

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

2008 TRANSMISSIONS**Automatic Transaxle/Transmission - CD4E - Escape & Mariner****SPECIFICATIONS****MATERIAL****Material**

Item	Specification	Fill Capacity
Automatic Transmission/Power Steering Dye 164-R3701 or equivalent	-	9.5L (10 qt)
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	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2	-

GENERAL SPECIFICATIONS**GENERAL SPECIFICATIONS**

Item	Specification
CD4E Transaxle Weight	88 kg (194 lb)

END PLAY SPECIFICATIONS**END PLAY SPECIFICATIONS**

Description	mm	Inch
Low/intermediate carrier assembly pinion gear end play	0.15-0.72	0.005-0.028
Final drive carrier assembly pinion gear end play	0.17-0.65	0.006-0.025

BAND AND CLUTCH APPLICATION CHART A**BAND AND CLUTCH APPLICATION CHART A**

Selector Position	(2/4) Band	Forward Clutch	Direct Clutch	Coast Clutch	Low/Rev Clutch	Reverse Clutch
Reverse					X	X
1st		X				
2nd	X	X				
3rd		X	X			

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4th	X	X/I	X			
M - 3rd		X	X	X		
M - 2nd	X	X		X		
M - 1st		X		X	X	

X = Transmits torque

I = Ineffective

BAND AND CLUTCH APPLICATION CHART B**BAND AND CLUTCH APPLICATION CHART B**

Selector Position	Forward One-Way Clutch		Low One-Way Clutch		Engine Braking
	Drive	Coast	Drive	Coast	
Reverse				X/I	Yes
1st	X	OR	X	OR	No
2nd	X	OR	OR	OR	No
3rd	X	OR	OR	OR	No
4th	OR	OR	OR	OR	Yes
M - 3rd	X		OR	OR	Yes
M - 2nd	X		OR	OR	Yes
M - 1st	X		X		Yes

X = Transmits torque

OR = Overrunning

I = Ineffective

LINE PRESSURE CHART**LINE PRESSURE CHART**

Line Pressure	Idle		Stall	
Range Selector Position	kPa	psi	kPa	psi
Park, Neutral	441-524	64-76	-	-
Reverse	441-524	64-76	1,786-2,027	259-294
D	324-372	47-54	1,158-1,269	168-184
2	324-372	47-54	1,158-1,269	168-184
1	324-372	47-54	1,158-1,269	168-184

FORWARD/COAST CLUTCH PACK**FORWARD/COAST CLUTCH PACK**

Description	mm	Inch
Clutch pack clearance	0.23-0.96	0.009-0.037
Retaining ring thickness	1.43-1.53	0.056-0.060
Retaining ring thickness	1.59-1.69	0.062-0.066
Retaining ring thickness	1.75-1.85	0.068-0.072

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Retaining ring thickness	1.92-2.02	0.075-0.079
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REVERSE CLUTCH PACK**REVERSE CLUTCH PACK**

Description	mm	Inch
Clutch plate to retaining ring	0.33-0.89	0.013-0.035
Retaining ring thickness	1.39-1.49	0.054-0.058
Retaining ring thickness	1.53-1.63	0.060-0.064
Retaining ring thickness	1.68-1.78	0.066-0.070

DIRECT CLUTCH PACK**DIRECT CLUTCH PACK**

Description	mm	Inch
Clutch plate to retaining ring	0.73-1.42	0.028-0.055
Retaining ring thickness	1.28-1.38	0.050-0.054
Retaining ring thickness	1.39-1.49	0.054-0.058
Retaining ring thickness	1.52-1.62	0.060-0.063
Retaining ring thickness	1.65-1.75	0.064-0.068

LOW/REVERSE CLUTCH PACK**LOW/REVERSE CLUTCH PACK**

Description	mm	Inch
Clutch plate to retaining ring	0.30-1.10	0.012-0.043
Pressure plate sizes	2.57-2.47	0.101-0.097
Pressure plate sizes	2.36-2.26	0.092-0.088
Pressure plate sizes	2.16-2.06	0.085-0.081

INTERMEDIATE AND OVERDRIVE SERVO**INTERMEDIATE AND OVERDRIVE SERVO**

Description	mm	Inch
Servo travel, wide groove	2.44-4.94	0.096-0.194

INTERMEDIATE/OVERDRIVE SERVO APPLY ROD**INTERMEDIATE/OVERDRIVE SERVO APPLY ROD**

Part Number	Number of Rings	Rod Length
F3RP-7H188-CB	0	108.1 mm (4.25 in)
F3RP-7H188-BB	1	107.1 mm

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		(4.21 in)
F3RP-7H188-AB	2	105.7 mm (4.16 in)

REVERSE/OVERDRIVE CARRIER ASSEMBLY PINION GEAR**REVERSE/OVERDRIVE CARRIER ASSEMBLY PINION GEAR**

Description	mm	Inch
End play	0.15-0.72	0.005-0.028

GEAR RATIOS - 3.0L ENGINE**GEAR RATIOS - 3.0L ENGINE**

Gear Range	Ratios
1st	2.889:1
2nd	1.571:1
3rd	1:1
4th	0.689:1
Reverse	2.31:1
Final Drive	3.77:1

GEAR RATIOS - 2.3L ENGINE**GEAR RATIOS - 2.3L ENGINE**

Gear Range	Ratios
1st	2.889:1
2nd	1.571:1
3rd	1:1
4th	0.689:1
Reverse	2.31:1
Final Drive	4.23:1

PUMP GEAR END**PUMP GEAR END**

Description	mm	Inch
Drive gear clearance	0.05-0.08	0.002-0.003

DRIVE SPROCKET ALIGNMENT NO. 10 THRUST WASHER**DRIVE SPROCKET ALIGNMENT NO. 10 THRUST WASHER**

Description	mm	Inch
Drive sprocket-to-converter housing thrust washer	1.51-1.41	0.059-0.052

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AA		
Drive sprocket-to-converter housing thrust washer BA	1.77-1.67	0.069-0.065
Drive sprocket-to-converter housing thrust washer CA	2.03-1.93	0.079-0.075
Drive sprocket-to-converter housing thrust washer DA	2.29-2.19	0.090-0.086
Distance measured during gauging procedure and appropriate thrust washer AA	1.12-0.86	0.044-0.033
Distance measured during gauging procedure and appropriate thrust washer BA	0.85-0.60	0.033-0.023
Distance measured during gauging procedure and appropriate thrust washer CA	0.59-0.34	0.023-0.013
Distance measured during gauging procedure and appropriate thrust washer DA	0.33-0.08	0.012-0.003

DRIVEN SPROCKET ALIGNMENT NO. 11 SHIM**DRIVEN SPROCKET ALIGNMENT NO. 11 SHIM**

Description	mm	Inch
Transaxle case-to-driven sprocket/final drive sun gear thrust bearing shim AB	2.20-2.10	0.086-0.082
Transaxle case-to-driven sprocket/final drive sun gear thrust bearing shim BB	2.02-1.92	0.079-0.075
Transaxle case-to-driven sprocket/final drive sun gear thrust bearing shim CB	1.85-1.75	0.072-0.068
Transaxle case-to-driven sprocket/final drive sun gear thrust bearing shim DB	1.67-1.57	0.065-0.061
Transaxle case-to-driven sprocket/final drive sun gear thrust bearing shim EB	1.50-1.40	0.059-0.052
Transaxle case-to-driven sprocket/final drive sun gear thrust bearing shim FB	1.32-1.22	0.051-0.048
Distance measured during gauging procedure and appropriate thrust bearing shim AB	14.34-14.1	0.564-0.557
Distance measured during gauging procedure and appropriate thrust bearing shim BB	14.16- 14.00	0.557-0.551
Distance measured during gauging procedure and appropriate thrust bearing shim CB	13.99- 13.83	0.551-0.544
Distance measured during gauging procedure and appropriate thrust bearing shim DB	13.82- 13.66	0.544-0.537
Distance measured during gauging procedure and appropriate thrust bearing shim EB	13.65- 13.49	0.537-0.531
Distance measured during gauging procedure and appropriate thrust bearing shim FB	13.48- 13.32	0.531-0.524

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DIFFERENTIAL END PLAY NO. 14 SHIM**DIFFERENTIAL END PLAY NO. 14 SHIM**

Description	mm	Inch
Differential case-to-converter housing thrust bearing shim AA (sizes)	1.08-0.98	0.042-0.038
Differential case-to-converter housing thrust bearing shim BA (sizes)	1.38-1.28	0.054-0.050
Differential case-to-converter housing thrust bearing shim CA (sizes)	1.67-1.57	0.065-0.061
Differential case-to-converter housing thrust bearing shim DA (sizes)	1.97-1.87	0.077-0.074
Differential case-to-converter housing thrust bearing shim EA (sizes)	2.27-2.17	0.089-0.085
Distance measured during gauging procedure and appropriate thrust bearing shim AA	130.76-130.46	5.148-5.136
Distance measured during gauging procedure and appropriate thrust bearing shim BA	130.45-130.16	5.135-5.124
Distance measured during gauging procedure and appropriate thrust bearing shim CA	130.15-129.87	5.124-5.112
Distance measured during gauging procedure and appropriate thrust bearing shim DA	129.88-129.57	5.112-5.101
Distance measured during gauging procedure and appropriate thrust bearing shim EA	129.56-129.27	5.100-5.089

PUMP ASSEMBLY ROTATING TORQUE**PUMP ASSEMBLY ROTATING TORQUE**

Description	Nm	Inch
Drive shaft rotational torque	0.3	2.6

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Description	Nm	lb-ft	lb-in
Accumulator body transfer plate bolts	12	9	-
Air cleaner assembly bolt	10	-	89
Battery tray bracket bolts	10	-	89
Converter housing pipe plugs	8	-	71
Cooler line fittings at case	48	35	-
Cooler tube bracket bolt	13	10	-
Cross brace bolts	90	66	-
Cross brace nut	175	129	-
Dampener	40	30	-

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Differential lube tube bolt	13	10	-
Drain plug	25	18	-
Exhaust flange retainers	29	21	-
Exhaust-to-intermediate shaft bracket nuts and bolts	30	22	-
Flexpipe-to-exhaust manifold nuts	25	18	-
Front mount bracket bolt	48	35	-
Generator shield bolt	10	-	89
Ground wire nut	25	18	-
Intermediate shaft bearing bracket bolts	27	20	-
LH splash shield	10	-	89
LH support insulator bolts	48	35	-
LH support insulator bracket nuts	40	30	-
LH support insulator through bolt	103	76	-
Line pressure port plug	14	10	-
Lower control arm-to-body bolt	115	85	-
Lower control arm-to-knuckle bolt	63	46	-
Lower front support insulator through bolt	103	76	-
Lower rear mount bolt	55	41	-
Lower support insulator through bolt	115	85	-
Main control valve body cover bolts ^a	-	-	-
Main control valve body-to-case bolts ^a	-	-	-
Manual control lever	27	20	-
Manual control lever bolt	27	20	-
Manual control lever shaft nut	74	55	-
Outer halfshaft spindle nut	290	214	-
Output shaft speed (OSS) sensor bolt	12	9	-
Parking pawl shaft retainer bolt	8	-	71
Power transfer unit (PTU) bracket bolts	55	41	-
PTU-to-transaxle bolts	70	52	-
PTU-to-transaxle (10M) bolt	47	35	-
Pressure tap plate bolts	8	-	71
Pump assembly bolts ^a	-	-	-
Pump support bolts	13	10	-
Rear cross brace bolts	115	85	-
Rear driveshaft flange	20	15	-
Rear driveshaft PTU bolts	37	27	-
Rear transaxle support-to-crossmember bolt	80	59	-
Rear transaxle support-to-crossmember nuts	80	59	-
Shift cable bracket bolts	23	17	-
Solenoid valve body bolts	10	-	89
Starter motor bolts (2.3L engine)	35	26	-

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Starter motor bolts (3.0L engine)	25	18	-
Starter motor solenoid battery nut (large)	12	9	-
Starter motor solenoid nut (small)	5	-	44
Stator support-to-converter housing bolts	14	10	-
Sway bar link nut	63	46	-
Thermostatic fluid level control valve bolt	12	9	-
Tie-rod end retaining nut	55	41	-
Torque converter housing pipe plugs	9	-	80
Torque converter housing-to-case bolts ^a	-	-	-
Torque converter nuts	40	30	-
Torque converter pump rotational torque	0.3	-	2.6
Transaxle retaining bolts	48	35	-
Transmission fluid cooler tube fittings	40	30	-
Transmission fluid cooler tube bolt	12	9	-
Transmission fluid cooler tubes	25	18	-
Transmission fluid filler tube bolt	8	-	71
Transmission range (TR) sensor bolts	11	8	-
Turbine shaft speed (TSS) sensor bolt	12	9	-
Wire harness bracket nut	25	18	-

^a Refer to the procedure in this article.

DESCRIPTION AND OPERATION

TRANSAXLE DESCRIPTION

This automatic transaxle is a 4-speed, front wheel drive (FWD) automatic transaxle with electronic controls for:

- electronic pressure control (EPC) solenoid for shift quality.
- shift scheduling.
- 3-2 shift timing.
- coast braking.
- torque converter clutch control.

The transaxle features a 4 element torque converter with a torque clutch and a geartrain that includes:

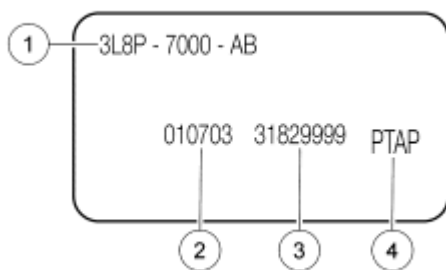
- compound planetary gearset.
- chain drive.
- planetary gearset final drive.
- pinion and side gear differential.

The hydraulic control system of the transaxle has 5 solenoids that control:

- shift feel, through line pressure control.
- shift scheduling, through shift valve positioning control.
- modulated application of the torque converter clutch.
- timing of 3-2 shifts.
- engine braking during coast operation.

IDENTIFICATION TAGS

When servicing the automatic transaxle, refer to the identification tag located on the case.



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Fig. 1: Identifying Identification Tags
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Transmission assembly part number
2	-	Sample build date code (DDMMYY)
3	-	Sample Julian build date and build number (YDDDXXXX)
4	-	Service model code

RANGE SELECTION

The transaxle range selector lever has 6 positions: P, R, N, Overdrive (Circle D), 2, 1. In addition, a transmission control switch (TCS) allows the driver to prevent a shift to 4th gear (Overdrive) and uses engine compression to help slow the vehicle (engine braking) in 2nd and 3rd gear.



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Fig. 2: Identifying Range Selector Lever**Courtesy of FORD MOTOR CO.****Park**

No power flow is transferred through the transaxle in PARK. A shift lever connected to a set of cams presses the parking pawl into the park gear on the driven sprocket. This locks the final drive and prevents the vehicle from rolling. For safety reasons, always apply the parking brake whenever the vehicle is parked.

Reverse

REVERSE allows the vehicle to be operated in a rearward direction, at a reduced gear ratio. Engine braking is provided in REVERSE.

Neutral

As in PARK, there is no power transferred through the transaxle in NEUTRAL. However, the final drive is not locked by the parking pawl, so the wheels are free to rotate. The vehicle may be started in NEUTRAL.

Drive

The DRIVE position provides all automatic shifts (1st through 4th), apply and release of the torque converter clutch, and maximum fuel economy during normal operation. Engine braking is provided in the 4th gear. Fourth gear (Overdrive) may be canceled by depressing the transmission control switch (TCS) that is located on the transmission range selector. Engine braking is also provided in 2nd and 3rd gear with the TCS on.

Second Gear Position

SECOND provides a 2nd gear hold position after automatic or manual upshift or downshift. When SECOND is selected from a stop, the transaxle will start in 2nd gear for maximum traction on slippery surfaces. Engine braking is provided in 2nd gear when in the SECOND position.

Low Position

MANUAL LOW provides a 1st gear hold after automatic or manual downshift. The transaxle is prevented from downshifting into 1st gear above a specific speed approximately 48 km/h (30 mph) to protect the powertrain from over speeding. Engine braking is provided in MANUAL LOW position making it especially useful for descending steep grades.

SHIFT PATTERNS**Upshifts**

The PCM has an adaptive learn strategy to electronically control the transaxle. The adaptive learn strategy will automatically adjust the shift feel to the driver demands. The first few hundred miles of operation the transaxle may have abrupt shifts, this is a normal operation and will correct itself. If the battery has been disconnected for longer than 20 minutes the shift tables will reset and need to be relearned. Upshifting is controlled by the PCM. The PCM receives inputs from various engine and vehicle sensors along with driver demands to control shift

scheduling, shift feel and torque converter clutch operation.

Downshifts

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

Coastdown

The coastdown downshift occurs as the name indicates, 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. The transaxle will disengage the torque converter clutch (TCC) to provide added acceleration, if applied.

Kickdown

For maximum acceleration, the driver can force a downshift by pressing the accelerator pedal to the floor. A forced downshift into 2nd gear is possible below 88 km/h (55 mph). Below approximately 40 km/h (25 mph) a forced kickdown to 1st gear will occur. For all shift speeds, specifications are subject to variation due to tire size and engine calibration requirements.

BUSHINGS, BEARING AND THRUST WASHER LOCATOR

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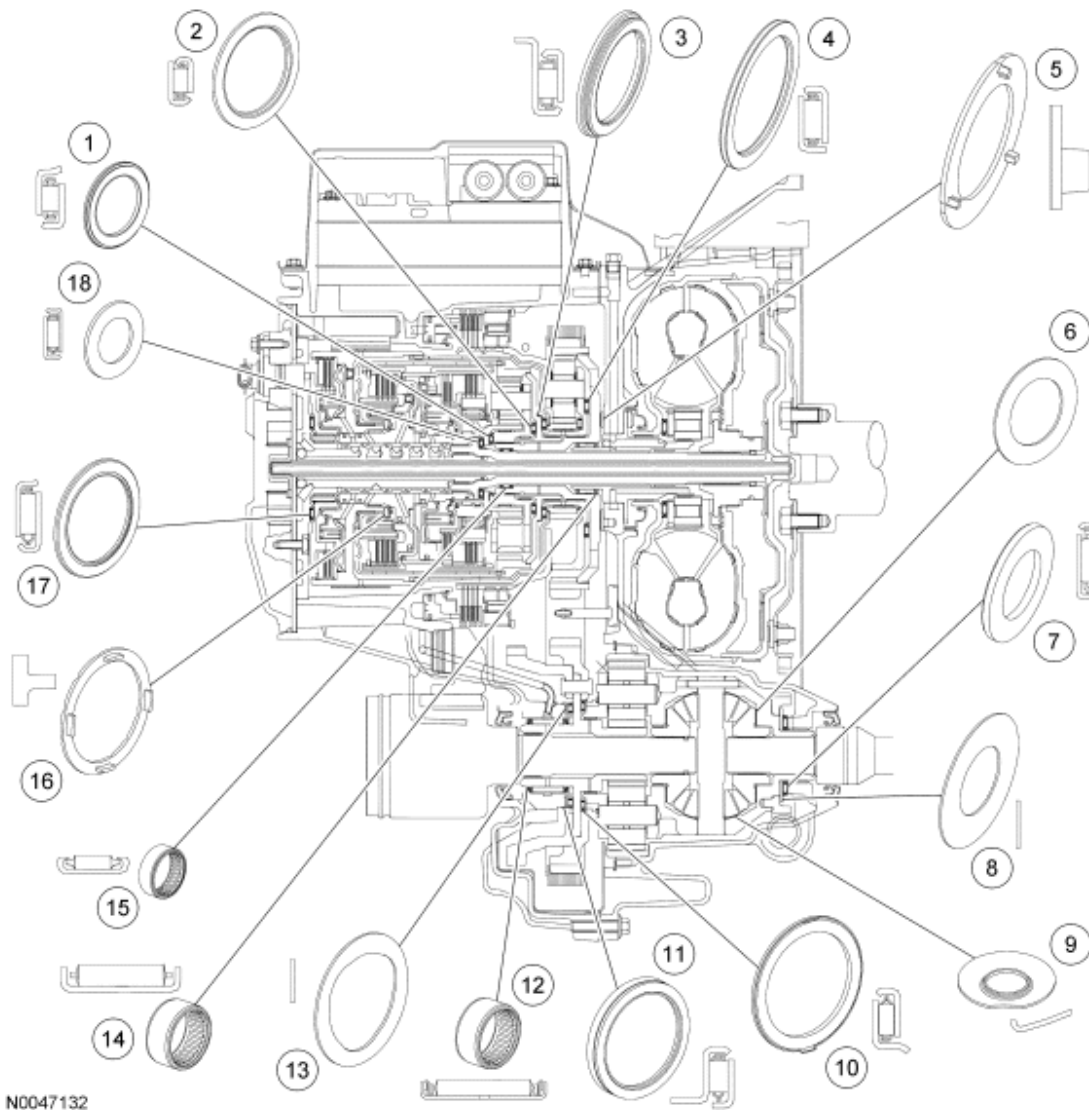


Fig. 3: Identifying Bushings, Bearing And Thrust Washer Location
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7H207	Bearing - low/intermediate sun gear thrust (No. 5)
2	7H028	Bearing - low/intermediate carrier thrust (No. 6)
3	7D234	Bearing - reverse/overdrive sun gear thrust (No. 7)
4	7H030	Bearing - reverse/overdrive ring gear thrust (No. 9)
5	7G099	Washer - drive sprocket thrust (No. 10)
6	4228	Washer - differential side gear thrust
7	7G112	Bearing - differential (No. 15)

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8	7F119	Shim - differential bearing (No. 14)
9	4230	Washer - differential pinion thrust
10	7G233	Washer - driven sprocket thrust (No. 13)
11	7G247	Bearing - driven sprocket (No. 12)
12	7G355	Bearing - driven sprocket (No. 18)
13	7H086	Shim - driven sprocket (No. 11)
14	7H032	Bearing - stator support (No. 17)
15	7H029	Bearing - reverse/overdrive ring gear (No. 16)
16	7G116	Washer - direct clutch thrust (No. 2)
17	7H241	Bearing - pump support thrust (No. 1)
18	7H026	Bearing - turbine shaft thrust (No. 4)

TORQUE CONVERTER

The torque converter is a 4 element assembly. The torque converter contains an impeller, a turbine, a reactor and a torque converter clutch (TCC) for increased fuel economy. It couples the engine to the turbine shaft assembly, provides torque multiplication and absorbs engine shock of gear shifting.

The lock-up temperature for the torque converter is based upon initial transmission fluid temperature (TFT) at key on. If the TFT reads below 16°C (60°F), the converter will lock-up at 16°C (60°F). If the initial TFT reads 16°C (61°F), the converter will lock-up at 21°C (70°F). This warm-up phase continues until approximately 32°C (90°F), at which temperature the converter lock-up is available immediately.

At high temperatures, the converter lock-up is delayed to avoid conditions which might cause shudder. Delayed converter lock-up begins at 80°C (175°F).

Impeller and Cover

The impeller and cover assembly drives the impeller blades and pump assembly. The impeller is primarily responsible for driving the turbine with hydraulic fluid by means of centrifugal force. The cover provides a mating surface for the torque converter clutch piston plate and dampener assembly.

Turbine

The turbine is driven by centrifugal fluid force from the impeller. The turbine transmits input torque to the drive chain and driven sprocket through the turbine shaft.

Reactor

The reactor redirects fluid flow from the turbine back to the impeller so that fluid rotates in the same direction as the impeller. This action also assists in torque multiplication.

Torque Converter Clutch (TCC)

The TCC provides a mechanical link or direct drive between the engine crankshaft and turbine shaft when

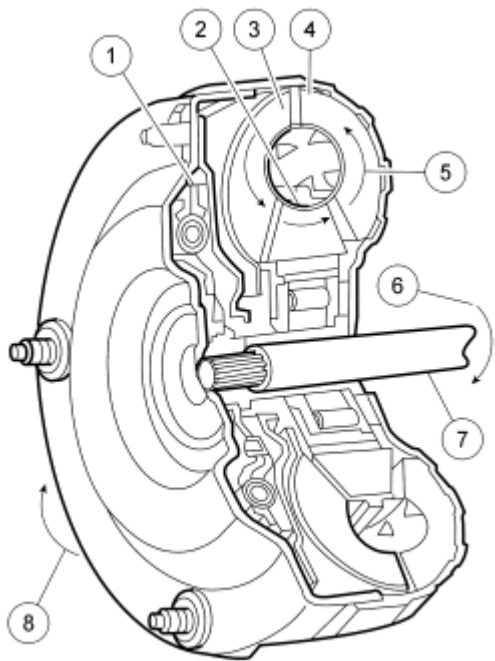
applied. The application of the TCC is controlled by the PCM. Under certain conditions, the PCM sends the appropriate signal to the TCC solenoid, which allows fluid pressure within the torque converter to force the TCC piston plate and dampener assembly against the cover creating a mechanical link between the engine and transaxle called torque converter lock-up.

Lock-up temperature for the torque converter is based on initial TFT with the key in the ON position. If the TFT reads below 16°C (60°F), the torque converter will lock at 16°C (60°F). If initial TFT is 17°C (63°F) the torque converter will lock at 21°C (70°F). This "warm-up" phase continues until the TFT is approximately 32°C (90°F), at which temperature converter lock-up is available immediately.

At high temperatures, torque converter lock-up is delayed to avoid conditions which might cause a shudder. Delayed torque converter lock-up begins at 79°C (175°F).

Turbine Shaft

The turbine shaft connects the torque converter stator with the forward/coast/direct clutch cylinder. When applied, the forward/coast/direct clutch cylinder transmits input torque to the reverse/overdrive ring gear assembly, which also acts as the drive sprocket. This allows input torque to be transmitted from the torque converter to the drive chain and driven sprocket.



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Fig. 4: Cut-Away View Of Torque Converter
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Converter clutch and dampener (part of 7902)

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2	-	Reactor (part of 7902)
3	-	Turbine (part of 7902)
4	-	Impeller (part of 7902)
5	-	Fluid motion
6	-	Transaxle input rotation
7	7F213	Input shaft
8	-	Engine rotation

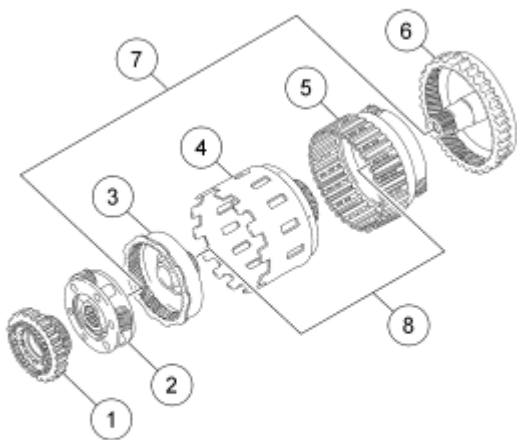
GEARTRAIN

The geartrain includes the planetary gearsets, apply components and final drive gearset and differential.

Planetary Gearsets

The automatic transaxle has 2 planetary gearsets to provide operation in reverse and 4 forward speeds. The gearsets are comprised of the following components:

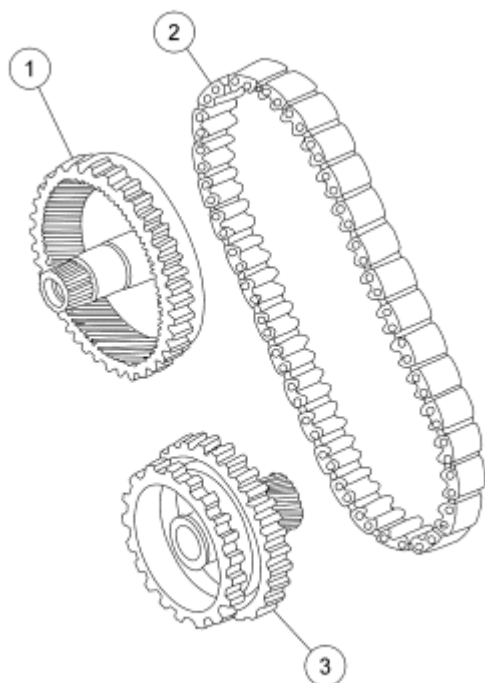
- Low/intermediate sun gear assembly
- Low/intermediate carrier assembly
- Low/intermediate ring gear assembly
- Reverse/overdrive sun gear and shell assembly
- Reverse/overdrive carrier assembly
- Reverse/overdrive ring gear assembly



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Fig. 5: Identifying Planetary Gearsets
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7H229	Sun gear assembly - low/intermediate
2	7A398	Carrier assembly - low/intermediate
3	7A153	Ring gear assembly - low/intermediate
4	7A626	Sun gear and shell assembly - reverse/overdrive
5	7D066	Carrier assembly - reverse/overdrive
6	7A153	Ring gear assembly - reverse/overdrive
7	-	Splined together
8	-	Splined together



N0024416

Fig. 6: Drive Chain Assembly
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7A153	Ring gear assembly - reverse/overdrive
2	7G249	Drive chain
3	7G132	Driven sprocket assembly

Drive Chain and Sprockets

A chain drive transfers torque from the torque converter turbine to the planetary gearsets. The chain drive is

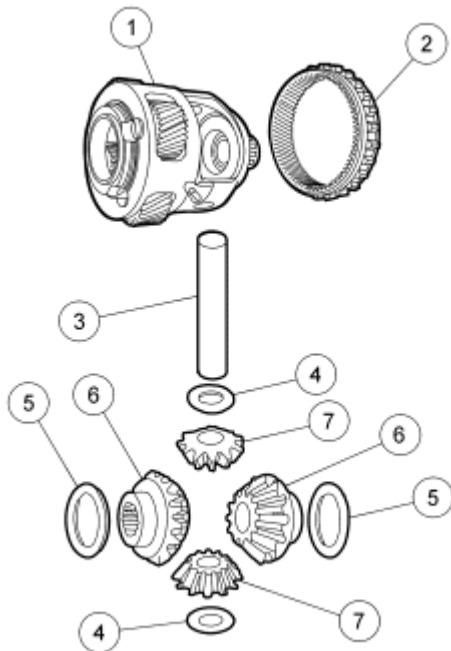
composed of the following components:

- Reverse/overdrive ring gear assembly which acts as a drive sprocket
- Driven sprocket
- Drive chain

The drive chain connects the reverse/overdrive sun gear with the driven sprocket. The final drive sun gear located on top of the driven sprocket meshes with the final drive gearset.

The final drive consists of a planetary gearset that transfers and multiplies torque from the planetary gearsets to the differential. The final drive consists of the following components:

- Final drive sun gear: is chain driven by the reverse/overdrive ring gear assembly and transfers torque to the final drive carrier.
- Final drive carrier: the final drive carrier acts as the driven member and is part of the differential case.
- Final drive ring gear: is held by the converter housing and is always the held member of the final drive planetary gearset.



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Fig. 7: Exploded View Of Final Drive Carrier & Differential Assembly
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	4204	Differential case (with final drive carrier)
2	7F453	Ring gear - final drive
3	4211	Pinion shaft - differential

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4	4230	Pinion thrust washers - differential
5	4228	Side gear thrust washers - differential
6	4236	Side gears - differential
7	4215	Pinion gears - differential

The differential assembly drives the differential pinion gears and the differential side gears, which in turn, drive the front wheel driveshaft and joints and provides differential action if driving wheels are turning at different speeds. The differential assembly consists of the following components:

- Differential case (part of the final drive carrier)
- Two pinion gears supported by a pinion shaft
- Two side gears supported by the differential case and halfshafts

APPLY COMPONENTS

Intermediate and Overdrive Band

The intermediate and overdrive band assembly holds the reverse clutch drum assembly to the transaxle case in 2nd and 4th gear. This action causes the reverse/overdrive sun gear and shell assembly to be held stationary in 2nd and 4th gears.

Intermediate and Overdrive Servo

The intermediate and overdrive servo is the hydraulic actuator which applies the intermediate and overdrive band assembly. Line pressure is applied through the servo apply circuit where it works on one side of the servo piston. This forces the piston to move up the servo bore in the transaxle case, which moves the servo apply rod against one end of the intermediate and overdrive band assembly. Because the other end of the intermediate and overdrive band assembly is anchored to the transaxle case, the ends of the intermediate and overdrive band assembly are squeezed around the reverse clutch drum assembly, holding the reverse clutch drum assembly stationary.

Forward Clutch

The forward clutch connects the turbine shaft to the outer race of the forward one-way clutch, which in turn drives the low/intermediate sun gear in all forward gear ranges. However, in 4th gear, the forward clutch transmits no power because the forward one-way clutch is overrunning. The forward clutch is a multi-disc clutch and is contained in the forward/coast/direct clutch cylinder assembly.

Direct Clutch

The direct clutch connects the turbine shaft to the low/intermediate ring gear assembly when the vehicle is in 3rd and 4th gears. It is a multi-disc clutch and is contained in the forward/coast/direct clutch cylinder assembly.

Reverse Clutch Coast Clutch

The reverse clutch connects the turbine shaft to the reverse/overdrive sun gear and shell assembly when it is in reverse gear. It is a multi-disc clutch and is contained in the reverse clutch drum assembly.

The coast clutch is a multi-disc clutch located beneath the forward clutch in the forward/coast/direct clutch cylinder assembly. It connects the low/intermediate sun gear assembly to the turbine shaft assembly when the transmission control switch is ON in the DRIVE position or when any manual gear is selected.

Low/Reverse Clutch

The low/reverse clutch holds the reverse/overdrive carrier assembly to the transaxle case when the transaxle is shifted into the R or 1 position. The low/reverse clutch is splined to the transaxle case and is a multi-disc clutch.

Forward One-Way Clutch (OWC)

The forward one-way clutch (OWC) is either a sprag or mechanical diode type, one-way clutch. The forward OWC combines with the forward clutch to connect the turbine shaft assembly to the low/intermediate sun gear assembly in 1st, 2nd and 3rd gears. The forward OWC overruns during all coasting operations and is always overrunning in 4th gear.

Low One-Way Clutch

The low OWC is a mechanical diode type OWC which allows the transaxle case to hold the reverse/overdrive carrier stationary when the transaxle is in 1st gear. The low OWC will only hold the reverse/overdrive carrier assembly during acceleration. When coasting, the low OWC will overrun, disconnecting the final drive from the compound planetary gearset.

HYDRAULIC SYSTEM

The hydraulic system uses transmission fluid to cool, lubricate and provide hydraulic pressure to the hydraulic circuits within the transaxle.

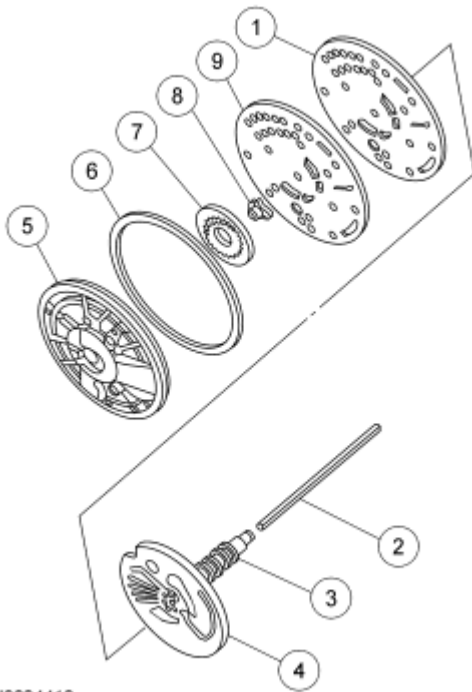


Fig. 8: Fluid Pump Assembly Components
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7G331	Gasket - pump body separator
2	7B328	Shaft - pump drive
3	7H114	Seal - pump support (6 required)
4	7A103	Support assembly - pump
5	7F370	Body - pump assembly
6	7A248	Seal - pump
7	-	Gears - pump (part of 7A103)
8	7F402	Insert - pump drive gear
9	7A142	Plate - pump body separator

Fluid Pump

The pump provides the volume of fluid required to charge the torque converter, main control valve body, cooling system, lubrication system and hydraulic apply devices. The transaxle uses a positive displacement gear and crescent-type pump which is shaft-driven by the torque converter.

Fluid Level and Filter

Fluid from the sump area (formed by the transaxle case and converter housing) flows through a filter to the pump. The filter has a recirculation port connected to the main control area of the case and receives fluid from the main regulator exhaust. This provides fluid under pressure to aid the pump in higher efficiency operation. A

thermostatic fluid control valve prevents foaming of fluid by maintaining a sump level below the rotating components. The 2-piece chain drive cover prevents foaming by not allowing the chain to rotate in the fluid. A magnet on the underside of the chain cover collects unwanted magnetic material.

Main Control

The main control houses the hydraulic valves and solenoid valves. These valves direct fluid flow, restrict fluid flow and change fluid pressure. The main control receives signals from the solenoid valve body and changes those signals into hydraulic actions. These actions control the operation of the hydraulic clutches and intermediate and overdrive band assembly, and supply lubrication to the transaxle.

Low/Reverse Accumulator

The low/reverse accumulator cushions the application of the low/reverse clutch when the transaxle is shifted to reverse gear.

2-4 Accumulator

The 2-4 accumulator cushions the shift feel during intermediate and overdrive band applications.

Forward Accumulator

The forward accumulator cushions the application of the forward clutch when the transaxle is shifted into Overdrive (Circle D), 2 or 1.

TRANSAXLE ELECTRONIC CONTROL SYSTEM

Shift timing, shift feel (line pressure) and torque converter clutch (TCC) control in the automatic transaxle are controlled electronically by the PCM and its input/output network. The transaxle control is separate from the engine control strategy in the PCM, although some of the input signals are shared. Some input signals come from the engine-related sensors, mass air flow (MAF) sensor or engine coolant temperature (ECT) sensor to give the PCM an idea of the load and climate under which the engine is operating. Some other inputs are based on driver inputs, such as accelerator pedal position which is relayed to the PCM by the throttle position (TP) sensor. Still other inputs are provided by the transaxle itself, from sensors such as the transmission range (TR) sensor (controlled by the placement of the transaxle range selector) and the transmission fluid temperature (TFT) sensor. Using all of these input signals, the PCM can determine when the time and conditions are right for a shift or converter clutch application. The PCM can also determine the line pressure needed to optimize shift feel. To accomplish these functions, the PCM controls 5 electronic solenoids, 2 ON/OFF solenoids for shifting, one pulse width modulating (PWM) solenoid for torque converter clutch control, an electronic pressure control (EPC) solenoid for line pressure control and a 3-2 timing/coast clutch solenoid to control the release of the coast clutch and the coordinated release of the direct clutch and the apply of the low and intermediate band, during a 3-2 downshift.

Air Conditioning (A/C) Clutch

The A/C cycling switch is located on the suction accumulator/drier of an original equipment manufacture (OEM) factory-installed air conditioning system. When the air conditioning clutch cycling switch contacts close, the PCM receives a signal voltage from the A/C clutch switch indicating that the A/C compressor clutch

is engaged. The PCM uses the A/C clutch cycling switch signal to adjust line pressure to compensate for the additional engine load.

Brake Pedal Position (BPP) Switch

The brake pedal position (BPP) switch signals the PCM when the brakes are applied. The BPP switch is closed when the brakes are depressed and open when they are released. The BPP switch will also disengage TCC when brake is applied.

Engine Coolant Temperature (ECT) Sensor

The engine coolant temperature (ECT) detects the temperature of the engine coolant and supplies the information to the PCM. The PCM uses the ECT sensor to control TCC operation.

Electronic Ignition (EI) System

The electronic ignition (EI) system consists of the PCM, a crankshaft position (CKP) sensor and one multi-tower ignition coil. The CKP sensor sends a crankshaft position signal to the PCM. The PCM then sends the appropriate ignition signal to the ignition coil. The PCM uses this signal in the transaxle shift strategy, as well as TCC control and electronic pressure control. Wide open throttle (WOT) shift control is also affected by the EI system input.

Mass Air Flow (MAF) Sensor

The mass air flow (MAF) directly measures the mass of the air flowing into the engine. The MAF sensor output is a D.C. (analog) signal ranging from about 0.5 volt to 5.0 volts used by the PCM to calculate the injector pulse width for air/fuel ratio. For transaxle strategies, the MAF sensor is used for electronic pressure control (EPC), shift and TCC scheduling.

Transmission Control Switch (TCS)

The transmission control switch (TCS) is a momentary contact switch. When the TCS switch is pressed, a signal is sent to the PCM. The PCM then energizes the transmission control indicator lamp (TCIL) and engages or disengages 4th gear operation and provides coast braking in 2nd and 3rd.

Transmission Control Indicator Lamp (TCIL)

The transmission control indicator lamp (TCIL) is located in the instrument panel and is labeled O/D OFF. The TCS controls the ON/OFF operation of the TCIL. When the driver initially presses the button of the TCS, the TCIL turns ON to indicate that transaxle operation in 4th gear is disabled. When the driver presses the TCS again, the TCIL turns OFF.

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 as a varying voltage signal. If a fault occurs in the TP sensor circuit, the PCM will recognize that the TP sensor signal is out of specification. The PCM will then operate the transaxle at a high EPC pressure to prevent transaxle damage. The PCM also uses this signal

for shift scheduling, EPC and TCC control.

Transmission Fluid Temperature (TFT) Sensor

The transmission fluid temperature (TFT) sensor is located on the solenoid valve body. It is a temperature-sensitive device called a thermistor. The resistance value of the TFT sensor will vary with temperature. The PCM monitors the voltage across the TFT sensor to determine the temperature of the transmission fluid. The PCM uses this signal to determine shift scheduling and to control line pressure for cold and hot temperature operation. The PCM also inhibits TCC operation at low transmission temperature and adjusts electronic pressure control (EPC) pressures for temperature.

Transmission Range (TR) Sensor

The PCM sends a voltage signal to the transmission range (TR) sensor. The TR sensor incorporates a series of step down resistors which act as a voltage divider. The PCM monitors this voltage, which corresponds to the position of the transmission range selector lever (P, R, N, Overdrive (Circle D), 2, 1) to determine desired gear and EPC pressure. The TR sensor is located on the top of the transaxle, and also contains the neutral/start, and reverse lamp circuits.

Turbine Shaft Speed (TSS) Sensor

The turbine shaft speed (TSS) sensor is a magnetic pickup that sends a signal to the PCM that indicates turbine shaft input speed. The TSS sensor provides converter turbine shaft speed information for TCC control strategy. Also used in determining static EPC pressure setting during shifts.

Output Shaft Speed (OSS) Sensor

The output shaft speed (OSS) sensor is a magnetic pick-up which detects the park gear teeth rotation and sends a signal to the PCM as an indicator of the transaxle output shaft speed. The OSS signal is processed by the PCM for shift scheduling and inputs to other control modules such as: Electronic Speedometer, Trip Computer, Speed Control, Adaptive Damping, Auxiliary Warning and Radio CD.

Solenoid Valve Body Assembly

The solenoid valve body assembly contains the TFT sensor, as well as 5 PCM controlled output devices:

- Electronic pressure control (EPC) solenoid
- Shift solenoid A (SSA)
- Shift solenoid B (SSB)
- 3-2 timing/coast clutch solenoid (3-2 T/CCS)
- Torque converter clutch (TCC) solenoid

Powertrain Control Module (PCM)

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

PCM controls the operation of the transaxle through wiring to the solenoid valve body assembly mounted on the main control assembly. An electrical connector from the solenoid valve body assembly fastens to the top of the transaxle case, where it connects to PCM wiring. The solenoid valve body assembly is serviced as one part when any new components are installed.

Electronic Pressure Control (EPC) Solenoid

The electronic pressure control (EPC) solenoid is a variable force style (VFS) solenoid. The VFS type solenoid is an electro-hydraulic actuator combining a solenoid and a regulating valve. This solenoid provides EPC which regulates line pressure (LP) and line modulator (LM) pressure. This is controlled by producing a resisting pressure to the main regulator and line modulator circuits. The LP and LM pressures control the clutch application pressures.

Torque Converter Clutch (TCC) Solenoid

The torque converter clutch (TCC) solenoid is a PWM style solenoid. The PWM solenoid is used to control the apply and release of the bypass clutch in the torque converter. By modulating the pulse width of the TCC solenoid, the pressure in the S4 circuit varies modulating the apply and release of the bypass clutch in the torque converter.

