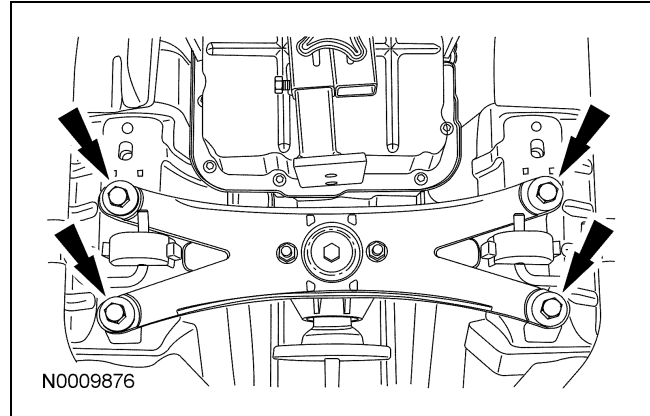


IN-VEHICLE REPAIR (Continued)

3. Install a new transmission output shaft flange nut.
 - Tighten to 130 Nm (96 lb-ft).



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

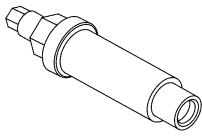
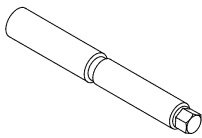
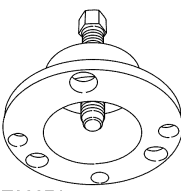


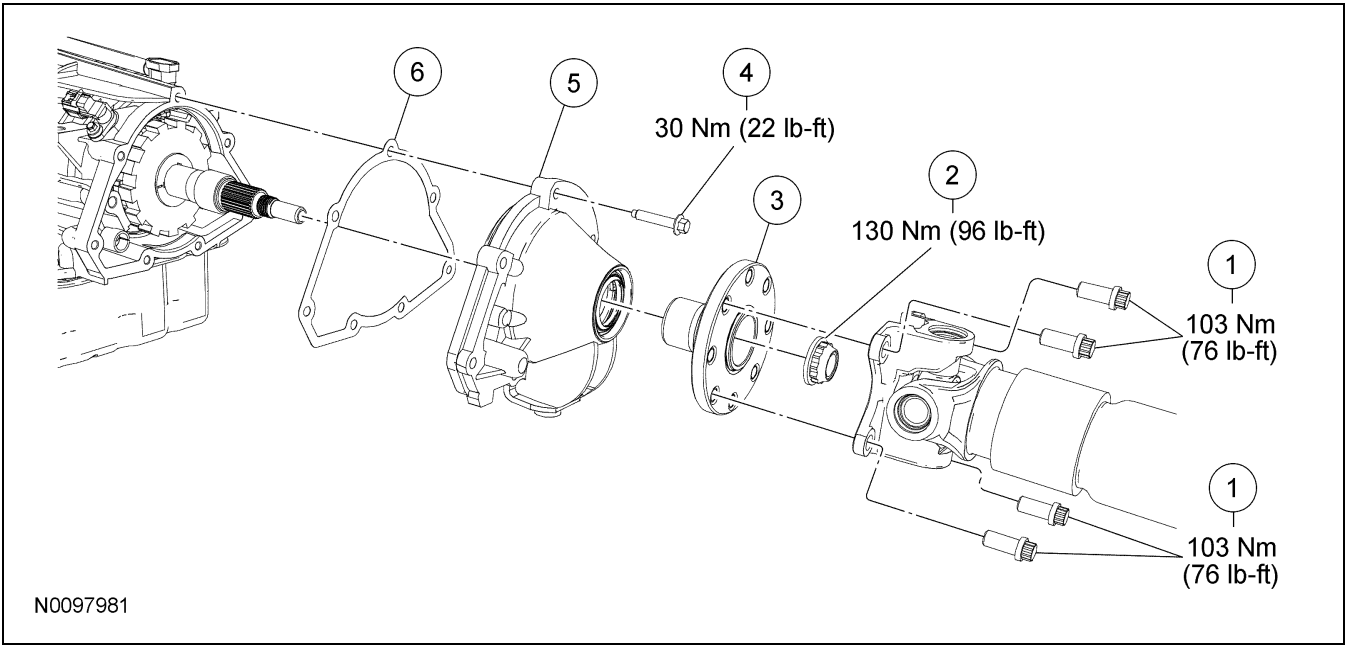
5. Install the driveshaft. For additional information, refer to Section 205-01.
6. Check the transmission fluid level. For additional information, refer to Transmission Fluid Level Check in this section.

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 Flange 307-523

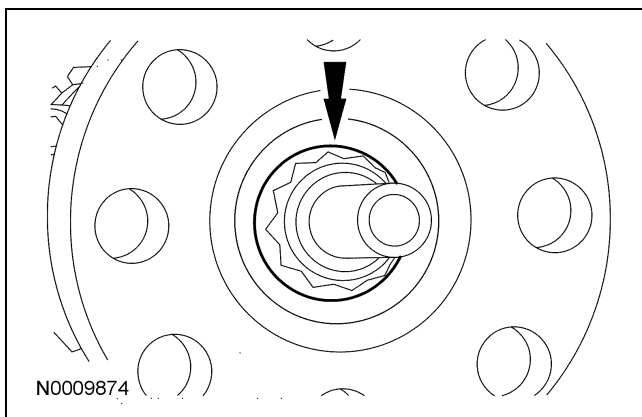
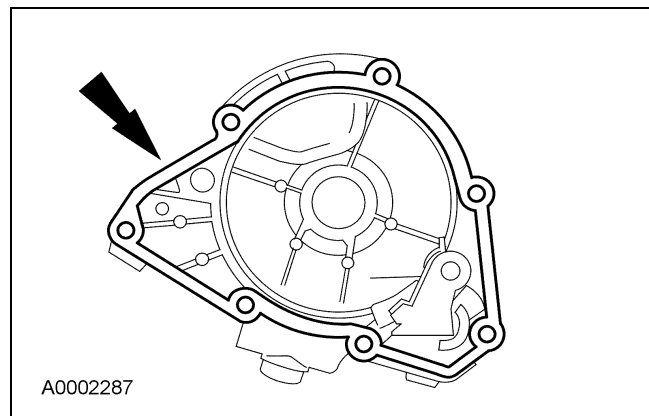
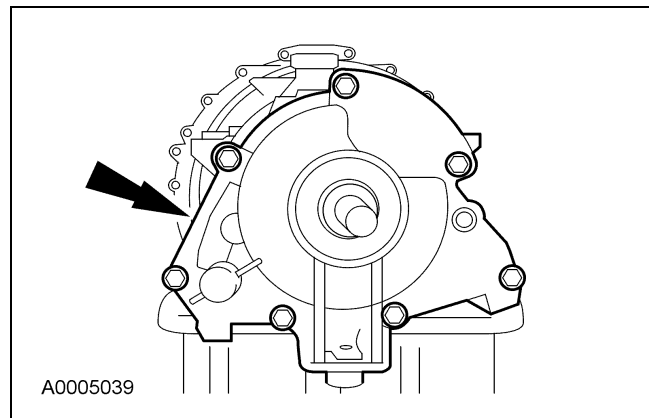
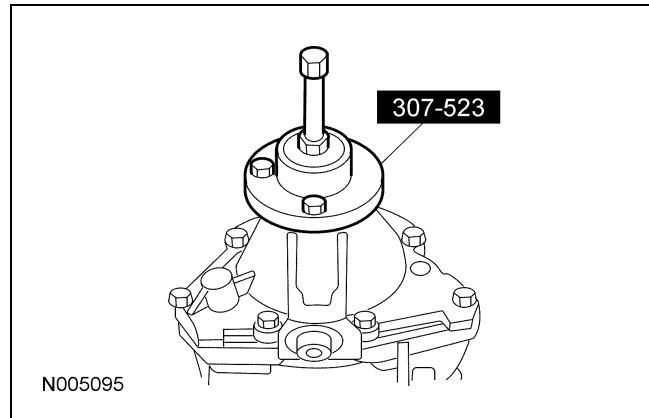


IN-VEHICLE REPAIR (Continued)

Item	Part Number	Description
1	W701357	Transmission output shaft flange coupler bolts (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 required)
7	7A039	Extension housing
8	7086	Extension housing gasket
9	—	Transmission crossmember

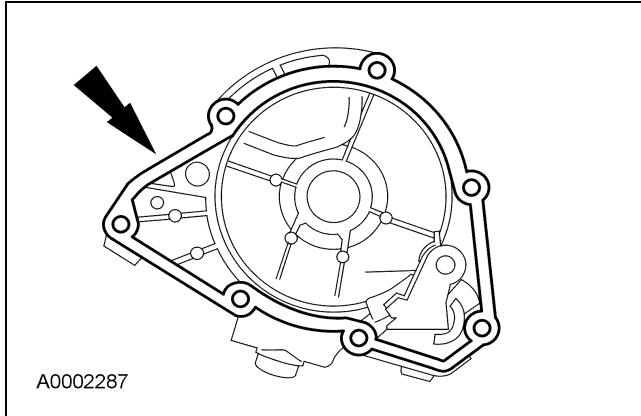
Removal

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. Remove the transmission crossmember. For additional information, refer to Section 502-00.
5. Remove and discard the transmission output shaft flange nut.
6. Using the Output Flange Remover, remove the output shaft flange.
7. **NOTICE:** The parking pawl, parking pawl return and parking pawl shaft may fall out during removal of the extension housing.
Remove the 7 extension housing screws and the extension housing.
8. Remove and discard the extension housing gasket.



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

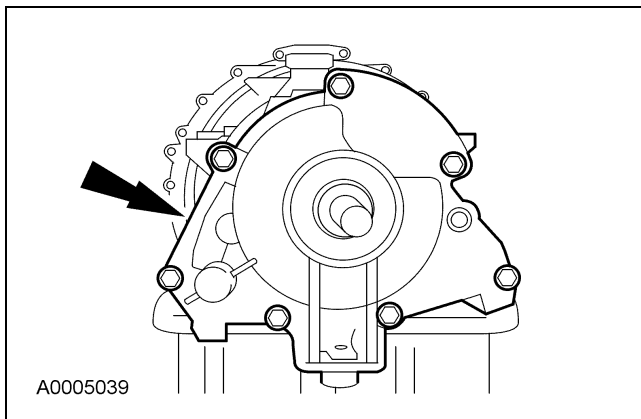
1. Clean the extension housing and install a new extension housing gasket. Make sure the parking pawl is installed correctly.



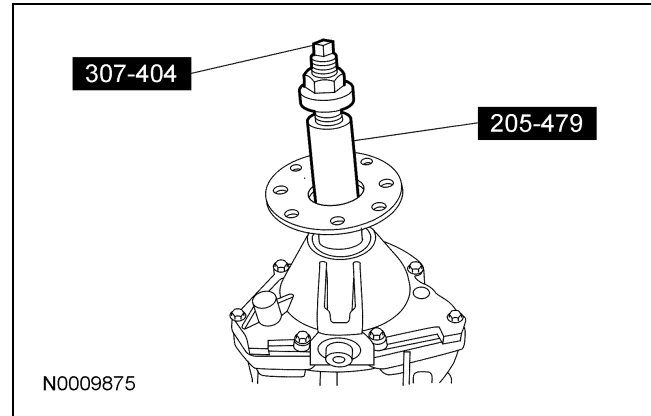
2. **NOTE:** Make sure the parking lever actuating rod is correctly seated into the case parking rod guide cup.

Install the extension housing and screws.

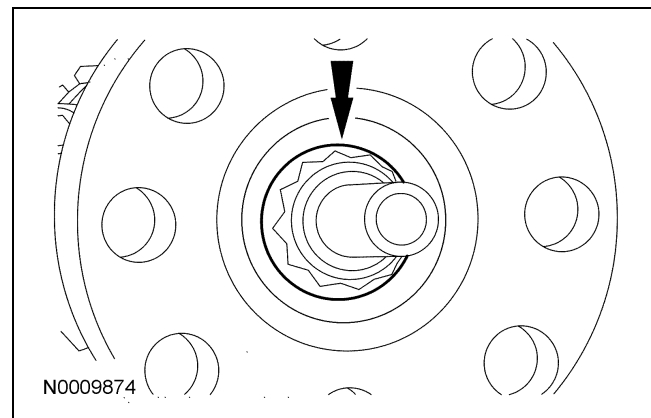
- Tighten to 30 Nm (22 lb-ft).



3. Using the Output Shaft Flange Installer and the Drive Pinion Flange Installer, install the output flange.



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



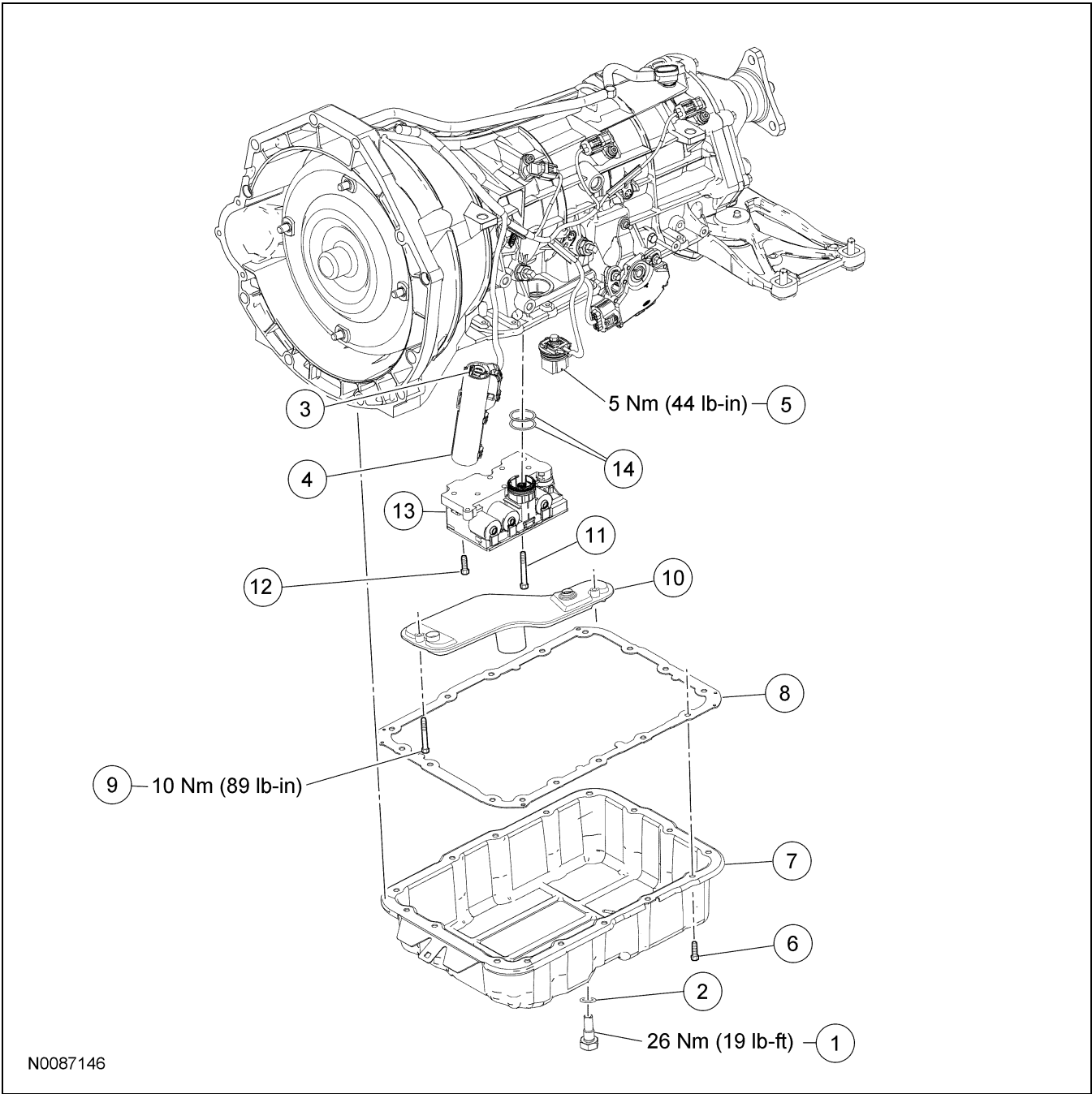
5. Install the transmission crossmember. For additional information, refer to Section 502-00.
6. Install the catalytic converter assembly. For additional information, refer to Section 309-00.
7. Install the driveshaft. For additional information, refer to Section 205-01.
8. Check the transmission fluid level. For additional information, refer to Transmission Fluid Level Check in this section.

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

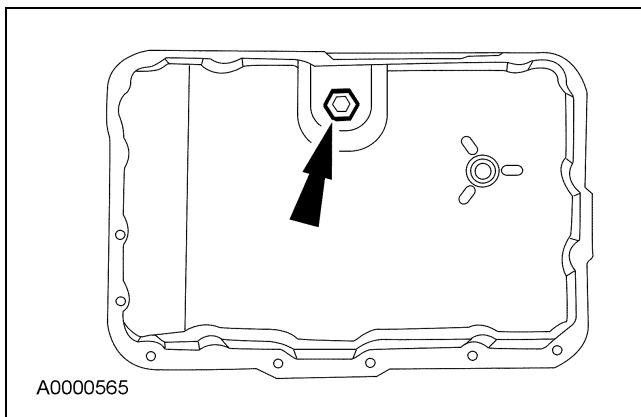


IN-VEHICLE REPAIR (Continued)

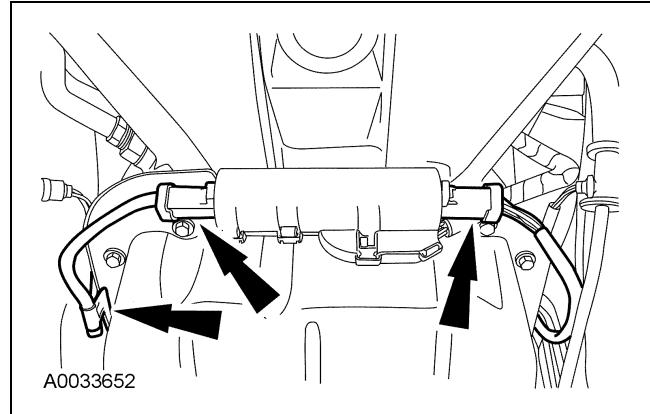
Item	Part Number	Description
1	7A010	Transmission fluid pan drain plug
2	6734	Transmission fluid pan drain plug gasket
3	—	Heated Oxygen Sensor (HO2S) connector (part of 9F472)
4	—	HO2S connector retainer
5	7E395	Transmission vehicle harness connector
6	W500213	Transmission fluid pan screw
7	7A194	Transmission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

Removal

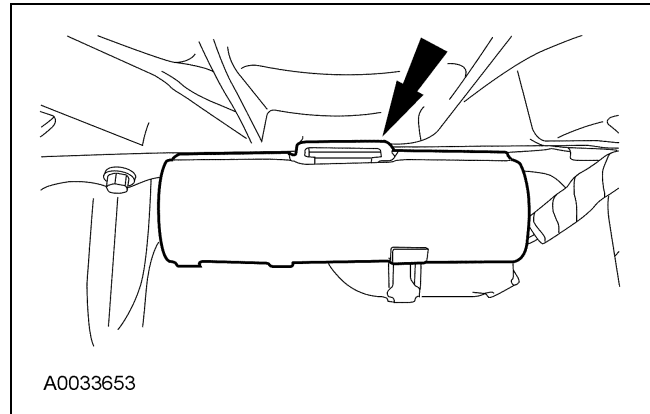
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Remove the transmission fluid pan drain plug and drain the transmission fluid.
 - Discard the transmission fluid drain plug gasket.



3. Disconnect the Heated Oxygen Sensor (HO2S) connectors and retaining clip from the RH transmission fluid pan rail and then position the connectors aside.



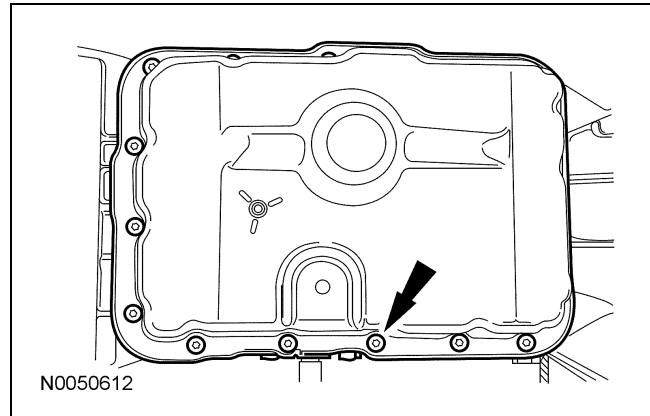
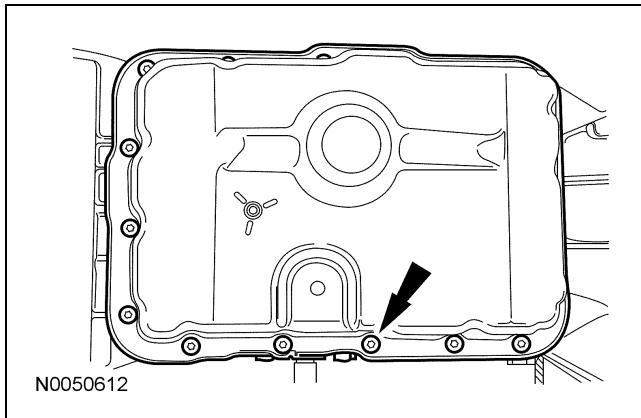
4. Remove the HO2S connector from the front of the transmission fluid pan rail.



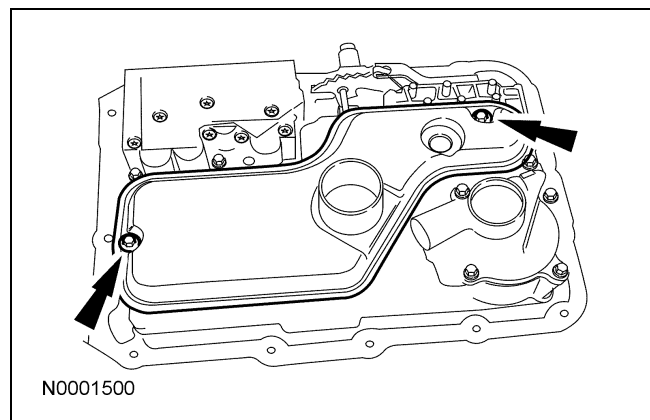
IN-VEHICLE REPAIR (Continued)

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

Remove the transmission fluid pan screws, transmission fluid pan gasket and transmission fluid pan.

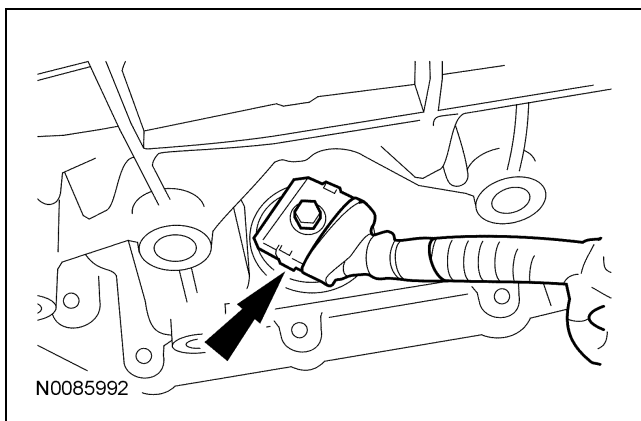


8. Remove the transmission fluid filter.



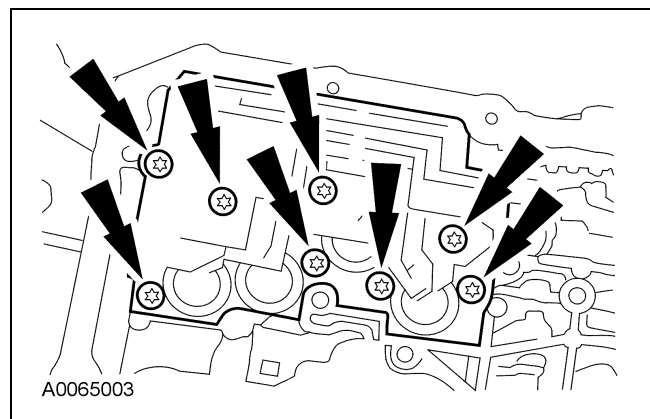
6. **NOTE:** Clean the area around the solenoid body connector to prevent contamination.

Disconnect the transmission vehicle harness connector.



9. **NOTICE:** Do not damage the transmission control solenoid body connector pins.

Remove the transmission control solenoid body screws and remove the transmission control solenoid body by lifting on the body and pushing the connector from the other side of the case.

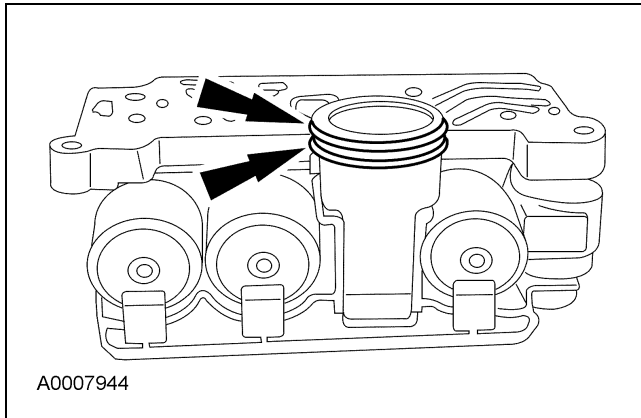


7. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect the gasket for damage. If not damaged, the transmission fluid pan gasket should be reused.

Remove the transmission fluid pan and transmission fluid pan gasket.

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

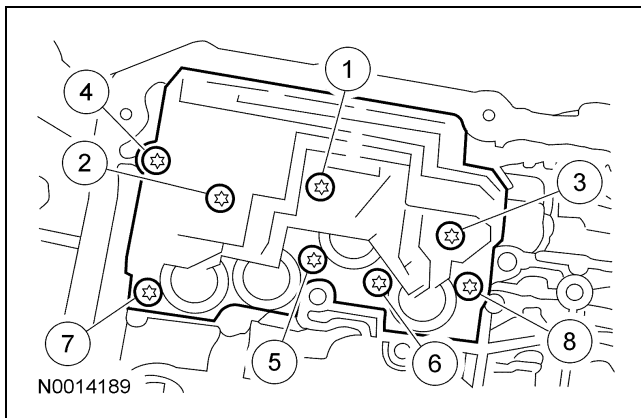
1. Install new O-ring seals on the transmission control solenoid body connector. Lubricate the O-ring seals with automatic transmission fluid.



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

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

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

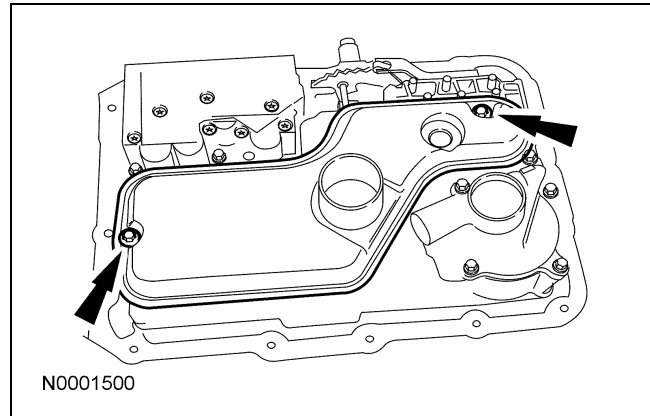


3. **NOTICE:** Lubricate the transmission fluid pan filter seals with automatic transmission fluid or they may be damaged.

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

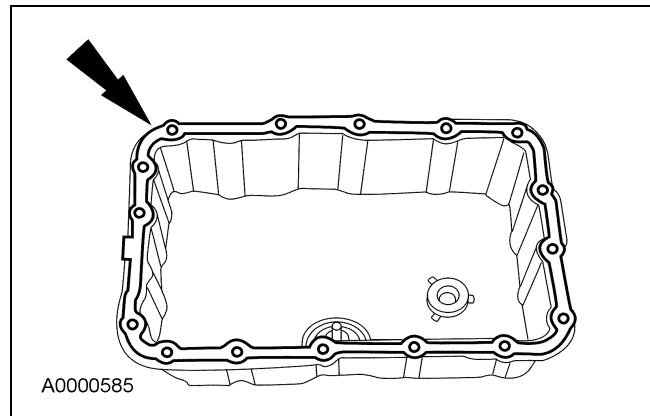
Lubricate the transmission fluid pan filter seals and install the transmission fluid pan filter.

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



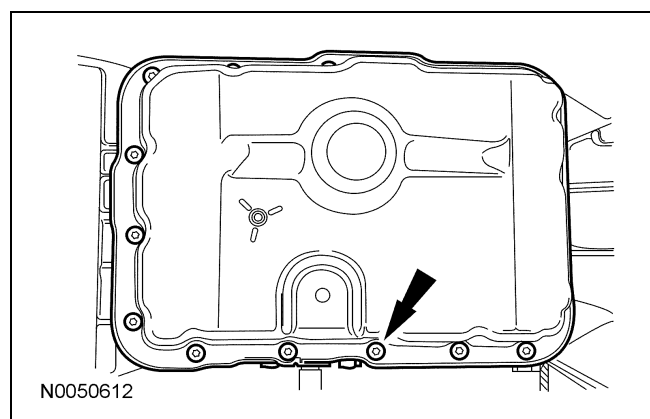
4. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the transmission fluid pan gasket should be reused.

Install the transmission fluid pan gasket on the transmission fluid pan.



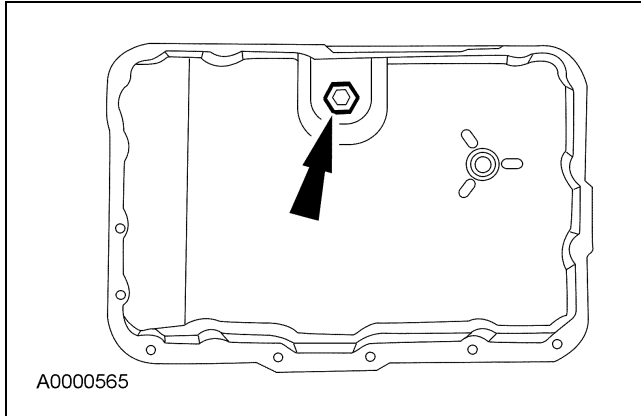
5. Install the transmission fluid pan and tighten the screws in a crisscross sequence.

- Tighten to 11 Nm (97 lb-in).



IN-VEHICLE REPAIR (Continued)

6. Install the transmission fluid pan drain plug.
 - Install a new transmission fluid pan gasket onto the transmission fluid pan drain plug.
 - Tighten to 26 Nm (19 lb-ft).



7. **NOTICE:** Damage will occur to the transmission vehicle harness connector if the screw is tightened above specification.

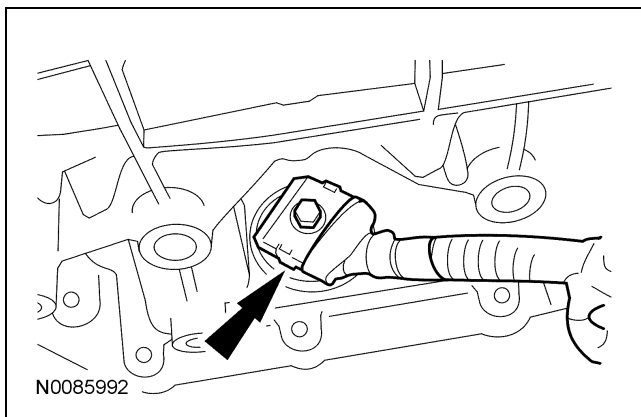
NOTE: Always install new O-ring seals on the transmission vehicle harness connector.

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

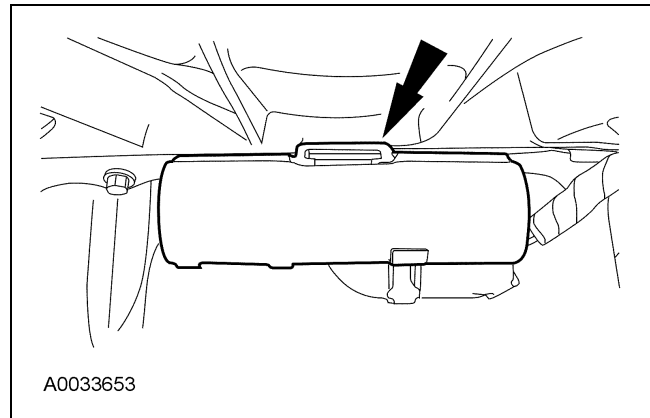
NOTE: Use petroleum jelly to lubricate the O-ring seals to aid in the installation process.

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

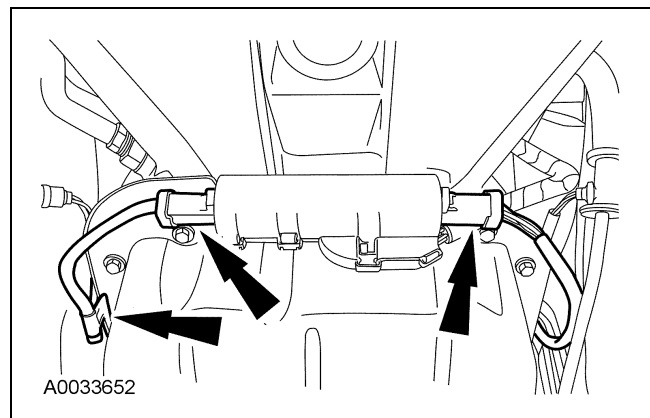
- Tighten to 5 Nm (44 lb-in).



8. Install the HO2S connector to the front of the transmission fluid pan rail.



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



10. Fill the transmission to the correct level. For additional information, refer to Transmission Fluid Drain and Refill — Automated Equipment or Transmission Fluid Level Check in this section.

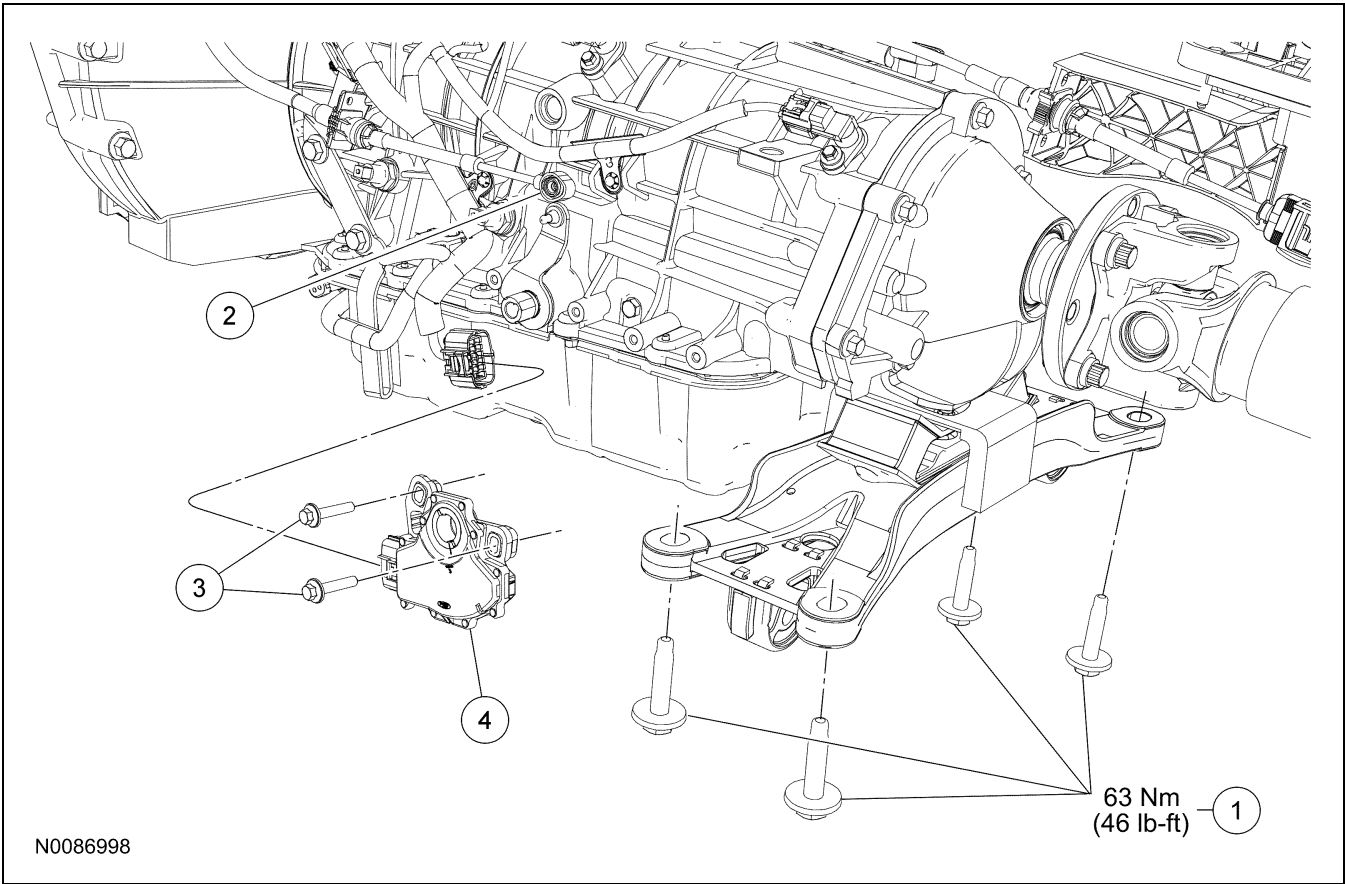
IN-VEHICLE REPAIR

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	Transmission Range (TR) sensor screws
4	7F293	TR sensor

Removal

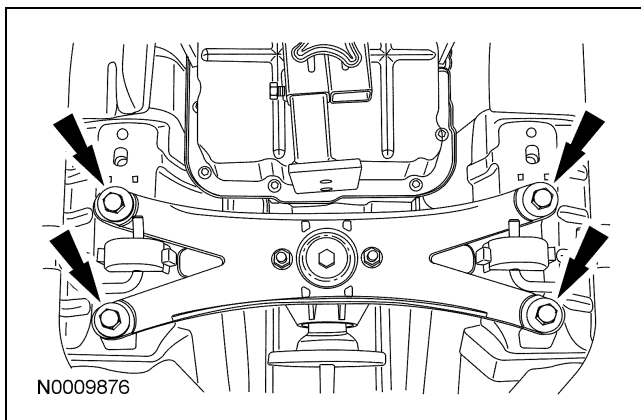
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

IN-VEHICLE REPAIR (Continued)

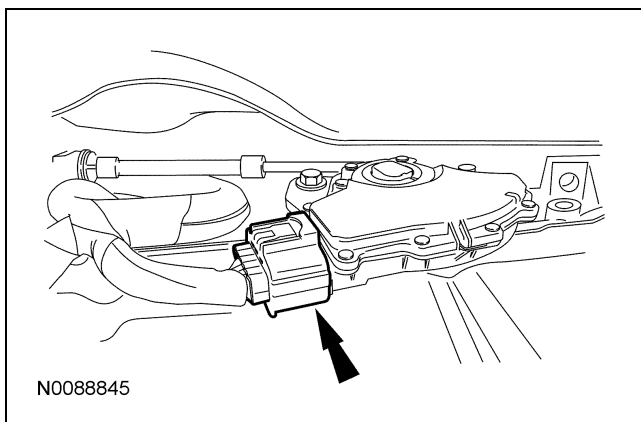
2.  **WARNING:** Secure the assembly to the jack. Avoid any obstructions while lowering and raising the jack. Contact with obstructions may cause the assembly to fall off the jack, which may result in serious personal injury.

Using a suitable transmission jack, support the transmission.

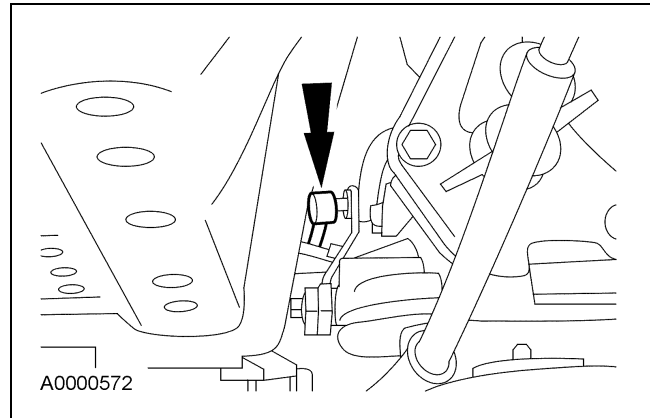
3. Remove the transmission crossmember-to-floor pan screws and lower the transmission enough to gain access to the Transmission Range (TR) sensor.



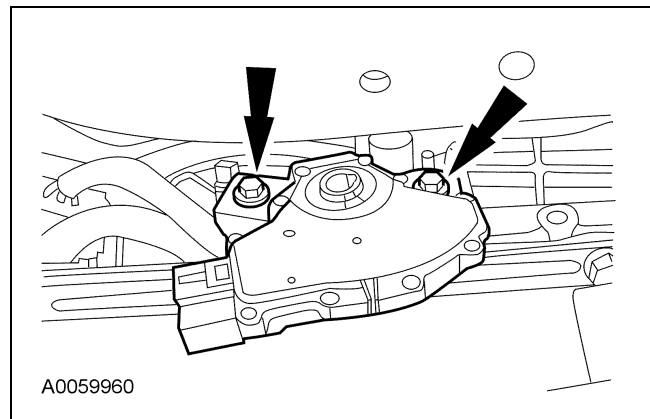
4. Disconnect the TR sensor connector.



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

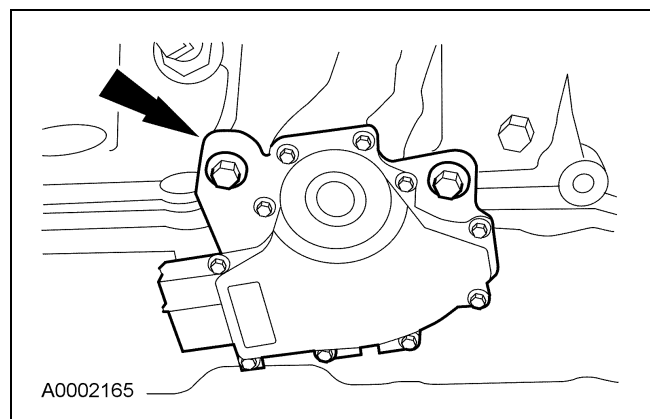


6. Remove the TR sensor screws and remove the TR sensor.

**Installation**

1. **NOTICE:** The Transmission Range (TR) sensor must fit flush against the boss on the case to prevent damage to the sensor.

Install the TR sensor and loosely install the screws.



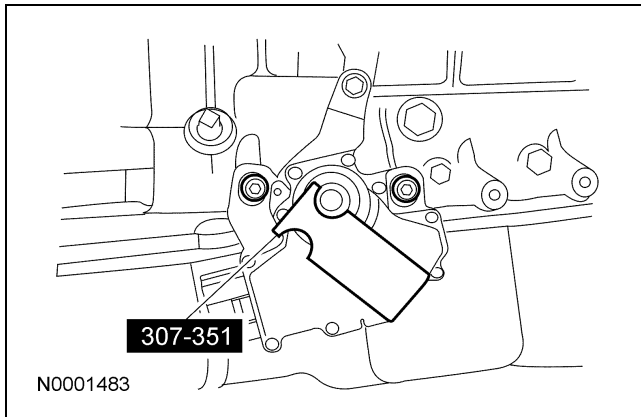
IN-VEHICLE REPAIR (Continued)

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

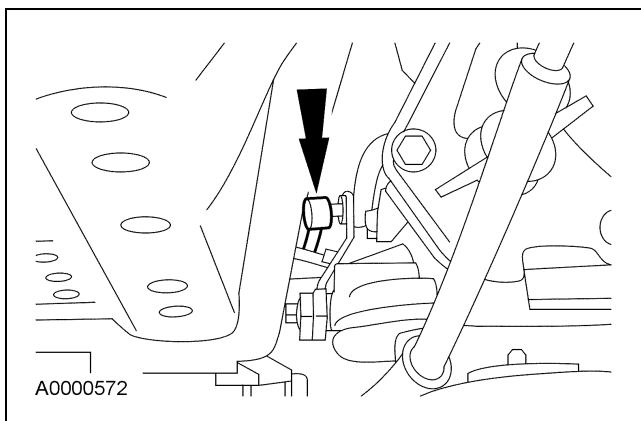
NOTE: The manual control lever must be in the NEUTRAL position.

Using the TR Sensor Alignment Gauge, align the TR sensor and tighten the screws in an alternating sequence.

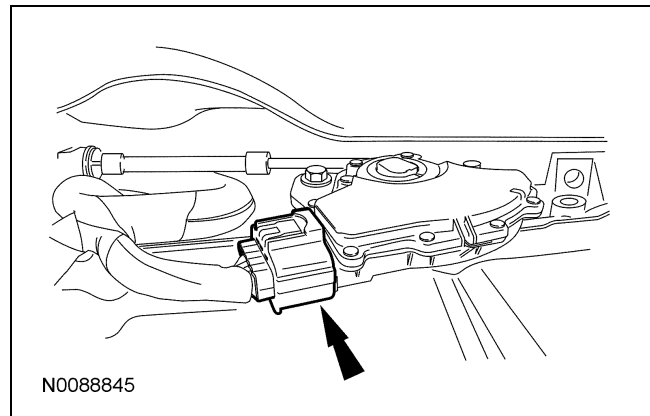
- Tighten 8 Nm (71 lb-in).



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

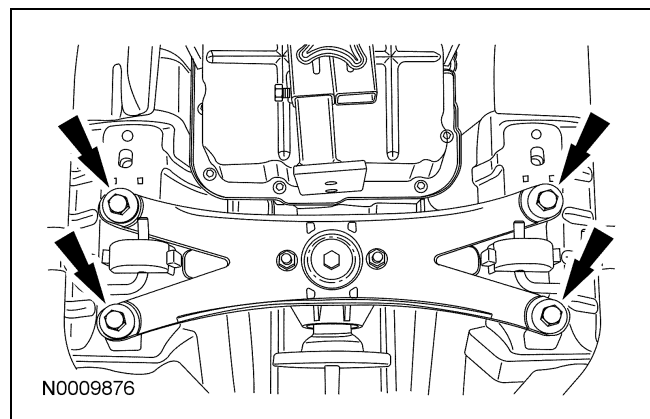


4. Connect the TR sensor connector.



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

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



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

REMOVAL AND INSTALLATION

Transmission

Special Tool(s)

 ST1636-A	Retainer, Torque Converter 307-346 (T97T-7902-A)

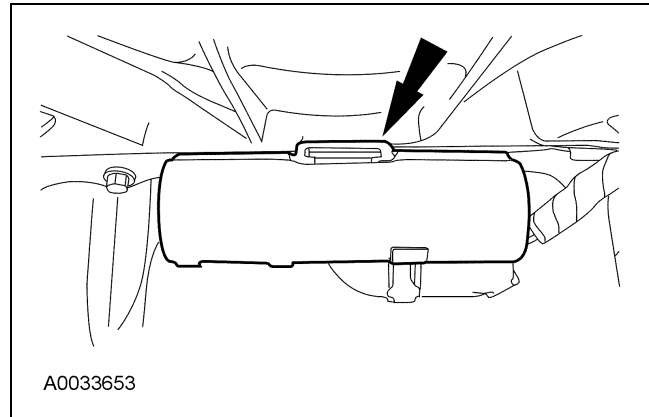
All vehicles

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.

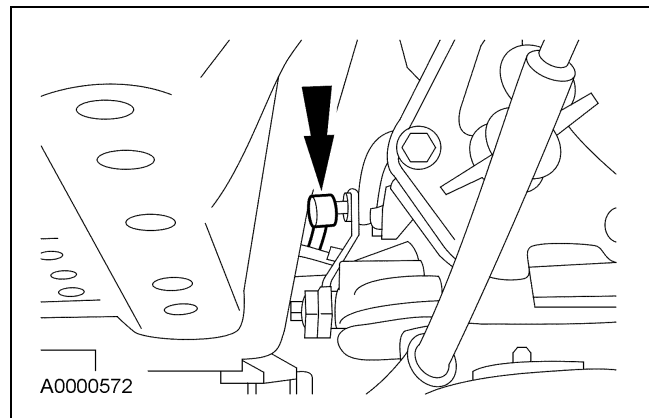
NOTE: If transmission disassembly or installation of a new transmission is necessary, drain the transmission fluid. Install the transmission fluid pan drain plug when finished.

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.

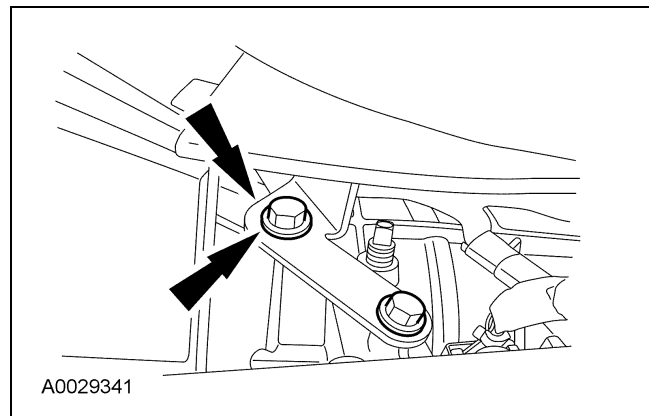
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Disconnect the battery ground cable. For additional information, refer to Section 414-01.
3. Remove the catalytic converter. For additional information, refer to Section 309-00.
4. Remove the driveshaft. For additional information, refer to Section 205-01.
5. Remove the Heated Oxygen Sensor (HO2S) connector from the front of the transmission fluid pan rail.



6. Remove the transmission crossmember. For additional information, refer to Section 502-00.
7. Remove the selector lever cable from the transmission manual control lever.



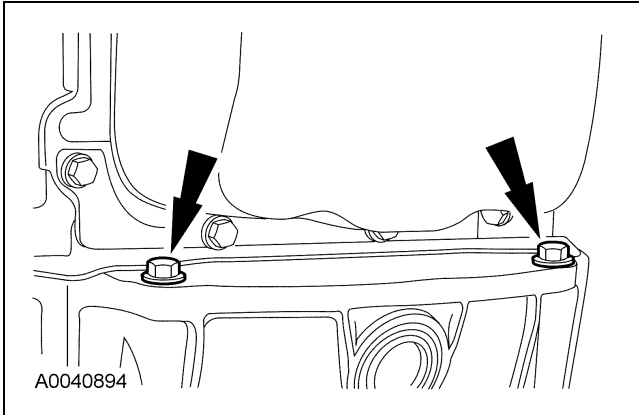
8. Remove the 2 transmission selector lever cable bracket bolts from the transmission and remove the bracket.



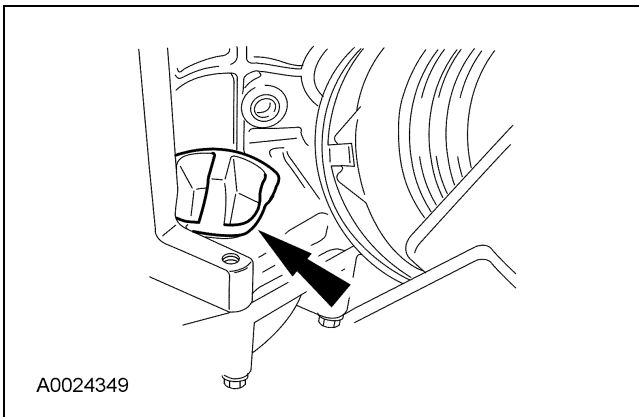
REMOVAL AND INSTALLATION (Continued)**4.6L engine**

9. Remove the starter. For additional information, refer to Section 303-06.

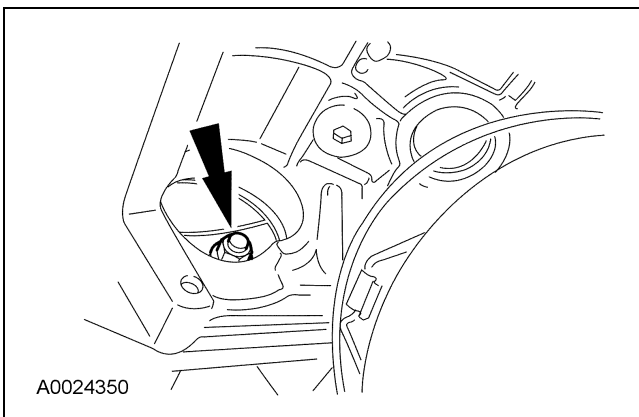
10. Remove the flexplate cover.



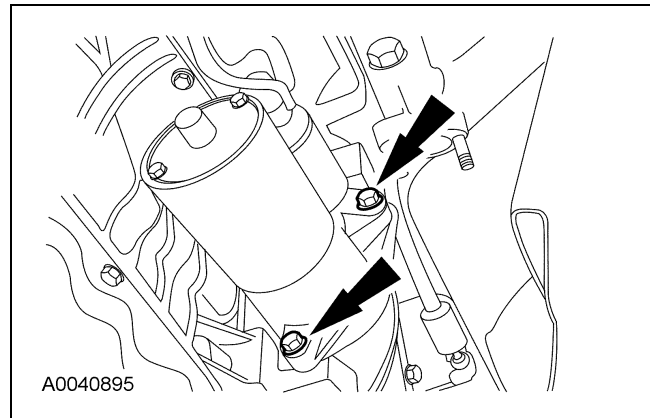
11. Remove the access cover.



12. Remove and discard the 4 torque converter nuts.

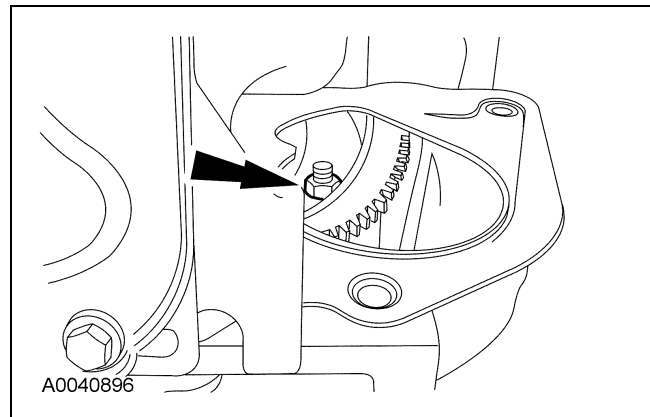
**4.0L engine**

13. Remove the starter and position aside.

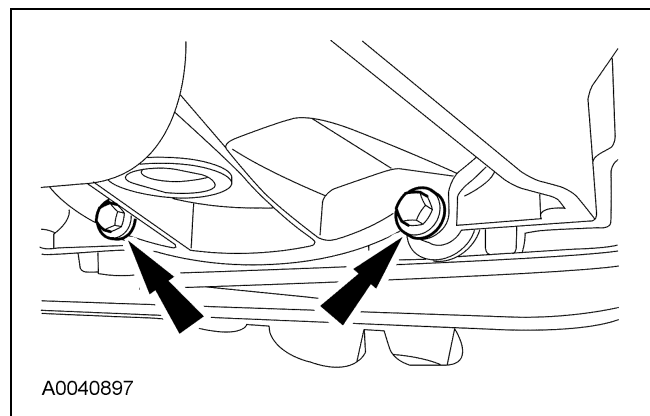


14. **NOTICE:** Rotating the crankshaft pulley bolt counterclockwise could cause a reduction in clamp load on the crankshaft pulley and timing sprocket, which could cause severe engine damage.

Remove and discard the 4 torque converter nuts.

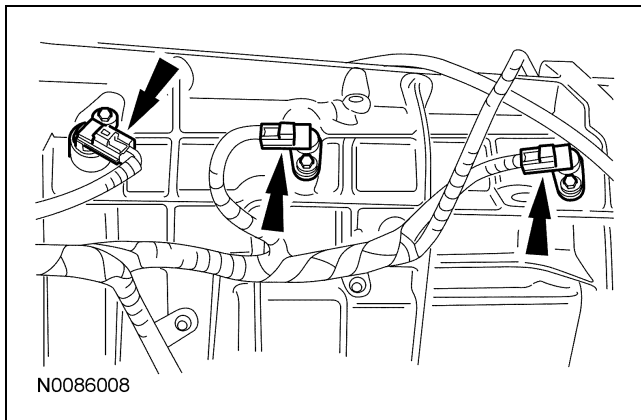


15. Remove the lower transmission retaining bolts.

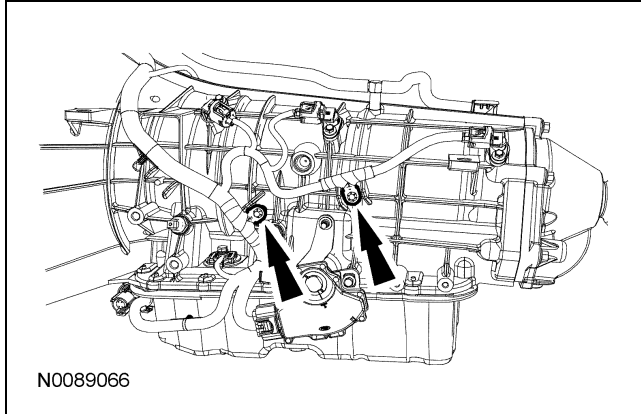


REMOVAL AND INSTALLATION (Continued)**All vehicles**

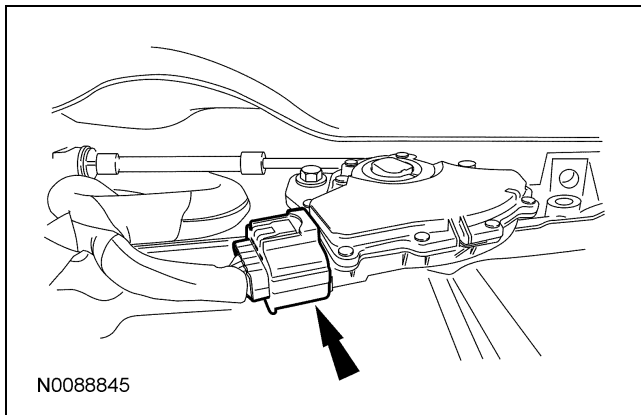
16. Lower the transmission to gain access to the sensor connectors and the transmission bolts.
17. Disconnect the Turbine Shaft Speed (TSS) sensor, Output Shaft Speed (OSS) sensor and intermediate shaft speed sensor connectors.



18. Disconnect the transmission vehicle harness retainers.

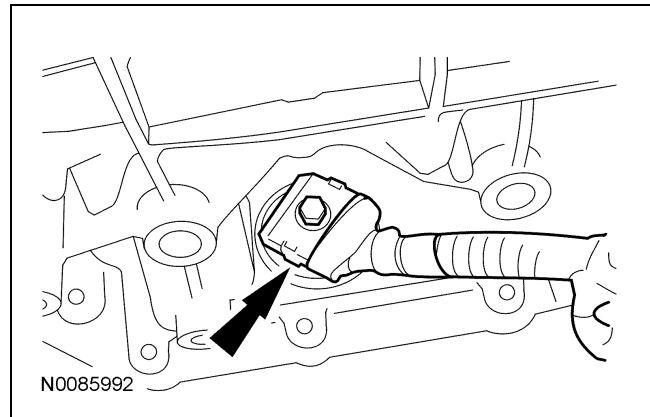


19. Disconnect the Transmission Range (TR) sensor connector.



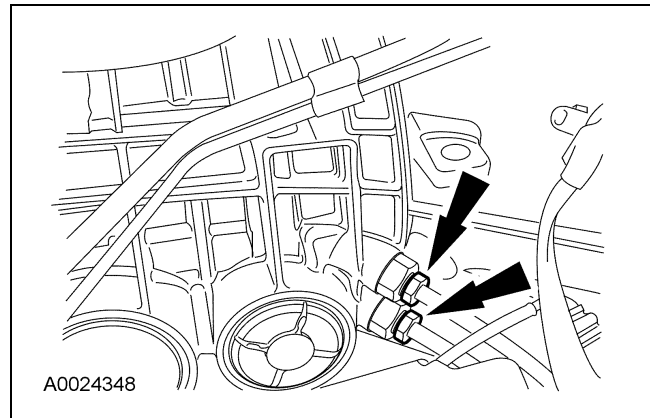
20. **NOTE:** Clean the area around the connector to prevent contamination of the transmission control solenoid body connector.

Remove the screw from the transmission vehicle harness connector and disconnect the connector.

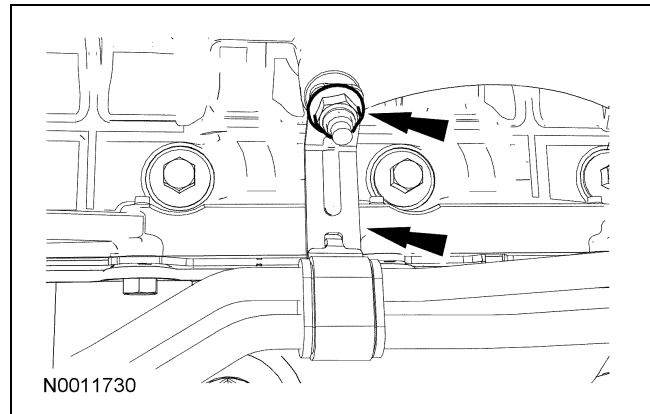


21. **NOTICE:** Do not damage the cooler tubes.

Remove the transmission fluid cooler tubes.