3-2 Timing/Coast Clutch Solenoid (3-2 T/CCS)

The 3-2 timing/coast clutch solenoid (3-2 T/CCS) is a VFS. The VFS type solenoid is an electro-hydraulic actuator combining a solenoid and a regulating valve. It supplies pressure to the S3 circuit to control the release of the direct clutch and to apply the intermediate and overdrive band during a 3-2 downshift. This solenoid also regulates the pressure in the S3 circuit to control the application and release of the coast clutch.

Shift Solenoid Assembly (SSA, SSB)

Shift solenoids SSA and SSB provide gear selection of 1st through 4th gears by providing ON/OFF pressure control to the shift valves.

DIAGNOSTIC TESTS

DIAGNOSTIC STRATEGY

NOTE: **Do not take shortcuts or assume that critical adjustments have already been made.**

Troubleshooting an electronically-controlled automatic transaxle is simplified by using the proven method of diagnosis. One of the most important things to remember is that there is a definite procedure to follow. Follow the procedures as written to avoid missing critical components or steps.

To correctly diagnose a concern, the technician should have the following publications available:

- **Introduction - Gasoline Engines** article
- TSBs

- Wiring diagrams

These publications provide the information required when diagnosing transaxle concerns.

Use the Diagnostic Flow Chart as a guide and follow the steps indicated.

Preliminary Inspection

- Know and understand the customer concern.
- Verify the concern by operating the vehicle.
- Check fluid level and condition.
- Check non-factory add-on items.
- Check shift linkages for correct adjustment.
- Check TSBs for the concern.

Diagnostics

- Carry out on-board diagnostic procedures: key ON/engine OFF (KOEO) and key ON/engine running (KOER).
- Record all DTCs.
- Repair all non-transaxle codes first.
- Repair all transaxle codes second.
- Erase all continuous codes and attempt to repeat them.
- Repair all continuous codes.
- If only pass codes, proceed to diagnosis by symptom charts for further information and diagnosis. Refer to **Diagnosis By Symptom**.

By following the diagnostic sequence, the repair technician will be able to diagnose and repair the concern the first time.

DIAGNOSTIC FLOW CHART

Special Tools

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

Prior to carrying out the flow test, the following items should be checked:

- Know and understand the customer concerns.

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- Check the fluid level and condition.
- Verify the concern by operating the vehicle.
- Check the non-factory installed items and verify correct installation.
- Check the selector lever linkage adjustments.
- Check TSBs for vehicle concerns.
- Carry out quick test both KOER and KOEO.
- Record all codes.
- Verify that the vehicle PCM is at the latest calibration release level.

DIAGNOSTIC FLOW CHART

Test	Result	Action
1) Did you record any DTCs?	Yes	REPAIR all hard DTCs. FOLLOW the pinpoint tests. For non-transmission related DTCs, refer to the <u>Introduction - Gasoline Engines</u> article first, then this Workshop Manual for transmission related DTCs.
	No	REFER to <u>Diagnosis By Symptom</u> in this article, then Go to Step 5.
2) Are any continuous test memory codes present?	Yes	CLEAR codes and CARRY OUT drive cycle test.
	No	Go to Step 4.
3) Did the continuous test memory codes reappear?	Yes	REPAIR all continuous test memory codes. Follow the pinpoint tests. For non-transmission related DTCs, refer to the <u>Introduction - Gasoline Engines</u> article first, then this Workshop Manual for transmission related DTCs, then Go to Step 4.
	No	Go to Step 4.
4) Is the concern repaired?	Yes	CARRY OUT the final quick test to verify that no DTCs are present. CLEAR memory codes. RETURN vehicle to customer.
	No	REFER to <u>Diagnosis By Symptom</u> .

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5) Are there any electrical concerns?	Yes	INSTALL the scan tool and CARRY OUT output state control test, then Go to Step 6.
	No	REFER to the hydraulic and mechanical routine to diagnose and repair the concern, then Go to Step 7.
6) Was the transaxle concern corrected when the scan tool was installed?	Yes	Refer to the <u>Introduction - Gasoline Engines</u> article, intermittent fault diagnosis section, and use the scan tool to diagnose cause of concern in the processor, vehicle harness or external inputs (sensors or switches).
	No	REFER to the hydraulic and mechanical routine to diagnose the concern, then Go to Step 7.
7) Is the concern repaired?	Yes	CARRY OUT the final quick test to verify that no DTCs are present. CLEAR memory codes. RETURN the vehicle to the customer.
	No	Concern should have been repaired. GO back through the Diagnostic Flow Chart and review other components that may have contributed to the concern. CHECK and diagnose those components. Get assistance from other sources.

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 before proceeding:

Know and Understand the Concern

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

- Hot or cold vehicle temperature
- Hot or cold ambient temperature
- Vehicle driving conditions
- Vehicle loaded or unloaded

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

Verification of Condition

This article provides information which must be used in both determining the actual cause of customer concerns and carrying out the appropriate repair procedures.

The following procedures must be used when verifying customer concerns for the transaxle:

Determine Customer Concerns

NOTE: If noise/vibration, check for dependencies: RPM, vehicle speed, shift, gear, range or temperature.

NOTE: Some transaxle conditions may cause engine concerns. The torque converter clutch not disengaging will stall the engine.

- Hot or cold vehicle operating temperature
- Hot or cold ambient temperature
- 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

CAUTION: The vehicle should not be driven if the transmission fluid level is below the bottom hole on the transmission fluid level indicator and the outside

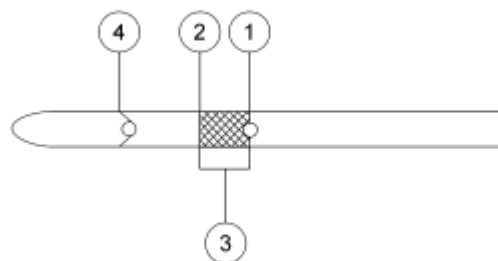
temperature is above 10°C (50°F).

NOTE: Transmission fluid expands when warmed. If your vehicle has been operated for an extended period at high speeds, in city traffic, during hot weather or while pulling a trailer, the vehicle should be turned off for about 30 minutes to allow the transmission fluid to cool before checking.

The transmission fluid level should be checked at normal operating temperatures, 66°C-77°C (150°F-170°F), on a level surface. You can check the transmission fluid level without driving if the outside temperature is above 10°C (50°F). When the vehicle has not been driven, and the outside temperature is above 10°C (50°F), the transmission fluid level should be between the holes on the transmission fluid level indicator. If the transmission fluid is to be checked when the transmission fluid is at room temperature, the transmission fluid level indicator could indicate that transmission fluid should be added if the transmission fluid level indicator is misread. If transmission fluid is added at this time, an overfill condition could result when the vehicle reaches operating temperature of 66°C-77°C (150°F-170°F).

Transmission Fluid Level Check

1. Park the vehicle on a level surface and engage the parking brake.
2. With your foot on the brake, start the engine and move the selector lever through all the gear ranges. Allow sufficient time for each gear to engage.
3. Place the selector in PARK (P) and leave the engine running.
4. Remove the transmission fluid level indicator and wipe it clean with a clean cloth.
5. Install the transmission fluid level indicator, making sure that it is fully seated in the transmission fluid filler tube.
6. Remove the transmission fluid level indicator. The transmission fluid should be in the designated areas for normal and room temperature.



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Fig. 9: Identifying Fluid Level Indicator
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Do not add if above the crosshatched area
2	-	Transmission fluid level at room temperature 10°C-35°C (50°F-95°F) (Do

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		not add transmission fluid)
3	-	Transmission fluid level at operating temperature 66°C-77°C (150°F-170°F)
4	-	Do not drive if below this area and outside temperatures are above 10°C (50°F)

High Transmission Fluid Level

Transmission fluid levels above the safe range may result in transaxle failure. An overfill condition of transmission fluid may cause shift or engagement concerns and possible damage. High transmission fluid levels can be caused by an overheating condition. A transmission fluid level that is too high may 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 transaxle malfunction and/or damage. If an overfill reading is indicated, drain and refill the transaxle.

Low Transmission Fluid Level

Do not drive the vehicle if the transmission fluid level is below the hole at the bottom of the transmission fluid level indicator, or not on the transmission fluid level indicator and the outside temperatures are above 10°C (50°F). A low transmission fluid level could result in poor transaxle engagement, slipping, malfunction and/or damage. This could also indicate a leak in one of the transaxle seals or gaskets.

Adding Transmission Fluid

CAUTION: The use of any other type of transmission fluid than specified could result in transmission malfunction and/or damage. An overfill condition of transmission fluid may cause shift or engagement concerns and possible damage.

Before adding transmission fluid, make sure that the correct type is being used. The type of transmission fluid that should be used is found on the transmission fluid level indicator, on the handle, in the owner manual and in [SPECIFICATIONS](#).

If transmission fluid needs to be added, add transmission fluid in 0.25L (1/2 pt) increments through the transmission fluid filler tube. Do not overfill the transmission fluid.

Transmission Fluid Condition Check

1. Check the transmission fluid level.
2. Observe the color and the odor. The color under normal circumstances should be dark reddish, not brown or black.
3. Hold the transmission fluid level indicator over a white facial tissue and allow the transmission fluid to drip onto the facial tissue and examine the stain.
4. If evidence of solid material is found, the transmission fluid pan should be removed for further inspection.
5. If the stain is a foamy pink color, this may indicate coolant in the transmission. The engine cooling

system should also be inspected at this time.

6. If transmission fluid contamination or transaxle failure is confirmed by the sediment in the bottom of the transmission fluid pan, the transaxle must be disassembled and completely cleaned. This includes the torque converter and cooler tubes.
7. Carry out diagnostic checks and adjustments. Refer to **Diagnosis By Symptom**.

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.

ROAD TESTING VEHICLE

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

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

SHIFT POINT ROAD TEST

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

1. Bring the engine and transaxle up to normal operating temperature.
2. Operate the vehicle with the transaxle range selector lever in the Overdrive (Circle D) position.
3. Apply minimum throttle and observe the speeds at which upshift occurs and torque converter engages. Refer to the following shift speed table.

CAUTION: Do not exceed posted speed limits when carrying out this test.

NOTE: **Shift speed ranges are approximate for all applications. For specific applications (engine, tire size, axle ratio and application), refer to the Automatic Transmission Specification Issue.**

SHIFT SPEED

Throttle Position	OD Position Shift	3.0L Km/h (mph)	2.3L Km/h (mph)
Closed	4-3	61 (38)	45 (28)
	3-2	32 (20)	27 (17)
	2-1	13 (8)	13 (8)
Minimum Monitor PID	1-2	21-26 (13-16)	16-24 (10-15)
TP Volt 1.25	2-3	37-43 (23-27)	30-34 (19-21)
	3-4	68-71 (42-44)	51-55 (32-34)
Wide Open Throttle	1-2	72 (45)	68 (42)
	2-3	129 (80)	114 (71)
	3-4	-	-

- Coasting 2-1 downshift procedure: accelerate the vehicle from a stop to 19-24 km/h (12-15 mph). Release the accelerator and coast down or lightly brake the vehicle. The coast downshift may be nearly imperceptible to the driver.
- With the vehicle in Overdrive (Circle D) (4th gear), depress the transmission control switch. The transaxle should downshift to 3rd gear. Remove foot from the accelerator pedal; engine braking should occur. The torque converter clutch will not reapply with closed throttle. Depending on vehicle speed, the torque converter clutch should disengage and then reapply after the accelerator pedal has been pressed.
- Depress the accelerator pedal to the floor. Depending on vehicle speed, the transaxle should shift from 3rd to 2nd gear, or 3rd to 1st.
- With the vehicle in Overdrive (Circle D) range above 80 km/h (50 mph) and less than half throttle, move the transaxle range selector lever from Overdrive (Circle D) range to manual 2 range and remove foot from the accelerator pedal. The transaxle should immediately downshift into 2nd gear. With the vehicle remaining in manual 2 range, move the transaxle range selector lever into manual 1 range and release the accelerator pedal. The transaxle should downshift into 1st gear at speeds below 48-56 km/h (28-32 mph) for 3.0L engine and 43 km/h (27 mph) for the 2.3L engine.
- If the transaxle fails to upshift/downshift or the torque converter does not apply and release, refer to the **Diagnosis By Symptom** in this article for possible causes.

TORQUE CONVERTER DIAGNOSIS

Prior to installing a new or remanufactured torque converter, all diagnostic procedures must be followed. This is to prevent the unnecessary installation of new or remanufactured 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 Customers Concern.
3. Verify the Concern - Carry out the Torque Converter Operation Test.
4. Carry out Diagnostic Procedures.
 - Carry out On-Board Diagnostics. Refer to the **Introduction - Gasoline Engines** article.
 - Repair all non-transmission related DTCs first.
 - Repair all transmission DTCs.
 - Rerun on-board diagnostics to verify repair.
 - Carry out Line Pressure Test. Refer to **Special Testing Procedures**.
 - Carry out Stall Speed Test. Refer to **Special Testing Procedures**.
 - Carry out Diagnosis by Symptom Routines. Refer to **Diagnosis By Symptom**.
 - 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 repair as required, before repairing the torque converter.

Torque Converter Clutch Operation Test

This test verifies that the torque converter clutch control system and the torque converter are operating correctly. Carry out the test as follows:

1. Carry out On-Board Diagnostic Test. Refer to the **Introduction - Gasoline Engines** article.
2. Connect a tachometer to the engine.
3. Bring engine to normal operating temperature by driving the vehicle at highway speeds for approximately 15 minutes in Overdrive (Circle D) position.
4. After normal operating temperatures are reached, maintain a constant vehicle speed of about 80 km/h (50 mph) and tap the brake pedal with the left foot.
5. Engine RPM should increase when the brake pedal is tapped, and should decrease about 5 seconds after the brake pedal is released. If this does not occur, see Torque Converter Operation Concerns. Refer to **Diagnosis By Symptom**. If the vehicle is at a stop and stalls in Overdrive (Circle D) at idle, move the transaxle range selector lever to the manual 1 position, see Torque Converter Operation Concerns. Refer to **Diagnosis By Symptom**. Repair as required. If the vehicle does not stall in manual 1, refer to **Diagnosis By Symptom**.

VISUAL INSPECTION

This inspection will identify modifications or additions to the vehicle operating system that can affect diagnosis.

- Vehicle modification

- Electronic add-on items
 - Air conditioning
 - Generators (alternators)
 - Engine turbo
 - Cellular telephone
 - Cruise control
 - CB radio
 - Linear boosters
 - Backup alarm signals
 - Computer
1. The above items, if not correctly installed, will affect PCM or transaxle function. Pay particular attention to add-on wiring splices in the PCM harness or transaxle wiring harness, abnormal tire size or axle ratio changes.
 2. Leaks. Refer to **Leakage Inspection**.
 3. Correct linkage adjustments. Refer to **AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E** article.

Selector Lever Linkage Check

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

Hydraulic leakage at the manual control valve can cause delay in engagement and/or slipping while operating if the linkage is not correctly adjusted. Correctly adjust the selector lever linkage. Refer to **AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E** article.

Check Technical Service Bulletins TSBs

Refer to all TSBs which pertain to the transaxle concern and follow the procedures as outlined.

Carry Out On-Board Diagnostics

After a road test, with the vehicle warm and before disturbing any connectors, carry out the Quick Test using the scan tool. Refer to the **Introduction - Gasoline Engines** article.

DIAGNOSTICS**Special Tools**

Illustration	Tool Name	Tool Number
	73 III Digital Multimeter	105-R0057 or equivalent

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 ST1137-A		
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) with appropriate hardware or equivalent scan tool	

Diagnosing an electronically controlled automatic transaxle is simplified by using the following procedures. One of the most important things to remember is that there is a definite procedure. Do not take short cuts 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 repair technician will be able to diagnose and repair the concern the first time.

On-Board Diagnostics With Scan Tool

NOTE: For detailed instructions and other diagnostic methods using the scan tool, refer to the Introduction - Gasoline Engines article or scan tool instruction guide.

NOTE: If using a generic scan tool, refer to the Introduction - Gasoline Engines article for instructions on carrying out On-Board Diagnostics procedures.

The Self Tests can be used to diagnose the PCM, sensors and actuators of this transaxle.

The following is a guide for using the on-board diagnostic (OBD) Self Tests and the scan tool.

- Self Test KOEO - Key On/Engine Off
- Self Test KOER - Key On/Engine Running
- Self Test CMDTCs - Continuous Memory DTCs
- Clearing DTCs
- OBD II Drive Cycle
- Other scan tool Features

For information on other diagnostic testing features using the scan tool, refer to the Introduction - Gasoline Engines article. Other diagnostic methods include the following:

- PID access mode, used to monitor sensors and actuators.
- Freeze frame data access mode, used to view emission-related data values from specific PIDs.
- Oxygen sensor monitor mode, used to monitor the oxygen sensor.

OUTPUT STATE CONTROL (OSC) MODE

NOTE: Retrieve continuous codes and carry out a KOEO and KOER On-Demand Self Test before using output state control (OSC). Any DTCs related to the transmission range (TR) sensor, output shaft speed (OSS) sensor or the vehicle speed sensor (VSS) must be fixed first or the PCM will not allow the OSC to operate.

OSC on the scan tool allows the technician to easily and quickly control the main functions and components of this transmission. OSC is used to help test the electrical, hydraulic or mechanical concerns related to the transmission. The scan tool also provides PID information, along with the OSC functions, to accurately diagnose the transmission. For example, OSC allows the technician to shift the transmission, engage the converter clutch, or command line pressure or turn a solenoid off and on. OSC has 2 menus for operation, the Bench Mode and the Drive Mode.

OSC - Bench Mode

The Bench Mode is functional only when the gear selector is in PARK or NEUTRAL. The Bench Mode may be used when the engine is either ON (running) or OFF. The Bench Mode allows the technician to function the following components:

- SSA/SS1 - Directs PCM to command Shift Solenoid A OFF or ON
- SSB/SS2 - Directs PCM to command Shift Solenoid B OFF or ON
- SSC/SS3 - Directs PCM to command the current to the 3-2 Timing/Coast Clutch Solenoid
- TCC - Directs PCM to command the Torque Converter Solenoid from 0% duty cycle to 100% duty cycle
- LINEDSD - Directs PCM to command line pressure from 0 to 300 PSI. The PCM will command the appropriate PCA current to obtain the commanded line pressure.
- PCB - Directs PCM to command pressure control solenoid B from 0 to 500 PSI. The PCM will command the appropriate PCB solenoid current to obtain the commanded pressure.

SSA/SS1, SSB/SS2, SSC/SS3 and TCC in Bench Mode

These OSC functions are used to command SSA/SS1, SSB/SS2, SSC/SS3 and TCC solenoids OFF and ON when carrying out an electrical circuit check.

The OSC functions for parameters SSA/SS1, SSB/SS2 and SSC/SS3 allows the technician to choose the following options:

- OFF - Directs PCM to command the solenoid OFF.
- ON - Directs PCM to command the solenoid ON.

The OSC options to control TCC for the torque converter clutch solenoid in Bench Mode are as follows:

- 0% - Commands PCM to control duty cycle to 0%.
- 100% - Commands PCM to control duty cycle to 100%.

Controlling the solenoids allows the technician to measure the circuit current using an inductive pickup or to measure the circuit voltage when carrying out electrical tests.

The vehicle requirements for SENDING an OSC value for SSA/SS1, SSB/SS2, SSC/SS3 and TCC are as follows:

- Key on/engine off or key on/engine running at idle.
- Gear selector in PARK or NEUTRAL.

The vehicle requirements must be met when sending the OSC value for SSA/SS1, SSB/SS2, SSC/SS3 and TCC commands. If the vehicle requirements are not met when sending the OSC value, the command is canceled. After sending the OSC value, if the vehicle requirements are no longer met, the OSC value will be canceled by the PCM (monitoring corresponding PID).

LINEDSD and PCB in Bench Mode

The LINEDSD in Bench Mode may be used when carrying out an electrical check on the line pressure control (LPC) or PCB solenoids or used to test the functionality of the transmission's electronic control of the line pressure. When testing the LPC or PCB for controlling the line pressure the technician is required to run the engine greater than 1,500 RPM. The hookup of a hydraulic pressure gauge is required to actually test whether the transmission line pressure is correct. This will test whether the hydraulic pump, the pressure regulator and the LPC/PCB solenoid and other associated mechanical and hydraulic components are working correctly.

The OSC functions for the parameter LINEDSD and PCB allows the technician to choose pressure between 0 and 300 psi for LINEDSD and between 0 and 500 psi for PCB:

The vehicle requirements for sending an OSC value for LINEDSD and PCB in Bench Mode is as follows:

- Key on/engine running, engine speed greater than 1,500 RPM.
- Gear selector in PARK or NEUTRAL.

The vehicle requirements must be met when sending the OSC value for LINEDSD or PCB. If the vehicle requirements are not met when sending the OSC value, the command will be canceled. After the OSC value for LINEDSD or PCB is sent, if the vehicle requirements are no longer met, the command will be canceled.

OSC - Drive Mode

The Drive Mode allows control of 2 transmission functions. Each OSC function has a unique set of vehicle operating requirements that the technician is required to meet before he/she is allowed to operate OSC. The recommended procedure, when using the Drive Mode, is to command one parameter at a time. The Drive Mode allows the technician to control the following OSC functions on the transmission:

- GEAR - Directs the PCM to upshift or down shift.
- OSC_TCC - Directs the PCM to engage or disengage the torque converter clutch.

GEAR in Drive Mode

This OSC function is used to test the transmission gear changes. The advantage of using OSC for changing gears is to allow the technician to easily test a specific gear and/or upshift or down shift that has been identified as the customer complaint. When using the OSC to command a shift change, the PCM should command the correct or normal pressure for that shift. The transmission will remain in the gear that OSC has commanded until OSC commands another gear or OSC is cancelled.

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

- 1 - Directs PCM to command 1st gear.
- 2 - Directs PCM to command 2nd gear.
- 3 - Directs PCM to command 3rd gear.
- 4 - Directs PCM to command 4th gear.

The vehicle requirements must be met when sending the OSC value for GEAR. If the vehicle requirements are not met when sending the OSC value, the command will be canceled. After the OSC value for GEAR is sent, if the vehicle requirements are no longer met, the command will be canceled.

It is recommended to use the OSC_TCC parameter in OSC to first turn off the converter clutch when testing the transmission gear changes. This will allow the technician to evaluate just the gear changes. If the torque converter clutch is not turned off, then the PCM may command the torque converter clutch to engage during a shift. This could make it more difficult for the technician to determine whether a bad shift is the result of the torque converter engaging or the actual gear change.

The vehicle requirements for SENDING a GEAR value is as follows:

- Engine is running
- Gear selector is in Overdrive (Circle D)
- Vehicle speed is greater than 3 km/h (2 mph)
- Vehicle speed must be lower than 48 km/h (30 mph) to command a downshift to 1st gear
- Vehicle speed must be lower than 96 km/h (60 mph) to command a downshift to 2nd gear
- Vehicle speed must be lower than 145 km/h (90 mph) to command a downshift to 3rd gear
- Vehicle speed must be greater than 48 km/h (30 mph) to command an upshift to 4th gear

OSC_TCC in Drive Mode

This function is used to test whether the torque converter clutch is locking and unlocking correctly.

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

- NORMAL - Allows the PCM to control the TCC normally.
- LOCK - Commands TCC solenoid ON (100% duty cycle) to engage the converter clutch.
- UNLOCK - Commands TCC solenoid OFF (0% duty cycle) to disengage the converter clutch.

The vehicle requirements must be met when sending the OSC value for OSC_TCC. If the vehicle requirements are not met when sending the OSC value, the command will be canceled. When the command is canceled, OSC

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is aborted and must be restarted. After the OSC value for OSC_TCC is sent, if the vehicle requirements are no longer met, the OSC value will be canceled by the PCM (monitoring corresponding PID).

The vehicle requirements for SENDING the OSCTCC value LOCK is as follows:

- Engine is running
- Gear selector is in Overdrive (Circle D)
- Vehicle speed is greater than 3 km/h (2 mph)
- Transmission fluid temperature (TFT) is between 16°C (60°F) and 116°C (240°F)
- Brake is off when vehicle speed is below 32 km/h (20 mph)
- Not an excessive load on the engine
- Not during an upshift or downshift
- Engine speed is greater then 1,500 RPM

The vehicle requirements for SENDING the OSC_TCC value UNLOCK is as follows:

- Engine is running
- The selector lever is in Overdrive (Circle D)
- Vehicle speed is greater than 3 km/h (2 mph)

Using Output State Control (OSC) and Monitoring PIDs

To confirm that the OSC value was sent by the scan tool and the PCM has accepted the OSC command, a corresponding PID for each OSC parameter must be monitored. After sending the OSC value, the corresponding PID value should be the same as the OSC value. Additional PIDs should be monitored to help the technician accurately diagnose the transmission. The following is a list of PIDs to monitor while using OSC.

OSC Parameter	Corresponding PID	Additional PIDs
SSA/SS1	SSA/SS1	SSA/SS1_F
SSB/SS2	SSB/SS2	SSB/SS2_F
SSC/SS3	SSC/SS3	SSC/SS3_F
LINEDSD	LINEDSD	PCA, PCA AMP, PCA_F
PCB	PCB	PCB, PCB_F
TCC	TCC	TCC_F
TCC_OSC	TCC_OSC	TCC, TCCPC, TCC_F, TCC_OSC, TCC_OT
GEAR	GEAR	GEAR, GEAR_OSC, GEAR_RAT, GEAR_MAX

PID Name	PID Description
PCA	Electronic pressure control commanded pressure (not actual) - PSI
GEAR	GEAR commanded state (not actual) - 1st, 2nd, 3rd

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	or 4th
LINEDSD	Line pressure commanded (not actual)
OSS	Output shaft speed sensor input - RPM
RPM	Engine speed sensor input - RPM
SSA/SS1	Shift solenoid A commanded state (not actual) - ON or OFF
SSB/SS2	Shift solenoid B commanded state (not actual) - ON or OFF
SSC/SS3	Shift solenoid 3-2T/CCS commanded state (not actual) - ON or OFF
SSA/SS1_F	Shift solenoid A circuit fault - YES or NO
SSB/SS2_F	Shift solenoid B circuit fault - YES or NO
SSC/SS3_F	Shift solenoid 3-2T/CCS circuit fault - YES or NO
TCC_RAT	Torque converter clutch ratio (engine speed minus turbine speed) - RPM
TCC	Torque converter clutch solenoid commanded state - duty cycle
TCC_F	Torque converter clutch solenoid circuit fault - YES or NO
TFT	Transmission fluid temperature -°C (°F) or voltage
TP	Throttle position - voltage
TR	Transmission range sensor - PARK, REVERSE, NEUTRAL, Overdrive (Circle D), etc.
TRAN_RAT	Actual transmission gear ratio - numeric ratio indicated.
TSS	Turbine shaft speed sensor input - RPM
VSS	Vehicle speed sensor input - MPH

TRANSAXLE DRIVE CYCLE TEST

NOTE: The Transaxle Drive Cycle Test must be carried out exactly. Faults have to occur consecutively for codes P0731, P0732, P0733 and P0734 to be set, and 5 times consecutively for continuous codes P0741 and P1741.

NOTE: When carrying out the Transaxle Drive Cycle Test, refer to the Solenoid Operation Chart for correct solenoid operation. Refer to Pinpoint Tests - Non OSC Equipped Vehicle.

1. Record and then erase Self Test codes.
2. Warm engine to normal operating temperature.
3. Make sure transmission fluid level is correct.
4. With transaxle in Overdrive (Circle D) position, press transmission control (TC) switch (LED lamp should illuminate) and moderately accelerate from a stop to 64 km/h (40 mph). This allows the transaxle

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to shift into 3rd gear. Hold the speed and throttle opening steady for a minimum of 15 seconds (30 seconds above an altitude of 4000 feet above sea level).

5. Press TC switch (LED lamp should turn off) and accelerate from 64 km/h (40 mph) to 80 km/h (50 mph). This allows the transaxle to shift into 4th gear. Hold the speed and throttle opening steady for a minimum of 15 seconds.
6. With the transaxle in 4th gear and maintaining steady speed and throttle opening, lightly apply brake pedal (to operate stop lamps). Then hold the speed and throttle steady for an additional 5 seconds (minimum).
7. Brake to a stop and remain stopped for a minimum of 20 seconds.
8. Repeat Steps 4 through 6 at least 5 times.
9. Carry out Self Test and record continuous codes.

DIAGNOSTIC TROUBLE CODE (DTC) CHARTS

DIAGNOSTIC TROUBLE CODE CHART

Five Digit DTC	Component	Description	Condition	Symptom	Action
P0102, P0103, P1100, P1101	Mass air flow (MAF)	MAF fault codes.	MAF system has a fault which may cause a transaxle concern. Refer to the <u>Introduction - Gasoline Engines</u> article for diagnosis.	Incorrect shift schedule, high/low EPC pressure. Incorrect converter engagement scheduling, symptoms similar to a TPS failure.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P0117	Engine coolant temperature (ECT)	ECT indicates 125°C (254°F).	ECT higher or lower than expected during key ON engine OFF (KOEO) and key ON engine running (KOER).	Torque converter clutch will always be off, resulting in poor fuel economy.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P0118	ECT	ECT indicates -40°C (-40°F).	ECT higher or lower than expected during KOEO and KOER.	Torque converter clutch will always be off, resulting in poor fuel economy.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P0122, P0123, P1120, P1121, P1125	Throttle position (TP)	TP fault codes.	Processor assembly has detected an error. This error may cause a transaxle concern. Refer to the <u>Introduction - Gasoline Engines</u> article	Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage. Torque converter clutch cycling.	Refer to the <u>Introduction - Gasoline Engines</u> article.

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			for diagnosis.		
P0300, P0308, P0320, P0340, P1351, P1364	Electronic Ignition (EI) System	EI system fault codes.	Ignition system has a fault which may cause a transaxle concern. Refer to the <u>Introduction - Gasoline Engines</u> article for diagnosis.	Engine fault, no torque converter engagement, late wide open throttle (WOT) shifts.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P0707	Transmission Range (TR)	TR out of range. Shorted circuit or sensor.	TR sensor, circuit or PCM shorted to ground.	Harsh shifts or engagements.	Go to <u>Pinpoint Test D.</u>
P0708	TR	TR out of range. Open circuit or sensor.	TR sensor, circuit or PCM indicate open.	Harsh shifts or engagements.	Go to <u>Pinpoint Test D.</u>
P0711	Transmission fluid temperature (TFT)	Transmission Temperature sensor in range failure.	The PCM has detected no change in TFT during normal operation.	Substitute ECT temperature reading.	Go to <u>Pinpoint Test B.</u>
P0712	TFT	150°C (302°F) indicated TFT sensor circuit grounded.	Voltage drop across TFT sensor exceeds temperature of 150°C (302°F).	Incorrect torque converter clutch operation. Incorrect EPC pressure control.	Go to <u>Pinpoint Test B.</u>
P0713	TFT	-40°C (-40°F) indicated TFT sensor circuit open.	Voltage drop across TFT sensor exceeds scale set for temperature -40° C (-40°F).	Incorrect torque converter clutch operation. Incorrect EPC pressure control.	Go to <u>Pinpoint Test B.</u>
P0715	Turbine shaft speed (TSS)	Insufficient input from turbine speed sensor.	PCM detected a loss of TSS signal during operation.	No torque converter engagements or harsh shifts. No 4th gear operation and engine braking in 2nd and 3rd gear.	Go to <u>Pinpoint Test F.</u>
P0717	TSS	Turbine shaft speed sensor circuit - signal.	PCM has detected NO TSS signal.	Possible harsh shifts, converter locks or engagements.	Go to <u>Pinpoint Test F.</u>
P0718	TSS	Turbine shaft speed sensor	PCM has detected a noisy TSS	Possible harsh shifts, converter	Go to <u>Pinpoint Test F.</u>

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		circuit intermittent.	signal.	locks or engagements.	
P0720	Output shaft speed (OSS)	Insufficient input from OSS sensor.	PCM has detected a loss of OSS signal during operation.	Harsh shift, abnormal shift schedule operation.	Go to <u>Pinpoint Test F.</u>
P0721	OSS	OSS signal noisy.	PCM has detected a noisy OSS sensor signal.	Harsh shifts, abnormal shift schedule operation.	Go to <u>Pinpoint Test F.</u>
P0722	OSS	OSS signal intermittent.	PCM has detected an intermittent OSS signal.	Harsh shift, abnormal shift schedule operation.	Go to <u>Pinpoint Test F.</u>
P0731**	Shift solenoid A (SSA), shift solenoid B (SSB), or internal parts	1st gear failure.	No 1st gear.	Harsh shifts. Incorrect gear selection depending on condition mode and manual lever position: see Solenoid ON/OFF Chart. Shift errors may also be due to other internal transaxle concerns (such as stuck valves, damaged friction material).	Go to <u>Pinpoint Test A.</u>
P0732**	SSA, SSB, or internal parts	2nd gear failure.	No 2nd gear.	Harsh shifts. Incorrect gear selection depending on condition mode and manual lever position: see solenoid ON/OFF Chart. Shift errors may also be due to other internal transaxle concerns (such as stuck valves, damaged friction material).	Go to <u>Pinpoint Test A.</u>
P0733**	SSA, SSB or internal parts	3rd gear failure.	No 3rd gear.	Harsh shifts. Incorrect gear selection depending on condition mode	Go to <u>Pinpoint Test A.</u>

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				and manual lever position: see solenoid ON/OFF Chart. Shift errors may also be due to other internal transaxle concerns (such as stuck valves, damaged friction material).	
P0734**	SSA, SSB or internal parts	4th gear failure.	No 4th gear.	Harsh shifts. Incorrect gear selection depending on condition mode and manual lever position: see Solenoid ON/OFF Chart. Shift errors may also be due to other internal transaxle concerns (such as stuck valves, damaged friction material).	Go to <u>Pinpoint Test A.</u>
P0743*, P0740***	Torque converter clutch (TCC)	Torque converter clutch solenoid circuit failure, open or shorted.	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open, shorted or processor drive failure.	Harsh shifts or engagements. Engine RPM higher or lower than expected.	Go to <u>Pinpoint Test C.</u>
P0750*, P0753***	SSA	SSA solenoid circuit failure, open or shorted.	Solenoid A circuit failed to provide voltage drop across solenoid. Circuit open or shorted or processor driver failure during self-test.	Incorrect gear selection depending on condition mode and manual lever position.	See the Solenoid Operation Chart, refer to <u>Pinpoint Tests - Non OSC Equipped Vehicle</u> Go to <u>Pinpoint Test A.</u>
P0755*, P0758***	SSB	SSB solenoid circuit failure, open or shorted.	Solenoid B circuit failed to provide voltage drop across solenoid. Circuit open or	Incorrect gear selection depending on condition mode and manual lever	See the Solenoid Operation Chart, refer to <u>Pinpoint Tests - Non OSC Equipped Vehicle.</u>

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			shorted or processor driver failure during self-test.	position.	Go to <u>Pinpoint Test A.</u>
P0778	3-2 Timing/Coast Clutch Solenoid (3-2T/CCS)	3-2 T/CCS solenoid or circuit electrical intermittent failures detected.	Voltage through 3-2T/CCS solenoid and circuit are checked. An error will be noted if tolerance is exceeded.	May flash the TCIL.	Go to <u>Pinpoint Test G.</u>
P0960*	Electronic pressure control (EPC)	EPC solenoid circuit failure, open circuit.	Voltage through EPC solenoid is checked and compared to a voltage through solenoid after a time delay. An error will be noted if tolerance is exceeded. KOEO and continuous self-test.	Open circuit - causes maximum EPC pressure, harsh engagements and shifts.	Go to <u>Pinpoint Test E.</u>
P0962, P0748	EPC	EPC solenoid circuit failure, shorted to ground.	Voltage through EPC solenoid is checked and compared to a voltage through solenoid after a time delay. An error will be noted if tolerance is exceeded. KOEO and continuous self-test.	Short to ground: limit engine torque (partial fuel shut-off, heavy misfire). Minimum line pressure.	Go to <u>Pinpoint Test E.</u>
P0963	EPC	EPC solenoid circuit failure, short circuit to VBAT.	Voltage through EPC solenoid is checked. An error will be noted if tolerance is exceeded.	Short to VBAT: maximum EPC pressure, harsh engagements and shifts. May flash the TCIL.	Go to <u>Pinpoint Test E.</u>
P0964*	3-2T/CCS	3-2T/CCS solenoid circuit failure - open.	3-2T/CCS circuit fails to provide voltage drop	Failed off - engine braking in second/third gears,	Go to <u>Pinpoint Test G.</u>

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			across solenoid. Circuit open or processor drive circuit failure during self-test.	firm or flared 3-2 downshifts. Harsh 4-3 downshifts.	
P0966*	3-2T/ CCS	3-2T/CCS solenoid circuit failure - short.	3-2T/CCS circuit fails to provide voltage drop across solenoid. Circuit shorted during self-test.	Failed on - no engine braking (except in Overdrive (Circle D)), delayed 3-2 downshifts.	Go to <u>Pinpoint Test G.</u>
P0967	3-2 T/CCS solenoid	3-2 TCCS solenoid circuit failure, short circuit to VBAT.	Voltage through 3-2T/CCS solenoid and circuit are checked. An error will be noted if tolerance is exceeded.	May flash the TCIL.	Go to <u>Pinpoint Test G.</u>
P1116	ECT	ECT out of self-test range.	ECT higher or lower than expected during KOEO and KOER.	Rerun self-test at normal operating temperature.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P1124	TP	TP voltage high/low for self-test.	TP was not in the correct position for self-test.	Rerun at appropriate TP position per application.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P1460	A/C	A/C switch error.	A/C or defrost on condition may result from A/C clutch being on during quick test.	Failed ON - EPC pressure slightly low with A/C off. Failed off - EPC pressure slightly low with A/C on.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P1501	Vehicle speed sensor (VSS)	VSS input out of self-test range.	PCM detected presence of a VSS signal during self-test.	No transmission symptom.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P1636	Inductive signature clip	Inductive signature clip communication.	PCM has detected an internal error.	-	Refer to the <u>Introduction - Gasoline Engines</u> article.
P1702	TR	Transmission range sensor circuit.	Transmission range sensor circuit intermittent.	Harsh shifts or engagements.	Go to <u>Pinpoint Test D.</u>

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P1703	Brake pedal position (BPP)	Brake not actuated during self-test.	Brake not cycled during KOER.	Failed on or not connected - converter clutch will not engage at less than 1/3 throttle.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P1703	BPP	BPP switch circuit failed.	Brake pedal position switch circuit failure.	Failed off - converter clutch will not disengage when brake is applied.	Refer to the <u>Introduction - Gasoline Engines</u> article.
P1705	TR	TR not in PARK.	Self-test not run in PARK.	Rerun self-test in PARK.	Go to <u>Pinpoint Test D.</u>
P1711	TFT	TFT out of ST range.	Transaxle not at operating temperature during self-test.	Warm or cool transaxle to normal operating temperature.	Go to <u>Pinpoint Test B.</u>
P1714	SSA	SSA fault.	Mechanical failure of the solenoid detected.	Incorrect gear selection depending on condition, mode and manual lever position.	See the Solenoid Operation Chart, refer to <u>Pinpoint Tests - Non OSC Equipped Vehicle.</u> Go to <u>Pinpoint Test H.</u>
P1715	SSB	SSB fault.	Mechanical failure of the solenoid detected.	Incorrect gear selection depending on condition, mode and manual lever position.	See the Solenoid Operation Chart, refer to <u>Pinpoint Tests - Non OSC Equipped Vehicle.</u> Go to <u>Pinpoint Test H.</u>
P1742, P1743***	TCC	TCC solenoid failed ON or OFF.	TCC solenoid has failed ON or OFF by electrical, mechanical or hydraulic concern.	Harsh shifts or engagements. Engine RPM higher or lower than expected.	Go to <u>Pinpoint Test C.</u>
P1744, P0741***	TCC	TCC function check.	Excessive slip detected during full TCC engagement.	Harsh shifts or engagements. Engine RPM higher or lower than expected.	Go to <u>Pinpoint Test C.</u>
P1780	Transmission control (TC) switch	Transmission control switch not changing states during self-test.	Transmission control switch not cycled during self-test. Circuit open or shorted.	No overdrive cancel when switch is cycled.	Rerun self-test and cycle switch, refer to the <u>Introduction - Gasoline Engines</u>

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					article.
P1782	Performance/economy (P/E) switch	P/E switch circuit out of self-test range (if equipped).	P/E switch not cycled during self-test or shorted/opened.	No change in states when cycled.	Rerun self-test and cycle switch. Refer to the <u>Introduction - Gasoline Engines</u> article.
P1783	TFT	Transmission overtemp condition indicated.	Transmission fluid temperature exceeded 127°C (270°F).	Increased line pressure.	Go to <u>Pinpoint Test B.</u>

* Output circuit check, generated only by electrical symptoms.

** May also be generated by some other non-electric transaxle hardware system.

*** The TCIL code will set on the first fault occurrence. On the second fault occurrence plus the second power up, the MIL and TCIL will illuminate.

Rotunda Transmission Tester

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

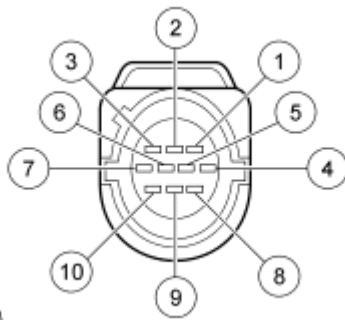
- Bench Testing - Engine Off
- Resistance/Continuity Test
- Solenoid Voltage Test
- Dynamic Testing - Engine On
- EPC Solenoid
- Transaxle Engagement
- Upshifts/Downshifts
- Torque Converter Clutch (TCC) Engagement
- Coast Clutch Engagement
- Turbine Shaft Speed (TSS) Sensor
- Output Shaft Speed (OSS) Sensor
- Transmission Range (TR) Sensor
- Switch Test - Park/Neutral, Backup Lamp and Optional Circuits

TRANSAXLE CONNECTOR LAYOUTS

NOTE: This vehicle is equipped with a new style PCM. This is a 50-pin control module with 3 separate connectors. One connector for the engine (E), one for the transaxle (T) and one for the body (B). The pin numbers listed throughout these pinpoint tests will have the letter E, T and B to designate the connector.

2008 Ford Escape

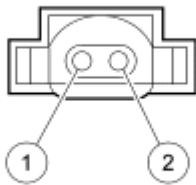
2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner



N0076903

Fig. 10: Transaxle Vehicle Harness Connector - C199
Courtesy of FORD MOTOR CO.

Pin	Description	PCM Pin Number
1	TFT signal	T29
2	Signal return	T41 (2.3L); E41 (3.0L)
3	TCC power	B35, B36
4	TCC signal	T46
5	SSB signal	T43
6	EPC power	B35, B36
7	SSA signal	T42
8	3-2 T/CCS signal	T23
9	Solenoid power	B35, B36
10	EPC signal	T11



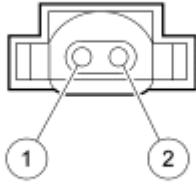
N0024420

Fig. 11: Output Shaft Speed (OSS) Sensor Connector - C193
Courtesy of FORD MOTOR CO.

Pin	Description	PCM Pin Number
1	OSS -	B50
2	OSS +	T4

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N0024420

Fig. 12: Turbine Shaft Speed (TSS) Sensor Connector - C143
Courtesy of FORD MOTOR CO.

Pin	Description	PCM Test Pin Number
1	TSS -	B50
2	TSS +	T15

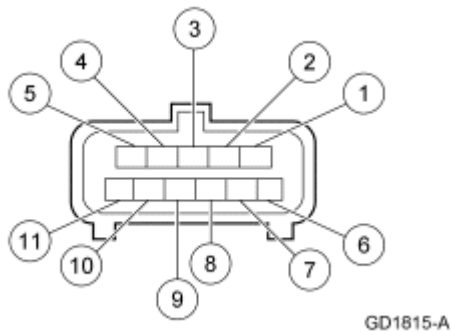


Fig. 13: Transmission (TR) Sensor Connector - C167
Courtesy of FORD MOTOR CO.