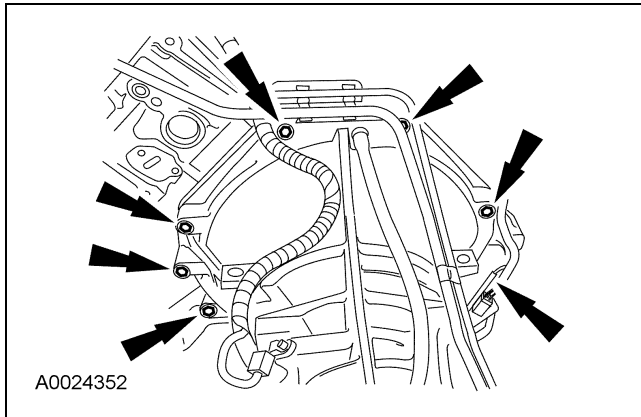


22. Remove the cooler line bracket to engine nut and position aside the transmission fluid cooler tube assembly bracket.

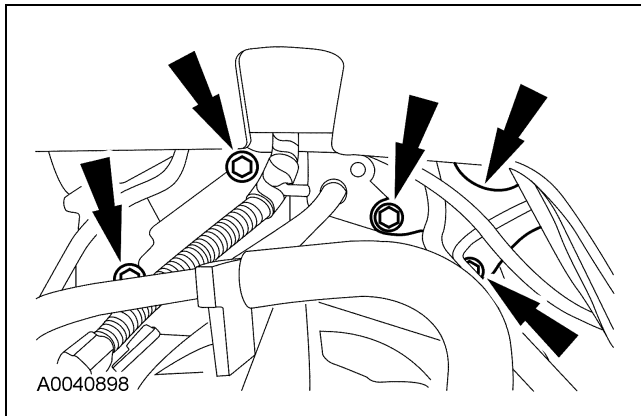


REMOVAL AND INSTALLATION (Continued)**4.6L engine**

23. Remove the 7 engine-to-transmission retaining bolts.

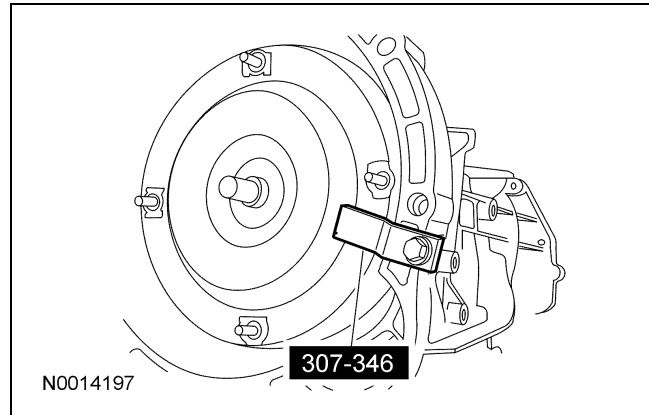
**4.0L engine**

24. Remove the 6 engine-to-transmission retaining bolts and position the fuel line bracket aside.

**All vehicles**

25. Lower the transmission assembly from the vehicle.

26. Install the Torque Converter Retainer.

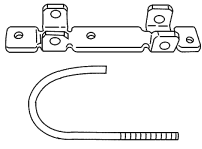
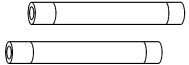
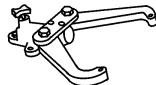
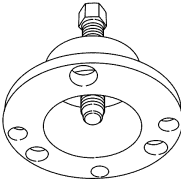
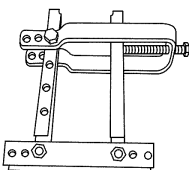


27. Carry out the transmission fluid cooler backflushing and cleaning if the transmission is being overhauled or installing a new or remanufactured transmission. For additional information, refer to Transmission Fluid Cooler Backflushing and Cleaning in this section.

DISASSEMBLY AND ASSEMBLY

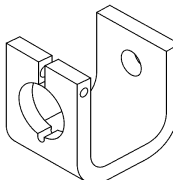
Transmission

Special Tool(s)

 ST2393-A	Compressor, Servo Cover 307-402
 ST1631-A	Handle, Torque Converter 307-091 (T81P-7902-C)
 ST1186-A	Holding Fixture, Transmission 307-003 (T57L-500-B)
 ST2417-A	Remover, Input Shaft Oil Seal 308-375
 ST2937A	Remover, Output Flange 307-523
 ST1758-A	Remover, Torque Converter Fluid Seal 307-309 (T94P-77001-BH)

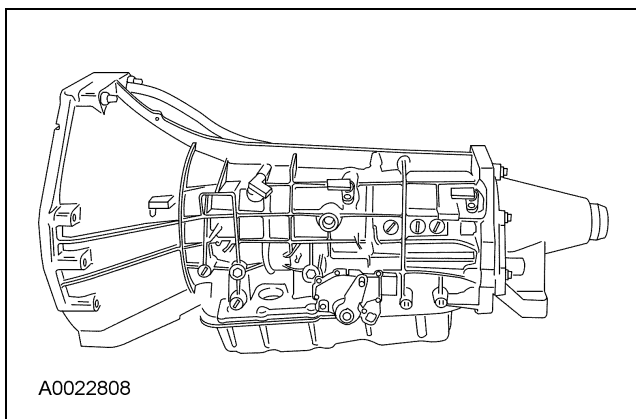
(Continued)

Special Tool(s)

 ST2418-A	Remover, Transmission Fluid Pump 307-397
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)

- NOTE:** Tag and identify all parts for reassembly.

Place the transmission on a bench.

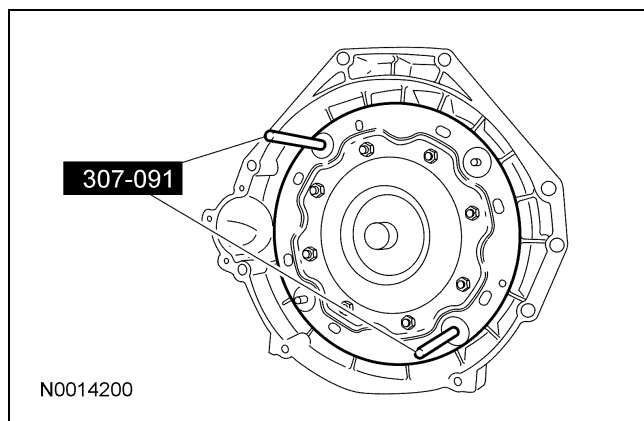


DISASSEMBLY AND ASSEMBLY (Continued)

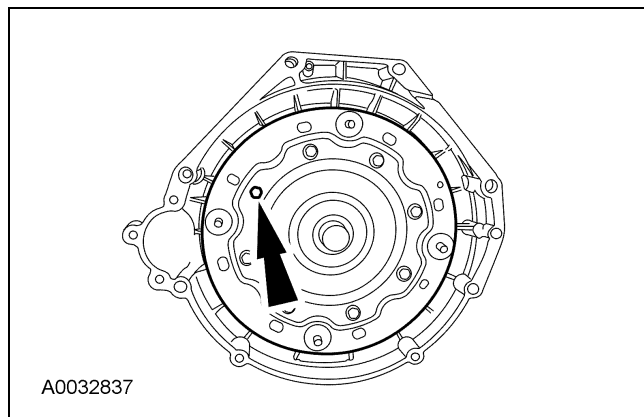
2.  **WARNING:** Secure the torque converter in the transmission during removal or installation. The torque converter is heavy and may result in injury if it falls out of the transmission. Failure to follow this instruction may result in serious personal injury.

NOTE: If not installing a new torque converter, leave the adapter plate screwed to the torque converter.

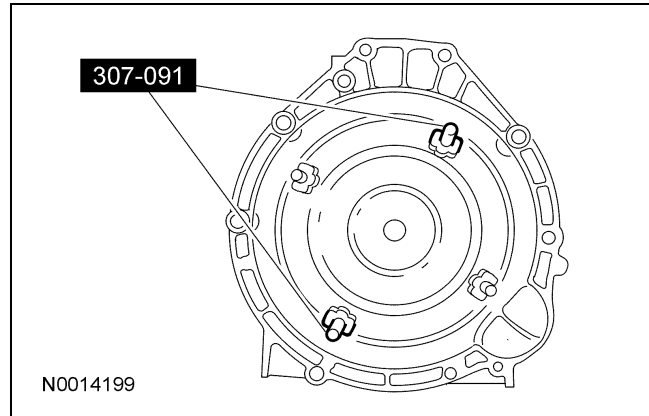
Using the Torque Converter Handles, remove the torque converter and adapter plate as an assembly.



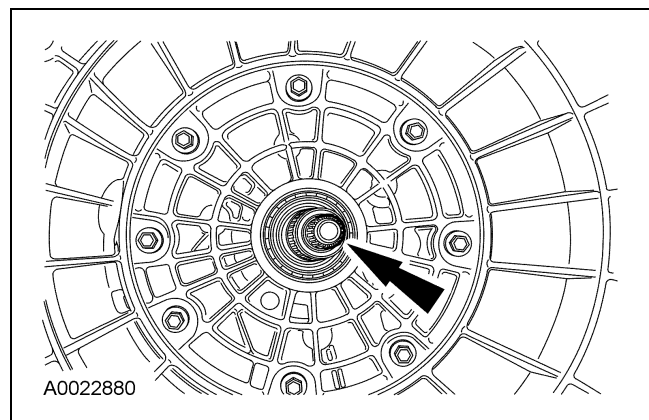
3. If the vehicle is equipped, and installation of a new or remanufactured torque converter is necessary, remove the torque converter adapter plate.



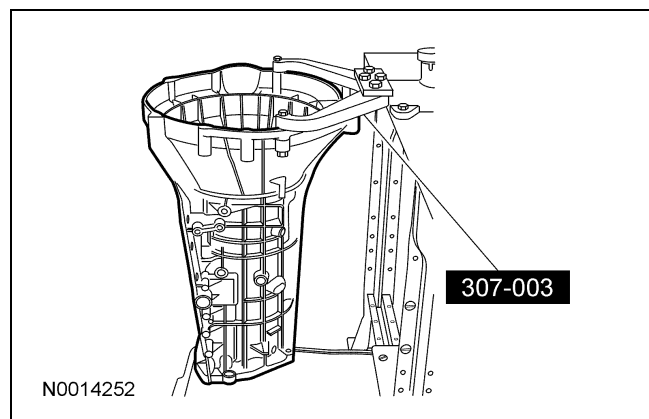
4. If the adapter plate has been removed, use the Torque Converter Handles to remove the torque converter.



5. Remove the input shaft.

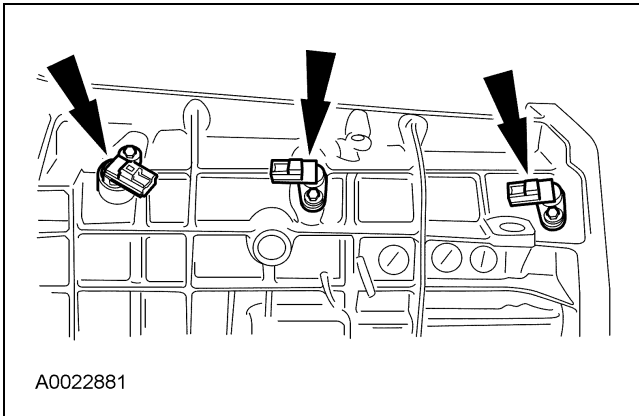


6. Using the Transmission Holding Fixture, install the transmission on to the bench with the torque converter housing facing up.

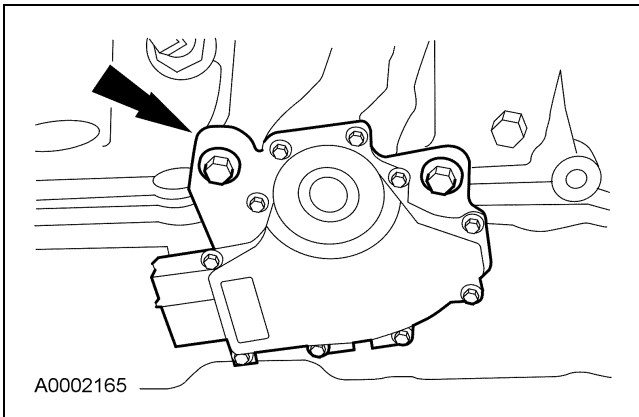


DISASSEMBLY AND ASSEMBLY (Continued)

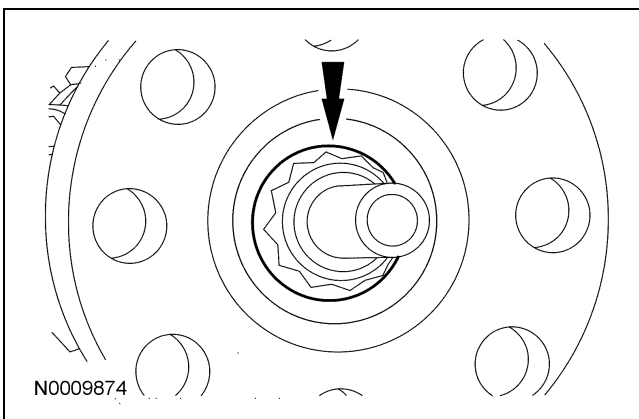
7. Remove the transmission sensors.



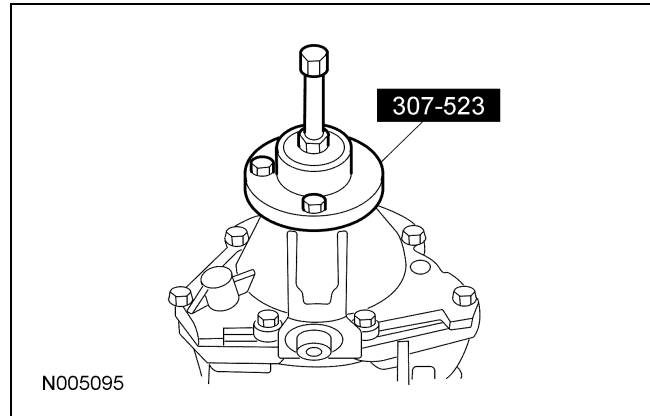
8. Remove the Transmission Range (TR) sensor.



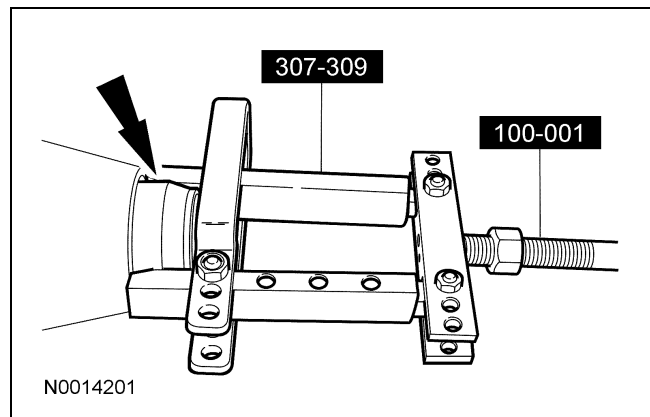
9. Remove and discard the output shaft flange nut.



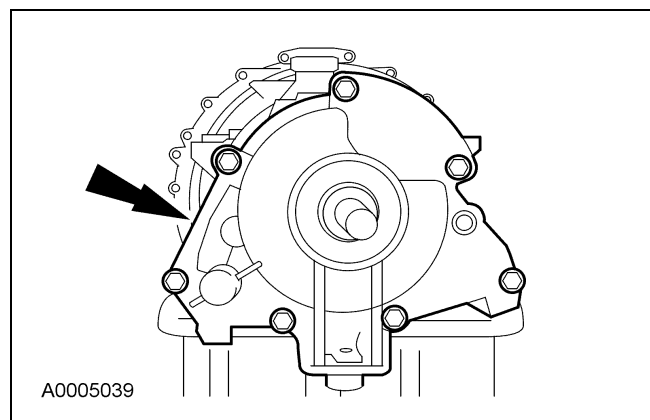
10. Using the Output Flange Remover, remove the output shaft flange.



11. Using the Torque Converter Fluid Seal Remover and Slide Hammer, remove the extension housing seal.



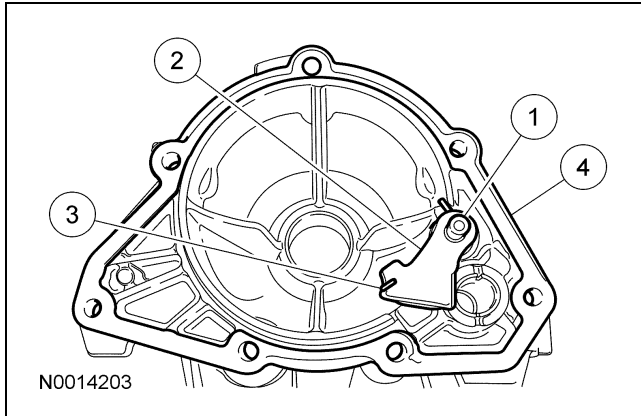
12. **NOTE:** The parking pawl, parking pawl return spring and parking pawl shaft may fall out during removal of the extension housing. Remove the extension housing.



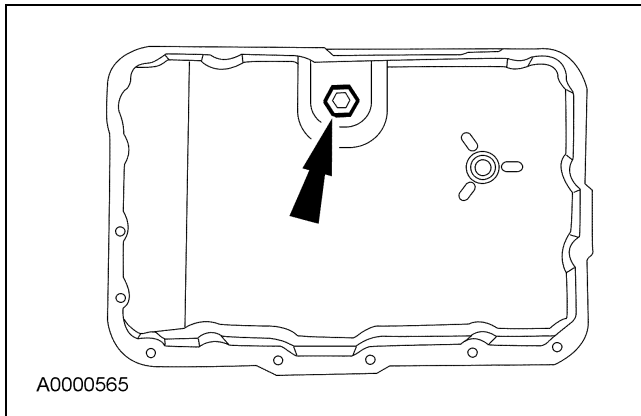
DISASSEMBLY AND ASSEMBLY (Continued)

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.

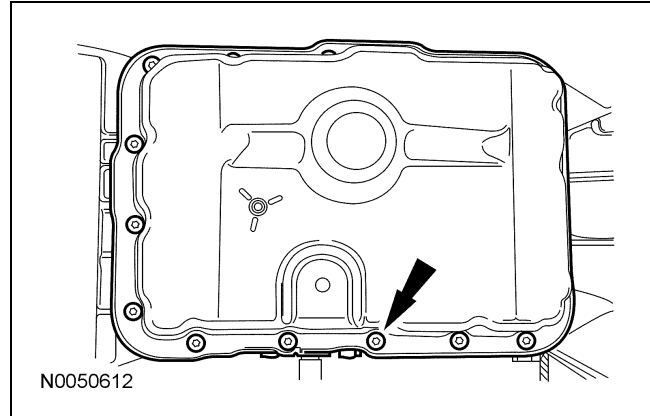


14. Remove the transmission fluid pan drain plug and discard the transmission fluid pan drain plug gasket.

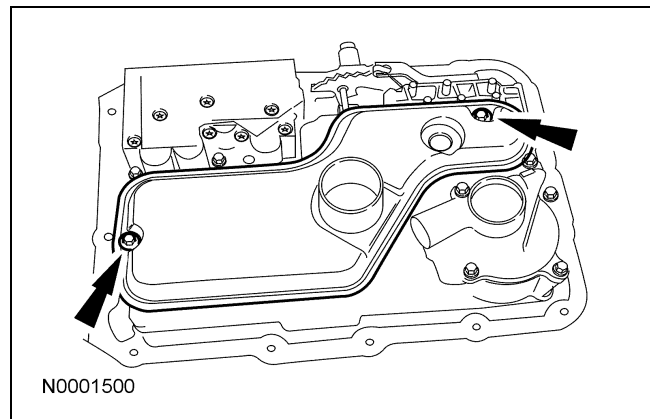


15. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect the gasket for damage. If the gasket is not damaged, the gasket should be reused.

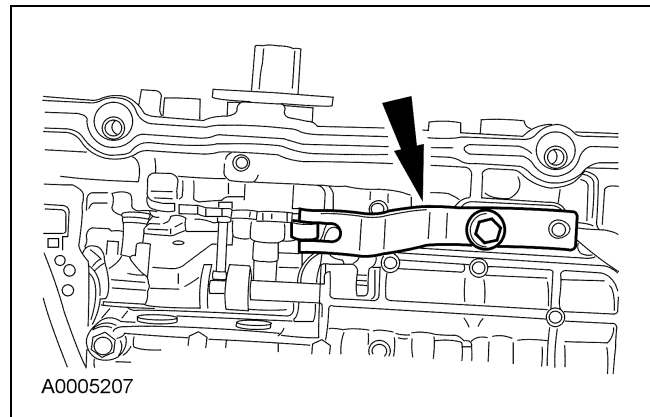
Remove the 16 transmission fluid pan screws, transmission fluid pan and transmission fluid pan gasket.



16. Remove the transmission fluid pan filter and discard.



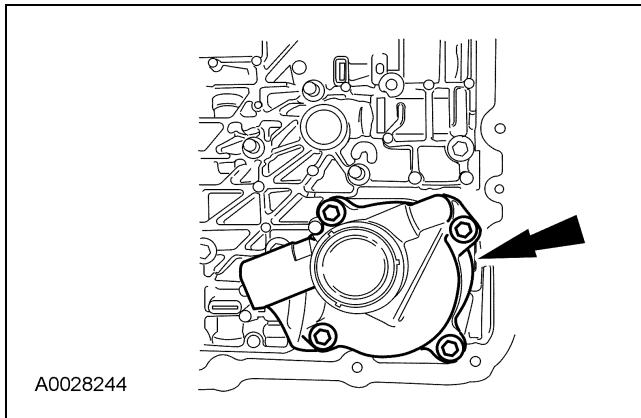
17. Remove the manual valve detent spring.



DISASSEMBLY AND ASSEMBLY (Continued)

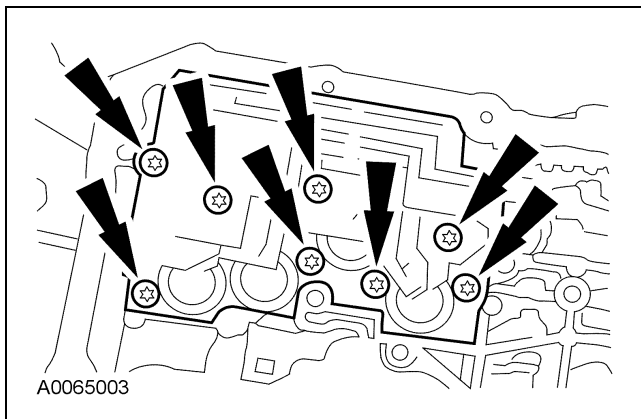
18.  **WARNING:** Follow the specified procedure when using the tool to remove the servo cover. The servo and servo cover are under high spring force and can separate forcefully, which may result in serious personal injury.

Remove the reverse servo assembly.

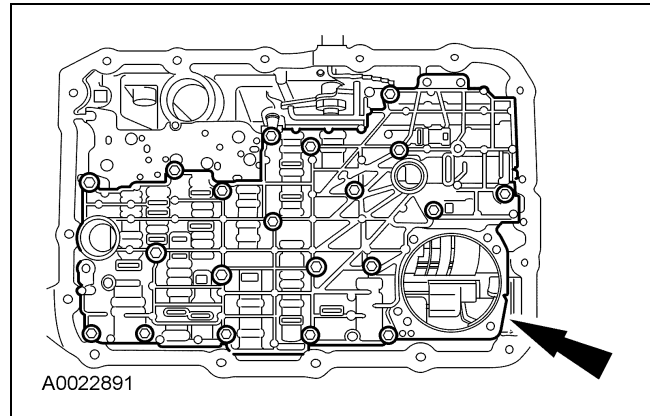


19. **NOTICE:** Do not damage the transmission control solenoid body connector pins.

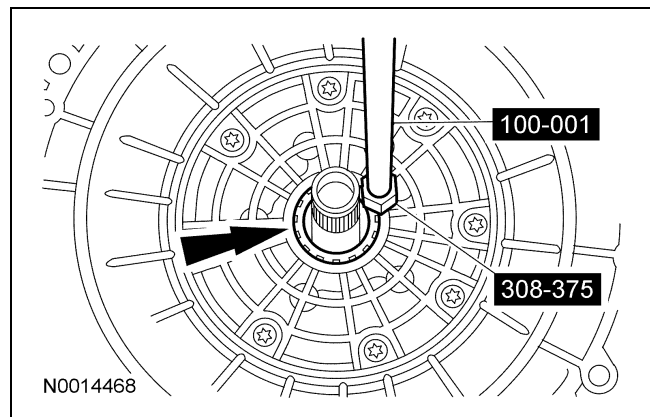
Remove the transmission control solenoid body assembly by lifting on the body and pushing the connector from the other side of the case.



20. Remove the main control valve body, separator plate and gasket.



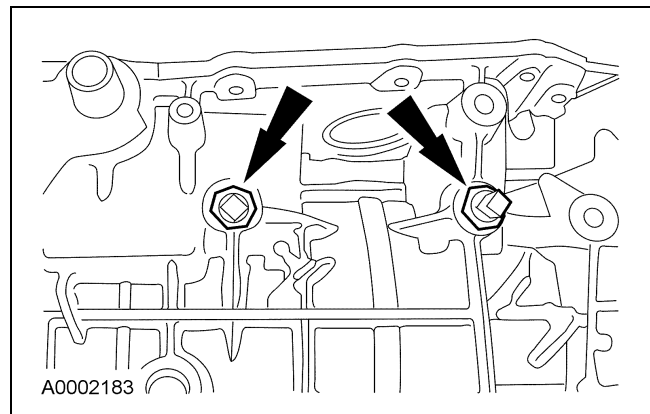
21. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the front fluid pump seal.



22. **NOTICE:** Failure to loosen the Overdrive (O/D)/intermediate band adjusting screw prior to pump removal may cause damage to the pump and overdrive/intermediate band.

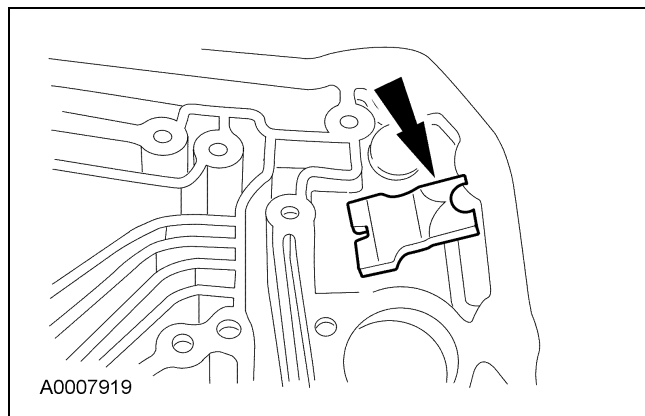
NOTE: Remove and discard the locknuts. The locknuts are not reusable for assembly.

Remove and discard the locknuts, and loosen the Overdrive (O/D)/intermediate band adjusting screw.



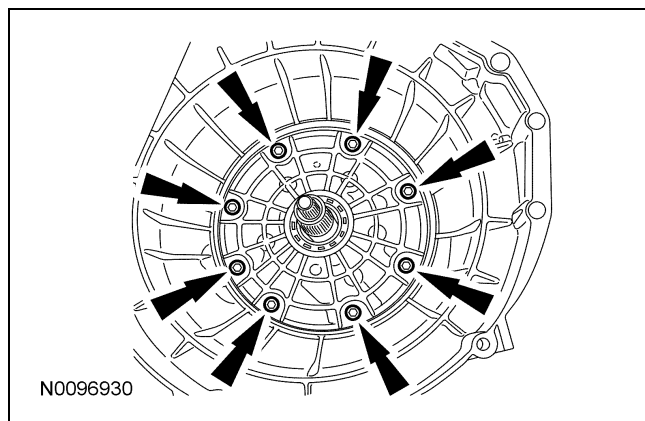
DISASSEMBLY AND ASSEMBLY (Continued)

23. Remove and tag part for assembly.

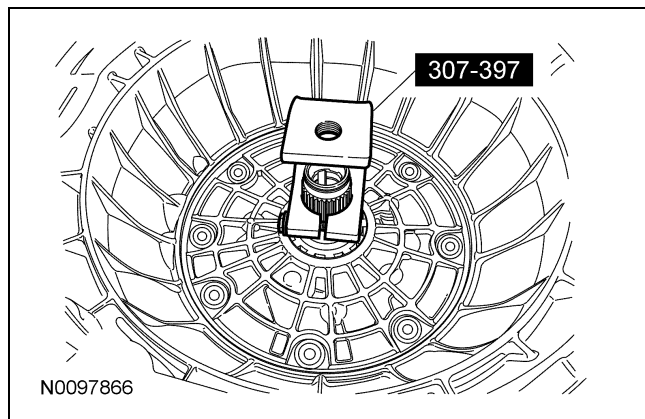


24. **NOTE:** Remove and discard the screws and washer assembly. The screws and washer assembly are not reusable for assembly.

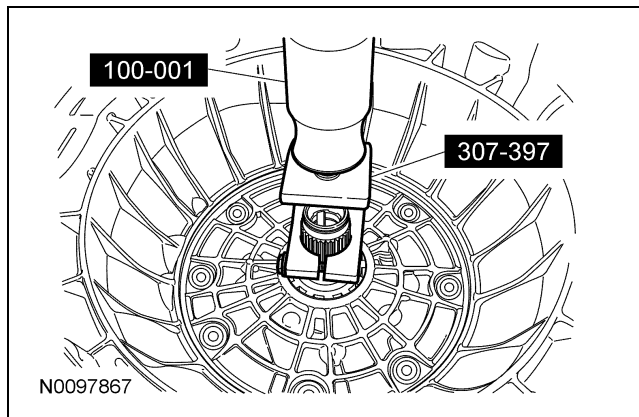
Remove and discard the screws and washer assembly.



25. Install the Transmission Fluid Pump Remover.

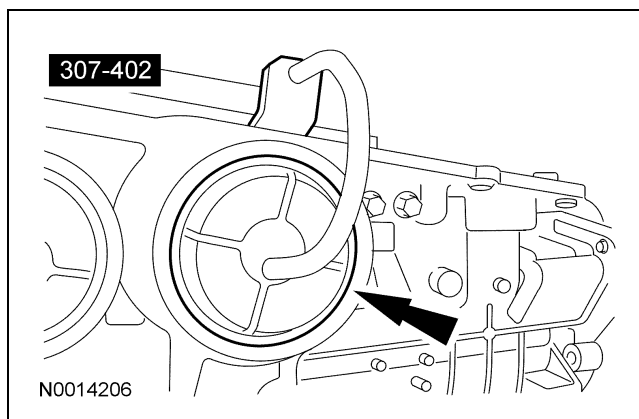


26. Using the Transmission Fluid Pump Remover and Slide Hammer, remove the pump.

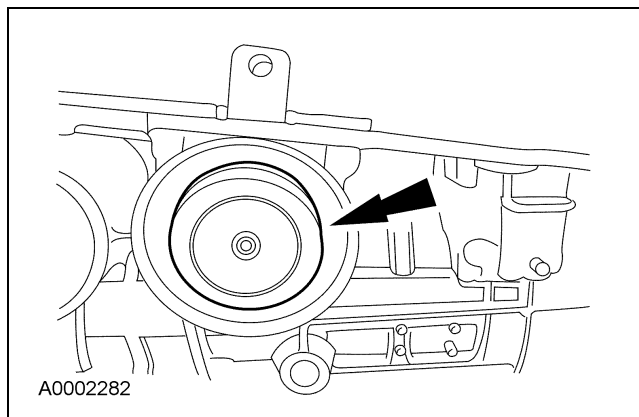


27. **⚠ WARNING:** Follow the specified procedure when using the tool to remove the servo cover. The servo and servo cover are under high spring force and can separate forcefully, which may result in serious personal injury.

Using the Servo Cover Compressor, remove the intermediate servo cover retaining ring.



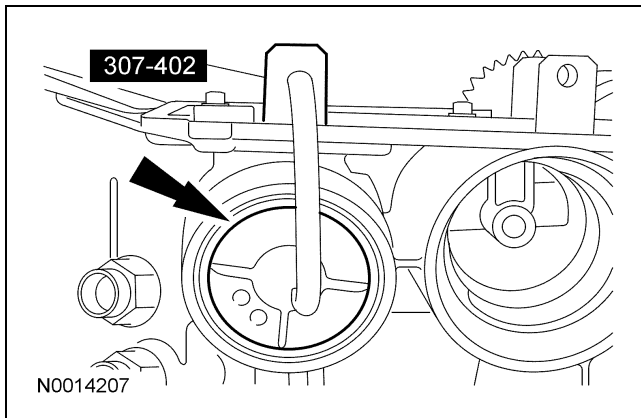
28. Remove the intermediate band servo piston and spring.



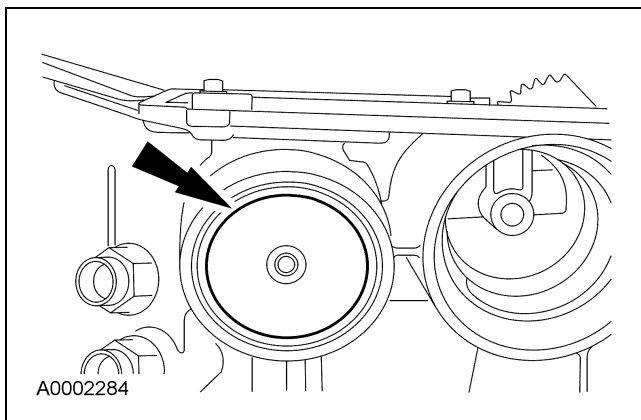
DISASSEMBLY AND ASSEMBLY (Continued)

29.  **WARNING:** Follow the specified procedure when using the tool to remove the servo cover. The servo and servo cover are under high spring force and can separate forcefully, which may result in serious personal injury.

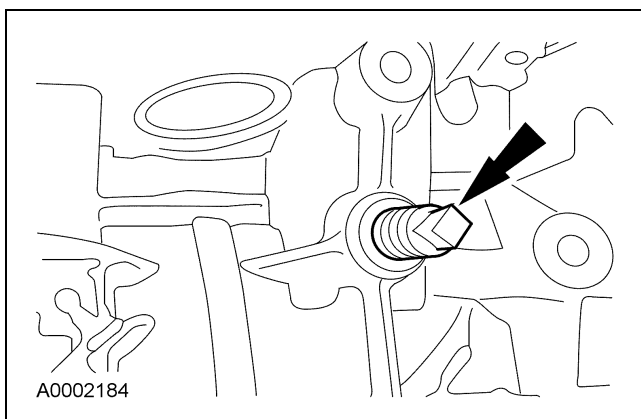
Using the Servo Cover Compressor, remove the O/D servo cover retaining ring and cover.



30. Remove the O/D servo piston and spring.

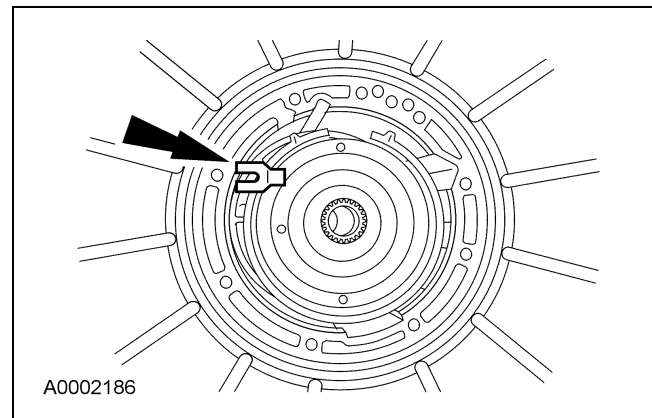


31. Remove the adjusting screw.



32. **NOTE:** Tag and identify parts for reassembly.

Compress the O/D band and remove the apply strut.

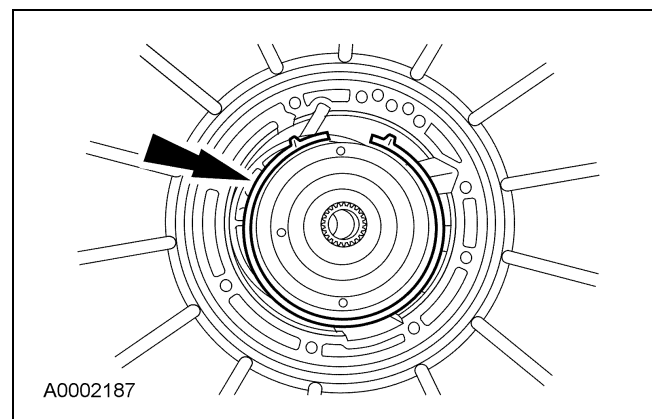


33. **NOTE:** Identify the anchor and apply ends of the O/D band.

NOTE: The new O/D 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.

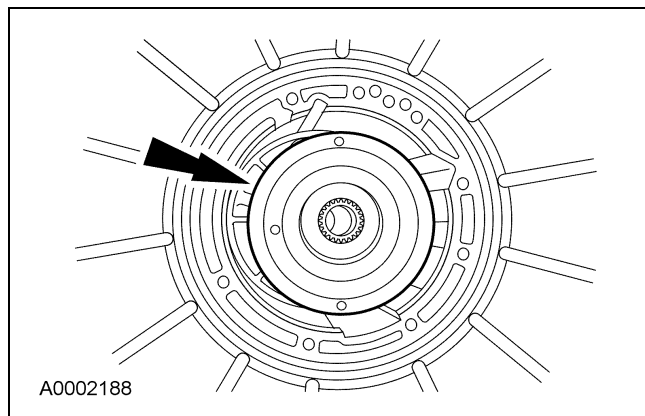
Remove and inspect the O/D band. Check the following conditions for installing a new band:

- Inspect for glazing.
- Inspect for missing friction material.
- Inspect for material flaking.
- Inspect for damage to the anchor pins.



DISASSEMBLY AND ASSEMBLY (Continued)

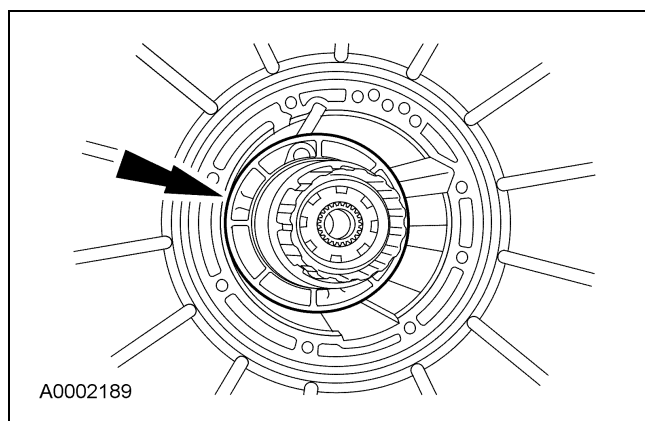
34. Remove the O/D brake band drum assembly.



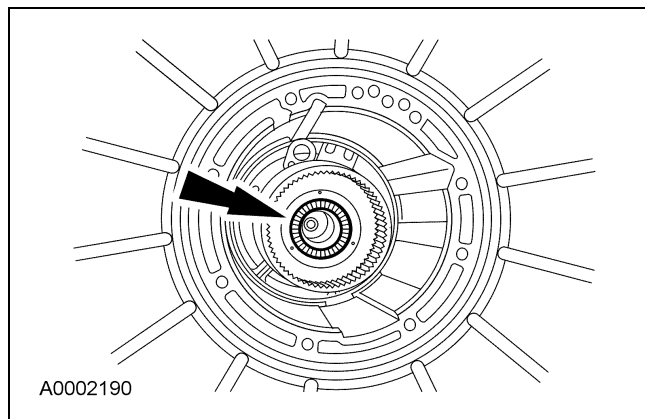
35. **NOTICE:** Do not bend the trigger wheel or damage may occur.

NOTE: The No. 12 thrust bearing is in this assembly.

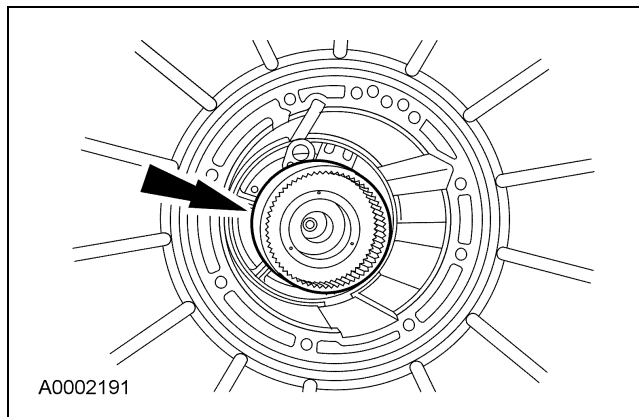
Remove the O/D planetary gear carrier.



36. Remove the No. 2 O/D planet thrust bearing.

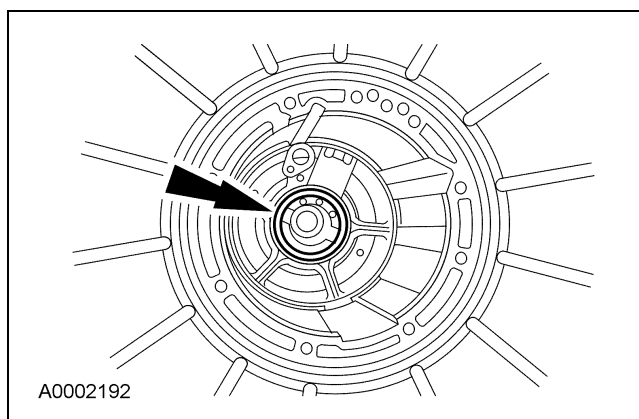


37. Remove the O/D ring gear, O/D One-Way Clutch (OWC) assembly and center shaft as an assembly.



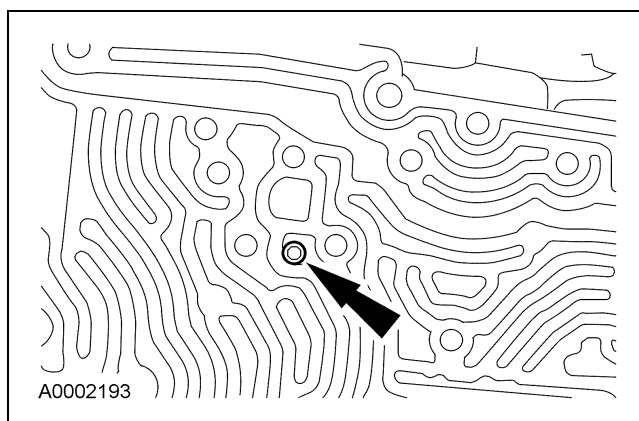
38. **NOTE:** Tag and identify the center shaft thrust bearing No. 3 for reassembly.

Remove the No. 3 center shaft thrust bearing.



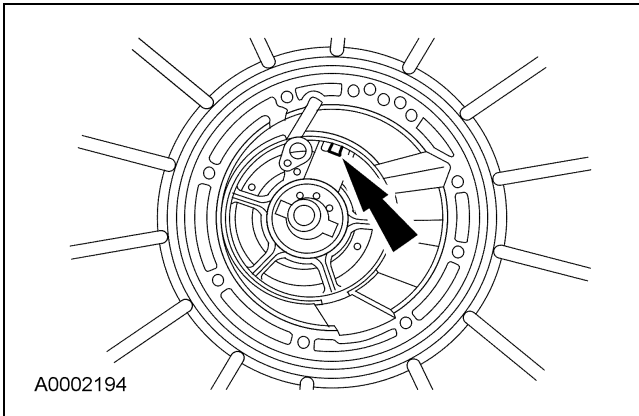
39. **NOTE:** The center support locknut could fall into the remaining assembly if not removed.

Remove the bolt.

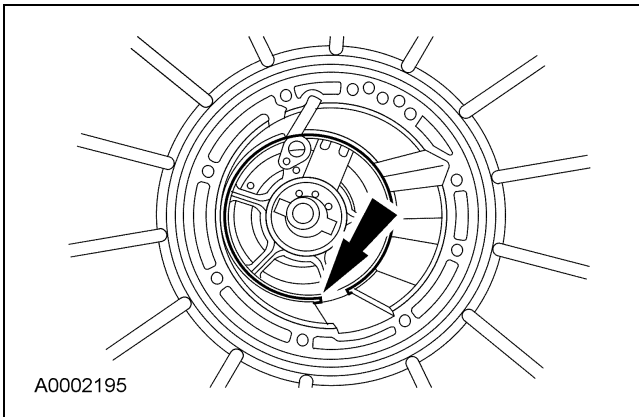


DISASSEMBLY AND ASSEMBLY (Continued)

40. Remove the locknut and cage.



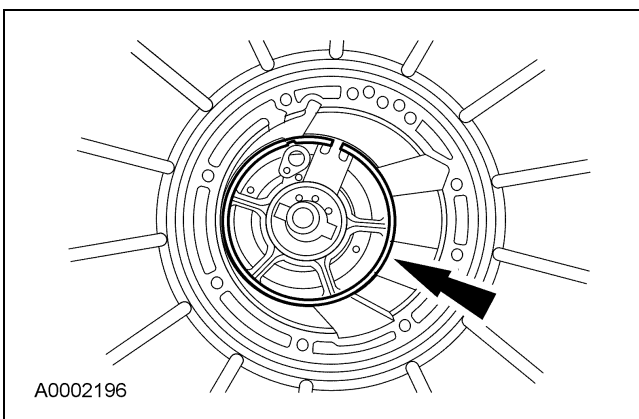
41. Remove the center support retaining ring.



42. **NOTE:** The center support is repaired as an assembly. Any damage requires installing a new component.

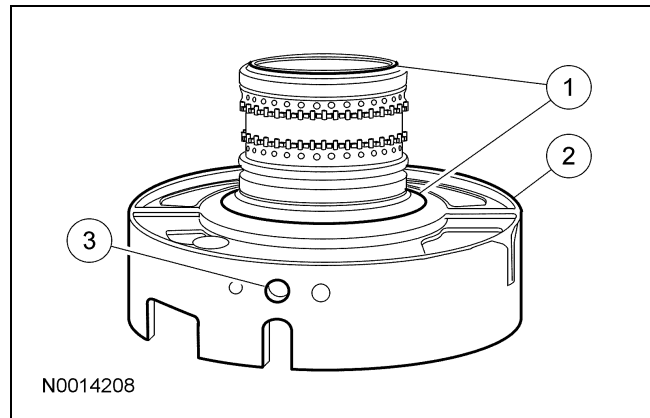
NOTE: When removing the center support, pull evenly around the center support web.

Remove the center support.

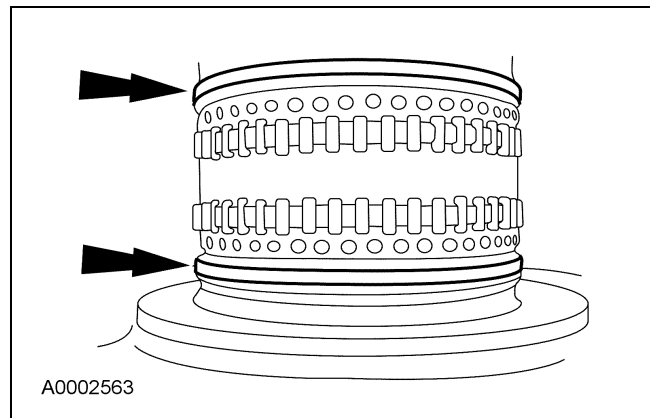


43. Inspect the center support assembly for wear or damage.

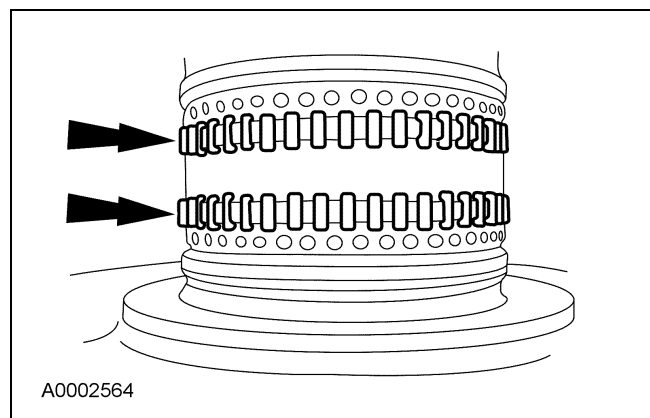
- 1 Inspect the thrust surfaces for wear or damage.
- 2 Inspect the center support sealing surface.
- 3 Inspect the fluid passage for blockage or damage.



44. Inspect the seal rings for damage.



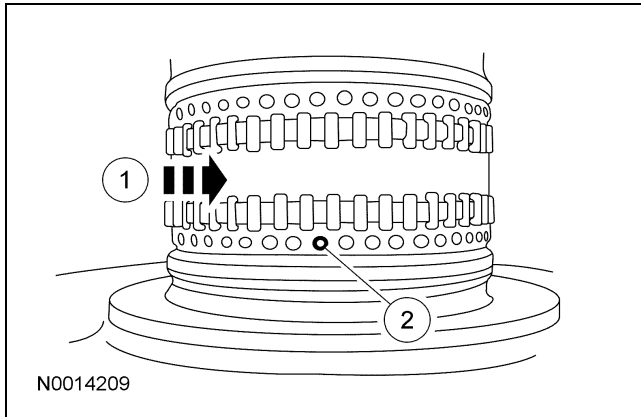
45. Inspect the bearing for missing rollers or damage.



DISASSEMBLY AND ASSEMBLY (Continued)

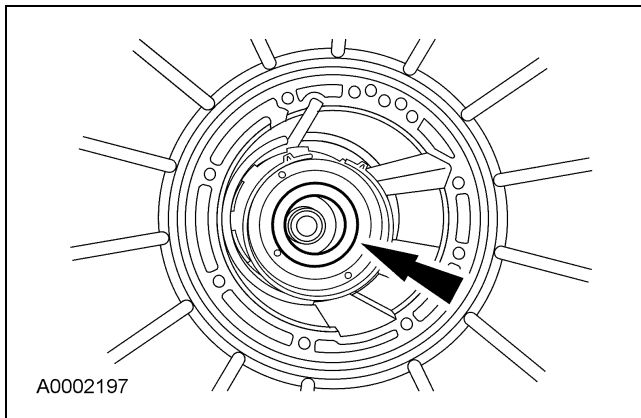
46. Inspect the direct clutch feed hole for blockage or damage.

- 1 Rotate the center support bearing to locate the direct clutch feed hole.
- 2 Inspect the direct clutch feed hole for blockage or damage.

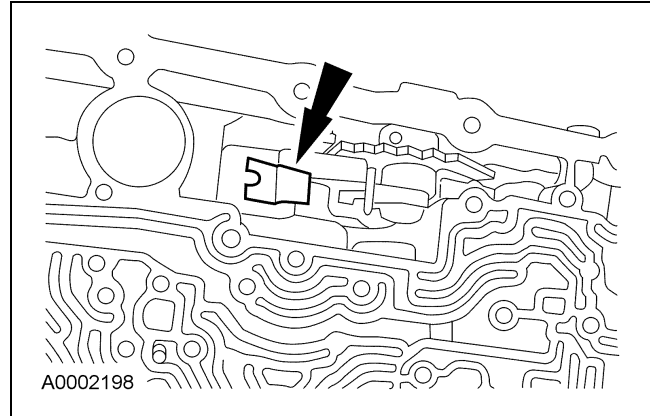


47. **NOTE:** Tag and identify the No. 4 intermediate clutch drum thrust bearing.

Remove the intermediate brake drum thrust bearing (No. 4).



48. Remove, tag and identify the band anchor strut for assembly.

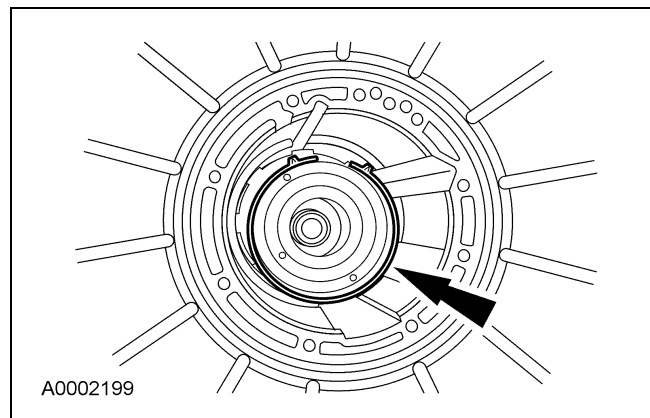


49. **NOTE:** Identify the anchor and apply ends of the intermediate band.

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.

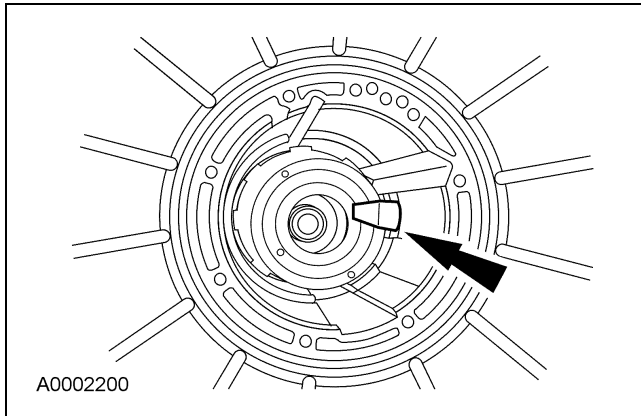
Remove and inspect the intermediate band. Check the following conditions when installing a new band:

- Inspect for glazing.
- Inspect for missing friction material.
- Inspect for material flaking.
- Inspect for damage to the anchor pins.

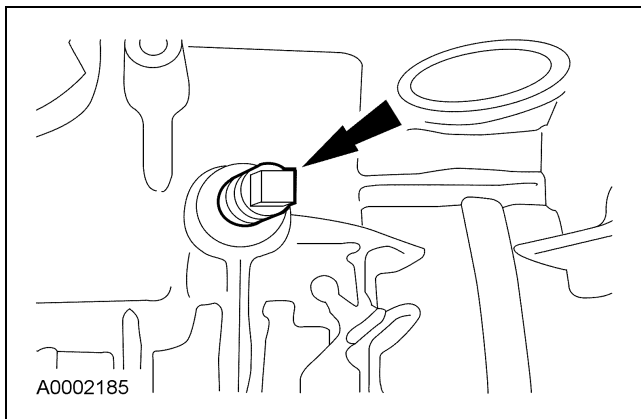


DISASSEMBLY AND ASSEMBLY (Continued)

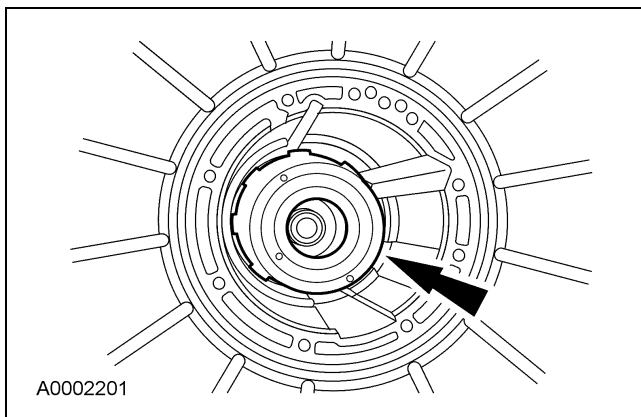
50. Remove, tag and identify the band apply strut.



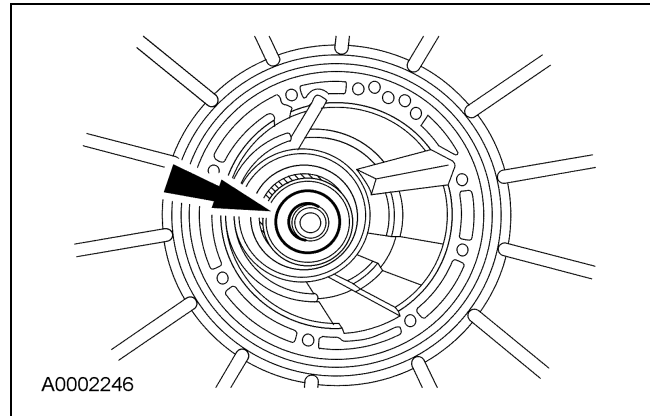
51. Remove the screw.



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.

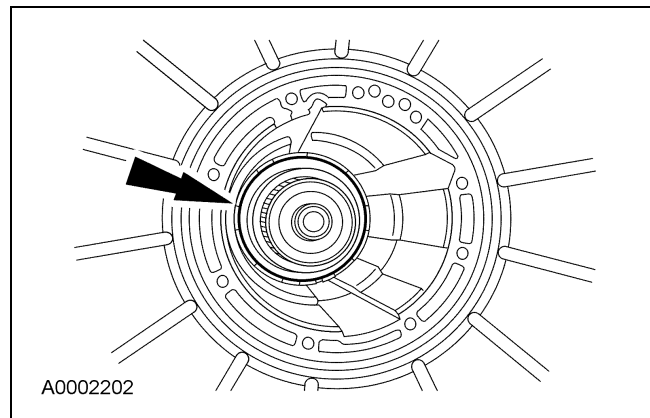


53. Remove the No. 5 forward clutch cylinder thrust bearing, tag and identify.



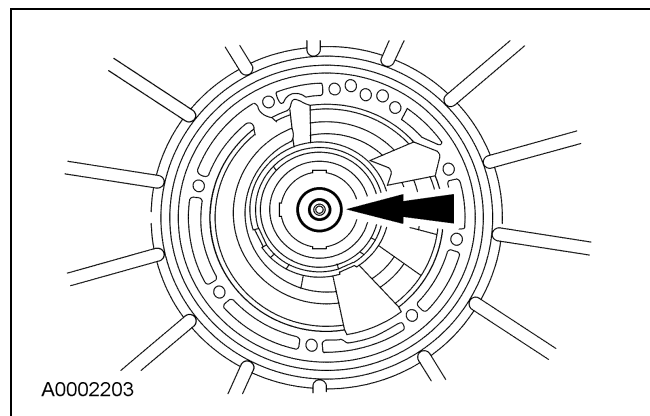
54. **NOTE:** The No. 6A thrust bearing may come out with the cylinder. Tag and identify for reassembly.

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.

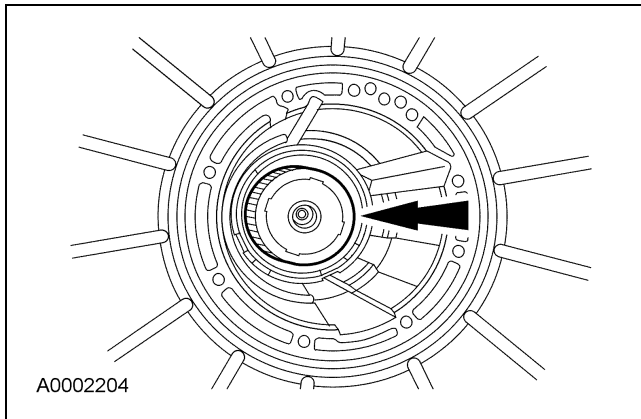
Remove the No. 6A forward ring gear hub thrust bearing.



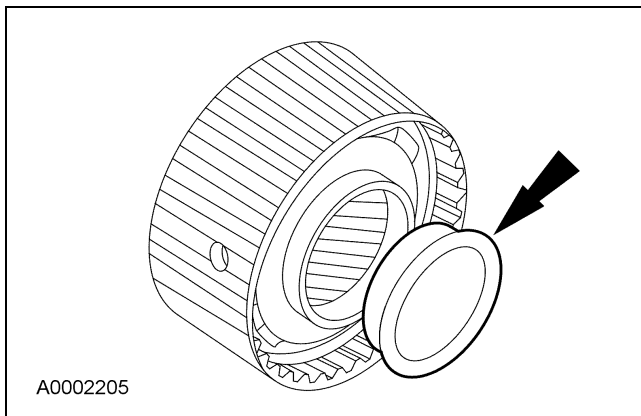
DISASSEMBLY AND ASSEMBLY (Continued)

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.

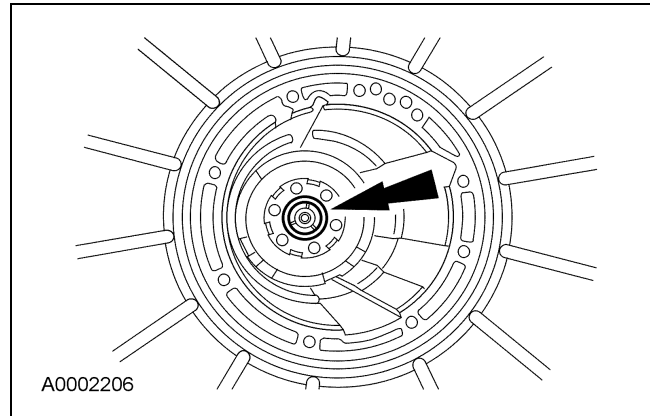


57. Remove the No. 6B forward clutch thrust washer from the forward ring gear hub.

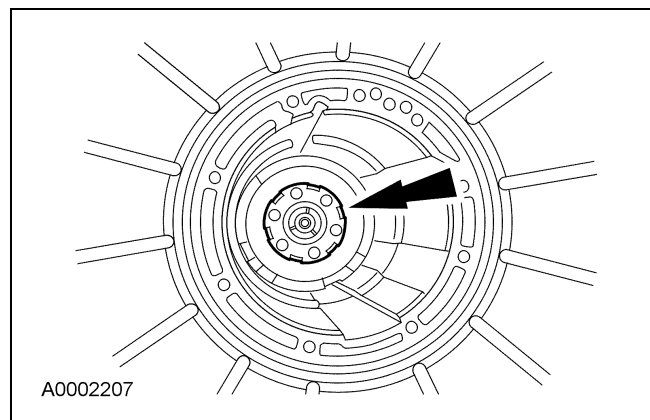


58. **NOTE:** The No. 7 forward planet thrust bearing may come out with the forward ring gear and hub assembly.

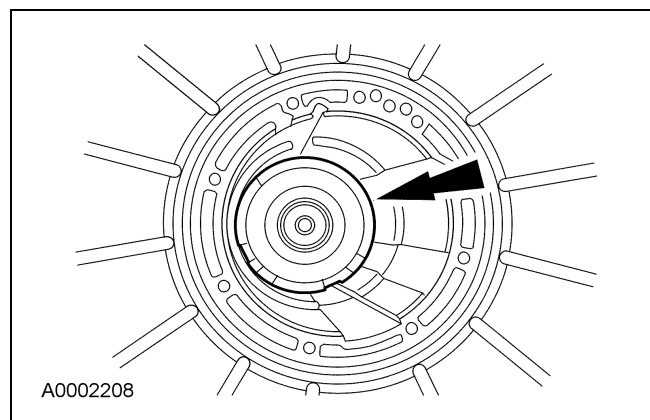
Remove the No. 7 forward planet thrust bearing.