Pin	Circuit Function	PCM Pin Number
1	Ground	-
2	Not used	-
3	Not used	-
4	Starter	-
5	TR sensor signal return	T41 (2.3L); E41 (3.0L)
6	Not used	-
7	Not used	-
8	Drive signal	-
9	Starter Relay Coil	-
10	PCM TR sensor signal	T27
11	Not used	-

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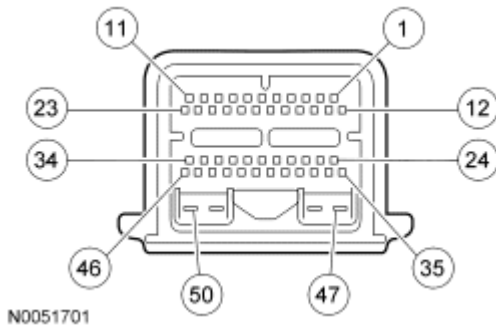


Fig. 14: Powertrain Control Module (PCM) Connector - C175T, C175B and C175E
 Courtesy of FORD MOTOR CO.

Pin Number	Circuit	Circuit Function
T4	-	Output shaft speed (OSS) sensor signal
T11	-	EPC signal
T15	-	Turbine shaft speed (TSS) sensor signal
T23	-	3-2 T/CCS signal
T27	-	PCM TR sensor signal
T29	-	TFT signal
T41 (2.3L)	-	TR sensor signal return
E41 (3.0L)	-	TR sensor signal return
T42	-	SSA signal
T43	-	SSB signal
T46	-	TCC signal
B35	-	TCC power, solenoid power, EPC power
B36	-	TCC power, solenoid power, EPC power
B50	-	TSS and OSS signal return

PINPOINT TESTS - NON OSC EQUIPPED VEHICLE

Special Tools

Illustration	Tool Name	Tool Number
 ST1137-A	73 III Digital Multimeter	105-R0057 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) with appropriate hardware or equivalent scan tool	

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SOLENOID OPERATION CHART

Transaxle Range Selector Lever Position	PCM Commanded Gear	SSA	SSB	3-2T/CCS	TCC
P/N	-	OFF	ON	ON	OFF
R	-	OFF	ON/OFF	ON	a
Overdrive (Circle D)	1	ON	ON	ON	a
	2	OFF	ON	ON	b
	3	OFF	OFF	ON	b
	4	ON	OFF	ON	b
D OD cancelled	1	ON	ON	ON	a
	2	OFF	ON	OFF	b
	3	OFF	OFF	OFF	b
2	2	OFF	ON	OFF	b
2 ^c	3	OFF	OFF	OFF	b
1	1	ON	ON	OFF	a
1 ^c	2	OFF	ON	OFF	b
1 ^c	3	OFF	OFF	OFF	b

^a Not allowed by hydraulics.

^b PCM commanded.

^c When a manual pull-in occurs above a calibrated speed, the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

Shift Solenoid Failure Mode Chart "Always OFF"

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

SSA Always OFF	Selector Lever Position			
	Overdrive (Circle D)	D ^a	2	1 ^b
PCM Gear Commanded	Actual Gear Obtained			
1	2	2	-	2
2	2	2	2	2
3	3	3	3	3
4	3	-	-	-

^a Overdrive canceled

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^b When a manual pull-in occurs above a calibrated speed, the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

SSB Always OFF	Selector Lever Position			
	Overdrive (Circle D)	D^a	2	1^b
PCM Gear Commanded	Actual Gear Obtained			
1	4	4	-	4 ^c
2	3	3	3	3
3	3	3	3	3
4	4	-	-	-

^a Overdrive canceled

^b When a manual pull-in occurs above a calibrated speed, the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

^c No forward movement.

Shift Solenoid Failure Mode Chart "Always ON"

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

SSA Always ON	Selector Lever Position			
	Overdrive (Circle D)	D^a	2	1^b
PCM Gear Commanded	Actual Gear Obtained			
1	1	1	-	1
2	1	1	1	1
3	4	4	4	4 ^c
4	4	-	-	-
Also No Reverse				

^a Overdrive canceled

^b When a manual pull-in occurs above a calibrated speed, the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

^c No forward movement.

SSB Always ON	Selector Lever Position			
	Overdrive (Circle D)	D^a	2	1^b
PCM Gear Commanded	Actual Gear Obtained			

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1	1	1	-	1
2	2	2	2	2
3	2	2	2	2
4	1	-	-	-

^a Overdrive canceled

^b When a manual pull-in occurs above a calibrated speed, the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

Pinpoint Tests

Refer to appropriate SYSTEM WIRING DIAGRAMS article, Transmission Controls for schematic and connector information.

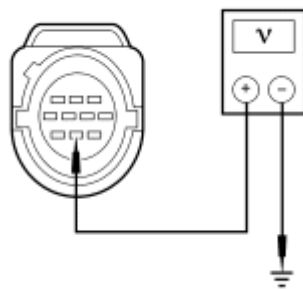
PINPOINT TEST A: SHIFT SOLENOIDS

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

A1 CHECK FOR BATTERY VOLTAGE AT THE TRANSAXLE CONNECTOR

CAUTION: Do not pry on the connector. This will damage the connector and may result in a transaxle concern. Press button and pull up on the transaxle vehicle harness connector.

- Disconnect: Transaxle Connector C199
- Inspect the transaxle vehicle harness connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Key in ON position.
- Measure the voltage at transaxle connector C199-9, circuit CBB24 (VT/GN).



N0072021

Fig. 15: Measuring Voltage
Courtesy of FORD MOTOR CO.

- Is the voltage greater than 10 volts?

YES : Go to A4.

NO : Go to A2.

A2 CHECK BATTERY CONTROL MODULE (BCM) FUSE 24 (10A)

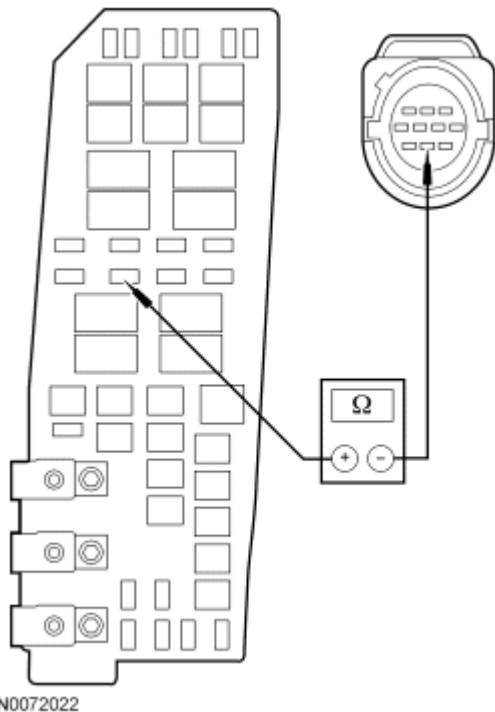
- Check fuse: BCM Fuse 24 (10A)
- Is the resistance less than 5 ohms?

YES : Go to A3.

NO : REPAIR circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) for a short to ground. CONNECT all electrical connectors. TEST the system for normal operation.

A3 CHECK THE SOLENOID POWER SUPPLY CIRCUIT FOR AN OPEN

- Key in OFF position.
- Disconnect: BCM fuse 24 (10A)
- Measure the resistance between the output side of BCM fuse 24 (10A) or circuit CBB28 (GY/VT) and transaxle connector C199-9, circuit CBB24 (VT/GN).



N0072022

Fig. 16: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance less than 5 ohms?

YES : Circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) has an intermittent open circuit. REPEAT this test step while wiggling the wiring harness. INSPECT the vehicle wiring harness for damage and repair as necessary.

NO : REPAIR circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) for an open. CONNECT all

electrical connectors. TEST the system for normal operation.

A4 CHECK SOLENOID CONTROL CIRCUIT FOR A SHORT TO POWER AND GROUND

- Disconnect: PCM Connector C175T
- Inspect the PCM connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.

NOTE: Use the table to determine which pin on PCM connector C175T is the SSA or SSB solenoid control circuit.

- Measure the resistance at PCM connector C175T between the shift solenoid pin and ground and transaxle connector C199-9, circuit CBB24 (VT/GN).

Shift Solenoid Control Circuit	PCM Connector Pin
SSA CET18 (GY/YE)	42
SSB CET19 (VT/GY)	43

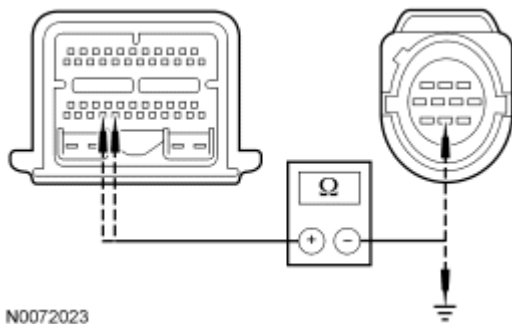


Fig. 17: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is each resistance greater than 10,000 ohms?

YES : Go to A5.

NO : REPAIR short circuit(s). CONNECT all components. TEST the system for normal operation.

A5 CHECK THE SOLENOID CONTROL CIRCUIT FOR AN OPEN

NOTE: Use the table to determine which pin on PCM connector C175T and transaxle connector C199 is the SSA or SSB solenoid control circuit.

- Measure the resistance at PCM connector C175T between the shift solenoid pin and the

corresponding pin on transaxle connector C199.

Shift Solenoid	Transaxle Connector Pin	PCM Connector Pin
SSA CET18 (GY/YE)	7	42
SSB CET19 (VT/GY)	5	43

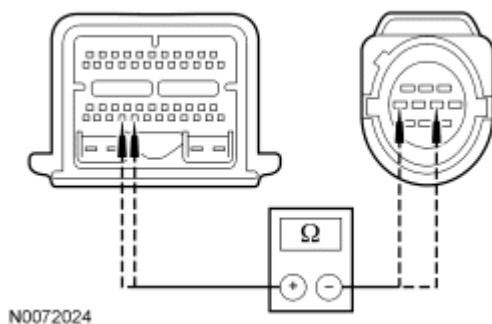


Fig. 18: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance less than 5 ohms?

YES : Go to A6.

NO : REPAIR the open circuit(s). CONNECT all components. TEST the system for normal operation.

A6 CHECK THE RESISTANCE OF THE SOLENOID FIELD CIRCUIT

- Measure the resistance between transaxle connector C199 pin 9, component side and pin 7 for SSA or pin 5 for SSB, component side.

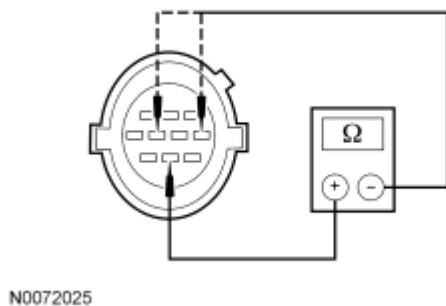


Fig. 19: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance between 12 and 22 ohms?

YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS - 2.3L** article or **ELECTRONIC ENGINE CONTROLS - 3.0L (4V)** article. RECONNECT all components. TEST the system for normal operation. If symptoms are still present, REFER to **Diagnosis By Symptom**.

NO : INSTALL a new main control assembly. REFER to **Main Control Valve Body**. CONNECT all components. TEST the system for normal operation.

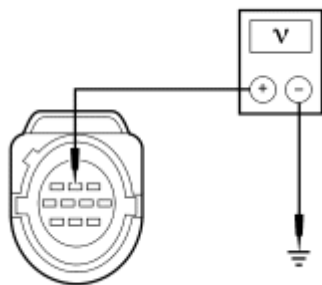
PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

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

B1 CHECK FOR REFERENCE VOLTAGE AT THE TRANSAXLE VEHICLE HARNESS CONNECTOR

CAUTION: Do not pry on the connector. This will damage the connector and may result in a transaxle concern. Press button and pull up on the transaxle vehicle harness connector.

- Key in OFF position.
- Disconnect: Transaxle Connector C199
- Key in ON position.
- Use a mirror to inspect both ends of the connector for damaged or pushed-out pins, corrosion, loose wires and missing or damaged seals.
- Measure the voltage between transaxle vehicle harness connector C199-2, circuit RE406 (GY/VT) and ground.



N0072056

Fig. 20: Measuring Voltage
Courtesy of FORD MOTOR CO.

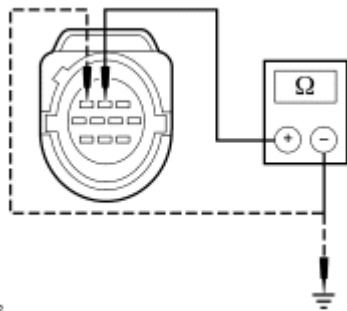
- Is the voltage between 4.75 and 5.25 volts?

YES : Go to B4.

NO : Go to B2.

B2 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO GROUND OR POWER

- Key in OFF position.
- Disconnect: PCM Connector C175T
- Inspect the PCM connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Key in ON position.
- Measure the resistance between transaxle vehicle harness connector C199-2, circuit RE406 (GY/VT) and C199-3, circuit CBB24 (VT/GN) and ground.



N0072026

Fig. 21: Measuring Resistance
Courtesy of FORD MOTOR CO.

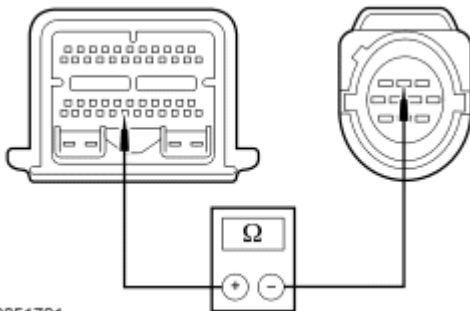
- Is the resistance greater than 10,000 ohms?

YES : Go to B3.

NO : REPAIR circuit RE406 (GY/VT) for a short. CONNECT all components. TEST the system for normal operation.

B3 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR AN OPEN

- Measure the resistance between PCM electrical connector C175T-41, circuit RE406 (GY/VT) and transaxle electrical connector C199-2, circuit RE406 (GY/VT).



N0051721

Fig. 22: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

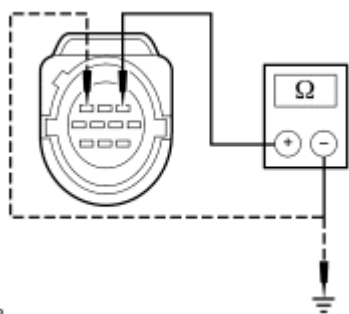
- Is the resistance less than 5 ohms?

YES : Circuit RE406 (GY/VT) may have an intermittent open or short. REPEAT test steps B2 and B3 while wiggling the wiring harness. INSPECT the vehicle wiring harness for damage and repair as necessary. If damage is not found in the wiring harness, install a new PCM.

NO : REPAIR circuit RE406 (GY/VT) for an open. CONNECT all components. TEST the system for normal operation.

B4 CHECK THE SIGNAL CIRCUIT FOR A SHORT TO GROUND OR POWER

- Disconnect: PCM Connector C175T
- Inspect the PCM connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Key in ON position.
- Measure the resistance between transaxle vehicle harness connector C199-1, circuit VET27 (BN/YE) and C199-3, circuit CBB24 (VT/GN) and ground.



N0072028

Fig. 23: Measuring Resistance
Courtesy of FORD MOTOR CO.

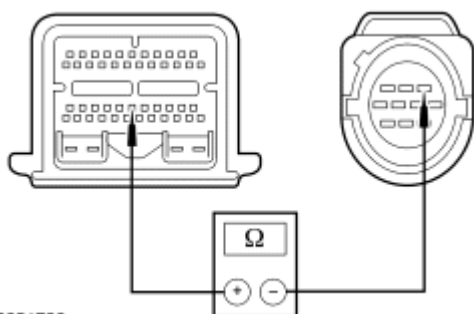
- Is the resistance greater than 10,000 ohms?

YES : Go to B5.

NO : REPAIR circuit VET27 (BN/YE) for a short. CONNECT all components. TEST the system for normal operation.

B5 CHECK THE SIGNAL CIRCUIT FOR AN OPEN

- Measure the resistance between PCM electrical connector C175T-29, circuit VET27 (BN/YE) and transaxle electrical connector C199-1, circuit VET27 (BN/YE).



N0051720

Fig. 24: Measuring Resistance

Courtesy of FORD MOTOR CO.

- Is the resistance less than 5 ohms?

YES : Go to B6.

NO : REPAIR circuit VET27 (BN/YE) for an open. CONNECT all components. TEST the system for normal operation.

B6 CHECK THE RESISTANCE OF THE TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

- Measure the resistance between pin 2 and pin 1 of transaxle vehicle harness connector C199, component side.

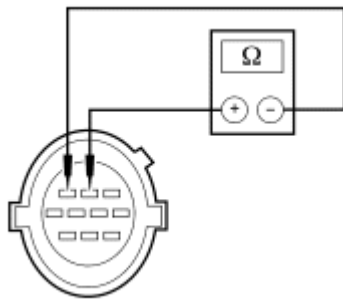


Fig. 25: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Compare the resistance with the following table.

TRANSMISSION FLUID TEMPERATURE

°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°	159°- 230°	2.7K-1.5K

111°- 130°	231°- 266°	1.5K-0.8K
131°- 150°	267°- 302°	0.8K- 0.54K

- **Is the resistance within range?**

YES : Go to B7.

NO : INSTALL a new main control assembly. REFER to Main Control Valve Body.

B7 CHECK FOR PCM COMMUNICATION

- Connect: PCM Connector C175T
- Connect: Transaxle Connector C199
- Connect the diagnostic tool.
- Monitor the TFT PID.
- **Is the TFT PID temperature displayed on the scan tool?**

YES : Go to B8.

NO : INSTALL a new PCM. REFER to ELECTRONIC ENGINE CONTROLS - 2.3L article or ELECTRONIC ENGINE CONTROLS - 3.0L (4V) article. CONNECT all components. TEST the system for normal operation.

B8 CHECK FOR AN ERRATIC OR INTERMITTENT OPEN TFT SENSOR SIGNAL

- While monitoring the TFT PID, carry out the following test: If transmission is cold, run transmission to warm it up. If transmission is warm, allow transmission to cool down.
- **Does the TFT PID temperature increase or decrease erratically as the transmission warms or cools or does the TFT voltage drop in and out of range?**

YES : INSTALL a new main control assembly. REFER to Main Control Valve Body.

NO : REFER to Diagnosis By Symptom to diagnose transaxle overheating.

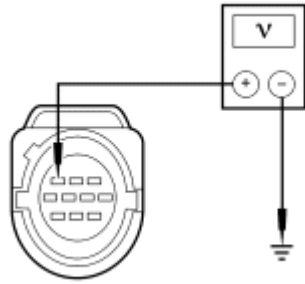
PINPOINT TEST C: TORQUE CONVERTER CLUTCH (TCC) SOLENOID

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

C1 CHECK FOR BATTERY VOLTAGE AT THE TRANSAXLE CONNECTOR

CAUTION: Do not pry on the connector. This will damage the connector and may result in a transaxle concern. Press button and pull up on the transaxle vehicle harness connector.

- Disconnect: Transaxle Connector C199
- Inspect the transaxle vehicle harness connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Key in ON position.
- Measure the voltage at transaxle connector C199-3, circuit CBB24 (VT/GN).



N0072029

Fig. 26: Measuring Voltage
Courtesy of FORD MOTOR CO.

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

YES : Go to C4.

NO : Go to C2.

C2 CHECK BATTERY CONTROL MODULE (BCM) FUSE 24 (10A)

- Check fuse: Battery Control Module (BCM) Fuse 24 (10A)

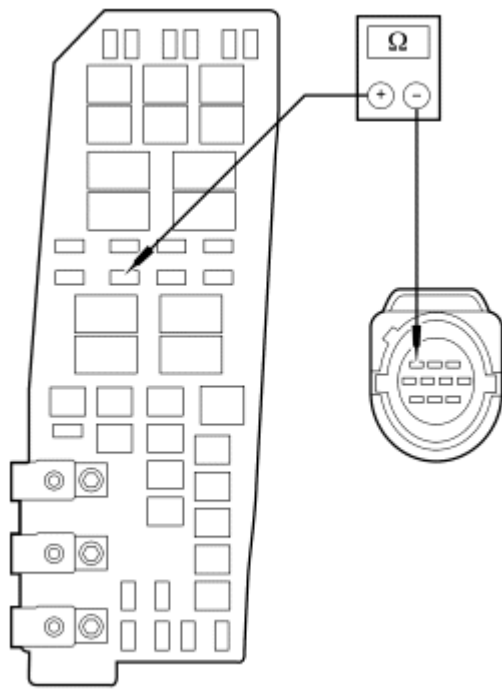
- **Is the resistance less than 5 ohms?**

YES : Go to C3.

NO : REPAIR circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) for a short to ground.
CONNECT all electrical connectors. TEST the system for normal operation.

C3 CHECK THE SOLENOID POWER SUPPLY CIRCUIT FOR AN OPEN

- Key in OFF position.
- Disconnect: BCM Fuse 24 (10A)
- Measure the resistance between the output side of BCM fuse 24 (10A) or circuit CBB28 (GY/VT) and transaxle connector C199-3, circuit CBB24 (VT/GN).



N0072027

Fig. 27: Measuring Resistance
Courtesy of FORD MOTOR CO.

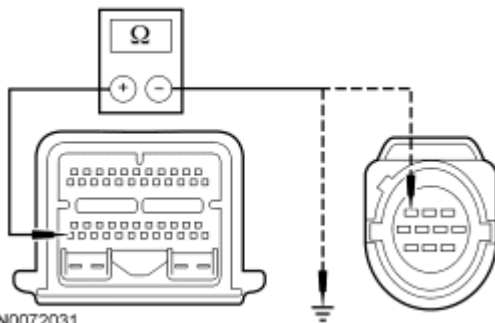
- **Is the resistance less than 5 ohms?**

YES : Circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) has an intermittent open circuit. REPEAT this test step while wiggling the wiring harness. INSPECT the vehicle wiring harness for damage and repair as necessary.

NO : REPAIR circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) for an open. CONNECT all electrical connectors. TEST the system for normal operation.

C4 CHECK SOLENOID CONTROL CIRCUIT FOR A SHORT TO POWER AND GROUND

- Disconnect: PCM Connector C175T
- Inspect the PCM connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Measure the resistance between PCM connector C175T-46, circuit CE418 (BU/OG) and ground and transaxle connector C199-3, circuit CBB24 (VT/GN).



N0072031

Fig. 28: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is each resistance greater than 10,000 ohms?

YES : Go to C5.

NO : REPAIR circuit CE418 (BU/OG) for a short. CONNECT all components. TEST the system for normal operation.

C5 CHECK THE SOLENOID CONTROL CIRCUIT FOR AN OPEN

- Measure the resistance between PCM connector C175T-46, circuit CE418 (BU/OG) and transaxle connector C199-4, circuit CE418 (BU/OG).

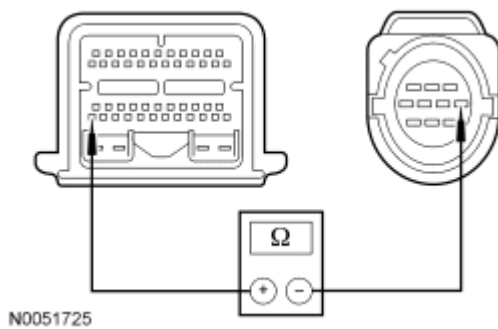


Fig. 29: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Is the resistance less than 5 ohms?

YES : Go to C6.

NO : REPAIR circuit CE418 (BU/OG) for an open. CONNECT all components. TEST the system for normal operation.

C6 CHECK THE RESISTANCE OF THE SOLENOID FIELD CIRCUIT

- Measure the resistance between transaxle connector C199 pin 3, component side and pin 4, component side.

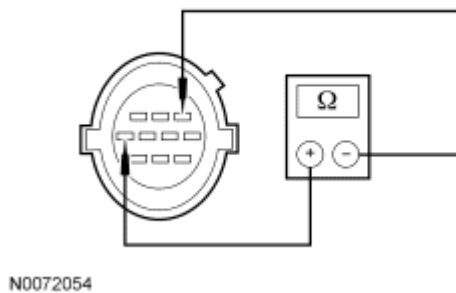


Fig. 30: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance between 12.5 and 19.0 ohms?

YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS - 2.3L** article or **ELECTRONIC ENGINE CONTROLS - 3.0L (4V)** article. RECONNECT all components. TEST the system for normal operation. If symptoms are still present, REFER to **Diagnosis By Symptom**.

NO : INSTALL a new main control assembly. REFER to **Main Control Valve Body**. CONNECT all components. TEST the system for normal operation.

PINPOINT TEST D: TRANSMISSION RANGE (TR) SENSOR**D1 VERIFY TRANSMISSION RANGE (TR) SENSOR ALIGNMENT**

- Make sure the TR sensor harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding.
- Verify selector lever linkage adjustment in the DRIVE position.
- Key in OFF position.
- Apply parking brake.
- Place the selector lever in NEUTRAL.
- Verify that the TR sensor is correctly adjusted.
- **Is the TR sensor correctly adjusted?**

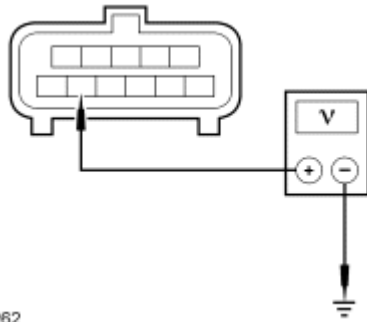
YES : Go to D2.

NO : ADJUST TR sensor. REFER to **Transmission Range (TR) Sensor**. PLACE selector lever in PARK. CLEAR the DTCs and RUN the Self Test.

D2 CHECK FOR REFERENCE VOLTAGE AT THE TR SENSOR VEHICLE HARNESS CONNECTOR

CAUTION: Do not pry on the connector. This will damage the connector and may result in a transaxle concern. Press button and pull up on the transaxle vehicle harness connector.

- Disconnect: TR Sensor C167
- Inspect the TR sensor vehicle harness connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Key in ON position.
- Measure the voltage between TR sensor harness connector C167-10, circuit CET52 (GN) and ground.



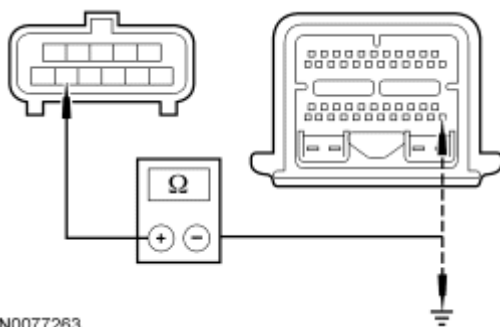
N0077262

Fig. 31: Measuring Voltage
Courtesy of FORD MOTOR CO.

- Is the voltage between 4.75 and 5.25 volts?
YES : Go to D5.
NO : Go to D3.

D3 CHECK THE TR SENSOR REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO GROUND OR POWER

- Key in OFF position.
- Disconnect: PCM Connector C175T
- Disconnect: PCM Connector C175B
- Inspect the PCM connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Key in ON position.
- Measure the resistance between TR sensor vehicle harness connector C167-10, circuit CET52 (GN) and PCM connector C175B-35, circuit CBB28 (GY/VT) and ground.



N0077263

Fig. 32: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance greater than 10,000 ohms?
YES : Go to D4.
NO : REPAIR circuit CET52 (GN) for a short. CONNECT all components. TEST the system for normal operation.

D4 CHECK THE TR SENSOR REFERENCE VOLTAGE CIRCUIT FOR AN OPEN

- Measure the resistance between PCM electrical connector C175T-27, circuit CET52 (GN) and TR sensor vehicle harness connector C167-10, circuit CET52 (GN).

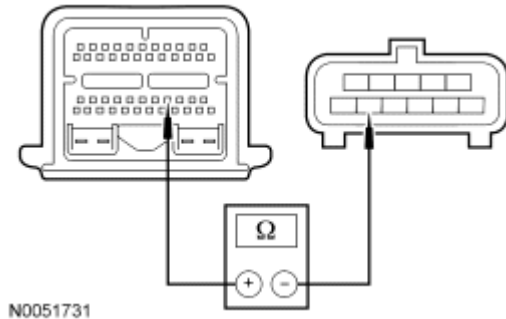


Fig. 33: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Is the resistance less than 5 ohms?

YES : Circuit CET52 (GN) may have an intermittent open or short. REPEAT test steps D3 and D4 while wiggling the wiring harness. INSPECT the vehicle wiring harness for damage and repair as necessary. If damage is not found in the wiring harness, install a new PCM.

NO : REPAIR circuit CET52 (GN) for an open. RECONNECT all components. CLEAR the DTCs. TEST the system for normal operation.

D5 CHECK THE TR SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND OR POWER

- Key in OFF position.
- Disconnect: PCM Connector C175B
- Inspect the PCM connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Disconnect: Mass Air Flow (MAF) Sensor Electrical Connector C128
- Disconnect: Fuel Tank Pressure Sensor C435
- Key in ON position.
- Measure the resistance between TR sensor vehicle harness connector C167-5, circuit RE407 (YE/VT) and PCM connector C175B-35, circuit CBB28 (GY/VT) and ground.

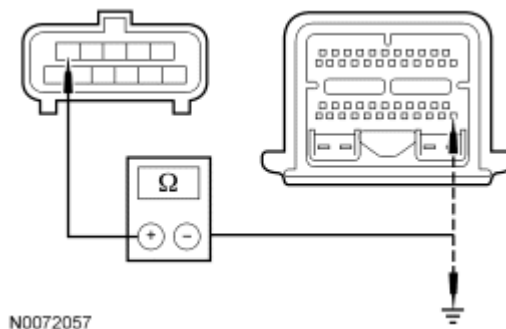


Fig. 34: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance greater than 10,000 ohms?

YES : Go to D6.

NO : REPAIR circuit RE407 (YE/VT) for a short. CONNECT all components. TEST the system for normal operation.

D6 CHECK THE TR SENSOR SIGNAL CIRCUIT FOR AN OPEN

- Measure the resistance between PCM electrical connector C175B-41, circuit RE407 (YE/VT) and TR sensor vehicle harness connector C167-5, circuit RE407 (YE/VT).

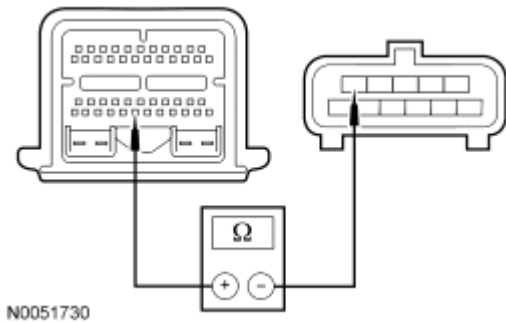


Fig. 35: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Is the resistance less than 5 ohms?

YES : Go to D7.

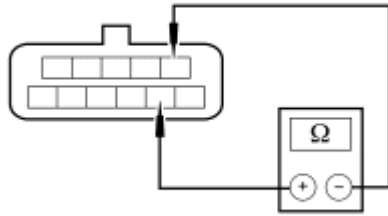
NO : REPAIR circuit RE407 (YE/VT) for an open. CONNECT all components. TEST the system for normal operation.

D7 CHECK TRANSMISSION RANGE (TR) SENSOR RESISTANCE

- Measure the resistance between C167-5 and 10, component side. Verify the sensor resistance values in all gear positions. Compare the values to the TR Sensor Resistance Table.

TR SENSOR RESISTANCE TABLE

Range Selector Position	Resistance (Ohms)
P	3,770-4,607
R	1,304-1,593
N	660-807
Overdrive (Circle D)	361-442
2	190-232
1	78-95



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Fig. 36: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Are all resistance values within specification?

YES : INSTALL a new PCM. CLEAR the DTCs, TEST the system for normal operation.

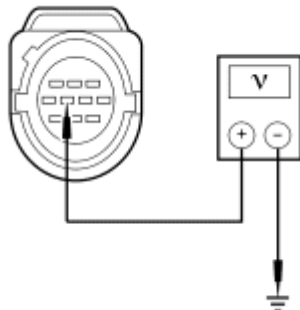
NO : INSTALL a new TR Sensor. REFER to Transmission Range (TR) Sensor. CLEAR the DTCs. TEST the system for normal operation.

PINPOINT TEST E: ELECTRONIC PRESSURE CONTROL (EPC) SOLENOID

E1 CHECK FOR BATTERY VOLTAGE AT THE TRANSAXLE CONNECTOR

CAUTION: Do not pry on the connector. This will damage the connector and may result in a transaxle concern. Press button and pull up on the transaxle vehicle harness connector.

- Disconnect: Transaxle Connector C199
- Inspect the transaxle vehicle harness connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Key in ON position.
- Measure the voltage at transaxle connector C199-6, circuit CBB24 (VT/GN).



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Fig. 37: Measuring Voltage
Courtesy of FORD MOTOR CO.

- Is the voltage greater than 10 volts?

YES : Go to E4.

NO : Go to E2.

E2 CHECK BATTERY CONTROL MODULE (BCM) FUSE 24 (10A)

- Check fuse: Battery Control Module (BCM) Fuse 24 (10A)
- **Is the resistance less than 5 ohms?**

YES : Go to E3.

NO : REPAIR circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) for a short to ground. CONNECT all electrical connectors. TEST the system for normal operation.

E3 CHECK THE SOLENOID POWER SUPPLY CIRCUIT FOR AN OPEN

- Key in OFF position.
- Disconnect: BCM Fuse 24 (10A)
- Measure the resistance between the output side of BCM fuse 24 (10A) or circuit CBB28 (GY/VT) and transaxle connector C199-6, circuit CBB24 (VT/GN).

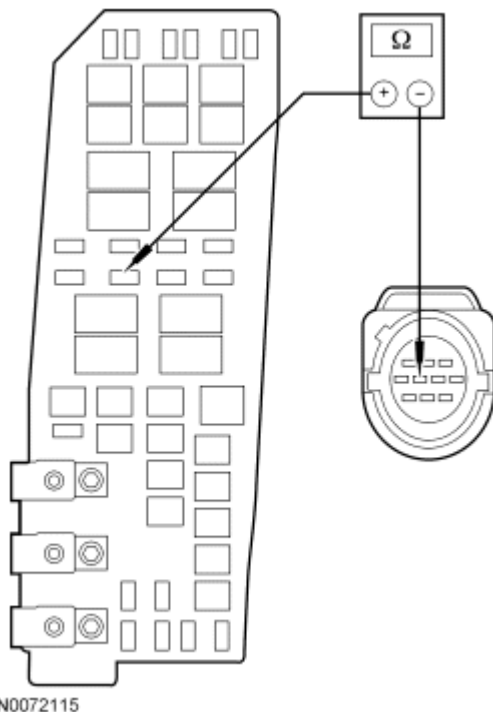


Fig. 38: Measuring Resistance
Courtesy of FORD MOTOR CO.

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

YES : Circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) has an intermittent open circuit. REPEAT this test step while wiggling the wiring harness. INSPECT the vehicle wiring harness for damage and repair as necessary.

NO : REPAIR circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) for an open. CONNECT all electrical connectors. TEST the system for normal operation.

E4 CHECK SOLENOID CONTROL CIRCUIT FOR A SHORT TO POWER AND GROUND

- Disconnect: PCM Connector C175T
- Inspect the PCM connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Measure the resistance between PCM connector C175T-11, circuit CET05 (BU/GN) and ground and transaxle connector C199-6, circuit CBB24 (VT/GN).

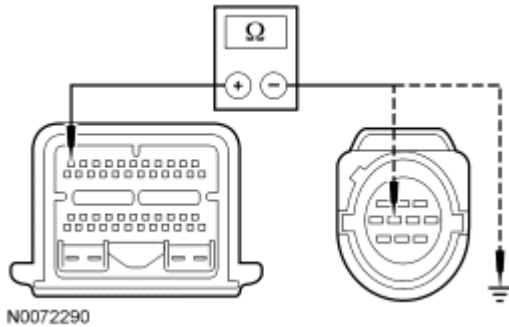


Fig. 39: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is each resistance greater than 10,000 ohms?

YES : Go to E5.

NO : REPAIR circuit CET05 (BU/GN) for a short. CONNECT all components. TEST the system for normal operation.

E5 CHECK THE SOLENOID CONTROL CIRCUIT FOR AN OPEN

- Measure the resistance between PCM connector C175T-11, circuit CET05 (BU/GN) and transaxle connector C199-10, circuit CET05 (BU/GN).

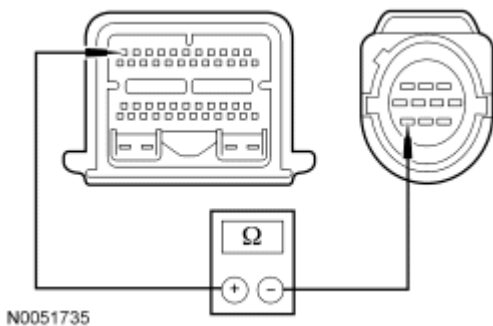


Fig. 40: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

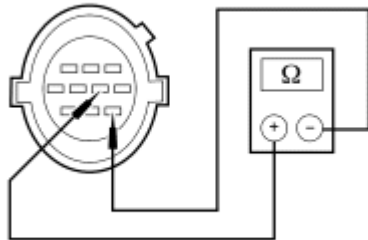
- Is the resistance less than 5 ohms?

YES : Go to E6.

NO : REPAIR circuit CET05 (BU/GN) for an open. CONNECT all components. TEST the system for normal operation.

E6 CHECK THE RESISTANCE OF THE SOLENOID FIELD CIRCUIT

- Measure the resistance between transaxle connector C199 pin 6, component side and pin 10, component side.



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Fig. 41: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance between 3.75 and 5.92 ohms?

YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS - 2.3L** article or **ELECTRONIC ENGINE CONTROLS - 3.0L (4V)** article. RECONNECT all components. TEST the system for normal operation. If symptoms are still present, REFER to **Diagnosis By Symptom**.

NO : INSTALL a new main control assembly. REFER to **Main Control Valve Body**. CONNECT all components. TEST the system for normal operation.

PINPOINT TEST F: TURBINE SHAFT SPEED (TSS) SENSOR AND OUTPUT SHAFT SPEED (OSS) SENSOR

NOTE: Refer to the output shaft speed (OSS) sensor or turbine shaft speed (TSS) sensor connector illustrations preceding these pinpoint tests.

F1 ELECTRONIC DIAGNOSTICS

- Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding.
- Connect the diagnostic tool.
- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Diagnose Data Link
- Enter the following diagnostic mode on the diagnostic tool: PCM
- Select PID/Data Monitor and Record.
- Select the following PIDs: TSS, OSS.
- **Does the vehicle enter PID/Data Monitor and Record?**
 - YES :** REMAIN in PID/DATA. Go to F2 .
 - NO :** RERUN procedure to enter PID. If vehicle did not enter PID, REFER to the **Introduction - Gasoline Engines** article.

F2 DRIVE CYCLE TEST

- While monitoring the appropriate sensor PID, drive the vehicle so that the transaxle upshifts and downshifts through all the gears.
- **Does the TSS or OSS Speed PID increase and decrease with engine and vehicle speed or is the sensor signal erratic (drop to zero or near zero and return to normal operation)?**

YES : If the TSS or OSS Speed PID increase and decrease with engine and vehicle speed, CLEAR all DTCs. ROAD TEST to VERIFY if concern is still present. If concern is still present, REFER to **Diagnosis By Symptom** .

If the sensor signal is erratic, INSPECT for intermittent concern in the external harness, sensor, PCM or connector.

NO : If the TSS or OSS Speed PID does not increase and decrease with engine and vehicle speed, the sensor signal is steady. INSPECT for open or short in vehicle harness, sensor, a PCM concern or internal hardware concern. Go to [F3](#) .

F3 CHECK CONTINUITY OF TSS OR OSS HARNESS CIRCUITS

CAUTION: Do not pry on the connector. This will damage the connector and may result in a transaxle concern. Press button and pull up on the transaxle vehicle harness connector.

- Key in OFF position.
- Disconnect: Turbine Shaft Speed (TSS) Sensor Electrical Connector C143 or Output Shaft Speed (OSS) Sensor Electrical Connector C193
- Disconnect: PCM Connector C175T
- Disconnect: PCM Connector C175B
- Inspect for damaged or pushed-out pins, corrosion or loose wires.
- Measure the resistance between PCM connector C175T-15, circuit VET33 (WH/OG) and TSS sensor connector C143-2, circuit VET33 (WH/OG).

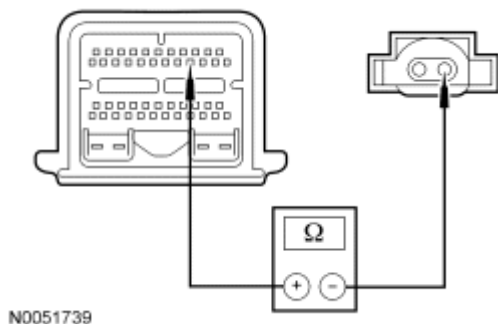


Fig. 42: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between PCM connector C175B-50, circuit RET33 (WH/VT) and TSS sensor connector C143-1, circuit RET33 (WH/VT).

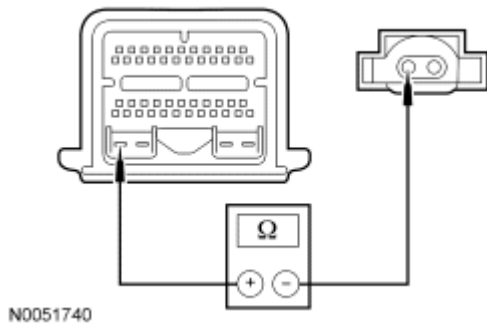


Fig. 43: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between PCM connector C175T-4, circuit VET26 (BN/GN) and OSS sensor connector C193-2, circuit VET26 (BN/GN).

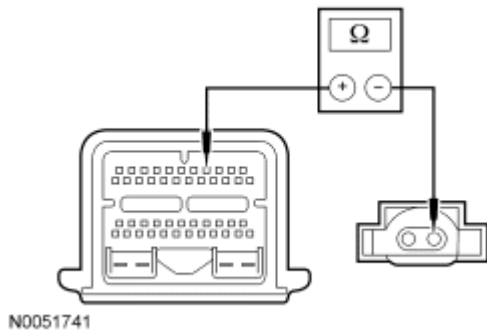


Fig. 44: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between PCM connector C175B-50, circuit RET33 (WH/VT) and OSS sensor connector C193-1, circuit RET33 (WH/VT).

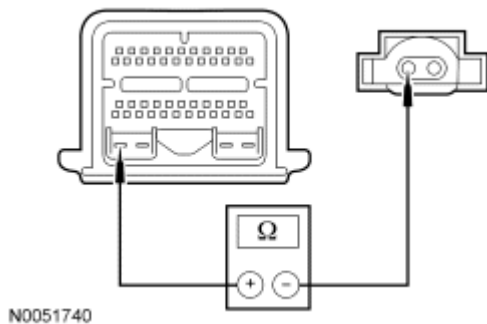


Fig. 45: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Is each resistance less than 5 ohms?
YES : Go to F4.

NO : REPAIR the open circuit(s). RECONNECT all components. CLEAR the DTCs. RERUN On-Board Diagnostics.

F4 CHECK TSS CIRCUITS OR OSS CIRCUITS FOR SHORT TO POWER AND GROUND

- Key in OFF position.
- Measure the resistance between the PCM connector C175T-15, circuit VET33 (WH/OG) and the PCM connector C175B pins 35, circuit CBB28 (GY/VT) and 36, circuit CBB28 (GY/VT).

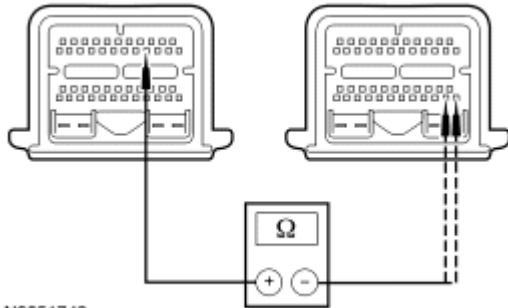


Fig. 46: Checking Circuits For Short Together
Courtesy of FORD MOTOR CO.

- Measure the resistance between the PCM connector C175T-4, circuit VET26 (BN/GN) and the PCM connector C175B pins 35, circuit CBB28 (GY/VT) and 36, circuit CBB28 (GY/VT).

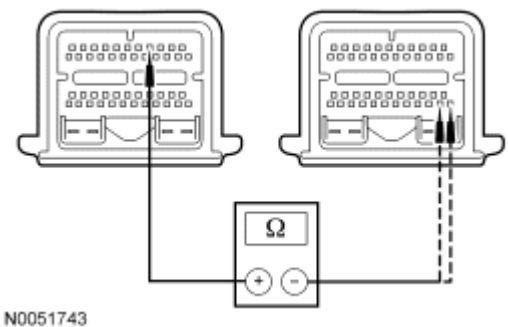


Fig. 47: Checking Circuits For Short Together
Courtesy of FORD MOTOR CO.

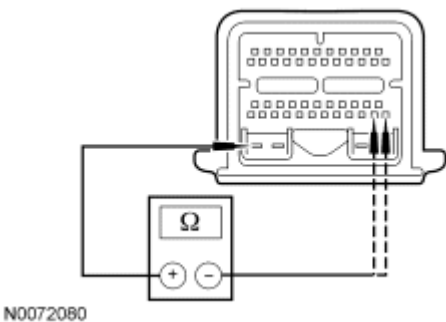


Fig. 48: Checking Circuits For Short Together

Courtesy of FORD MOTOR CO.

- For the TSS and OSS (-), measure the resistance between PCM connector C175B-50, circuit RET33 (WH/VT) and pins 35, circuit CBB28 (GY/VT) and 36, circuit CBB28 (GY/VT).
- Measure the resistance between the PCM connector C175T-15, circuit VET33 (WH/OG) and the PCM connector C175B pins 47, circuit GD122 (BK), 48, circuit GD122 (BK), 49, circuit GD122 (BK) and 50, circuit RET33 (WH/VT).

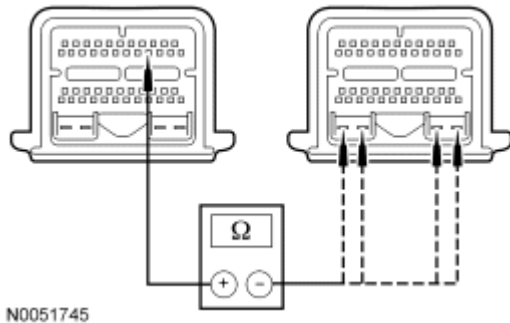


Fig. 49: Checking Circuits For Short Together
Courtesy of FORD MOTOR CO.

- Measure the resistance between the PCM connector C175T-4 and the PCM connector C175B pins 47, circuit GD122 (BK), 48, circuit GD122 (BK), 49, circuit GD122 (BK) and 50, circuit RET33 (WH/VT).

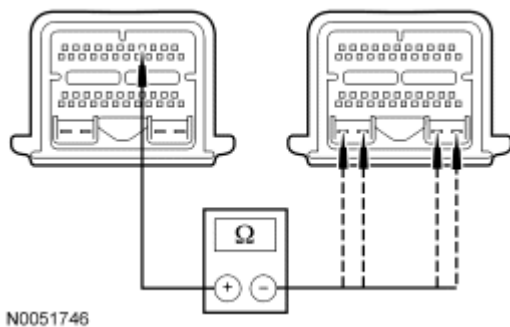


Fig. 50: Checking Circuits For Short Together
Courtesy of FORD MOTOR CO.

- Measure the resistance between the PCM connector C175B-50, circuit RET33 (WH/VT) and PCM connector C175B pins 47, circuit GD122 (BK), 48, circuit GD122 (BK) and 49, circuit GD122 (BK).

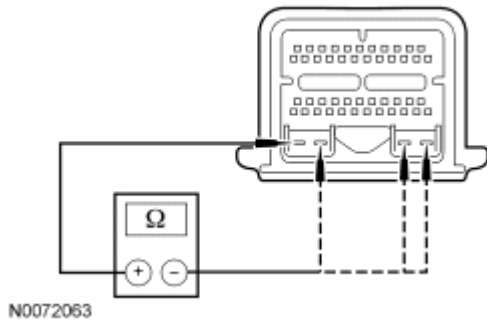


Fig. 51: Checking Circuits For Short Together
Courtesy of FORD MOTOR CO.

- Is each resistance greater than 10,000 ohms?

YES : Go to F5.

NO : REPAIR the shorted circuit(s). RECONNECT all components. ERASE DTCs and RERUN On-Board Diagnostics.

F5 CHECK RESISTANCE OF TSS OR OSS SENSOR

- Measure the resistance between TSS sensor or OSS sensor pins 1 and 2.

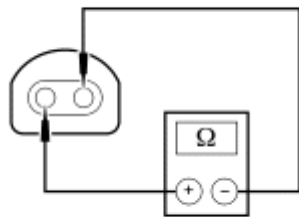


Fig. 52: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Record the resistance.

Sensor	Resistance (Ohms)
TSS	625-1,150
OSS	503-1,010

- Is resistance within specification for the appropriate sensor?

YES : Go to F6.

NO : INSTALL a new TSS/OSS sensor. REFER to Turbine Shaft Speed (TSS) Sensor or Output Shaft Speed (OSS) Sensor. TEST the system for normal operation.

F6 CHECK SENSOR FOR SHORT TO GROUND

- Measure the resistance between ground and TSS sensor or OSS sensor pins 1 and 2.

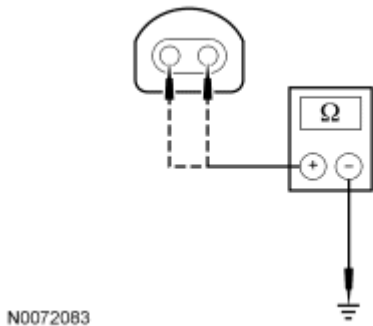


Fig. 53: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance greater than 10,000 ohms?

YES : For TSS, go to F7 .

For OSS, go to F9 .

NO : INSTALL a new TSS or OSS sensor. REFER to **Turbine Shaft Speed (TSS) Sensor** or **Output Shaft Speed (OSS) Sensor**. Go to F5 .

F7 CHECK TSS MAGNETISM

- Remove the TSS sensor from transaxle.
- Place the TSS sensor against a metal surface to which it should stick. The TSS sensor should be magnetized and stick to the metal surface.
- **Does TSS sensor stick?**

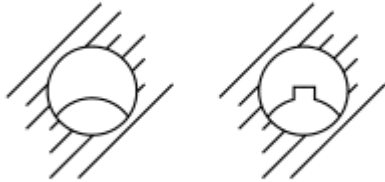
YES : Go to F8.

NO : INSTALL a new TSS sensor. REFER to **Turbine Shaft Speed (TSS) Sensor**.

F8 CHECK EXCITER WHEEL

NOTE: **Make sure a tooth is visible. The exciter wheel will always be visible through the TSS sensor hole.**

- Remove the TSS sensor.
- With a remote starter switch, start and stop engine until a tooth of the exciter wheel is visible through the TSS sensor hole.



GD1882-A

Fig. 54: Checking Exciter Wheel
Courtesy of FORD MOTOR CO.

- **Are all 4 teeth present?**

YES : INSTALL a new TSS sensor. REFER to **Turbine Shaft Speed (TSS) Sensor**. TEST the system for normal operation.

NO : REPAIR or INSTALL a new exciter wheel as necessary. TEST the system for normal operation.

F9 CHECK OSS MAGNETISM

- Remove OSS sensor from transaxle.
- Place the OSS sensor against a metal surface to which it should stick. The OSS sensor should be magnetized and stick to the metal surface.
- **Does the OSS sensor stick?**

YES : The concern is not in the OSS sensor system. REFER to **Diagnosis By Symptom** shift concerns for further diagnosis.

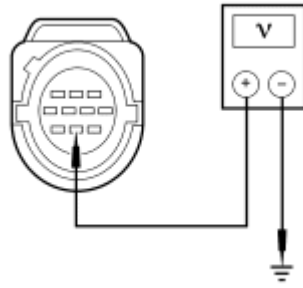
NO : INSTALL a new OSS sensor. REFER to **Output Shaft Speed (OSS) Sensor**.

PINPOINT TEST G: TIMING/COAST CLUTCH SOLENOID (3-2T/CCS)

G1 CHECK FOR BATTERY VOLTAGE AT THE TRANSAXLE CONNECTOR

CAUTION: Do not pry on the connector. This will damage the connector and may result in a transaxle concern. Press button and pull up on the transaxle vehicle harness connector.

- Disconnect: Transaxle Connector C199
- Inspect the transaxle vehicle harness connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Key in ON position.
- Measure the voltage at transaxle connector C199-9, circuit CBB24 (VT/GN).



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Fig. 55: Measuring Voltage
Courtesy of FORD MOTOR CO.

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

YES : Go to G4.

NO : Go to G2.

G2 CHECK BATTERY CONTROL MODULE (BCM) FUSE 24 (10A)

- Check fuse: Battery Control Module (BCM) Fuse 24 (10A)

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

YES : Go to G3.

NO : REPAIR circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) for a short to ground.
CONNECT all electrical connectors. TEST the system for normal operation.

G3 CHECK THE SOLENOID POWER SUPPLY CIRCUIT FOR AN OPEN

- Key in OFF position.
- Disconnect: BCM Fuse 24 (10A)
- Measure the resistance between the output side of BCM fuse 24 (10A) or circuit CBB28 (GY/VT) and transaxle connector C199-9, circuit CBB24 (VT/GN).

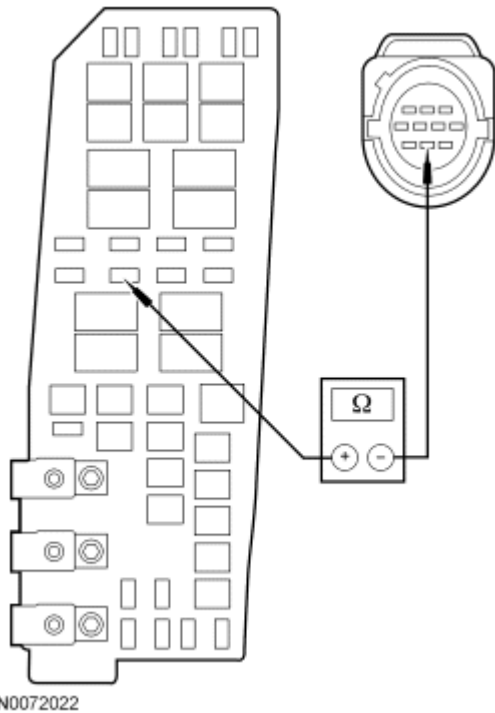


Fig. 56: Measuring Resistance
Courtesy of FORD MOTOR CO.

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

YES : Circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) has an intermittent open. REPEAT this test step while wiggling the wiring harness. INSPECT the vehicle wiring harness for damage and repair as necessary.

NO : REPAIR circuit CBB24 (VT/GN) or circuit CBB28 (GY/VT) for an open. CONNECT all electrical connectors. TEST the system for normal operation.

G4 CHECK SOLENOID CONTROL CIRCUIT FOR A SHORT TO POWER AND GROUND

- Disconnect: PCM Connector C175T
- Inspect the PCM connector for damage. Make sure the pins are fully engaged and in good condition before proceeding.
- Measure the resistance between PCM connector C175T-23, circuit CET44 (BU/BN) and ground and transaxle connector C199-9, circuit CBB24 (VT/GN).

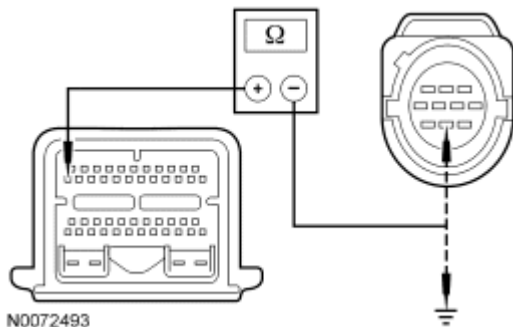


Fig. 57: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is each resistance greater than 10,000 ohms?

YES : Go to G5.

NO : REPAIR circuit CET44 (BU/BN) for a short. CONNECT all components. TEST the system for normal operation.

G5 CHECK THE SOLENOID CONTROL CIRCUIT FOR AN OPEN

- Measure the resistance between PCM connector C175T-23, circuit CET44 (BU/BN) and transaxle connector C199-8, circuit CET44 (BU/BN).

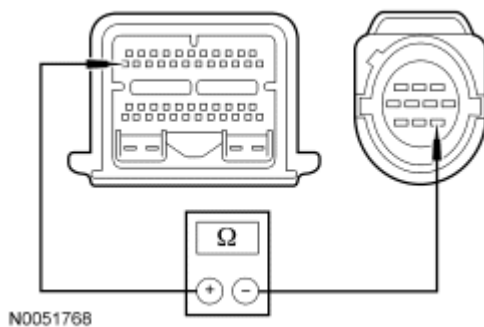


Fig. 58: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Is the resistance less than 5 ohms?

YES : Go to G6.

NO : REPAIR circuit CET44 (BU/BN) for an open. CONNECT all components. TEST the system for normal operation.

G6 CHECK THE RESISTANCE OF THE SOLENOID FIELD CIRCUIT

- Measure the resistance between transaxle connector C199 pin 9, component side and pin 8, component side.

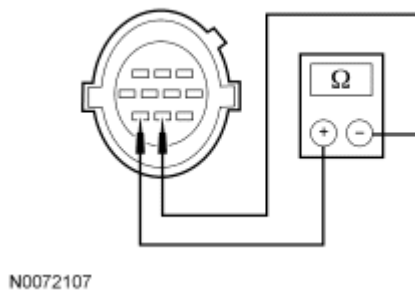


Fig. 59: Measuring Resistance
Courtesy of FORD MOTOR CO.

- Is the resistance between 3.75 and 5.92 ohms?

YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS - 2.3L** article or **ELECTRONIC ENGINE CONTROLS - 3.0L (4V)** article. RECONNECT all components. TEST the system for normal operation. If symptoms are still present, REFER to **Diagnosis By Symptom**.

NO : INSTALL a new main control assembly. REFER to **Main Control Valve Body**. CONNECT all components. TEST the system for normal operation.

PINPOINT TEST H: SOLENOID MECHANICAL FAILURE

NOTE: **Repair all other DTCs before repairing the following DTCs: P1714, P1715.**

H1 ELECTRONICS DIAGNOSIS

- Disconnect the diagnostic tool.
- Select PARK.
- Key in ON position.
- Carry out KOEO Test until continuous DTCs have been displayed.
- If P1714, P1715 DTCs are present, continue with this test.
- **Are other DTCs present for 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 Self Test.

NO : INSTALL a new solenoid and/or body. REFER to **Main Control Valve Body**. Go to H2 .

H2 TRANSAXLE DRIVE CYCLE TEST

- Carry out Transaxle Drive Test. Refer to **Transaxle Drive Cycle Test**.
- **Does the vehicle upshift and downshift OK?**

YES : Go to H3.

NO : REFER to **Diagnosis By Symptom** in this article to diagnose shift concerns.

H3 RETRIEVE DTCs

- Connect the diagnostic tool.
- Select PARK.
- Key in ON position.
- Carry out KOEO Test until continuous DTCs have been displayed.
- **Are DTCs P1714, P1715 still present?**

YES : INSTALL a new PCM. ROAD TEST and RERUN Quick Test.

NO : Testing completed. If a concern still exists, REFER to **Diagnosis By Symptom**.

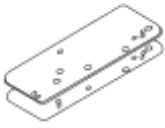
SPECIAL TESTING PROCEDURES

Special Tools

Illustration	Tool Name	Tool Number

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 ST1801-A	Air Test Plate, Transmission	307-301 (T94P-77000-S)
 ST1940-A	Test Plate Screw Set, Transmission	307-126 (T82P-7006-C)

The special tests are designed to aid the technician in diagnosing the hydraulic and mechanical portion of the transaxle.

Engine Idle Speed Check

Refer to the **Introduction - Gasoline Engines** article for the engine idle speed adjustment procedure.

Line Pressure Test

CAUTION: Carry out Line Pressure Test before carrying out Stall Speed Test. If line pressure is low at stall, do not carry out stall test or further transaxle damage may occur. Do not maintain wide open throttle (WOT) in any gear range for more than 5 seconds.

CAUTION: The transaxle vehicle harness must be connected to verify these pressures.

The Line Pressure Test verifies that the line pressure is within specifications.

1. Remove the line pressure port plug.
2. Connect pressure gauge to line pressure tap.

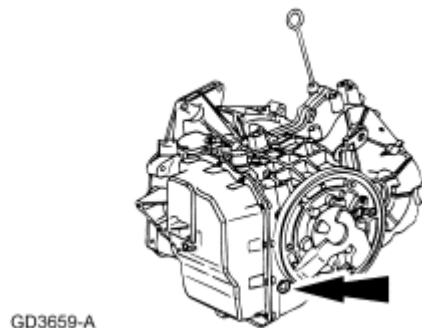


Fig. 60: Line Pressure Tap
Courtesy of FORD MOTOR CO.

3. Start engine and check line pressures. Refer to following the Line Pressure Chart to determine if line pressure is within specifications.
4. If line pressure is not within specifications, carry out on-board diagnostics and pinpoint test, air pressure check and repair main control system or pump as required.
5. After completing the line pressure test install the line pressure port plug.
 - Tighten to 14 Nm (10 lb-ft).

LINE PRESSURE CHART (2.3L AND 3.0L)

Gear	Line Pressure at Idle		Line Pressure at Stall	
	kPa	psi	kPa	psi
P/N	441-524	64-76	-	-
R	441-524	64-76	1786-2027	259-294
D	324-372	47-54	1158-1269	168-184
2	324-372	47-54	1158-1269	168-184
1	324-372	47-54	1158-1269	168-184

Line Pressure Diagnosis

If the line pressure is low at idle in all ranges check the following items:

- Low fluid level
- Restricted inlet filter
- Loose main body
- Solenoid body or accumulator body to case bolts
- Excessive leakage in pump
- Case
- Control bodies
- Sticking main regulator valve or damaged inlet tube seal on inlet filter
- Damaged gaskets or separator plate

If the line pressure is high at idle in all ranges then check the following items:

- Main regular valve
- Solenoid body and wiring harness
- Run Quick Test referred to in electrical diagnosis in this article

Stall Speed Test

The Stall Speed Test checks the operation of the following items:

- Torque converter one-way clutch
- Forward clutch

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- Low/reverse one-way clutch
- Reverse clutch
- Forward one-way clutch
- Engine driveability concerns

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.

CAUTION: Carry out Line Pressure Test before carrying out the stall test. If line pressure is low at stall, do not carry out stall test or further transaxle damage may occur.

NOTE: The stall test should only be carried out with the engine and transaxle at normal operating temperatures.

1. Connect a tachometer to the engine.

CAUTION: Do not maintain wide open throttle (WOT) in any gear range for more than 5 seconds.

CAUTION: If engine RPM recorded by the tachometer exceeds maximum specified RPM, release accelerator pedal immediately. Clutch or band slippage is indicated.

2. Press accelerator pedal to floor (WOT) in each range. Record RPM reached in each range. Stall speeds should be in appropriate range.

STALL SPEED CHART

Engine	RPM
3.0L	2,656-3,095
2.3L	2,284-2,682

After testing DRIVE (D) and REVERSE (R), move transaxle range selector lever to NEUTRAL (N) and run engine for about 15 seconds to allow torque converter to cool before testing next range.

If the stall speeds were too high, refer to the following Stall Speed Diagnosis Chart. If the stall speeds were too low, first check engine tune-up. If engine is OK, remove torque converter and check torque converter one-way clutch for slippage.

STALL SPEED DIAGNOSIS CHART

Range	Possible Source

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D, 2, 1	Forward Clutch
	Forward One-Way Clutch
	Low One-Way Clutch
R	Reverse Clutch
	Low/Reverse Clutch

Air Pressure Tests

A no-drive condition can exist even with correct transmission fluid pressure because of inoperative clutches or bands. Refer to the Band and Clutch Application Charts A and B to determine the appropriate elements. A clutch concern can be located by substituting air pressure for oil pressure to determine the location of the malfunction.

For example, when the transaxle range selector lever is in a forward gear range (Overdrive (Circle D), 2, 1), a no-drive condition can be caused by an inoperative forward clutch.

Test Procedures

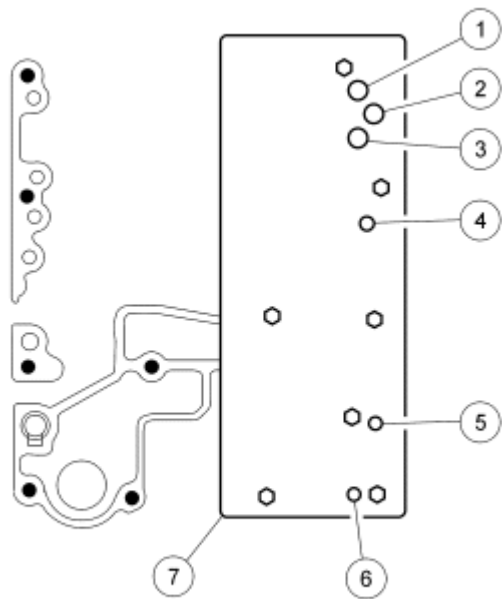
Carry out the following procedures:

1. Drain the transaxle. Remove main control cover.
2. Remove the main control as an assembly with the solenoid body assembly.
3. The inoperative clutches can be located by applying air pressure into the appropriate clutch port. Refer to Air Pressure Test Port Locations diagram.
4. Install the transmission test plate using 6 bolts.
 - Tighten to 12 Nm (9 lb-ft).

CAUTION: The coast clutch circuit should not be applied unless air pressure is maintained in the forward clutch circuit. Failure to do so can result in the coast clutch piston coming out of the forward clutch piston.

NOTE: Refer to the Band and Clutch Application Charts A and B.

5. Apply air pressure 275 kPa (40 psi) to the appropriate clutch port (refer to Air Pressure Test Port Locations diagram). A dull thud may be heard, or movement felt when the clutch piston is applied. If clutch seals or check balls are leaking, a hissing may be heard.



N0024421

Fig. 61: Air Pressure Test Port Locations
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Test port - reverse clutch
2	-	Test port - forward clutch
3	-	Test port - direct clutch
4	-	Test port - low/reverse clutch
5	-	Test port - servo release
6	-	Test port - servo apply
7	307-301	Test plate - transmission

Air Pressure Test Results

If the servos do not operate, disassemble, clean and inspect them to locate the source of the concern.

If air pressure applied to the clutch passages fails to operate a clutch or operates clutches simultaneously, inspect the fluid passages in the case.

If air pressure applied to the accumulator fails to operate an accumulator, remove and inspect case passages and piston.

LEAKAGE INSPECTION

Special Tools

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Illustration	Tool Name	Tool Number
 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

Leakage at the main control cover gasket often can be stopped by tightening the main control cover bolts to 16 N.m (12 lb-ft). If necessary, install a new main control cover gasket.

Check the fluid filler tube connection at the transaxle case. If leakage is found, install a new fluid filler tube grommet.

Check the cooler lines and fittings between the transaxle and the cooler in the radiator for looseness, wear or damage. If leakage cannot be stopped by tightening a tube nut, install new parts. When fluid is found leaking between the case and the fluid tube connector, check for a missing or damaged O-ring, then tighten the fitting to maximum specification. Do not try to stop the fluid leak by increasing the torque beyond specification. This can cause damage to the case threads. If the leak continues, install a new fluid tube connector and tighten to specification. The same procedure should be followed for fluid leaks between the radiator and the fluid tube connector.

Check the engine coolant in the radiator. If transmission fluid is present in the coolant, the cooler in the radiator is probably leaking.

The cooler can be further checked for leaks by disconnecting the fluid cooler tubes for the fluid tube connectors and applying no more than 345 kPa (50 psi) air pressure to the fluid tube connectors. Remove the radiator cap to relieve the pressure buildup at the exterior of the fluid cooler tank. If the cooler is leaking or will not hold pressure, install a new cooler.

If leakage is found at the manual control lever, install a new manual control lever seal.

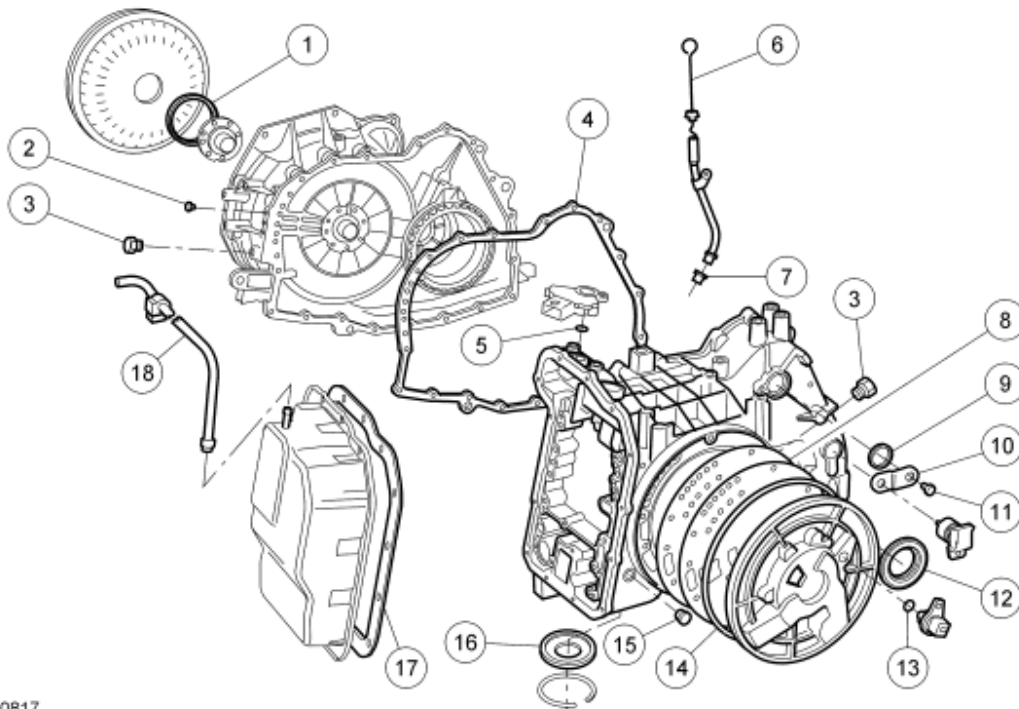
Check for fluid leaking from the differential seal. Leakage can result from a damaged seal, missing garter spring or worn front wheel driveshaft and joint. Install a new seal assembly or front wheel driveshaft and joint as necessary.

Check for fluid leaks in the pump to case interface. A leak may be due to a rolled pump lip seal or a damaged seal. Repair the pump assembly.

External Sealing

This transaxle has the following parts to prevent external fluid leakages:

- Gaskets
- Lip type seals
- O-rings
- Seal rings



N0030B17

Fig. 62: External Sealing
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7F401	Seal assembly - converter impeller hub
2	7A137	Pipe plug - 1/8-27 dry seal case (pressure taps - 4 required)
3	7D273	Connector assembly - 3/8-18 cooler line fitting (2 required)
4	7B353	Gasket - transaxle split flange
5	7F337	Seal assembly - manual control
6	7A020	Indicator assembly - fluid level
7	7N243	Grommet - fluid filler tube
8	7G331	Gasket - pump body separator
9	7B498	Seal - manual control lever

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10	-	Lever assembly - manual control
11	N605903-S36	Bolt - M8 - 1.25 x 17 hex flange head (attaches manual control lever)
12	1177	Seal assembly - differential (2 required)
13	7Z101	O-ring - transmission speed sensor
14	7A248	Seal - pump O-ring
15	7N279	Plug - 1/4-18 dry seal tapered thread (line pressure)
16	7D027	Cover assembly - intermediate overdrive servo
17	7F396	Gasket - main control cover
18	7A246	Vent assembly - main control cover

Fluid Leakage in Torque Converter Area

Use the following procedures to locate the exact source of leakage in the torque converter area. Leakage at the front of transaxle, as evidenced by fluid around the converter housing, may have several sources. By careful observation, it is possible in many instances to pinpoint the source of the leak before removing the transaxle from the vehicle. The paths which the fluid can take to reach the bottom of the converter housing are as follows:

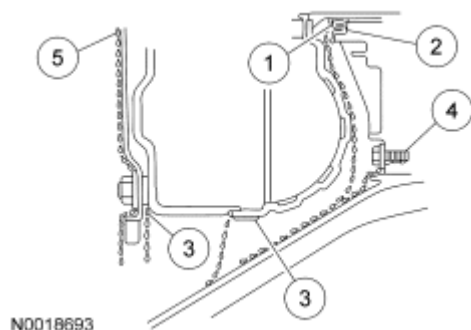


Fig. 63: Identifying Torque Converter Fluid Leakage Area
Courtesy of FORD MOTOR CO.

1. Fluid leaking by the converter impeller hub seal lip will tend to move along the drive hub and onto the back of the impeller housing. Except in the case of a total seal failure, fluid leakage by the lip of the seal will be deposited on the inside of the converter housing only, near the outside diameter of the housing.
2. Fluid leakage by the outside diameter of the converter impeller hub seal and the case will follow the same path as leaks by the inside diameter of the seal.
3. Fluid leakage from the converter-to-flexplate stud weld will appear at the outside diameter of the torque converter, on the back face of flexplate and in the converter housing only near the flexplate. If a converter-to-flexplate stud leak is suspected, remove converter and pressure check.
4. Engine oil leaks are sometimes incorrectly diagnosed as transaxle pump seal leaks. The following areas of possible leakage should be checked to determine if engine oil leakage is causing the concern.
5. Leakage at the valve cover may allow oil to flow over the converter housing or seep down between the converter housing and cylinder block causing oil to be present in or at the bottom of the converter

housing.

- Oil plug leaks will allow oil to flow down the rear face of the cylinder block to the converter housing.
- Leakage at the crankshaft seal will work back to the flexplate and then into the converter housing.

Leak Check Test

The following procedures should be used to determine the cause of the leakage before repair is made.

1. Remove the fluid level indicator and note the color of the fluid. Original factory fill fluid is dyed red to aid in determining if leakage is from the engine or transaxle. Unless a considerable amount of makeup fluid has been added or the fluid has been changed, the red color should assist in pinpointing the leak.
2. Remove the dust cover. Clean off any fluid from the top and bottom of the converter housing, front of the case and rear face of the engine and oil pan. Clean the torque converter area by washing with a suitable nonflammable solvent and blow dry with compressed air.
3. Wash out the converter housing and the front of the flexplate. The converter housing can be washed out using cleaning solvent and a squirt-type oil can. Blow dry all washed areas with compressed air.
4. Start and run the engine until the transaxle reaches normal operating temperature. Observe the back of the block and top of the converter housing for evidence of fluid leakage. Raise the vehicle on a hoist. Run the engine at fast idle, then at engine idle, occasionally shifting to the DRIVE and REVERSE ranges to increase pressure within the transaxle. Observe the front of the flexplate, back of the block (in as far as possible) and inside the converter housing and front of the case. Run the engine until fluid leakage is evident and the source of leakage can be determined.

Leak Check Test With A Black Light

Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye (164-R3701) is used to detect a transmission fluid leak.

1. Add Automatic Transmission/Power Steering Dye to the transmission fluid. Use one 30 mL (1 oz) of dye solution for every 3.8L (4 qt) of transmission fluid.
2. Start and run the engine until the transaxle reaches its normal operating temperature. Observe the back of the cylinder block and top of the torque converter housing for evidence of fluid leakage. Raise the vehicle on a hoist and run the engine at fast idle, then at engine idle, occasionally shifting to the DRIVE and REVERSE ranges to increase pressure within the transaxle. Observe the front of the flexplate, back of the cylinder block (in as far as possible) and inside the torque converter housing and front of the case. Continue running the engine until fluid leakage is evident and the probable source of leakage can be determined.

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

CAUTION: Whenever a transaxle has been disassembled to install new parts or because the valve body sticks from foreign material, the torque converter and transmission fluid cooler must be cleaned by using a suitable cleaner. Under no circumstances should an attempt be made to clean converters by hand agitation with solvent.

When internal wear or damage has occurred in the transaxle, metal particles, clutch plate material or band material can be carried into the torque converter and transmission fluid cooler. These contaminants are a major cause of recurring transaxle concerns and must be removed from the system before the transaxle is returned for repair.

Transmission Fluid Cooler Flow Test

NOTE: The transaxle selector lever linkage adjustment, fluid level and line pressure must be within specification before carrying out this test. Refer to **AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E** article for transaxle selector lever linkage adjustment procedure. For transmission fluid level checking procedures, refer to **Preliminary Inspection**. For transaxle line pressure testing, refer to **Special Testing Procedures**.

1. Check the transmission fluid level and fill as necessary.
2. Remove the transmission fluid level indicator from fluid filler tube and install a funnel in the fluid filler tube.
3. With the vehicle in NEUTRAL, position it on a hoist. Refer to **JACKING AND LIFTING** article. Inspect the transmission fluid cooler lines for damage. Install new transmission fluid cooler lines as needed.
4. Disconnect cooler return line (rear line) by separating the tubing from the cooler line rubber hose.
5. Plug the cooler line to avoid transmission fluid loss.
6. Connect one end of a hose to the cooler return line hose and route the other end of the hose up to a point where it can be inserted into the funnel at the fluid filler tube.
7. Start the engine and run at idle with transaxle in NEUTRAL range until the automatic transmission fluid is warm. Temperature is important to the flow rate measurement.
 - Option 1: Once fluid flow no longer has air bubbles in it, remove the rubber hose from the funnel and insert it into liter container. After 15 seconds, install the hose into the funnel and measure the amount of automatic transmission fluid in the container. The rate of flow should be approximately 0.83-1.0L (28-34 oz) in 15 seconds.
 - Option 2: Once fluid flow no longer has air bubbles in it, remove the rubber hose from the funnel and insert it into a liter container. As soon as 1L (1.06 qt) is dispensed into the container, install the hose into the funnel. One liter of automatic transmission fluid should flow through the cooling system in approximately 15-17 seconds.
8. Once adequate flow is determined, shut off the engine, remove the extension hose and reassemble the cooler line with the constant tension clamp.
9. If flow is not adequate, stop the engine. Disconnect the hose from the cooler return line and connect it to the converter-out line. If flow is now liberal, carry out backflushing and cleaning procedure. Refer to **Transmission Fluid Cooler Backflushing and Cleaning**. If flow is still not liberal, repair the pump or

converter.

10. Check the transmission fluid level and adjust as required.

Transmission Fluid Cooler Tube Replacement

When fluid leakage is found at the transmission fluid cooler tubes or installation of new cooler tubes is necessary, refer to **TRANSAXLE/TRANSMISSION COOLING - CD4E** article.

DIAGNOSIS BY SYMPTOM

Special Tools

Illustration	Tool Name	Tool Number
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) with appropriate hardware or equivalent scan tool	

The Diagnosis by Symptom charts give the technician diagnostic information, direction and possible components of concern, using a symptom as a starting point.

The Diagnosis by Symptom charts are divided into 2 categories: electrical routines, indicated by 200 series numbers, and hydraulic/mechanical routines, indicated by 300 series numbers. The electrical routines list the possible electrical components that could cause or contribute to the symptom described. The hydraulic/mechanical routines list the possible hydraulic or mechanical components that could cause or contribute to the symptom described.

Diagnosis by Symptom Chart Directions

NOTE: The PCM has an adaptive learn strategy to electronically control the transaxle. The adaptive learn strategy will automatically adjust the shift feel to the driver demands. The first few hundred miles of operation the transaxle may have abrupt shifts, this is a normal operation and will correct itself. If the battery has been disconnected for longer than 20 minutes the shift tables will reset and need to be relearned. Upshifting is controlled by the PCM. The PCM receives inputs from various engine and vehicle sensors along with driver demands to control shift scheduling, shift feel and torque converter clutch operation.

1. Use the index and select the symptom/concern that best describes the condition.
2. Turn to the routine indicated in the index.
3. Always begin diagnosis of a symptom by using the following:
 - Preliminary inspections
 - Verification of condition
 - Fluid level check
 - Other test procedures as directed

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4. Begin with the electrical routine if indicated. Follow the reference or action required statements. Always carry out the On-Board Diagnostic Tests as required. Never skip steps. Repair as required. If the concern is still present after electrical diagnosis, proceed to the hydraulic/mechanical routine listed.

NOTE: Not all concerns and conditions with electrical components will set a DTC. Be aware that components listed can still be the cause. Verify correct function of those components prior to proceeding to the hydraulic/mechanical routine listed.

5. The hydraulic/mechanical routines list possible hydraulic or mechanical components that could cause the concern. These components are listed in the removal sequence and by "most likely." All components listed must be inspected to verify correct servicing is carried out.

DIAGNOSIS BY SYMPTOM INDEX

Title	Routines	
	Electrical ^a	Hydraulic/Mechanical
Engagement Concerns		
No Forward Only	201	301
No Reverse Only	202	302
Harsh Reverse or Forward	203	303
Delayed/Soft Reverse or Forward	205	305
No Forward and No Reverse	207	307
Shift Concerns		
Some or All Shifts Missing	210	310
Shift Timing - Early/Late	211	311
Timing - Erratic/Hunting	212	312
Feel - Soft/Slipping	213	313
Feel - Harsh	214	314
No 1st Gear, Engages in Higher Gear ("D" Position)	215	315
No Manual 1st Gear (First in "D", OK)	216	316
No 1-2 Shift (Automatic)	220	320
No 2-3 Shift (Automatic)	221	321
No 3-4 Shift (Automatic)	222	322
Soft/Slip 1-2 Shift Only (Automatic)	226	326
Soft/Slip 2-3 Shift Only (Automatic)	227	327
Soft/Slip 3-4 Shift Only (Automatic)	228	328
Soft/Slip 4-3 Shift Only (Automatic)	229	329

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Soft/Slip 3-2 Shift Only (Automatic)	230	330
Soft/Slip 2-1 Shift Only (Automatic)	231	331
Harsh 1-2 Shift Only (Automatic)	232	332
Harsh 2-3 Shift Only (Automatic)	233	333
Harsh 3-4 Shift Only (Automatic)	234	334
Harsh 4-3 Shift Only (Automatic)	235	335
Harsh 3-2 Shift Only (Automatic)	236	336
Harsh 2-1 Shift Only (Automatic)	237	337
Torque Converter Clutch Operation Concerns		
No Apply	240	340
Always Applied/May Stall Engine	241	341
Cycling Shudder Chatter	242	342
Other Shift Concerns		
Shift Lever Effort High	251	351
External Leaks	252	352
Vehicle Driveability Concerns	253	353
Noise/Vibration - Forward/Reverse	254	354
Engine will Not Crank	255	355
No PARK Range	256	356
Transaxle Overheating	257	357
No Engine Braking in Manual 1st Position	258	358
No Engine Braking in Drive (TC switch ON) or Manual 2nd Position	259	359
Vehicle Movement with Range Selector Lever in the N Position	262	362

^a Carry out electrical routines first.

Diagnostic Routines

ENGAGEMENT CONCERN: NO FORWARD

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Possible Component	Reference/Action
201 - ELECTRICAL ROUTINE	
Powertrain Control Systems	
No Electrical Concerns	
301 - HYDRAULIC/MECHANICAL ROUTINE	
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Internal Shift Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks or ball plug missing or leaking, or a plugged hole	Inspect for damage. Repair or install new as necessary.
Pump support seal ring, No. 3 or No. 4, damaged	Inspect for damage. Repair or install new as necessary.
Main Controls	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Pressure tap plate/gasket damaged or leaking	Inspect for damage. Repair or install new as necessary.
Separator plates damaged	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Main regulator valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Forward accumulator leaking	Inspect for damage. Repair or install new as necessary.
Forward Clutch and Coast Clutch Assembly	
Seals or pistons damaged	Check pressure at line pressure tap. Carry out Air Pressure Test, refer to <u>Special Testing Procedures</u> . Inspect for damage. Repair or install new as necessary.
Forward clutch return spring damaged	Inspect for damage. Repair or install new as necessary.
Ball check valve damaged	Inspect for mislocation, poor seating, damage. Repair or install new as necessary.
Friction elements severely damaged or worn	Check for abnormal wear, damage. Repair or install new as necessary.

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Forward/coast/direct clutch cylinder damaged, leaking, misassembled or binding	Inspect for damage. Repair or install new as necessary.
Cylinder to hub weld broken or splines damaged	Inspect for damage. Repair or install new as necessary.
Low One-Way Clutch Assembly	
Worn	Inspect for damage. Repair or install new as necessary.
Damaged	Inspect for damage. Repair or install new as necessary.
Misassembled	Inspect for damage. Repair or install new as necessary.
Forward One-Way Clutch Assembly	
Worn	Inspect for damage. Repair or install new as necessary.
Damaged	Inspect for damage. Repair or install new as necessary.
Misassembled	Inspect for damage. Repair or install new as necessary.
Low Intermediate Carrier	
Damaged	Inspect for damage. Repair or install new as necessary.
Misassembled	Inspect for damage. Repair or install new as necessary.

ENGAGEMENT CONCERN: NO REVERSE ONLY

Possible Component	Reference/Action
202 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, SSA ON, transmission range (TR) sensor	Run On-Board Diagnostics tests. Refer to the Introduction - Gasoline Engines article for diagnosis. Go to Pinpoint Test A and Go to Pinpoint Test D .
302 - HYDRAULIC/MECHANICAL ROUTINE	
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .
Internal Shift Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the linkage, verify that the TR sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .
Incorrect Pressures	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to Special Testing Procedures . If pressure is low, check the following possible components: main control, pump assembly, reverse clutch assembly, low/reverse clutch assembly.
Main Controls	

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Bolts out of torque specification Gaskets damaged or leaking 1-2 shift valve, SSA, main regulator valve, low/reverse modulator valve, low/reverse accumulator piston, pressure tap plate damaged, missing, stuck, misassembled Separator plates damaged Hydraulic passages damaged	Adjust bolts to specification. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary.
Pump Assembly Bolts out of torque specification Gaskets damaged or leaking Porosity/cross leaks/ball plug missing or leaking, plugged hole Pump support seal rings, No. 6 or No. 7, damaged	Adjust bolts to specification. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary.
Reverse Clutch Assembly Low line pressure Seals, piston damaged Ball check valve damaged Friction elements worn, severely damaged or misassembled Piston return spring damaged Reverse clutch hub to forward/coast/direct hub splines damaged	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u>. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary.
Low/Reverse Clutch Assembly Low line pressure Seals or piston damaged Friction elements worn or severely damaged Piston return spring damaged Wave springs missing Piston bore damaged	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u>. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary.
Forward/Coast/Direct Clutch Cylinder Reverse seal rings damaged, missing, misassembled	Inspect for damage. Repair or install new as necessary.
Case Reverse to low/reverse clutch feeds have severe cross- leakage or porosity	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to <u>Special Testing Procedures</u>. Inspect for damage. Repair or install new as necessary.
Reverse/Overdrive Gear Set	

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Damaged

Inspect for damage. Repair or install new as necessary.