59. Remove the forward planetary assembly.

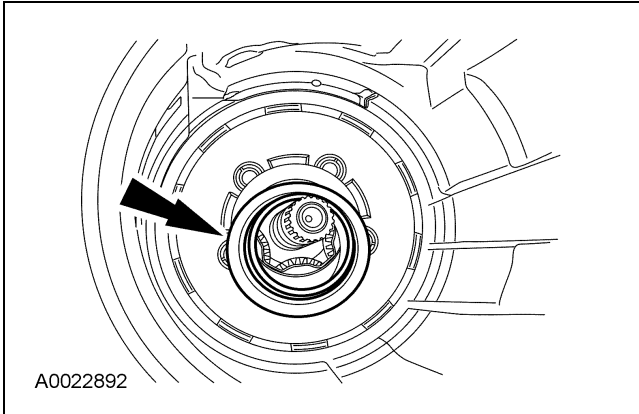


60. Remove the input shell and sun gear assembly.

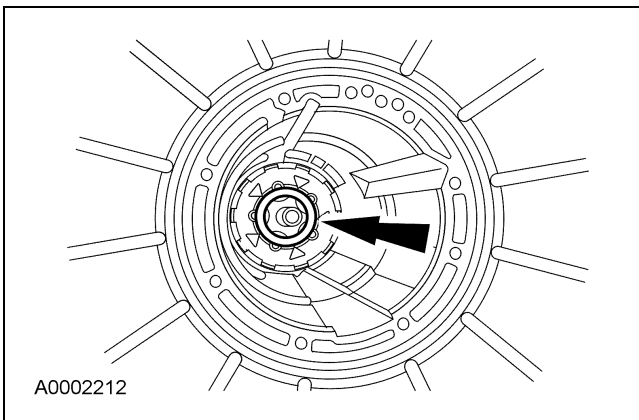


DISASSEMBLY AND ASSEMBLY (Continued)

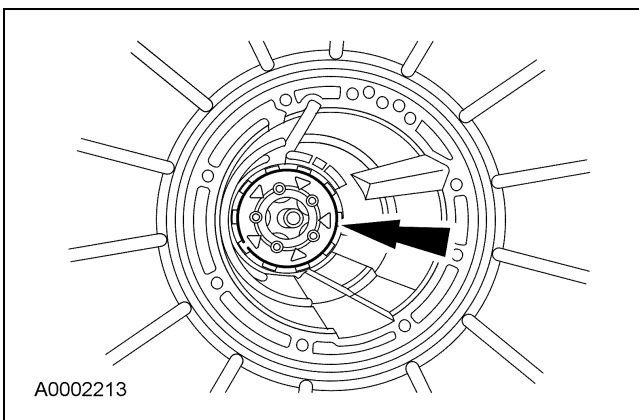
61. Remove the spacer.



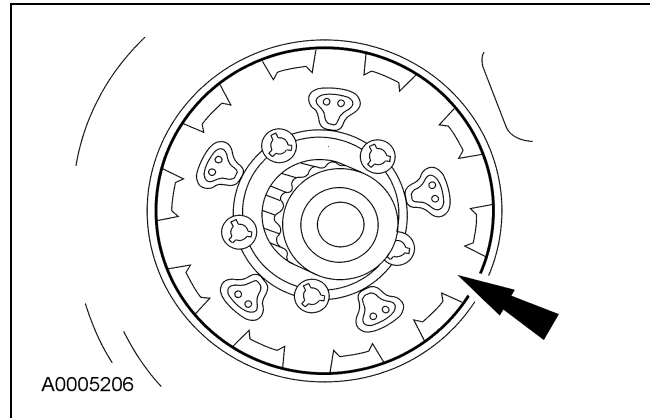
62. **NOTE:** Tag and identify the No. 8 low/reverse planetary carrier thrust bearing.
Remove the thrust bearing.



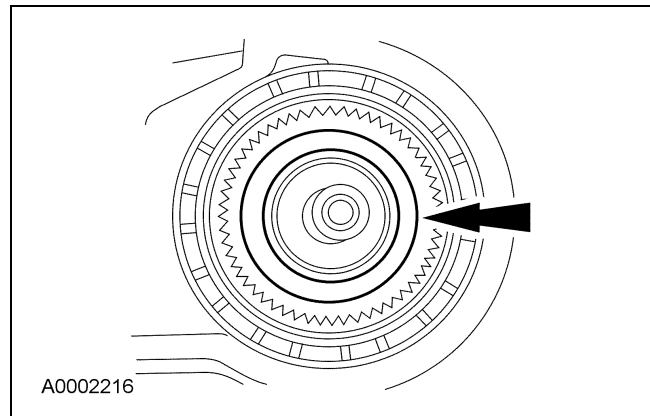
63. Remove the retaining ring.



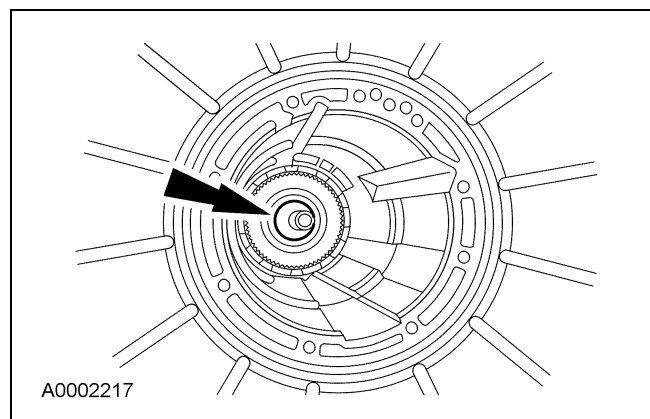
64. Remove the low/reverse planetary assembly.



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.

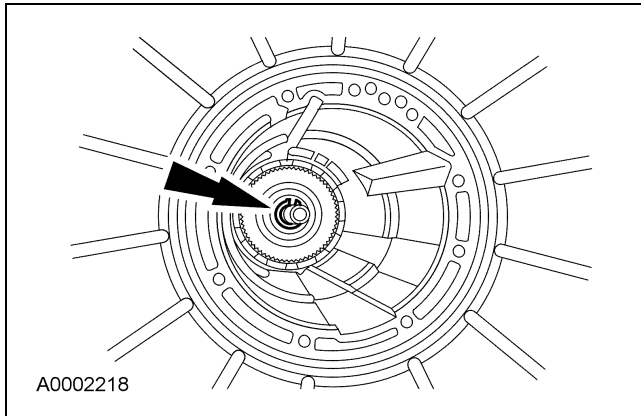
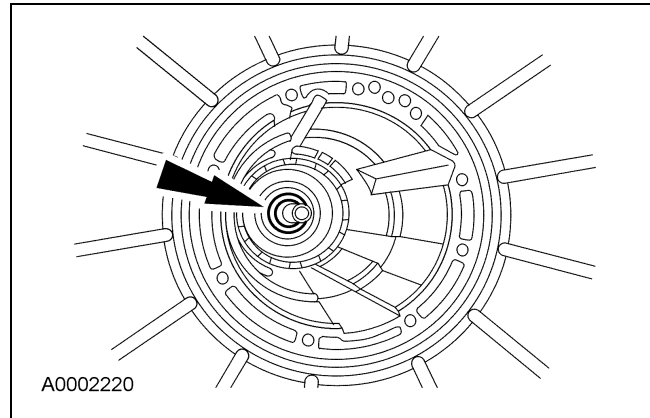


DISASSEMBLY AND ASSEMBLY (Continued)

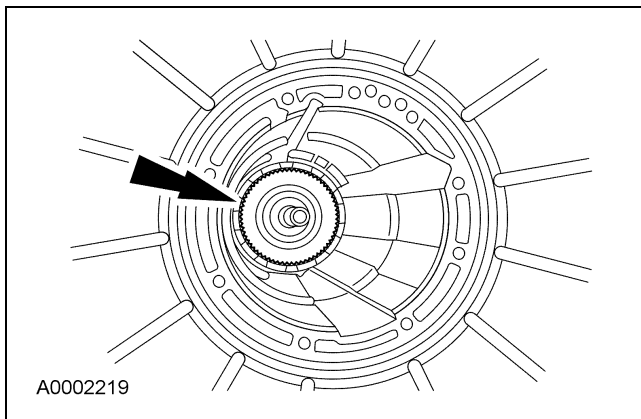
67.  **WARNING:** Hold onto the output shaft so it does not fall out after removing the snap ring. Failure to follow this instruction may result in serious personal injury.

NOTICE: Discard the output shaft retaining ring. A new retaining ring must be used for assembly, otherwise transmission damage can occur.

While holding the output shaft, remove and discard the output shaft retaining ring.



68. Remove the output shaft ring gear and hub.

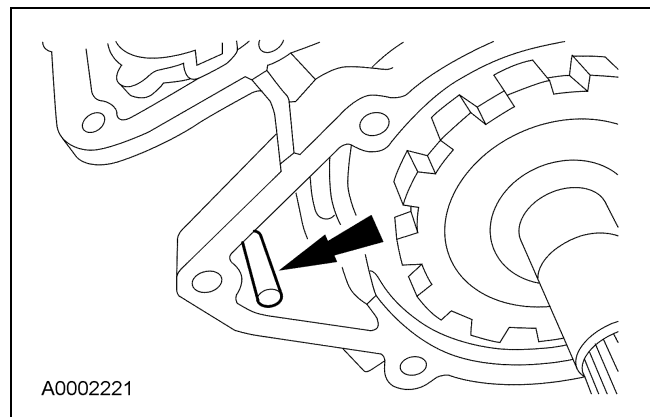


69. Remove the No. 10 low/intermediate sun gear bearing.

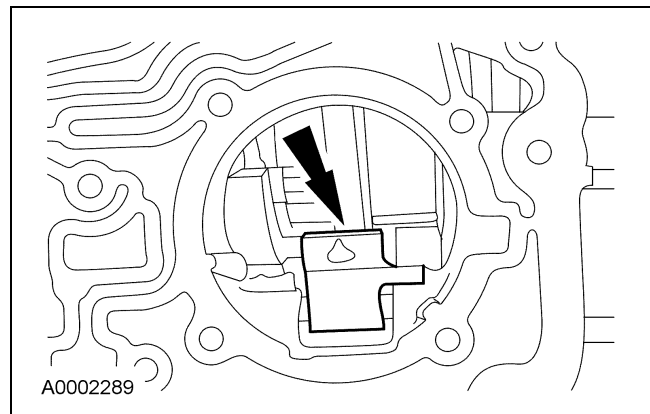
70. **NOTICE:** Do not pry on the outer edge of the case. Damage to the gasket sealing surface may occur.

NOTE: It may be necessary to grind flat spots on the edges of the reverse band actuating lever shaft in order to remove it.

Hold the flat spots on the reverse band actuating lever shaft, wiggle it back and forth and remove the reverse band actuating lever shaft.



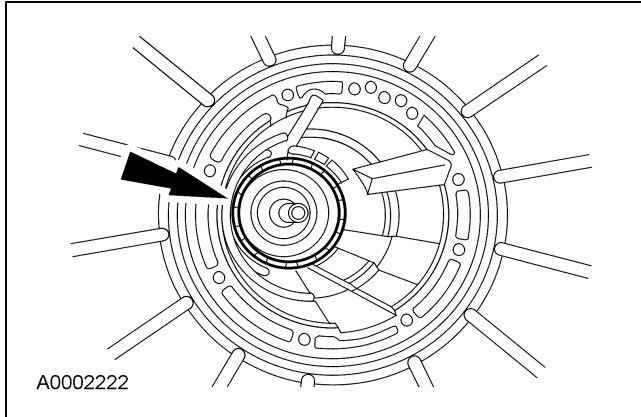
71. Remove the reverse band actuating lever assembly.



DISASSEMBLY AND ASSEMBLY (Continued)

72. **NOTE:** The inner race of the rear OWC is not removable. It is repaired in the case.

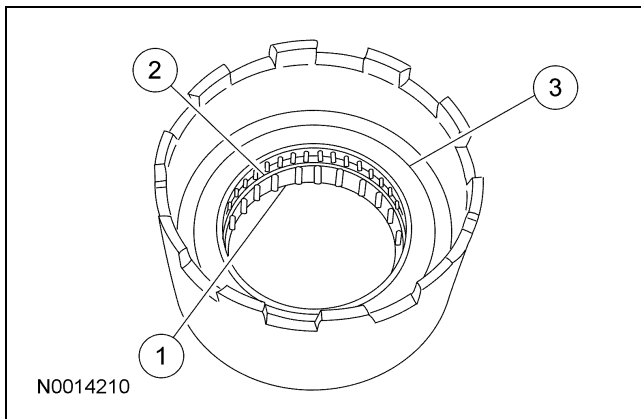
Remove the low/reverse brake drum and OWC assembly by rotating it clockwise.



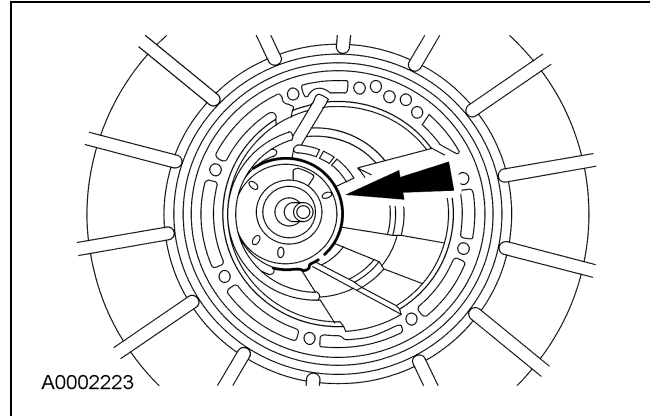
73. **NOTE:** The reverse OWC is part of the reverse brake drum assembly. Install a new reverse brake drum as an assembly only.

Inspect the reverse brake drum assembly and install a new reverse brake drum assembly if damaged.

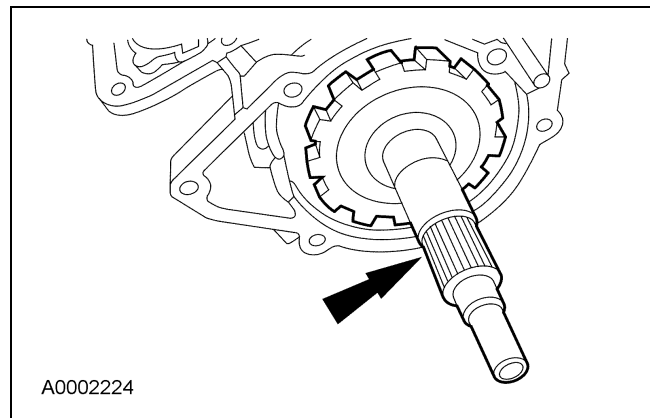
- 1 Inspect the reverse brake drum sprags.
- 2 Inspect the reverse brake drum rollers.
- 3 Inspect the reverse brake drum.



74. Remove the reverse band.

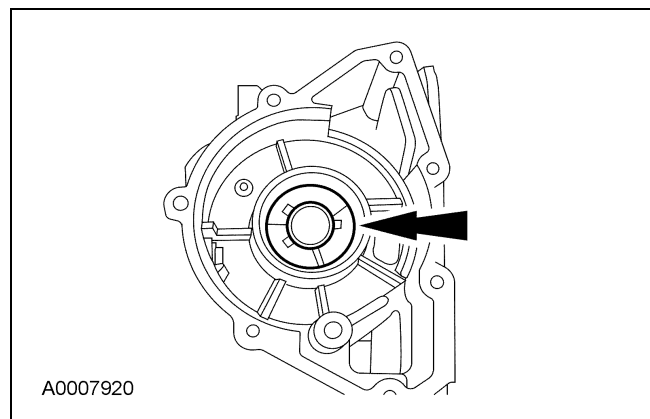


75. Remove the output shaft and park gear.



76. **NOTE:** Tag and identify the No. 11 output shaft thrust washer.

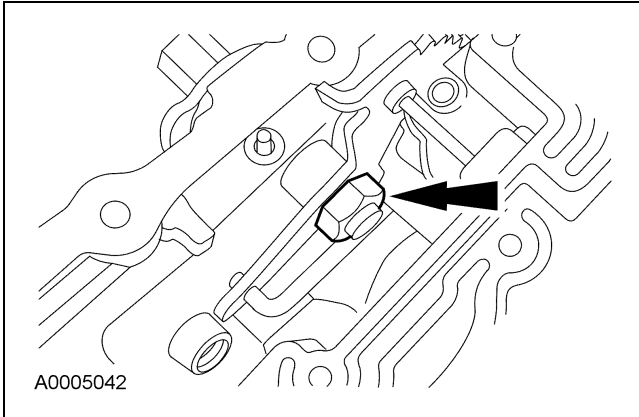
Remove the output shaft thrust washer.



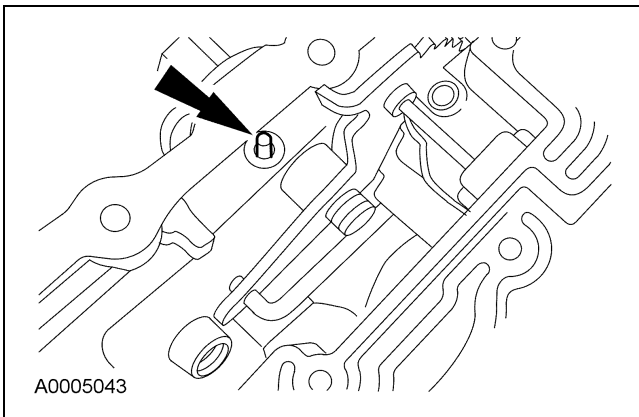
DISASSEMBLY AND ASSEMBLY (Continued)

77. **NOTICE:** To avoid damage, make sure the wrench does not strike the manual valve inner lever pin.

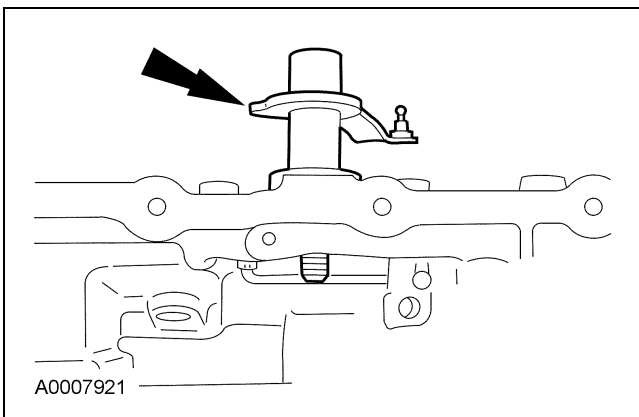
Remove the nut.



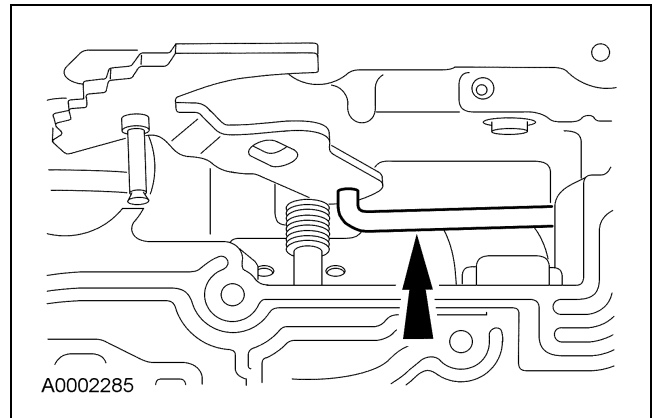
78. Remove the manual shaft retaining pin.



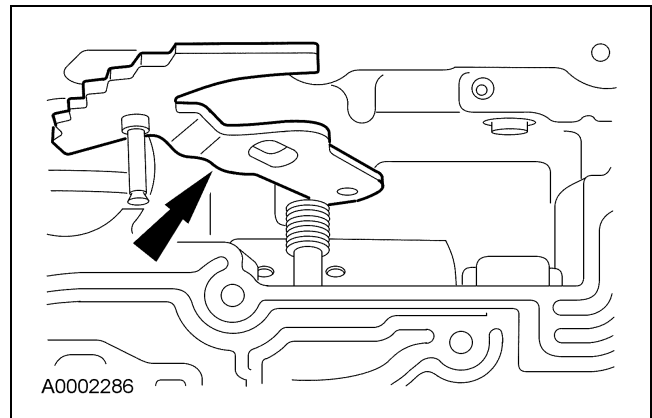
79. Remove the manual control lever shaft.



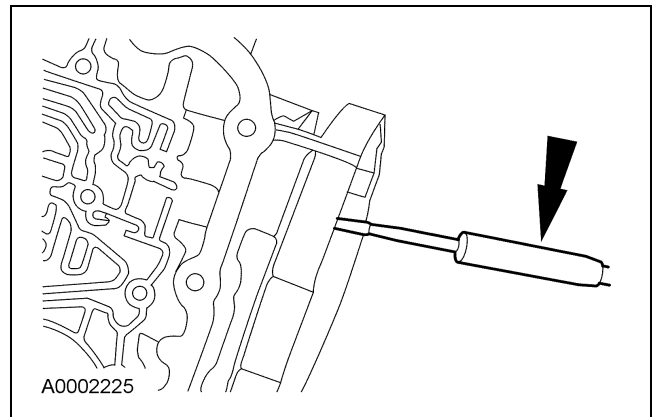
80. Disconnect the manual valve inner lever from the parking lever actuating rod.



81. Remove the manual valve inner lever.



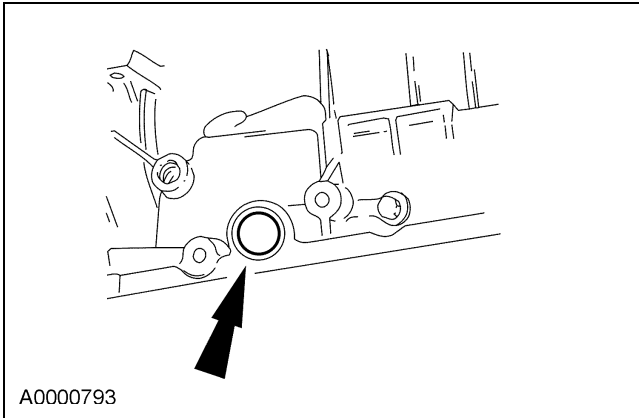
82. Remove the parking lever actuating rod.



DISASSEMBLY AND ASSEMBLY (Continued)

83. **NOTICE:** Do not damage the bore.

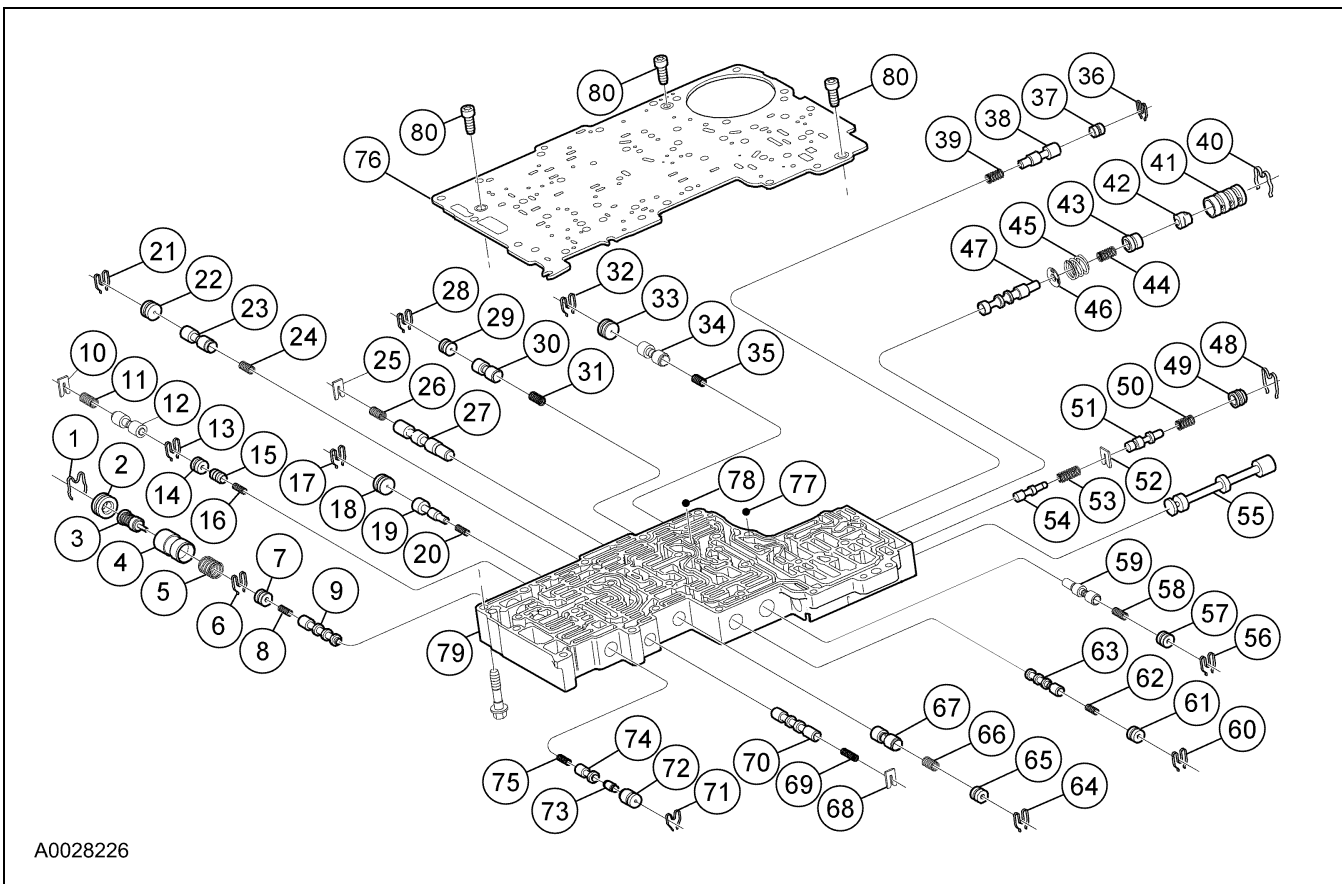
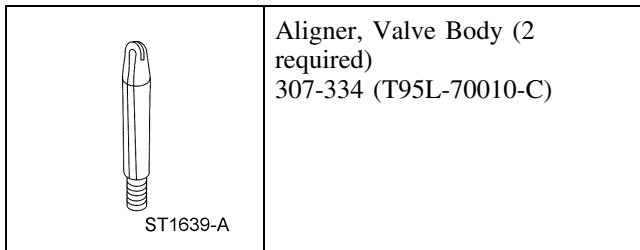
Remove the manual control lever seal.



DISASSEMBLY AND ASSEMBLY

Main Control Valve Body

Special Tool(s)



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
8	—	Spring — converter clutch control valve

(Continued)

Item	Part Number	Description
9	—	Valve — converter clutch control
10	—	Plate
11	—	Spring — coast clutch control
12	—	Valve — coast clutch control
13	—	Clip — retainer
14	—	Plug — retainer
15	—	Valve — converter clutch back pressure

(Continued)

DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
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
49	—	Plug — retainer

(Continued)

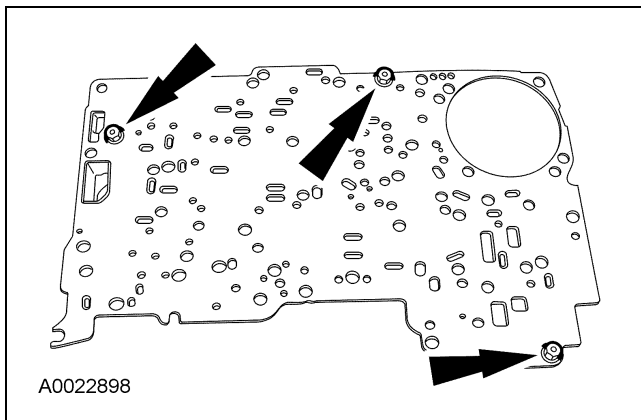
Item	Part Number	Description
50	—	Spring — converter limit
51	—	Valve — converter limit
52	—	Plate
53	—	Spring — solenoid regulator valve
54	—	Valve — solenoid regulator
55	—	Valve — manual
56	—	Clip — retainer
57	—	Plug — retainer
58	—	Spring — rear servo control valve
59	—	Valve — rear servo control
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 (O/D) servo control
70	—	Valve — O/D 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	Main control valve body separator plate screws

DISASSEMBLY AND ASSEMBLY (Continued)

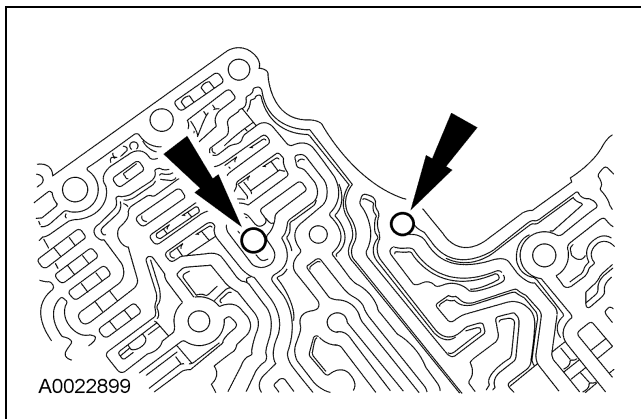
Disassembly

1. **NOTE:** The main control valve body separator plate has a bonded gasket. Do not reuse. Discard the plate.

Remove and discard the main control 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. Thoroughly clean all parts in solvent and blow dry with moisture-free compressed air.

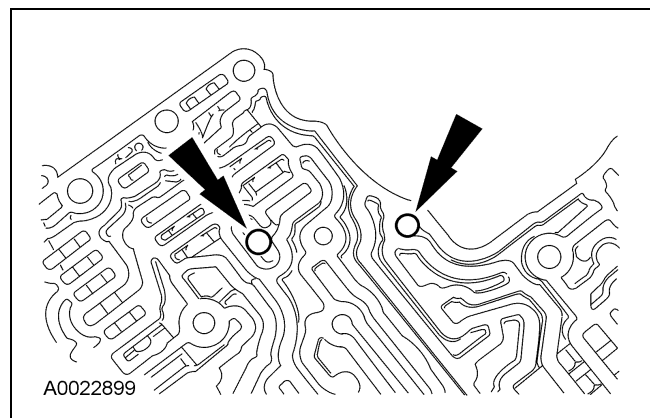
2. **NOTICE:** Do not stone, file or sand the valves. This will remove the anodized finish and may result in further main control or transmission damage.

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.

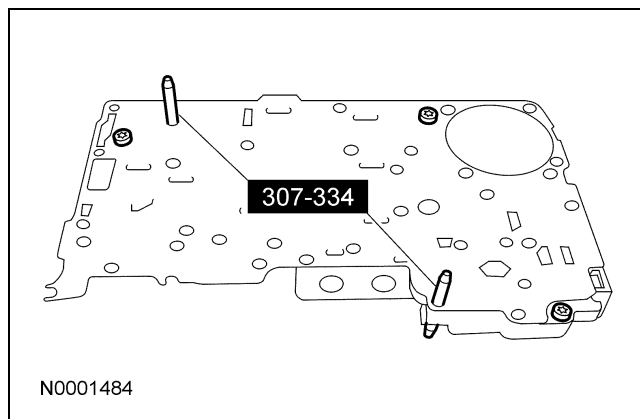


DISASSEMBLY AND ASSEMBLY (Continued)

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

Using the Valve Body Aligners, install a new main control valve body separator plate.

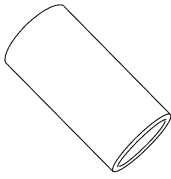
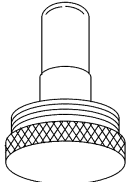
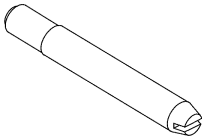
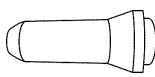
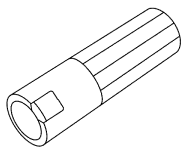
- Tighten to 7 Nm (62 lb-in).



DISASSEMBLY AND ASSEMBLY

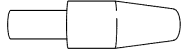
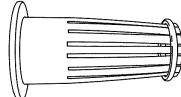
Fluid Pump

Special Tool(s)

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

(Continued)

Special Tool(s)

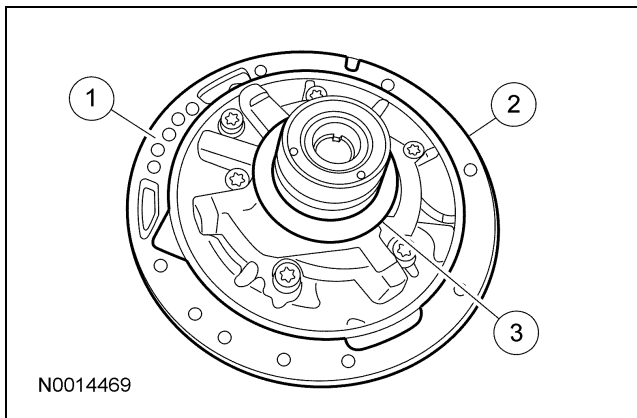
 ST2684-A	Transmission Fluid Pump Seal Aligner 307-451/1
 ST2686-A	Transmission Fluid Pump Seal Installer 307-451/3
 ST2685-A	Transmission Fluid Pump Seal Sizer 307-451/2

Material

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

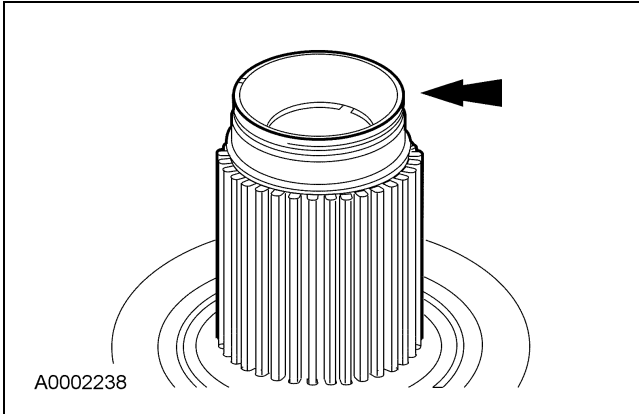
Disassembly

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 (square cut).
 - 3 Remove and tag the No. 1 thrust washer.

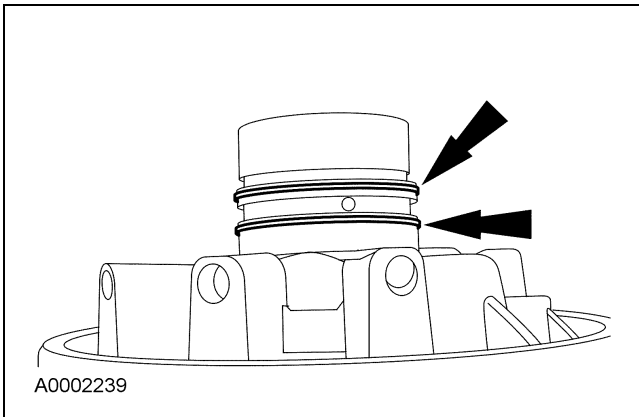


DISASSEMBLY AND ASSEMBLY (Continued)

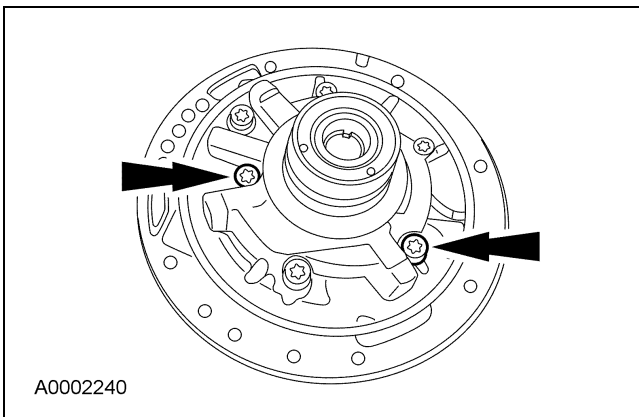
2. Remove the fluid pump support seal ring.



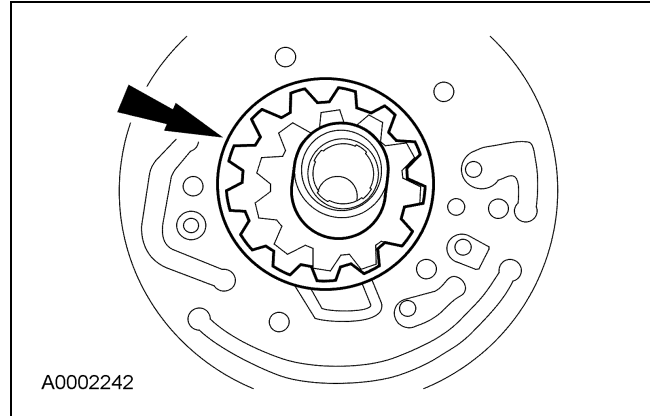
3. Remove the seal rings.



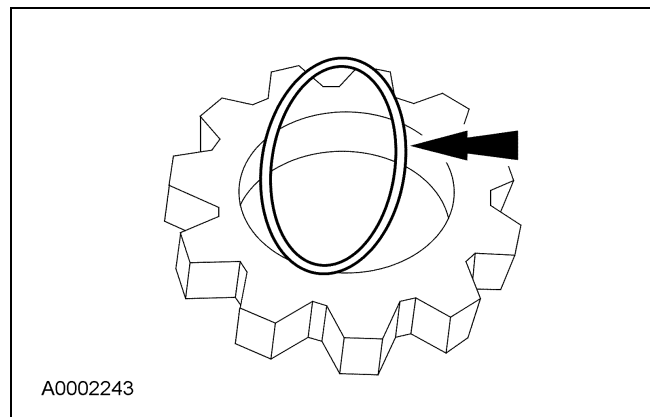
4. Remove the fluid pump housing.



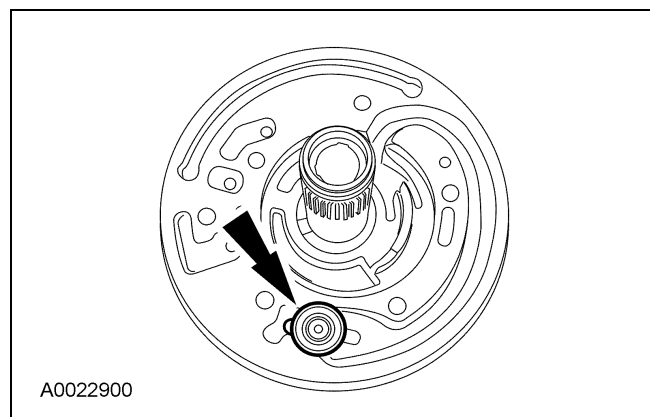
5. **NOTE:** A rough casting on the pump surface crescent is not a flaw.
NOTE: The fluid pump gears are part of the pump assembly and are not repaired separately.
 Remove the fluid pump gears.



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

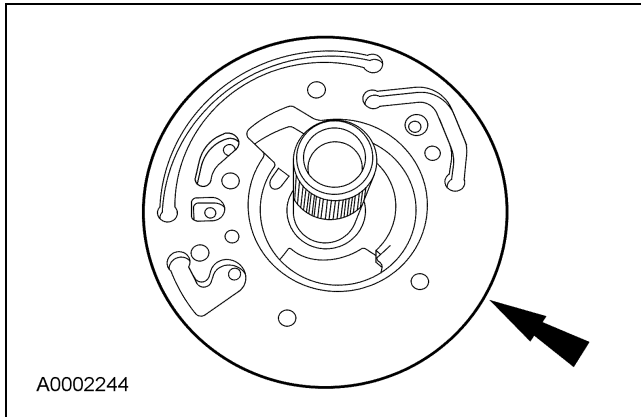


7. Remove and discard the valve.

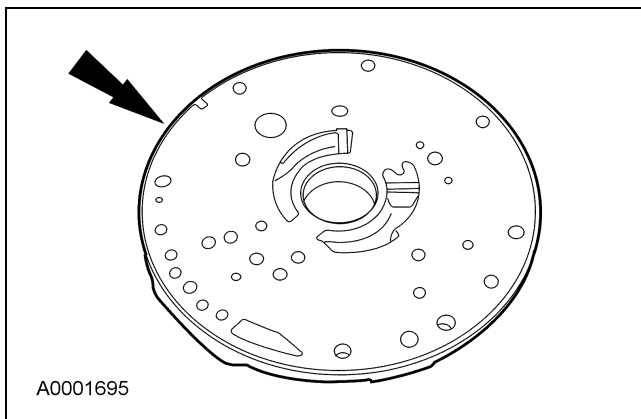


DISASSEMBLY AND ASSEMBLY (Continued)

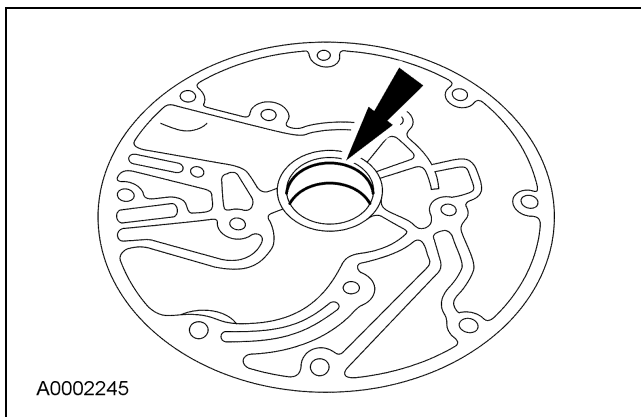
8. Inspect the Overdrive (O/D) pump.
 - Inspect the O/D pump support gear pockets for scoring and wear.
 - Clean and inspect the O/D and rear input shaft bushings.



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



10. Inspect the fluid pump to converter housing bushing.

**Assembly**

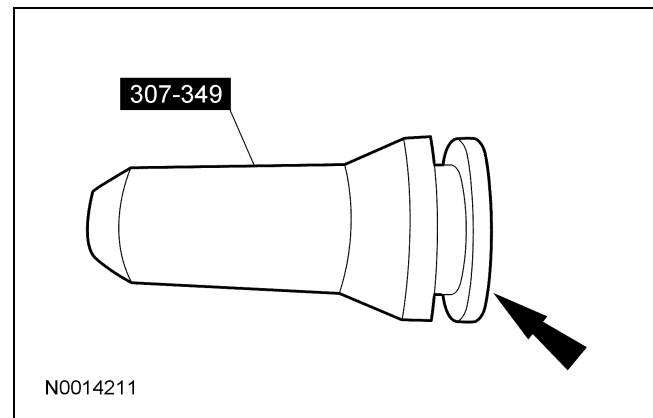
1. **NOTE:** Minor burrs and scoring may be removed with crocus cloth. If damage is found, install a new assembly.

Inspect the fluid pump components for the following:

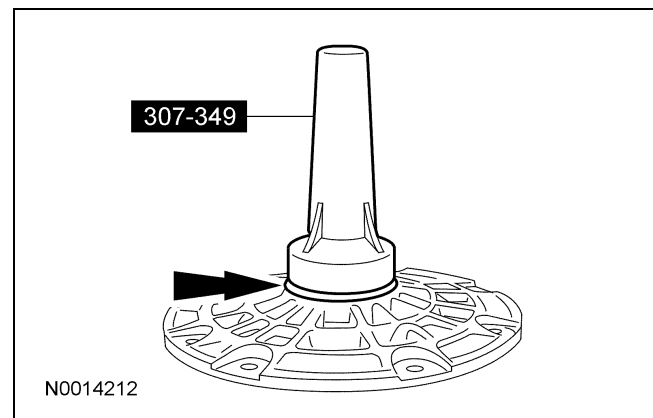
- Pump body and case for burrs.
- Fluid passages for obstructions.

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 Torque Converter Fluid Seal Installer.

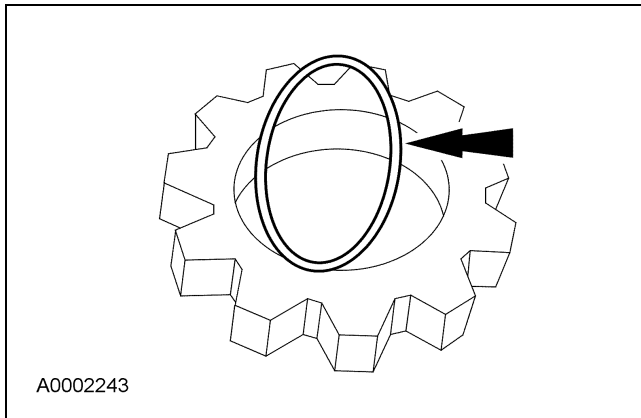


3. Using the Torque Converter Fluid Seal Installer, install the converter hub seal.

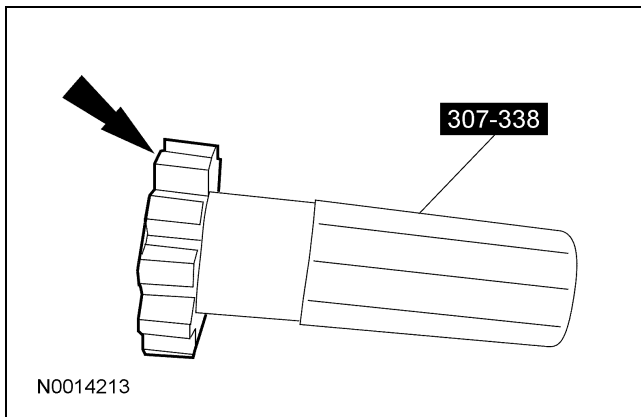


DISASSEMBLY AND ASSEMBLY (Continued)

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

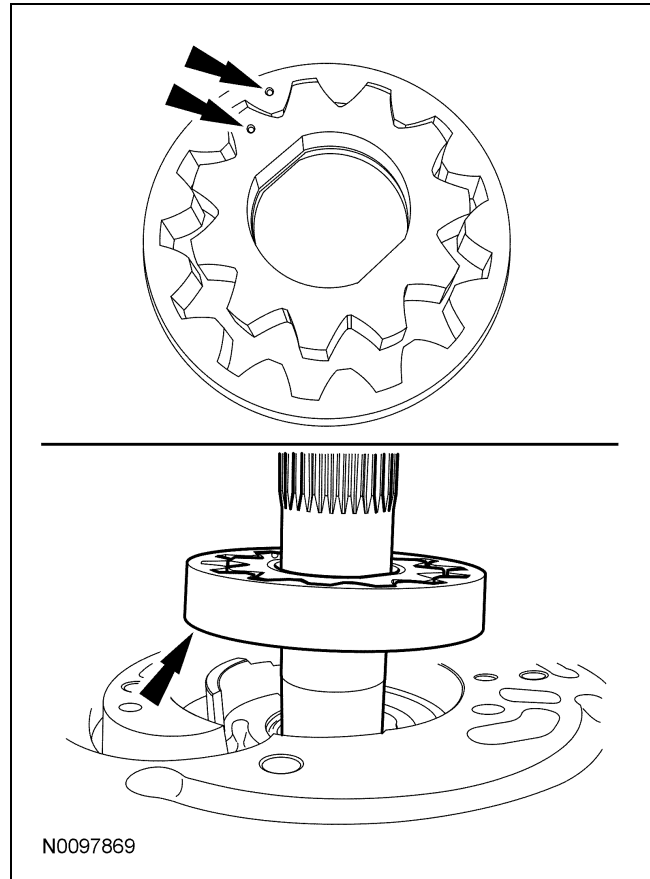


5. **NOTE:** Lubricate the Piston Seal Sizer with multi-purpose grease.
Using the Piston Seal Sizer, seat the O-ring seal in the pump gear.

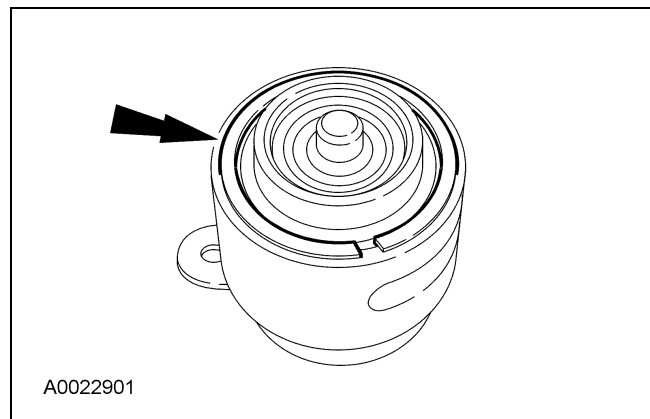


6. **NOTE:** The chamber on the inside edge of the small gear must be UP when in the pump housing gear pocket. The dimples on the gears must be facing DOWN when installed into the pump housing gear pocket.

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

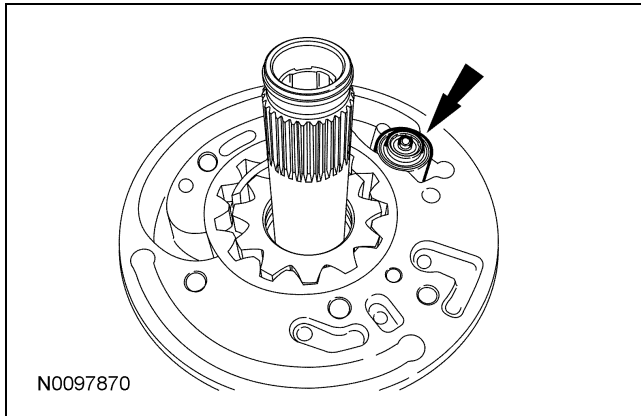


7. Install a new seal on the new valve.

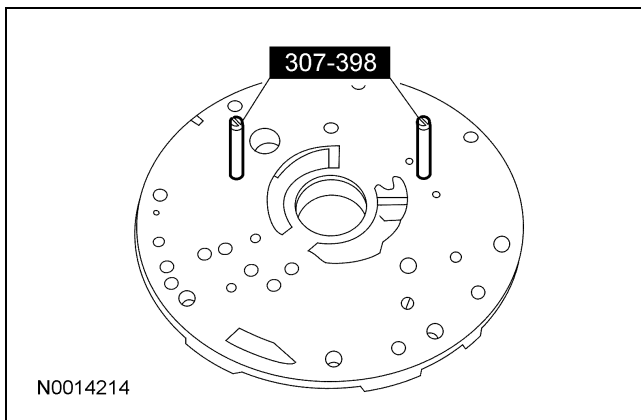


DISASSEMBLY AND ASSEMBLY (Continued)

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

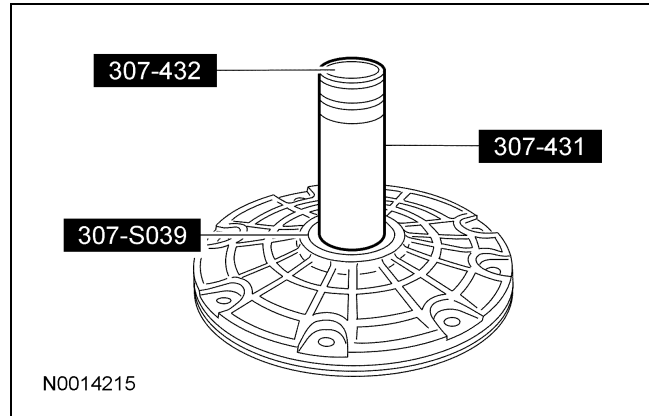


9. First, install the fluid pump adapter plate, then install the Transmission Pump Alignment Pins in their correct location.

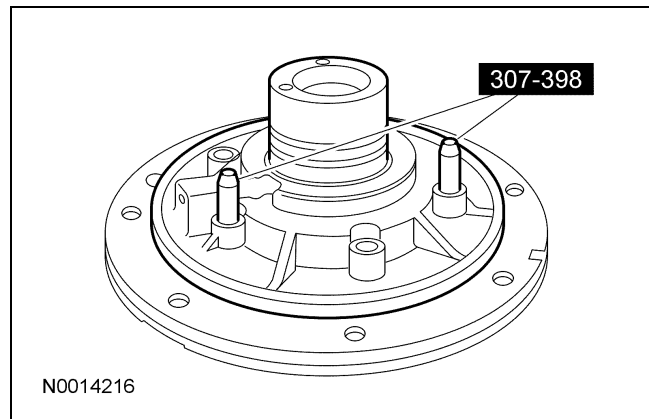


10. **NOTICE:** The Fluid Pump Alignment Set along with the Fluid Pump Handle Aligner and Fluid Pump Pilot Aligner must be used to correctly align the pump with the adapter plate to reduce gear noise, bushing failure and leakage.

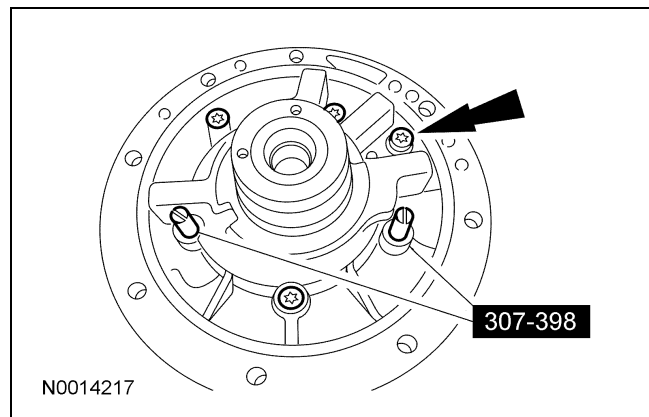
Using the Fluid Pump Alignment Set along with the Fluid Pump Handle Aligner and Fluid Pump Pilot Aligner, align the fluid pump to the adapter plate.



11. Using the Transmission Pump Alignment Pins, assemble the pump.

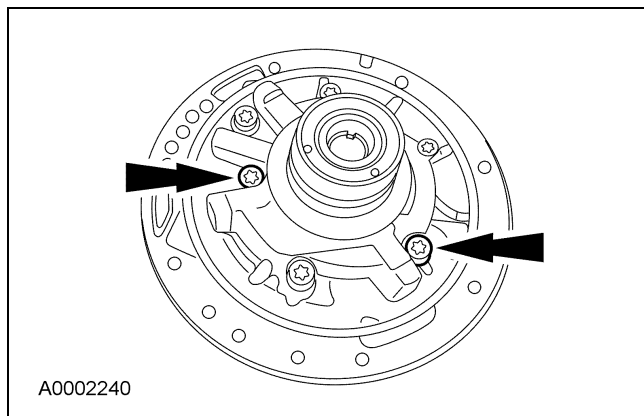


12. Loosely install the fluid pump housing screws in their correct location and remove the Transmission Pump Alignment Pins.



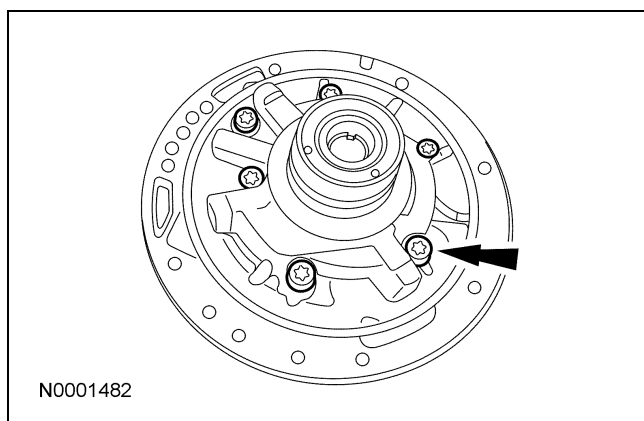
DISASSEMBLY AND ASSEMBLY (Continued)

13. Install the 2 remaining screws.

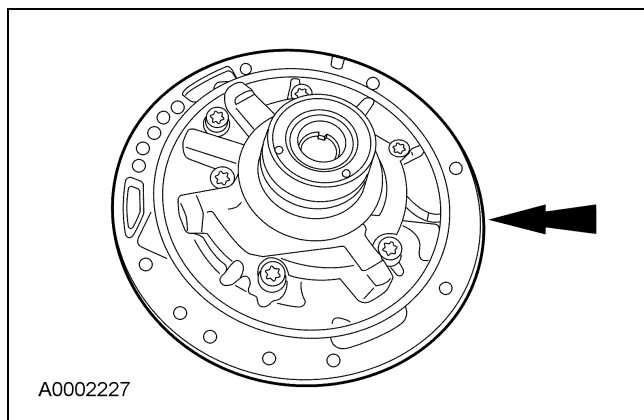


14. Tighten all of the fluid pump screws in a star pattern.

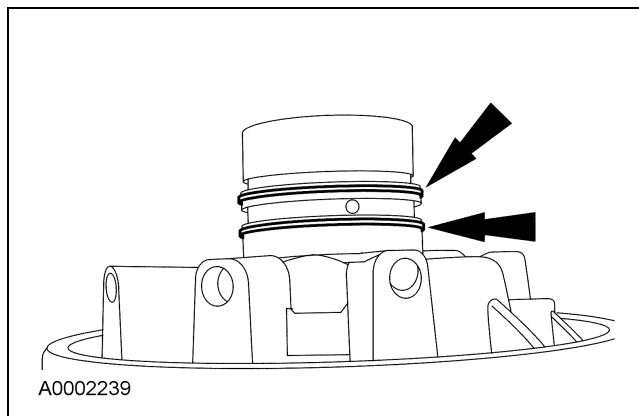
- Tighten to 22 Nm (16 lb-ft).



15. Install a new fluid pump seal.

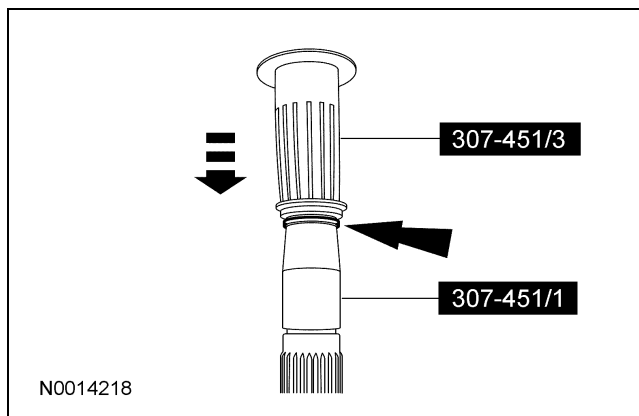


16. Install the 2 new seal rings.



17. **NOTICE:** Be careful not to overstretch the seal ring past the seal ring groove. Damage to the seal will occur.

Using the Transmission Fluid Pump Seal Aligner and the Transmission Fluid Pump Seal Installer, install the fluid pump seal ring.

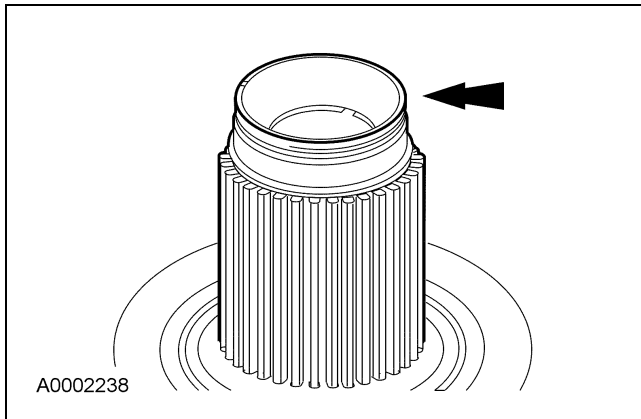


DISASSEMBLY AND ASSEMBLY (Continued)

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

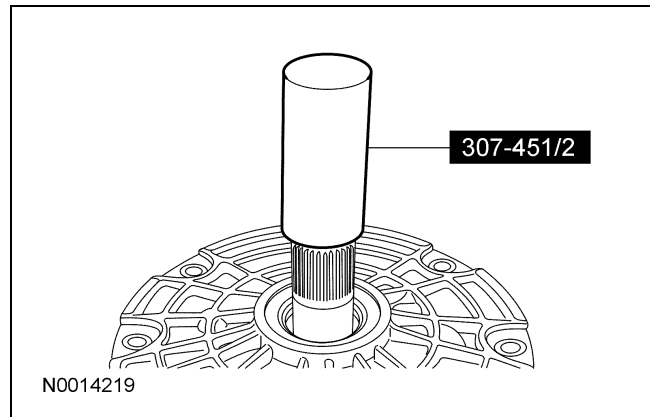
NOTE: Make sure seal ring grooves are clean and free of burrs. Make sure that the seal ring is seated into the groove.

Verify the seal ring is installed correctly.



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

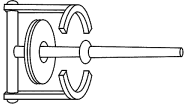
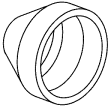
Using the Transmission Fluid Pump Seal Sizer, size the seal to the correct size. Leave the Transmission Fluid Pump Seal Sizer on the seal ring for 2 minutes to obtain the correct seal size.



DISASSEMBLY AND ASSEMBLY

Overdrive Brake and Coast Clutch Drum Assembly

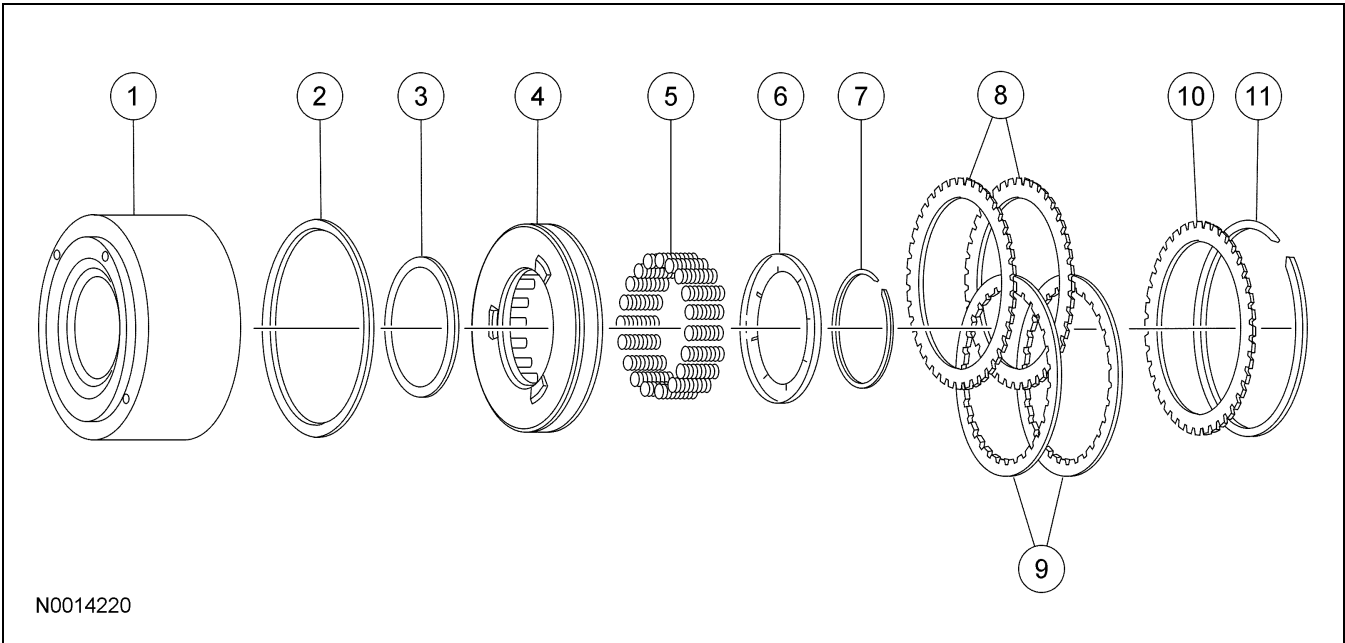
Special Tool(s)

 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 (O/D) Brake and Coast Clutch Drum Assembly

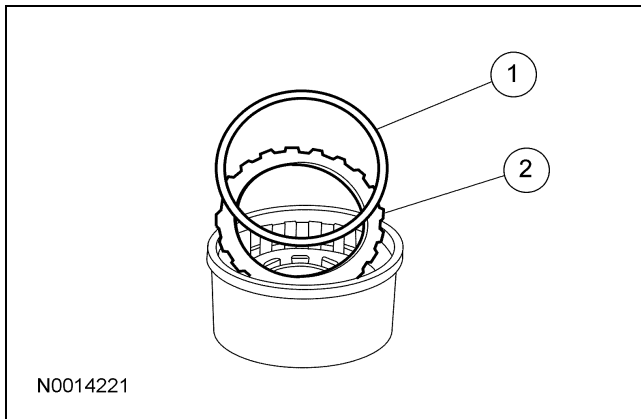


DISASSEMBLY AND ASSEMBLY (Continued)

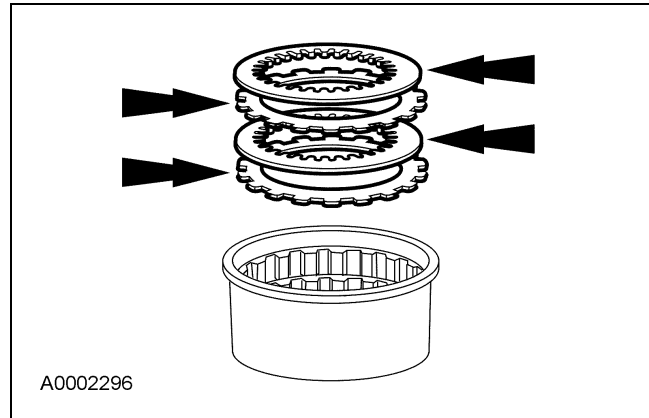
Item	Part Number	Description
1	7L669	Coast clutch drum
2	7A548	Overdrive (O/D) piston outer seal ring
3	7D404	O/D piston inner seal ring
4	7A262	O/D clutch piston
5	7A480	O/D piston spring (20 required)
6	7A527	Coast clutch piston spring retainer
7	E860125-S	Retaining ring
8	7B442	Coast clutch external 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.



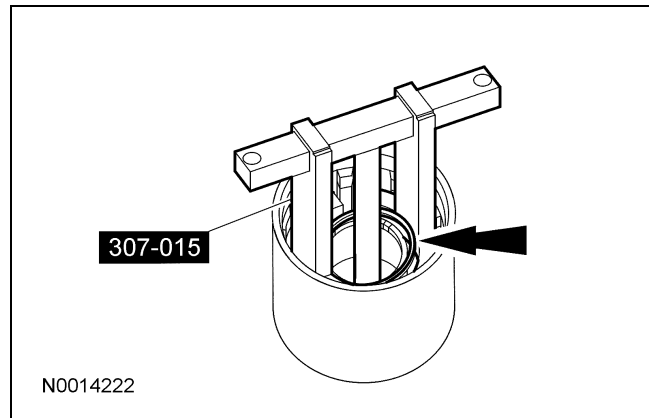
2. Remove the coast clutch disc pack.
 - Inspect for wear, install a new pack as necessary.



3. **⚠ WARNING:** While removing or installing the retaining ring, slowly release tool pressure on clutch piston springs. Failure to follow this instruction may cause the assembly to separate forcefully, resulting in serious personal injury.

NOTICE: Do not fully compress the Clutch Spring Compressor or damage to the spring retainer may occur.

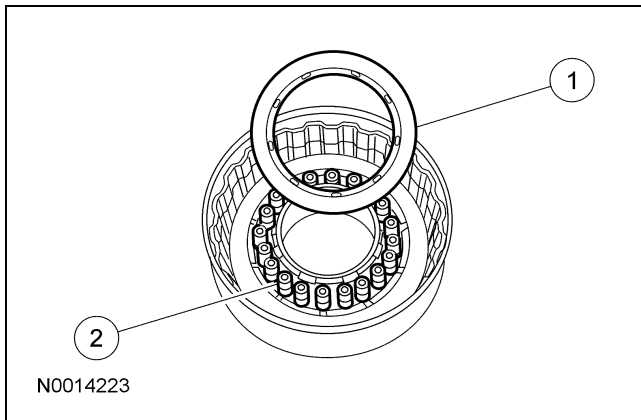
Using the Clutch Spring Compressor, remove the coast clutch piston retaining ring.



4. Relieve the coast clutch spring tension and remove the Clutch Spring Compressor.

DISASSEMBLY AND ASSEMBLY (Continued)

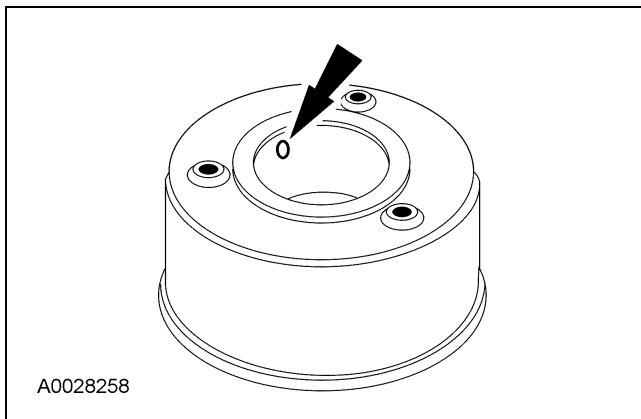
5. Remove the coast clutch piston springs.
 - 1 Remove the coast clutch piston retainer.
 - 2 Remove the clutch piston springs.



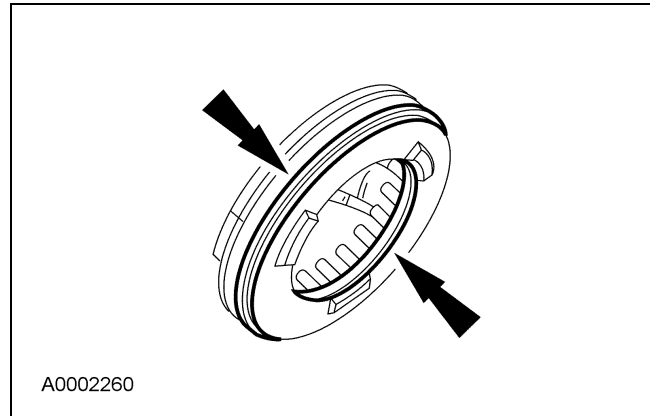
6.  **WARNING:** When using compressed air, never let air pressure exceed 138 kPa (20 psi) and always wear safety glasses. Compressed air may cause foreign material or parts to become airborne. Failure to follow this instruction may result in serious personal injury.

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.

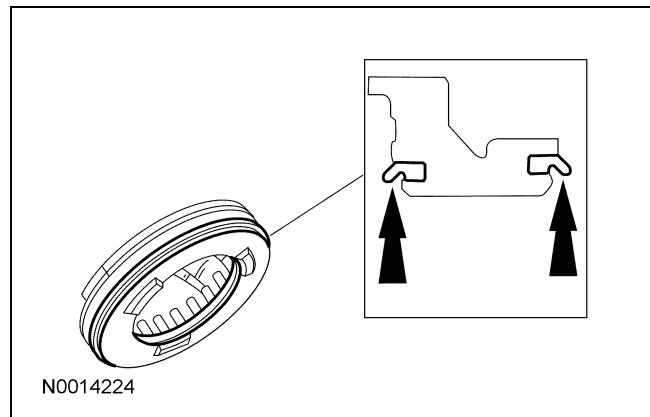


7. Remove and discard the coast clutch piston inner seal and the coast clutch piston outer seal.

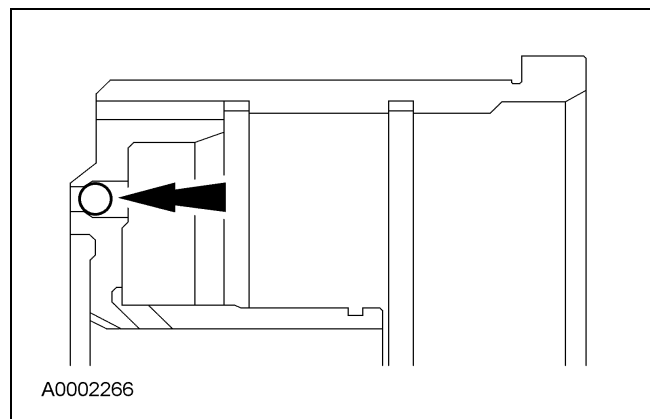
**Assembly**

1. **NOTICE:** 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.

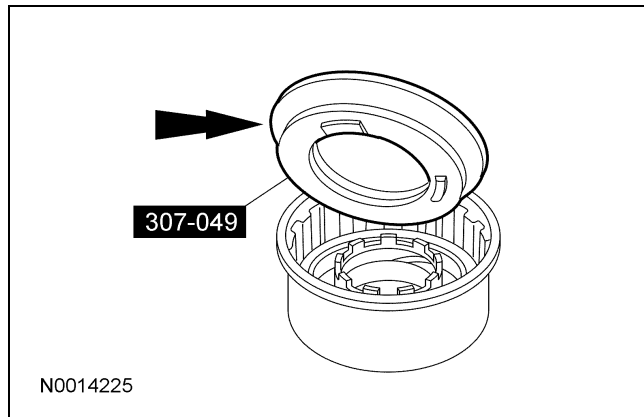


DISASSEMBLY AND ASSEMBLY (Continued)

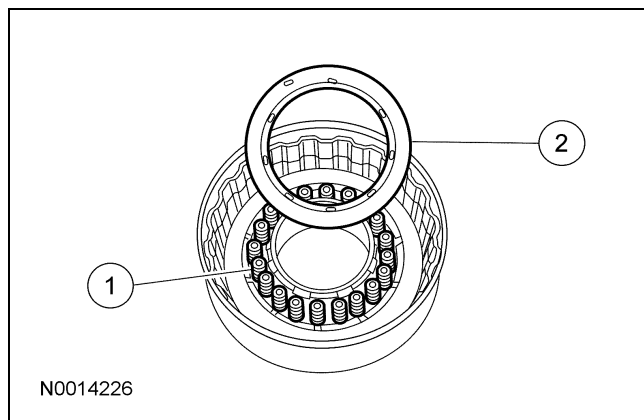
3. **NOTICE:** Care must be taken to prevent damage to the seals during installation.

Using the Piston Seal Protector, install the coast clutch piston.

- Lubricate the seals with transmission fluid.

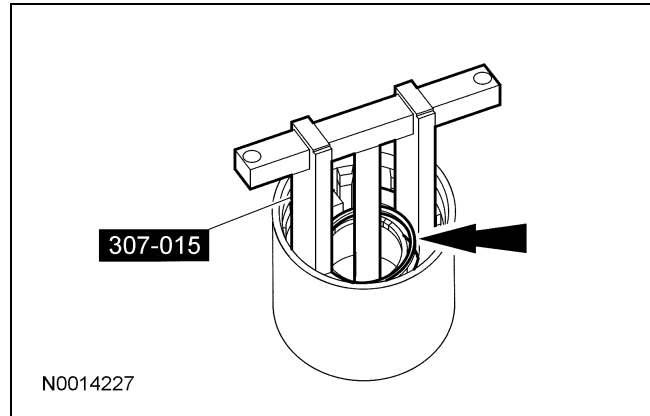


4. Install the coast clutch piston springs.
- 1 Install the coast clutch piston springs.
 - 2 Install the coast clutch spring retainer.



5. **NOTICE:** Do not fully compress the Clutch Spring Compressor or damage to the coast clutch piston spring retainer may occur.

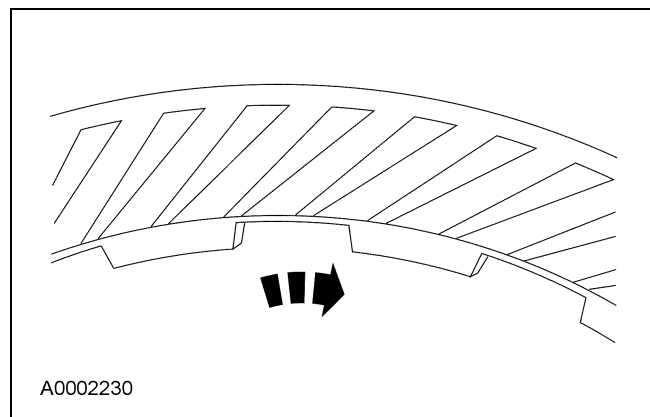
Using the Clutch Spring Compressor, install the coast clutch piston spring retainer ring.



6. **NOTICE:** Coast clutch friction plates are directional and must be installed with grooves clockwise (ID to OD). The word TOP should face up, otherwise transmission damage can occur.

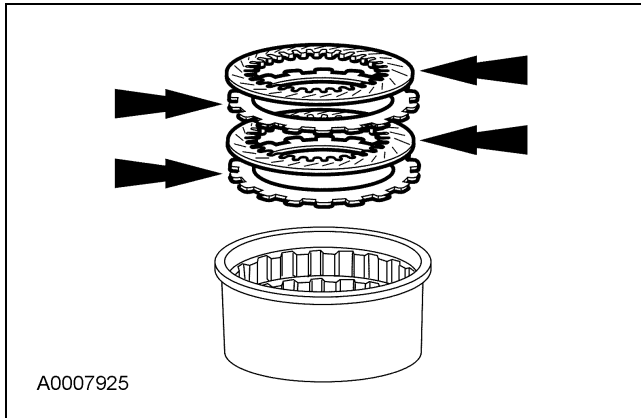
NOTICE: If new clutch plates are being used, they should be soaked in automatic transmission fluid before assembly, otherwise transmission damage can occur.

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 (Continued)

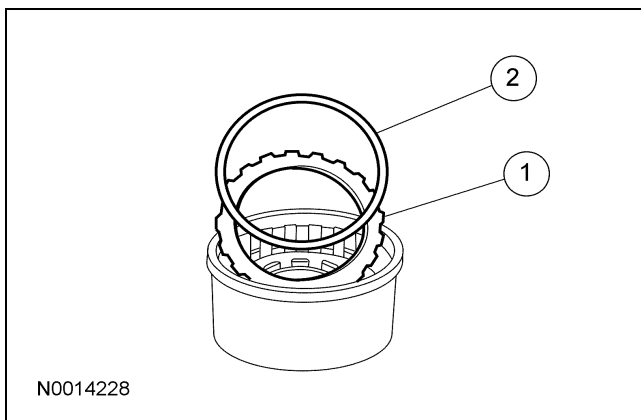
7. Install the 2 steel clutch plates and 2 friction clutch plates in alternating order starting with a steel clutch plate.



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

Install the coast clutch pressure plate.

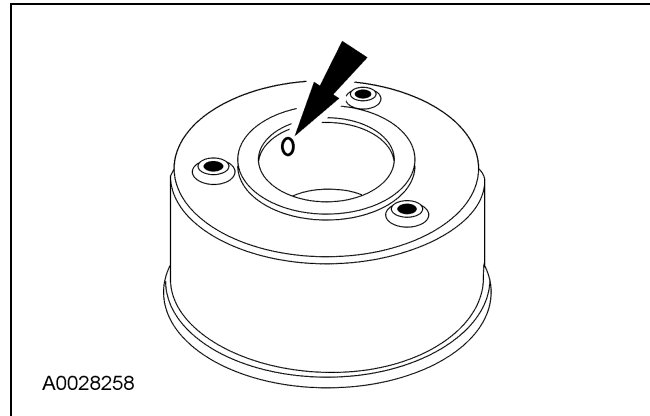
- 1 Install the coast clutch pressure plate.
- 2 Install the original coast clutch retaining ring.



9. **WARNING:** When using compressed air, never let air pressure exceed 138 kPa (20 psi) and always wear safety glasses. Compressed air may cause foreign material or parts to become airborne. Failure to follow this instruction may result in serious personal injury.

Air check the assembly.

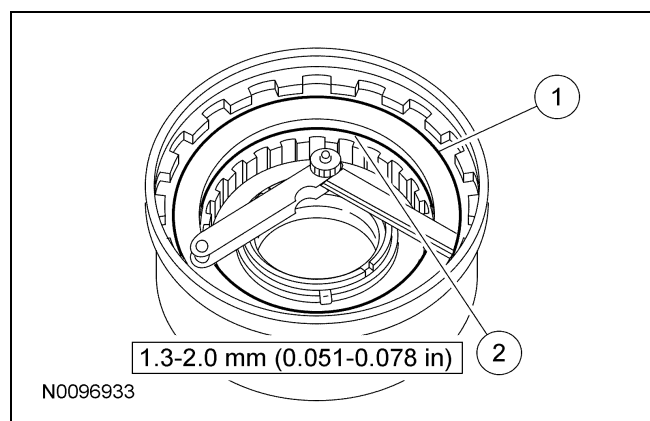
- Apply air pressure to the hole in the drum while blocking the other hole.



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.

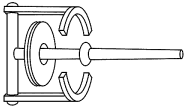
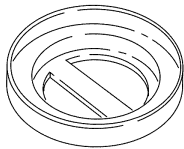
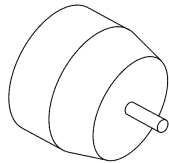
Part Number	Thickness		Diameter	
	mm	Inch	mm	Inch
E860126-S	1.37	0.053	130.1	5.122
E860127-S	1.73	0.068	130.1	5.122
E860128-S	2.08	0.081	130.1	5.122
E860129-S	2.44	0.096	130.1	5.122



DISASSEMBLY AND ASSEMBLY

Forward Clutch

Special Tool(s)

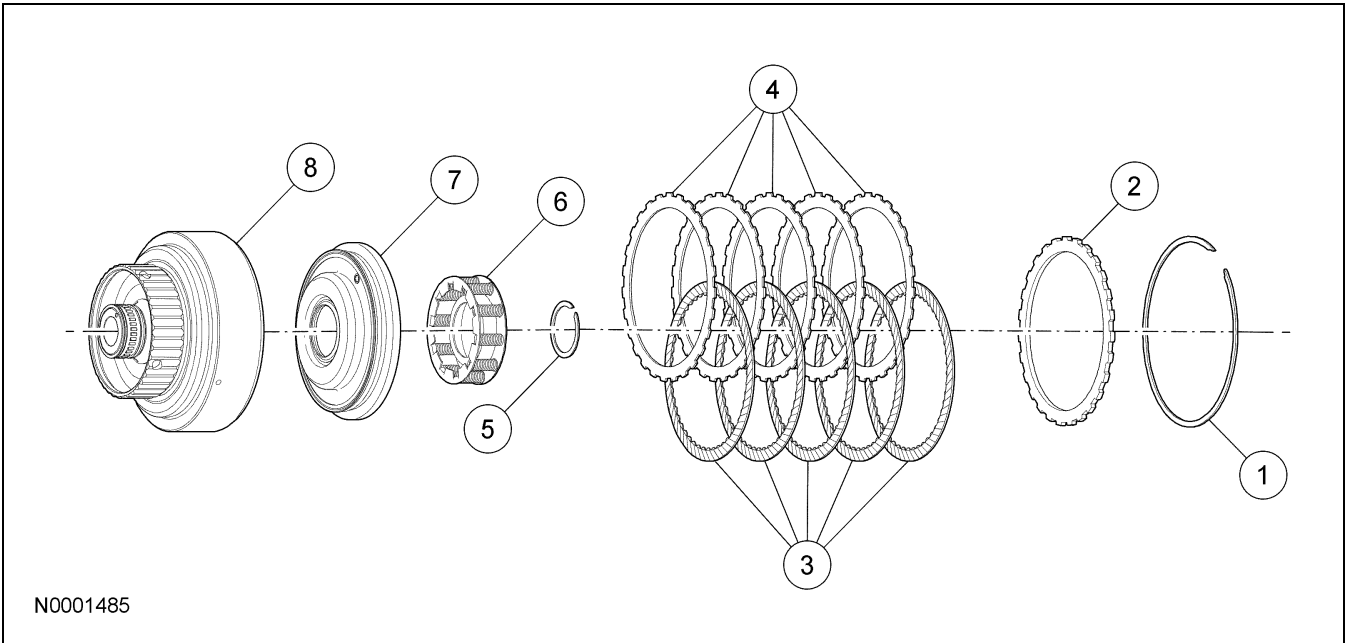
 ST1190-A	Compressor, Clutch Spring 307-015 (T65L-77515-A)
 ST2534-A	Gauge, Forward Clutch Seal 307-434
 ST1813-A	Protector, Piston Seal 307-051 (T74P-77548-A)

Material

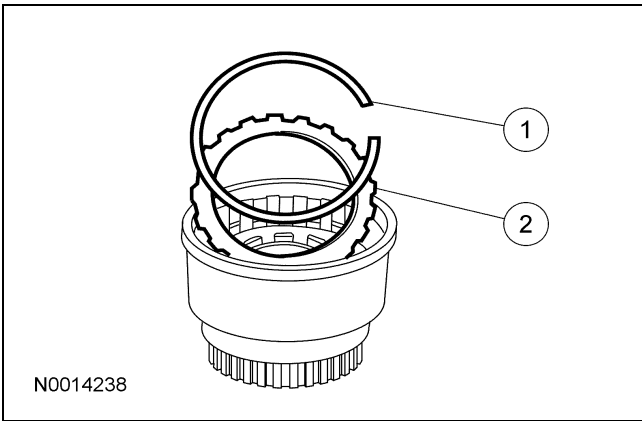
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

DISASSEMBLY AND ASSEMBLY (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

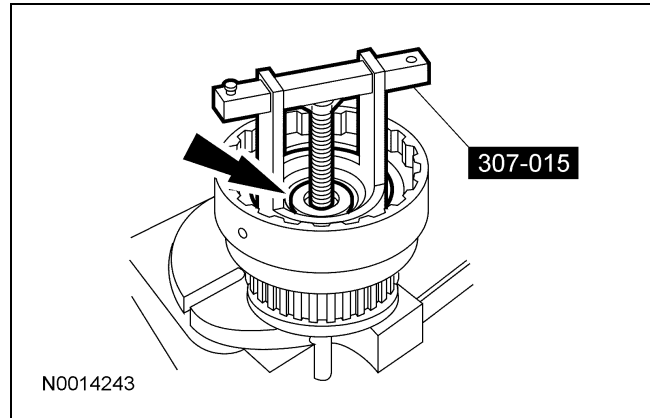
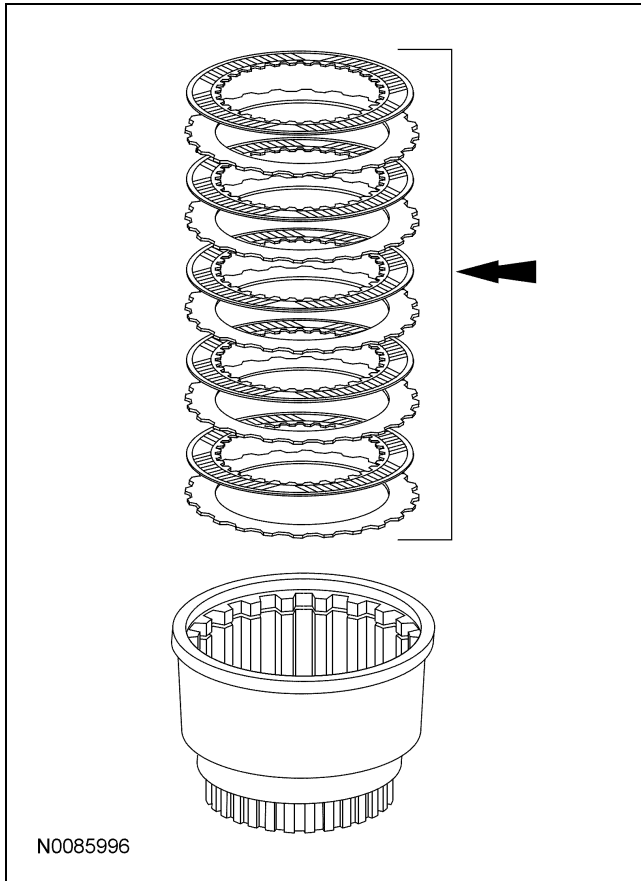


Disassembly

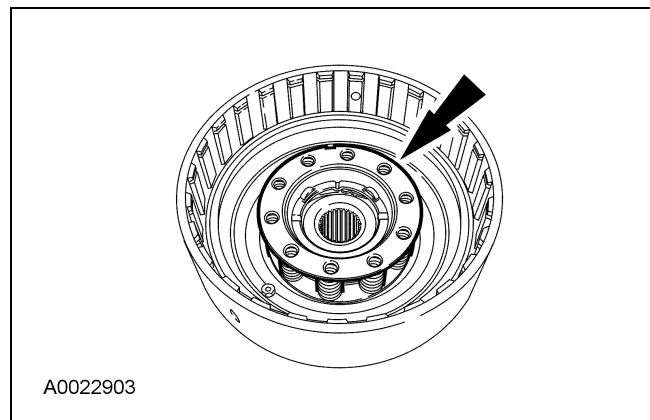
1. Remove the pressure plate.
 - 1 Remove the forward clutch retaining ring.
 - 2 Remove the pressure plate.

DISASSEMBLY AND ASSEMBLY (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:** While removing or installing the retaining ring, slowly release tool pressure on clutch piston springs. Failure to follow this instruction may cause the assembly to separate forcefully, resulting in serious personal injury.

NOTICE: Do not fully depress the Clutch Spring Compressor or damage to the spring retainer may occur.

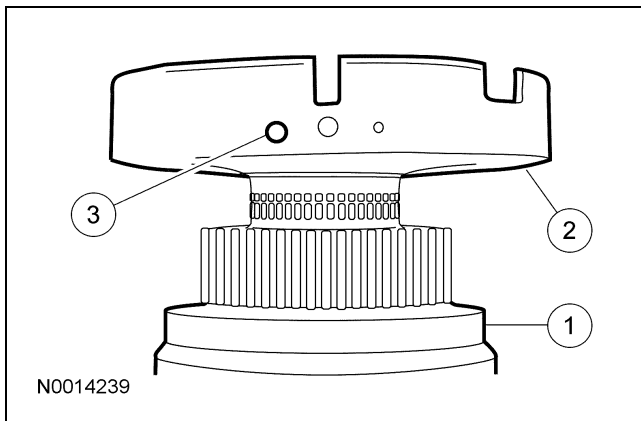
Using the Clutch Spring Compressor, remove the forward clutch piston retaining ring.

DISASSEMBLY AND ASSEMBLY (Continued)

6.  **WARNING:** When using compressed air, never let air pressure exceed 138 kPa (20 psi) and always wear safety glasses. Compressed air may cause foreign material or parts to become airborne. Failure to follow this instruction may result in serious personal injury.

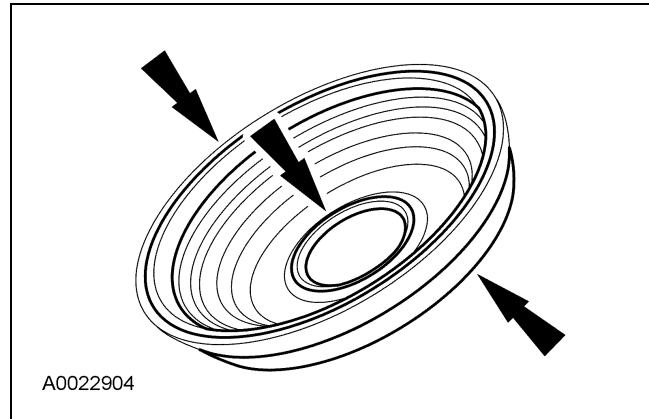
Remove the forward clutch piston.

- 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.

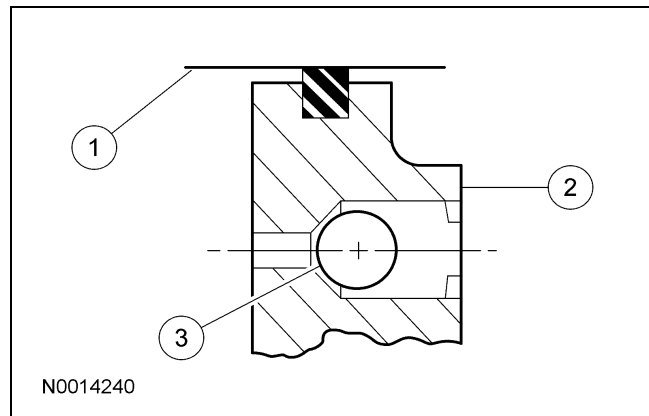
**Assembly**

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.



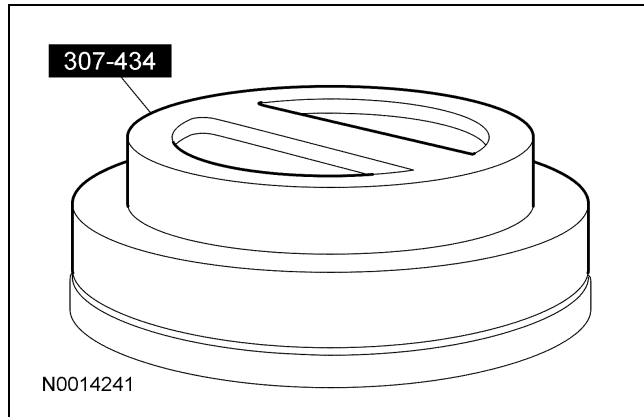
3. Inspect the forward clutch drum assembly.
 - 1 Inspect the forward clutch cylinder surfaces for scores or burrs.
 - 2 Inspect the forward clutch piston for scores or burrs.
 - 3 Verify the check ball is free to move in the piston.



DISASSEMBLY AND ASSEMBLY (Continued)

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

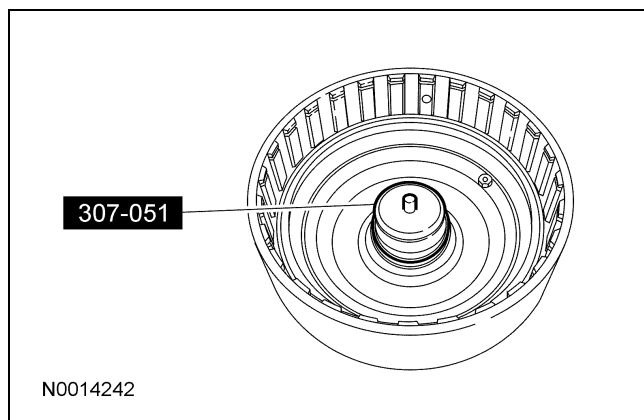
Install the Forward Clutch Seal Gauge on the forward clutch piston.



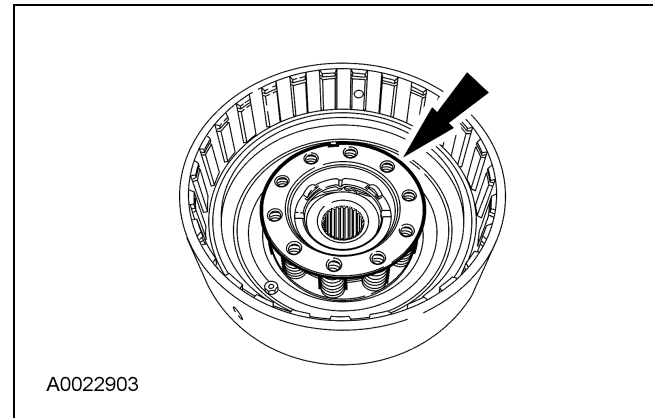
5. **NOTICE:** Care must be taken to prevent damage to the seals.

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

Using the Piston Seal Protector, install the forward clutch piston assembly into the forward clutch cylinder.

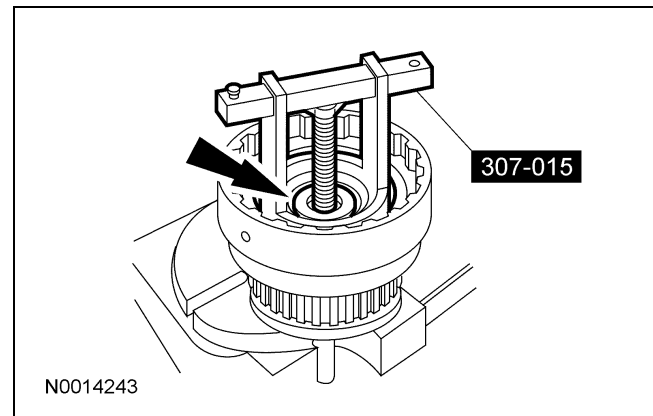


6. Install the forward clutch piston spring assembly.



7. **NOTICE:** Do not fully depress the Clutch Spring Compressor or damage to the spring retainer may occur.

Using the Clutch Spring Compressor, install the forward clutch piston spring retaining ring.

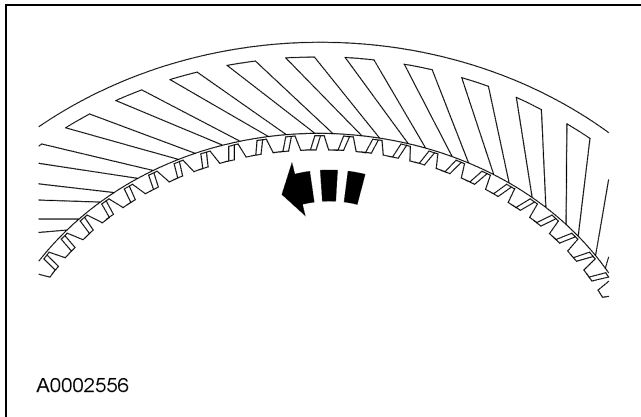


DISASSEMBLY AND ASSEMBLY (Continued)

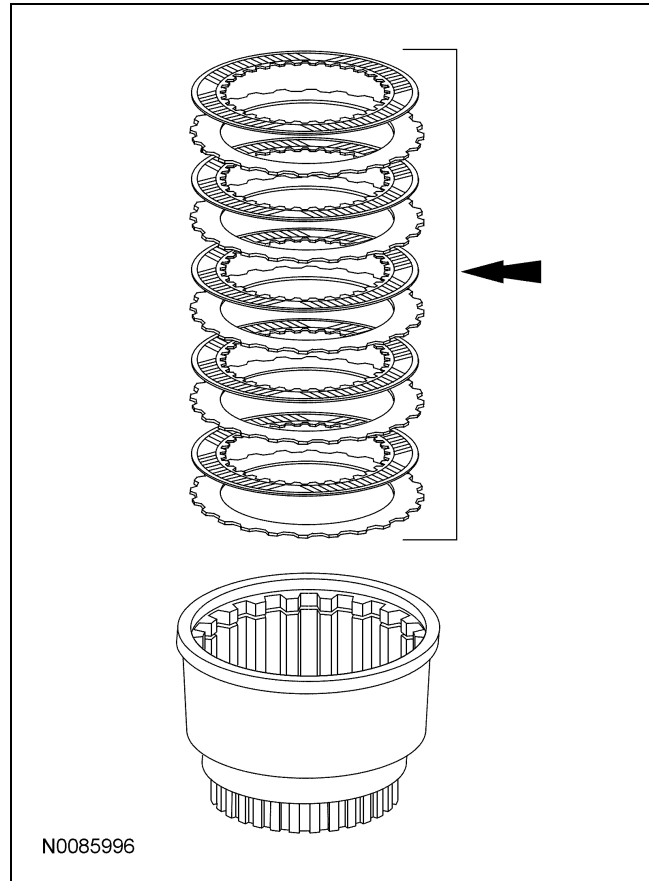
8. **NOTICE:** The forward clutch friction plates are directional and must be installed with grooves pointing counterclockwise, otherwise transmission damage can occur.

NOTICE: If new plates are used, they should be soaked in automatic transmission fluid before assembly, otherwise transmission damage can occur.

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



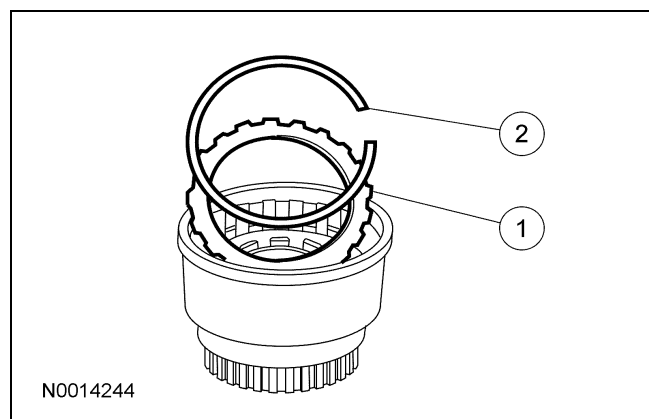
9. Install the steel clutch plates and friction clutch plates in alternating order starting with a steel clutch plate.



10. **NOTE:** 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.

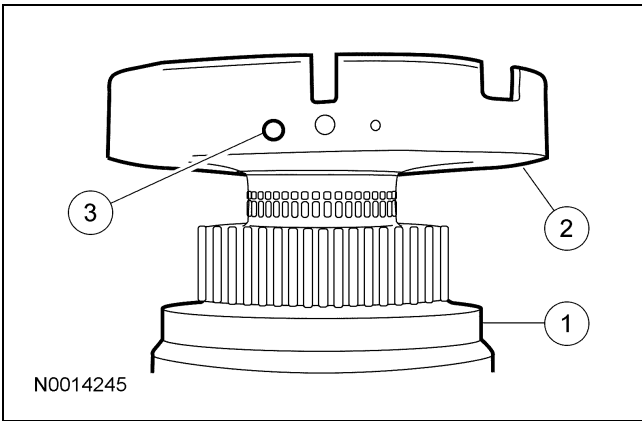


DISASSEMBLY AND ASSEMBLY (Continued)

11.  **WARNING:** When using compressed air, never let air pressure exceed 138 kPa (20 psi) and always wear safety glasses. Compressed air may cause foreign material or parts to become airborne. Failure to follow this instruction may result in serious personal injury.

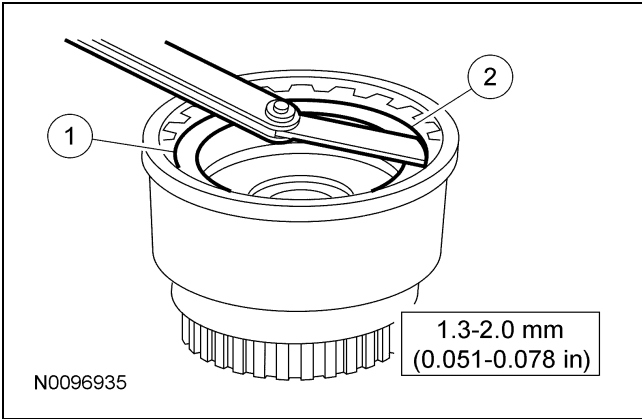
Air check the forward clutch piston.

- 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.



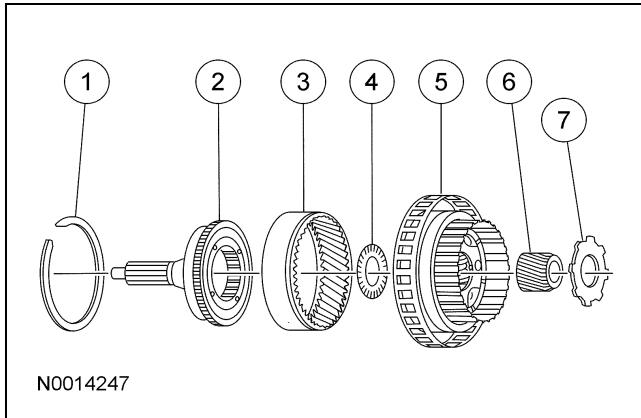
12. Check the forward clutch disc pack free play.
- 1 Press down on the forward clutch disc pack.
 - 2 Using a feeler gauge, check the gap between the forward clutch retaining ring and the forward clutch pressure plate.
- If the clearance is not within specifications, install the correct size retaining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

Part Number	Thickness		Diameter	
	mm	Inch	mm	Inch
XW4Z-7D483-AB	1.73	0.068	141.45	5.568
XW4Z-7D483-AC	2.08	0.081	141.45	5.568
XW4Z-7D483-AD	2.44	0.096	141.45	5.568



DISASSEMBLY AND ASSEMBLY

Overdrive Planetary and One-Way Clutch Assembly



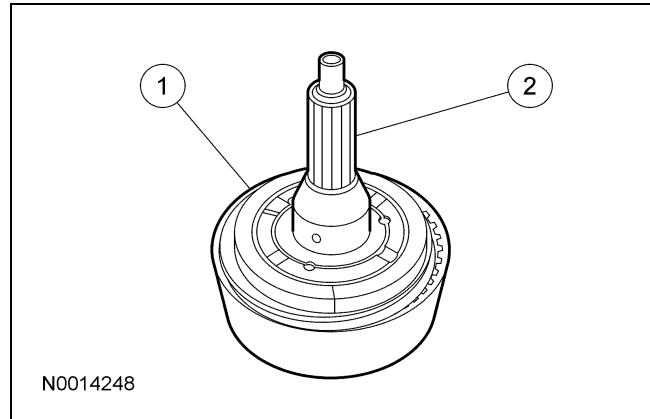
Item	Part Number	Description
1	W702037	Retaining ring
2	7A658	Center shaft
3	7A153	Overdrive (O/D) ring gear
4	7L495	No. 2 O/D planetary thrust bearing
5	7B446	O/D planetary gear carrier assembly
6	7D063	O/D sun gear
7	7660	Coast clutch adapter

Disassembly

- NOTE:** The Overdrive (O/D) One-Way Clutch (OWC) is serviced with the center shaft assembly.

Remove the center shaft from the O/D ring gear.

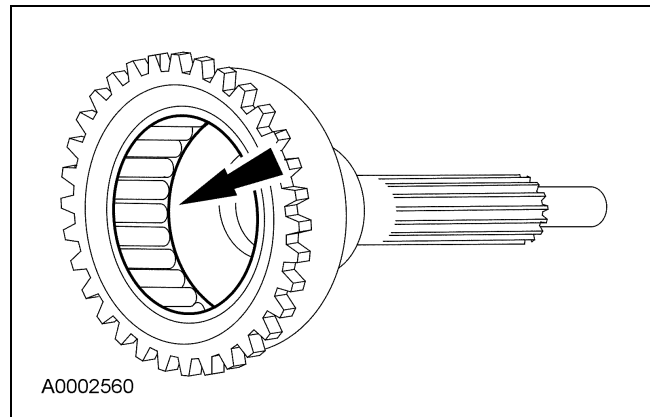
- 1 Remove the O/D center shaft retaining ring.
- 2 While rotating counterclockwise remove the center shaft from the ring gear.



- 2. NOTICE:** Do not remove the Overdrive (O/D) One-Way Clutch (OWC). Damage to the clutch may occur if it is removed.

Clean and inspect the O/D OWC and center shaft.

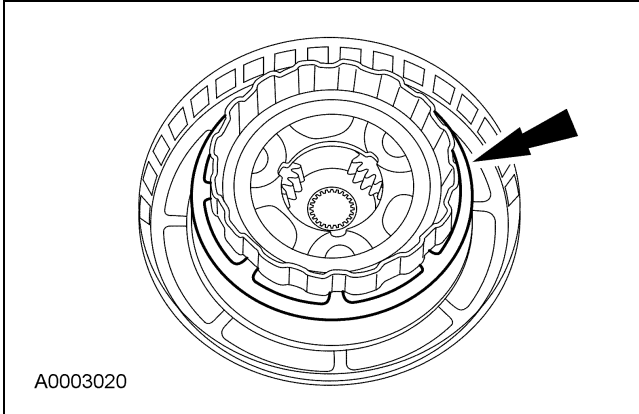
- Inspect for cracks in the roller cage and wear on the roller clutch, and the press fit of the OWC to the center shaft.



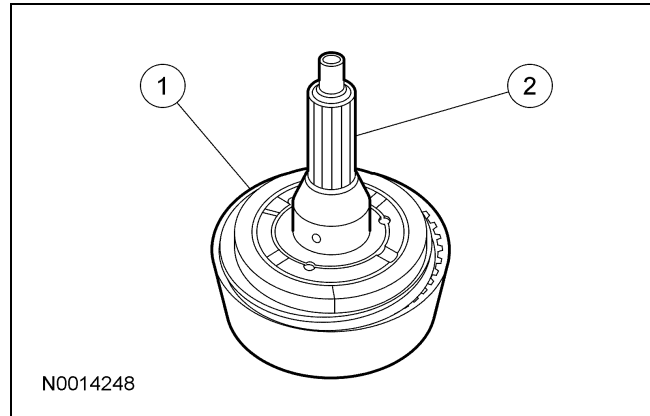
DISASSEMBLY AND ASSEMBLY (Continued)

3. Inspect the OWC.

- Temporarily insert the O/D planetary gear carrier assembly into the OWC rollers for verification of the OWC.
- The planetary gear must rotate counterclockwise and hold when rotated clockwise.
- Remove the planetary gear carrier assembly.

**Assembly**

1. Install the center shaft and OWC.
 - 1 Install the center shaft and OWC.
 - 2 Install the center shaft retaining ring.



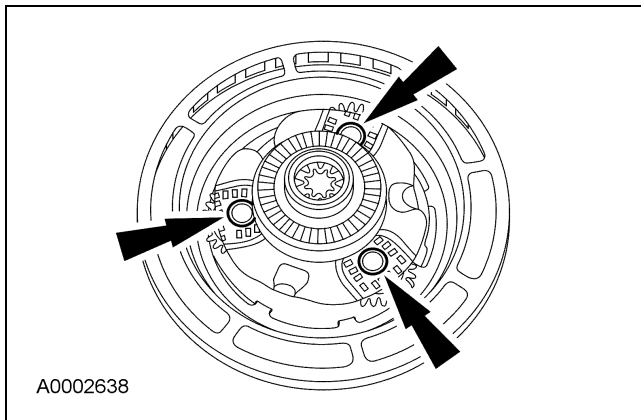
DISASSEMBLY AND ASSEMBLY

Overdrive Planetary Gears

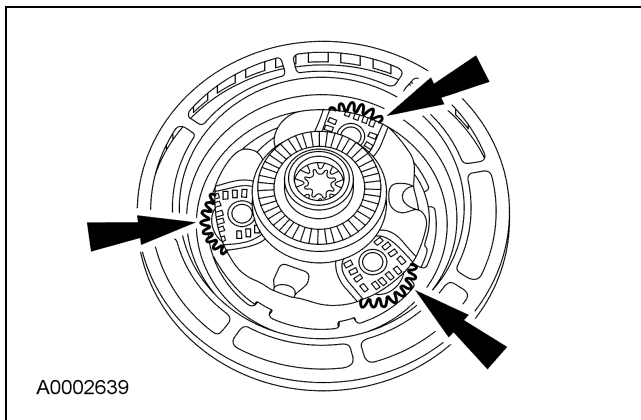
Disassembly

1. **NOTE:** Individual parts of the Overdrive (O/D) planetary assembly are not serviceable.

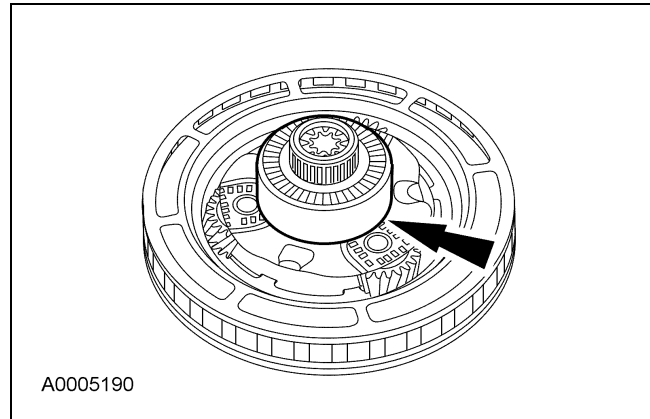
Before installing a O/D planetary assembly, the shaft retaining pins should be checked for adequate staking. Check the pins and shafts in the O/D planetary assemblies for loose fit and/or complete disengagement. Install a new O/D planetary assembly if necessary.



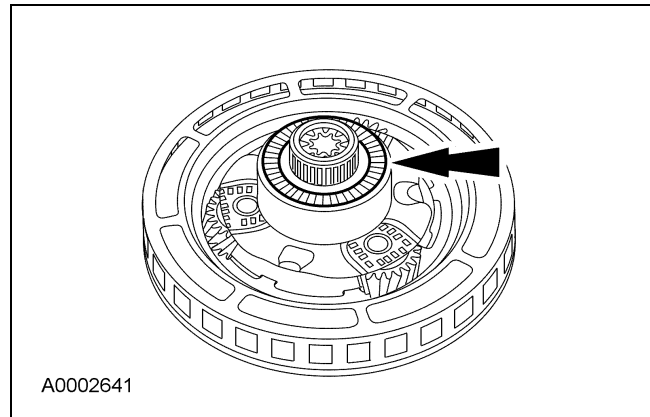
2. Inspect the pinion gears for damaged or excessively worn teeth and for free rotation.



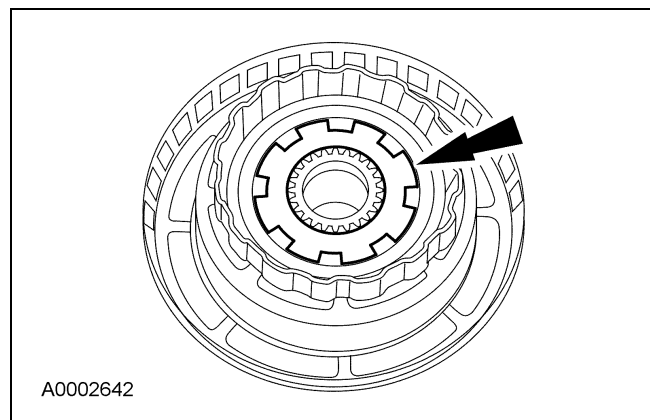
3. Inspect the O/D One-Way Clutch (OWC) inner race and the inner and outer races for scored or damaged surface areas where the rollers contact the races.



4. Remove and inspect the No. 2 O/D planetary thrust bearing on the nose of the O/D planetary gear assembly.

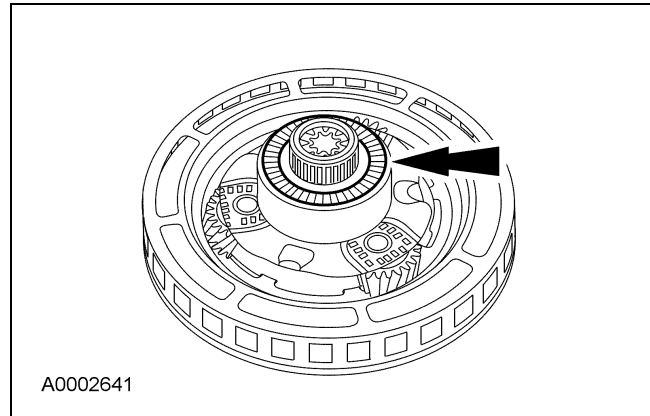
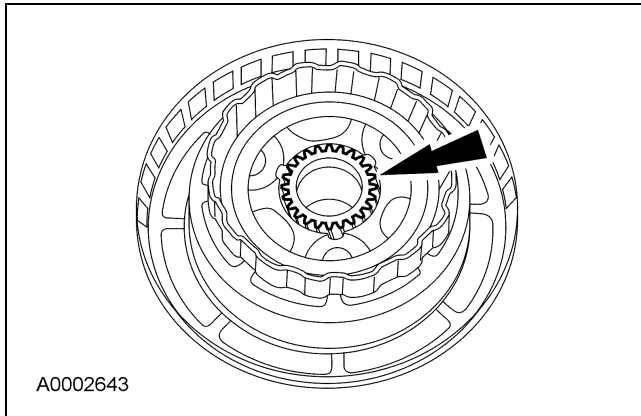


5. **NOTE:** Inspect the sun gear for damaged or worn teeth.
Remove the coast clutch-to-O/D carrier adapter.



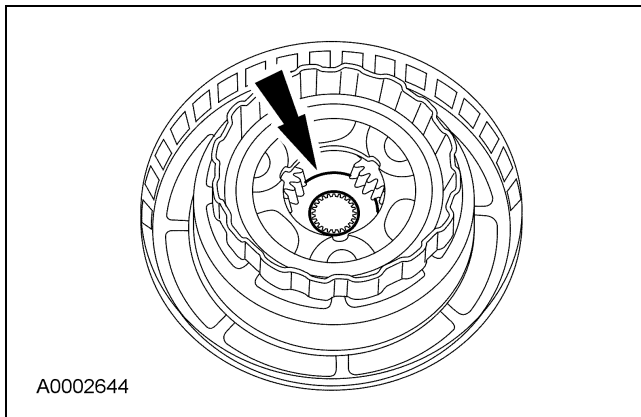
DISASSEMBLY AND ASSEMBLY (Continued)

6. Remove and inspect the O/D sun gear.

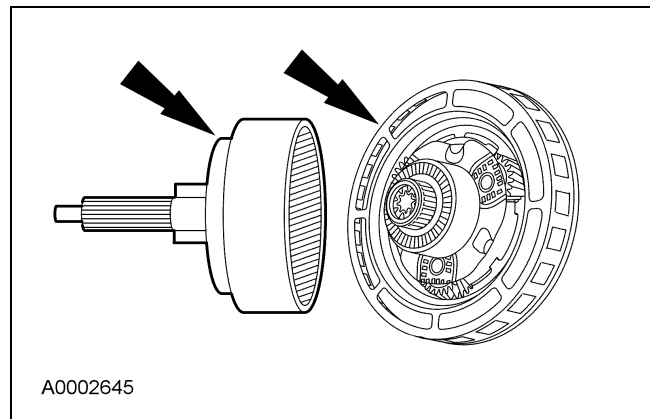


7. **NOTICE:** Do not attempt to remove the No. 12 bearing from behind the pinion gears or transmission damage can occur.

Inspect the No. 12 bearing for damage.



2. Install the O/D planetary gear carrier into the center shaft and O/D.

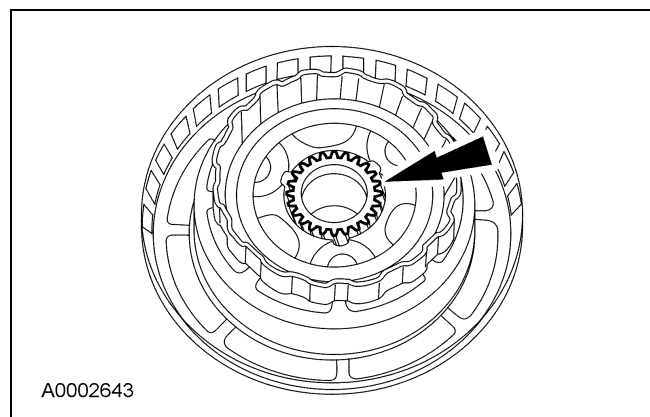


3. **NOTE:** Make sure that the No. 12 bearing is in place in the O/D planetary prior to installing the O/D sun gear.

Install the O/D sun gear with the recessed gear teeth facing toward the adapter.

Assembly

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

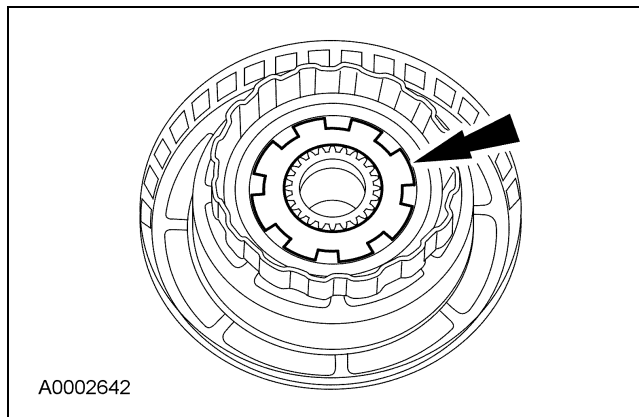


DISASSEMBLY AND ASSEMBLY (Continued)

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

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

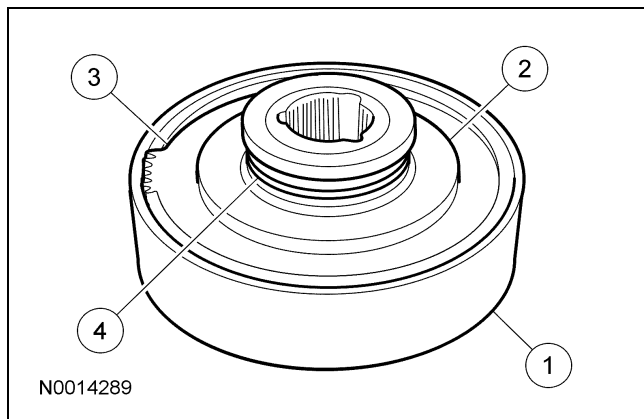
Install the coast clutch-to-O/D carrier adapter.



DISASSEMBLY AND ASSEMBLY

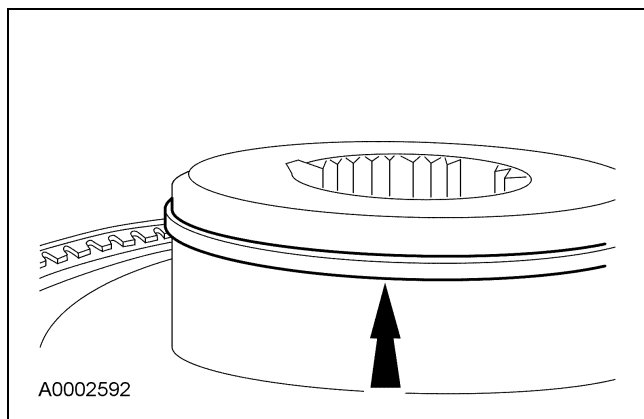
Output Shaft Ring Gear and Hub Shaft Assembly

Disassembly

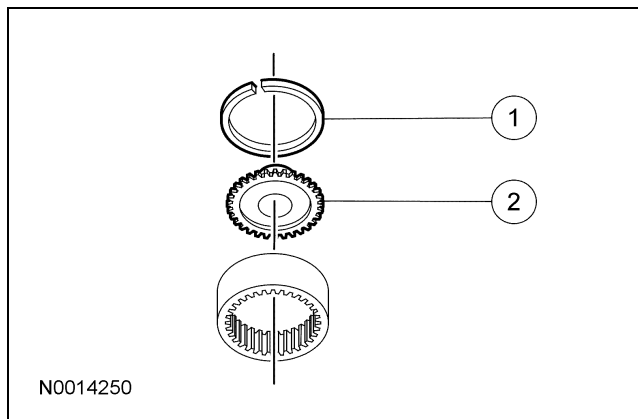


Item	Part Number	Description
1	7A153	Output shaft ring gear
2	7D164	Output shaft hub
3	7C122	Retaining ring
4	7D019	Output shaft hub seal

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.

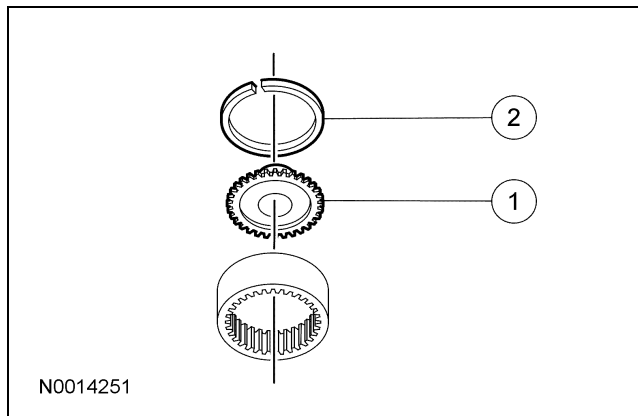


3. Remove the output shaft ring gear from the output shaft hub.
 - 1 Remove the retaining ring.
 - 2 Remove the output shaft ring gear.

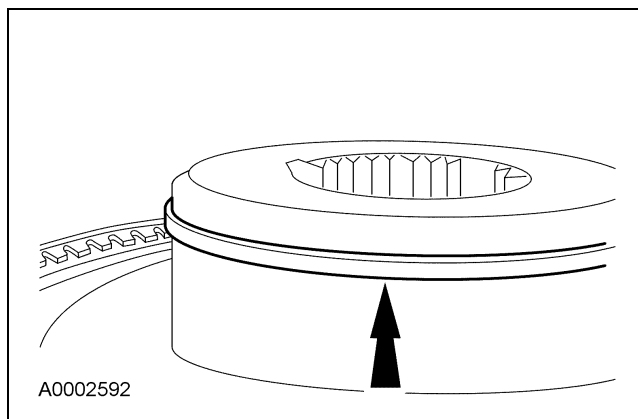


Assembly

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



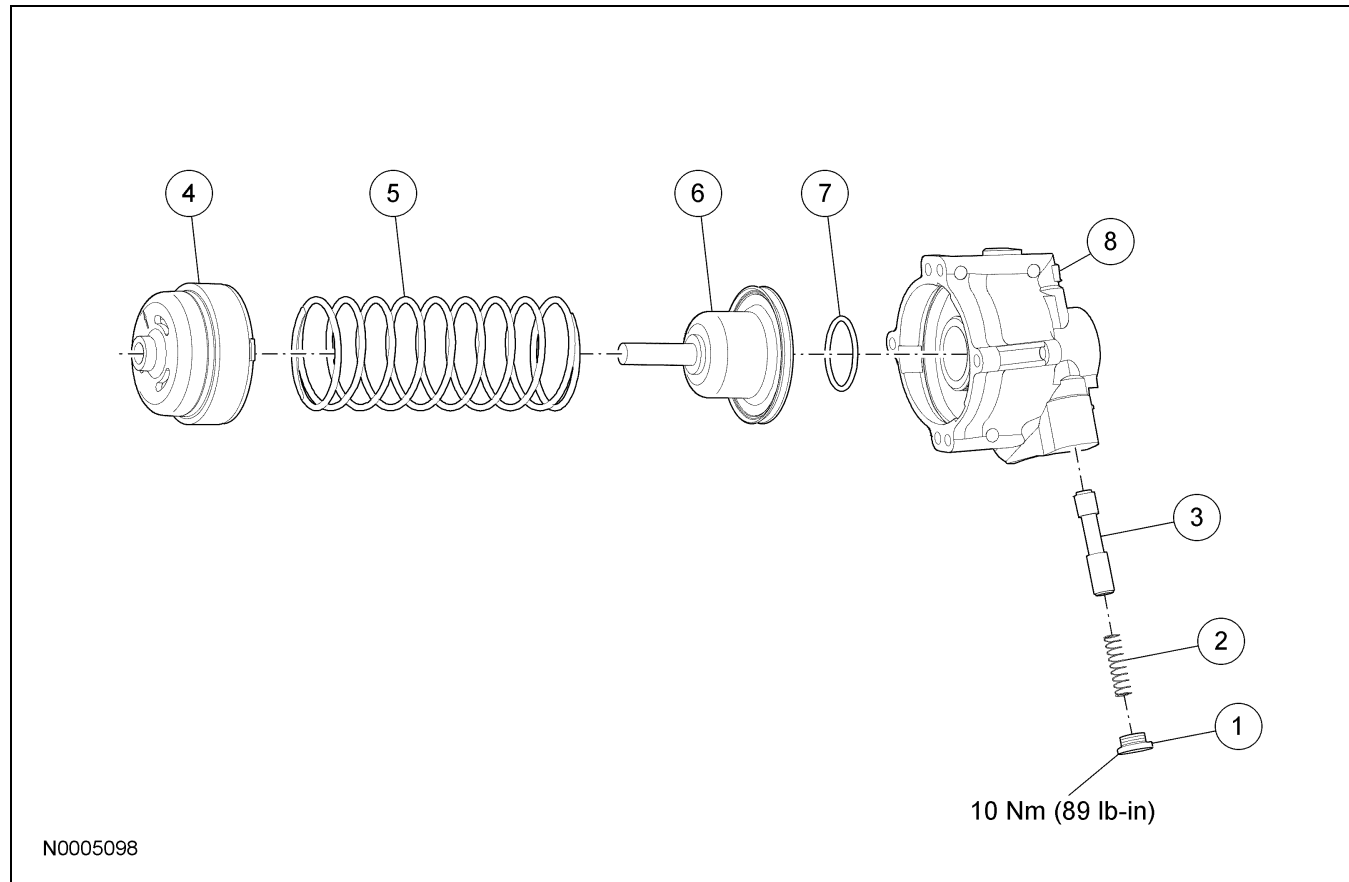
2. Install the seal.