ENGAGEMENT CONCERN: HARSH REVERSE OR FORWARD

Possible Component	Reference/Action
203 - ELECTRICAL ROUTINE	
Powertrain Control System Electrical inputs/outputs, vehicle wiring harnesses, PCM, electronic pressure control (EPC) solenoid, transmission fluid temperature (TFT) sensor, 3-2 timing/coast clutch solenoid (3-2T/CCS)	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article for diagnosis. Go to <u>Pinpoint Test B</u> and Go to <u>Pinpoint Test E</u> .
303 - HYDRAULIC/MECHANICAL ROUTINE	
Fluid Incorrect Fluid Level Condition	Fill fluid to correct level. Refer to <u>Preliminary Inspection</u> . Inspect fluid condition. Refer to <u>Preliminary Inspection</u> .
CV Joints/Front Wheel Driveshaft and Joint Splines damaged	Inspect for damage. Repair or install new as necessary.
Powertrain Mounts Loose, broken, missing or misaligned Powertrain contacting other vehicle components	Inspect mounts. Repair or install new as necessary. Inspect for contact. Repair or install new as necessary.
Selector Lever Linkage Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Internal Shift Linkages Damaged, disconnected	Inspect and service as required. After inspecting the linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Incorrect Pressures Incorrect line pressure	Check pressure at line tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> . If high, verify engagements at minimum EPC using the scan tool. If line remains high, check the following component: main control.
Fluid Filter and Seal Assembly Filter/seal damaged, plugged	Install new filter and seal assembly. Refer to <u>Transaxle</u> .

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Recirculating seal damaged or out of position	Install new recirculating seal. Refer to Transaxle .
Main Controls	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Low/reverse accumulator piston and spring (reverse), main regulator valve, forward accumulator piston and spring misassembled, stuck or damaged	Inspect for damage. Repair or install new as necessary.
EPC solenoid stuck or damaged	Inspect for damage, contamination. Activate solenoid using Transmission Tester or scan tool. Repair or install new as necessary.
Forward Clutch Assembly (Forward Only)	
Forward clutch cylinder damaged	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures .
Piston bore damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn	Inspect for damage. Repair or install new as necessary.
Forward clutch return spring damaged or missing	Inspect for damage. Repair or install new as necessary.
Ball check damaged	Inspect for damage. Repair or install new as necessary.
Piston or seal damaged	Inspect for damage. Repair or install new as necessary.
Reverse Clutch Assembly (Reverse Only)	
Seal or piston damaged	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures .
Reverse piston damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn, misassembled	Inspect for damage. Repair or install new as necessary.
Return spring assembly damaged, worn	Inspect for damage. Repair or install new as necessary.
Ball check damaged, missing	Inspect for damage. Repair or install new as necessary.
Low/Reverse Clutch Assembly (Reverse Only)	
Seals or reverse clutch piston damaged	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures .
Wave spring damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn, misassembled	Inspect for damage. Repair or install new as necessary.
Return spring assembly damaged, worn or misassembled	Inspect for damage. Repair or install new as necessary.

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Piston bore damaged	Inspect for damage. Repair or install new as necessary.
Direct Clutch Assembly (Reverse Only)	
Friction elements severely damaged	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures . Inspect for damage. Repair or install new as necessary.

ENGAGEMENT CONCERN: DELAYED/SOFT REVERSE OR FORWARD

Possible Component	Reference/Action
305 - HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
Incorrect Fluid Level	Fill fluid to correct level. Refer to Preliminary Inspection .
Condition	Inspect fluid condition. Refer to Preliminary Inspection .
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .
Internal Shift Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the linkage, verify that the TR sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .
Incorrect Pressures	
Low line pressure	Check pressure at line tap. Carry out Line Pressure and Stall Speed Tests. Refer to Special Testing Procedures . If pressure is low, check the following possible components: main control, pump assembly, clutch assemblies, fluid filter and seal assembly, recirculating seal.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks/ball plug missing or leaking, or passage blockage	Inspect for damage. Repair or install new as necessary.
Pump support seal rings, No. 3 or No. 4 (Forward), or No. 6 or No. 7 (Reverse), damaged	Inspect for damage. Repair or install new as necessary.
Pump gear/pocket damaged	Inspect for damage. Repair or install new as necessary.
Separator plate damaged	Inspect for damage. Repair or install new as necessary.
Fluid Filter and Seal Assembly	
Filter/seal damaged, plugged	Install new filter and seal assembly. Refer to Transaxle .
Recirculating seal damaged or out of position	Install new recirculating seal. Refer to Transaxle .

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Main Controls	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Manual valve, main regulator valve, low/reverse modulator valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Separator plates damaged	Inspect for damage. Repair or install new as necessary.
Pressure tap plate/gasket leaks, damaged, misassembled	Inspect for damage. Repair or install new as necessary.
Low/Reverse Clutch Assembly (Reverse Only)	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> .
Piston or seals damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn	Inspect for damage. Repair or install new as necessary.
Return spring damaged	Inspect for damage. Repair or install new as necessary.
Piston bore damaged	Inspect for damage. Repair or install new as necessary.
Excessive clutch pack end clearance	Inspect for damage. Repair or install new as necessary.
Reverse Clutch Assembly (Reverse Only)	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> .
Seals or piston damaged	Inspect for damage. Repair or install new as necessary.
Check ball damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn	Inspect for damage. Repair or install new as necessary.
Return spring worn, damaged	Inspect for damage. Repair or install new as necessary.
Piston bore damaged	Inspect for damage. Repair or install new as necessary.
Excessive clutch pack end clearance	Inspect for damage. Repair or install new as necessary.
Forward Clutch Assembly (Forward Only)	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> .
Seals or piston damaged	Inspect for damage. Repair or install new as necessary.
Ball check damaged, missing or not seating correctly	Inspect for damage, correct seating or missing. Install new cylinder as necessary.
Friction elements damaged, worn or excessive end clearance	Inspect for damage and end clearance. Repair or install new as necessary.
Forward/Coast/Direct Clutch Cylinder Assembly	
Reverse seal ring damaged or missing	Inspect for damage. Repair or install new as necessary.
Cylinder damaged or leaking	Inspect for damage. Repair or install new as necessary.

ENGAGEMENT CONCERN: NO FORWARD AND NO REVERSE

Possible Component	Reference/Action

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207 - ELECTRICAL ROUTINE

No Electrical Concerns

307 - HYDRAULIC/MECHANICAL ROUTINE**Fluid**Incorrect Fluid Level
ConditionFill fluid to correct level. Refer to **Preliminary Inspection**.
Inspect fluid condition. Refer to **Preliminary Inspection**.**Selector Lever Linkage**

Damaged, out of adjustment

Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to **AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E** article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to **Transmission Range (TR) Sensor Adjustment**.**Internal Shift Linkages**

Damaged, disconnected

Inspect and service as required. After inspecting the linkage, verify that the TR sensor is correctly adjusted. Refer to **Transmission Range (TR) Sensor Adjustment**.**Incorrect Pressures**

Low or no line pressure

Check pressure at line tap. Carry out Line Pressure and Stall Speed Tests. Refer to **Special Testing Procedures**. If pressure is low, check the following possible components: fluid filter and seal assembly, main controls, pump assembly. If OK, proceed to turbine shaft.**Pump Assembly**Bolts out of torque specification
Gaskets damaged or leaking
Porosity/cross leaks/passage(s) blocked
Pump support seal ring missing
Pump shaft broken, damagedAdjust bolts to specification.
Inspect for damage. Repair or install new as necessary.
Inspect for damage. Repair or install new as necessary.
Inspect for damage. Repair or install new as necessary.
Inspect for damage. Repair or install new as necessary.**Fluid Filter and Seal Assembly**Filter/seal damaged, plugged
Recirculating seal damaged or out of positionInstall new filter and seal assembly. Refer to **Transaxle**.
Install new recirculating seal. Refer to **Transaxle**.**Main Controls**Bolts out of torque specification
Gaskets damaged or leaking
Pressure plate/gasket damaged or missing
Main regulator valve, manual valve stuck, damaged, plugged, missing, link not connectedAdjust bolts to specification.
Inspect for damage. Repair or install new as necessary.
Inspect for damage. Repair or install new as necessary.
Inspect for damage. Repair or install new as necessary.**Flexplate (Starter Gear)**

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Damaged, broken	Inspect for damage. Repair or install new as necessary.
Torque Converter Assembly	
Pump drive shaft insert damaged	Inspect for damage. Repair or install new as necessary.
Studs broken or damaged	Inspect torque converter. If damaged, Repair or install new as necessary.
Splines damaged	Inspect for damage. Repair or install new as necessary.
Internal blades damaged, broken	Inspect for damage. Repair or install new as necessary.
Turbine Shaft to Forward/Coast/Direct Clutch Cylinder Housing	
Splines damaged	Inspect for damage. Repair or install new as necessary.
Chain and Sprocket Assembly	
Broken, damaged	Inspect for damage. Repair or install new as necessary.
Park Mechanism	
Parking pawl return spring damaged, missing misassembled	Inspect for damage. Repair or install new as necessary.
Front Wheel Drive (FWD) Shafts and Joints	
Broken or splines damaged	Inspect for damage. Repair or install new as necessary.
Final Drive and Differential Assembly	
Splines damaged	Inspect for damage. Repair or install new as necessary.
Gearset damaged	Inspect for damage. Repair or install new as necessary.
Planetary Gearset	
Gear teeth, carriers, splines damaged or broken	Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: SOME OR ALL SHIFTS MISSING

Possible Component	Reference/Action
210 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, shift solenoids, transmission range (TR) sensor, throttle position (TP) sensor, output shaft speed (OSS) sensor, TC switch	Carry out Shift Point Road Test. Refer to Shift Point Road Test . Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test A and Go to Pinpoint Test D .
310 - HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
Incorrect Fluid Level	Fill fluid to correct level. Refer to Preliminary Inspection .
Condition	Inspect fluid condition. Refer to Preliminary Inspection .
Selector Lever Linkage	
	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS -

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Damaged, out of adjustment	CD4E article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Internal Selector Lever Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
For diagnosis related to a specific gear use the scan tool to determine gear	Refer to the following shift routine(s) for further diagnosis:
Shift Concern: No 1-2 Shift	Routine 220/320
Shift Concern: No 2-3 Shift	Routine 221/321
Shift Concern: No 3-4 Shift	Routine 222/322

SHIFT CONCERNS: SHIFT TIMING - EARLY/LATE

Possible Component	Reference/Action
211 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, throttle position (TP) sensor, output shaft speed (OSS) sensor, transmission fluid temperature (TFT) sensor	Carry out Shift Point Road Test. Refer to <u>Shift Point Road Test</u> . Run-On Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> .
311 - HYDRAULIC/MECHANICAL ROUTINE	
Other	
Tire size change	Refer to the specification decal on door panel and verify that vehicle has original equipment. Changes in tire size or speedometer gear will affect shift timing.

SHIFT CONCERNS: TIMING - ERRATIC/HUNTING

Possible Component	Reference/Action
212 - ELECTRICAL ROUTINE	
Powertrain Control System	
Engine concerns	Refer to <u>ENGINE SYSTEM - GENERAL INFORMATION</u> article to diagnose erratic engine operations.
Electrical inputs/outputs, vehicle harnesses, PCM, shift solenoids, transmission range (TR) sensor, stop lamp switch, TCC solenoid, output shaft speed (OSS) sensor, throttle position (TP) sensor, TSS, EPC, 3-2T/CCS	Carry out Shift Point Test. Refer to <u>Shift Point Road Test</u> . Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test A</u> , go to <u>Pinpoint Test C</u> , go to <u>Pinpoint Test D</u> , go to <u>Pinpoint Test F</u> and Go to <u>Pinpoint Test G</u> .
312 - HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
	Fill fluid to correct level. Refer to <u>Preliminary</u>

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Incorrect Fluid Level Condition	Inspection. Inspect fluid condition. Refer to Preliminary Inspection.
Main Control Bolts out of torque specification Gaskets damaged or leaking 3-2 timing valve, pull-in valve, 2-4 accumulator, servo release shuttle valve, 3-2 control valve stuck, damaged, misassembled Solenoid screen blocked Separator plates damaged, blocked Pressure tap plate/gasket damaged SSA, SSB, 3-2T/CCS solenoid not functioning correctly, stuck, damaged	Adjust bolts to specification. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Clean or install a new screen. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Activate solenoids using the scan tool. Inspect for damage. Repair or install new as necessary.
Specific Shifts Check shift concerns Shift Concern: No 1-2 Shift Shift Concern: No 2-3 Shift Shift Concern: No 3-4 Shift Shift Concern: Soft/Slip 1-2 Shift Shift Concern: Soft/Slip 2-3 Shift Shift Concern: Soft/Slip 3-4 Shift Shift Concern: Soft/Slip 4-3 Shift Shift Concern: Soft/Slip 3-2 Shift Shift Concern: Soft/Slip 2-1 Shift Shift Concern: Harsh 1-2 Shift Shift Concern: Harsh 2-3 Shift Shift Concern: Harsh 3-4 Shift Shift Concern: Harsh 4-3 Shift Shift Concern: Harsh 3-2 Shift	Refer to the following shift routine(s) for further diagnosis: Routine 220/320 Routine 221/321 Routine 222/322 Routine 226/326 Routine 227/327 Routine 228/328 Routine 229/329 Routine 230/330 Routine 231/331 Routine 232/332 Routine 233/333 Routine 234/334 Routine 235/335 Routine 236/336

SHIFT CONCERNS: FEEL - SOFT/SLIPPING

Possible Component	Reference/Action
213 - ELECTRICAL ROUTINE	
Powertrain Control System Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoid, transmission fluid temperature (TFT) sensor, throttle position (TP) sensor, mass air flow (MAF) sensor	Carry out Shift Point Road Test. Refer to Shift Point Road Test . Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test B and Go to Pinpoint Test E .
Fluid	

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Incorrect Fluid Level Condition	Fill fluid to correct level. Refer to <u>Preliminary Inspection.</u> Inspect fluid condition. Refer to <u>Preliminary Inspection.</u>
Selector Lever Linkage Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment.</u>
Internal Selector Lever Linkages Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment.</u>
Incorrect Pressures Low line pressure Soft/Slip 1-2 Shift Soft/Slip 2-3 Shift Soft/Slip 3-4 Shift Soft/Slip 4-3 Shift Soft/Slip 3-2 Shift Soft/Slip 2-1 Shift	Check pressures at line tap. Carry out Line Pressure Tests. Refer to <u>Special Testing Procedures.</u> If pressures are low or all shifts are soft/slipping, check the following components: main control, pump assembly, fluid filter/seal assembly. If pressures are OK and a specific shift is soft/slipping, refer to the appropriate routine(s) for additional diagnosis. Routine 226/326 Routine 227/327 Routine 228/328 Routine 229/329 Routine 230/330 Routine 231/331
Main Controls Bolts out of torque specification Gaskets damaged or leaking Main regulator valve, line modulator valve stuck, damaged or misassembled or springs missing, tangled or damaged EPC solenoid stuck or damaged Separator plates damaged, blocked Pressure tap plate/gasket damaged or missing	Adjust bolts to specification. Inspect gaskets. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage, contamination. Activate solenoid using Transmission Tester or scan tool. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary.
Pump Assembly Bolts out of torque specification	Adjust bolts to specification.

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Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Fluid Filter/Seal Assembly	
Filter/seal damaged, plugged or missing	Install new filter and seal assembly. Refer to <u>Transaxle</u> .
Recirculating seal damaged or out of position	Install new recirculating seal. Refer to <u>Transaxle</u> .

SHIFT CONCERNS: FEEL - HARSH

Possible Component	Reference/Action
214 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, electronic pressure control (EPC) solenoid, transmission fluid temperature (TFT) sensor, throttle position (TP) sensor, mass air flow (MAF) sensor, torque converter clutch (TCC) solenoid, transmission range (TR) sensor, 3-2T/CCS	Carry out Torque Converter Clutch Operation Test. Refer to <u>Torque Converter Diagnosis</u> . Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> , go to <u>Pinpoint Test C</u> , go to <u>Pinpoint Test D</u> , go to <u>Pinpoint Test E</u> , go to <u>Pinpoint Test F</u> and Go to <u>Pinpoint Test G</u> .
314 - HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
Incorrect Fluid Level	Fill fluid to correct level. Refer to <u>Preliminary Inspection</u> .
Condition	Inspect fluid condition. Refer to <u>Preliminary Inspection</u> .
CV Joint/Front Wheel Driveshaft and Joints	
Splines damaged, loose	Inspect for damage. Repair or install new as necessary.
Powertrain Mounts	
Damaged, loose, missing	Inspect for damage. Repair or install new as necessary.
Incorrect Pressures	
High line pressure	Check pressure at line tap. Carry out Line Pressure Test and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> . If pressures are high or all shifts are harsh, go to main controls. If pressures are OK and a specific shift is harsh, refer to the appropriate shift routine for additional diagnosis.
Harsh 1-2 Shift	Routine 232/332
Harsh 2-3 Shift	Routine 233/333
Harsh 3-4 Shift	Routine 234/334
Harsh 4-3 Shift	Routine 235/335
Harsh 3-2 Shift	Routine 236/336
Harsh 2-1 Shift	Routine 237/337
Main Controls	
Bolts out of torque specification	Adjust bolts to specification.

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Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Main regulator valve, bypass valve, line modulator valve stuck, damaged or misassembled. Springs tangled, missing, damaged	Inspect for damage. Repair or install new as necessary.
EPC solenoid stuck or damaged	Inspect for damage, contamination. Activate solenoid using Transmission Tester or scan tool. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plate damaged, blocked	Inspect for damage. Repair or install new as necessary.
Torque Converter Assembly	
Piston damaged	Inspect for damage. Repair or install new as necessary.
Pump support seal No. 1 (CBY circuit) leaking, missing or damaged	Inspect for damage. Repair or install new as necessary.
Case leaking	Inspect for damage. Repair or install new as necessary.
Converter assembly damaged	If heat stained, install a new converter.

SHIFT CONCERNS: NO 1ST GEAR, ENGAGES IN HIGHER GEAR ("D" POSITION)

Possible Component	Reference/Action
215 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, shift solenoids, transmission range (TR) sensor	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test A</u> and Go to <u>Pinpoint Test D</u> .
Starts out and holds 3rd gear in the "D" position, reverse engagement is normal	Smart junction box power disconnected.
315 - HYDRAULIC/MECHANICAL ROUTINE	
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Internal Selector Lever Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Main Controls	
Bolts out of torque specification	Adjust bolts to specification.

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Gaskets damaged or leaking Pull-in valve, solenoid regulator valve, shift valves stuck, damaged, misassembled Solenoid filter gasket damaged or misassembled Hydraulic passages damaged SSA, SSB solenoid not functioning	Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Activate solenoid using the scan tool. Repair or install new as necessary.
For diagnosis related to a specific gear, use the scan tool to determine gear No. 1-2 Shift No. 2-3 Shift No. 3-4 Shift	Refer to the following routines: Routine 220/320 Routine 221/321 Routine 222/322
Mechanical Seals, clutches damaged, worn Direct clutch, 2/4 band, 2/4 servo damaged, stuck on	Repair or install new as necessary. Repair or install new as necessary.

SHIFT CONCERNS: NO MANUAL 1ST GEAR (1ST IN "D" IS OK)

Possible Component	Reference/Action
216 - ELECTRICAL ROUTINE	
Powertrain Control System Electrical inputs/outputs, vehicle wiring harnesses, PCM, shift solenoids, transmission range (TR) sensor.	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test A</u> and Go to <u>Pinpoint Test D</u> .
316 - HYDRAULIC/MECHANICAL ROUTINE	
Selector Lever Linkage Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Internal Selector Lever Linkages Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Main Controls	

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Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Pull-in valve stuck, damaged	Inspect for damage. Repair or install new as necessary.
SSB stuck "ON"	Activate solenoid using the scan tool. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged, blocked	Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: NO 1-2 SHIFT (AUTOMATIC)

Possible Component	Reference/Action
220 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, shift solenoids, transmission range (TR) sensor	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test A</u> and Go to <u>Pinpoint Test D</u> .
320 - HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
Line pressure	Check pressure at line tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> . If not OK, check the following component: main control.
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
1-2 shift valve, 2-4 accumulator, main regulator valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
SSA not functioning correctly	Inspect for damage. Activate solenoid using the Transmission Tester or scan tool.
Pressure tap plate/gasket damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Intermediate Overdrive Band and Servo Assembly	
Seals damaged, missing	Inspect for damage. Repair or install new as necessary.
Piston damaged	Inspect for damage. Repair or install new as necessary.
Band damaged	Inspect for damage. Repair or install new as necessary.

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Springs damaged	Inspect for damage. Repair or install new as necessary.
Servo rod or rod bore damaged	Inspect for damage. Repair or install new as necessary.
Low One-Way Clutch Assembly	
Assembly	Inspect for damage. Repair or install new as necessary.
OD/Reverse Sun Gear and Shell	
Damaged, weld broken	Inspect for damage. Repair or install new as necessary.
Lugs damaged	Inspect for damage. Repair or install new as necessary.
Case	
Low and intermediate band anchor area damaged	Inspect for damage. If damaged, install a new case.
Porosity/leakage in servo apply, servo release circuits	Inspect the case for leakage/porosity. Carry out Air Pressure Tests. Refer to Special Testing Procedures . Install a new case as required.

SHIFT CONCERNS: NO 2-3 SHIFT (AUTOMATIC)

Possible Component	Reference/Action
221 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, shift solenoids, transmission range (TR) sensor	Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test A and Go to Pinpoint Test D .
321 - HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
Line pressure	Check pressure at line pressure tap. Carry out Line Pressure Tests. Refer to Special Testing Procedures . If not OK, check the following components: main control.
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gasket leaks	Inspect for damage. Repair or install new as necessary.
2-3 shift valve (also no 4th), main regulator valve stuck, damaged, misassembled	Inspect for damage. Repair or install new as necessary.
SSB not functioning correctly (also no 4th)	Inspect for damage. Activate solenoid using Transmission Tester or scan tool.
Separator plates damaged	Inspect for damage. Repair or install new as necessary.
Pressure tap plate/gasket leaks	Inspect for damage. Repair or install new as necessary.

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Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Pump support seal rings, No. 4 or No. 5, damaged	Inspect for damage. Repair or install new as necessary.
Direct Clutch Assembly	
Line pressure	Check pressure at line pressure tap. Carry out Line Pressure Tests. Refer to <u>Special Testing Procedures</u> .
Seals or piston damaged	Inspect for damage. Repair or install new as necessary.
Piston bore damaged	Inspect for damage. Repair or install new as necessary.
Friction severely damaged, worn	Inspect for damage. Repair or install new as necessary.
Ball check not seating correctly	Inspect for damage. Repair or install new as necessary.
Return spring assembly	Inspect for damage. Repair or install new as necessary.
Cylinder bore/splines damaged	Inspect for damage. Repair or install new as necessary.
Shell/hub damaged	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Servo	
Piston or piston bore damaged	Inspect for damage. Repair or install new as necessary.
Rod bore or rod damaged, leaking	Inspect for damage. Repair or install new as necessary.
Case	
Leakage in the servo apply, servo release or direct clutch circuits	Inspect case for damage. Repair or install new as necessary. Carry out Air Pressure Tests. Refer to <u>Special Testing Procedures</u> .

SHIFT CONCERNS: NO 3-4 SHIFT (AUTOMATIC)

Possible Component	Reference/Action
222 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses,	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u>

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PCM, shift solenoids, transmission range (TR) sensor, transmission control (TC) switch	article. Go to <u>Pinpoint Test A</u> and Go to <u>Pinpoint Test D</u> .
322 - HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
Line pressure	Check pressure at line tap. Carry out Line Pressure Tests. Refer to <u>Special Testing Procedures</u> . If out of specification, check Main Control.
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
3-4 shift valve, main regulator valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
SSA not functioning correctly (also no 1st)	Activate solenoid using the Transmission Tester or scan tool. Repair or install new as necessary.
Separator plates damaged or orifice blocked	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Intermediate overdrive band damaged, worn	Inspect for damage. Repair or install new as necessary.
Servo rod or rod bore damaged	Inspect for damage. Repair or install new as necessary.
Servo piston or cover damaged or leaking	Inspect for damage. Repair or install new as necessary.
Springs damaged	Inspect for damage. Repair or install new as necessary.
Coast Clutch Assembly	
Seals damaged, missing	Inspect for damage. Repair or install new as necessary.
Piston damaged	Inspect for damage. Repair or install new as necessary.
Friction severely damaged, worn	Inspect for damage. Repair or install new as necessary.
Check ball severely damaged	Inspect for damage. Repair or install new as necessary.
Forward One-Way Clutch Assembly	
Damaged	Inspect for damage. Repair or install new as necessary.
Case	
Band anchor damaged	Inspect for damage. If damaged, install a new case.
Servo apply and servo release circuits leaking	Inspect for damage. Repair as required.

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SHIFT CONCERNS: SOFT/SLIP 1-2 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
226 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoid, transmission fluid temperature (TFT) sensor	Run On-Board Diagnostic Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Carry out Stall Speed Tests. Refer to <u>Special Testing Procedures</u> . Go to <u>Pinpoint Test B</u> and Go to <u>Pinpoint Test E</u> .
326 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
2-4 accumulator piston plug and seal (also soft 3-4 shift), main regulator valve, line modulator valve (also soft 3-4 shift) stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Pressure tap plate/gasket damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Piston out of torque specification	Inspect for damage. Repair or install new as necessary.
Servo rod or rod bore damaged	Inspect for damage. Repair or install new as necessary.
Intermediate overdrive band or reverse clutch drum assembly worn, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Springs damaged	Inspect for damage. Repair or install new as necessary.
Servo cover and seal damaged	Inspect for damage. Repair or install new as necessary.
Forward One-Way Clutch Assembly (Slips in 1st)	
Not holding or damaged	Inspect for damage. Repair or install new as necessary.
Forward clutch assembly (slips in 1st)	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to <u>Special Testing Procedures</u> .
Seals damaged	Inspect for damage. Repair or install new as necessary.
Return spring damaged	Inspect for damage. Repair or install new as necessary.

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Friction elements damaged	Inspect for damage. Repair or install new as necessary.
Pump support seals No. 3, No. 4 damaged	Inspect for damage. Repair or install new as necessary.
Low One-Way Clutch Assembly	
Not overrunning, damaged	Inspect for damage. Repair or install new as necessary.
Low Reverse Clutch Assembly	
Friction elements severely damaged	Inspect for damage. Repair or install new as necessary.
Case	
Band anchor damaged	Inspect for damage. If damaged, install a new case.
Porosity/leakage in servo apply, servo release circuits	Inspect the case for leakage/porosity. Carry out Air Pressure Tests. Refer to Special Testing Procedures . Install a new case as necessary.

SHIFT CONCERNS: SOFT/SLIP 2-3 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
227 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoid, transmission fluid temperature (TFT) sensor	Run On-Board Diagnostics Tests. Carry out Stall Speed Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test B and Go to Pinpoint Test E .
327 - HYDRAULIC/MECHANICAL ROUTINE	
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Pump support seals No. 4 or No. 5 damaged, missing	Inspect for damage. Repair or install new as necessary.
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Line modulator valve (also soft 1-2 and 3-4 shifts), servo release shuttle valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged	Inspect for damage. Repair or install new as necessary.

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Pressure tap plate/gasket leaks	Inspect for damage. Repair or install new as necessary.
Direct Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> .
Seals or piston damaged	Inspect for damage. Repair or install new as necessary.
Piston bore damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn or excessive end clearance	Inspect for damage. Check end clearance. Repair or install new as necessary.
Check ball not seating correctly	Inspect for damage. Repair or install new as necessary.
Return spring assembly damaged	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Servo	
Piston or piston bore damaged	Inspect for damage. Repair or install new as necessary.
Servo rod or rod bore damaged	Inspect for damage. Repair or install new as necessary.
Case	
Leakage in the servo apply, servo release or direct clutch circuits	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to <u>Special Testing Procedures</u> . Inspect for case damage.
Forward One-Way Clutch Assembly	
Not holding, damaged	Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: SOFT/SLIP 3-4 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
228 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoids, transmission fluid temperature (TFT) sensor	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> and Go to <u>Pinpoint Test E</u> .
328 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specifications.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Line modulator valve, 2-4 accumulator valve plug and seal (also soft 1-2 shift), stuck, damaged or	Inspect for damage. Repair or install new as

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misassembled	necessary.
Pressure tap plate/gasket leaks	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged or orifice blocked	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Intermediate overdrive band or reverse clutch drum assembly worn, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Piston, seals or piston bore damaged, missing	Inspect for damage. Repair or install new as necessary.
Servo cover or seal damaged	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures . Inspect for damage. Repair or install new as necessary.
Servo rod or rod bore damaged	Inspect for damage. Repair or install new as necessary.
Springs damaged	Inspect for damage. Repair or install new as necessary.
Direct Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures .
Seals damaged, missing	Inspect for damage. Repair or install new as necessary.
Piston damaged	Inspect for damage. Repair or install new as necessary.
Check ball damaged, missing or leaking	Inspect for damage. Repair or install new as necessary.
Return spring damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged	Inspect for damage. Repair or install new as necessary.
Case	
Band anchor damaged	Inspect for damage. If damaged, install a new case.
Servo apply and servo release circuits leaking	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures . Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: SOFT/SLIP 4-3 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
229 - ELECTRICAL ROUTINE	

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Powertrain Control System

Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoid, output shaft speed sensor (OSS), mass air flow (MAF) sensor, throttle position (TP) sensor

Run On-Board Diagnostics Tests. Refer to the **Introduction - Gasoline Engines** article. Go to **Pinpoint Test E**.

329 - HYDRAULIC/MECHANICAL ROUTINE

Main Control

Bolts out of torque specification

Adjust bolts to specification.

Gaskets damaged or leaking

Inspect for damage. Repair or install new as necessary.

Servo release shuttle valve, main regulator valve stuck, damaged or misassembled

Inspect for damage. Repair or install new as necessary.

Hydraulic passages damaged

Inspect for damage. Repair or install new as necessary.

Pressure tap plate/gasket leaks or damage

Inspect for damage. Repair or install new as necessary.

Separator plates damaged, blocked

Inspect for damage. Repair or install new as necessary.

Intermediate/Overdrive Band and Servo Assembly

Intermediate overdrive band and reverse clutch drum assembly worn, damaged or misassembled

Inspect for damage. Repair or install new as necessary.

Servo return spring broken

Inspect for damage. Repair or install new as necessary.

Servo rod damaged

Inspect for damage. Repair or install new as necessary.

Piston seal damaged

Inspect for damage. Repair or install new as necessary.

Direct Clutch Assembly

Low line pressure

Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to **Special Testing Procedures**.

Seals damaged, missing

Inspect for damage. Repair or install new as necessary.

Piston damaged

Inspect for damage. Repair or install new as necessary.

Check ball damaged, missing or leaking

Inspect for damage. Repair or install new as necessary.

Return spring damaged

Inspect for damage. Repair or install new as necessary.

Friction elements damaged

Inspect for damage. Repair or install new as necessary.

Forward/Coast Clutch Assembly

Low line pressure

Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to **Special Testing Procedures**.

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Seals damaged, missing	Inspect for damage. Repair or install new as necessary.
Piston damaged	Inspect for damage. Repair or install new as necessary.
Friction elements worn, damaged	Inspect for damage. Repair or install new as necessary.
Check ball not functioning	Inspect for damage. Repair or install new as necessary.
Forward clutch piston and return spring damaged	Inspect for damage. Repair or install new as necessary.
Case	
Porosity/cross leaks in servo apply, servo release, direct clutch circuits	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures . Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: SOFT/SLIP 3-2 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
230 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoid, throttle position (TP) sensor, output shaft speed (OSS) sensor, mass air flow (MAF) sensor, 3-2 timing/coast clutch solenoid (3-2T/CCS)	Run On-Board Diagnostics tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test E and Go to Pinpoint Test G .
330 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
3-2 timing valve, solenoid regulator valve, 3-2 control valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
3-2T/CCS solenoid not functioning correctly	Activate solenoid using the scan tool. Repair or install new as necessary.
Pressure tap plate/gasket leaks or damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged, blocked	Inspect for damage. Repair or install new as necessary.
Direct Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to Special Testing Procedures .
Return spring damaged, broken	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn	Inspect for damage. Repair or install new as necessary.

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Ball check not releasing	Inspect for damage. Repair or install new as necessary.
Piston or seal damaged	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Intermediate overdrive band or reverse clutch drum assembly worn, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Servo piston damaged	Inspect for damage. Repair or install new as necessary.
Servo return and cushion springs damaged, misassembled	Inspect for damage. Repair or install new as necessary.
Springs damaged, misassembled	Inspect for damage. Repair or install new as necessary.
Servo rod bent, damaged	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Pump support seal rings No. 4, No. 5, No. 6 damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Forward to direct passage leaks	Inspect for damage. Repair or install new as necessary.
Case	
Band anchor damaged	Inspect for damage. If damaged, install a new case.
Leakage in servo apply/release circuits	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures . Inspect for damage. Repair or install new as necessary.
Case bore damaged (servo rod)	Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: SOFT/SLIP 2-1 SHIFT ONLY (AUTOMATIC OR KICKDOWN)

Possible Component	Reference/Action
231 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoid, transmission fluid temperature (TFT) sensor, throttle position (TP) sensor, mass air flow (MAF) sensor	Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test B and Go to Pinpoint Test E .
331 - HYDRAULIC/MECHANICAL ROUTINE	
Pump Assembly	

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Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Pump support seals No. 3 or No. 4 leaking, misassembled, damaged	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Servo and Band Assembly	
Servo piston damaged	Inspect for damage. Repair as necessary
Servo piston return spring damaged	Inspect for damage. Repair as necessary
Forward Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to Special Testing Procedures .
Piston or seals damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged	Inspect for damage. Repair or install new as necessary.
Low One-Way Clutch	
Damaged, not holding	Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: HARSH 1-2 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
232 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoids, transmission fluid temperature (TFT) sensor, TSS, throttle position (TP) sensor, mass air flow (MAF) sensor, TCC solenoid, transmission range (TR) sensor	Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test B , go to Pinpoint Test C , go to Pinpoint Test D , go to Pinpoint Test E and Go to Pinpoint Test F .
332 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
2-4 accumulator valve, 3-2 control valve (also harsh 3-4 shift) stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Separator plates damaged	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.

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Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Pump support seal rings No. 3 or No. 4 damaged	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Cushion return springs damaged	Inspect for damage. Repair or install new as necessary.
Intermediate overdrive band damaged, worn	Inspect for damage. Repair or install new as necessary.
Intermediate overdrive band or reverse clutch drum assembly worn, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Forward Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to Special Testing Procedures .
Seals damaged	Inspect for damage. Repair or install new as necessary.
Return spring damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged	Inspect for damage. Repair or install new as necessary.
Case	
Band anchor area damaged	Inspect for damage. If damaged, install a new case.

SHIFT CONCERNS: HARSH 2-3 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
233 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoid, transmission range (TR) sensor, transmission fluid temperature (TFT) sensor, mass air flow (MAF) sensor, TCC solenoid, turbine shaft speed (TSS) sensor	Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test B , go to Pinpoint Test C , go to Pinpoint Test D , go to Pinpoint Test E and Go to Pinpoint Test F .
333 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Line modulator valve (also 1-2 and 3-4 harsh shift), servo release shuttle valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.

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Separator plates damaged	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Pump support seal rings No. 4 or No. 5 damaged	Inspect for damage. Repair or install new as necessary.
Direct Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to Special Testing Procedures .
Piston or piston bore damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn	Inspect for damage. Repair or install new as necessary.
Ball check not seating correctly	Inspect for damage. Repair or install new as necessary.
Return spring damaged	Inspect for damage. Repair or install new as necessary.
Clutch cylinder splines damaged	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Servo	
Servo piston or piston bore damaged	Inspect for damage. Repair or install new as necessary.
Servo rod damaged	Inspect for damage. Repair or install new as necessary.
Case	
Leakage in the servo apply, servo release or direct clutch circuits	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to Special Testing Procedures . Inspect case for damage. Repair or install a new case as necessary.
Servo rod bore damaged	Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: HARSH 3-4 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
234 - ELECTRICAL ROUTINE	
Powertrain Control System	
	Run On-Board Diagnostics Tests. Refer to

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Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC Solenoid, 3-2T/CCS, transmission range (TR) sensor, transmission fluid temperature (TFT) sensor, TSS, throttle position (TP) sensor, mass air flow (MAF) sensor, TCC solenoid	the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> , go to <u>Pinpoint Test C</u> , go to <u>Pinpoint Test D</u> , go to <u>Pinpoint Test E</u> , go to <u>Pinpoint Test F</u> and Go to <u>Pinpoint Test G</u> .
334 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Line modulator valve (also 1-2 and 2-3 harsh shift), 3-2 control valve, 2-4 accumulator valve, coast clutch valve, stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged, blocked	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Coast clutch Teflon® seals damaged	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Intermediate overdrive band and reverse clutch drum assembly, damaged, worn, misassembled	Inspect for damage. Repair or install new as necessary.
Servo piston or cover damaged or leaking	Inspect for damage. Repair or install new as necessary.
Springs damaged	Inspect for damage. Repair or install new as necessary.
Coast Clutch Assembly	
Piston or seals damaged, missing	Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn	Inspect for damage. Repair or install new as necessary.
Check ball not functioning	Inspect for damage. Repair or install new as necessary.
Direct Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> .
Piston or seals damaged, missing	Inspect for damage. Repair or install new as necessary.

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Check ball damaged, missing or leaking	Inspect for damage. Repair or install new as necessary.
Return spring damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged	Inspect for damage. Repair or install new as necessary.
Clutch cylinder splines damaged	Inspect for damage. Repair or install new as necessary.
Case	
Band anchor damaged	Inspect for damage. If damaged, install a new case.

SHIFT CONCERNS: HARSH 4-3 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
235 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, electronic pressure control (EPC) solenoid, transmission range (TR) sensor, 3-2T/CCS, transmission fluid temperature (TFT) sensor, OSS, TSS, throttle position (TP) sensor, mass air flow (MAF) sensor, TCC solenoid	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> , go to <u>Pinpoint Test C</u> , go to <u>Pinpoint Test D</u> , go to <u>Pinpoint Test E</u> , go to <u>Pinpoint Test F</u> and Go to <u>Pinpoint Test G</u> .
335 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Servo release shuttle valve, 3-2 timing/coast valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged, blocked	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Porosity/cross leaks, seal rings damaged, missing or leaking ball plug	Inspect for damage. Repair or install new as necessary.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Pump support seal rings No. 2, No. 3, No. 4 or No. 5 (coast and direct clutch circuits) damaged	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Servo rod bent, damaged	Inspect for damage. Repair or install new as necessary.
	Inspect for damage. Repair or install new as

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Servo return spring broken	necessary.
Coast Clutch Assembly	
Seals damaged, missing	Inspect for damage. Repair or install new as necessary.
Piston damaged	Inspect for damage. Repair or install new as necessary.
Friction elements worn, damaged	Inspect for damage. Repair or install new as necessary.
Check ball not functioning	Inspect for damage. Repair or install new as necessary.
Forward clutch piston and return spring damaged	Inspect for damage. Repair or install new as necessary.
Case	
Porosity/cross leaks in servo apply, servo release, direct clutch, coast clutch circuits	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to <u>Special Testing Procedures</u> . Inspect for damage. Repair or install new as necessary.

SHIFT CONCERNS: HARSH 3-2 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
236 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, electronic pressure control (EPC) solenoid, transmission range (TR) sensor, 3-2T/CCS, transmission fluid temperature (TFT) sensor, OSS, TSS, throttle position (TP) sensor, mass air flow (MAF) sensor, TCC solenoid	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> , go to <u>Pinpoint Test C</u> , go to <u>Pinpoint Test D</u> , go to <u>Pinpoint Test E</u> , go to <u>Pinpoint Test F</u> and Go to <u>Pinpoint Test G</u> .
336 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
3-2 timing valve, solenoid regulator valve, 3-2 control valve stuck, damaged, misassembled	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged or blocked	Inspect for damage. Repair or install new as necessary.
3-2T/CCS solenoid not functioning correctly	Activate solenoid using the scan tool. If coast clutch operation is OK, proceed to direct clutch assembly.
Direct Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests.

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Return spring damaged, broken	Refer to Special Testing Procedures . Inspect for damage. Repair or install new as necessary.
Friction elements damaged, worn	Inspect for damage. Repair or install new as necessary.
Check ball not exhausting	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Intermediate overdrive band or reverse clutch drum assembly damaged, worn or misassembled	Inspect for damage. Repair or install new as necessary.
Servo piston damaged	Inspect for damage. Repair or install new as necessary.
Servo return and cushion springs damaged, misassembled	Inspect for damage. Repair or install new as necessary.
Springs damaged, misassembled	Inspect for damage. Repair or install new as necessary.
Servo rod bent or damaged	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Pump support seal rings damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Case	
Band anchor damaged	Inspect for damage. If damaged, install a new case.

SHIFT CONCERNS: HARSH 2-1 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
237 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, EPC solenoids, transmission fluid temperature (TFT) sensor, TSS, throttle position (TP) sensor, mass air flow (MAF) sensor, TCC solenoid, transmission range (TR) sensor	Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test B , go to Pinpoint Test C , go to Pinpoint Test D , go to Pinpoint Test E and Go to Pinpoint Test F .
337 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.

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2-4 accumulator valve, 3-2 control valve (also harsh 3-4 shift) stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Separator plates damaged	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Pump support seal rings No. 3 or No. 4 damaged	Inspect for damage. Repair or install new as necessary.
Porosity/cross leaks	Inspect for damage. Repair or install new as necessary.
Intermediate/Overdrive Band and Servo Assembly	
Cushion return springs damaged	Inspect for damage. Repair or install new as necessary.
Intermediate overdrive band damaged, worn	Inspect for damage. Repair or install new as necessary.
Intermediate overdrive band or reverse clutch drum assembly worn, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
Forward Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> .
Seals damaged	Inspect for damage. Repair or install new as necessary.
Return spring damaged	Inspect for damage. Repair or install new as necessary.
Friction elements damaged	Inspect for damage. Repair or install new as necessary.
Case	
Band anchor area damaged	Inspect for damage. If damaged, install a new case.

TORQUE CONVERTER CLUTCH OPERATION CONCERNS: NO APPLY

Possible Component	Reference/Action
240 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, transmission fluid temperature (TFT) sensor, TCC solenoid, brake pedal position (BPP) switch, OSS, TSS	Carry out Torque Converter Clutch Operation Test. Refer to <u>Torque Converter Diagnosis</u> . Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> , go to <u>Pinpoint Test C</u> , and Go to <u>Pinpoint Test F</u> .
340 - HYDRAULIC/MECHANICAL ROUTINE	

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Main Control

Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Solenoid pressure regulator valve, bypass clutch control valve and plunger, converter regulator valve stuck, damaged, misassembled	Inspect for damage. Repair or install new as necessary.
TCC solenoid not functioning correctly	Activate solenoid using the scan tool. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plates damaged or blocked	Inspect for damage. Repair or install new as necessary.

Torque Converter Assembly

Leakage, internal damage	Inspect for damage and leakage. Carry out Torque Converter Clutch Operation Test. Refer to <u>Torque Converter Diagnosis</u> .
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TORQUE CONVERTER CLUTCH OPERATION CONCERNS: ALWAYS APPLIED/MAY STALL ENGINE

Possible Component	Reference/Action
241 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, transmission fluid temperature (TFT) sensor, TCC solenoid	Carry out Torque Converter Clutch Operation Tests. Refer to <u>Torque Converter Diagnosis</u> . Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> and Go to <u>Pinpoint Test C</u> .
341 - HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Bypass clutch control valve and plunger (always applied), converter regulator valve stuck, damaged, misassembled	Inspect for damage. Repair or install new as necessary.
Separator plates damaged, blocked	Inspect for damage. Repair or install new as necessary.
NOTE: Torque converter clutch not applied in 1st gear or reverse gear.	Activate solenoid using the scan tool. Repair or install new as necessary.
TCC solenoid not functioning correctly.	Inspect for damage. Repair or install new as necessary.
Pressure tap plate/gasket damaged	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.

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Pump support No. 1 seal ring damaged, missing, misassembled	Inspect for damage. Repair or install new as necessary.
Torque Converter Assembly	
Internal seals damaged	Inspect for damage. Repair or install new as necessary.
Piston plate damaged/stuck to cover	If cover is heat stained, install a new torque converter.
Case	
Porosity/cross leaks from the clutch bypass circuit	Inspect for damage. Repair or install new as necessary.

TORQUE CONVERTER CLUTCH CONCERNS: CYCLING SHUDDER CHATTER

Possible Component	Reference/Action
242 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, TCC solenoid, transmission range (TR) sensor, throttle position (TP) RPM, PCM calibration may not be at current level	Carry out Torque Converter Clutch Operation Tests. Refer to <u>Torque Converter Diagnosis</u> . Clear codes. Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test C</u> .
342 - HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
Incorrect Fluid Level	Fill fluid to correct level. Refer to <u>Preliminary Inspection</u> .
Condition	Inspect fluid condition. Refer to <u>Preliminary Inspection</u> .
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
TCC solenoid malfunction	Activate solenoid using the scan tool. Repair or install new as necessary.
Pump Assembly	
Bolts out of torque specification	Adjust bolts to specification.
Cross leaks	Inspect for porosity leaks, gasket damage, install a new pump as required
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Torque Converter Assembly	
Internal seals damaged	Inspect for damage. Repair or install new as necessary.
Piston plate damaged/stuck to cover	If cover is heat stained, install a new torque converter.

OTHER CONCERNS: SELECTOR LEVER EFFORT IS HIGH

Possible Component	Reference/Action
251 - ELECTRICAL ROUTINE	
No Electrical Concerns	
351 - HYDRAULIC/MECHANICAL ROUTINE	
Brake Shift Interlock Solenoid	

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Out of adjustment	Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article.
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Internal Selector Lever Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Manual control lever damaged, park mechanism damaged, shaft bent, detent lever shaft bore (in case) damaged, detent spring bent/damaged, nut loose	Inspect for damage. Repair as required.
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Manual valve stuck, damaged	Inspect for damage. Repair or install new as necessary.

OTHER CONCERNS: EXTERNAL LEAKS

Possible Component	Reference/Action
252 - ELECTRICAL ROUTINE	
No Electrical Concerns	
352 - HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
Incorrect Fluid Level	Fill fluid to correct level. Refer to <u>Preliminary Inspection</u> .
Condition	Inspect fluid condition. Refer to <u>Preliminary Inspection</u> .
Seals/Gaskets	
Differential seals, retainer seal, pump assembly, main control cover, servo cover, split flange gasket, converter impeller hub, manual lever shaft seal, fluid level indicator tube	Locate source of leak. Repair as required. If differential seal or converter impeller hub is leaking, inspect drain back holes in case/converter housing, inspect surface front wheel driveshaft and joint for a rough surface. Rough surface may cause seal leakage. Repair or install new as necessary.
Other	
Fluid tube fitting, line pressure tap, pressure port plugs, drain plug, cooler tubes, case porosity,	Locate source of leak. Repair or install new as necessary.

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cracked case, cooler bypass valve	
Vent blocked or damaged	Check vent for damage or blockage. Repair or install new as necessary.
Bolts at split flange or main control cover leaking	Inspect for leaks. Repair or install new as necessary.
Sensors/Connectors	
Transmission connectors, transmission range (TR) sensor, TSS sensor or seal	Locate source of leak. Repair or install new as necessary.

OTHER CONCERNS: VEHICLE DRIVEABILITY

Possible Component	Reference/Action
253 - ELECTRICAL ROUTINE	
Powertrain Control System	
Base engine concerns Electrical inputs/outputs, vehicle wiring harnesses, PCM, transmission fluid temperature (TFT) sensor, TCC solenoid, transmission range (TR) sensor, throttle position (TP) sensor	Refer to <u>ENGINE SYSTEM - GENERAL INFORMATION</u> article. Carry out Torque Converter Clutch Operation Test. Refer <u>Torque Converter Diagnosis</u> . Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> , go to <u>Pinpoint Test C</u> and Go to <u>Pinpoint Test D</u> .
353 - HYDRAULIC/MECHANICAL ROUTINE	
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Selector Lever Linkages	
Damaged, disconnected Verify correct shift points and engagements	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> . Refer to <u>Road Testing Vehicle</u> .
Torque Converter	
Torque converter clutch always applied/may stall engine Torque converter one-way clutch Damaged	Go to Routine 341. Inspect torque converter. Repair or install new as necessary. Inspect torque converter. Repair or install new as necessary.

NOTE: Noise, vibration and harness (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 **NOISE, VIBRATION AND HARSHNESS** article. 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 **NOISE, VIBRATION AND HARSHNESS** article for the next likely system and continue diagnose.

OTHER CONCERNS: NOISE/VIBRATION - FORWARD/REVERSE

Possible Component	Reference/Action
254 - ELECTRICAL ROUTINES	
No Electrical Concerns	
354 - HYDRAULIC/MECHANICAL ROUTINES	
For Noises/Vibrations That Change With Engine Speed	
Torque converter components	Locate source of disturbance. Repair or install new as necessary.
Fluid level (low) pump cavitation	Adjust fluid to correct level. Refer to <u>Preliminary Inspection</u> .
Pump assembly	Refer to <u>Pump Assembly</u> .
Engine drive accessories	Refer to <u>ENGINE - 2.3L</u> article or <u>ENGINE - 3.0L (4V)</u> article.
Cooler tubes grounding out	Refer to <u>TRANSAXLE/TRANSMISSION COOLING - CD4E</u> article.
Flexplate	Refer to <u>ENGINE - 2.3L</u> article or <u>ENGINE - 3.0L (4V)</u> article.
For Noises That Change With Vehicle Speed	
Powertrain mounts loose, damaged	Locate source of disturbance. Repair or install new as necessary.
Tires	Refer to <u>SUSPENSION SYSTEM - GENERAL INFORMATION</u> article.
Driveline concerns: front wheel driveshaft and joint or differential: final drive/chain, suspension, modifications	Refer to <u>SUSPENSION SYSTEM - GENERAL INFORMATION</u> article.
Planetary gear sets	Refer to <u>Planetary Gearsets And Chain Drive Parts</u> .
Chain grounding to chain pan	Inspect chain pan for signs of damage or wrong installation. Repair or install new as necessary.
Forward one-way clutch	Refer to <u>Forward One-Way Clutch - Sprag Type</u> or <u>Low One-Way Clutch - Mechanical Diode Type</u> .
Torque converter assembly	Refer to <u>Torque Converter</u> .
Hydraulic pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to <u>Special Testing Procedures</u> .
Other Noises/Vibrations	
Speedometer cable or gears	Locate source of disturbance. Repair or install new as necessary.
Selector lever cable and bracket vibration, grounding out	Locate source of disturbance. Repair or install new as necessary. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article or <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS -</u>

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	HYBRID article.
Loose exhaust pipe or heat shield	Locate source of disturbance. Repair or install new as necessary. Refer to EXHAUST SYSTEM article.
Loose flexplate-to-converter nuts	Adjust bolts to specification.

OTHER CONCERNS: ENGINE WILL NOT CRANK

Possible Component	Reference/Action
255 - ELECTRICAL ROUTINE	
Powertrain Control System	
Base engine concerns	Refer to the Introduction - Gasoline Engines article.
Electrical inputs/outputs, vehicle wiring harnesses, PCM, transmission range (TR) sensor damaged, misadjusted	Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test D .
355 - HYDRAULIC/MECHANICAL ROUTINE	
Starter/Flexplate	
Damaged or misassembled	Inspect for damage, misassembly. Repair or install new as necessary.
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .
Internal Selector Lever Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .

OTHER CONCERNS: NO PARK RANGE

Possible Component	Reference/Action
256 - ELECTRICAL ROUTINE	
No Electrical Concerns	
356 - HYDRAULIC/MECHANICAL ROUTINE	
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .
Internal Selector Lever Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to

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	Transmission Range (TR) Sensor Adjustment.
Park Mechanism Park gear on driven sprocket assembly, parking pawl return spring, park pawl ratchet springs, parking pawl shaft, manual control lever, cam apply lever, manual lever detent spring, transmission range (TR) sensor, parking pawl apply cam, manual shaft nut damaged, missing or misassembled	Inspect for damage. Repair or install new as necessary.

OTHER CONCERNS: TRANSAXLE OVERHEATING

Possible Component	Reference/Action
257 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, TCC solenoid, transmission fluid temperature (TFT) sensor, OSS, TSS	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test B</u> , go to <u>Pinpoint Test C</u> and Go to <u>Pinpoint Test F</u> .
357 - HYDRAULIC/MECHANICAL ROUTINE	
Vehicle Overheating	
Engine overheating	Refer to <u>ENGINE COOLING</u> article.
Fluid	
Incorrect Fluid Level	Fill fluid to correct level. Refer to <u>Preliminary Inspection</u> .
Condition	Inspect fluid condition. Refer to <u>Preliminary Inspection</u> . If fluid is aerated, check thermal valve and filter seals. Repair or install new as necessary.
Cooler Tubes	
Damaged, blocked, reversed	Inspect for damage. Repair or install new as necessary.
AC Condenser Combo Cooler	
Damaged, blocked, restricted or leaking	Inspect for damage or incorrect installation. Repair or install new as necessary. Refer to <u>CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS</u> article or <u>CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS - HYBRID</u> article.
Main Control	
Bolts out of torque specification	Adjust bolts to specification.
Main regulator valve, bypass clutch control	

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valve, converter regulator valve stuck, damaged, misassembled	Inspect for damage. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Separator plates/gaskets damaged	Inspect for damage. Repair or install new as necessary.
Torque Converter Clutch	
TCC solenoid not functioning correctly (off)	Activate solenoid using the scan tool. Repair or install new as necessary.
No Apply	Go to Routine 240/340.
Pump Assembly	
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Rear lube passage blocked	Inspect for damage. Repair or install new as necessary.
Chain Pan	
Missing	Inspect for missing pan. Install pan if missing.
Thermostatic Fluid Level Control Valve	
Stuck open or damaged	Inspect for damage. Repair or install new as necessary.
Gasket damaged or missing	Inspect for damage. Repair or install new as necessary.
Bolt or bracket damaged, missing, or incorrect installed	Inspect for damage. Repair or install new as necessary.
Case/Converter Housing/Stator Support	
Front lube passage blocked or restricted	Check pressure at line pressure tap. Carry out Line Pressure Test, refer to <u>Special Testing Procedures</u> . Inspect passages.

OTHER CONCERNS: NO ENGINE BRAKING IN MANUAL 1ST POSITION

Possible Component	Reference/Action
258 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, 3-2 timing/coast clutch solenoid	Run On-Board Diagnostics Tests. Refer to the <u>Introduction - Gasoline Engines</u> article. Go to <u>Pinpoint Test G</u> .
358 - HYDRAULIC/MECHANICAL ROUTINE	
Main Controls	
Bolts out of specification	Adjust bolts to specification.
Gaskets damaged or leaking	Inspect for damage. Repair or install new as necessary.
Low/reverse modulator valve, coast clutch valve stuck, damaged or misassembled	Inspect for damage. Repair or install new as necessary.
3-2 timing/coast clutch solenoid stuck or damaged	Inspect for damage, contamination. Activate solenoid using the Transmission Tester or scan tool. Repair or install new as necessary.
Hydraulic passages damaged	Inspect for damage. Repair or install new as necessary.
Pressure tap plate/gasket damaged	Inspect for damage. Repair or install new as necessary.
Separator plate/gasket damaged	Inspect for damage. Repair or install new as necessary.
Coast Clutch Assembly	
Assembly misassembled, damaged	Inspect for damage. Repair or install new as necessary.

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Forward clutch hub seal damaged	Inspect for damage. Repair or install new as necessary.
Piston or seals damaged	Inspect for damage. Repair or install new as necessary.
Check ball damaged, missing	Inspect for damage. Repair or install new as necessary.
Low/Reverse Clutch Assembly	
Low line pressure	Check pressure at line pressure tap. Carry out Line Pressure and Stall Speed Tests. Refer to Special Testing Procedures .
Assembly misassembled, damaged	Inspect for damage. Repair or install new as necessary.
Piston or seals damaged	Inspect for damage. Repair or install new as necessary.
Pump Assembly	
Pump support No. 2 or No. 3 seal rings for the coast clutch circuit damaged, missing	Inspect for damage. Repair or install new as necessary.

OTHER CONCERNS: NO ENGINE BRAKING IN DRIVE (TC SWITCH ON) OR MANUAL 2ND POSITION

Possible Component	Reference/Action
259 - ELECTRICAL ROUTINE	
Powertrain Control System	
Electrical inputs/outputs, vehicle wiring harnesses, PCM, 3-2 timing/coast clutch solenoid	Run On-Board Diagnostics Tests. Refer to the Introduction - Gasoline Engines article. Go to Pinpoint Test G . Carry out Stall Speed Tests. Refer to Special Testing Procedures .
359 - HYDRAULIC/MECHANICAL ROUTINE	
Selector Lever Linkage	
Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .
Internal Selector Lever Linkages	
Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to Transmission Range (TR) Sensor Adjustment .
Pump Assembly	
Pump support No. 2 or No. 3 seal rings for the coast clutch circuit damaged, missing	Inspect for damage. Repair or install new as necessary.

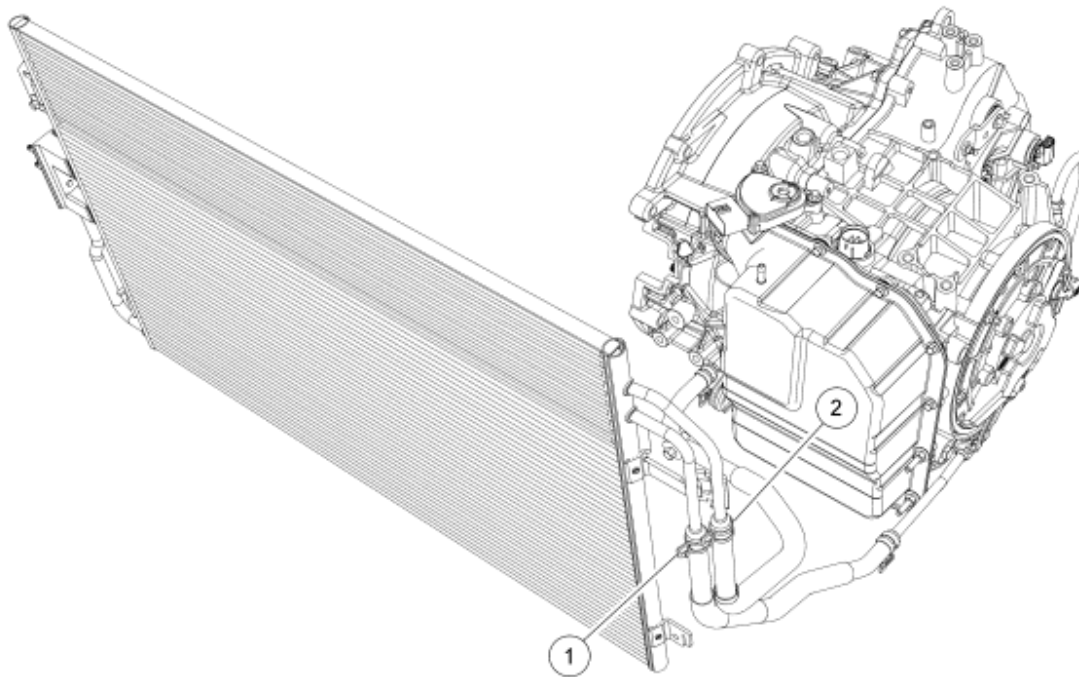
OTHER CONCERNS: VEHICLE MOVEMENT WITH GEAR SELECTOR IN THE "N" POSITION

Possible Component	Reference/Action
262 - ELECTRICAL ROUTINE	
No Electrical Concerns	

362 - HYDRAULIC/MECHANICAL ROUTINE

Selector Lever Linkage Damaged, out of adjustment	Inspect and repair as required. Verify the selector lever linkage adjustment. Refer to <u>AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E</u> article. After adjusting the selector lever linkage, verify that the transmission range (TR) sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Internal Selector Lever Linkages Damaged, disconnected	Inspect and service as required. After inspecting the selector lever linkage, verify that the TR sensor is correctly adjusted. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> .
Pump Assembly Gaskets damaged or leaking Pump support seal ring No. 2, leakage from lube circuit into forward clutch circuit	Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary.
Forward/Coast Clutch Assembly Friction plates severely damaged Return spring damaged Check ball damaged, missing	Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary. Inspect for damage. Repair or install new as necessary.

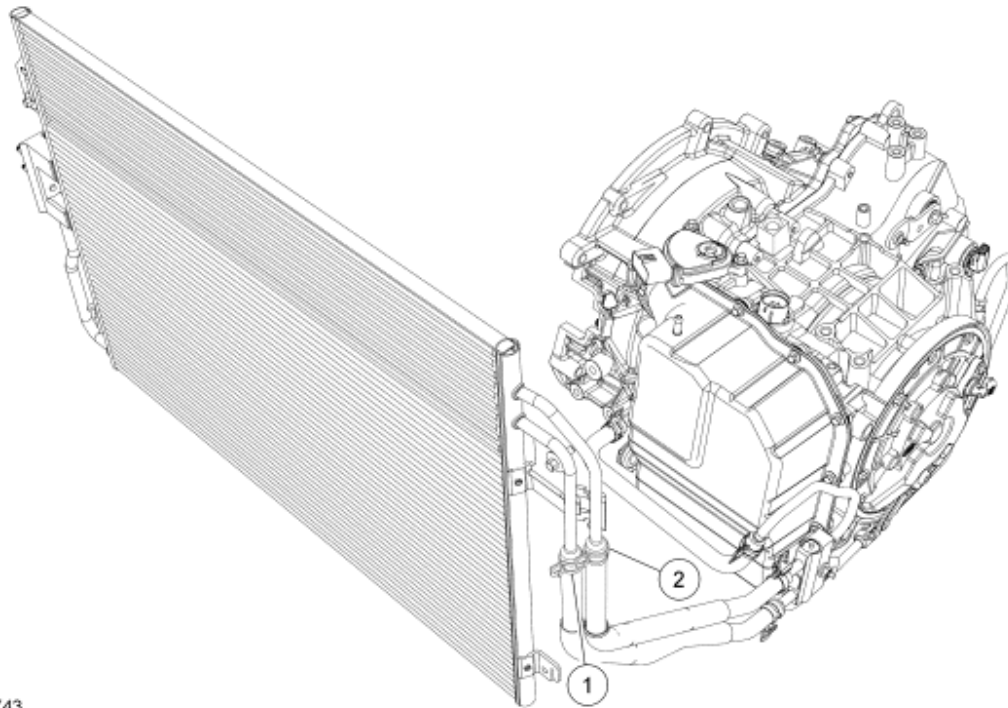
GENERAL PROCEDURES**TRANSMISSION FLUID COOLER BACKFLUSHING AND CLEANING**



N0064040

Fig. 64: Transmission Fluid Combo Cooler Without Cooler Bypass Valve
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Transmission fluid cooler outlet tube
2	-	Transmission fluid cooler inlet tube



N0066743

Fig. 65: Transmission Fluid Combo Cooler With Cooler Bypass Valve
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Transmission fluid cooler outlet tube
2	-	Transmission fluid cooler inlet tube

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the retainer, the 5 bolts and the LH splash shield.

CAUTION: Do not exceed 276 kPa (40 psi) of air pressure when flushing the transmission fluid cooler or damage to the internal transmission fluid cooler fins will occur.

CAUTION: Flush with clean transmission fluid only. Do not use solvents, mineral spirits or water-based cleaners.

3. Backflush any contaminants from the oil-to-air cooler by connecting the flushing machine pressure line to the transmission fluid cooler outlet tube and the return line to the transmission fluid cooler inlet tube.

After 5 minutes, stop the machine, reverse the hoses and repeat the flushing.

CAUTION: Do not exceed 276 kPa (40 psi) of air pressure when flushing the

transmission fluid cooler. Damage to the transmission fluid cooler will occur.

NOTE: Some vehicles are equipped with a cold weather bypass valve which cannot be cleaned or flushed. A new valve should be installed as part of an overhaul or prior to the installation of a remanufactured transaxle.

- Using compressed air, blow through the transmission fluid coolers until all fluid is removed.

TRANSMISSION FLUID DRAIN AND REFILL

Material

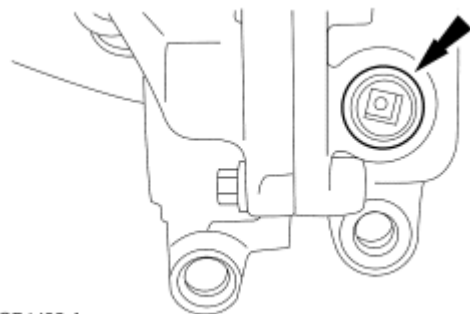
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

Draining

- With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.

NOTE: If an internal problem is suspected, drain the fluid through a paper filter. A small amount of metal or friction particles may be found from normal wear. If an excessive amount of metal or friction material is present the transaxle will need to be overhauled.

- Remove the transaxle drain plug.

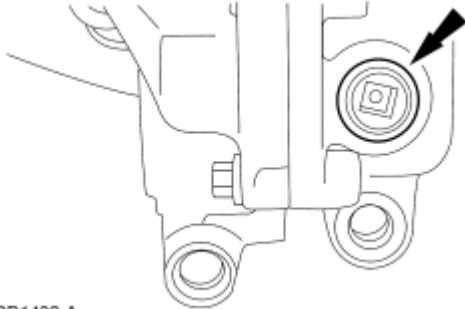


GD1438-A

Fig. 66: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

Refill

1. Using a small amount of thread sealant on the threads, install the transaxle drain plug.
 - Tighten to 25 Nm (18 lb-ft).



GD1438-A

Fig. 67: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

2. Fill the transaxle with clean automatic transmission fluid.
3. Start the engine and run through all the gears and check fluid level.

TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT

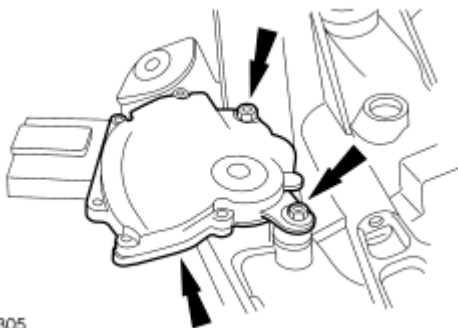
Special Tools

Illustration	Tool Name	Tool Number
 ST1633-A	Alignment Gauge, TR Sensor	307-351 (T97L-70010-A)

1. Remove the battery and tray. For additional information, refer to **CHARGING SYSTEM - GENERAL INFORMATION** article.

NOTE: Make sure the transaxle is in the **NEUTRAL** position.

2. Loosen the transmission range (TR) sensor bolts.



A0100305

Fig. 68: Locating TR Sensor & Bolts
Courtesy of FORD MOTOR CO.

3. Using the special tool, align the TR sensor and tighten the bolts.
 - Tighten to 11 Nm (8 lb-ft).

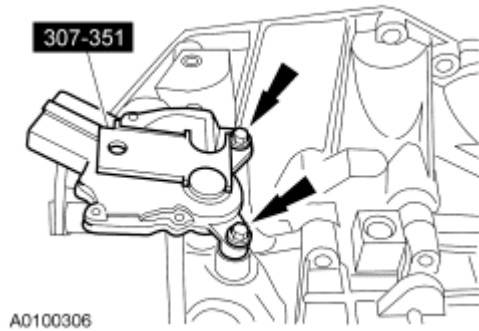


Fig. 69: Aligning TR Sensor Using Special Tools
Courtesy of FORD MOTOR CO.

4. Install the battery and tray. For additional information, refer to **CHARGING SYSTEM - GENERAL INFORMATION** article.
5. Check for correct operation. The engine should start only in PARK or NEUTRAL. The reverse lamps should illuminate in the REVERSE position.

TORQUE CONVERTER

1. A new or remanufactured torque converter must be installed if one or more of the following statements is true:
 - A torque converter malfunction has been determined based on complete diagnostic procedures.
 - Converter stud or studs, impeller hub or bushing are damaged.
 - Discoloration (due to overheating).
 - Evidence of transmission assembly or fluid contamination due to the following transmission or converter failure modes:
 - Major metallic failure.
 - Multiple clutches or clutch plate failures.
 - Sufficient component wear which results in metallic contamination.
 - Internal torque converter contamination present. For additional information refer to **Torque Converter Contamination Inspection**.

TORQUE CONVERTER CONTAMINATION INSPECTION

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

1. If a new or remanufactured torque converter is not being installed, the following steps must be completed.
2. With the torque converter on a bench, pour a small amount of transmission fluid from the torque converter onto an absorbent white tissue or through a paper filter and examine the fluid.
3. Observe the color and odor of the fluid. The fluid should be red, not brown or black. Odor may indicate an overheating condition such as clutch disc or band failure.
4. Examine the stain on the tissue for evidence of particles (spec of any kind). Examine the fluid level indicator for signs of antifreeze (gum or varnish). If particles are present in the fluid or there is evidence of engine coolant or water, a new torque converter must be installed.
5. If there are no particles or contamination present, drain the remainder of the transmission fluid from the torque converter.
6. Add 1.9L (2 qt) of clean automatic transmission fluid into the converter and agitate by hand.
7. Thoroughly drain the fluid.

IN-VEHICLE SERVICING

MAIN CONTROL COVER

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

REMOVAL

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.

3.0L engines

2. Drain the engine coolant. For additional information, refer to **ENGINE COOLING** article.

All vehicles

3. Remove the breather tube and disconnect the mass air flow (MAF) sensor electrical connector.

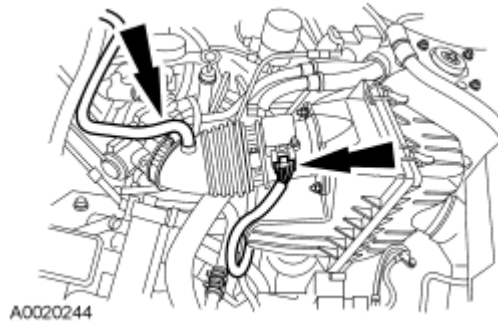


Fig. 70: Locating Breather Tube & Mass Air Flow (MAF) Sensor
Courtesy of FORD MOTOR CO.

4. Remove the intake tube and the air cleaner cover.

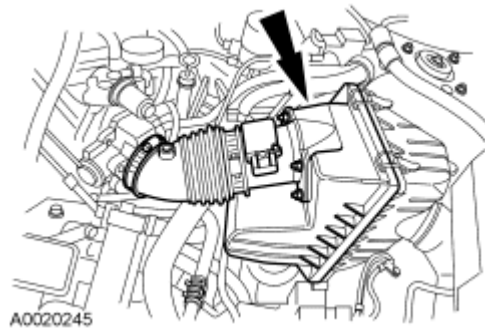


Fig. 71: Locating Intake Tube & Air Cleaner Cover
Courtesy of FORD MOTOR CO.

5. Remove the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
6. Disconnect the wiring harness from the battery tray bracket.

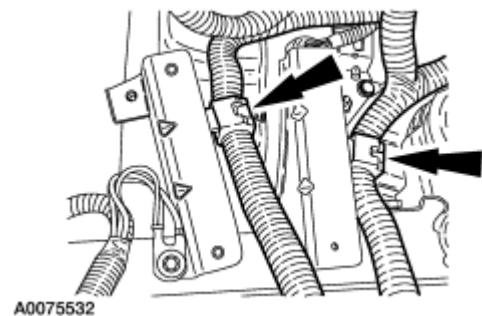
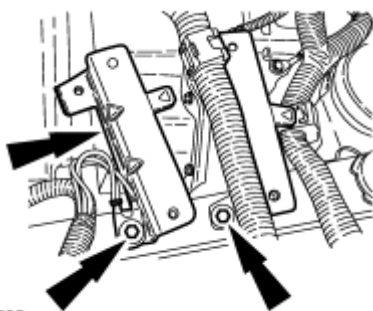


Fig. 72: Locating Battery Tray Bracket & Wiring Harness
Courtesy of FORD MOTOR CO.

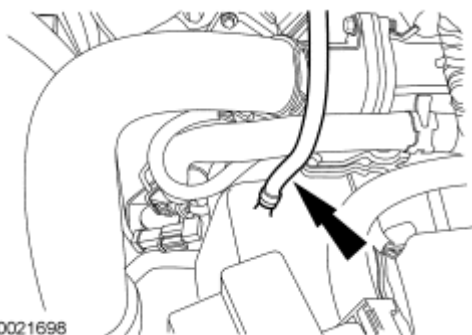
7. Remove the battery tray bracket.



A0075533

Fig. 73: Locating Battery Tray Bracket
Courtesy of FORD MOTOR CO.

8. Disconnect the vent hose from the main control cover.



A0021698

Fig. 74: Locating Vent Hose To Main Control Cover
Courtesy of FORD MOTOR CO.

3.0L engines

9. Remove the lower radiator hose and position aside.



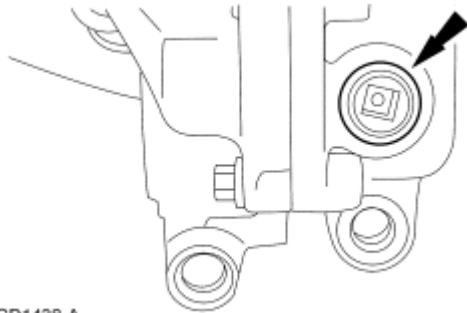
N0029794

Fig. 75: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

10. Remove the wire harness retainer from the front engine mount.

All vehicles

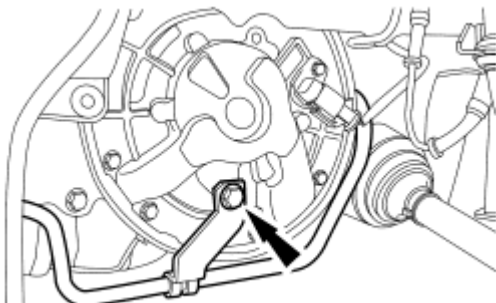
11. Remove the transaxle drain plug and drain the transmission fluid.



GD1438-A

Fig. 76: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

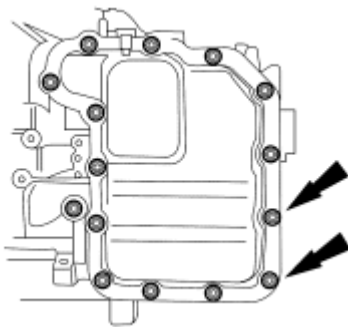
12. Remove the transmission fluid cooler tube bracket bolt.



N0029795

Fig. 77: Locating Transmission Fluid Cooler Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

13. Remove the main control cover bolts, transmission fluid cooler bypass studs and the cover.



N0014663

Fig. 78: Locating Main Control Cover Bolts, Studs & Cover
Courtesy of FORD MOTOR CO.

NOTE: Do not discard the gasket. It is a reusable type. Inspect the gasket for damage. Install a new gasket as necessary.

14. Remove the main control cover gasket.

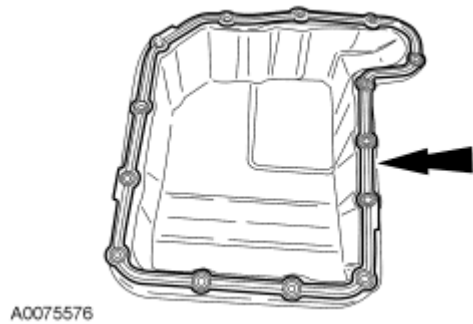


Fig. 79: Locating Main Control Cover Gasket
Courtesy of FORD MOTOR CO.

INSTALLATION

All vehicles

NOTE: The main control cover gasket is a reusable type. Inspect the gasket for damage. Install a new gasket as necessary.

1. Install the main control cover gasket.

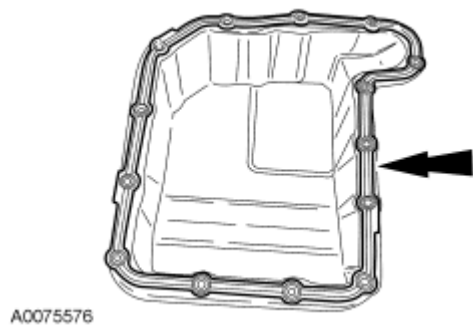
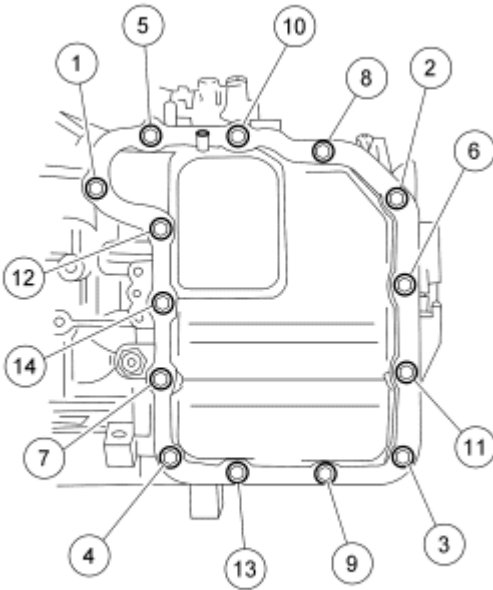


Fig. 80: Locating Main Control Cover Gasket
Courtesy of FORD MOTOR CO.

NOTE: Install studs in locations 3 and 11.

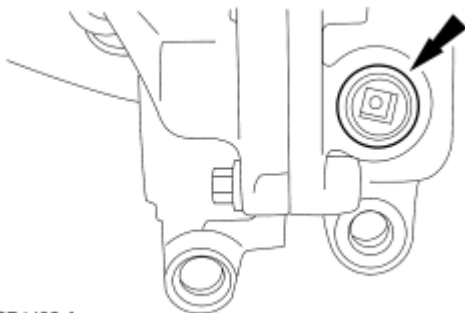
2. Install the main control cover.
 - Tighten to 13 Nm (10 lb-ft), in the sequence shown.



AD100508

Fig. 81: Identifying Main Control Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

3. Using a small amount of pipe sealant on the threads, install the transaxle drain plug.
 - Tighten to 27 Nm (20 lb-ft).



GD1438-A

Fig. 82: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

4. Position the transmission fluid cooler tube in place and install the bolt.
 - Tighten to 25 Nm (18 lb-ft).

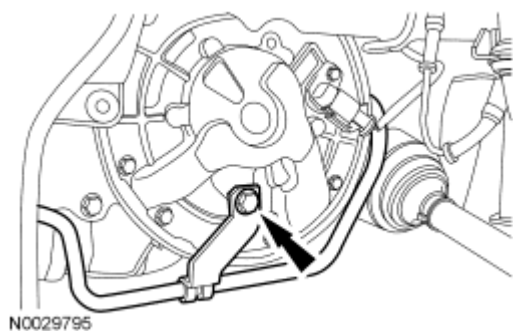


Fig. 83: Locating Transmission Fluid Cooler Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

3.0L engines

5. Install the wire harness retainer to the front engine mount.
6. Install the lower radiator hose.



Fig. 84: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

All vehicles

7. Connect the vent hose to the main control cover.

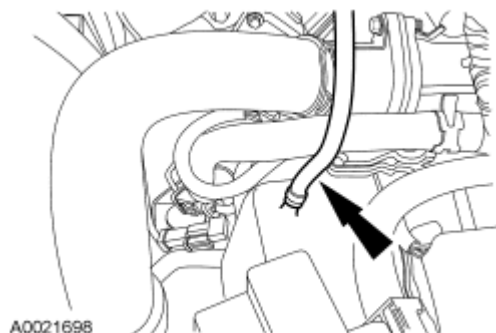


Fig. 85: Locating Vent Hose To Main Control Cover
Courtesy of FORD MOTOR CO.

8. Install the intake tube and the air cleaner cover.

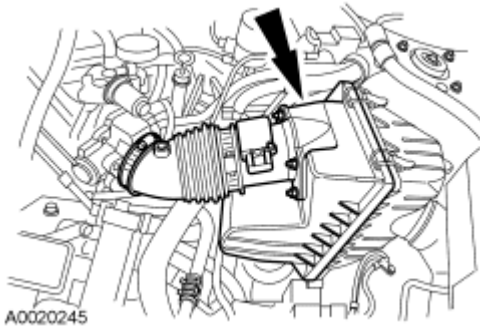


Fig. 86: Locating Intake Tube & Air Cleaner Cover
Courtesy of FORD MOTOR CO.

9. Install the breather tube and connect the MAF sensor electrical connector.

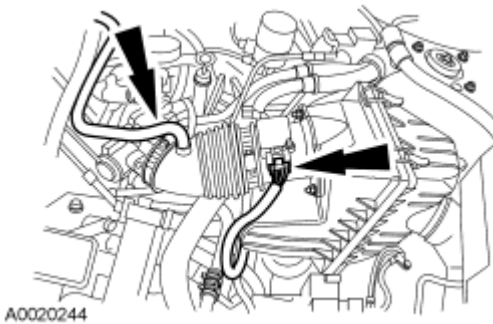


Fig. 87: Locating Breather Tube & Mass Air Flow (MAF) Sensor
Courtesy of FORD MOTOR CO.

10. Install the battery tray bracket.
 - Tighten to 10 Nm (89 lb-in).

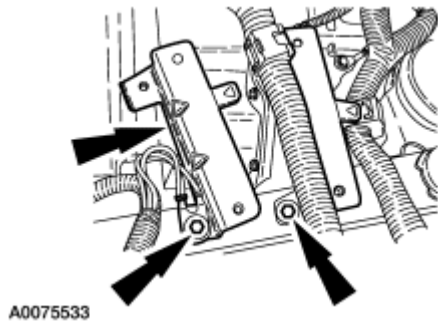


Fig. 88: Locating Battery Tray Bracket
Courtesy of FORD MOTOR CO.

11. Connect the wiring harness to the battery tray bracket.

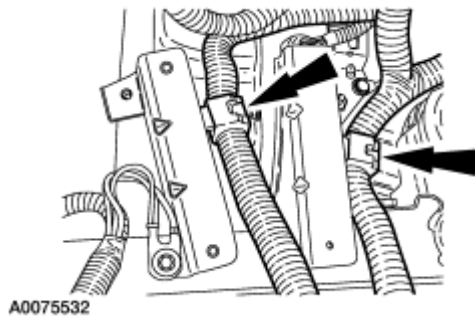


Fig. 89: Locating Battery Tray Bracket & Wiring Harness
Courtesy of FORD MOTOR CO.

12. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
13. Fill the transaxle with clean transmission fluid.

3.0L engines

14. Fill the engine cooling system. For additional information, refer to **ENGINE COOLING** article.

All vehicles

15. Start the engine, run through all of the gears and check the transmission fluid level.

MAIN CONTROL VALVE BODY

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

REMOVAL

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.

3.0L engine

2. Drain the engine coolant. For additional information, refer to **ENGINE COOLING** article.

All vehicles

3. Remove the breather tube and disconnect the mass air flow (MAF) sensor electrical connector.

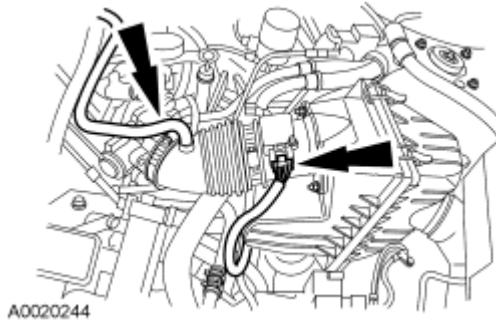


Fig. 90: Locating Breather Tube & Mass Air Flow (MAF) Sensor
Courtesy of FORD MOTOR CO.

4. Remove the intake tube and the air cleaner cover.

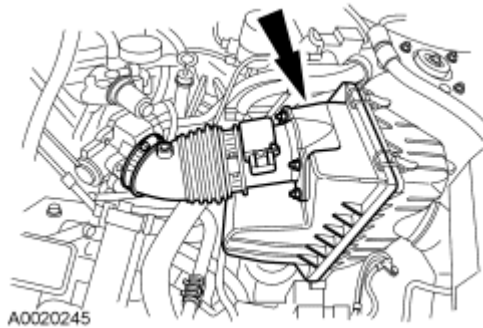


Fig. 91: Locating Intake Tube & Air Cleaner Cover
Courtesy of FORD MOTOR CO.

5. Remove the battery and tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
6. Disconnect the wiring harness from the battery tray bracket.

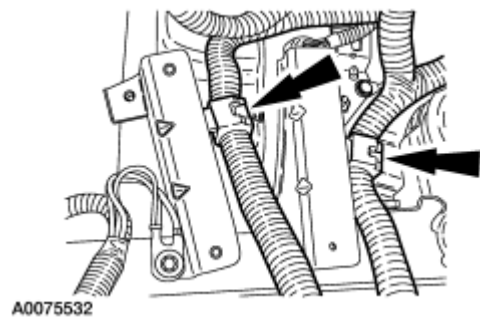


Fig. 92: Locating Battery Tray Bracket & Wiring Harness
Courtesy of FORD MOTOR CO.

7. Remove the battery tray bracket.

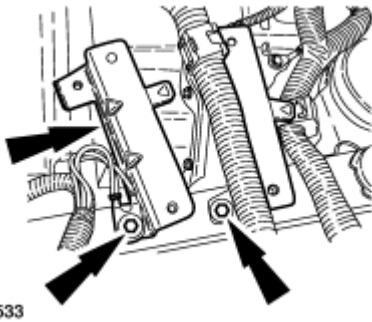


Fig. 93: Locating Battery Tray Bracket
Courtesy of FORD MOTOR CO.

8. Disconnect the transaxle wiring harness electrical connector and the transmission range (TR) sensor electrical connector.

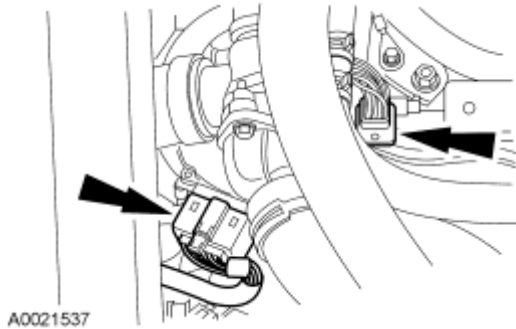


Fig. 94: Locating Transaxle Wiring Harness Electrical Connector
Courtesy of FORD MOTOR CO.

9. Disconnect the selector lever cable.

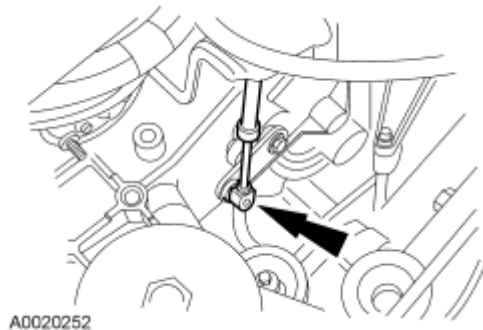


Fig. 95: Locating Shift Cable End At Manual Lever
Courtesy of FORD MOTOR CO.

10. Remove the selector lever cable and bracket and position it aside.

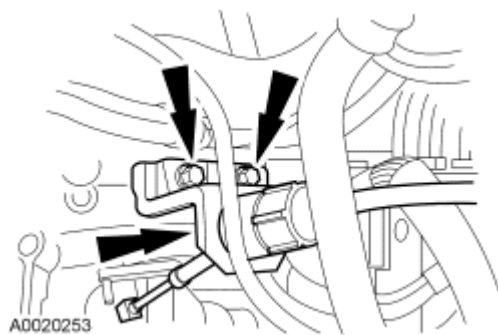


Fig. 96: Locating Gearshift Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

11. Remove the vent tube hose from the main control cover.

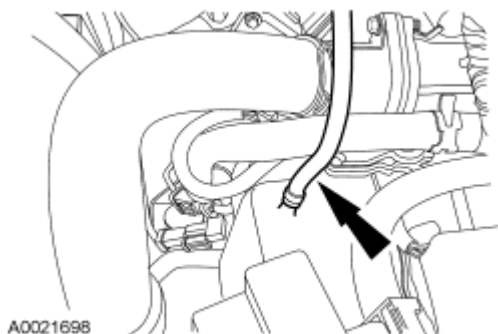


Fig. 97: Locating Vent Hose To Main Control Cover
Courtesy of FORD MOTOR CO.