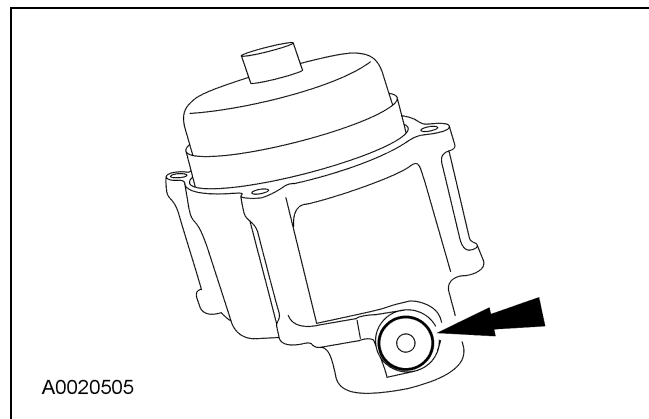
DISASSEMBLY AND ASSEMBLY

Reverse Servo Assembly

Disassembly



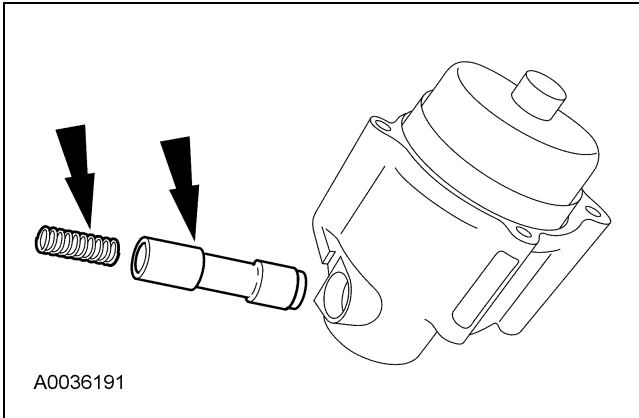
Item	Part Number	Description
1	7D321	Control valve spring retainer
2	7A270	Fluid pressure regulator valve spring
3	7D488	Reverse servo check valve
4	7D372	Reverse servo plate
5	7D466	Reverse servo accumulator spring
6	7D189	Reverse servo piston and seal
7	7423	Reverse servo piston O-ring
8	7D036	Reverse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



1. Remove the control valve spring retainer.

DISASSEMBLY AND ASSEMBLY (Continued)

2. Remove the reverse servo spring and check valve.

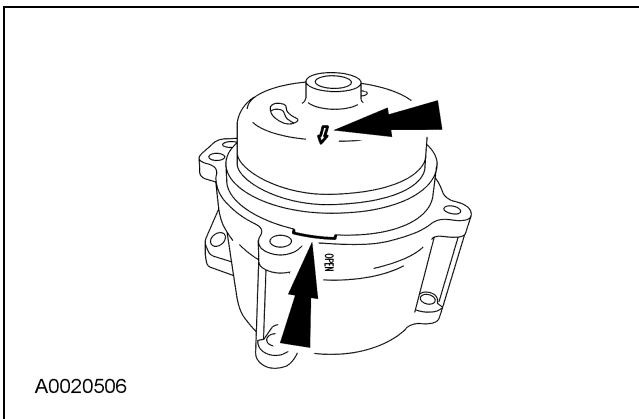


3. **WARNING:** Follow the specified procedure when using the tool to remove the servo cover. The servo and servo cover are under high spring force and can separate forcefully, which may result in serious personal injury.

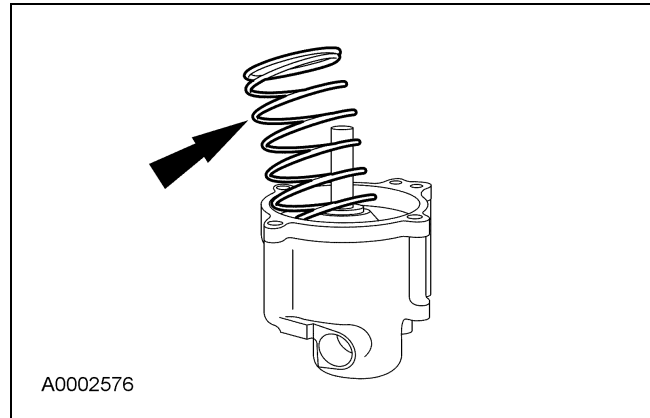
NOTE: Tabs on servo plate mate with slots on cover every 120 degrees.

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.

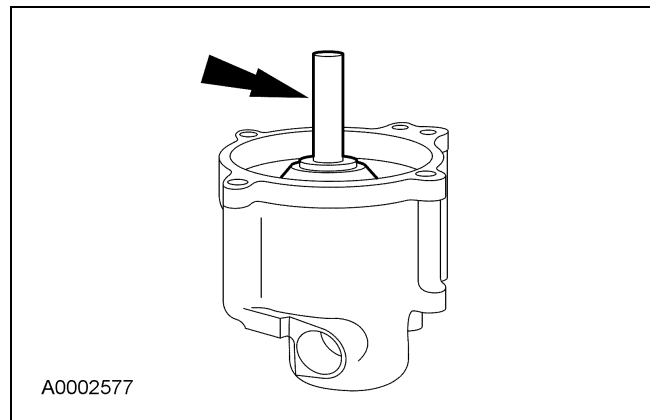


4. Remove the reverse servo spring.

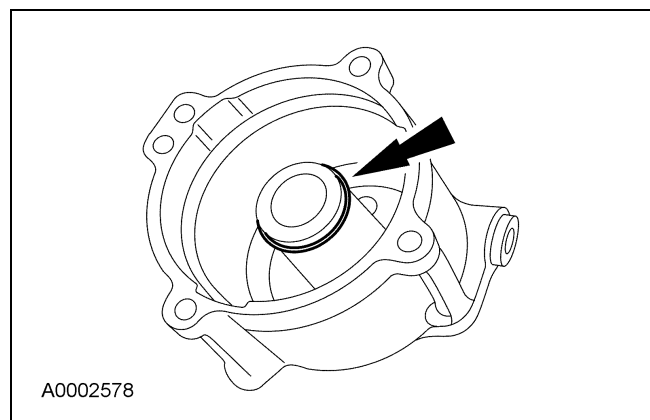


5. Remove the reverse servo piston and seal assembly.

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



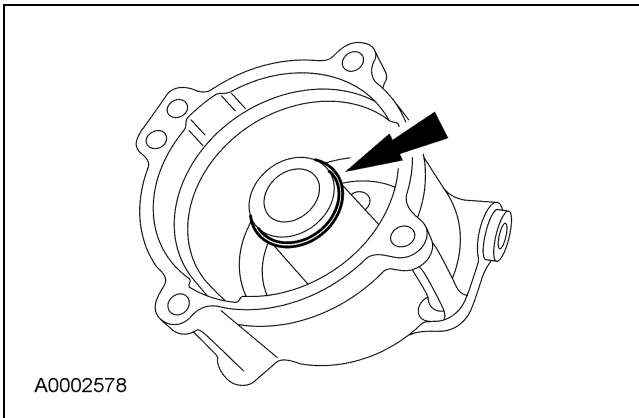
6. Remove and discard the reverse servo piston seal.



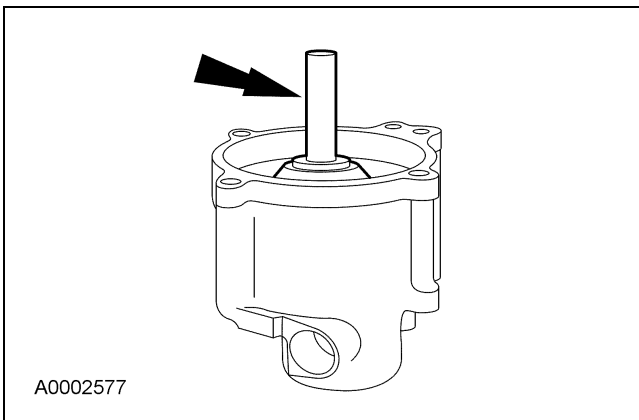
DISASSEMBLY AND ASSEMBLY (Continued)**Assembly**

1. **NOTICE:** Try not to roll the seal onto the housing when installing the seal or damage to the seal may occur.

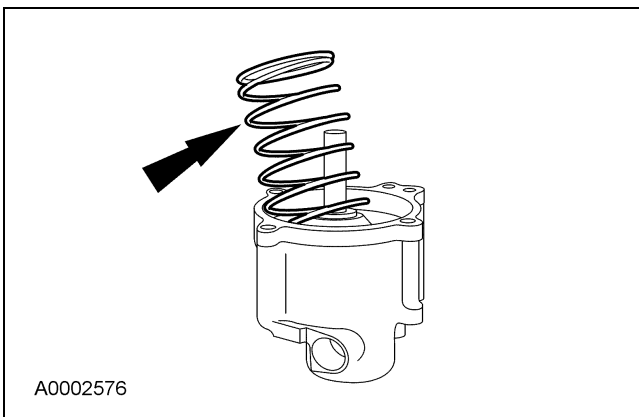
Lubricate and install a new reverse servo piston seal.



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



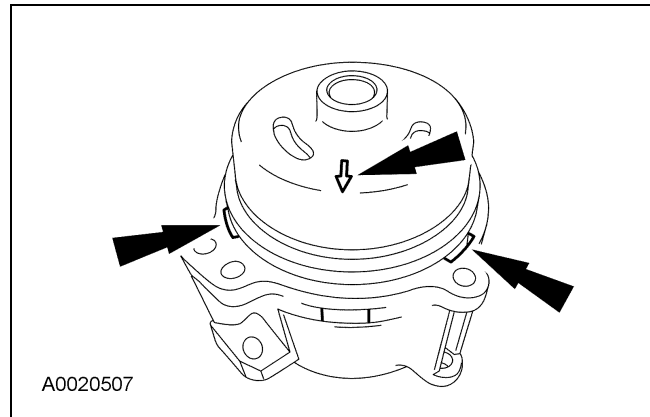
3. Install the reverse servo spring.



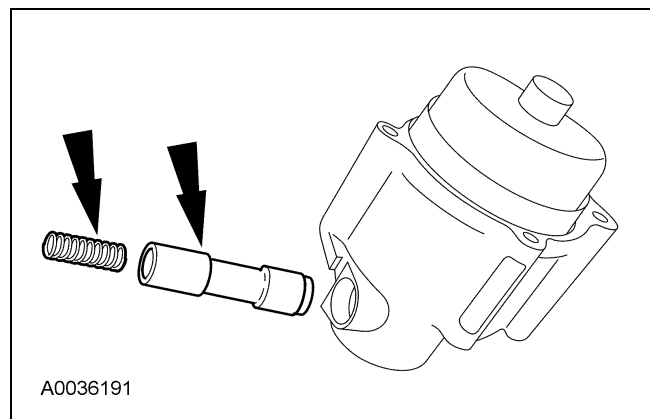
4.  **WARNING:** Follow the specified procedure when using the tool to remove the servo cover. The servo and servo cover are under high spring force and can separate forcefully, which may result in serious personal injury.

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

Install the reverse servo plate.

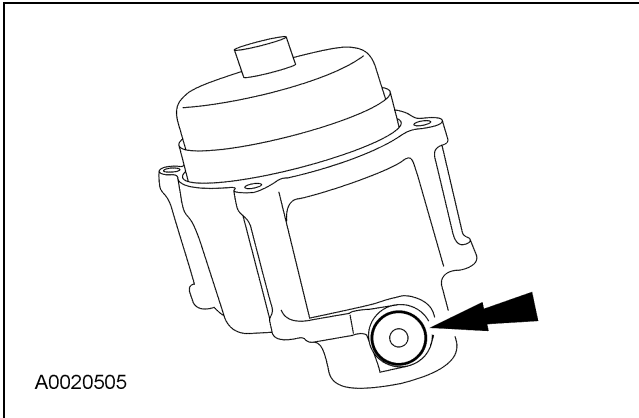


5. Install the reverse servo spring and check valve.



DISASSEMBLY AND ASSEMBLY (Continued)

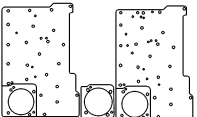
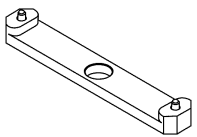
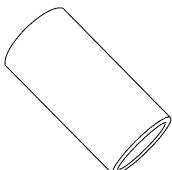
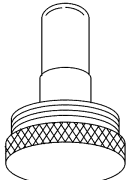
6. Install the control valve spring retainer.
 - Tighten to 10 Nm (89 lb-in).



DISASSEMBLY AND ASSEMBLY

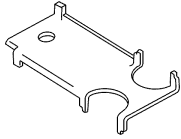
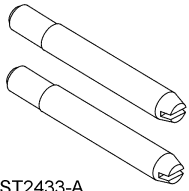
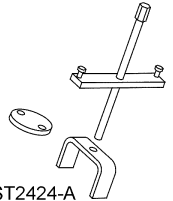
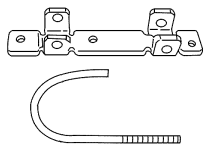
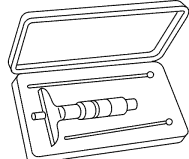
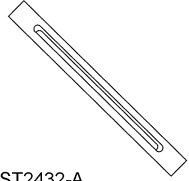
Transmission

Special Tool(s)

 ST1792-A	Adjustment Set, Transmission Band 307-S022 (T71P-77370-A)
 ST2538-A	Air Test Plate and Gaskets, Transmission 307-433-01, 307-433-02, 307-433-03
 ST2426-A	Aligner, Flex Plate 307-403
 ST2532-A	Aligner, Fluid Pump Handle 307-431
 ST2533-A	Aligner, Fluid Pump Pilot 307-432
 ST1639-A	Aligner, Valve Body 307-334 (T95L-70010-C)

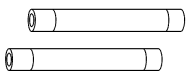
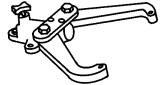
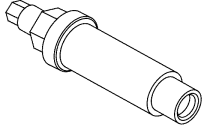
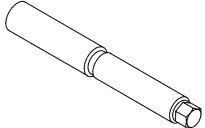
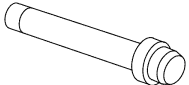
(Continued)

Special Tool(s)

 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
 ST2433-A	Alignment Pins, Transmission Pump 307-399
 ST1817-A	Alignment Set, Fluid Pump 307-S039 (T74P-77103-X)
 ST2424-A	Compressor, Cushion Spring 307-401
 ST2393-A	Compressor, Servo Cover 307-402
 ST1274-A	Depth Micrometer 303-D026 (D80P-4201-A) or equivalent
 ST2432-A	Gauge Bar 307-400

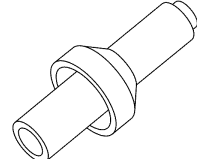
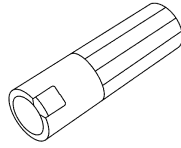
(Continued)

DISASSEMBLY AND ASSEMBLY (Continued)**Special Tool(s)**

 ST1631-A	Handle, Torque Converter 307-091 (T81P-7902-C)
 ST1186-A	Holding Fixture, Transmission 307-003 (T57L-500-B)
 ST2440-A	Installer, Drive Pinion Flange 205-479
 ST2416-A	Installer, Output Shaft Flange 307-404
 ST1199-A	Installer, Shift Shaft Fluid Seal 307-050 (T74P-77498-A)

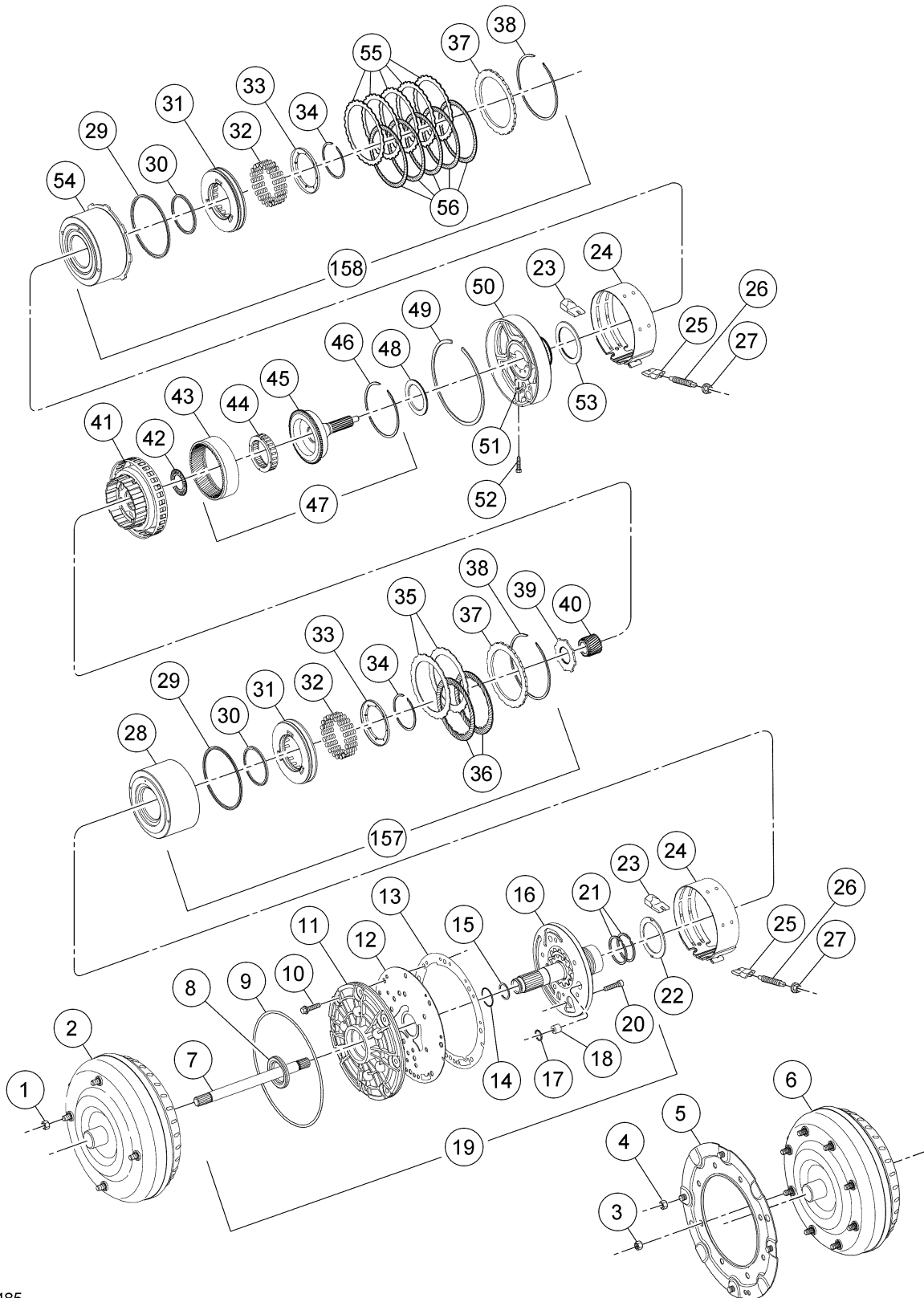
(Continued)

Special Tool(s)

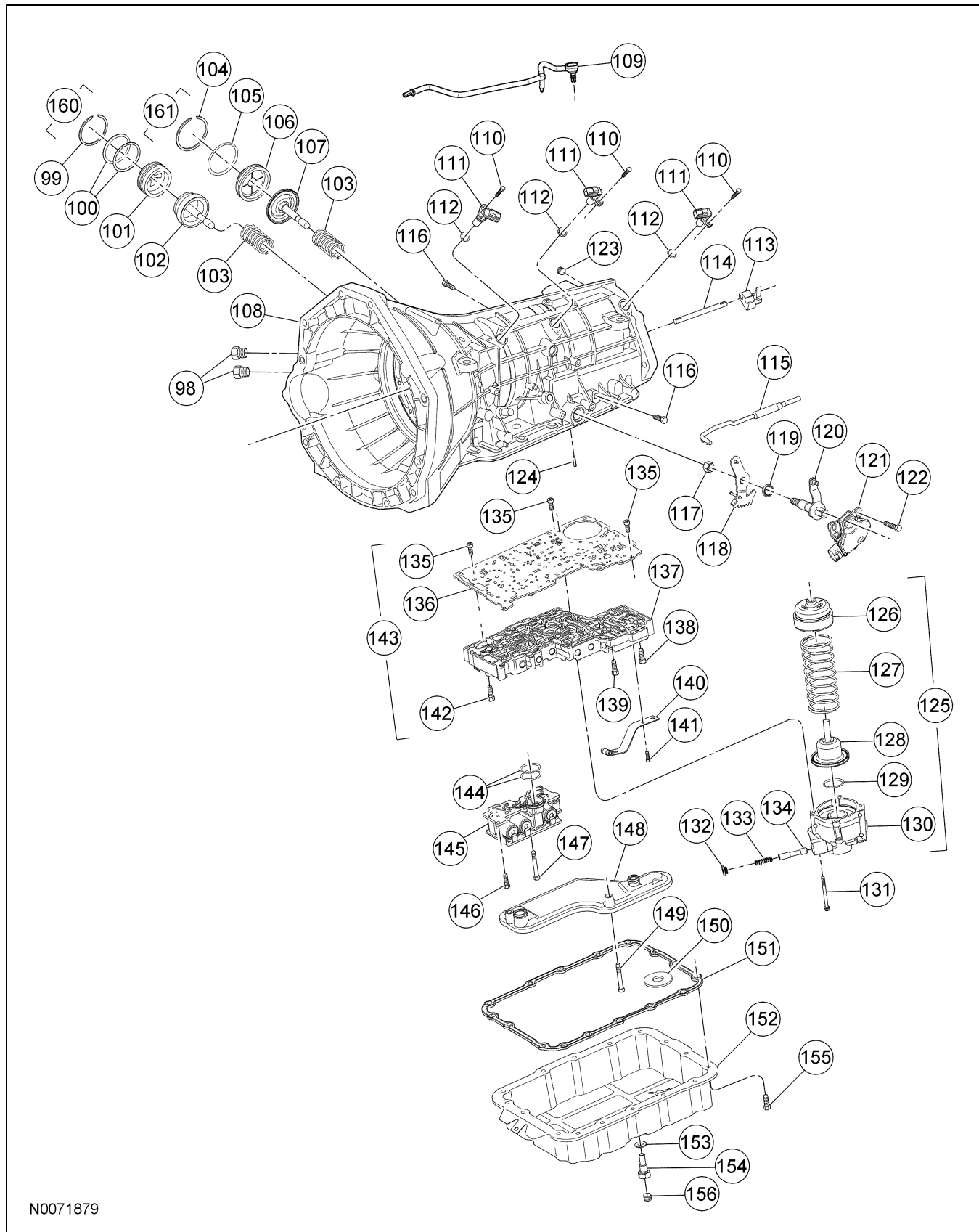
 ST1188-A	Installer, Transmission Extension Housing Oil Seal 307-038 (T74P-77052-A)
 ST1826-A	Sizer, Piston Seal 307-338 (T95L-70010-G)

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

DISASSEMBLY AND ASSEMBLY (Continued)**Disassembled Views**

N0086485

DISASSEMBLY AND ASSEMBLY (Continued)

N0071879

DISASSEMBLY AND 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 (O/D) brake drum seals
22	7D014	Fluid pump input thrust washer No. 1
23	7D029	Intermediate and O/D brake band anchor struts (2 required)
24	7D034	Intermediate and O/D brake bands (2 required)
25	7D029	Intermediate and O/D brake band apply struts (2 required)

(Continued)

Item	Part Number	Description
26	7C492	O/D/intermediate band adjusting screws
27	71000	O/D/intermediate locking nuts
28	7L669	O/D brake band drum assembly
29	7A548	Direct and O/D piston outer seals
30	7D404	Direct and O/D piston inner seals
31	7A262	Direct and O/D clutch pistons
32	7A480	Direct and O/D clutch piston springs
33	7A527	Clutch piston spring retainers (2 required)
34	E860125	Retaining rings (retains 7D041 to drum) (2 required)
35	7B442	Coast clutch external splined plates (steel) (2 required)
36	7B164	Coast clutch internal splined friction plates (2 required)
37	7B066	Coast and direct clutch pressure plates (2 required)
38	E860126 — E860129	Coast and direct clutch plates retaining rings (select fit) (2 required)
39	7660	Coast clutch-to-O/D carrier adapter
40	7D063	O/D sun gear
41	7B446	O/D planetary gear carrier (with trigger wheel)
42	7L495	O/D planet thrust bearing No. 2
43	7A153	O/D ring gear
44	7A089	Center shaft One-Way Clutch (OWC) assembly
45	7A658	O/D 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
51	E826160	Nut and cage assembly (attaches center support to case)

(Continued)

DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
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 plates (5 required)
62	7B164	Forward clutch internally spline friction plates (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
80	7C122	Output shaft ring gear retaining ring
81	7D019	Output shaft hub seal

(Continued)

Item	Part Number	Description
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 assemblies (2 required)
99	7H074	Ring O/D servo retainer
100	W703119	O/D servo cover seals (2 required)
101	7D027	O/D servo cover
102	7D021	O/D servo piston and rod
103	7D028	Intermediate/O/D servo piston springs (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 screws (M6 x 19)
111	7H103	Output Shaft Speed (OSS), Turbine Shaft Speed (TSS) and intermediate shaft speed sensors
112	W702981	Speed sensor-to-case O-ring seals

(Continued)

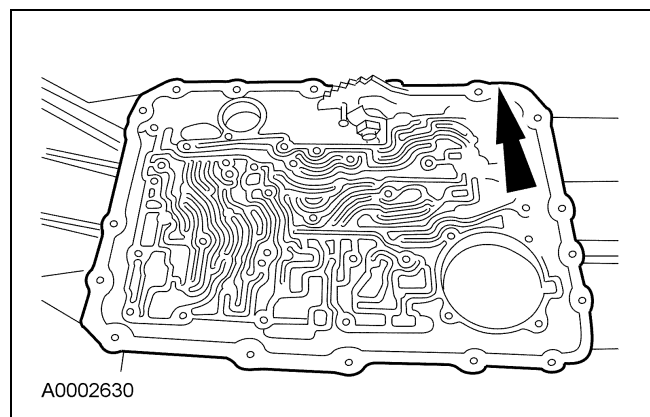
DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
113	7A179	Reverse brake drum lever
114	7D433	Reverse band actuating lever shaft
115	7A232	Parking pawl actuating rod
116	390318	Pipe plugs
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	Transmission Range (TR) sensor
122	W500015	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 screws
136	7Z490	Main control valve body separating plate (bonded)
137	7A101	Lower main control valve body
138	W500102	Main control valve body screw (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 seals

(Continued)

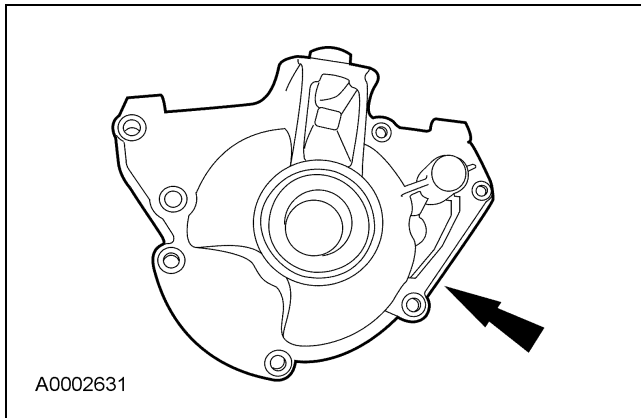
Item	Part Number	Description
145	7G391	Transmission control solenoid body
146	W702921	Transmission control solenoid body screw
147	W703189	Transmission control solenoid body screw (7 required)
148	7A098	Transmission fluid pan filter
149	W705559	Transmission fluid pan filter screw
150	7L027	Transmission 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	—	O/D/coast clutch assembly
158	—	Direct clutch assembly
159	—	Forward clutch assembly
160	—	O/D servo
161	—	Intermediate servo

1. Thoroughly clean the transmission case and extension housing in solvent and blow dry with compressed air.
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

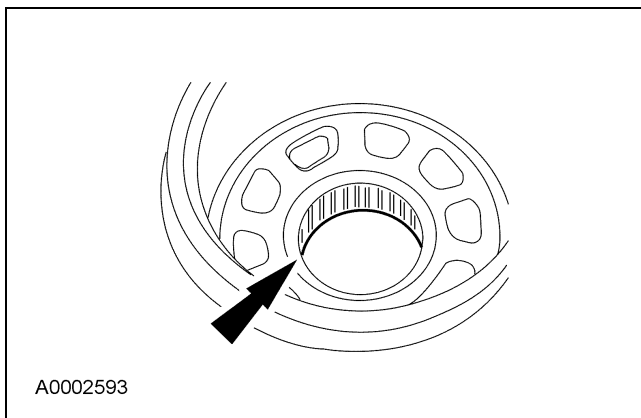


DISASSEMBLY AND ASSEMBLY (Continued)

3. Inspect the extension housing for cracks, burrs or warpage.

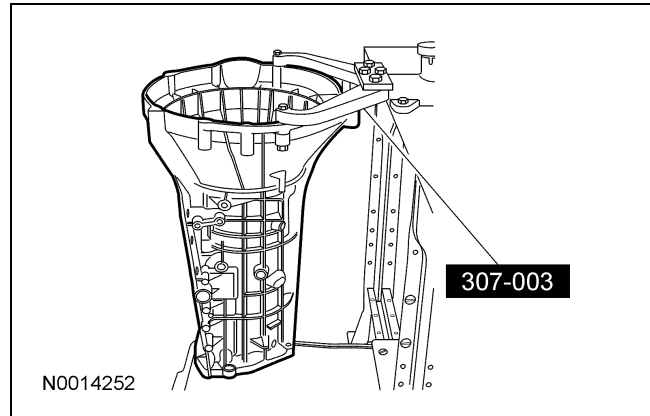


4. Inspect the case bearing for damage. If damage to the case bearing is indicated, install a new case.

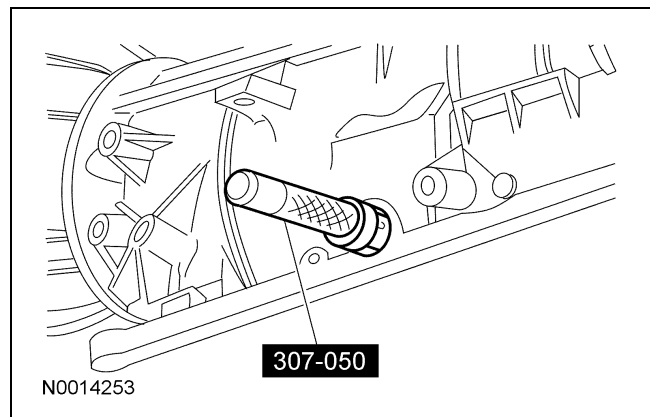


5. **⚠ WARNING:** Always verify that the lockpin on the bench-mounted holding fixture is correctly secured to help prevent unexpected component rotation. Failure to follow this instruction may result in serious personal injury.

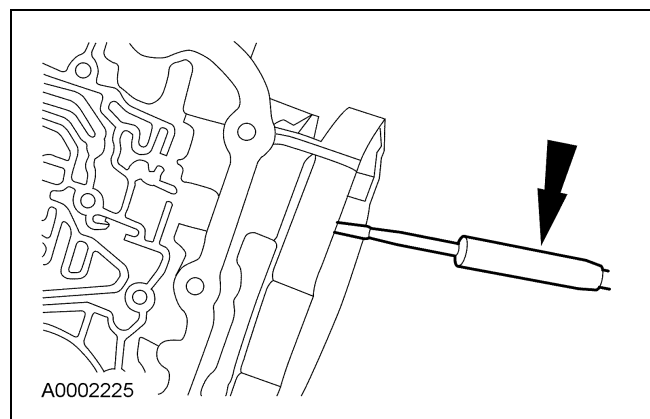
Using the Transmission Holding Fixture, install the transmission on to the bench with the converter housing facing up.



6. Using the Shift Shaft Fluid Seal Installer, install the manual control lever seal and lubricate it with petroleum jelly.

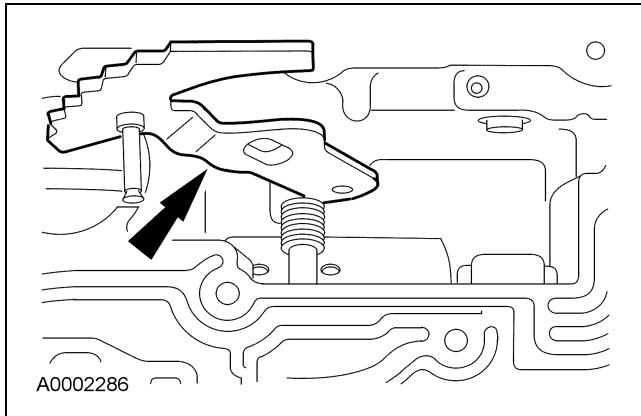


7. Install the parking lever rod.

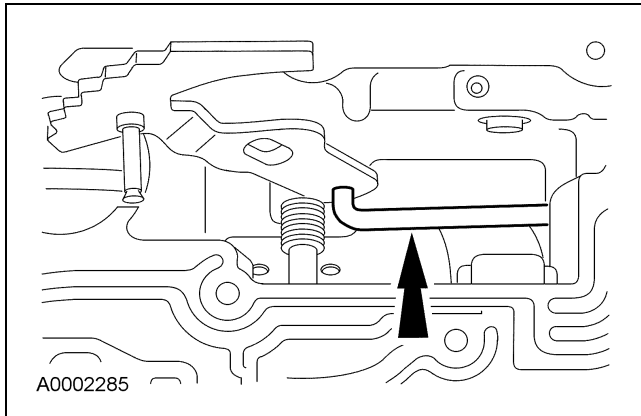


DISASSEMBLY AND ASSEMBLY (Continued)

8. Install the manual control lever.

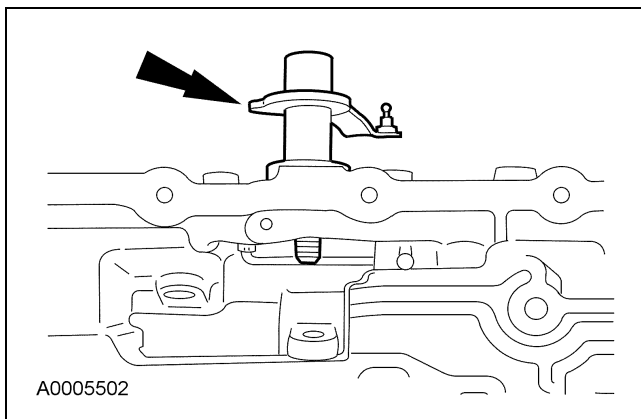


9. Assemble the manual valve inner lever and parking lever actuating rod as shown.

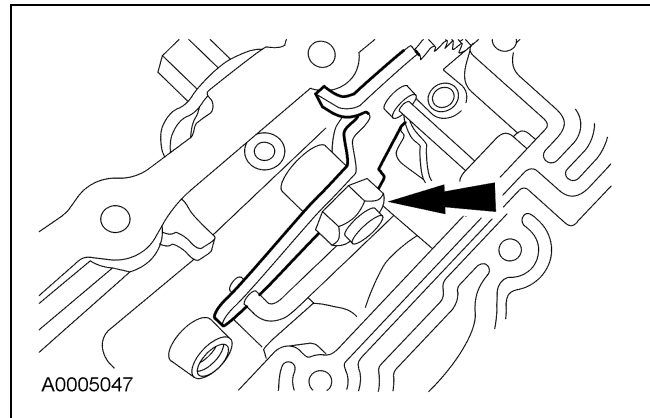


10. **NOTE:** Align the flats on the manual valve inner lever with the flats on the manual control lever shaft.

Install the manual control lever shaft.



11. Install the manual valve inner lever onto the manual shaft and loosely install the nut.

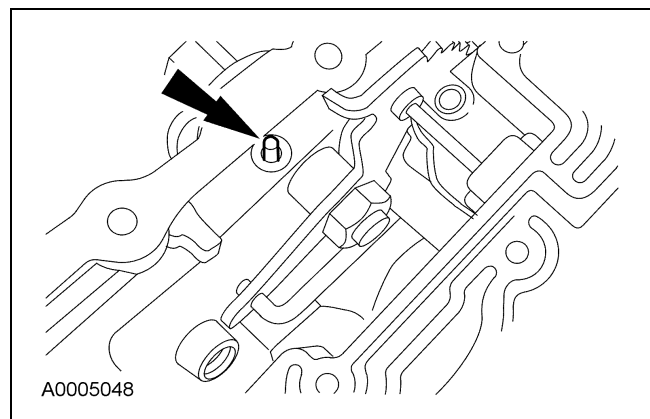


12. **NOTICE:** Use care not to damage the transmission fluid pan rail surface when installing the retaining pin.

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.

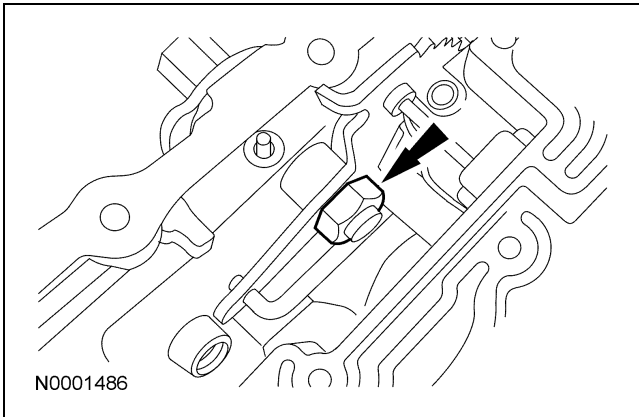


DISASSEMBLY AND ASSEMBLY (Continued)

13. **NOTICE:** To avoid damage, do not allow the wrench to strike the manual valve inner lever pin.

Tighten the manual control lever shaft nut.

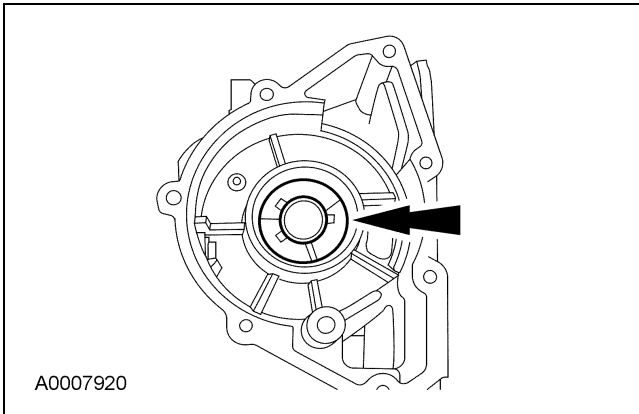
- Tighten to 48 Nm (35 lb-ft).



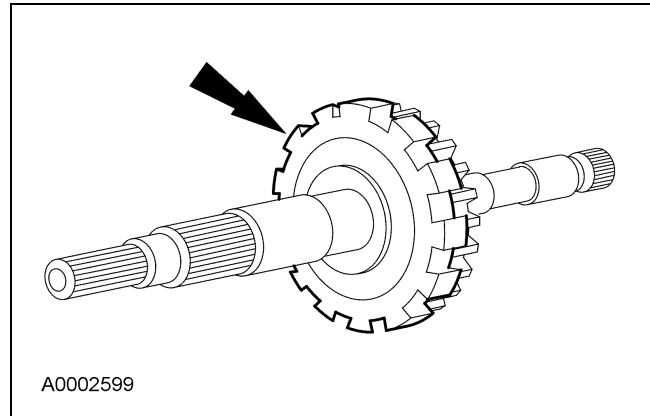
14. **NOTICE:** The tabs on the output shaft thrust washer (No. 11) point into the case. Make sure the thrust washer is correctly seated or damage may occur.

Install the output shaft thrust washer (No. 11).

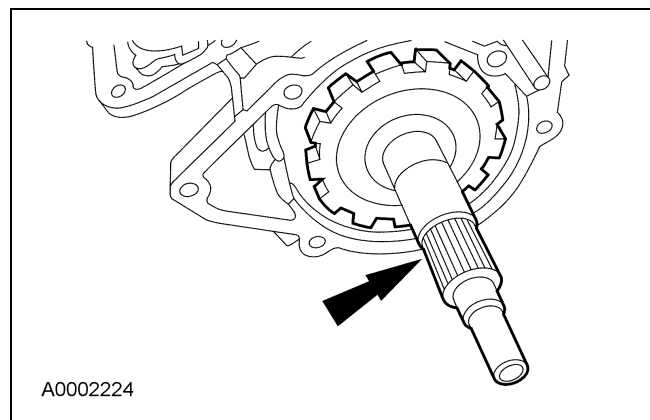
- Coat the output shaft thrust washer with petroleum jelly.



15. Install the park gear on the output shaft.

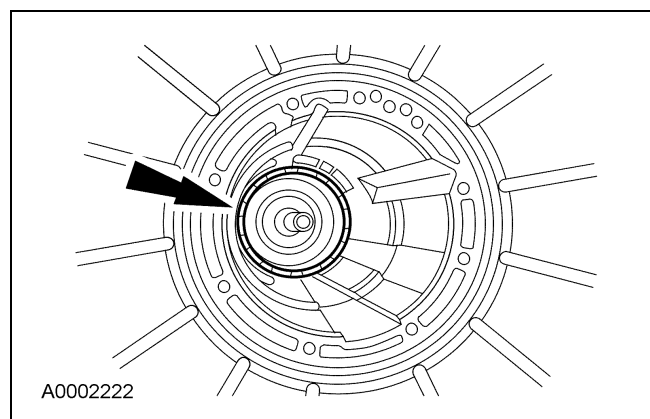


16. Install the output shaft and park gear.



17. Install the low/reverse brake drum.

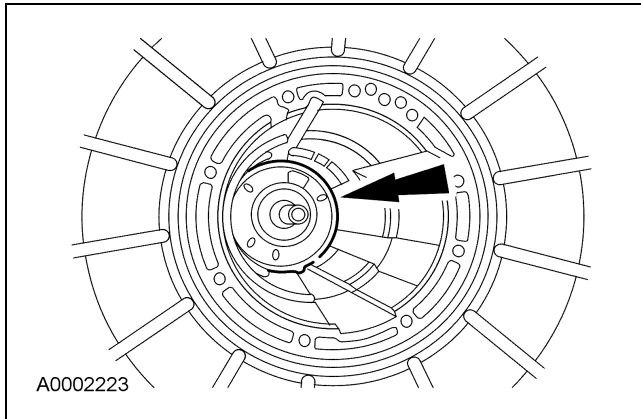
- Rotate the low/reverse brake drum clockwise to install.



DISASSEMBLY AND ASSEMBLY (Continued)

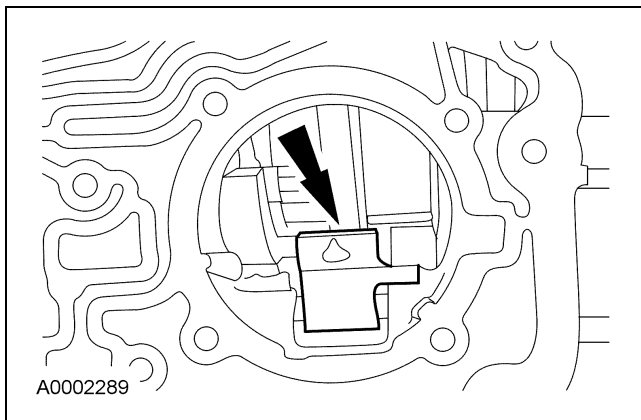
18. **NOTE:** Make sure band is resting on the 2 anchor pins in the case.

Install the low/reverse band over the reverse drum.

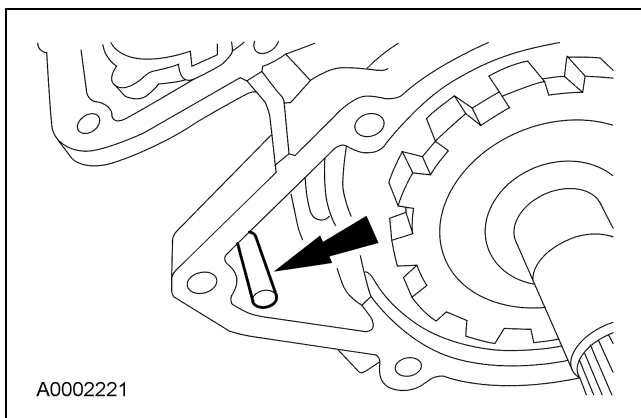


19. **NOTE:** The reverse band actuating lever must fit into the notches in the band.

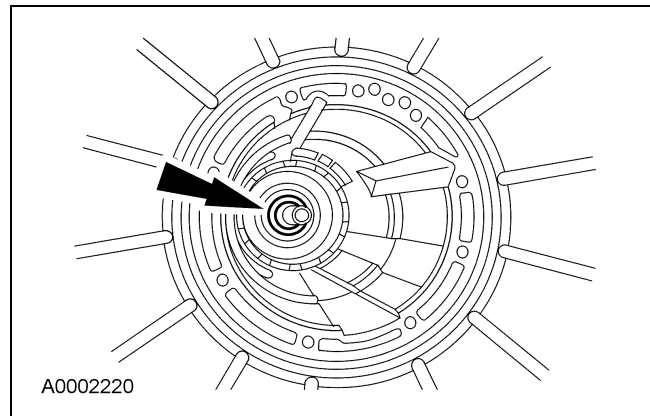
Install the reverse band actuating lever into the reverse band.



20. Install the reverse band actuating lever shaft into the case and into the reverse band actuating lever.

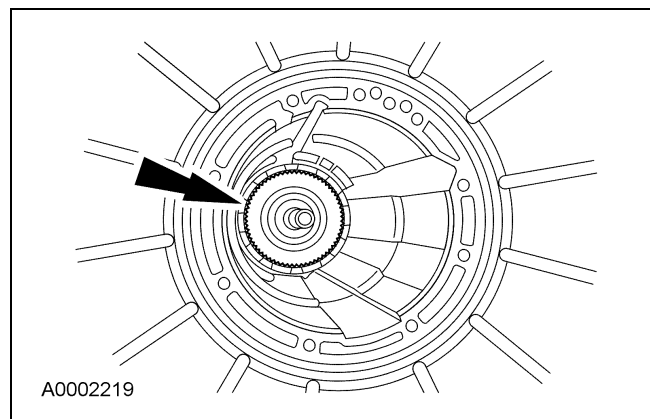


21. Install the No. 10 needle bearing into the case.



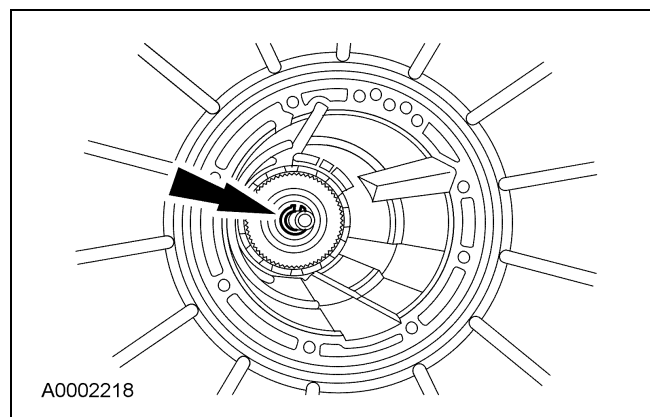
22. **NOTICE:** Do not damage the seal against the case during assembly.

Install the output shaft ring gear, hub and seal.



23. **NOTICE:** Always install a new output shaft retaining ring, otherwise transmission damage can occur.

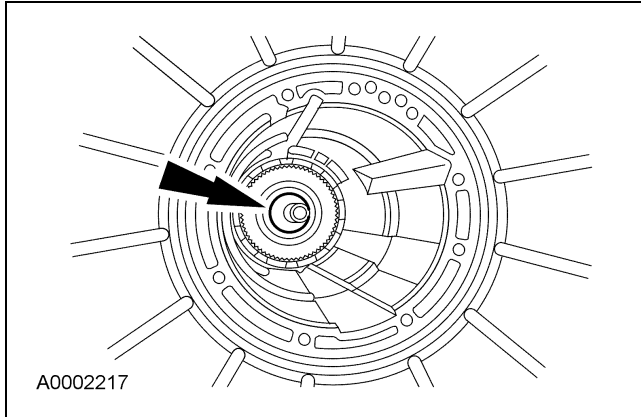
Install a new output shaft retaining ring.



DISASSEMBLY AND ASSEMBLY (Continued)

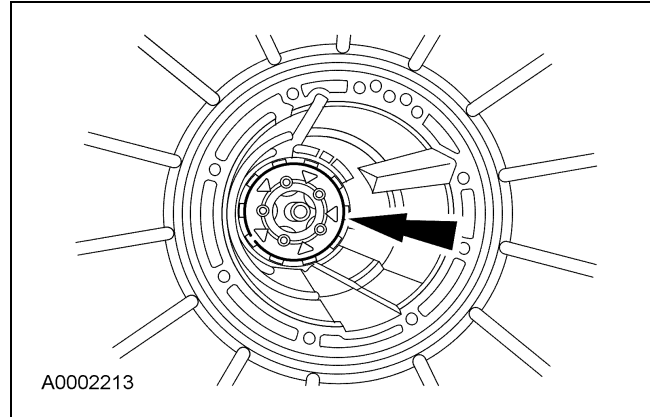
24. **NOTE:** Install the output shaft sleeve with the cone facing up. This sleeve will snap into place when correctly installed.

Install the output shaft sleeve.

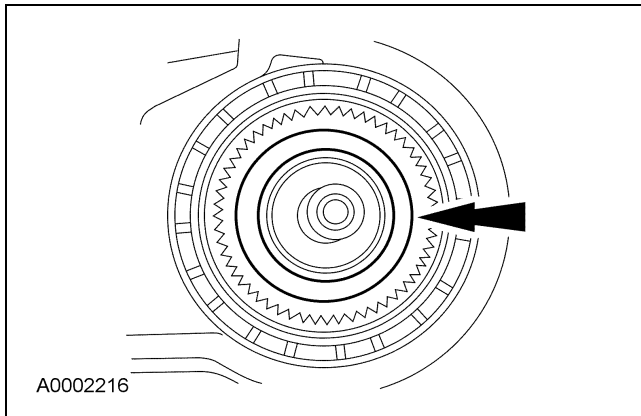


27. **NOTE:** The low/reverse brake drum must be pulled forward to install the low/reverse planet retaining ring.

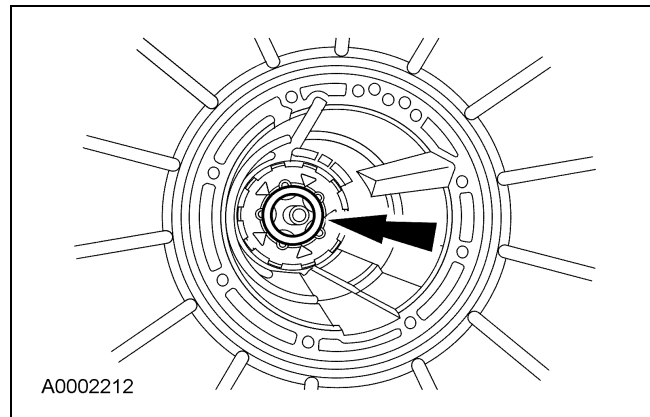
Install the retaining ring.



25. Install low/reverse planetary carrier needle bearing (No. 9) onto the output shaft ring gear and hub assembly.

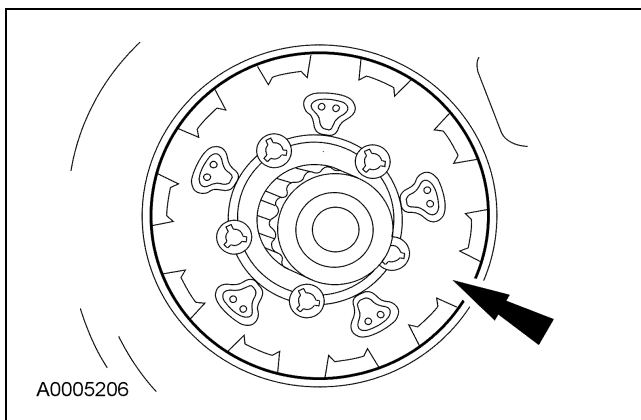


28. Install the No. 8 thrust bearing.

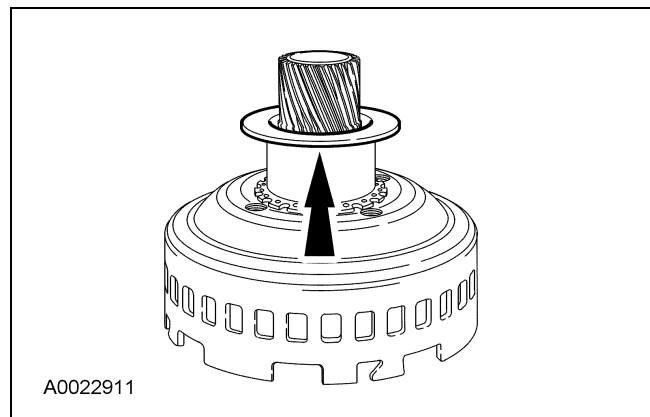


26. **NOTICE:** Make sure the needle bearings stay in place or damage may occur.

Install the low/reverse planetary assembly.

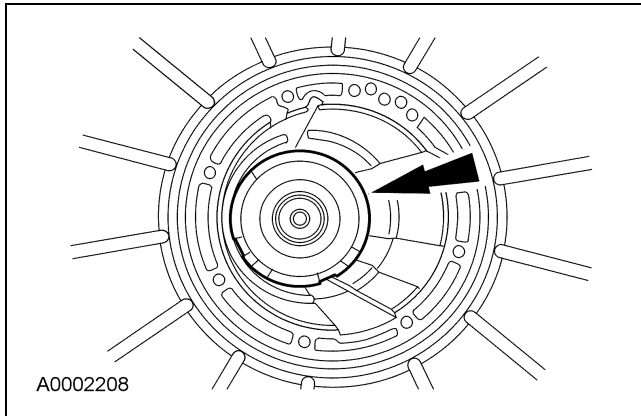


29. Install the spacer on the input shell, using petroleum jelly to hold it in place.

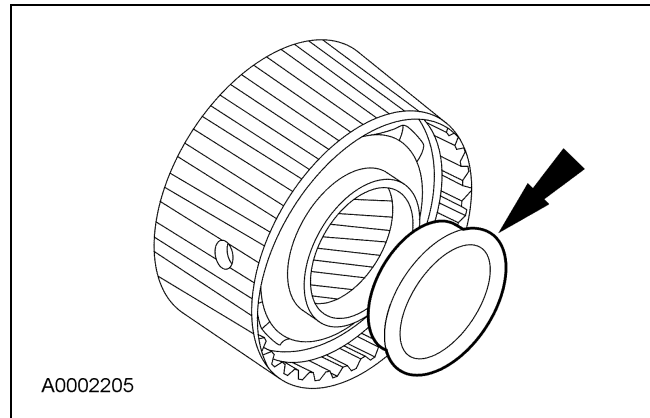


DISASSEMBLY AND ASSEMBLY (Continued)

30. Install the input shell and sun gear assembly.

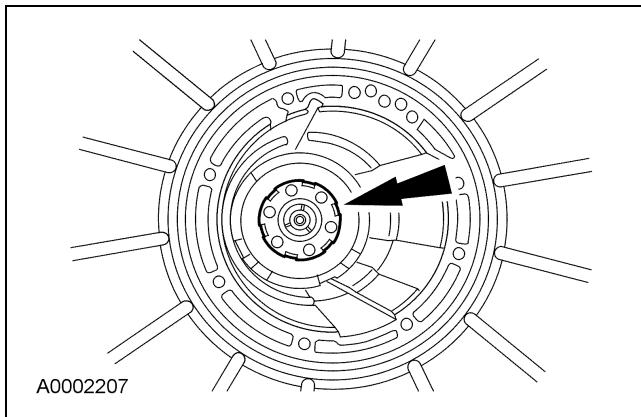


33. Install the No. 6B forward clutch thrust washer onto the forward ring gear hub.

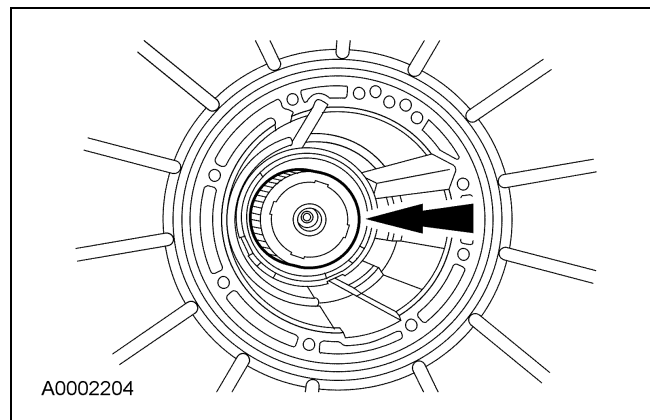


31. **NOTE:** The No. 13 bearing must be correctly seated in the forward planet assembly so the sun gear can be installed correctly.

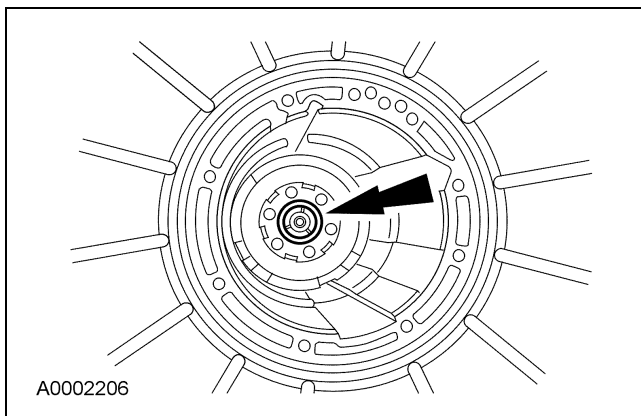
Install the forward planetary assembly.



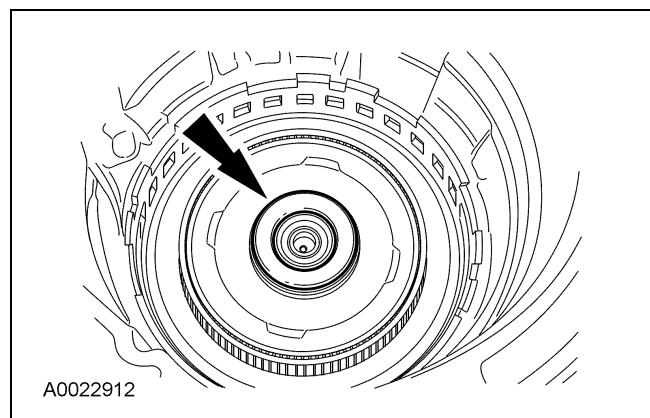
34. Install the forward ring gear and hub as an assembly.



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.