3.0L engine

12. Remove the lower radiator hose and position aside.



Fig. 98: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

13. Remove the wire harness retainer from the front engine mount.

All vehicles

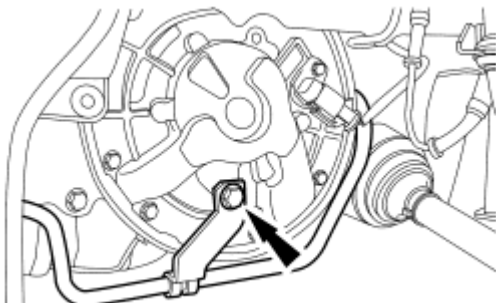
14. Remove the transaxle drain plug and drain the transmission fluid.



GD1438-A

Fig. 99: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

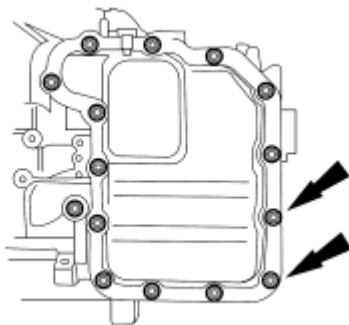
15. Remove the transmission fluid cooler tube bracket bolt.



N0029795

Fig. 100: Locating Transmission Fluid Cooler Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

16. Remove the main control cover bolts, studs and the cover.



N0014663

Fig. 101: Locating Main Control Cover Bolts, Studs & Cover
Courtesy of FORD MOTOR CO.

NOTE: Do not discard the gasket. It is a reusable type. Inspect the gasket for damage. Install a new gasket as necessary.

17. Remove the main control cover gasket.

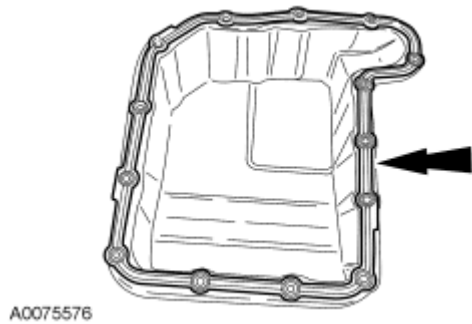


Fig. 102: Locating Main Control Cover Gasket
Courtesy of FORD MOTOR CO.

18. Remove the main control valve body bolts.

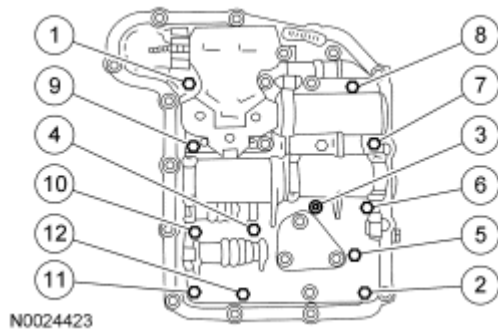


Fig. 103: Main Control Valve Body Mounting Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Do not damage the manual valve.

19. Lift the main control valve body while disconnecting the manual valve link.

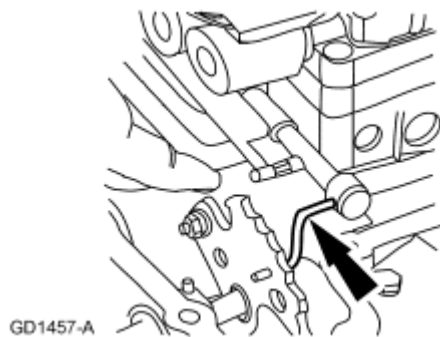


Fig. 104: Manual Valve Link At Main Control Valve Body
Courtesy of FORD MOTOR CO.

20. Depress the retaining tabs and push the solenoid valve body electrical connector down through the transaxle case.

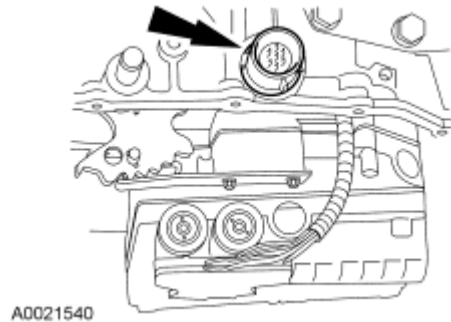


Fig. 105: Locating Solenoid Valve Body Electrical Connector Retaining Tabs
Courtesy of FORD MOTOR CO.

21. Make sure the manual valve does not fall out of the main control valve body while removing from the vehicle.

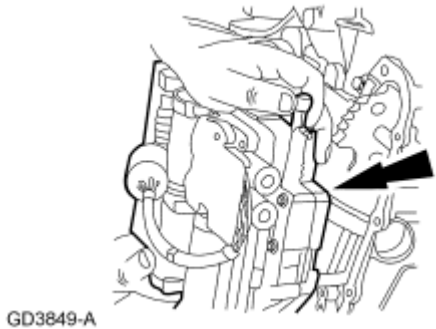


Fig. 106: Main Control Valve Body & Holding Manual Valve
Courtesy of FORD MOTOR CO.

INSTALLATION

All vehicles

1. Install the manual control lever in the main control valve body.

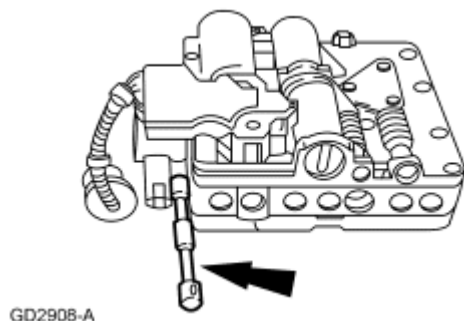


Fig. 107: Manual Control Lever & Main Control Valve Body
Courtesy of FORD MOTOR CO.

NOTE: **Inspect the solenoid valve body harness connector O-ring seal for damage. If damaged, install a new O-ring seal, before installing the connector into the case.**

2. Depress the retaining tabs and push the solenoid valve body electrical connector up through the transaxle case.

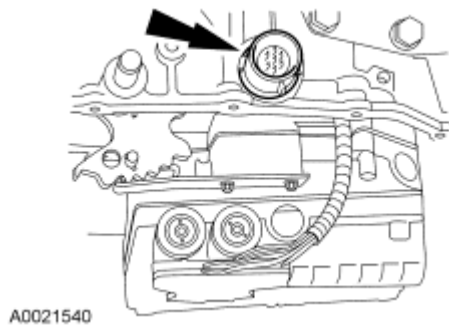


Fig. 108: Locating Solenoid Valve Body Electrical Connector Retaining Tabs
Courtesy of FORD MOTOR CO.

3. Position the main control valve body in place while connecting the manual valve link.

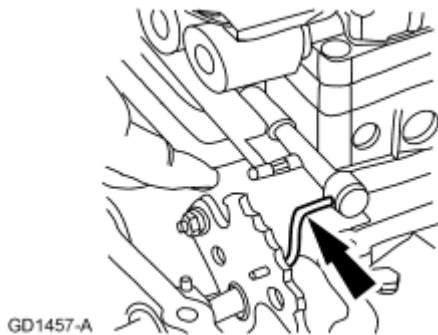


Fig. 109: Manual Valve Link At Main Control Valve Body
Courtesy of FORD MOTOR CO.

4. Install the main control valve body assembly. Tighten the bolts in the sequence indicated.
 - Tighten to 10 Nm (89 lb-in).

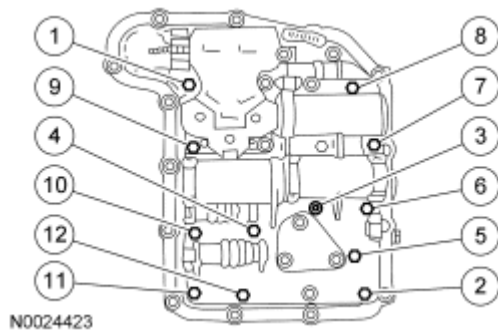


Fig. 110: Main Control Valve Body Mounting Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: The main control cover gasket is a reusable type. Inspect the gasket for damage. Install a new gasket as necessary.

5. Install the main control cover gasket.

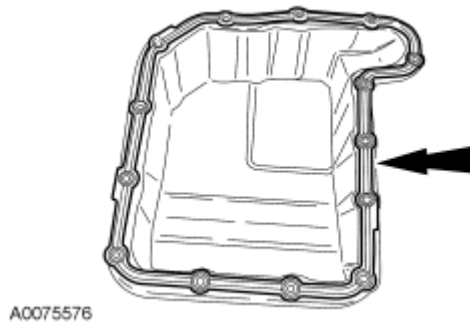
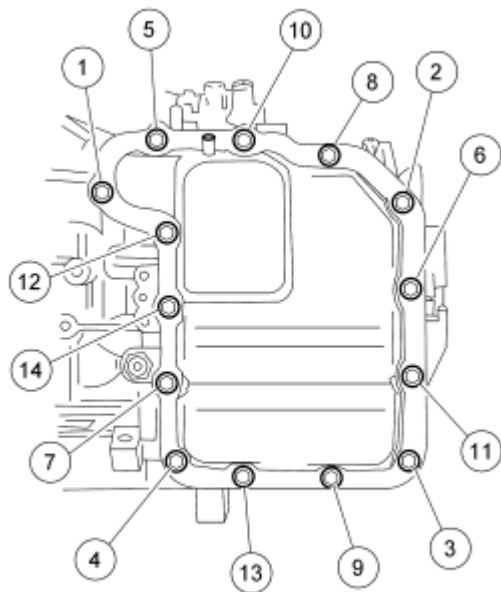


Fig. 111: Locating Main Control Cover Gasket
Courtesy of FORD MOTOR CO.

NOTE: Install the cooler bypass valve studs in locations 3 and 11.

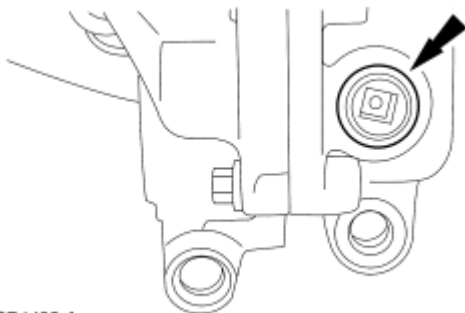
6. Install the main control cover. Tighten the bolts and studs in the indicated sequence.
 - Tighten to 13 Nm (10 lb-ft).



AD100508

Fig. 112: Identifying Main Control Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

7. Using a small amount of pipe sealant on the threads, install the transaxle drain plug.
 - Tighten to 27 Nm (20 lb-ft).



GD1438-A

Fig. 113: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

8. Position the transmission fluid cooler tube in place and install the bolt.
 - Tighten to 25 Nm (18 lb-ft).

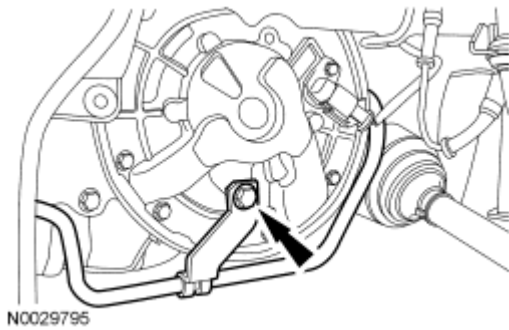


Fig. 114: Locating Transmission Fluid Cooler Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

3.0L engine

9. Install the wire harness retainer to the front engine mount.
10. Install the lower radiator hose.



Fig. 115: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

All vehicles

11. Install the selector lever cable and bracket.
 - Tighten to 23 Nm (17 lb-ft).

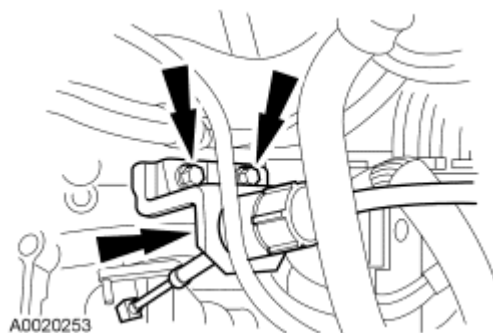


Fig. 116: Locating Gearshift Cable Bracket Bolts

Courtesy of FORD MOTOR CO.

12. Connect the selector lever cable end.

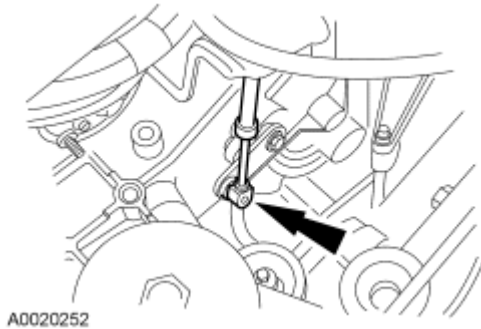


Fig. 117: Locating Shift Cable End At Manual Lever
Courtesy of FORD MOTOR CO.

13. Connect the vent hose to the main control cover.

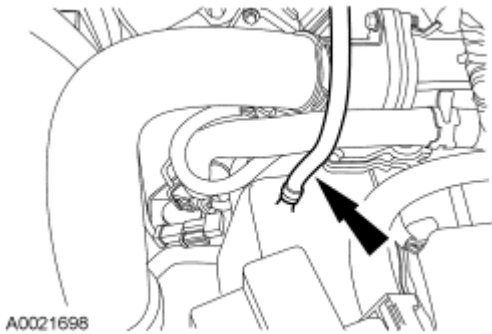


Fig. 118: Locating Vent Hose To Main Control Cover
Courtesy of FORD MOTOR CO.

14. Connect the transaxle wiring harness electrical connector and the transmission range (TR) sensor electrical connector.

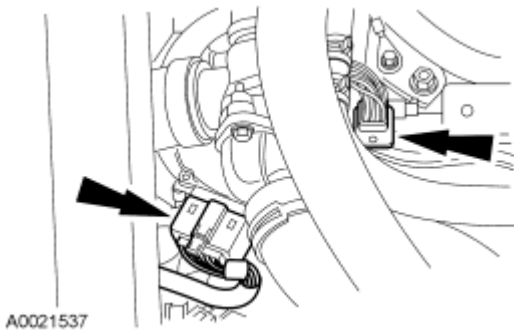


Fig. 119: Locating Transaxle Wiring Harness Electrical Connector
Courtesy of FORD MOTOR CO.

15. Install the intake tube and the air cleaner cover.

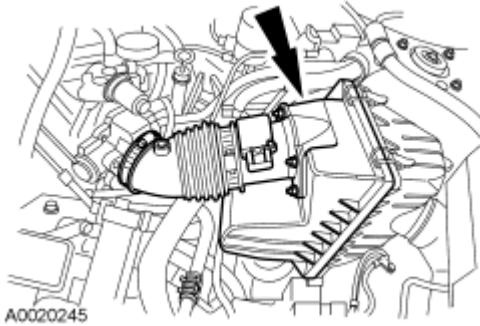


Fig. 120: Locating Intake Tube & Air Cleaner Cover
Courtesy of FORD MOTOR CO.

16. Install the breather tube and connect the MAF sensor electrical connector.

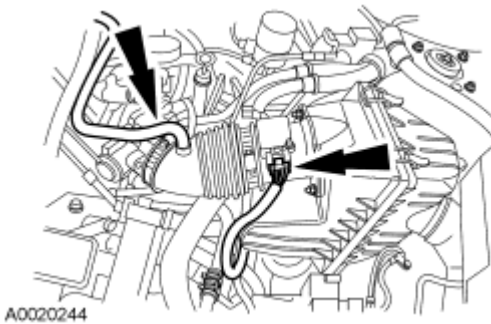


Fig. 121: Locating Breather Tube & Mass Air Flow (MAF) Sensor
Courtesy of FORD MOTOR CO.

17. Install the battery tray bracket.
- Tighten to 10 Nm (89 lb-in).

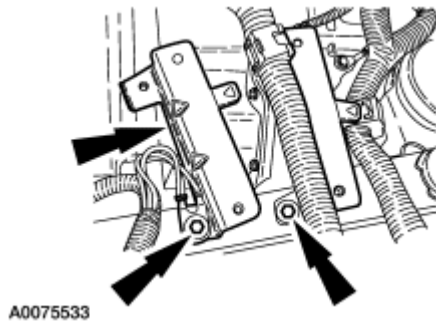


Fig. 122: Locating Battery Tray Bracket
Courtesy of FORD MOTOR CO.

18. Connect the wiring harness to the battery tray bracket.

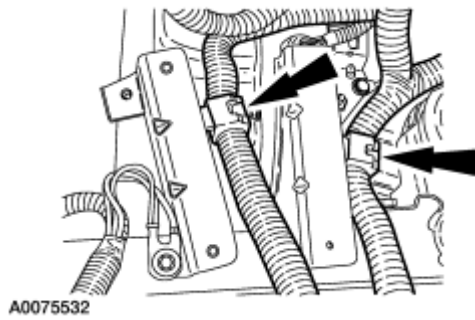


Fig. 123: Locating Battery Tray Bracket & Wiring Harness
Courtesy of FORD MOTOR CO.

19. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
20. Fill the transaxle with clean transmission fluid.

3.0L engine

21. Fill the engine coolant. For additional information, refer to **ENGINE COOLING** article.

All vehicles

22. Start the engine and run through all the gears and check transmission fluid level.

TURBINE SHAFT SPEED (TSS) SENSOR

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

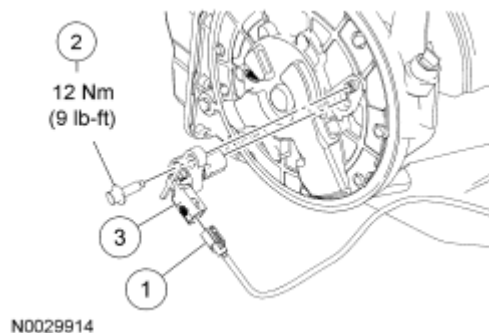


Fig. 124: Exploded View Of Turbine Shaft Speed (TSS) Sensor With Torque Specification
Courtesy of FORD MOTOR CO.

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

Item	Part Number	Description
1	-	Turbine shaft speed (TSS) electrical connector
2	-	TSS sensor bolt
3	-	TSS sensor

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the 7 retainers and the LH splash shield.
 - To install, tighten to 10 Nm (89 lb-in).

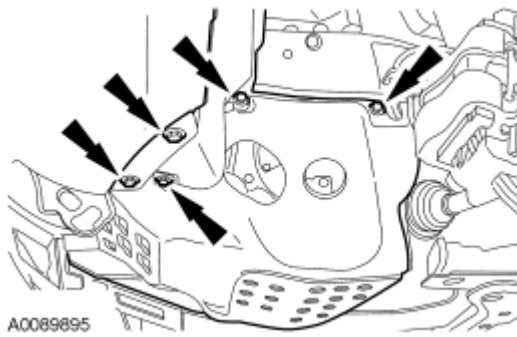


Fig. 125: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

3. Remove the turbine shaft speed (TSS) sensor
 1. Disconnect the TSS electrical connector.
 2. Remove the TSS sensor bolt.
 3. Remove the TSS sensor.
 4. To install, tighten to 12 Nm (9 lb-ft).

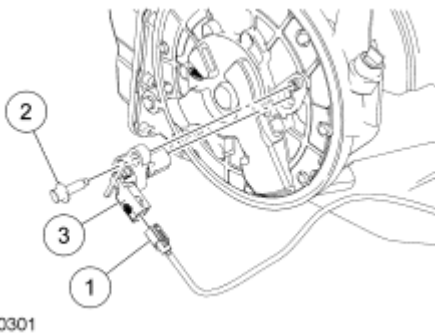


Fig. 126: Identifying Turbine Shaft Speed (TSS) Sensor
Courtesy of FORD MOTOR CO.

NOTE: When installing the sensor, lubricate the O-ring seal with clean transmission fluid.

4. Inspect the O-ring seal for nicks or cuts. Install a new O-ring seal as necessary.

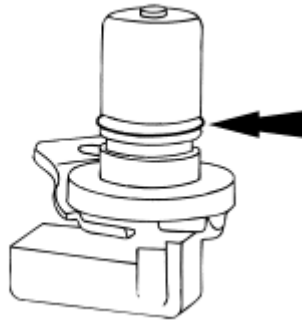


Fig. 127: Identifying O-Ring Seal
Courtesy of FORD MOTOR CO.

5. To install, reverse the removal procedure.

OUTPUT SHAFT SPEED (OSS) SENSOR

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

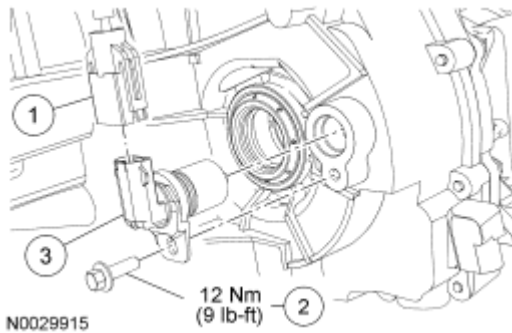


Fig. 128: Exploded View Of Output Shaft Speed (OSS) Sensor With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Output shaft speed (OSS) electrical connector
2	-	OSS sensor bolt
3	-	OSS sensor

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the 7 retainers and the LH splash shield.
 - To install, tighten to 10 Nm (89 lb-in).

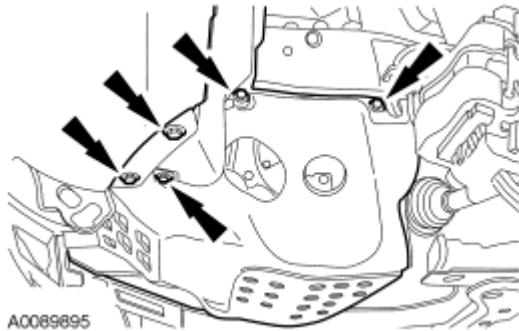


Fig. 129: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

3. Remove the output shaft speed (OSS) sensor
 1. Disconnect the OSS electrical connector.
 2. Remove the OSS sensor bolt.
 3. Remove the OSS sensor.
 - To install, tighten to 12 Nm (9 lb-ft).

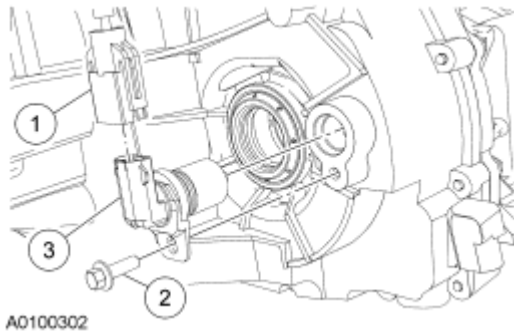
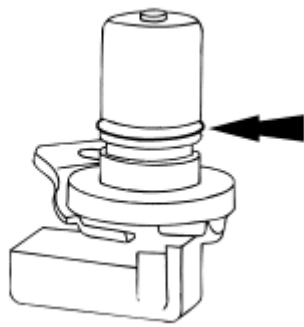


Fig. 130: Identifying Output Shaft Speed (OSS) Sensor
Courtesy of FORD MOTOR CO.

NOTE: When installing the sensor, lubricate the O-ring seal with clean transmission fluid.

4. Inspect the O-ring seal for nicks or cuts. Install a new O-ring seal as necessary.



GD3777-A

Fig. 131: Identifying O-Ring Seal
 Courtesy of FORD MOTOR CO.

5. To install, reverse the removal procedure.

DIFFERENTIAL SEALS - LH

Special Tools

Illustration	Tool Name	Tool Number
 ST1957-A	Installer, Halfshaft Output Fluid Seal	307-157 (T86P-1177-B)
 ST2381-A	Remover, Input Shaft Oil Seal	308-375
 ST1185-A	Slide Hammer	100-001 (T50T-100-A)

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

REMOVAL

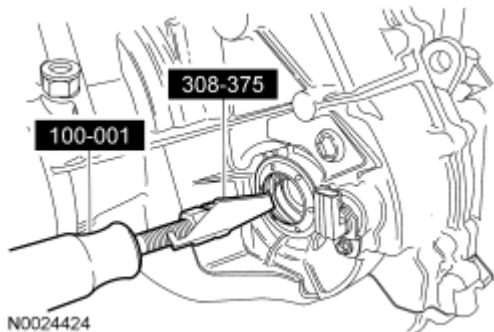
1. With the vehicle in **NEUTRAL**, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the transaxle drain plug and drain the fluid.



GD1438-A

Fig. 132: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

3. Remove the LH halfshaft. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.
4. Using the special tools, remove and discard the LH differential seal.

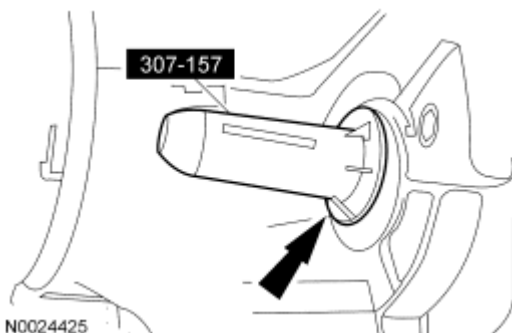


N0024424

Fig. 133: Removing LH Differential Seal Using Special Tools
Courtesy of FORD MOTOR CO.

INSTALLATION

1. Using the special tool, install the LH differential seal.



N0024425

Fig. 134: Installing LH Differential Seal Using Special Tools
Courtesy of FORD MOTOR CO.

2. Install the LH halfshaft. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.
3. Using a small amount of thread sealant on the threads, install the transaxle drain plug.
 - Tighten to 25 Nm (18 lb-ft).

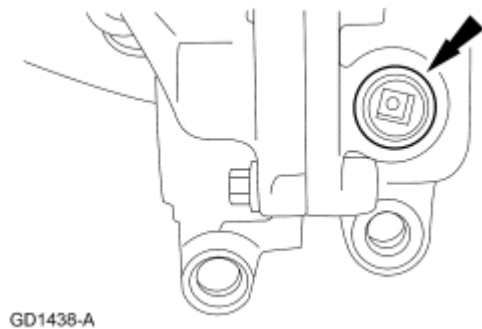


Fig. 135: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

4. Fill the transaxle with clean automatic transmission fluid.
5. Start the engine and run through all the gears and check fluid level.

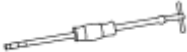
DIFFERENTIAL SEALS - RH

Special Tools

Illustration	Tool Name	Tool Number
ST1957-A	Installer, Halfshaft Output Fluid Seal	307-157 (T86P-1177-B)
ST2525-A	Installer, RH Halfshaft Fluid Seal	307-428
ST2381-A	Remover, Input Shaft Oil Seal	308-375

2008 Ford Escape

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 ST2526-A	Remover, RH Halfshaft Fluid Seal	307-429
 ST1185-A	Slide Hammer	100-001 (T50T-100-A)

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

REMOVAL

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the transaxle drain plug and drain the transmission fluid.

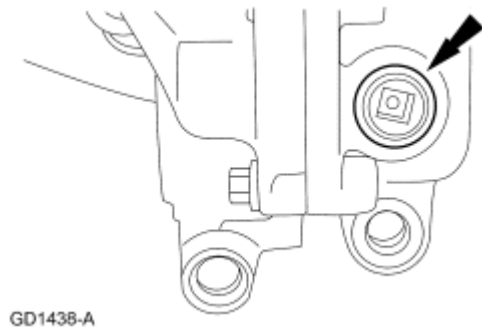


Fig. 136: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

3. Remove the RH halfshaft and intermediate shaft. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.
4. If equipped, remove the power transfer unit (PTU). For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.
5. If the vehicle is equipped with a PTU, use the special tools to remove the RH differential seal.

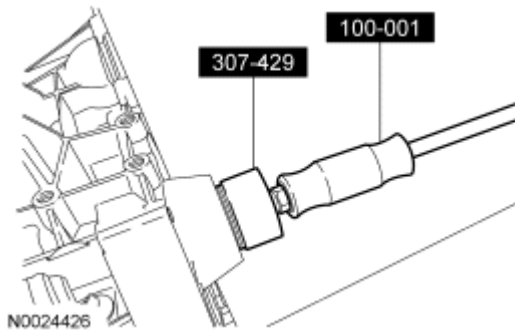


Fig. 137: Removing RH Differential Seal Using Special Tools (1 Of 2)
Courtesy of FORD MOTOR CO.

6. If the vehicle is not equipped with a PTU, use the special tools to remove the RH differential seal.

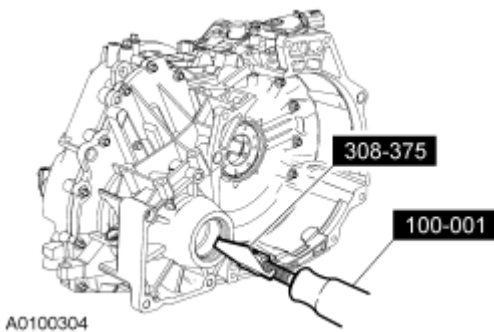


Fig. 138: Removing RH Differential Seal Using Special Tools (2 Of 2)
Courtesy of FORD MOTOR CO.

INSTALLATION

1. If the vehicle is equipped with a PTU, use the special tools to install the RH differential seal.

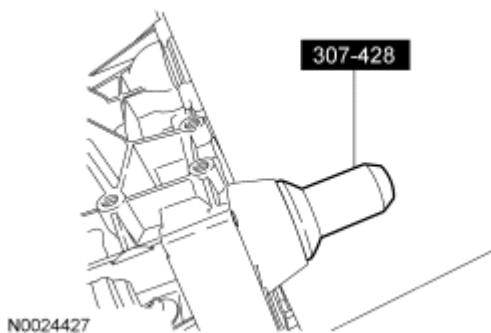


Fig. 139: Installing RH Differential Seal Using Special Tools (1 Of 2)
Courtesy of FORD MOTOR CO.

2. If the vehicle is not equipped with a PTU, use the special tools to install the RH differential seal.

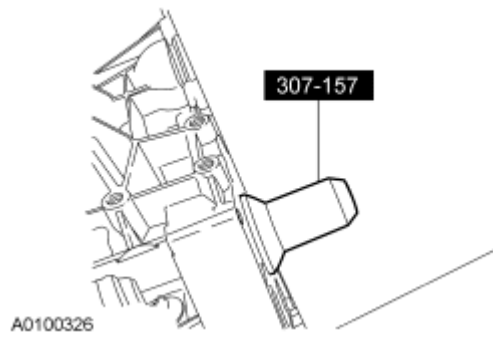


Fig. 140: Installing RH Differential Seal Using Special Tools (2 Of 2)
Courtesy of FORD MOTOR CO.

3. If equipped, install the PTU. For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.
4. Install the RH halfshaft. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.
5. Using a small amount of thread sealant on the threads, install the transaxle drain plug.
 - Tighten to 25 Nm (18 lb-ft).

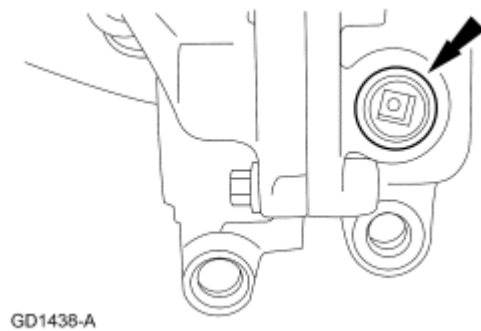


Fig. 141: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

6. Fill the transaxle with clean automatic transmission fluid.
7. Start the engine and run through all the gears and check the fluid level.

TRANSMISSION RANGE (TR) SENSOR

Special Tools

Illustration	Tool Name	Tool Number
 ST1633-A	Alignment Gauge, TR Sensor	307-351 (T97L-70010-A)

REMOVAL

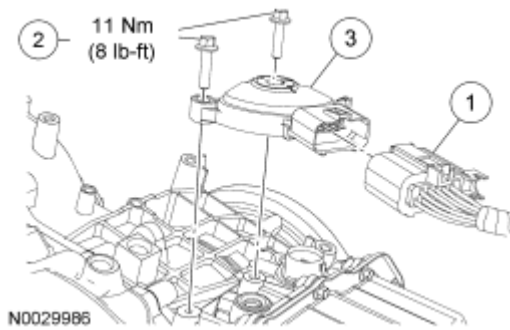


Fig. 142: Exploded View Of Transmission Range (TR) Sensor With Torque Specification
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Transmission range (TR) sensor electrical connector
2	-	TR sensor bolts
3	-	TR sensor

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the battery and tray. For additional information, refer to **CHARGING SYSTEM - GENERAL INFORMATION** article.
3. Remove the transmission range (TR) sensor.
 1. Disconnect the TR sensor electrical connector.
 2. Remove the TR sensor retaining bolts.
 3. Remove the TR sensor.

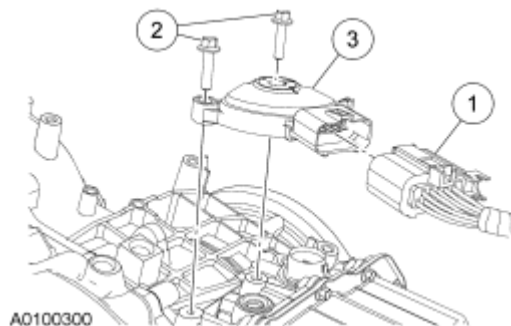
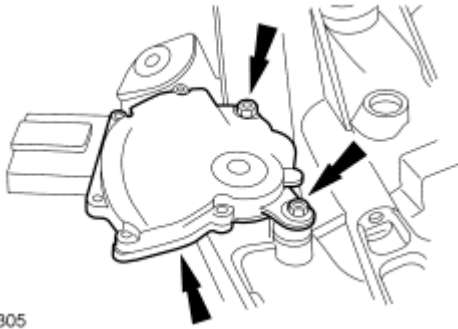


Fig. 143: Identifying Transmission Range (TR) Sensor Components
 Courtesy of FORD MOTOR CO.

INSTALLATION

NOTE: Make sure the transaxle is in the NEUTRAL position.

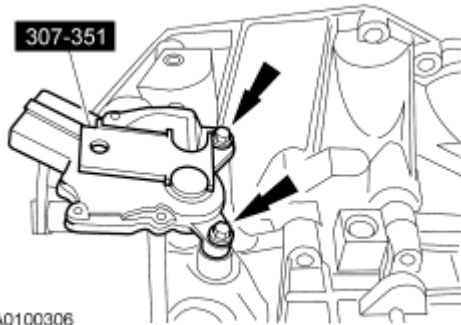
1. Install the TR sensor and loosely install the bolts.



A0100305

Fig. 144: Locating TR Sensor & Bolts
Courtesy of FORD MOTOR CO.

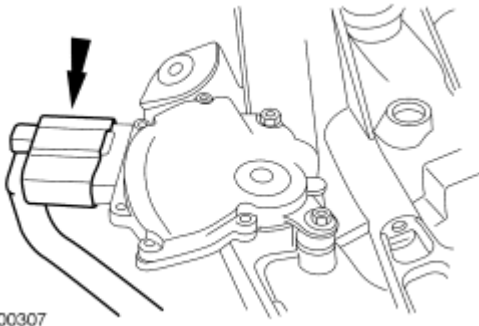
2. Using the special tool, align the TR sensor and tighten the bolts.
 - Tighten to 11 Nm (8 lb-ft).



A0100306

Fig. 145: Aligning TR Sensor Using Special Tools
Courtesy of FORD MOTOR CO.

3. Connect the TR sensor electrical connector.



A0100307

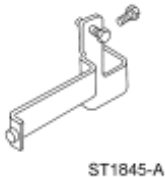
Fig. 146: Locating TR Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

4. Install the battery and tray. For additional information, refer to **CHARGING SYSTEM - GENERAL**

INFORMATION article.

5. Check the correct operation. The engine should start only in PARK or NEUTRAL. The reverse lamps should illuminate in the REVERSE position.

OVERDRIVE SERVO**Special Tools**

Illustration	Tool Name	Tool Number
 ST1845-A	Remover/Installer, Servo Cover	307-295 (T94P-77000-L)

REMOVAL

NOTE: Servicing the intermediate/overdrive servo in the vehicle is only recommended in the event of a leak. If the servo has failed it will be necessary to remove and disassemble the transaxle to inspect the intermediate/overdrive band assembly and direct clutch for damage.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the 7 retainers and the LH splash shield.

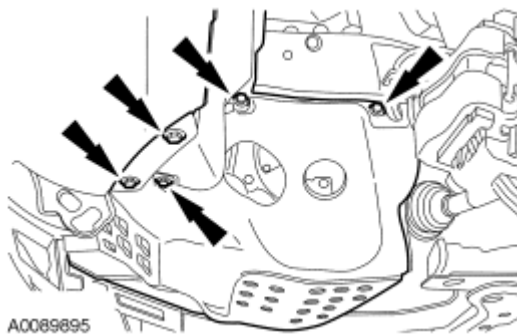


Fig. 147: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

3. Remove the transmission fluid cooler tube bracket and bolt and position it aside.

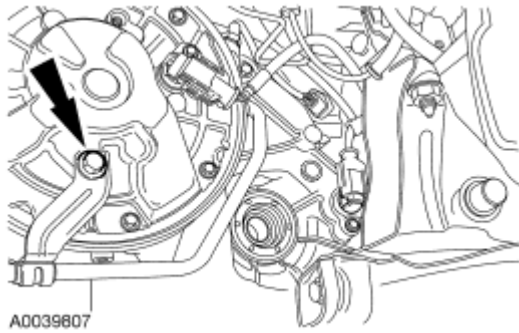


Fig. 148: Locating Transmission Fluid Cooler Line Bracket & Bolt
Courtesy of FORD MOTOR CO.

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.

CAUTION: Do not use a screwdriver to remove the retaining ring or damage to the case may occur. Use only snap ring pliers to remove the retaining ring.

4. Using the special tool, remove the servo retaining ring.
 1. Install the special tool.
 2. Compress the servo assembly by tightening the bolt.
 3. Remove the retaining ring.

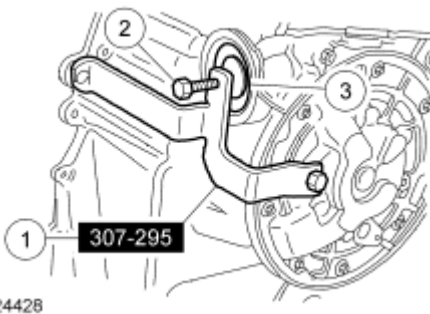


Fig. 149: Removing Servo Retaining Ring Using Special Tools
Courtesy of FORD MOTOR CO.

5. Remove the servo cover assembly.
6. Remove the intermediate and overdrive servo piston and return spring.
7. Wipe the servo piston and the servo cover cap with a lint free cloth.

CAUTION: Do not clean the rubber sealing surfaces of the servo piston and the

servo cover cap with cleaning solvent or damage to the sealing surface may result.

8. Inspect the servo piston for cracks on its pressure surfaces and in the sealing area. Look for damage near the point where the servo piston is attached to the servo rod.
9. Squeeze the servo piston lip for flexibility. If the lip feels brittle, install a new piston.
10. Inspect the servo retainer spring for cracks, breaks or deformation.

INSTALLATION

1. Install the return spring and the intermediate overdrive servo piston.
2. Install the servo cover cap.
3. Install the special tool.

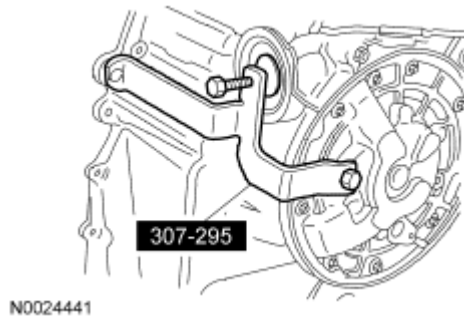


Fig. 150: Identifying Special Tool
Courtesy of FORD MOTOR CO.

CAUTION: Do not use a screwdriver to install the retaining ring or damage to the case may occur. Use only snap ring pliers to install the retaining ring.

CAUTION: If the case is stamped "WG", install a wide-groove snap ring, or the servo will be damaged.

NOTE: The WG stamp is located on the case toward the passenger side of the overdrive servo. The letters WG are etched into the case and hard to see.

NOTE: If the servo cover will not seat deep enough in the bore to install the servo cover retaining ring, use a blunt punch or small hammer and gently tap the cover around the outer edge until the servo cover retaining ring can be installed.

4. Tighten the special tool bolt.
 - Install the servo cover retaining ring.

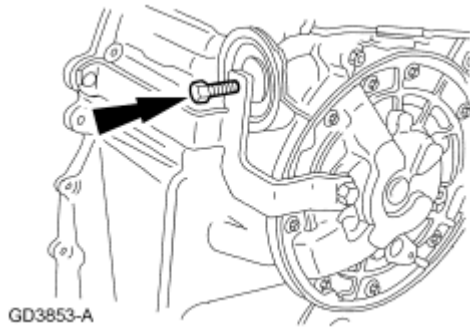


Fig. 151: Special Tool Bolt
Courtesy of FORD MOTOR CO.

5. Loosen the special tool bolt.
 - When the spring tension is released, remove the special tool.

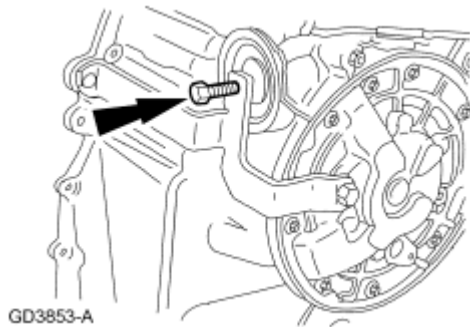


Fig. 152: Special Tool Bolt
Courtesy of FORD MOTOR CO.

6. Install the transmission fluid cooler tube and bolt.
 - Tighten to 25 Nm (18 lb-ft).

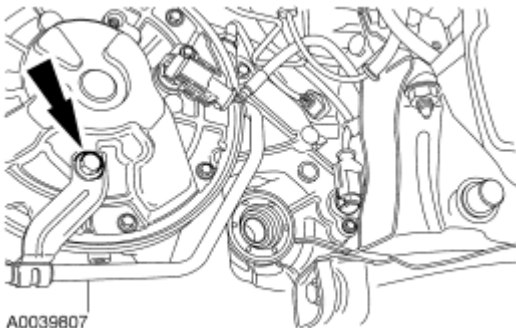


Fig. 153: Locating Transmission Fluid Cooler Line Bracket & Bolt
Courtesy of FORD MOTOR CO.

7. Install the LH splash shield and the 7 retainers.
 - Tighten to 10 Nm (89 lb-in).

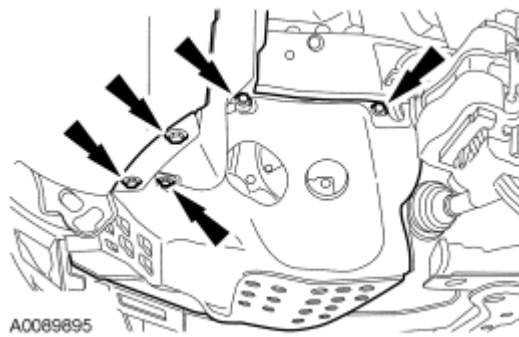
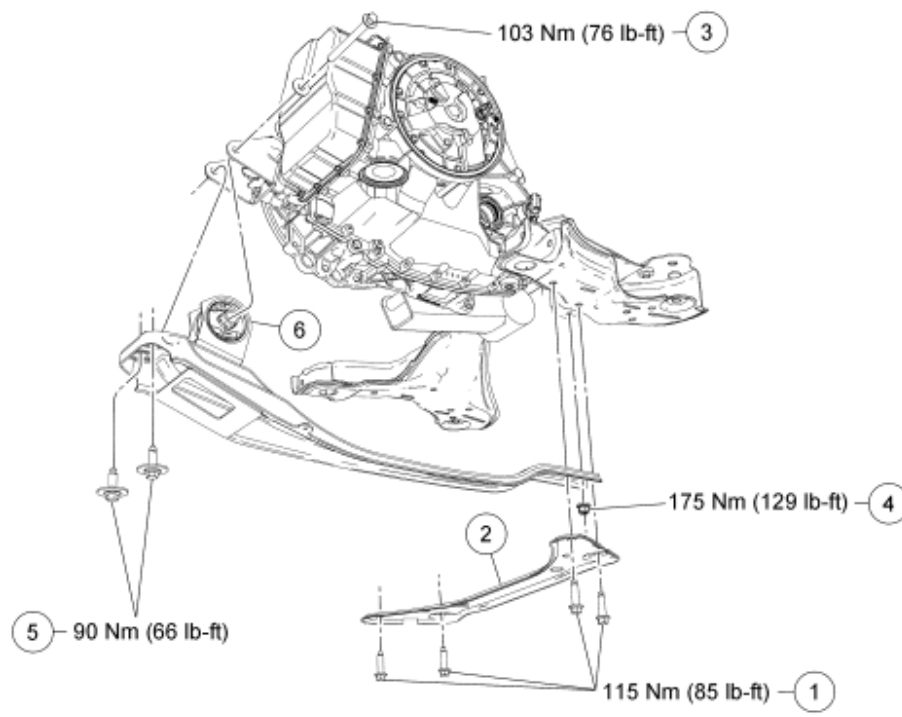


Fig. 154: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

8. Start the vehicle. Place the transmission range selector lever in each gear and allow to engage. Check for leaks.
9. Check the transmission fluid.