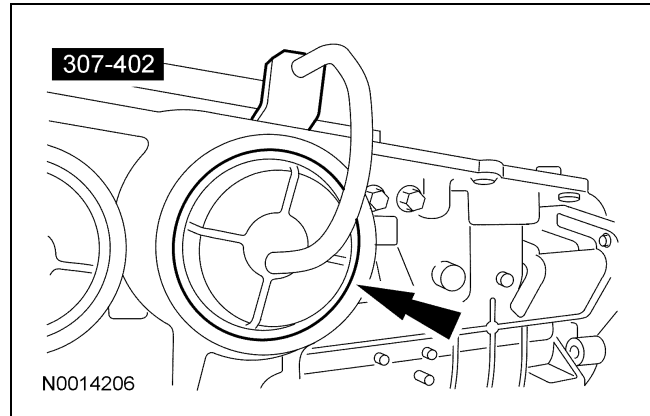
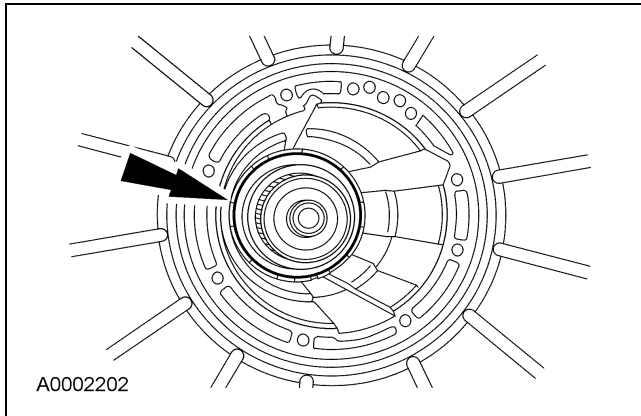


35. Install the No. 6A forward ring gear hub thrust bearing into the forward ring gear and hub.

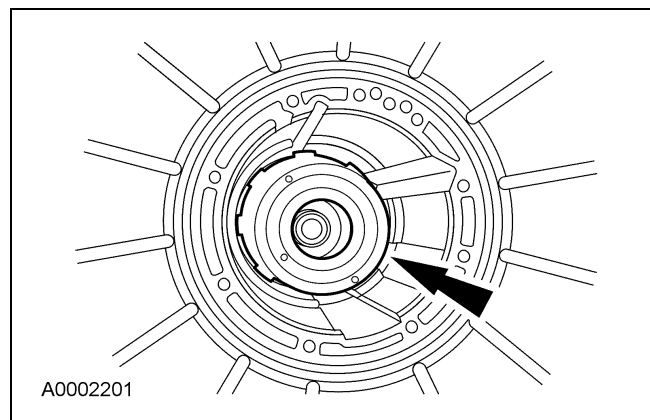
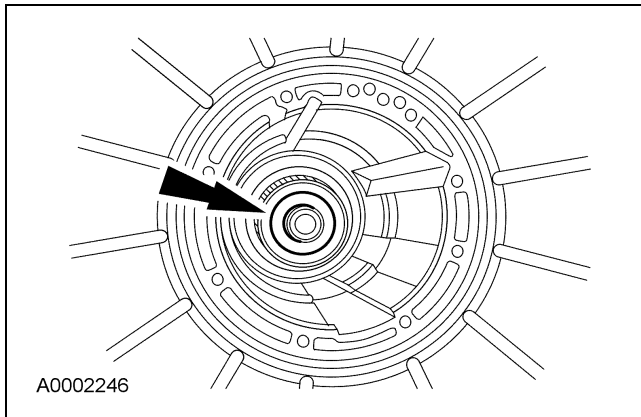


DISASSEMBLY AND ASSEMBLY (Continued)

36. Install the forward clutch cylinder.

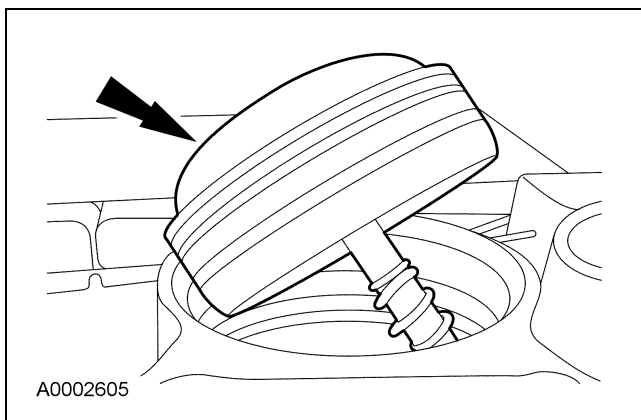


37. Install the No. 5 thrust bearing.



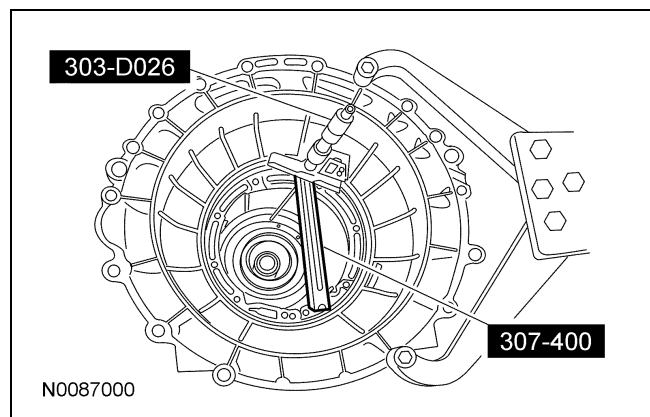
38. Install the intermediate servo piston and spring.

- Lubricate the servo bore with automatic transmission fluid.



39. Using the Servo Cover Compressor, install the retaining ring.

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.

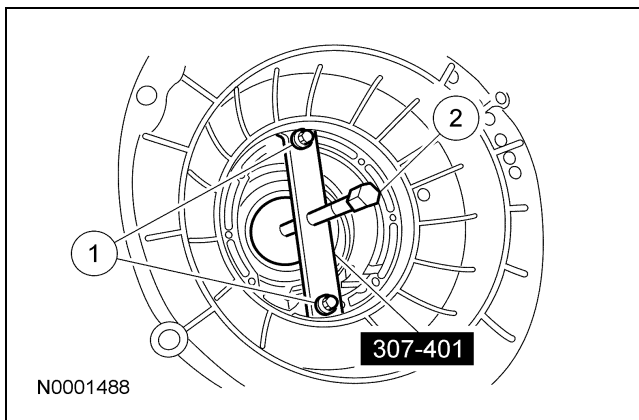


DISASSEMBLY AND ASSEMBLY (Continued)

42. **NOTICE:** The torque specifications are critical for this procedure. Failure to use the correct torque specifications may cause transmission damage.

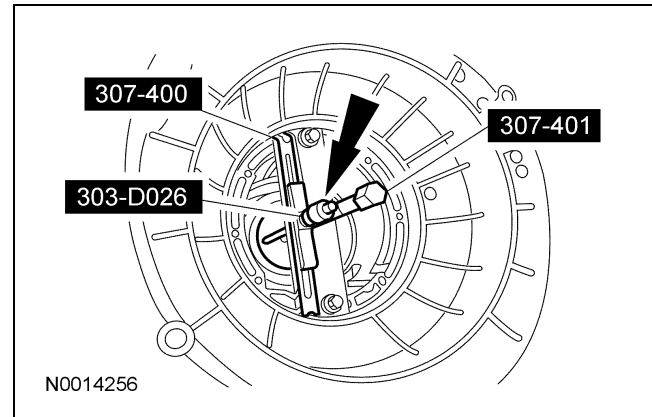
Install the Cushion Spring Compressor.

- 1 Install the Cushion Spring Compressor and the bolts using the 2 pump screw locations at approximately 6 o'clock and 12 o'clock positions.
 - Tighten to 15 Nm (133 lb-in).
- 2 Tighten the center screw.
 - Tighten to 1.13 Nm (10 lb-in).



43. **NOTE:** Align the disc holes on Cushion Spring Compressor with the slot in Gauge Bar for correct measurement.

Using the Depth Micrometer, 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 Gauge Bar 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

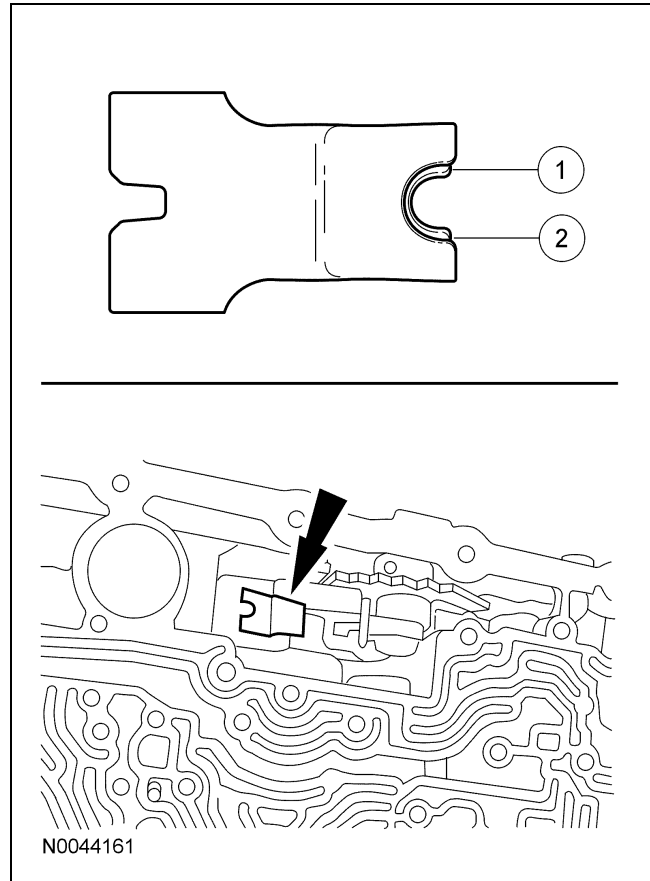
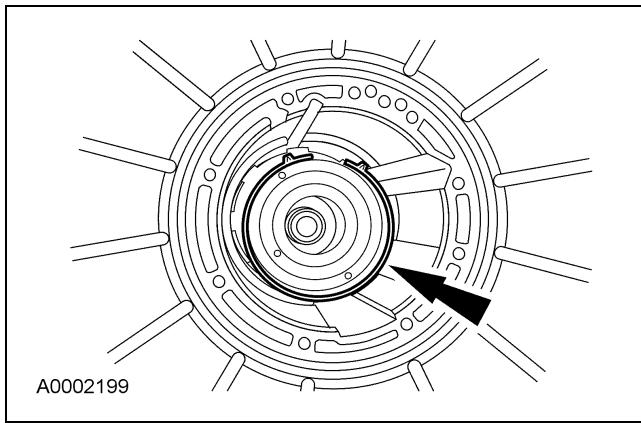
DISASSEMBLY AND ASSEMBLY (Continued)

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.



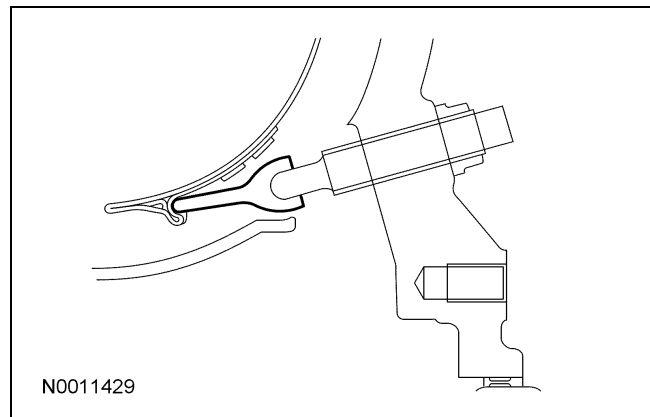
48. **NOTICE:** To avoid a “fall-out” condition of the strut from the screw during assembly and function, the small U-shaped notch should be toward the band/case side and the large U-shaped notch toward the main control side.

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).

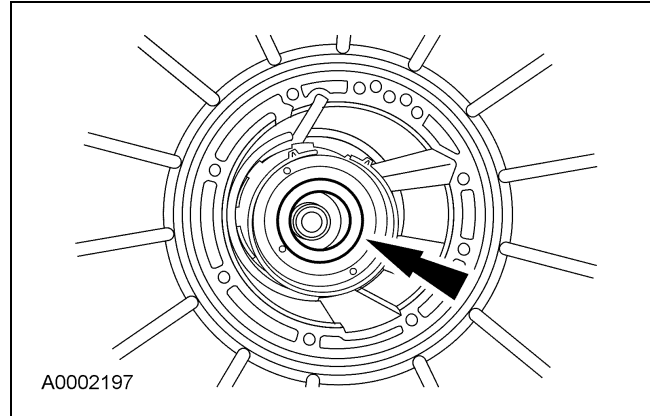
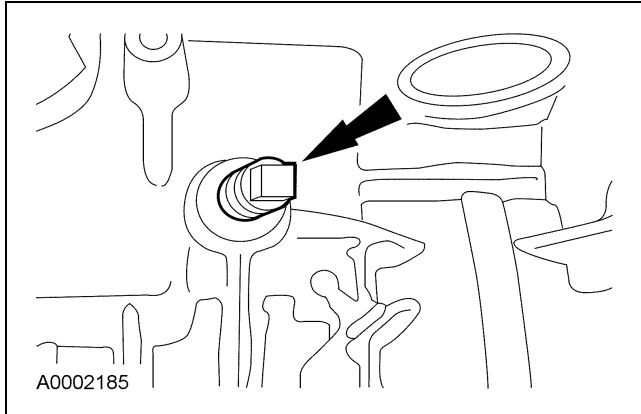
49. **NOTICE:** If the strut is installed incorrectly, transmission damage will occur.

Check to make sure that the intermediate band anchor strut is installed in the correct orientation to the case and adjustment screw.



DISASSEMBLY AND ASSEMBLY (Continued)

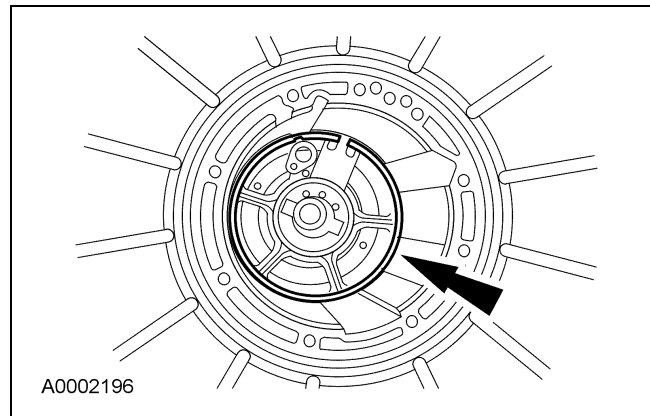
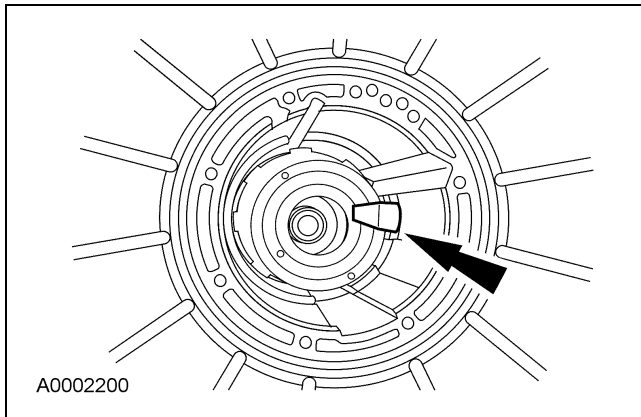
50. Loosely install the adjustment screw.



54. **NOTE:** Align the center support screw hole with correct case hole.

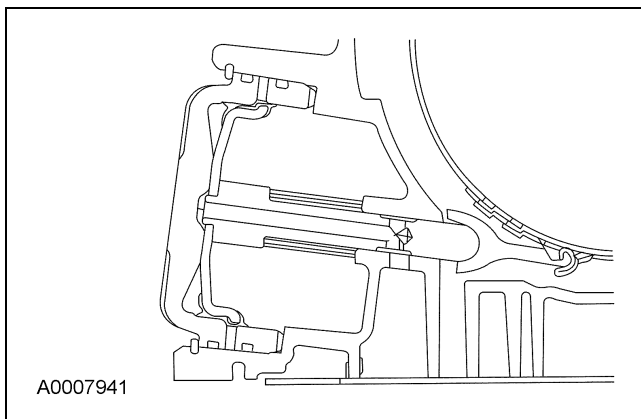
Install the center support.

51. Install the intermediate band apply strut.

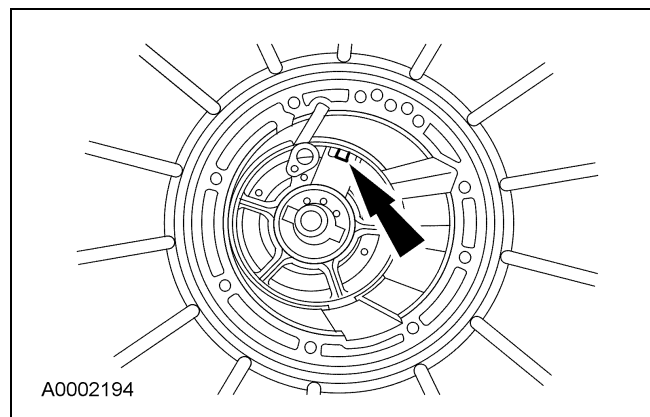


52. **NOTICE:** If the strut is installed incorrectly, transmission damage will occur.

Check to make sure that the intermediate band apply strut is installed in the correct orientation to the case and piston rod.



55. Install the center support locknut and cage.

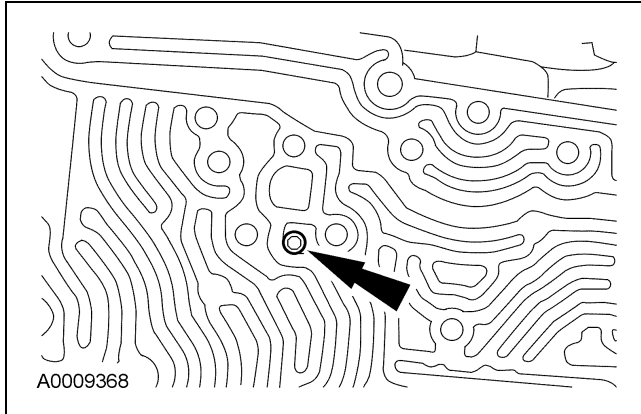


53. Install the selected No. 4 thrust washer on the direct clutch drum.

- Coat the thrust washer with petroleum jelly.

DISASSEMBLY AND ASSEMBLY (Continued)

56. Loosely install the screw.

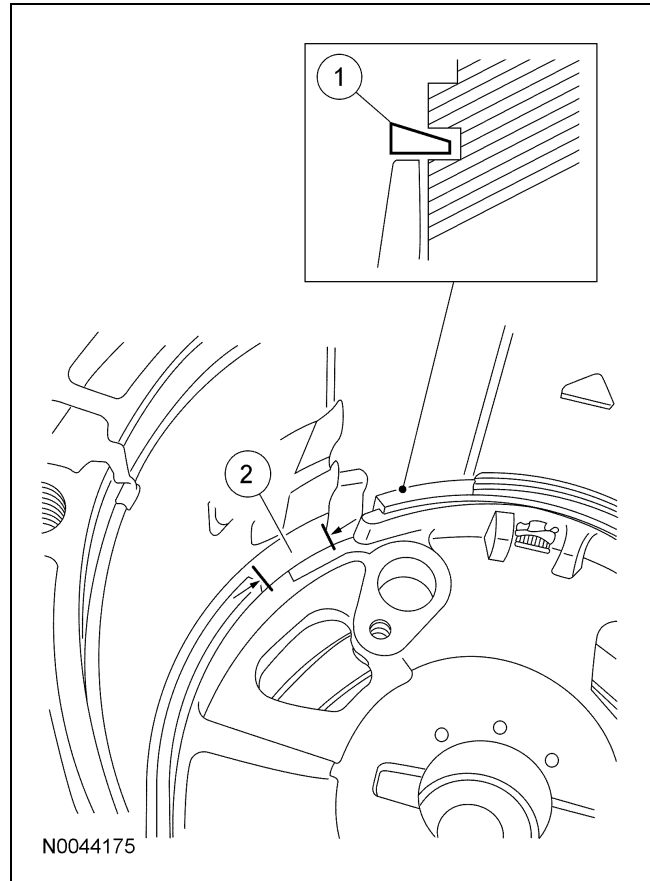


57. **NOTICE:** Install the center support retaining ring with the tapered side facing up or damage may occur.

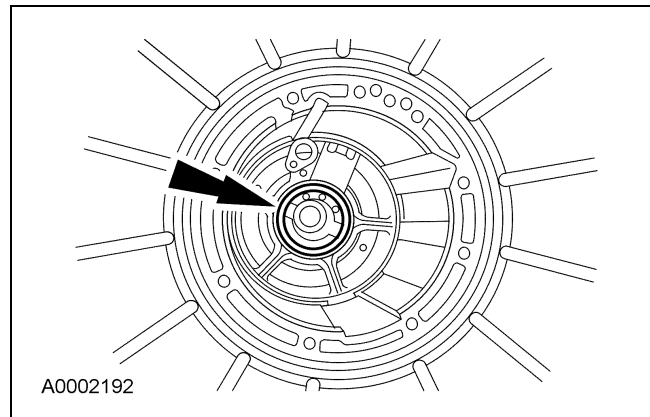
NOTICE: Make sure the notch opening is not obstructed by the center support retaining ring or damage may occur.

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.

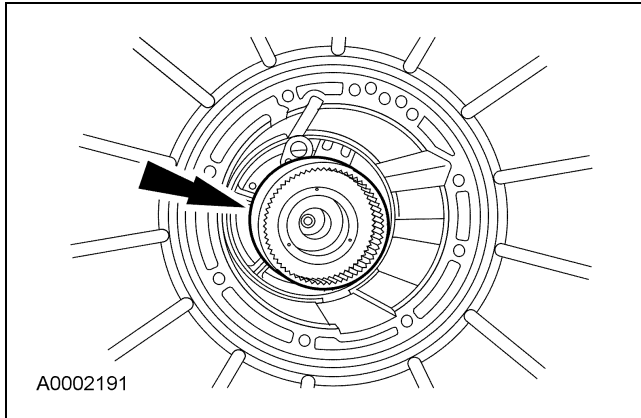


58. Install the center shaft thrust bearing (No. 3).



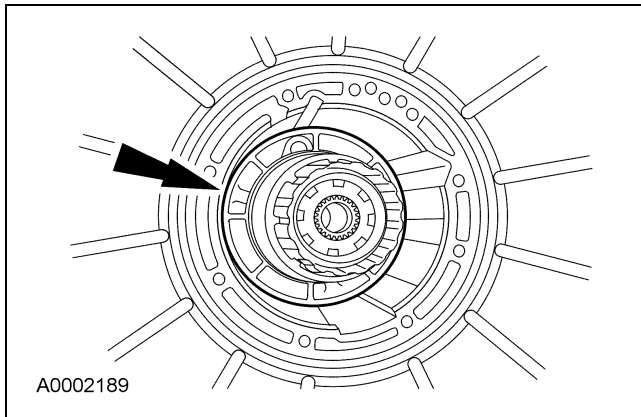
DISASSEMBLY AND ASSEMBLY (Continued)

59. Install the O/D ring gear, O/D OWC and center shaft assembly.

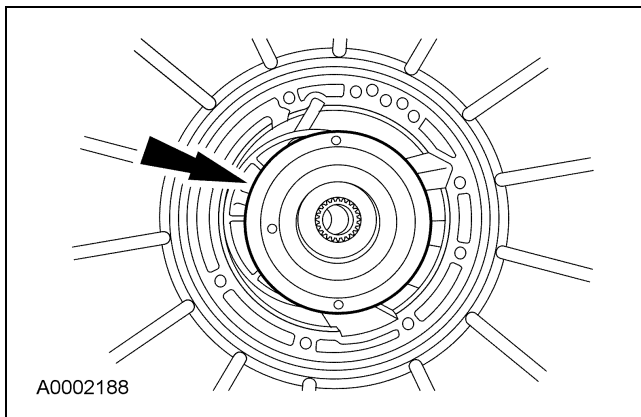


60. **NOTICE:** Do not bend the trigger wheel. Make sure that the No. 2 thrust bearing is in this assembly.

Install the planetary gear O/D carrier.

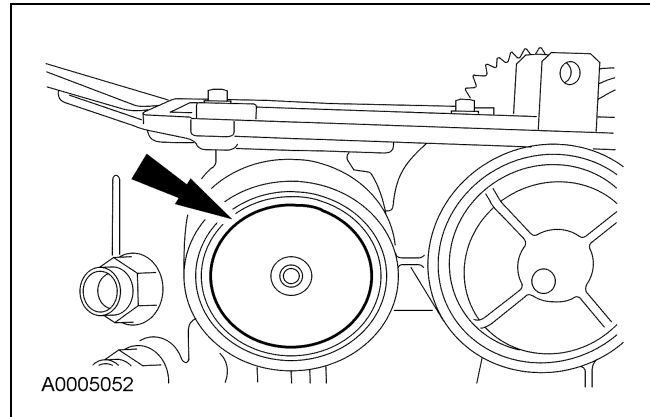


61. Install the O/D brake drum and coast clutch drum assembly.

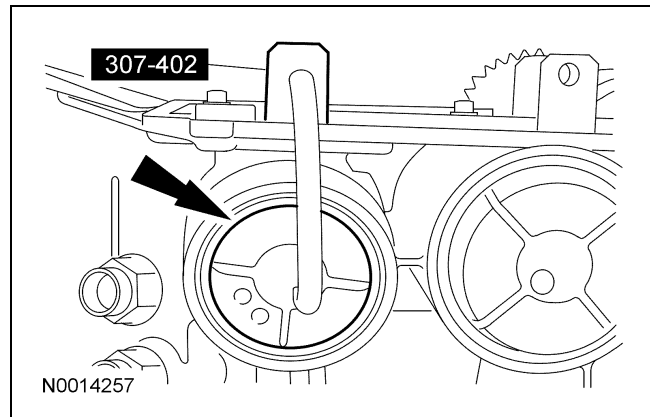


62. Install the O/D band servo piston and spring.

- Lubricate the servo bore with automatic transmission fluid.



63. Using the Servo Cover Compressor, install the retaining ring.



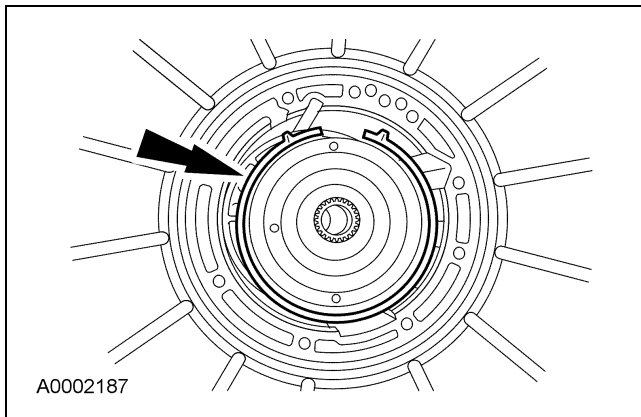
DISASSEMBLY AND ASSEMBLY (Continued)

64. **NOTE:** If the O/D band is reused, it must be installed in the same position as when removed.

NOTE: Make sure that the O/D band apply strut is aligned with the band notch.

NOTE: The new O/D 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.

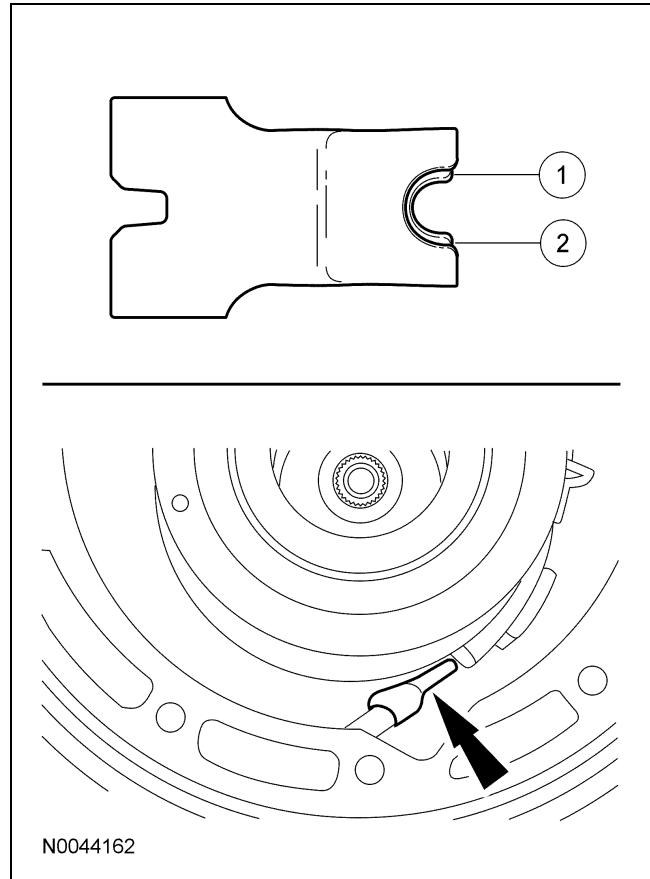
Install the O/D band.



65. **NOTICE:** 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.

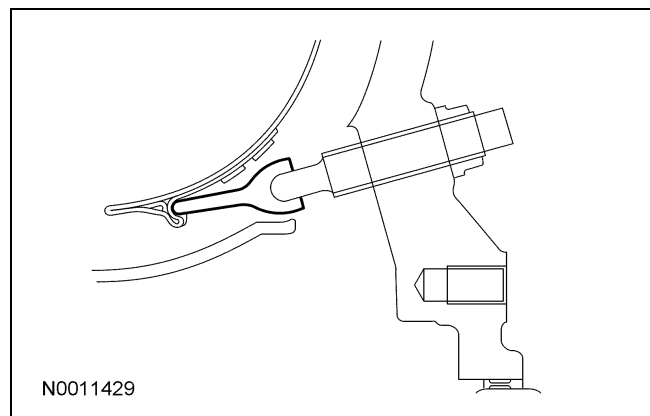
Install the O/D band anchor strut.

- 1 Band/case side of the anchor (small U notch).
- 2 Main control side of the anchor (large U notch).



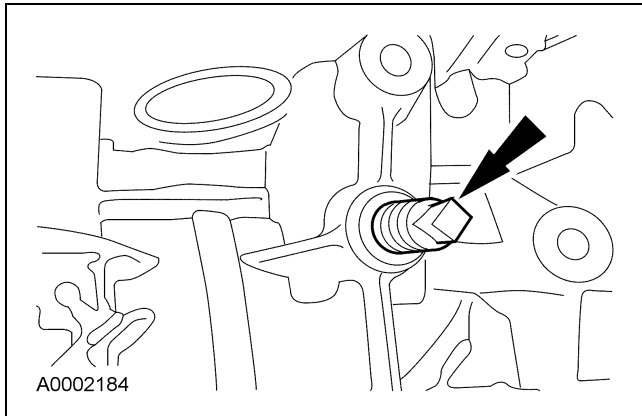
66. **NOTICE:** If the strut is installed incorrectly, transmission damage will occur.

Check to make sure that the intermediate band anchor strut is installed in the correct orientation to the case and adjustment screw.

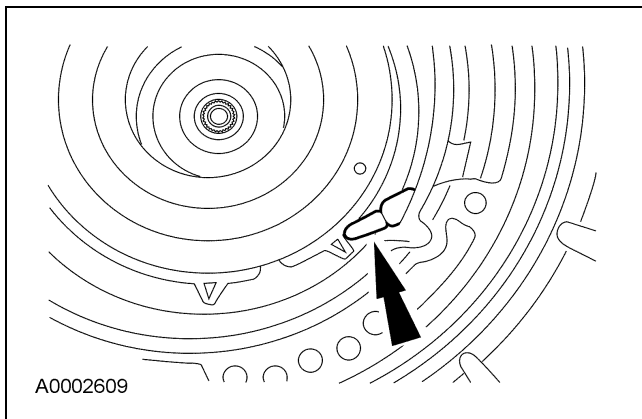


DISASSEMBLY AND ASSEMBLY (Continued)

67. Loosely install the adjustment screw.

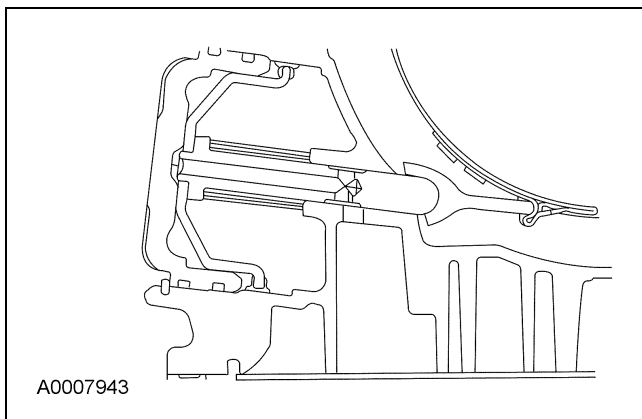


68. Install the O/D apply strut.



69. **NOTICE:** If the strut is installed incorrectly, transmission damage will occur.

Check to make sure that the O/D band apply strut is installed in the correct orientation to the case and piston rod.



70. **NOTICE:** The torque specifications are critical for this procedure. Failure to use the correct torque specifications may cause transmission damage.

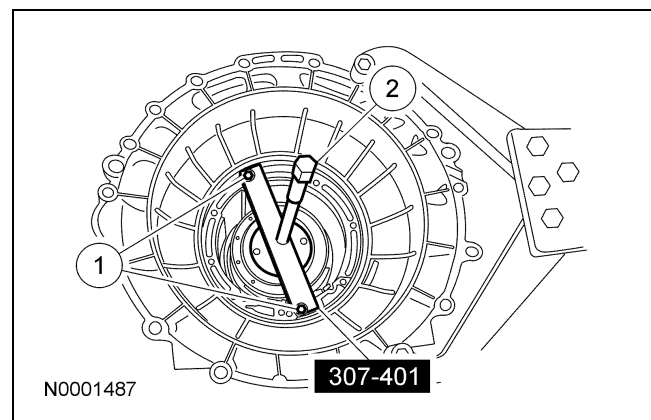
Install the Cushion Spring Compressor.

1 Install the Cushion Spring Compressor and the bolts using the 2 pump screw locations at approximately 6 o'clock and 12 o'clock positions.

■ Tighten to 15 Nm (133 lb-in).

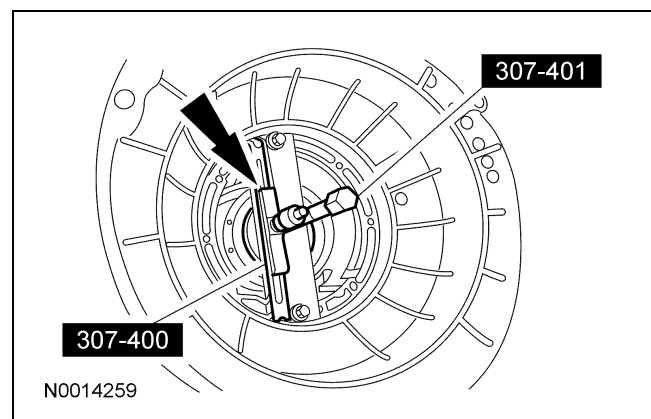
2 Tighten the center screw.

■ Tighten to 1 Nm (9 lb-in).



71. **NOTE:** Align the disc holes on Cushion Spring Compressor 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 Gauge Bar and record as dimension B.



72. Add dimension A to B, divide by 2 and record as dimension C.

DISASSEMBLY AND ASSEMBLY (Continued)

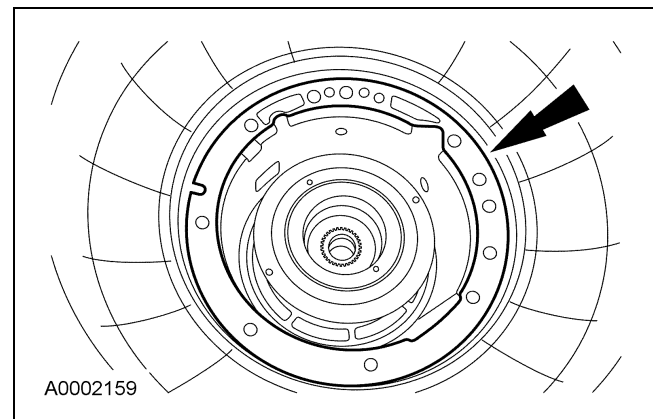
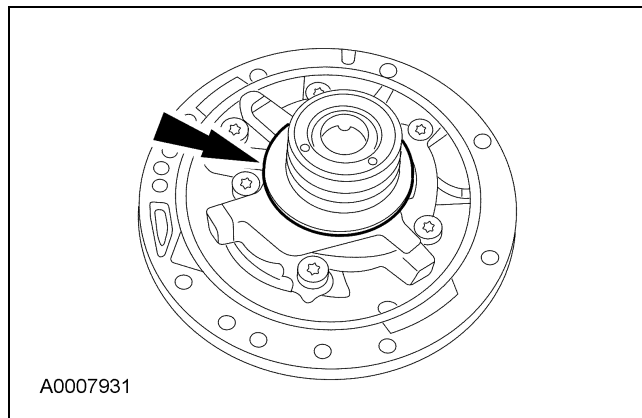
73. Subtract the thickness of the gauge bar 17.78 mm (0.70 in) from dimension C and record as dimension D.

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.

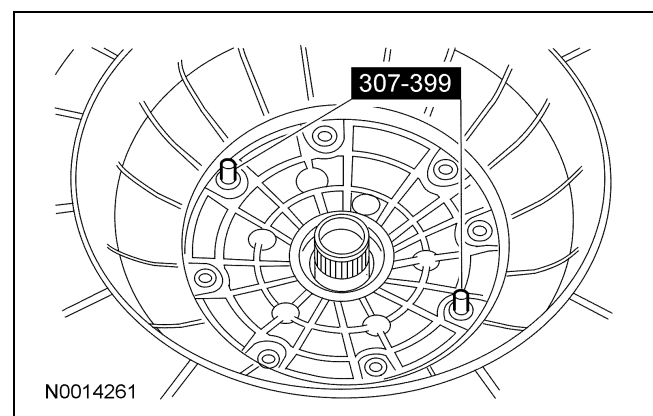
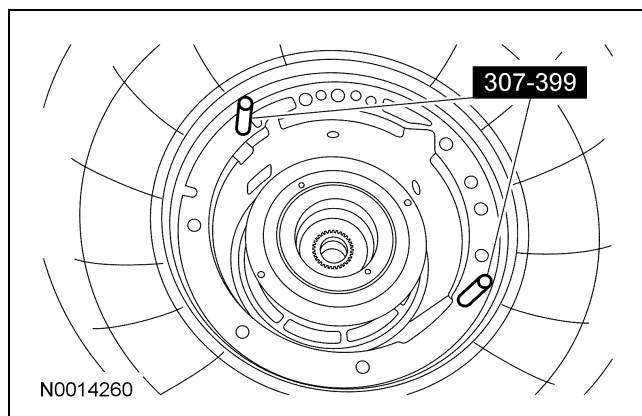
- Coat the fluid pump input thrust washer with petroleum jelly.



76. **NOTICE:** 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 or damage may occur.

Install the fluid pump.

76. Install the Transmission Pump Alignment Pins into the transmission case.

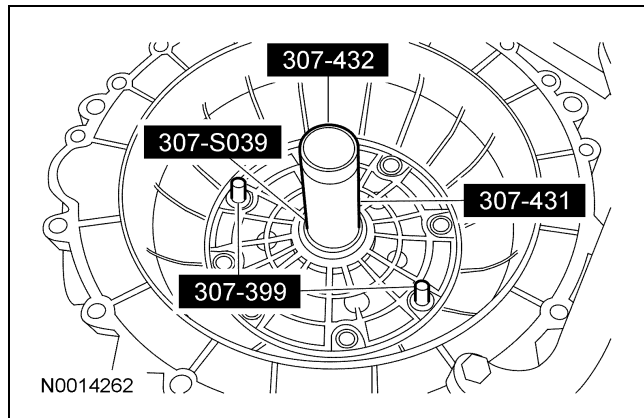


77. Install the pump gasket.

DISASSEMBLY AND ASSEMBLY (Continued)

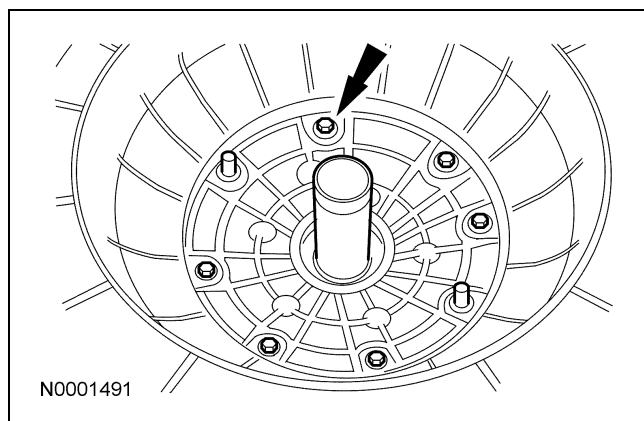
79. **NOTICE:** The Fluid Pump Alignment Set, Transmission Pump Alignment Pins, Fluid Pump Handle Aligner and the Fluid Pump Pilot Aligner must be used to correctly align the pump with the adapter plate to reduce gear noise, bushing failure and leakage.

Using the Fluid Pump Alignment Set, Transmission Pump Alignment Pins, Fluid Pump Handle Aligner and the Fluid Pump Pilot Aligner, align the fluid pump to the adapter plate.



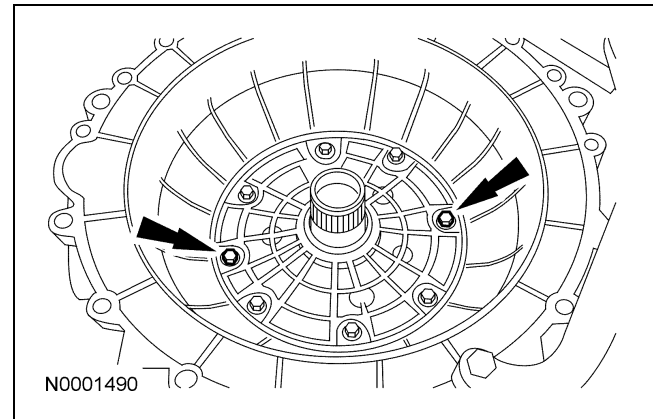
80. Install the fluid pump housing screws. Tighten the screws in a star pattern.

- Tighten to 25 Nm (18 lb-ft).



81. Remove the Fluid Pump Alignment Set, Transmission Pump Alignment Pins, Fluid Pump Handle Aligner and the Fluid Pump Pilot Aligner and install the 2 remaining screws.

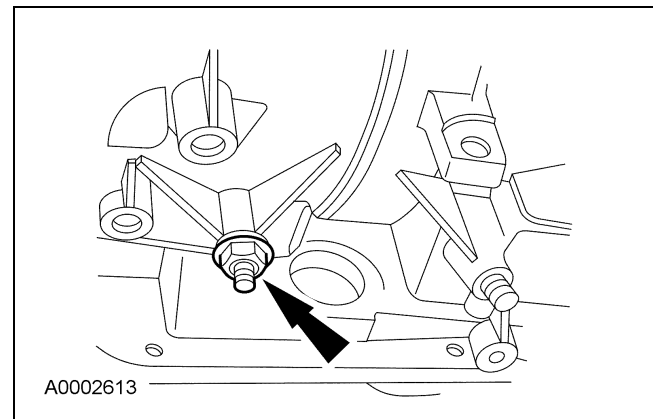
- Tighten to 25 Nm (18 lb-ft).



82. **NOTICE:** Do not allow Overdrive (O/D) band adjustment screw to back out. Band strut may fall out of position.

NOTE: 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.

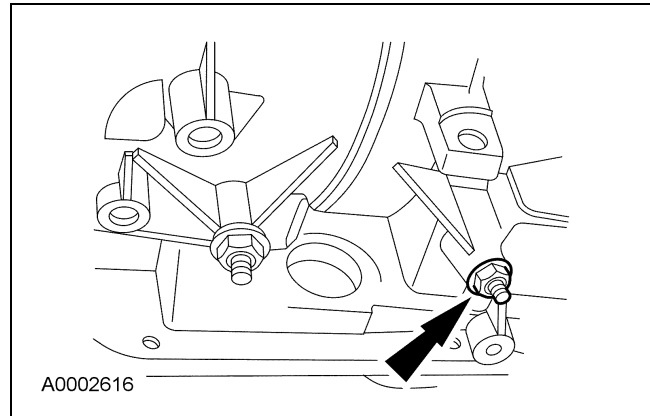
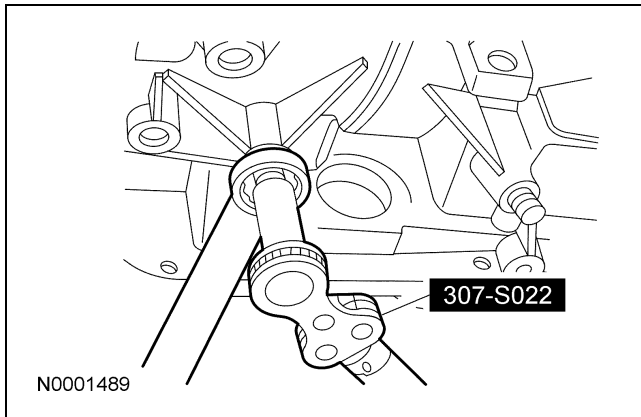


DISASSEMBLY AND ASSEMBLY (Continued)

83. **NOTICE:** The Overdrive (O/D) servo must be installed prior to band adjustment or damage may occur.

Using the Transmission Band Adjustment Set, tighten the O/D band adjustment screw in 2 stages.

- Stage 1: Tighten to 14 Nm (124 lb-in).
- Stage 2: Back off the screw exactly 1.5 turns and hold that position.



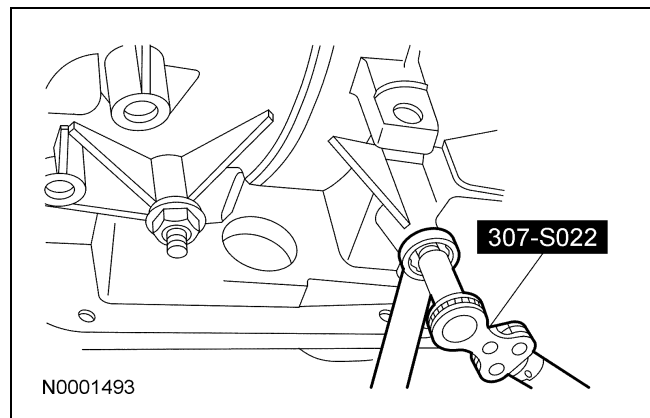
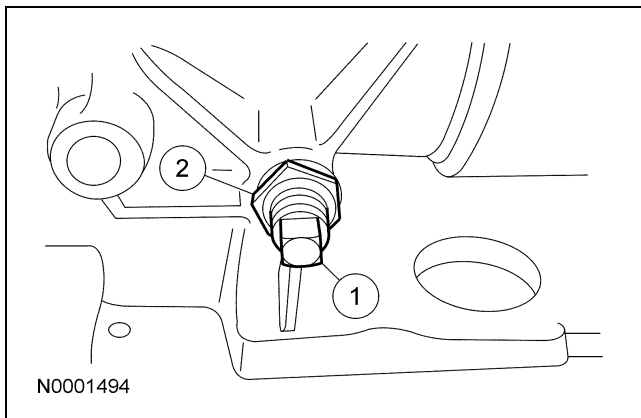
86. **NOTICE:** The intermediate servo must be installed prior to band adjustment or damage may occur.

Using the Transmission Band Adjustment Set, tighten the intermediate band adjustment screw in 2 stages.

- Stage 1: Tighten to 14 Nm (124 lb-in).
- Stage 2: Back off the screw exactly 1.5 turns and hold that position.

84. Tighten the O/D band locknut.

- 1 Hold the O/D band adjustment screw stationary.
- 2 Tighten the O/D band locknut.
 - Tighten to 54 Nm (40 lb-ft).



85. **NOTICE:** Do not allow the intermediate band adjusting screw to back out. Band strut could fall out of position.

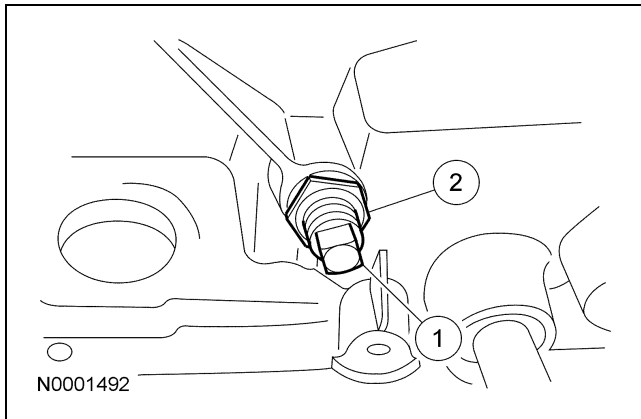
NOTE: Install, but do not tighten, a new locknut on the band adjustment screw. Apply petroleum jelly to the locknut seal.

Install a new nut on the band adjustment screw.

DISASSEMBLY AND ASSEMBLY (Continued)

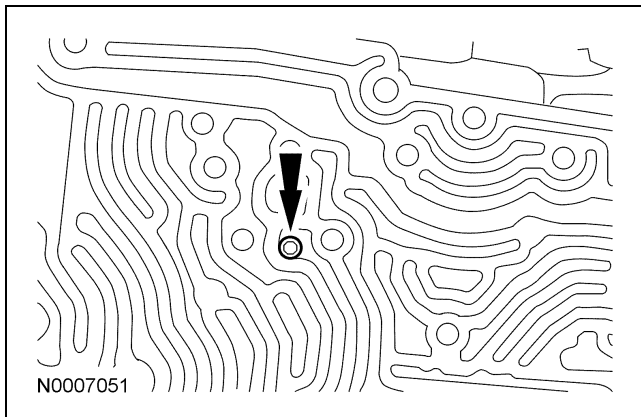
87. Tighten the intermediate band locknut.

- 1 Hold the intermediate band adjustment screw stationary.
 - 2 Tighten the intermediate band locknut.
- Tighten to 54 Nm (40 lb-ft).

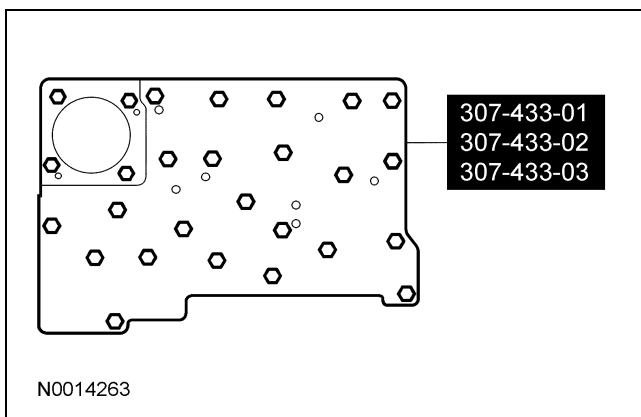


88. Tighten the center support screw.

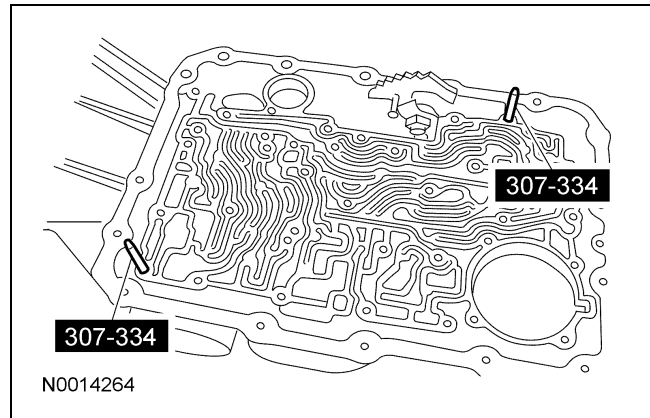
- Tighten to 11 Nm (97 lb-in).



89. Using the Transmission Air Test Plate and Gaskets, carry out the Air Pressure Test procedure. For additional information, refer to Special Testing Procedures in this section.

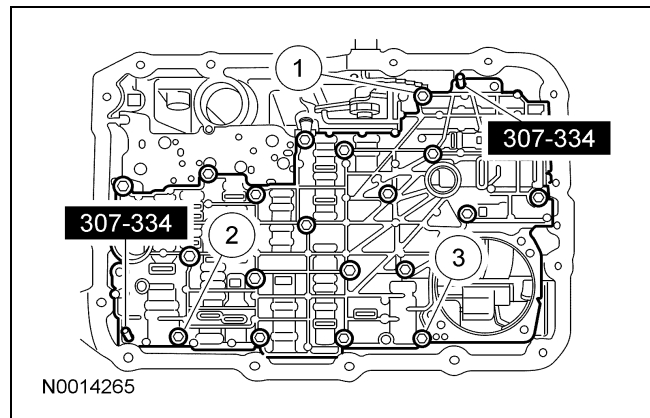


90. Install the Valve Body Aligners into the transmission case.

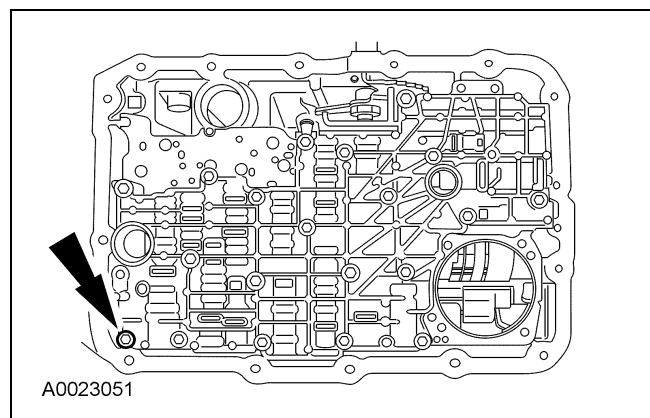


91. Using the Valve Body Aligners, install the main control valve body and loosely install the screws.

- 1 Install the short screw.
- 2 Install the screw with the larger head.
- 3 Install the remaining screws.



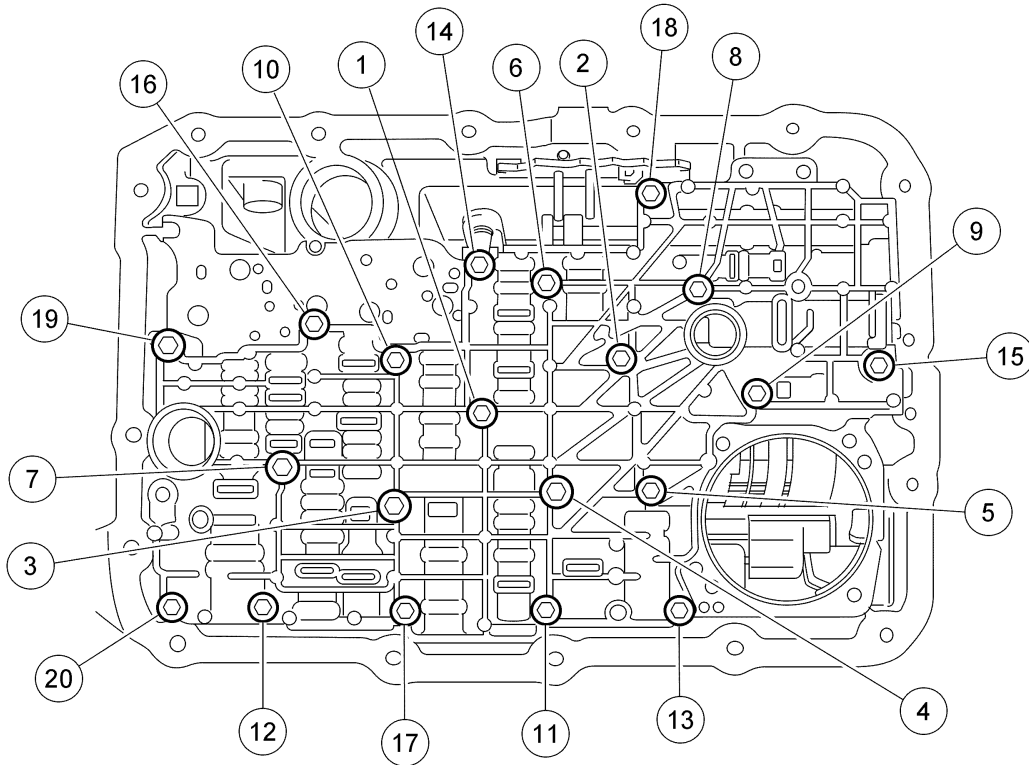
92. Remove the Valve Body Aligners and loosely install one screw.



DISASSEMBLY AND ASSEMBLY (Continued)

93. Tighten the screws in the sequence shown.

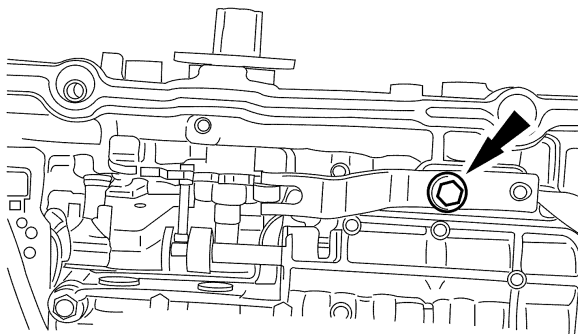
- Tighten to 10 Nm (89 lb-in).



N0089067

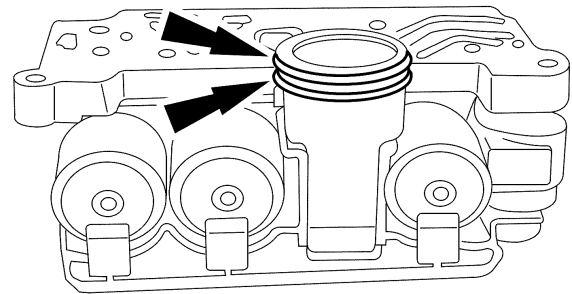
94. With the manual lever in the NEUTRAL position, install the manual valve detent spring.

- 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 automatic transmission fluid.



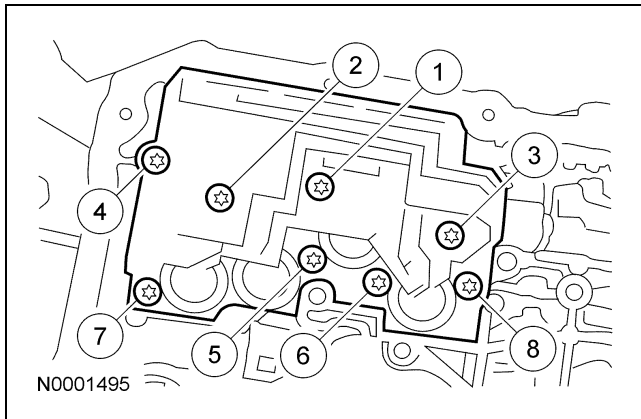
A0007944

DISASSEMBLY AND ASSEMBLY (Continued)

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

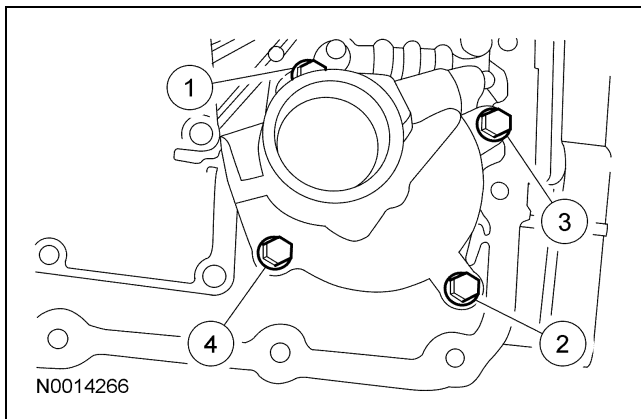
Install the solenoid body. Tighten the screws in the sequence shown.

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



97. Install the reverse servo. Tighten the bolts in the sequence shown in 2 stages.

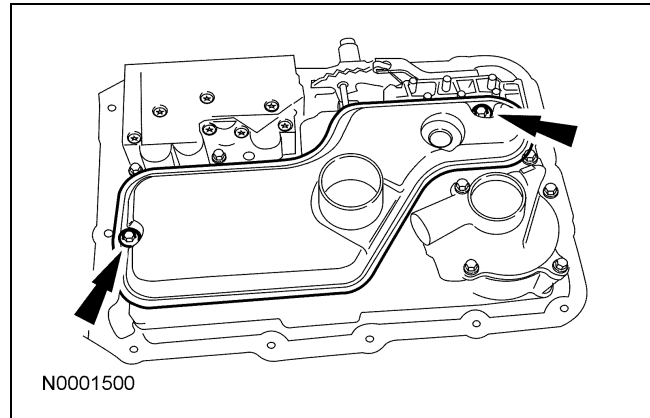
- Stage 1: Tighten to 5 Nm (44 lb-in).
- Stage 2: Tighten to 11 Nm (97 lb-in).



98. **NOTICE:** Lubricate the transmission fluid pan filter seals with automatic transmission fluid or they may be damaged.

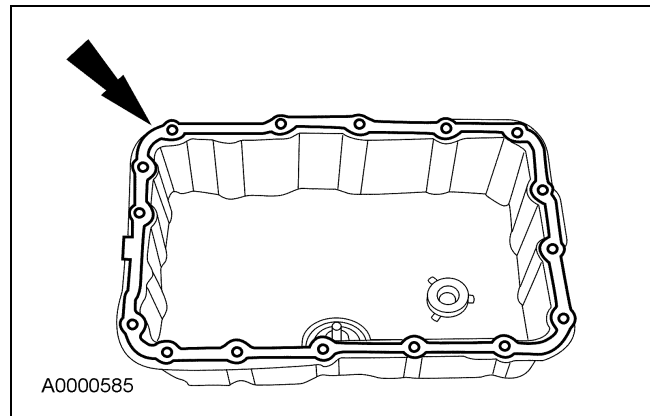
NOTE: Make sure that the transmission fluid pan filter seals are correctly seated on the filter. Lubricate the transmission fluid pan filter seals and install the transmission fluid pan filter.

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



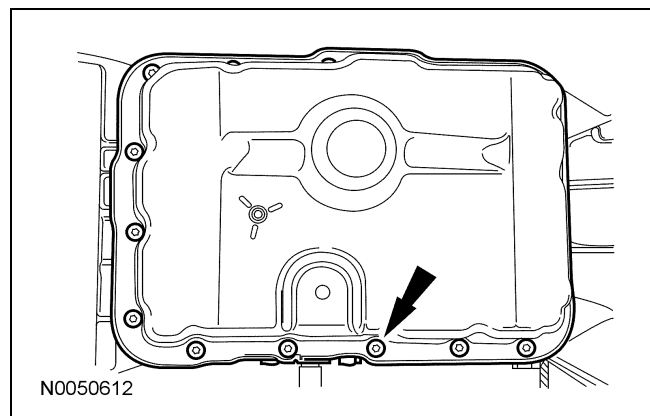
99. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the transmission fluid pan gasket should be reused.

Install the transmission fluid pan gasket on the transmission fluid pan.



100. Install the transmission fluid pan and tighten the screws in a crisscross sequence.

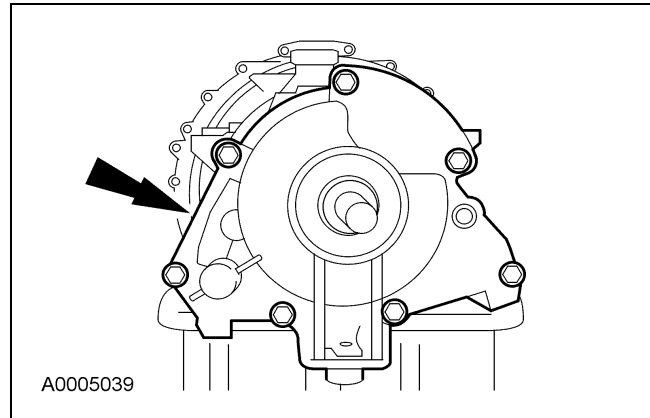
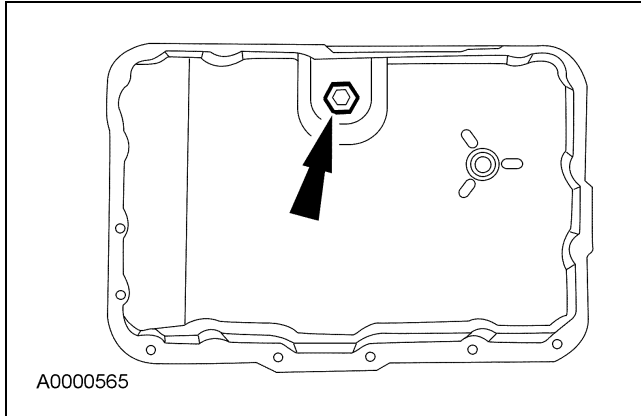
- Tighten to 11 Nm (97 lb-in).



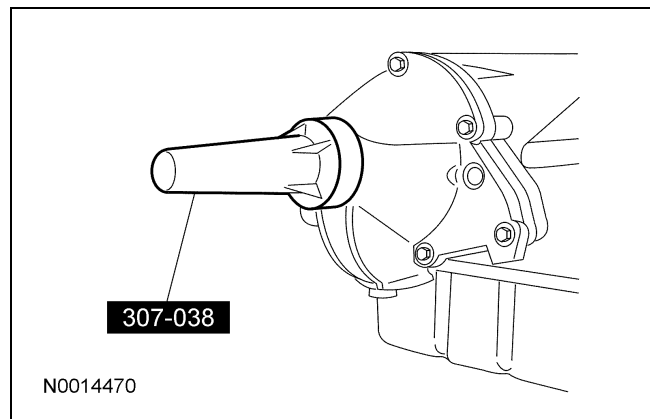
DISASSEMBLY AND ASSEMBLY (Continued)

101. Install the drain plug.

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

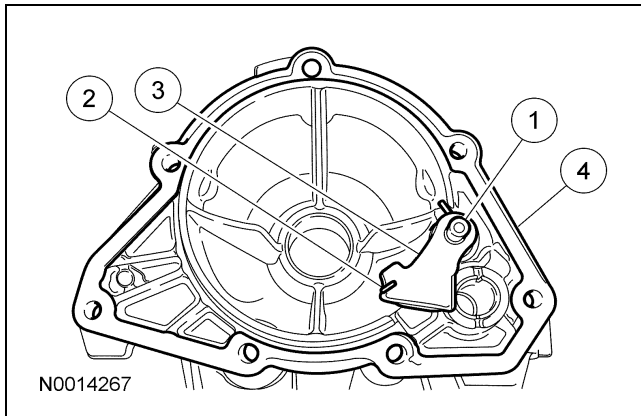


104. Using the Transmission Extension Housing Oil Seal Installer, install the extension housing seal.



102. Install the parking pawl assembly and gasket.

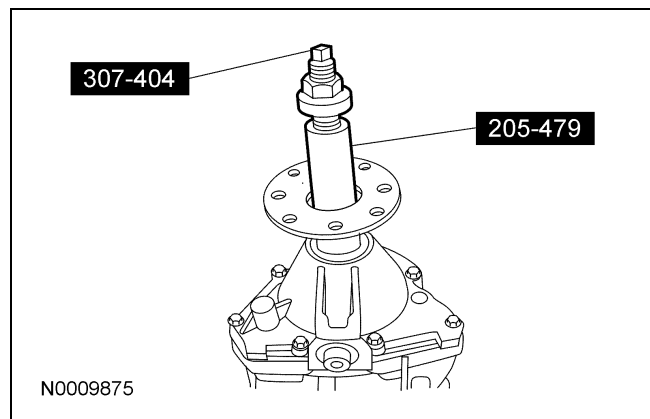
- 1 Install the parking pawl shaft.
- 2 Install the parking pawl return spring.
- 3 Install the parking pawl.
- 4 Install a new gasket.



103. Install the extension housing.

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

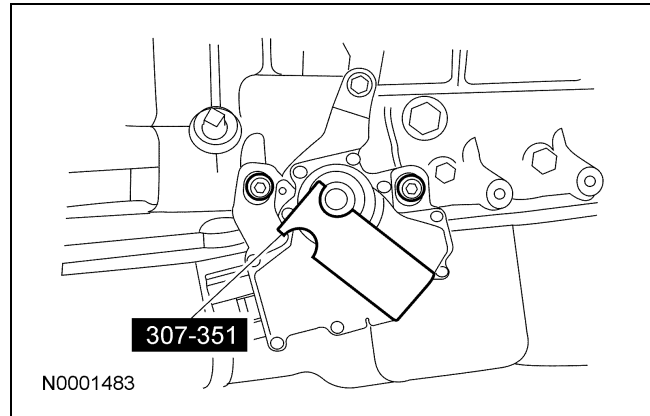
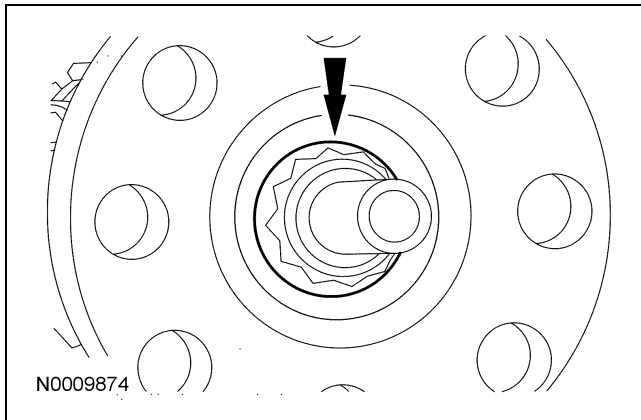
105. Using the Drive Pinion Flange Installer and Output Shaft Flange Installer, install the output shaft flange.



DISASSEMBLY AND ASSEMBLY (Continued)

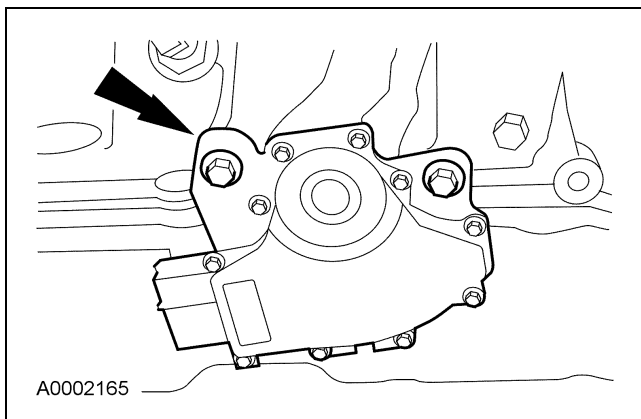
106. Install a new output shaft flange nut.

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



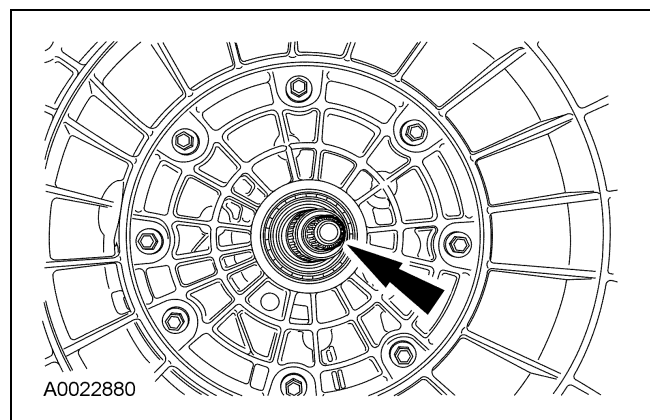
107. **NOTICE:** The Transmission Range (TR) sensor must fit flush against the boss on the case to prevent damage to the sensor.

Install the TR sensor and loosely install the screws.



109. **NOTICE:** 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 or damage may occur.

Install the input shaft.



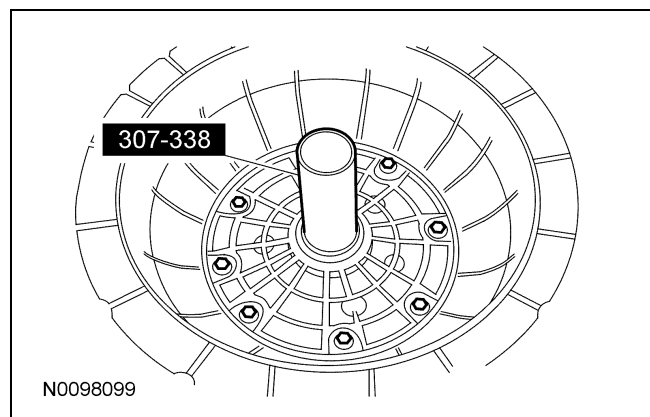
108. **NOTICE:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

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

Using the TR Sensor Alignment Gauge, align the TR sensor and tighten the screws in an alternating sequence.

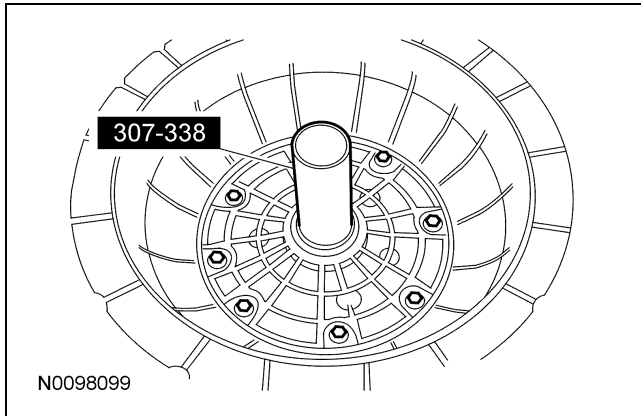
- Tighten 8 Nm (71 lb-in).

110. Using the Piston Seal Sizer, make sure that the front fluid pump seal assembly is fully seated.



DISASSEMBLY AND ASSEMBLY (Continued)

111. Remove the Piston Seal Sizer.

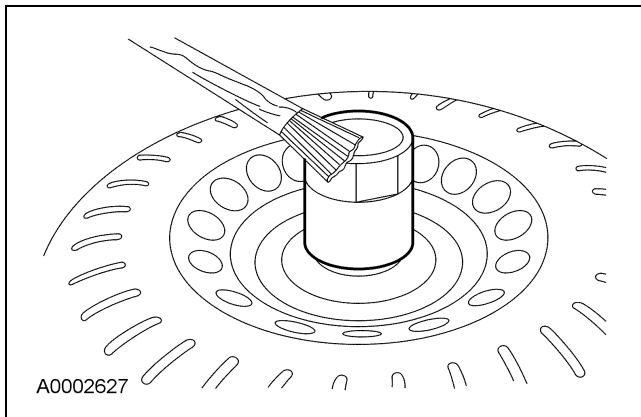


112. **NOTICE:** Do not damage the fluid pump gear O-ring seal when installing torque converter.

NOTICE: Make sure the converter hub is fully engaged in the pump support and gear and rotates freely. Do not damage the hub seal.

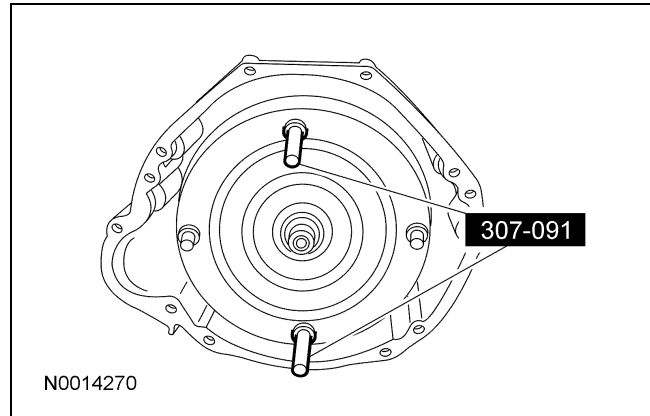
NOTICE: If the torque converter slides out, the hub seal may be damaged.

Lubricate the converter hub with automatic transmission fluid.

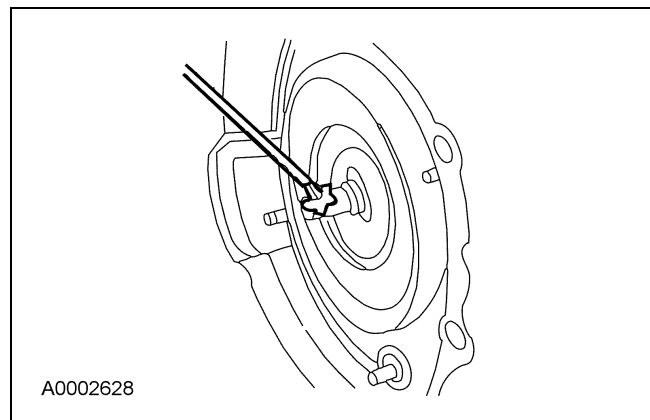


113.  **WARNING:** Secure the torque converter in the transmission during removal or installation. The torque converter is heavy and may result in injury if it falls out of the transmission. Failure to follow this instruction may result in serious personal injury.

Using the Torque Converter Handles, install the torque converter by pushing and rotating.



114. Lubricate the torque converter pilot hub with multi-purpose grease.



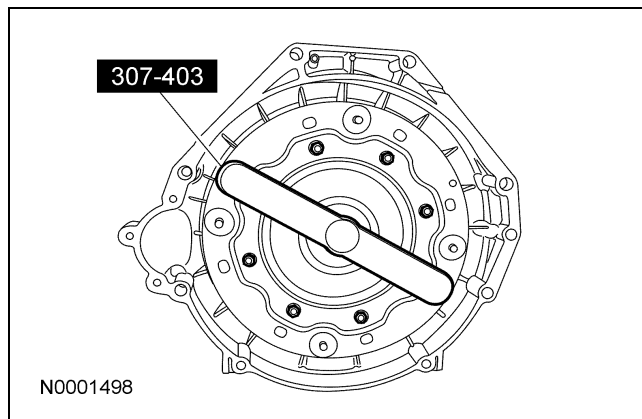
DISASSEMBLY AND ASSEMBLY (Continued)

115. **NOTICE:** The Flex Plate Aligner must be used to correctly align the adapter plate to the converter or transmission damage may occur. In order to correctly install the Flex Plate Aligner, 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.

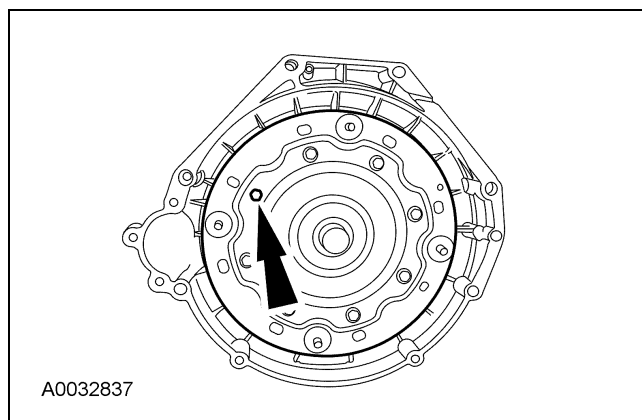
If the vehicle is equipped, use the Flex Plate Aligner to install the torque converter flexplate adapter assembly and 8 nuts.

- Tighten to 44 Nm (32 lb-ft).

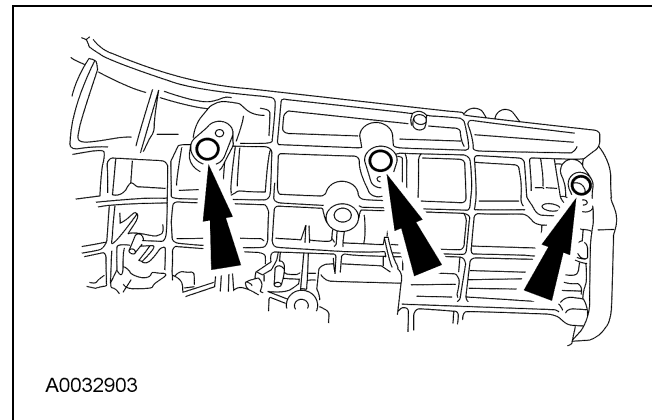


116. Remove the Flex Plate Aligner and install the remaining torque converter flexplate adapter nuts.

- Tighten to 44 Nm (32 lb-ft).



117. Using one of the speed sensor holes, fill the transmission with 8.5L (9 qt) of automatic transmission fluid.

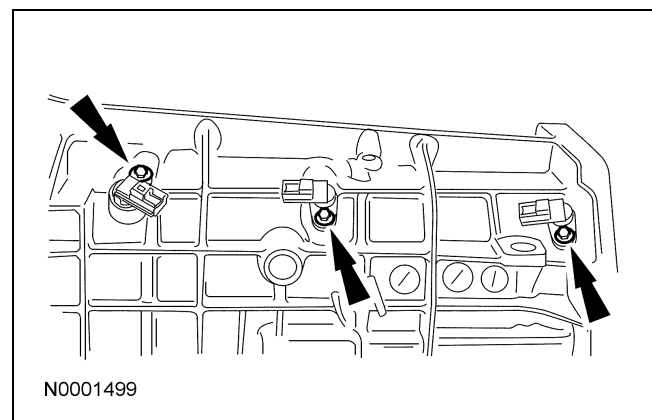


118. **NOTE:** Inspect O-ring seals for damage.

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 (124 lb-in).



REMOVAL AND INSTALLATION

Transmission

All vehicles

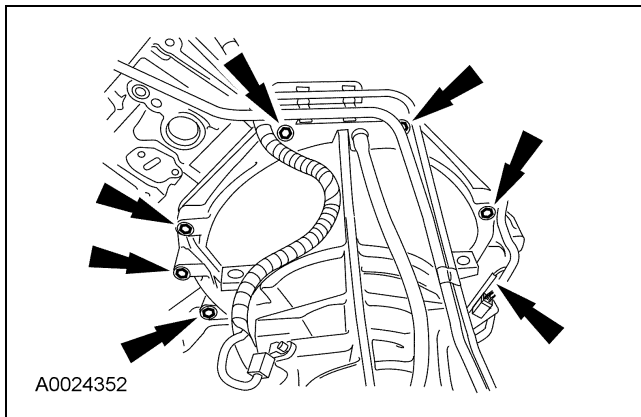
1.  **WARNING:** Secure the assembly to the jack. Avoid any obstructions while lowering and raising the jack. Contact with obstructions may cause the assembly to fall off the jack, which may result in serious personal injury.

Secure the transmission to the transmission jack with a safety chain.

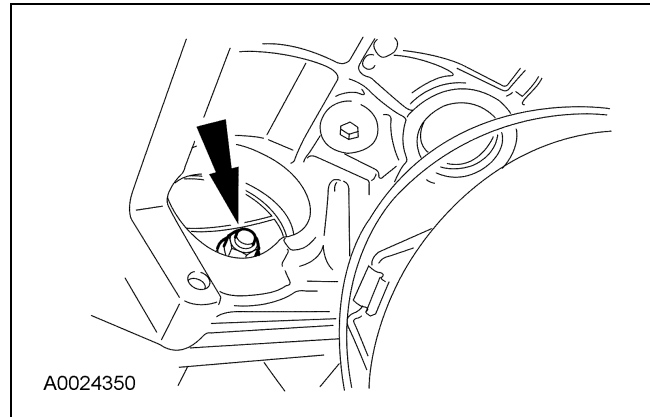
2. Rotate the torque converter and adapter plate so the orange or green paint daub on the torque converter is in the 12 o'clock location.
3. Raise and position the transmission to the back of the engine.

4.6L engine

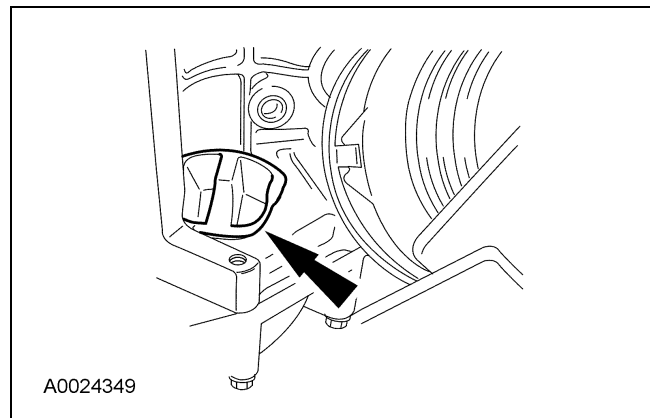
4. Install the 7 engine-to-transmission retaining bolts.
 - Tighten to 48 Nm (35 lb-ft).



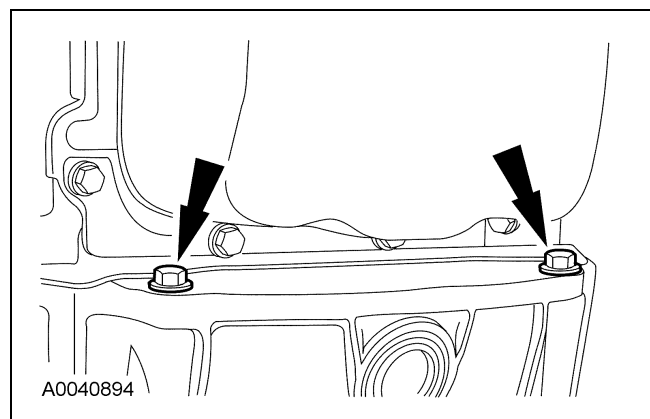
5. Install the 4 new torque converter nuts.
 - Tighten to 44 Nm (32 lb-ft).



6. Install the access cover.



7. Install the flexplate cover.
 - Tighten to 35 Nm (26 lb-ft).

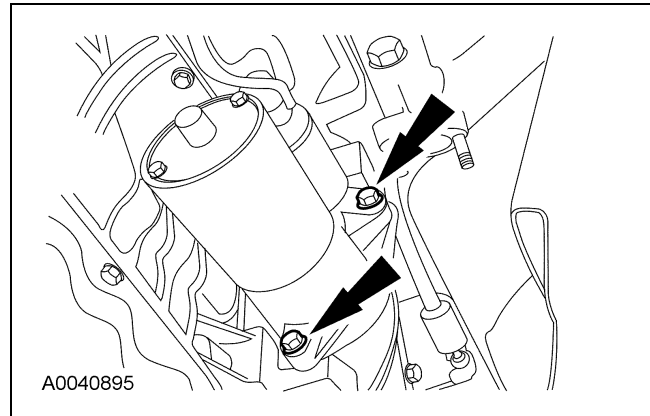
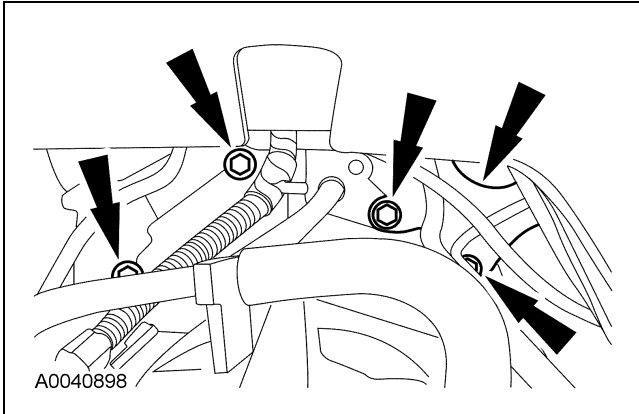


8. Install the starter. For additional information, refer to Section 303-06.

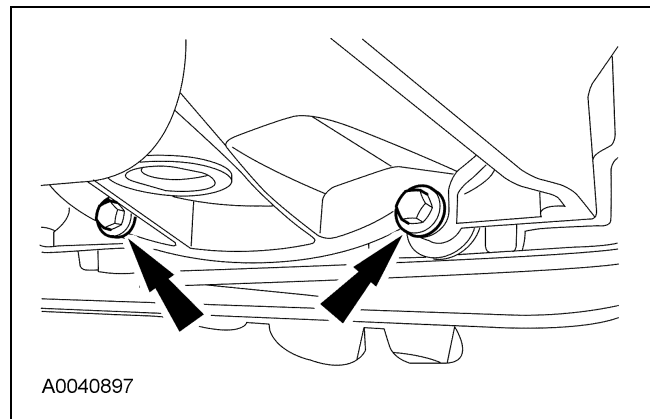
REMOVAL AND INSTALLATION (Continued)

4.0L engine

9. Position the fuel line bracket in place and install the 6 engine-to-transmission retaining bolts.
 - Tighten to 48 Nm (35 lb-ft).



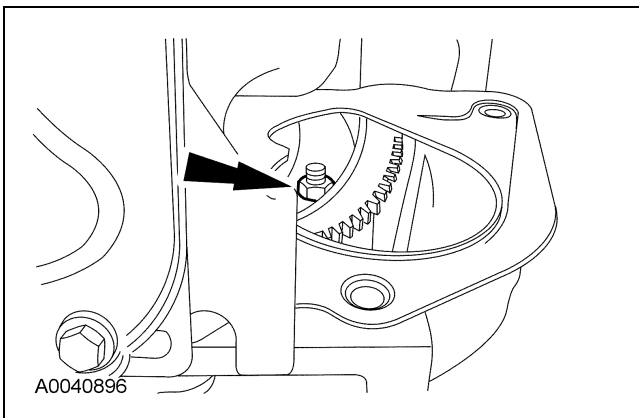
12. Install the lower transmission retaining bolts.
 - Tighten to 48 Nm (35 lb-ft).



10. **NOTICE:** Rotating the crankshaft pulley bolt counterclockwise could cause a reduction in clamp load on the crankshaft pulley and timing sprocket, which could cause severe engine damage.

Install the 4 new torque converter nuts.

- Tighten to 44 Nm (32 lb-ft).

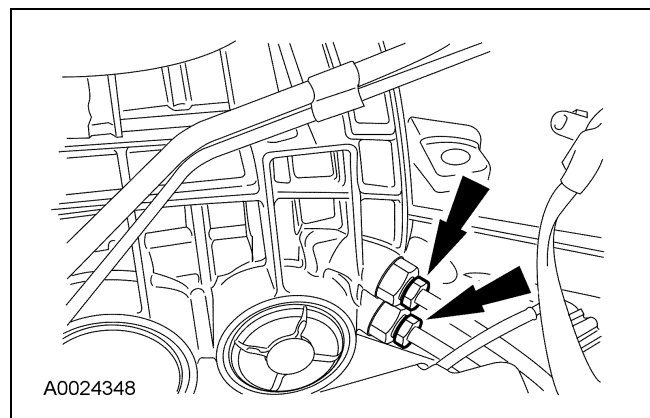


All vehicles

13. **NOTICE:** Use care not to bend or force the transmission fluid cooler tubes, otherwise, damage to the transmission fluid cooler tubes and the transmission may result.

Install the transmission fluid cooler tubes.

- Tighten to 40 Nm (30 lb-ft).



11. **NOTE:** Clean the starter motor mounting flange and mating surface of the starter motor to make sure there is a correct ground connection.

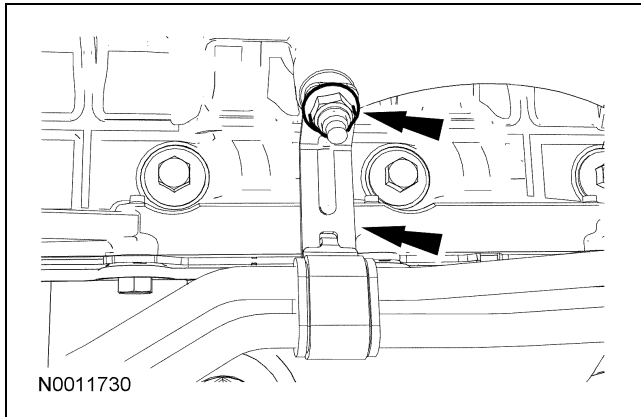
Install the starter motor.

- Tighten to 25 Nm (18 lb-ft).

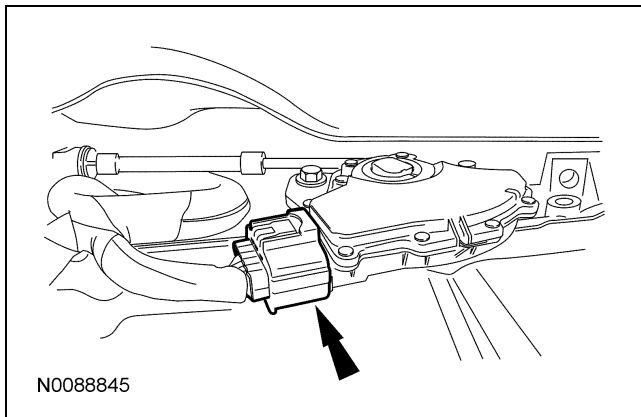
REMOVAL AND INSTALLATION (Continued)

14. Install the transmission fluid cooler tube assembly bracket and nut.

- Tighten to 25 Nm (18 lb-ft).



15. Connect the Transmission Range (TR) sensor connector.



16. **NOTICE:** Damage will occur to the transmission control solenoid body assembly if the screw is tightened above the specification.

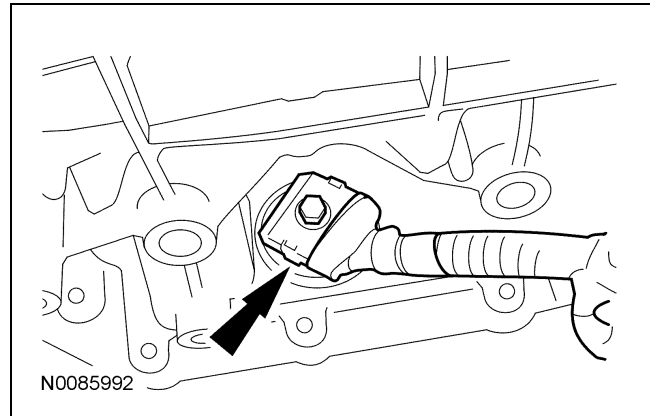
NOTE: Always install new O-ring seals on the transmission vehicle harness connector.

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

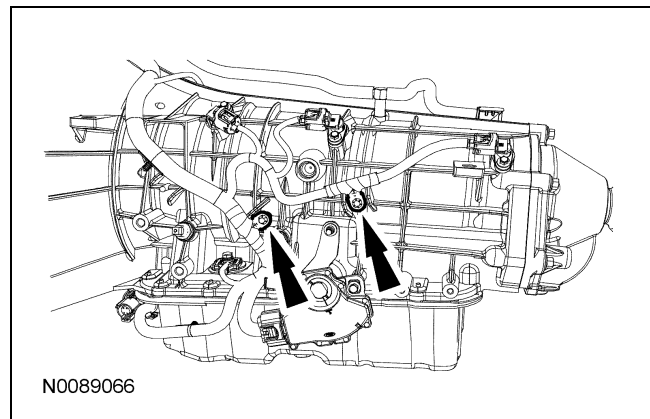
NOTE: Use petroleum jelly to lubricate the O-ring seals to aid in the installation process.

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

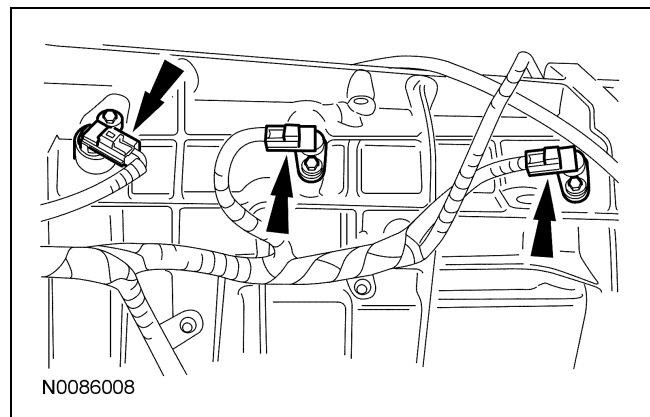
- Tighten to 5 Nm (44 lb-in).



17. Position the transmission vehicle harness and install the retainers.



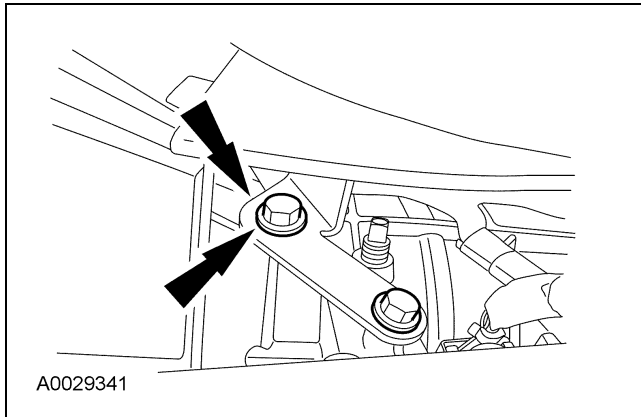
18. Connect the Turbine Shaft Speed (TSS) sensor, Output Shaft Speed (OSS) sensor and intermediate shaft speed sensor connectors.



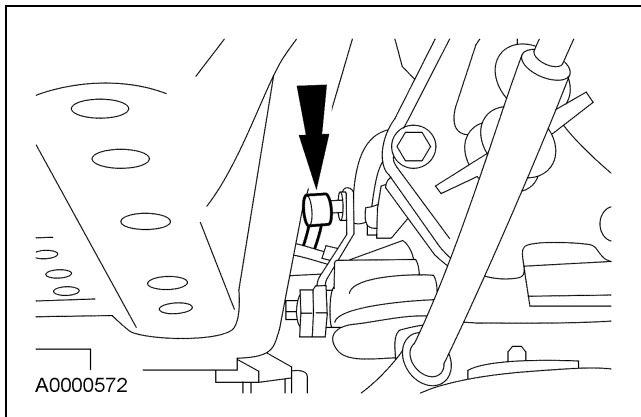
REMOVAL AND INSTALLATION (Continued)

19. Install the selector lever cable bracket and install the 2 bolts.

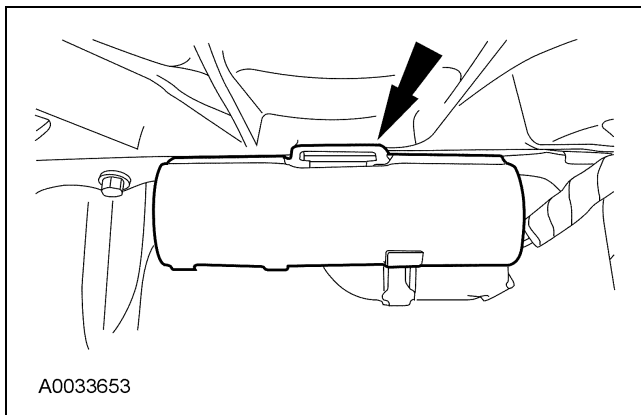
- Tighten to 28 Nm (21 lb-ft).



20. Install the selector lever cable onto the transmission manual lever.



21. Install the transmission crossmember. For additional information, refer to Section 502-00.
22. Install the Heated Oxygen Sensor (HO2S) connector to the front of the transmission fluid pan rail.



23. Install the driveshaft. For additional information, refer to Section 205-01.

24. Install the catalytic converter. For additional information, refer to Section 309-00.

25. 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.

26. **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.

27. Carry out the fluid level check. For additional information, refer to Transmission Fluid Level Check in this section.

28. Verify that the selector lever cable is correctly adjusted. For additional information, refer to Section 307-05.

REMOVAL AND INSTALLATION (Continued)

29. Check the operation of the transmission and inspect for leaks.
-

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V	11.2L (11.9 qt)

Torque Specifications

Description	Nm	lb-ft	lb-in
Cooler line bracket to engine nut/bolt	48	35	—
Fluid cooler mounting screws	10	—	89
Fluid cooler tube nut at transmission	40	30	—

DESCRIPTION AND OPERATION

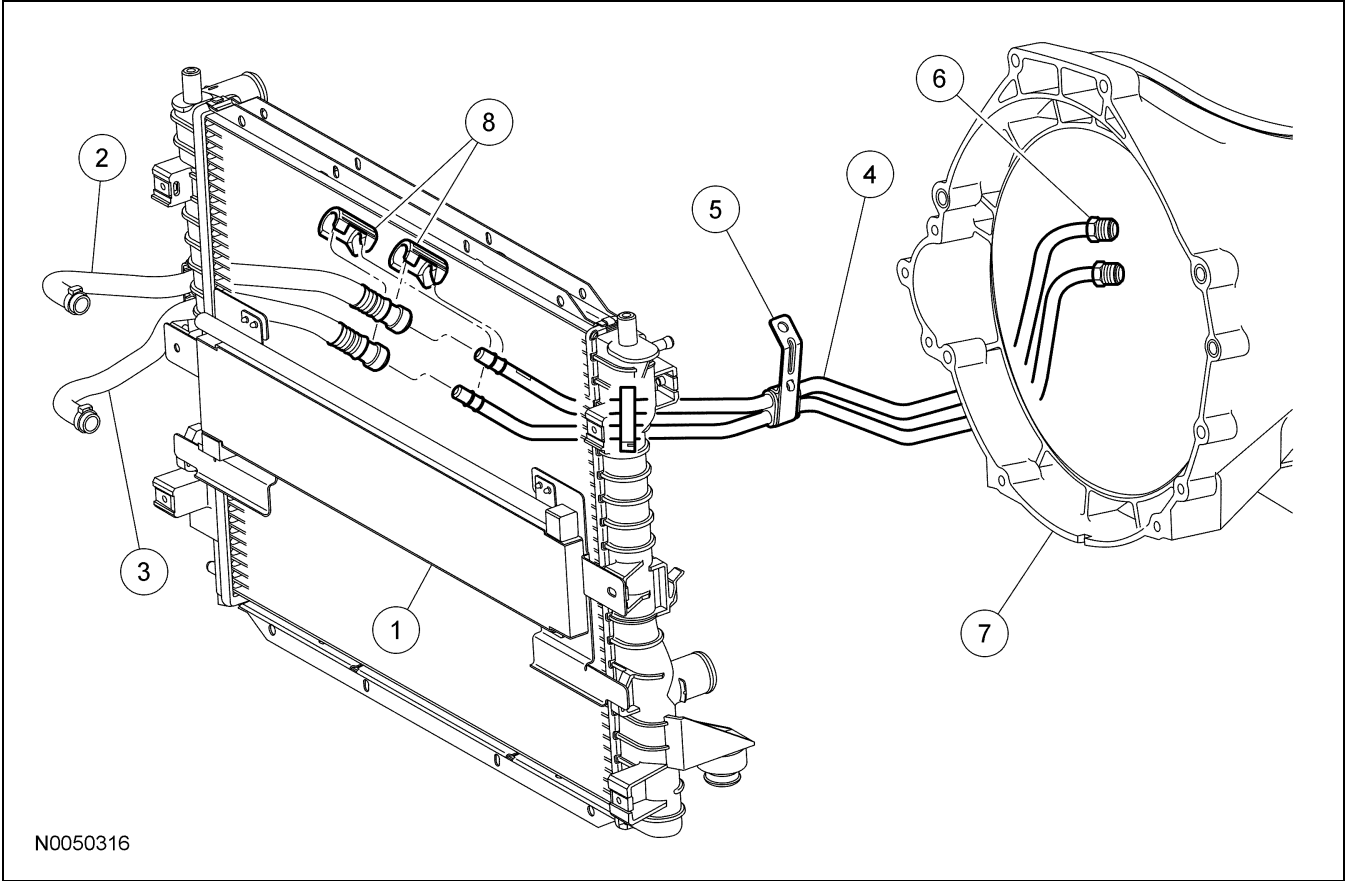
Transmission Cooling

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)



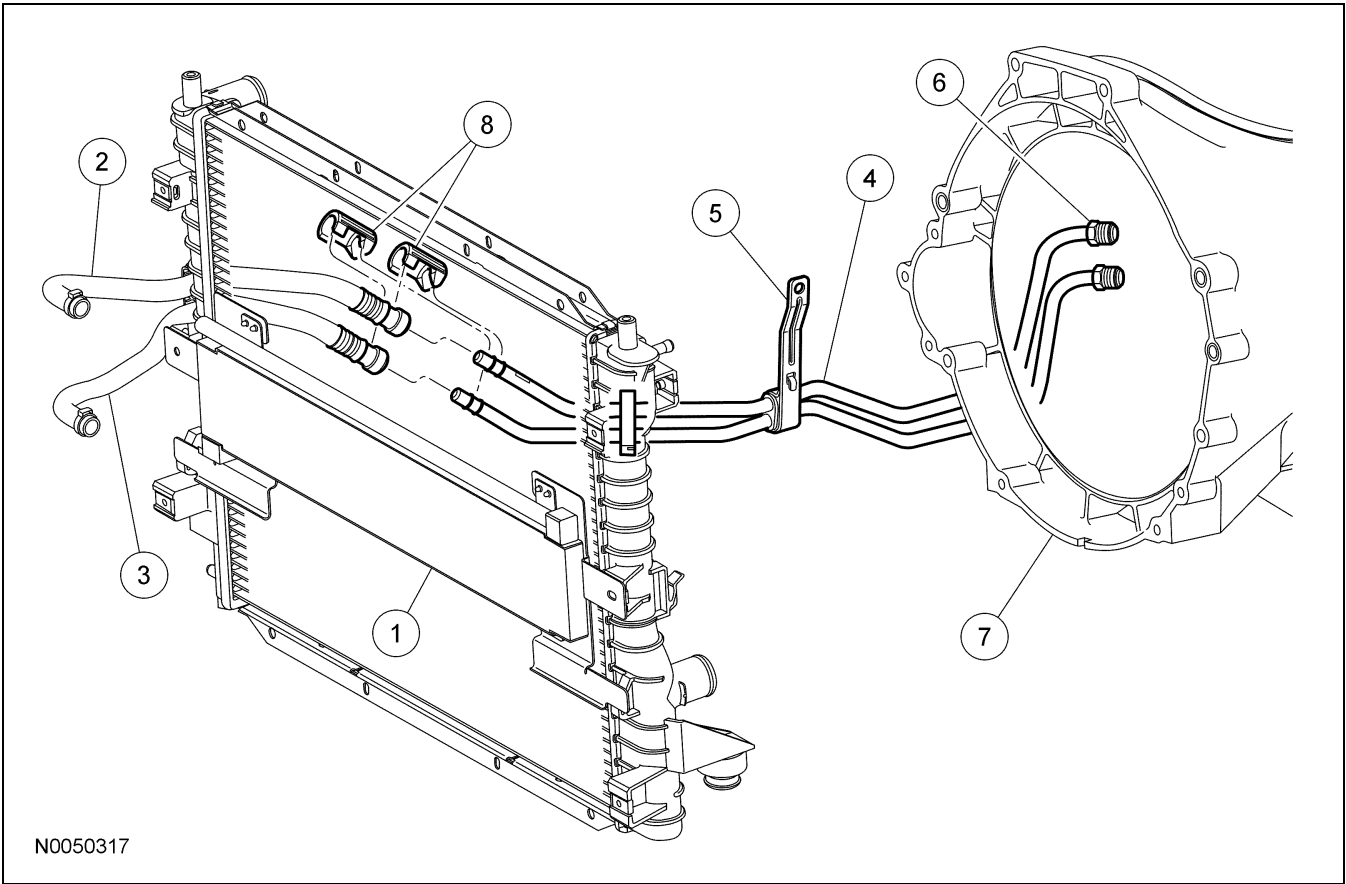
Item	Part Number	Description
1	7A095	Auxiliary oil cooler
2	7W064	Fluid cooler outlet hose
3	7W063	Fluid cooler inlet hose
4	7H420	Fluid cooler tube assembly
5	—	Fluid cooler tube assembly bracket (part of 7H420)

(Continued)

Item	Part Number	Description
6	—	Fluid cooler tube assembly nut (part of 7H420)
7	7005	Transmission case
8	7J081	Transmission fluid cooler tube quick connect secondary latches

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 nut (part of 7H420)
7	7005	Transmission case
8	7J081	Transmission fluid cooler tube quick connect secondary latches

(Continued)

DIAGNOSIS AND TESTING

Transmission Cooling

NOTICE: 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 — Transmission Cooling****Symptom Chart — Transmission Cooling**

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 fluid to correct level. - INSPECT fluid 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.

Symptom Chart — Noise, Vibration and Harshness (NVH)**Symptom Chart — Noise, Vibration And Harshness (NVH)**

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

Condition	Possible Sources	Action
Vibration — a high frequency (20-80 Hz) that is felt through the seat or selector lever. Changes with engine speed	Transmission cooler lines grounded out	CHECK the transmission cooler lines. REPAIR as necessary.

GENERAL PROCEDURES

Transmission Fluid Cooler Backflushing and Cleaning

1. Refer to Section 307-01.
-

GENERAL PROCEDURES

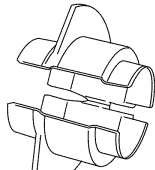
Transmission Fluid Cooler Flow Test

1. Refer to Section 307-01.
-

REMOVAL AND INSTALLATION

Transmission Fluid Cooler Tubes

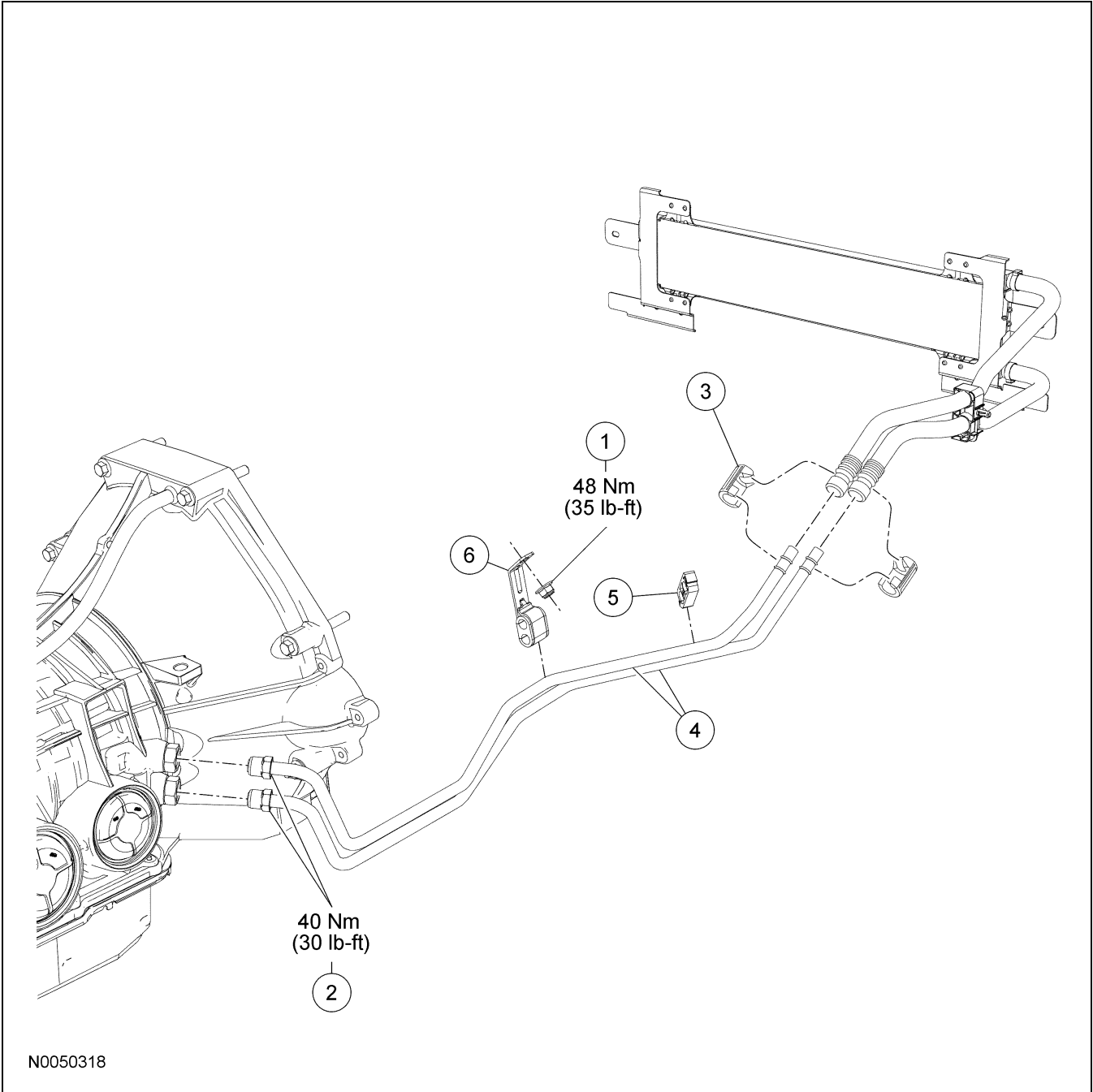
Special Tool(s)

 ST2935A	Disconnect Tool, Transmission Cooler Line 307-569

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)

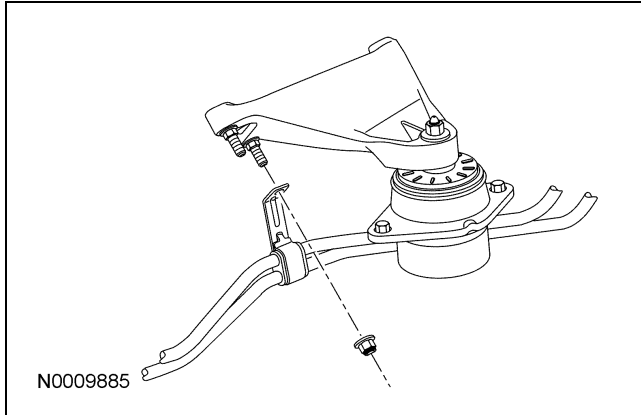
Removal

All vehicles

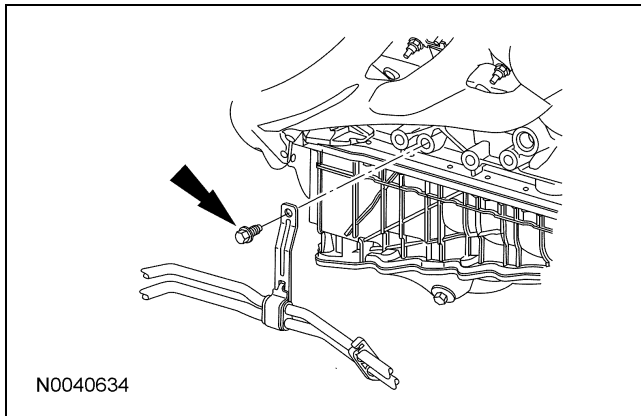
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

REMOVAL AND INSTALLATION (Continued)**4.6L engines**

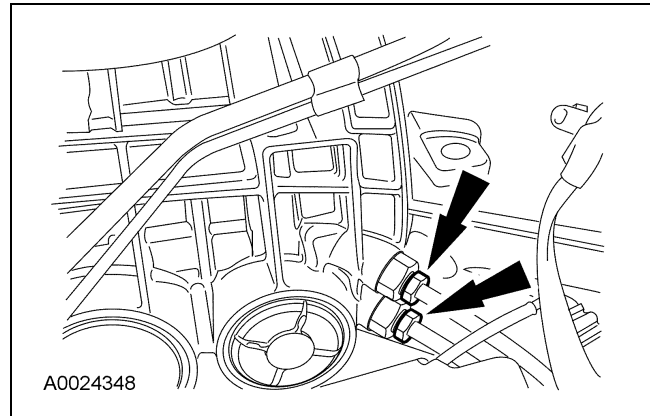
2. Remove the fluid cooler tube bracket at the engine.

**4.0L engines**

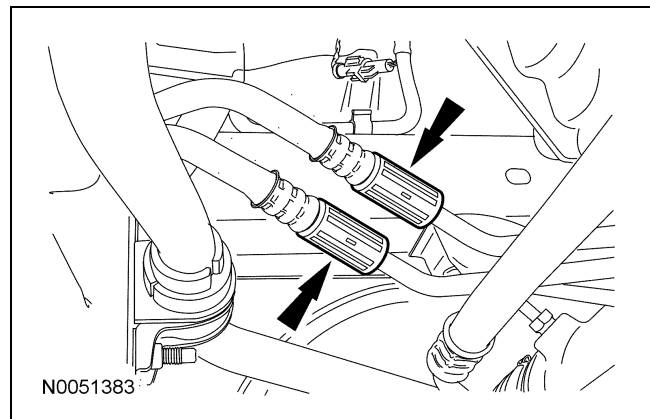
3. Remove the fluid cooler tube bracket at the engine.

**All vehicles**

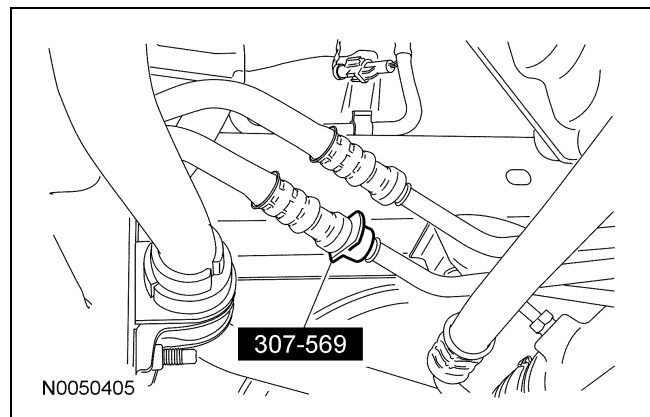
4. **NOTE:** Use a backup wrench to hold the case fitting secure.
Remove the fluid cooler tubes at the transmission.



5. Remove both transmission cooler tube quick connect secondary latches.



6. Using the special tool, disconnect both transmission cooler tubes from the transmission cooler hoses.

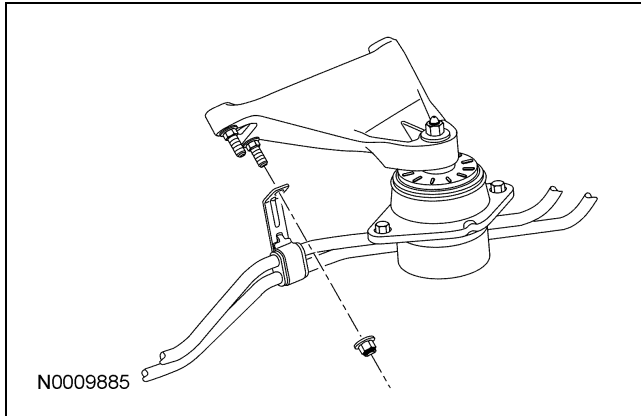


REMOVAL AND INSTALLATION (Continued)

Installation

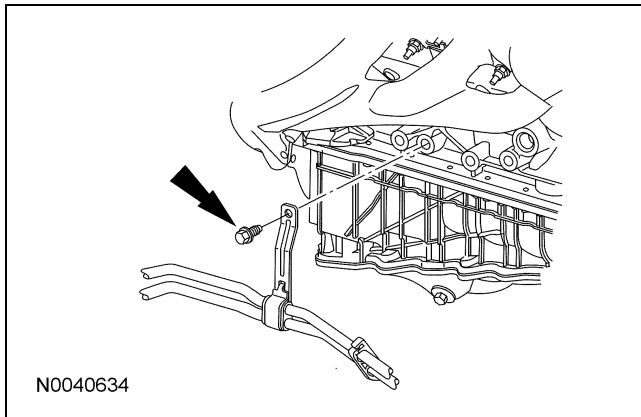
4.6L engines

1. Loosely install the fluid cooler tube bracket at the engine.



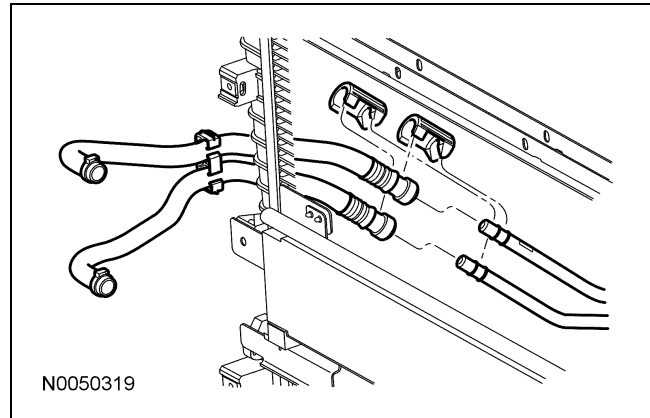
4.0L engines

2. Loosely install the fluid cooler tube bracket at the engine.

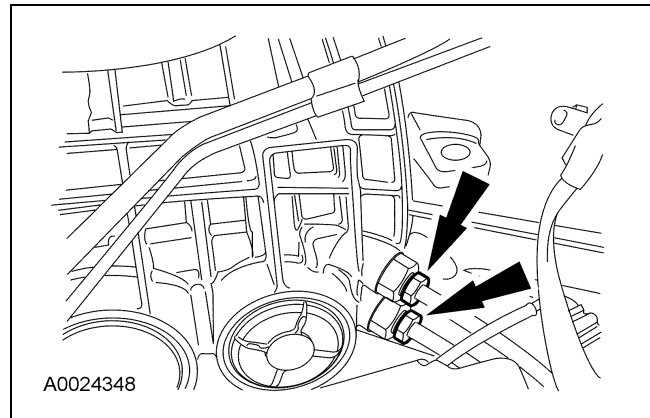


All vehicles

3. Install the fluid cooler hoses on the fluid cooler tubes and install the secondary latches onto the tubes.

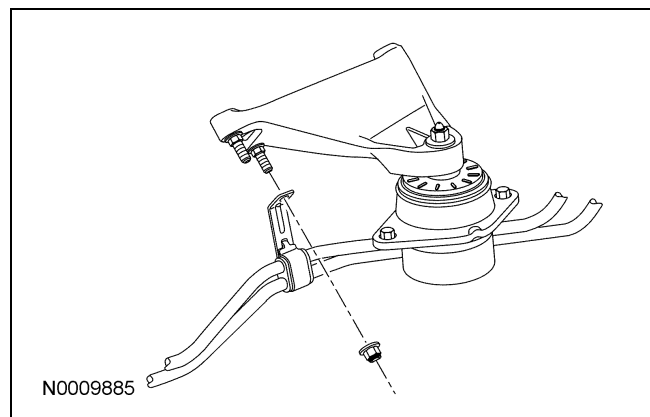


4. **NOTE:** Use a backup wrench to hold the case fitting secure.
Install the fluid cooler tubes at the transmission.
 - Tighten to 40 Nm (30 lb-ft).



4.6L engines

5. Tighten the fluid cooler tube bracket nut at the engine.
 - Tighten to 48 Nm (35 lb-ft).

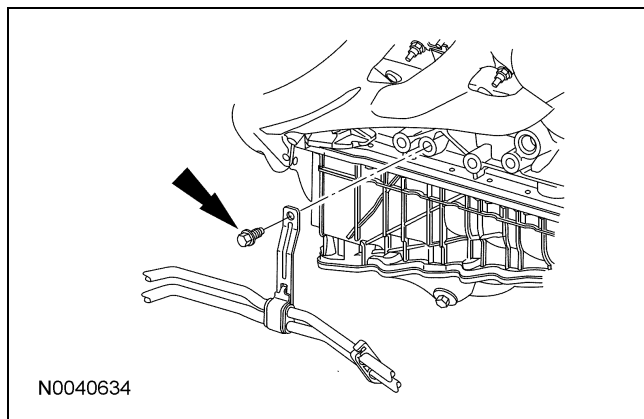


REMOVAL AND INSTALLATION (Continued)**4.0L engines**

6. Tighten the fluid cooler tube bracket bolt at the engine.
 - Tighten to 48 Nm (35 lb-ft).

All vehicles

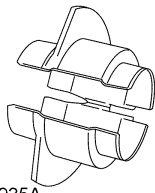
7. Fill the transmission with clean automatic transmission fluid and verify correct operation.



REMOVAL AND INSTALLATION

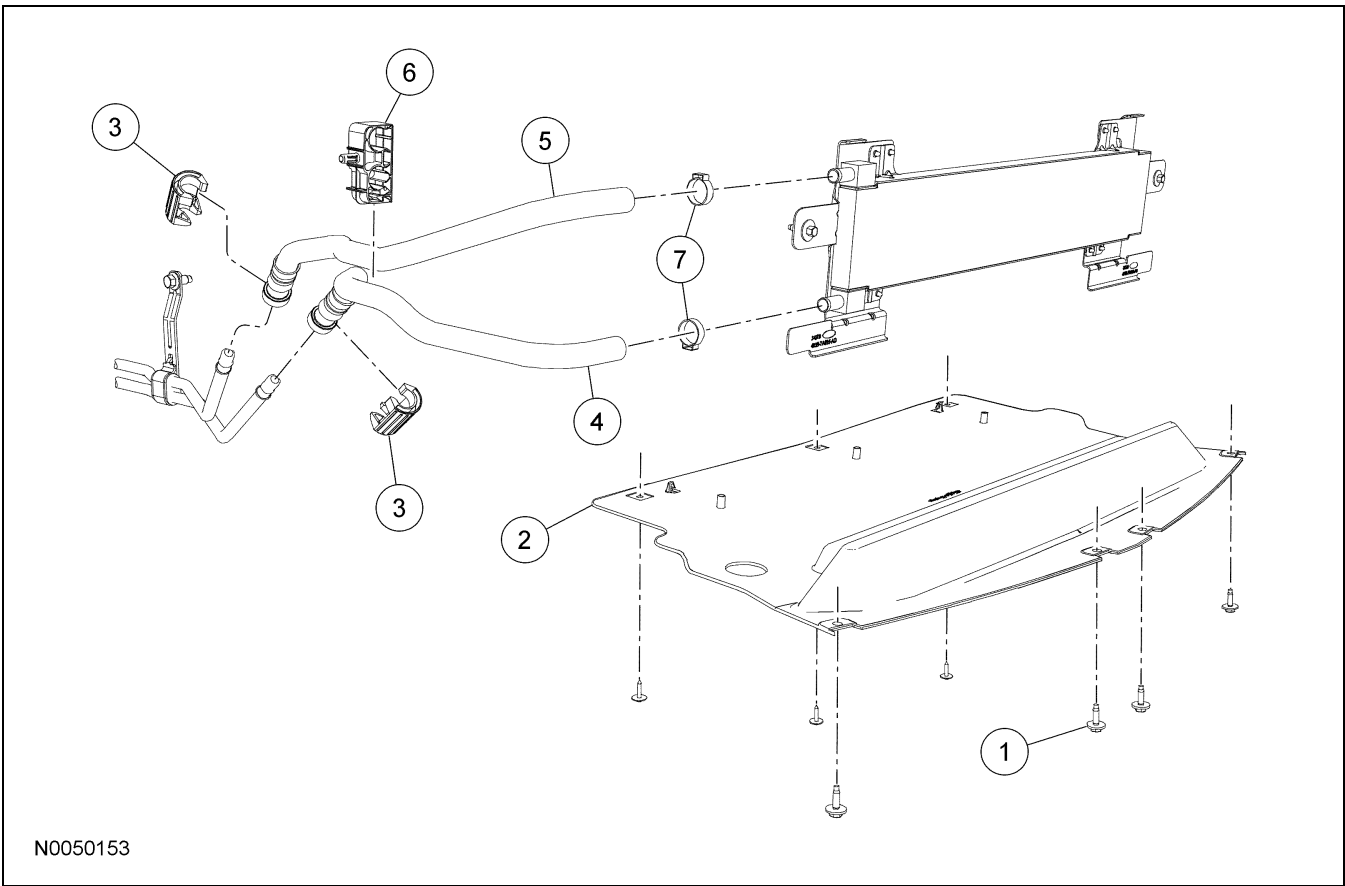
Transmission Fluid Cooler Hoses

Special Tool(s)

 ST2935A	Disconnect Tool, Transmission Cooler Line 307-569

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 screw (7 required)
2	—	Lower air deflector

(Continued)

Item	Part Number	Description
3	7J081	Transmission fluid cooler tube quick connect secondary latches

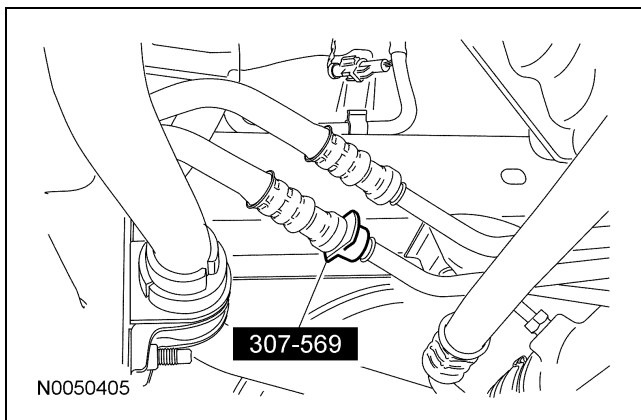
(Continued)

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

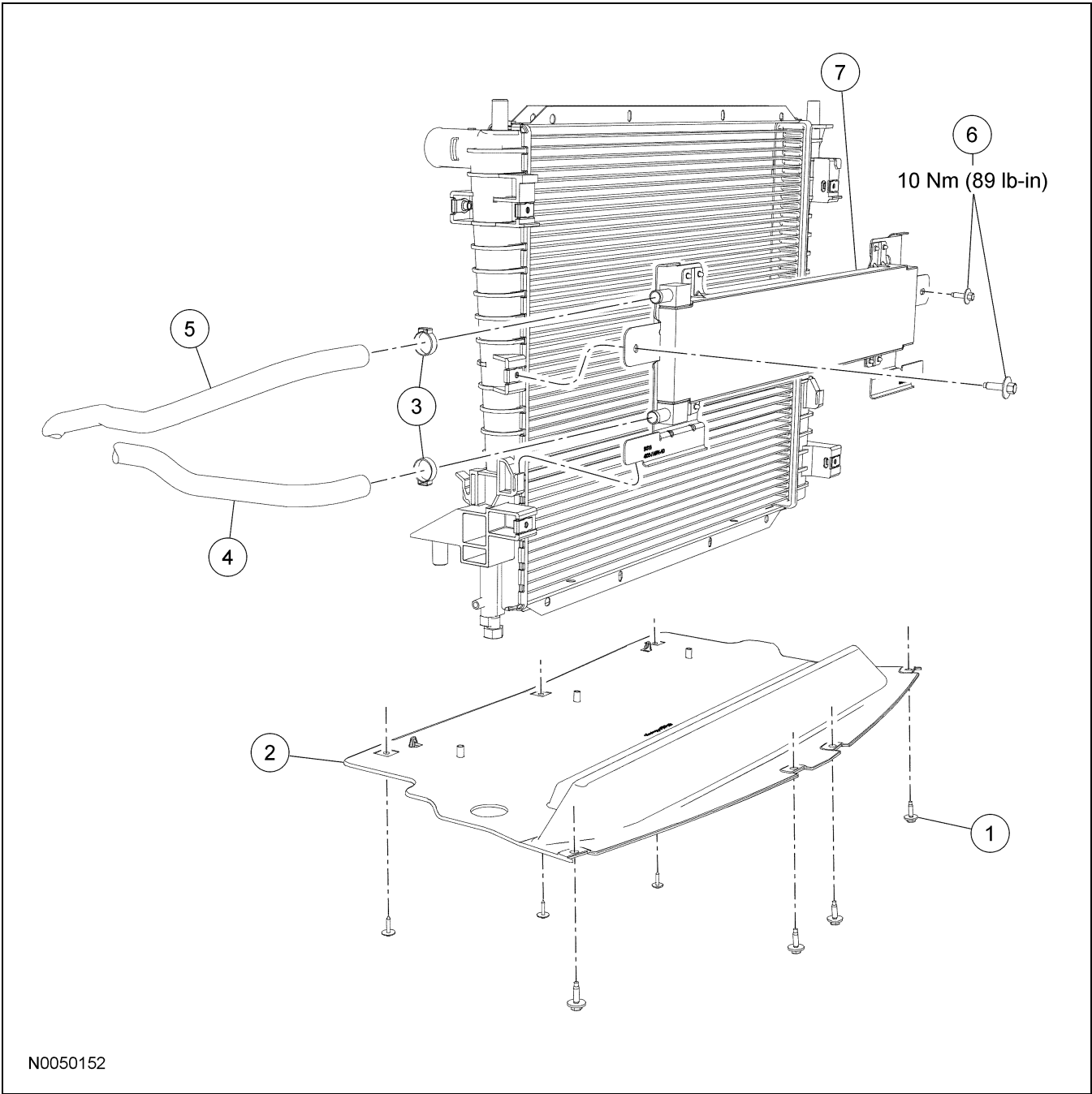
1. Install the transmission fluid cooler hoses into the retainer.
2. Connect the transmission fluid cooler hoses to the cooler.
3. Install 2 new transmission fluid cooler hose-to-cooler clamps.
4. Connect the transmission fluid cooler hoses to the cooler tubes.
5. Install the transmission fluid cooler 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

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	—	Lower air deflector screw (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.

SPECIFICATIONS

Torque Specifications

Description	Nm	lb-ft	lb-in
Transmission selector lever cable bracket bolts	28	20	—
Transmission selector lever housing assembly screws and nuts	9	—	80
Transmission selector lever knob screw	3	—	27

DESCRIPTION AND OPERATION

External Controls

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

Brake Shift Interlock Actuator (BSIA)

A Brake Shift Interlock Actuator (BSIA) system is used on vehicles equipped with an automatic transmission. This system is used to prevent moving the transmission selector lever from the PARK position unless the brake pedal is applied. When the BSIA is de-energized, the transmission selector lever is locked in the PARK position. When the brake pedal is applied, the BSIA is energized and the transmission selector lever can be moved from the PARK position.

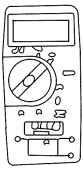
Transmission Control Switch (TCS)

The Transmission Control Switch (TCS) is a momentary contact switch that is located on the transmission selector lever. Pushing the TCS will disengage or engage the Overdrive (O/D) function of the automatic transmission. If O/D is disengaged, the icon O/D OFF will illuminate on the Instrument Cluster (IC).

DIAGNOSIS AND TESTING

External Controls

Special Tool(s)

 ST1137-A	73 Digital Multimeter 105-R0051 or equivalent

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 — External Controls](#) or GO to [Symptom Chart — NVH](#).

Visual Inspection Chart

Mechanical	Electrical
• Selector lever linkage binding • Brake Shift Interlock Actuator (BSIA) • Transmission selector lever cable	• Bussed Electrical Center (BEC) fuse(s): — 39 (15A) — 59 (30A) • Smart Junction Box (SJB) • Wiring harness (circuitry) • Loose connections or corroded terminals • LED

DTC Chart

DTC	Component	Description	Condition	Symptom	Action
B2572	Brake Shift Interlock Actuator (BSIA)	BSIA output circuit failure	The associated circuitry connected to the Smart Junction Box (SJB) or fuse, or the SJB itself may have an issue causing a BSIA concern.	BSIA is inoperative or does not operate correctly.	GO to Pinpoint Test A.

Symptom Chart — External Controls

Symptom Chart — External Controls

Condition	Possible Sources	Action
• The Brake Shift Interlock Actuator (BSIA) system does not release/lock correctly	• Wiring harness (circuitry) • BSIA fuse 59 (30A) • BSIA • Smart Junction Box (SJB)	• GO to Pinpoint Test A.
• The transmission selector lever is out of correct gear relationship	• Transmission selector lever cable and bracket installation • Transmission selector lever retaining clip • Transmission selector lever cable out of adjustment	• GO to Pinpoint Test B.
• Transmission selector lever indicator does not correspond to the gear	• Transmission selector lever cable and bracket installation • Transmission selector lever linkage	• TIGHTEN the bolts holding the transmission selector lever cable bracket. • VERIFY Transmission Range (TR) sensor range for correct adjustment. REFER to Section 307-01.

DIAGNOSIS AND TESTING (Continued)**Symptom Chart — External Controls (Continued)**

Condition	Possible Sources	Action
The Transmission Control Switch (TCS) is inoperative	- Bussed Electrical Center (BEC) fuse 39 (15A) - TCS - TCS not cycled during self-test - PCM - Wiring harness (circuitry)	GO to Pinpoint Test C.
The Transmission Control Indicator Lamp (TCIL) is not operating correctly	- LED - Instrument Cluster (IC) - PCM	REFER to Section 413-01.
Excessive selector lever effort	- Transmission selector lever cable - Transmission selector cable and bracket installation	- INSTALL a new transmission selector lever cable. - ADJUST the transmission selector cable. TIGHTEN the transmission selector cable bracket bolts.
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.

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

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

Condition	Possible Sources	Action
Vibration — a high frequency (20-80 Hz) that is felt through the seat or transmission selector lever. Changes with engine speed	Transmission selector lever cable incorrectly routed, grounded out or loose	CHECK the transmission selector lever cable. REPAIR as necessary. REFER to Selector Lever Cable and Bracket in this section.
Rattle, noise, buzz or other noise	- Transmission selector lever loose - Transmission selector lever	- TIGHTEN the selector lever bolt. - INSTALL a new transmission selector lever. REFER to Selector Lever in this section.

Pinpoint Tests

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

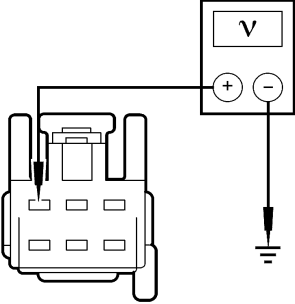
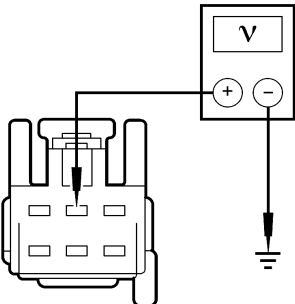
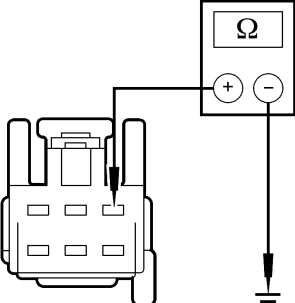
Refer to Wiring Diagrams Cell 29, Transmission Control for schematic and connector information.

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

Test Step		Result / Action to Take
A1	CHECK CIRCUIT 1040 (RD/BK) FOR AN OPEN	
	Disconnect: Transmission Selector Lever C307.	

(Continued)

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

	Test Step	Result / Action to Take
A1	CHECK CIRCUIT 1040 (RD/BK) FOR AN OPEN (Continued)	
	- Measure the voltage between selector lever C307-3, circuit 1040 (RD/BK), harness side and ground while applying and releasing the brake pedal.  N0050538 - Is the voltage greater than 10 volts with the brake pedal applied and 0 volt with the brake pedal released?	Yes GO to A2. No REPAIR circuit 1040 (RD/BK). CLEAR the DTC. TEST the system for normal operation.
A2	CHECK CIRCUIT 664 (YE/LG) FOR AN OPEN	
	- Measure the voltage between selector lever C307-2, circuit 664 (YE/LG), harness side and ground.  N0050539 - Is the voltage greater than 10 volts?	Yes GO to A3. No REPAIR circuit 664 (YE/LG) for an open. CLEAR the DTC. TEST the system for normal operation.
A3	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 in this section. CLEAR the DTC. TEST the system for normal operation. No REPAIR circuit 1205 (BK) for an open. CLEAR the DTC. TEST the system for normal operation.

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST B: THE TRANSMISSION SELECTOR LEVER IS OUT OF CORRECT GEAR RELATIONSHIP**

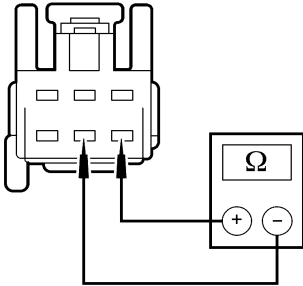
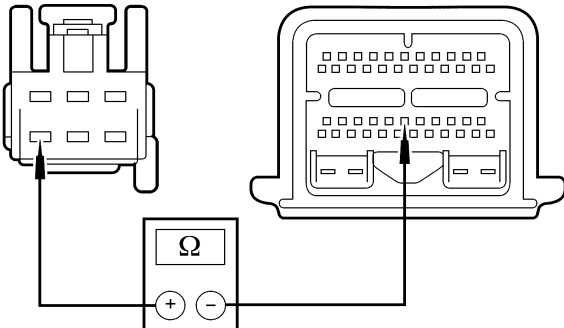
Test Step		Result / Action to Take
B1	CHECK THE TRANSMISSION SELECTOR LEVER LINKAGE	Yes GO to B2 . No REPAIR as necessary. TEST the system for normal operation.
	- Ignition ON. - Apply the brake pedal. - Move the transmission selector lever in all ranges. - Observe the transmission selector lever linkage during operation. Is the transmission selector lever linkage OK?	
B2	CHECK THE TRANSMISSION SELECTOR LEVER CABLE	Yes GO to B3 . No REPAIR as necessary. REFER to Selector Lever Cable and Bracket in this section. TEST the system for normal operation.
	- Check the transmission selector lever cable and transmission selector lever cable bracket installation and tightness. Is the transmission selector lever cable and transmission selector lever cable bracket correctly installed and adjusted?	
B3	CHECK THE TRANSMISSION SELECTOR LEVER LINKAGE/CABLE FOR CORRECT GEAR RELATIONSHIP	Yes VERIFY the correct adjustment of the Transmission Range (TR) sensor. REFER to Section 307-01. ADJUST the TR sensor if necessary. TEST the system for normal operation. No ADJUST the transmission selector lever cable. REFER to Selector Lever Cable Adjustment in this section. TEST the system for normal operation.
	- Apply the brake pedal. - Move the transmission selector lever in all ranges. Does the indicator match the gear selection?	

PINPOINT TEST C: THE TCS IS INOPERATIVE

Test Step		Result / Action to Take
C1	CHECK THE VOLTAGE TO THE TCS	
	- Ignition OFF. - Disconnect: Transmission Selector Lever C307. - Ignition ON. - Measure the voltage between transmission selector lever C307-5, circuit 1862 (VT/WH), harness side and ground. N0050541 Is the voltage greater than 10 volts?	
		Yes GO to C2 . No REPAIR circuit 1862 (VT/WH). TEST the system for normal operation.

(Continued)

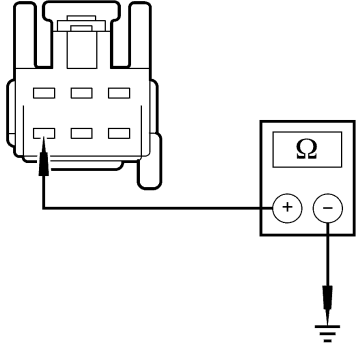
DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST C: THE TCS IS INOPERATIVE (Continued)**

	Test Step	Result / Action to Take
C2	CHECK THE TCS	
	- Measure the resistance between selector lever C307-5 and C307-6, component side, while applying and releasing the Transmission Control Switch (TCS).  N0051230 - Is the resistance less than 5 ohms with the TCS applied and greater than 10,000 ohms with the TCS released?	Yes GO to C3. No INSTALL a new selector lever knob. TEST the system for normal operation.
C3	CHECK CIRCUIT 224 (TN/WH) FOR AN OPEN	
	- Ignition OFF. - Disconnect: PCM C175B. - Measure the resistance between selector lever C307-6, circuit 224 (TN/WH), harness side and PCM C175B-29, circuit 224 (TN/WH), harness side.  N0071935 - Is the resistance less than 5 ohms?	Yes GO to C4. No REPAIR circuit 224 (TN/WH) for an open. TEST the system for normal operation.

(Continued)

DIAGNOSIS AND TESTING (Continued)

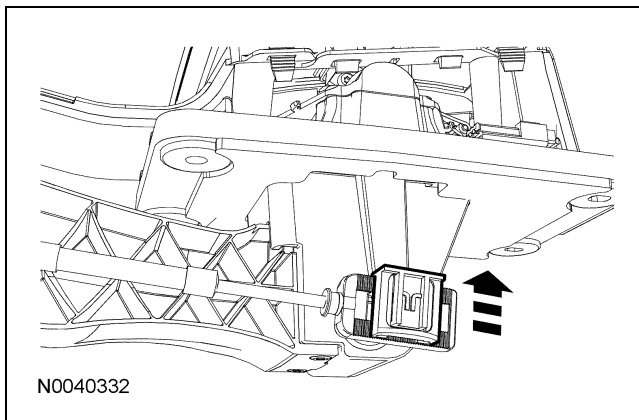
PINPOINT TEST C: THE TCS IS INOPERATIVE (Continued)

Test Step		Result / Action to Take
C4	CHECK CIRCUIT 224 (TN/WH) FOR A SHORT TO GROUND - Measure the resistance between selector lever C307-6, circuit 224 (TN/WH), harness side and ground.  N0071934 - Is the resistance greater than 10,000 ohms?	Yes INSTALL a new PCM. REFER to Section 303-14. TEST the system for normal operation. No REPAIR circuit 224 (TN/WH) for a short to ground. TEST the system for normal operation.

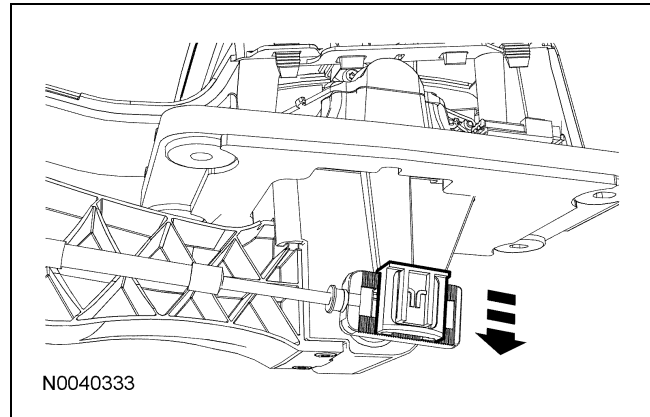
GENERAL PROCEDURES

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 selector lever in the D position.
3. Lift the lock upward on the transmission selector cable lock and remove the transmission selector cable from the selector lever.



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

GENERAL PROCEDURES

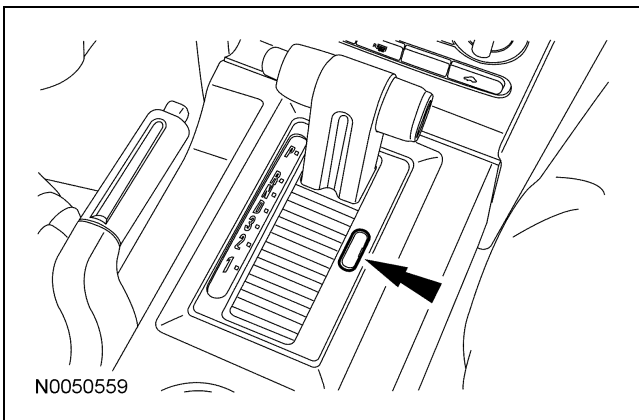
Brake Shift Interlock Override

NOTE: If it is necessary to use the Brake Shift Interlock Actuator (BSIA) override procedure to move the transmission selector lever out of the PARK position, it is possible that a fuse has blown and the brake lights are not operational. Before driving the vehicle, verify that the brake lights are working.

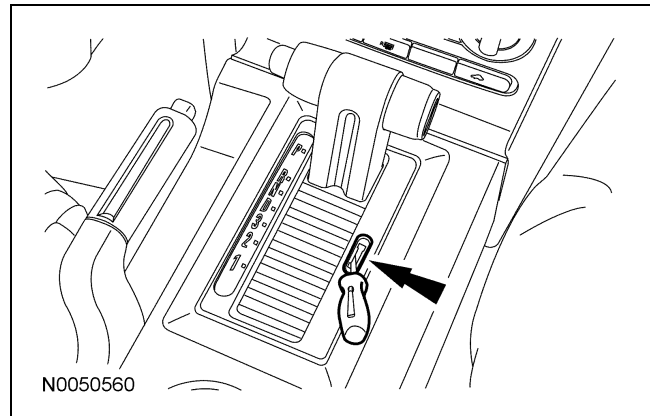
This vehicle is equipped with a BSIA feature that prevents the transmission selector lever from being moved out of the PARK position when the ignition is in the ON position until the brake pedal is applied.

If the transmission selector lever cannot be moved out of the PARK position when the ignition is in the ON position and the brake pedal is applied:

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



3. Using a suitable tool, press the brake shift interlock override mechanism on the transmission selector lever assembly, apply the brake pedal, press the button on the transmission selector lever knob and move the transmission selector lever into NEUTRAL.



4. Insert the ignition key into the ignition and start the vehicle.
5. To install, reverse the procedure.

REMOVAL AND INSTALLATION

Brake Shift Interlock Actuator

Removal and Installation

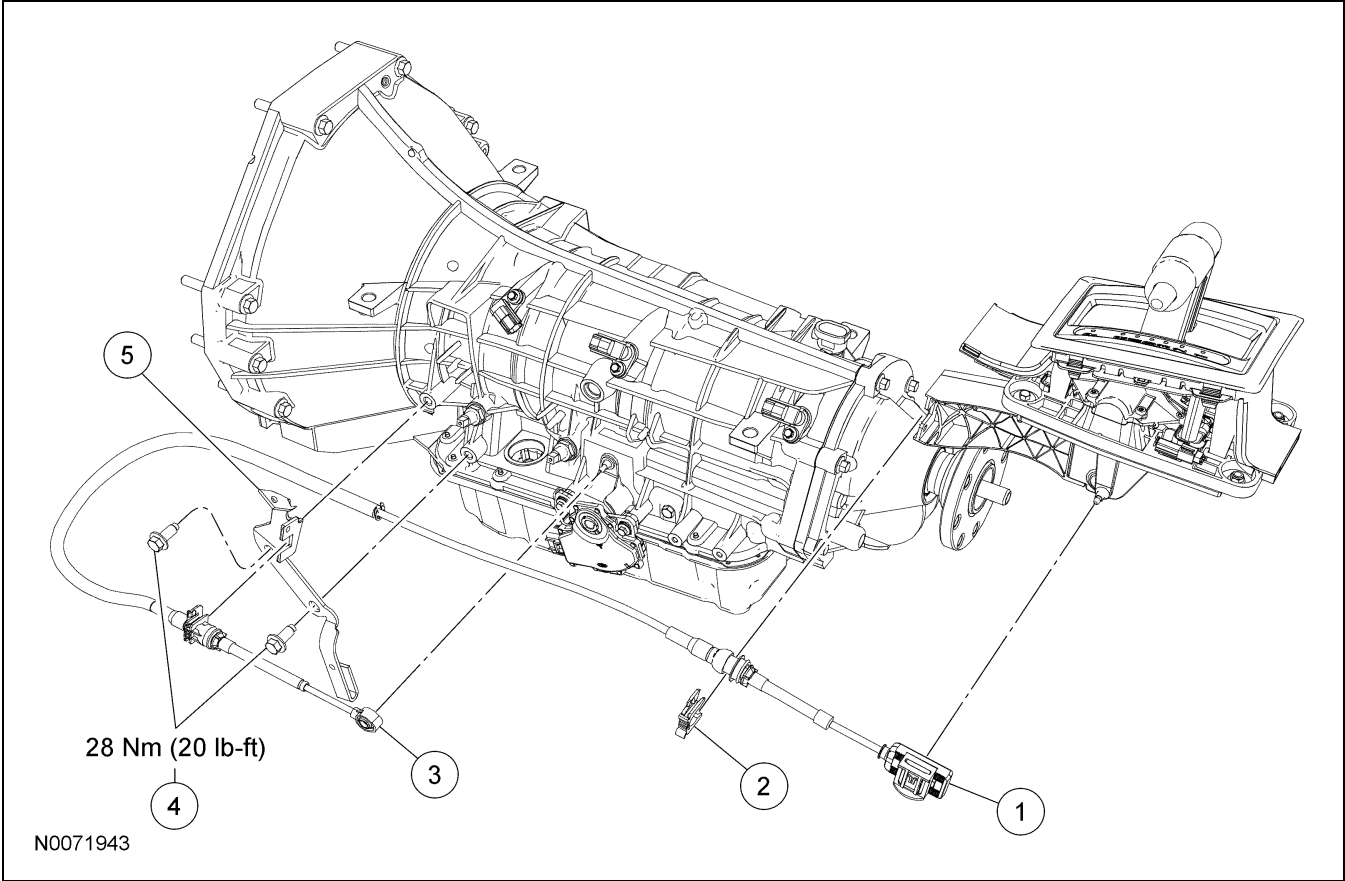
1. **NOTE:** The Brake Shift Interlock Actuator (BSIA) is not serviced separately. If a new BSIA is required, install a new transmission selector lever assembly.

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

REMOVAL AND INSTALLATION

Selector Lever Cable and Bracket

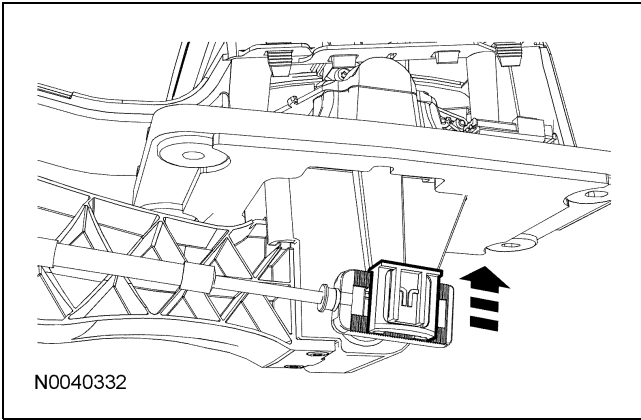
Removal



Item	Part Number	Description
1	7E395	Transmission selector lever cable
2	7H181	Transmission selector lever cable retaining clip
3	7E395	Transmission selector lever cable
4	N605918-S439	Transmission selector lever cable bracket bolts
5	7B229	Transmission selector lever cable bracket

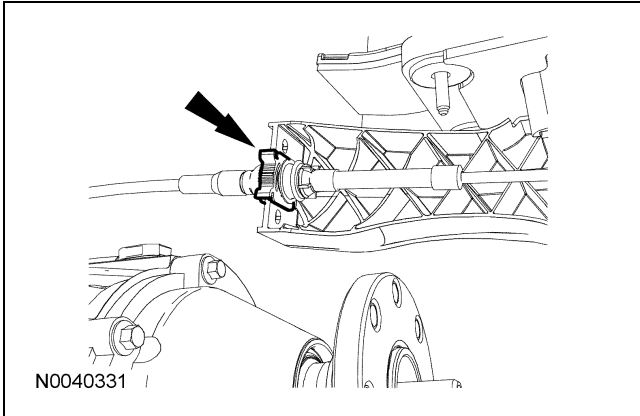
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

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

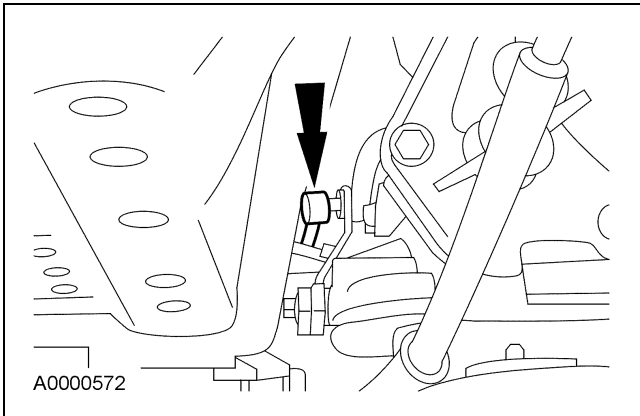


REMOVAL AND INSTALLATION (Continued)

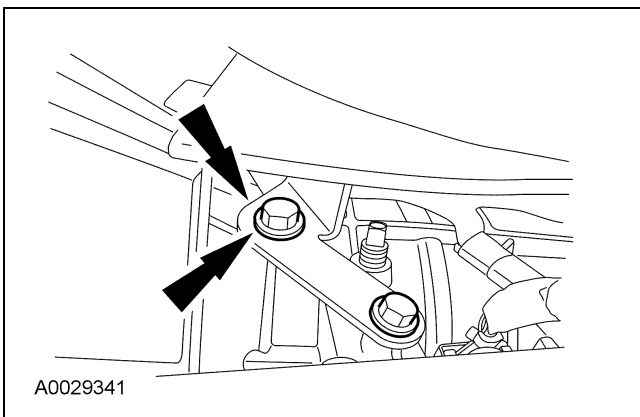
3. Remove the transmission selector lever cable from the transmission selector lever cable bracket and discard the transmission selector lever cable retaining clip.



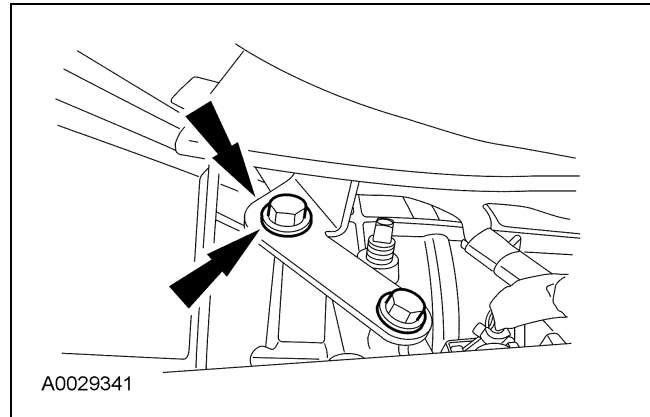
4. Remove the transmission selector lever cable from the transmission manual control lever.



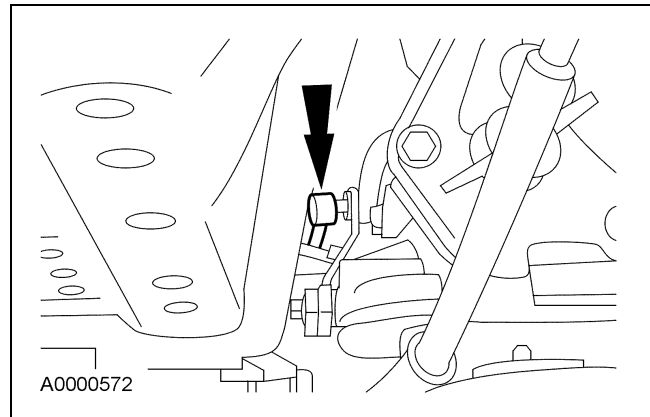
5. Remove the 2 transmission selector lever cable bracket bolts from the transmission and remove the bracket.

**Installation**

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



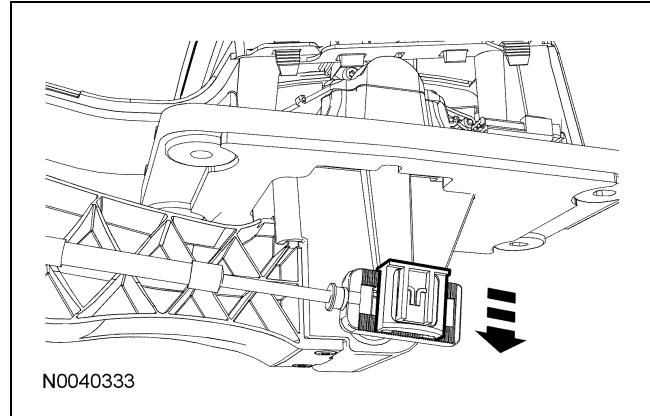
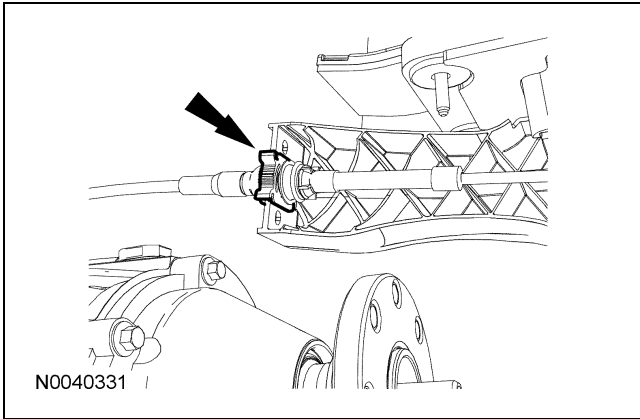
2. Install the transmission selector lever cable eyelet onto the transmission manual control lever.



REMOVAL AND INSTALLATION (Continued)

3. **NOTE:** It is necessary to install a new plastic transmission selector lever cable retaining clip prior to installation.

Install the transmission selector lever cable into the transmission selector lever cable bracket.

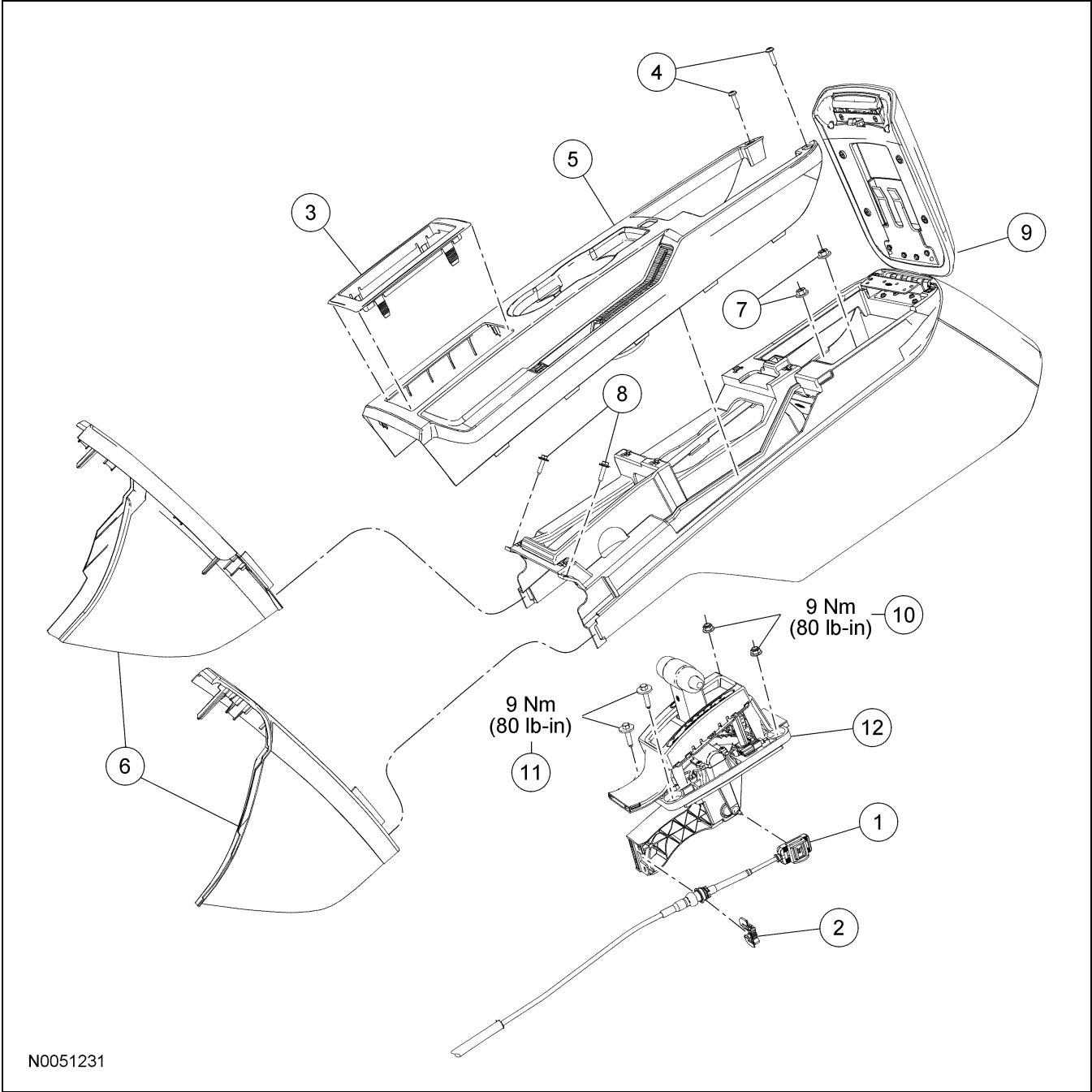


4. Install the transmission selector lever cable onto the selector lever and lock the selector lever cable adjustment lock.
5. Verify the transmission selector lever cable is adjusted correctly. For additional information, refer to Selector Lever Cable Adjustment in this section.
-

REMOVAL AND INSTALLATION

Selector Lever

Removal



Item	Part Number	Description
1	7E395	Transmission selector lever cable
2	7H181	Transmission selector lever cable retaining clip

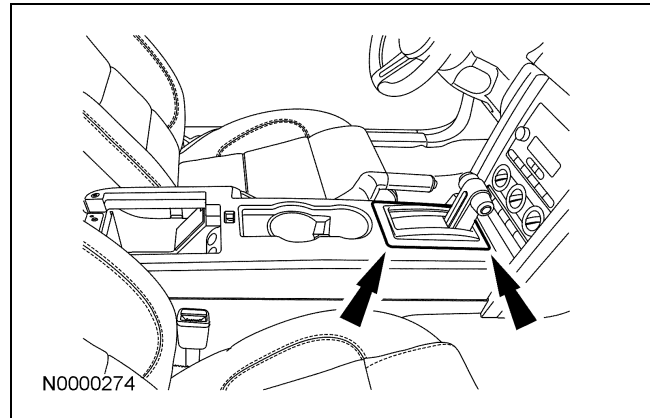
(Continued)

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

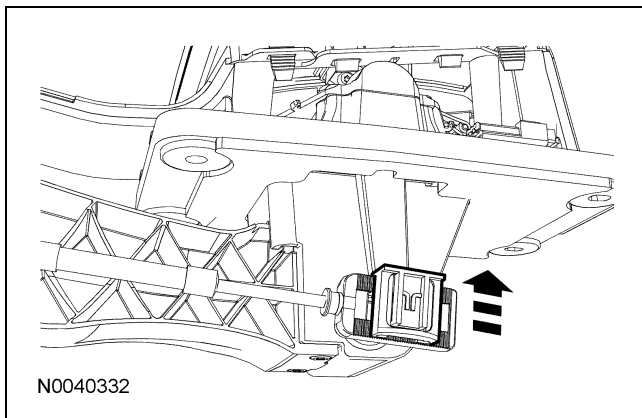
(Continued)

REMOVAL AND INSTALLATION (Continued)

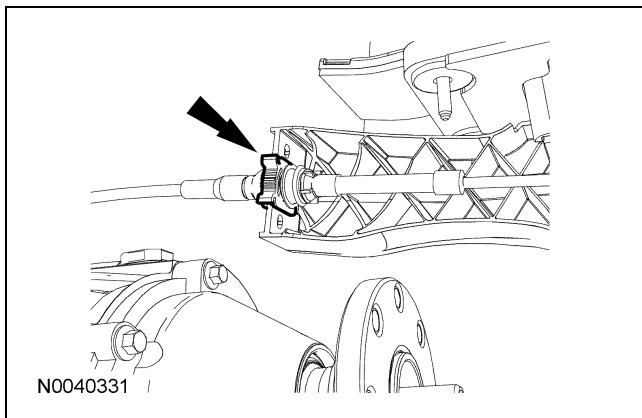
Item	Part Number	Description
6	—	Center stack kick panels
7	—	Center console nuts
8	—	Center console screws
9	—	Center console
10	N800942-S301A	Transmission selector lever housing assembly nuts
11	N800947-S301A	Transmission selector lever housing assembly screws
12	7210	Transmission selector lever assembly



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

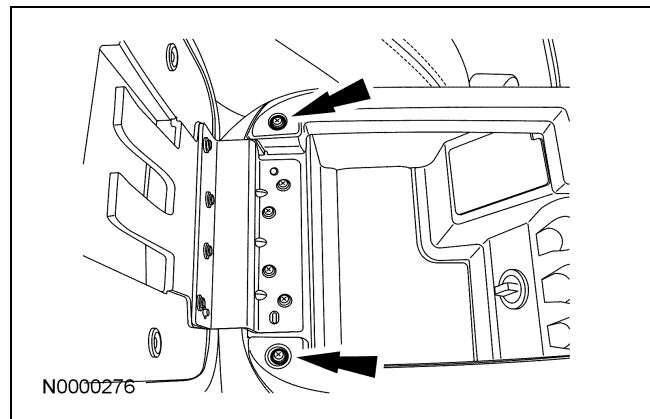


3. Remove the transmission selector lever cable from the bracket and discard the transmission selector lever cable retaining clip.



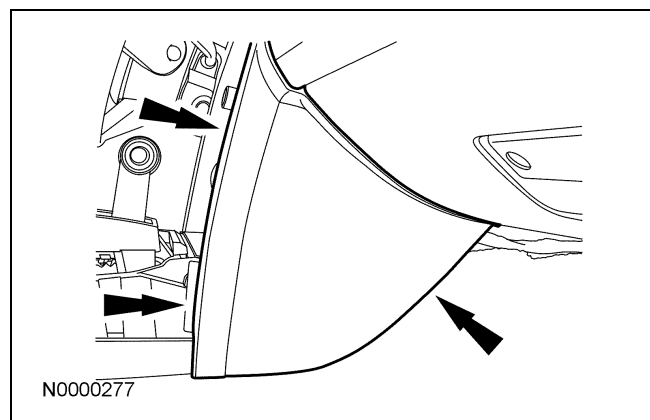
4. Remove the center console transmission selector lever trim.

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



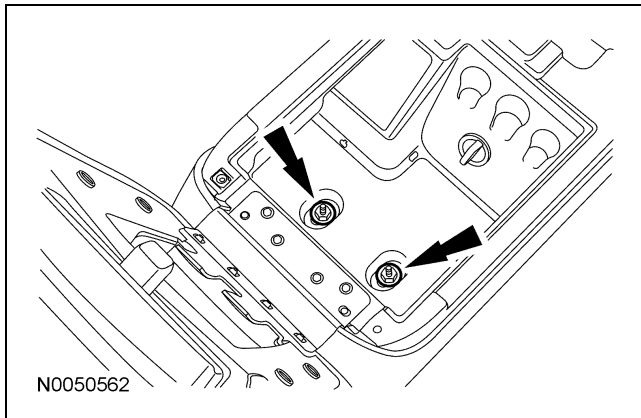
6. **NOTE:** Passenger side center stack kick panel shown, driver side similar.

Remove the driver and passenger center stack kick panels.

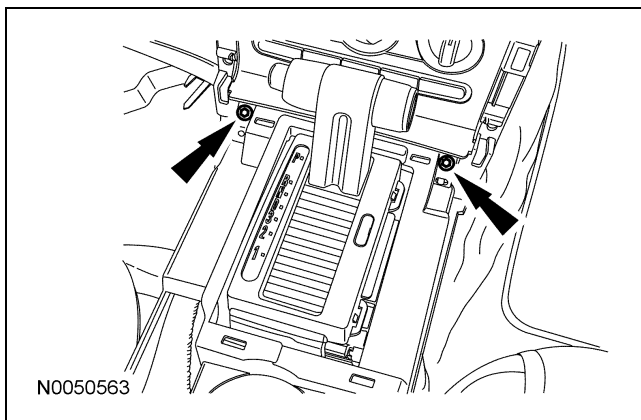


REMOVAL AND INSTALLATION (Continued)

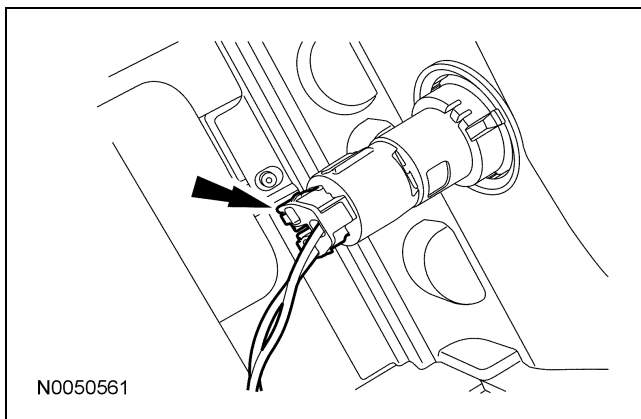
7. Remove the 2 nuts in the bottom of the center console.



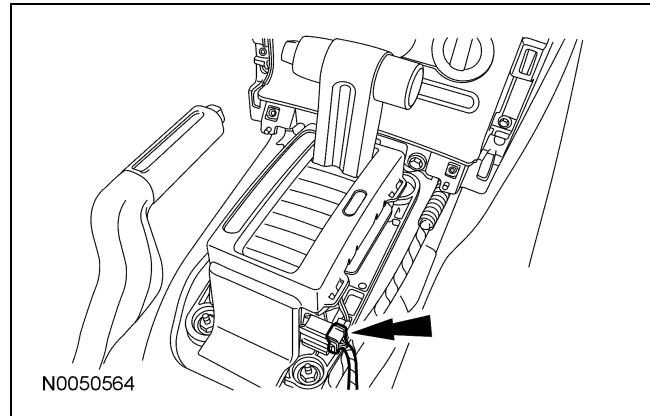
8. Remove the 2 screws from the front of the center console.



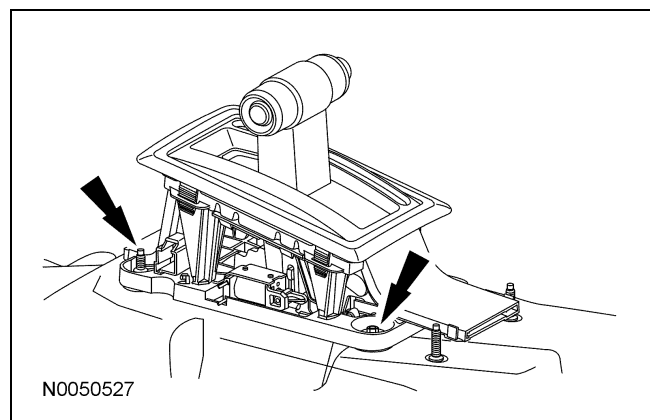
9. Lift up the center console, disconnect the power point electrical connector and remove the center console.



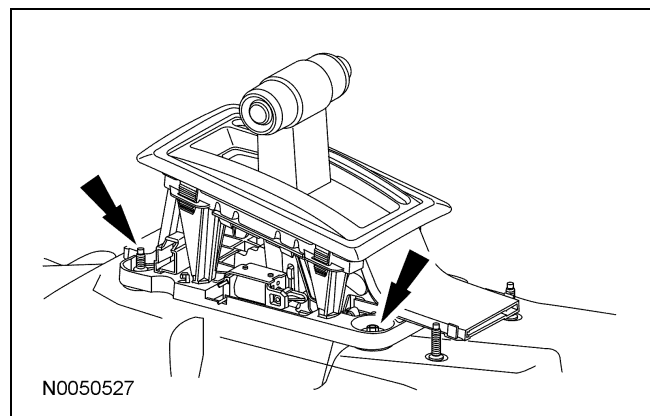
10. Disconnect the transmission selector lever electrical connector.



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

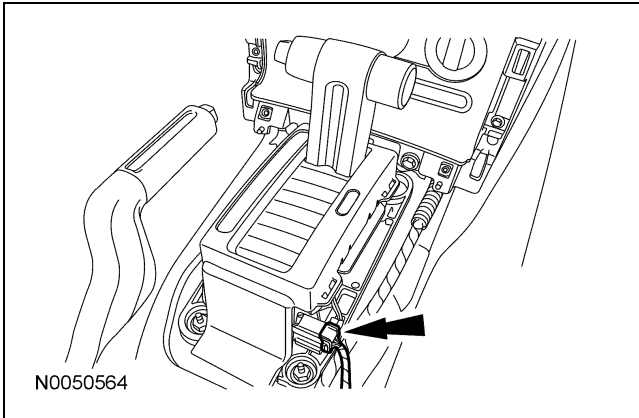
**Installation**

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

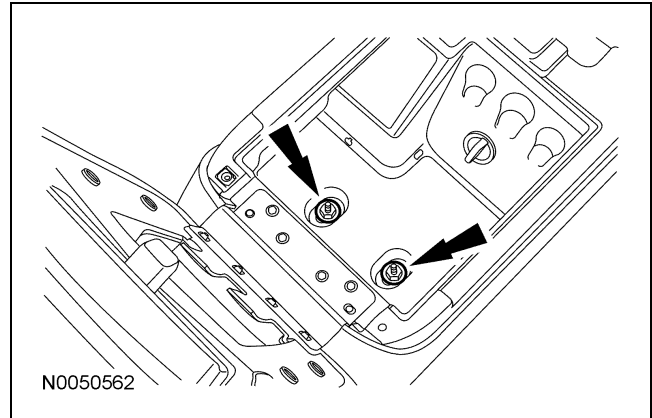


REMOVAL AND INSTALLATION (Continued)

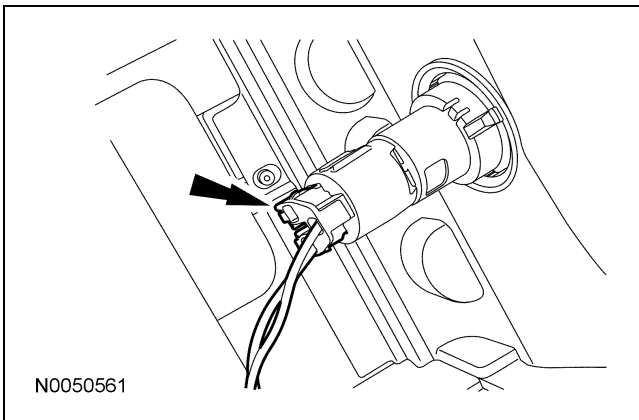
2. Connect the transmission selector lever electrical connector.



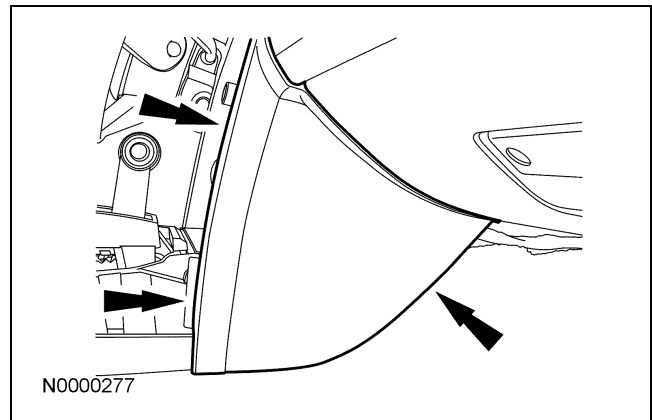
5. Install the 2 nuts into the bottom of the center console.



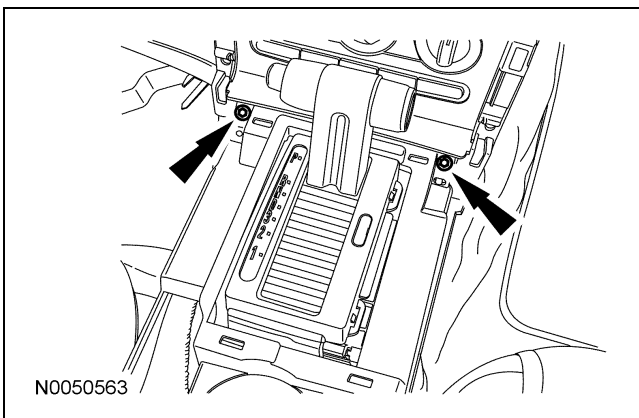
3. Connect the power point electrical connector and install the center console.



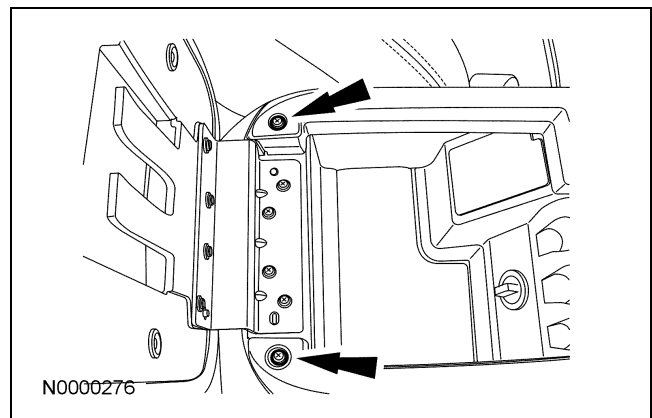
6. Install the driver and passenger side center stack kick panels.



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

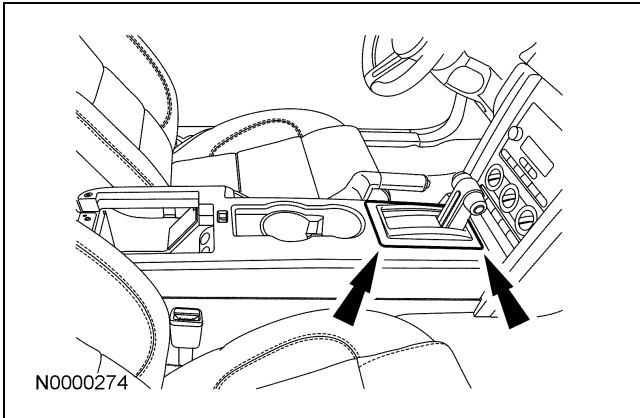


7. Install the center console finish panel and the 2 screws.

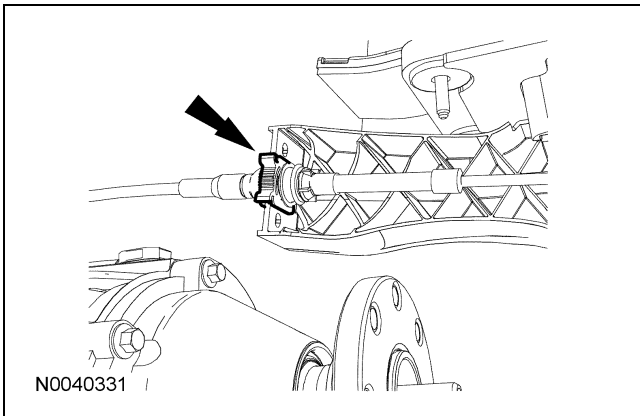


REMOVAL AND INSTALLATION (Continued)

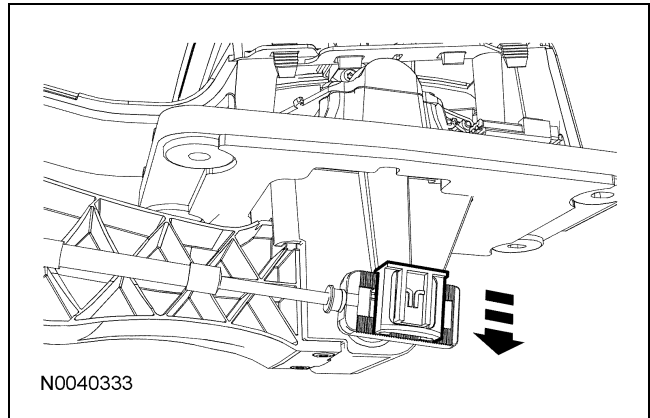
8. Install the center console transmission selector lever trim.



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



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



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

REMOVAL AND INSTALLATION

Transmission Control (TC) Switch

Removal and Installation

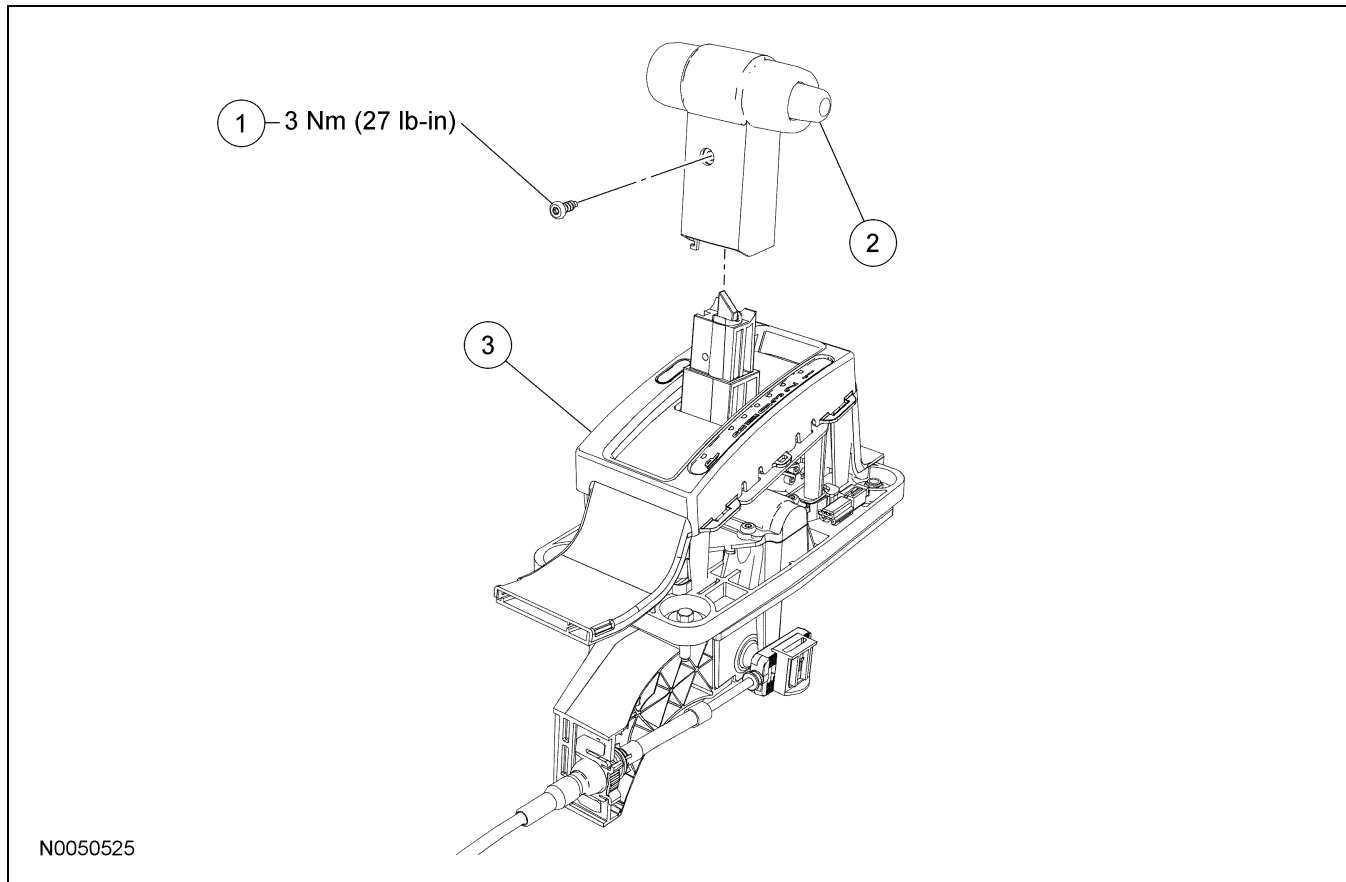
1. **NOTE:** The Transmission Control Switch (TCS) is not serviced separately. If a new TCS is required, install a new transmission selector knob assembly.

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

REMOVAL AND INSTALLATION

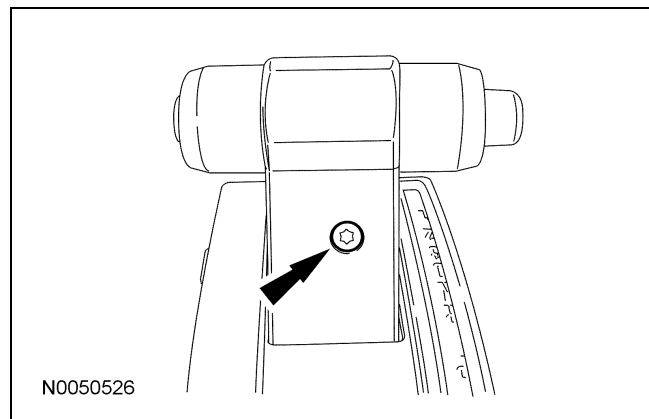
Selector Lever Knob

Removal



Item	Part Number	Description
1	—	Transmission selector lever knob screw
2	7213	Transmission selector lever knob
3	7210	Transmission selector lever assembly

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



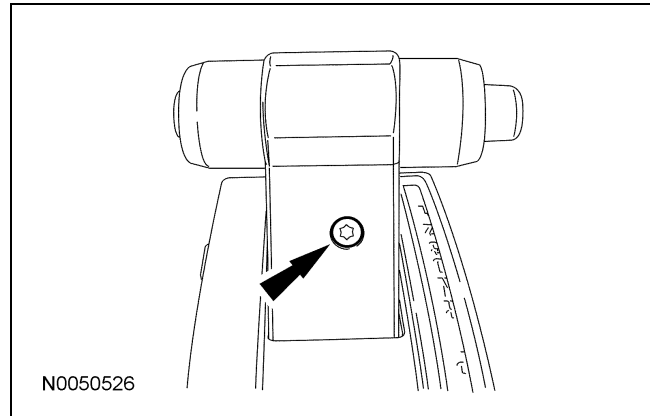
3. Slide the transmission selector lever knob up and off the selector shaft. Disconnect the Transmission Control Switch (TCS) electrical connector.

REMOVAL AND INSTALLATION (Continued)**Installation**

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

Align the transmission 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.