TRANSAXLE SUPPORT INSULATOR - LOWER, FRONT



N0079049

Fig. 155: Transaxle Support Insulator Components - Lower, Front With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W500644	Rear cross brace bolts
2	-	Cross brace
		Lower front support insulator through

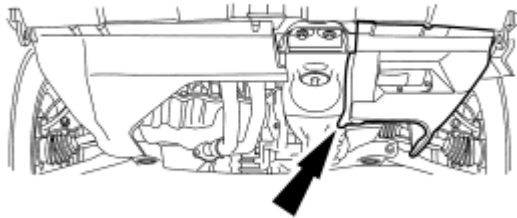
2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

3	W500743	bolt
4	W710553-S440	Cross brace nut
5	W713325	Cross brace bolts
6	6E037	Engine support crossmember

REMOVAL

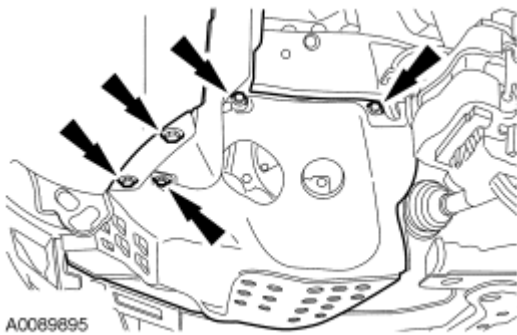
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the LH splash shield.



A0021538

Fig. 156: Locating LH Splash Shield
Courtesy of FORD MOTOR CO.

3. Remove the 7 retainers and the LH splash shield.



A0089895

Fig. 157: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

4. Remove the 4 bolts and the rear cross brace.

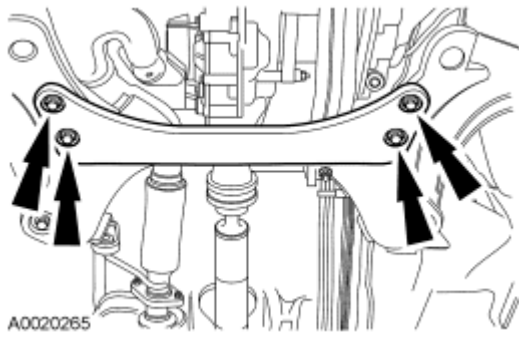


Fig. 158: Locating Cross Brace & Bolts
Courtesy of FORD MOTOR CO.

5. Remove the lower front bolt support insulator through bolt and the 2 cross brace bolts.

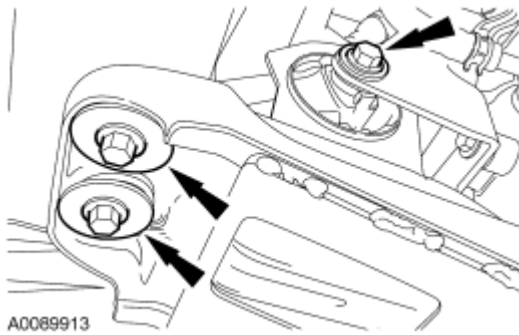


Fig. 159: Identifying Front Roll Restrictor Bolt & Bolts For Engine Support Crossmember
Courtesy of FORD MOTOR CO.

6. Remove the cross brace nut and remove the brace.

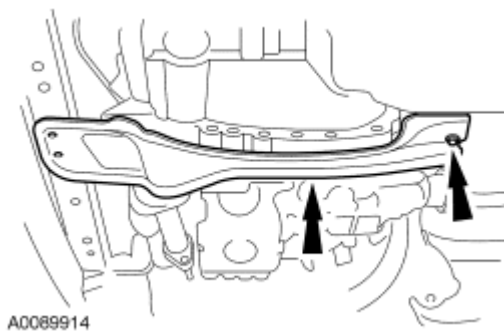


Fig. 160: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

7. Remove the 2 bolts from the mount and remove the mount.

INSTALLATION

1. Install a new mount onto the cross brace and install the bolts.

- Tighten to 115 Nm (85 lb-ft).
2. Position the cross brace in place and install the nut.
 - Tighten to 175 Nm (129 lb-ft).

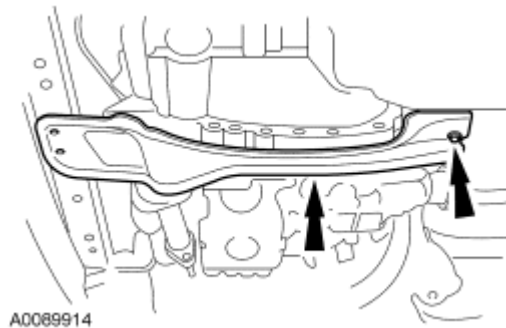


Fig. 161: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

3. Install the 2 bolts for the cross brace.
 - Tighten to 90 Nm (66 lb-ft).

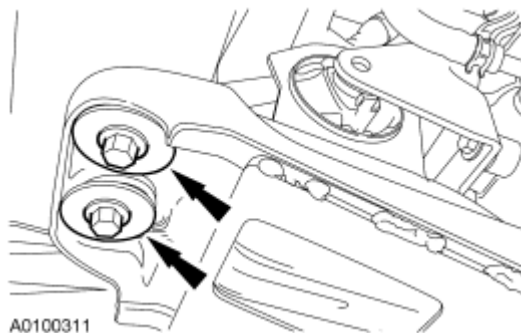


Fig. 162: Locating Cross Brace Bolts
Courtesy of FORD MOTOR CO.

4. Install the lower front support insulator through bolt for the mount.
 - Tighten to 103 Nm (76 lb-ft).

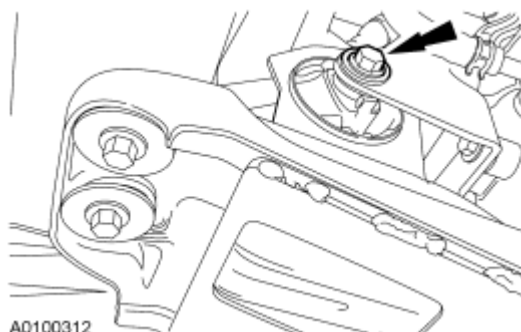


Fig. 163: Locating Mount Through Bolt
Courtesy of FORD MOTOR CO.

5. Install the rear cross brace and the 4 bolts.
 - Tighten to 115 Nm (85 lb-ft).

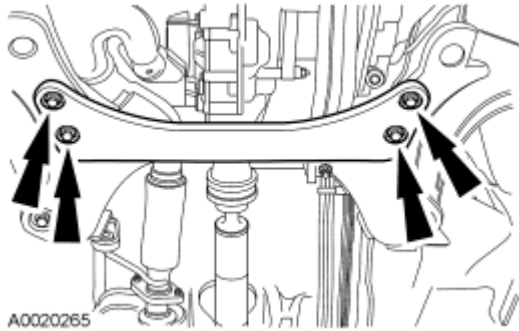


Fig. 164: Locating Cross Brace & Bolts
Courtesy of FORD MOTOR CO.

6. Install the LH splash shield and the 7 retainers.
 - Tighten to 10 Nm (89 lb-in).

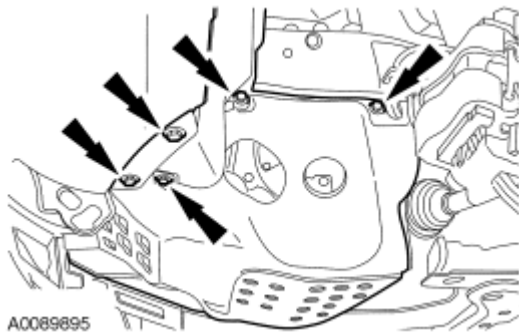


Fig. 165: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

7. Install the LH splash shield.

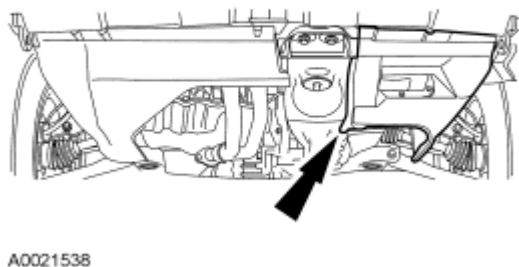


Fig. 166: Locating LH Splash Shield
Courtesy of FORD MOTOR CO.

TRANSAXLE SUPPORT INSULATOR - LOWER, REAR, 3.0L DOHC

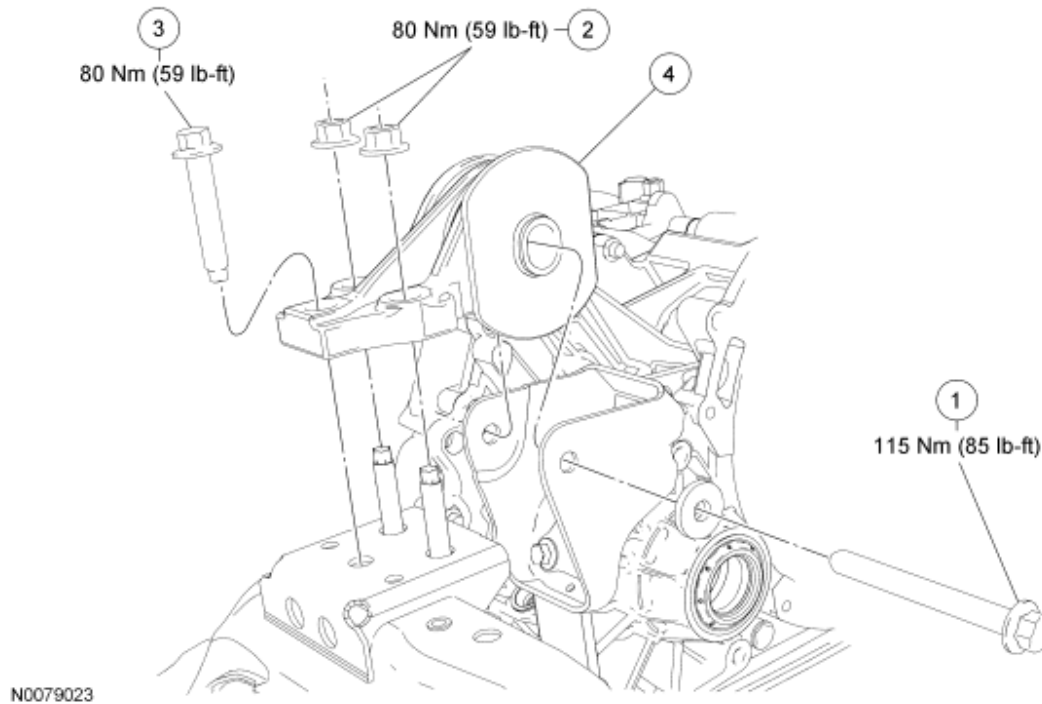


Fig. 167: Transaxle Support Insulator Components - Lower, Rear, 3.0L DOHC With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W710173	Lower support insulator through bolt
2	N807144-S440	Lower support insulator nuts
3	W500743-S439	Lower support insulator bolt
4	6E037	Lower support insulator

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Disconnect the breather tube and mass air flow (MAF) sensor.

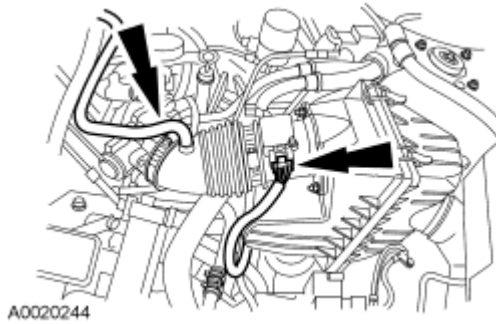


Fig. 168: Locating Breather Tube & Mass Air Flow (MAF) Sensor
Courtesy of FORD MOTOR CO.

3. Remove the intake tube and air cleaner cover.

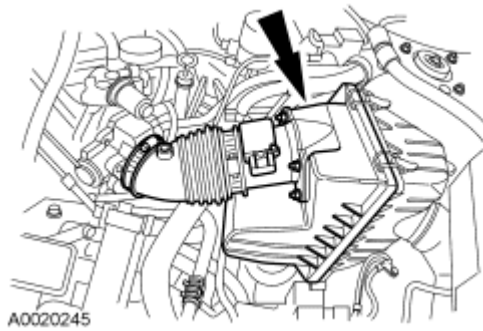


Fig. 169: Locating Intake Tube & Air Cleaner Cover
Courtesy of FORD MOTOR CO.

4. Remove the air cleaner assembly.

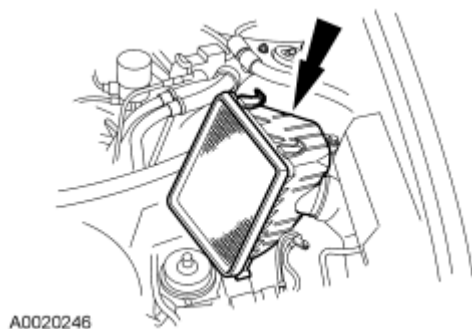


Fig. 170: Locating Air Cleaner Assembly
Courtesy of FORD MOTOR CO.

5. Remove the lower support insulator through bolt.
 - To install, tighten to 115 Nm (85 lb-ft).
6. Remove the lower support insulator bolt and 2 nuts.
 - To install, tighten to 80 Nm (59 lb-ft).

7. To install, reverse the removal procedure.

TRANSAXLE SUPPORT INSULATOR - LOWER, REAR, 2.3L

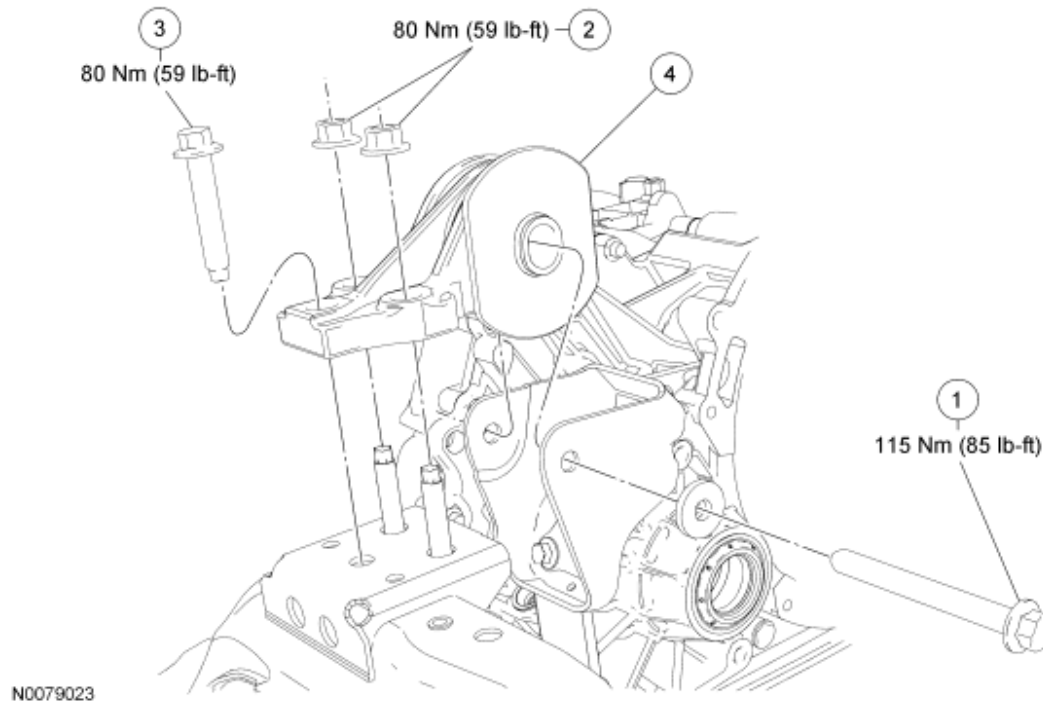


Fig. 171: Transaxle Support Insulator Components - Lower, Rear, 2.3L With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W710173	Lower support insulator through bolt
2	N807144-S440	Lower support insulator nuts
3	W500743-S439	Lower support insulator bolt
4	6E037	Lower support insulator

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Disconnect the breather tube and mass air flow (MAF) sensor.

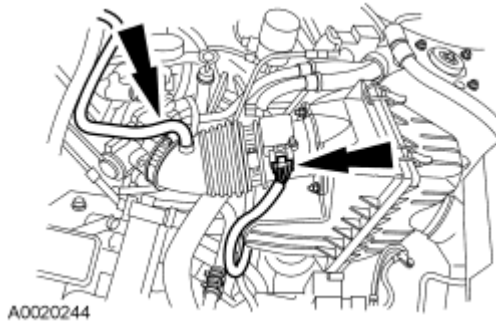


Fig. 172: Locating Breather Tube & Mass Air Flow (MAF) Sensor
Courtesy of FORD MOTOR CO.

3. Remove the intake tube and air cleaner cover.

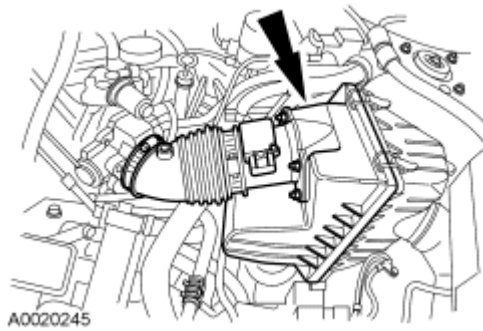


Fig. 173: Locating Intake Tube & Air Cleaner Cover
Courtesy of FORD MOTOR CO.

4. Remove the air cleaner assembly.

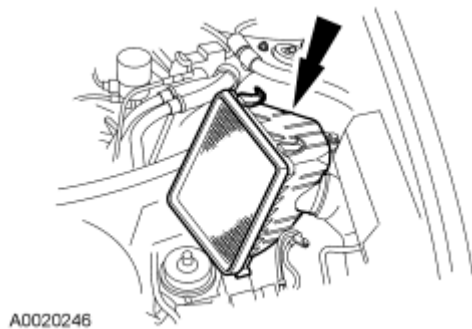


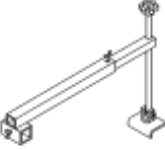
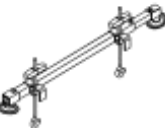
Fig. 174: Locating Air Cleaner Assembly
Courtesy of FORD MOTOR CO.

5. Remove the lower support insulator through bolt.
 - To install, tighten to 115 Nm (85 lb-ft).
6. Remove the lower support insulator bolt and 2 nuts.
 - To install, tighten to 80 Nm (59 lb-ft).

- To install, reverse the removal procedure.

TRANSAXLE SUPPORT INSULATOR - LH

Special Tools

Illustration	Tool Name	Tool Number
 ST2378-A	Adapters for 303-290	303-290A-01
 ST2379-A	Adapter for 303-290A (Support Leg)	303-290A-03A
 ST2524-A	Engine Lifting Chains (Part of Spreader Bar)	303-D089 (D93P-6001-A3) or equivalent
 ST2363-A	Support Bar, Engine	303-290A

REMOVAL AND INSTALLATION

- Disconnect the breather tube and mass air flow (MAF) sensor.

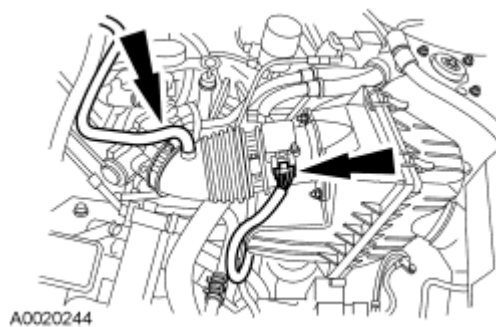


Fig. 175: Locating Breather Tube & Mass Air Flow (MAF) Sensor
Courtesy of FORD MOTOR CO.

2. Remove the intake tube and air cleaner cover.

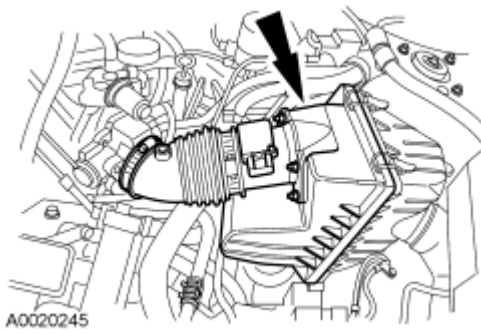


Fig. 176: Locating Intake Tube & Air Cleaner Cover
Courtesy of FORD MOTOR CO.

3. Remove the air cleaner as an assembly.

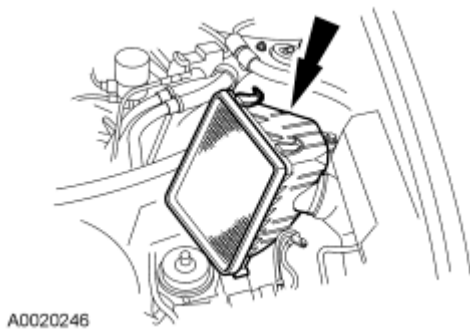


Fig. 177: Locating Air Cleaner Assembly
Courtesy of FORD MOTOR CO.

4. Install the special tools.

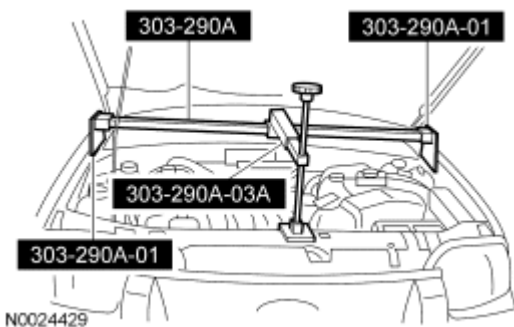


Fig. 178: Drivetrain Support Tool
Courtesy of FORD MOTOR CO.

5. Install the special tools.

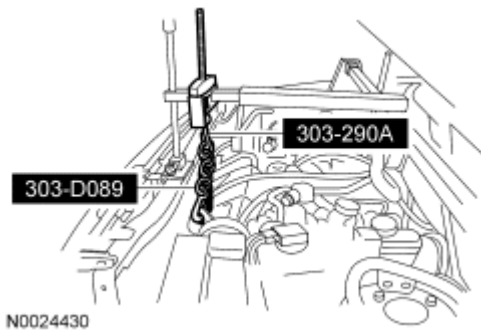


Fig. 179: Identifying Special Tools
Courtesy of FORD MOTOR CO.

6. Remove the upper transaxle mount through bolt.
 - To install, tighten to 103 Nm (76 lb-ft).

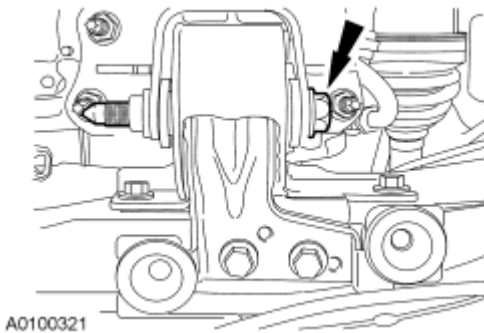


Fig. 180: Locating Upper Transaxle Mount Through Bolt
Courtesy of FORD MOTOR CO.

7. Remove the 4 upper transaxle mount bolts and remove the mount.
 - To install, tighten to 48 Nm (35 lb-ft).

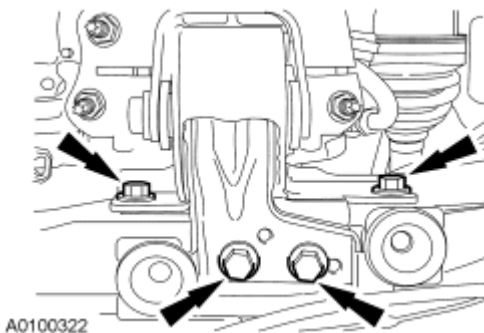


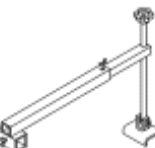
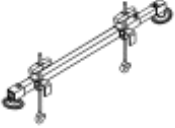
Fig. 181: Locating Upper Transaxle Mount Bolts & Mount
Courtesy of FORD MOTOR CO.

8. To install, reverse the removal procedure.

REMOVAL

TRANSAXLE - 2.3L

Special Tools

Illustration	Tool Name	Tool Number
 ST1326-A	Adapter for 303-224 (Handle)	205-153 (T80T-4000-W)
 ST2378-A	Adapters for 303-290	303-290A-01
 ST2379-A	Adapter for 303-290A (Support Leg)	303-290A-03A
 ST2665-A	Remover, Halfshaft	205-529
 ST1636-A	Retainer, Torque Converter	307-346 (T97T-7902-A)
 ST2363-A	Support Bar, Engine	303-290A
 ST1408-A	Tie-Rod End Remover	211-105 (T85M-3395-A)

REMOVAL

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the battery and the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
3. Remove the air cleaner as an assembly.
 1. Remove the bolt.
 2. Disconnect the mass air flow (MAF) sensor electrical connector.
 3. Disconnect the brake booster vacuum hose.
 4. Disconnect the wiring harness retainer.
 5. Disconnect the breather tube.
 6. Loosen the clamp and remove the air cleaner assembly.

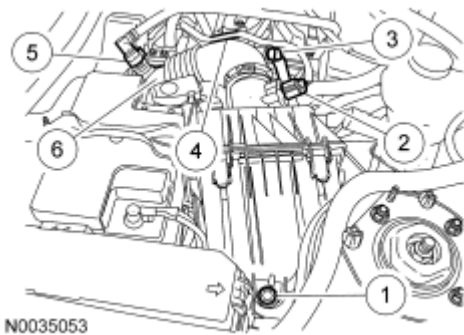


Fig. 182: Identifying Air Cleaner Assembly
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

4. Disconnect the power transfer unit (PTU) vent hose from the clip located on the transmission fluid filler tube.

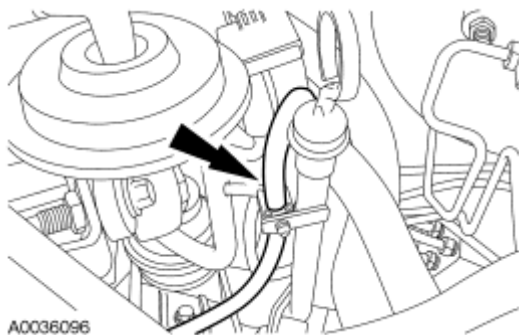


Fig. 183: Locating Power Transfer Unit (PTU) Vent Hose
Courtesy of FORD MOTOR CO.

All vehicles

5. Remove the nut holding the wiring harness bracket and unplug the bulkhead electrical connector.

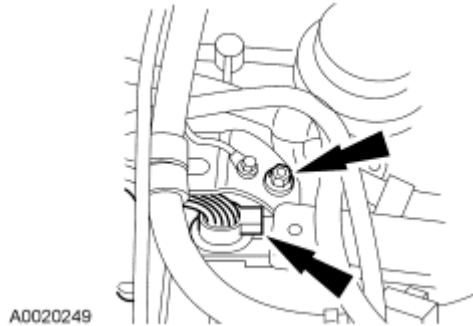


Fig. 184: Locating Wire Harness Bracket Nut & Plug
Courtesy of FORD MOTOR CO.

6. Remove the main control cover vent tube.

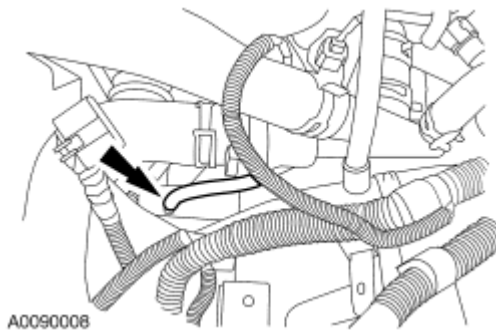


Fig. 185: Locating Main Control Cover Vent Tube
Courtesy of FORD MOTOR CO.

7. Disconnect the selector lever cable from the manual control lever.

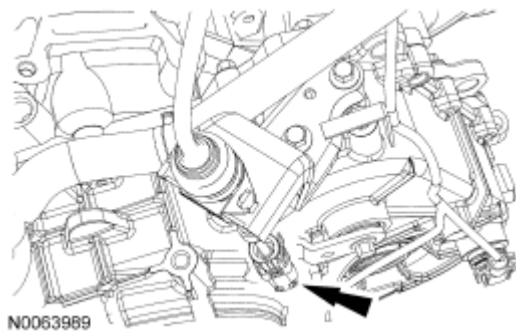


Fig. 186: Identifying Gearshift Cable
Courtesy of FORD MOTOR CO.

8. Disconnect the wire harness retainer from the selector lever cable bracket, remove the 2 retaining bolts

and position the selector lever cable and bracket aside.

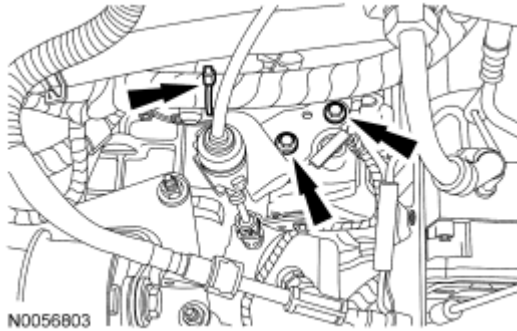


Fig. 187: Identifying Harness Retainer And Bolts
Courtesy of FORD MOTOR CO.

9. Remove the selector lever cable retainer from the transmission fluid filler tube.

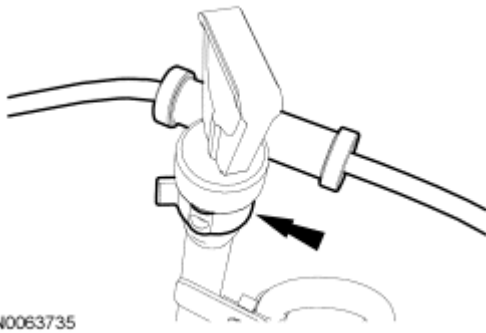


Fig. 188: Identifying Selector Lever Cable Retainer
Courtesy of FORD MOTOR CO.

10. Disconnect the transmission range (TR) sensor electrical connector.

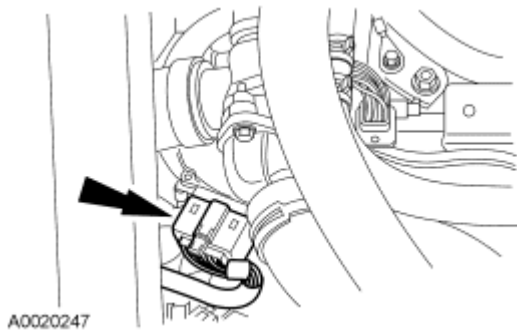


Fig. 189: Locating Transmission Range (TR) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

11. Remove the 3 upper transaxle retaining bolts.

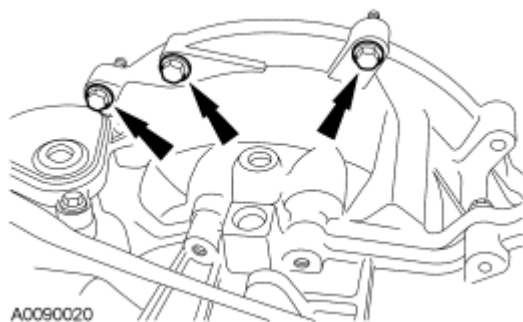


Fig. 190: Locating Upper Transaxle Bolts
Courtesy of FORD MOTOR CO.

12. Install the special tools.

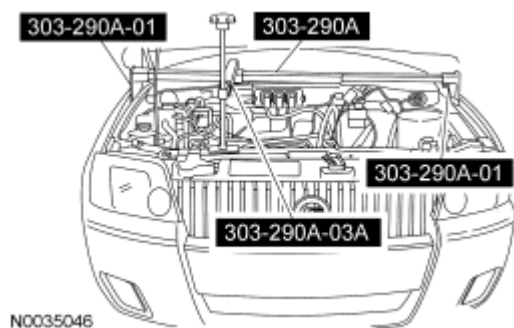


Fig. 191: Special Tool
Courtesy of FORD MOTOR CO.

13. Install the special tools.

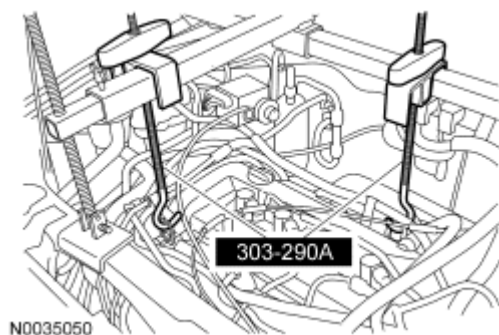


Fig. 192: Special Tool
Courtesy of FORD MOTOR CO.

14. Remove the LH support insulator through bolt.

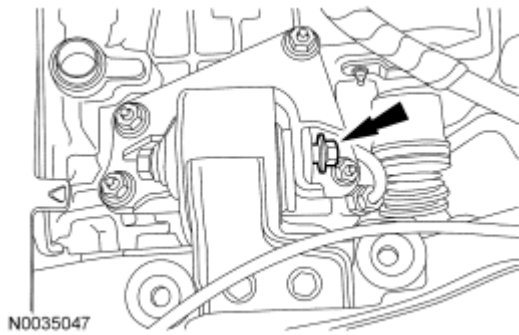


Fig. 193: Locating LH Transaxle Mount Through Bolt
Courtesy of FORD MOTOR CO.

15. Remove the 2 nuts, the bolt and the through bolt and remove the rear transaxle mount.

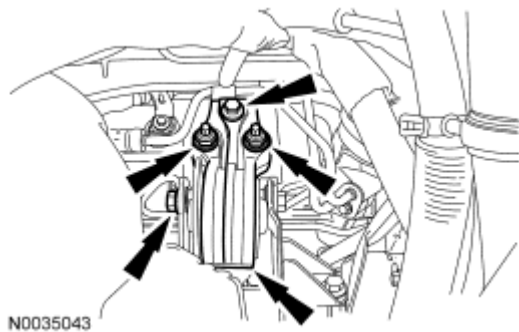


Fig. 194: Locating Rear Transaxle Mount Bolts
Courtesy of FORD MOTOR CO.

AWD vehicles

16. Index the driveshaft to the yoke and remove the 6 bolts holding the driveshaft to the PTU.

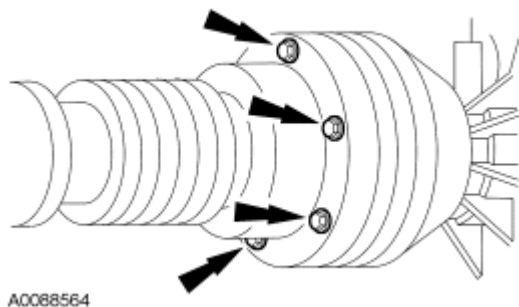


Fig. 195: Locating Driveshaft & Bolts
Courtesy of FORD MOTOR CO.

17. Remove the 2 center bearing nuts and position the driveshaft aside with mechanic's wire.

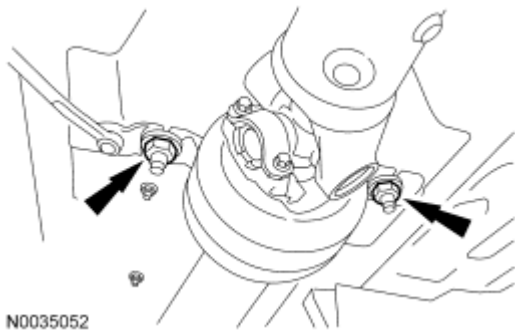


Fig. 196: Locating Center Bearing Nuts
Courtesy of FORD MOTOR CO.

All vehicles

18. Remove the 4 bolts and remove the cross brace.

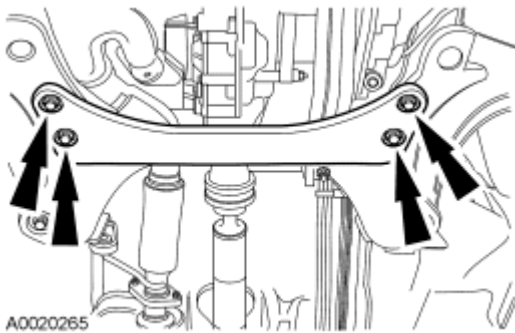


Fig. 197: Locating Cross Brace & Bolts
Courtesy of FORD MOTOR CO.

19. Remove the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.
20. Remove the 7 retainers and the LH splash shield.

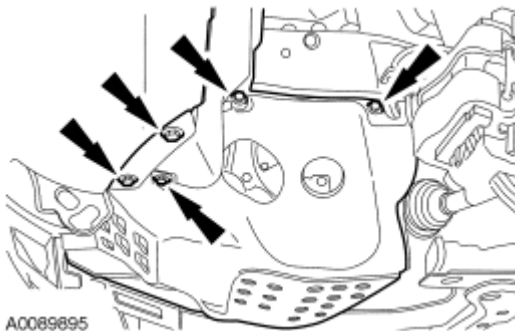


Fig. 198: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

21. Remove the 6 retainers and the RH splash shield.

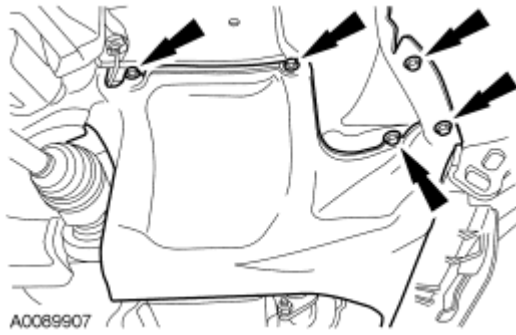


Fig. 199: Right Splash Shield Bolts
Courtesy of FORD MOTOR CO.

22. Remove the lower front support insulator through bolt for the mount and the 2 bolts from the cross brace.

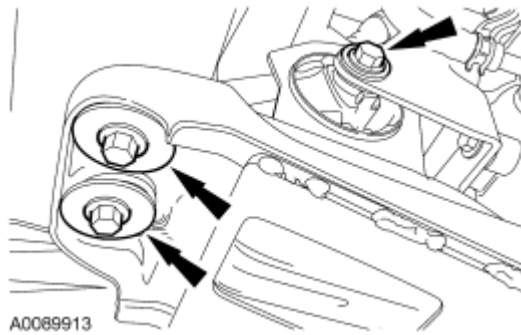


Fig. 200: Identifying Front Roll Restrictor Bolt & Bolts For Engine Support Crossmember
Courtesy of FORD MOTOR CO.

23. Remove and discard the nut and remove the rear cross brace.

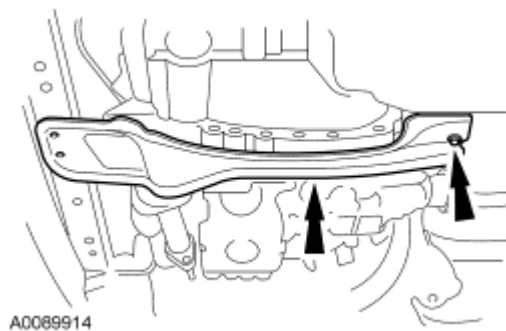


Fig. 201: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

NOTE: If transmission disassembly or installation of a new transmission is necessary, the transmission fluid will need to be drained.

24. Remove the drain plug and drain the transmission fluid.



GD1438-A

Fig. 202: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

25. Disconnect the LH suspension.
1. Disconnect the sway bar link.
 2. Remove the tie-rod end retaining nut.
 3. Remove the lower control arm knuckle bolt.

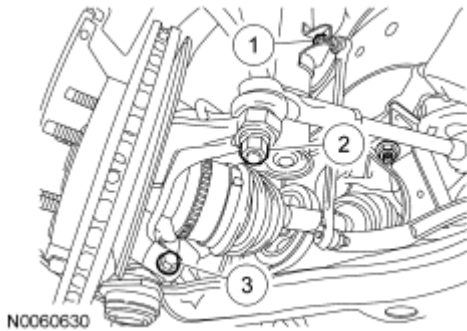


Fig. 203: Identifying Sway Bar Link, Nut And Bolt
Courtesy of FORD MOTOR CO.

26. Disconnect the RH suspension.
1. Disconnect the sway bar link.
 2. Remove the tie-rod end retaining nut.
 3. Remove the lower control arm knuckle bolt.

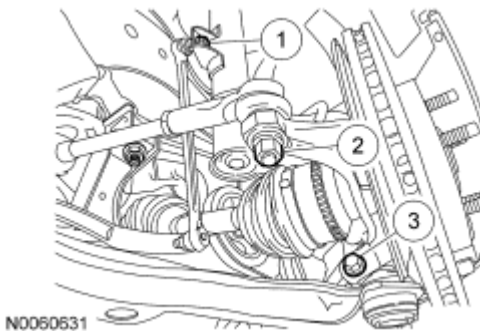


Fig. 204: Identifying Sway Bar Link, Nut And Bolt
Courtesy of FORD MOTOR CO.

27. Using the special tool, disconnect the LH and RH tie-rod end from the steering knuckle.

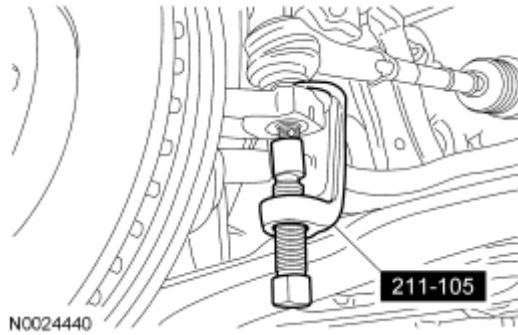


Fig. 205: Disconnecting LH And RH Tie Rod End From Steering Knuckle
Courtesy of FORD MOTOR CO.

28. Carefully pry down on the LH and RH lower control arms, disconnect the steering knuckle from the lower ball joint and position the steering knuckle aside.
29. Remove the brake hose retainer and the ABS sensor retaining bolt from the RH strut.

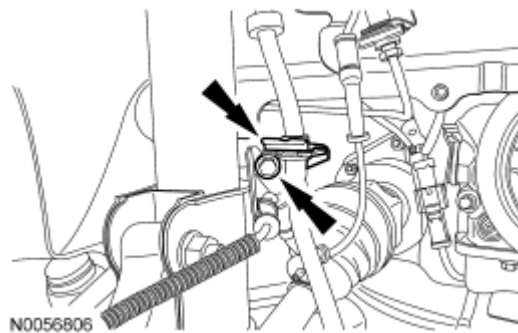


Fig. 206: Identifying Retainer And Bolt
Courtesy of FORD MOTOR CO.

30. Using the special tools, remove the RH halfshaft from the intermediate shaft and secure the halfshaft aside.

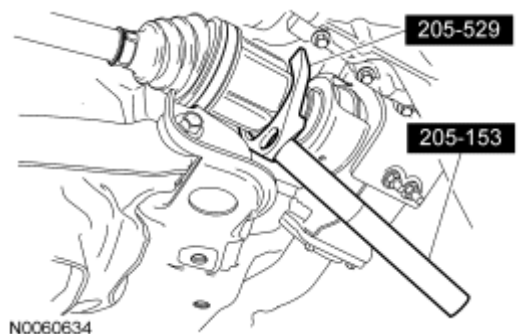


Fig. 207: Identifying Special Tools
Courtesy of FORD MOTOR CO.

31. Remove the brake hose retainer and the ABS sensor retaining bolt from the LH strut.

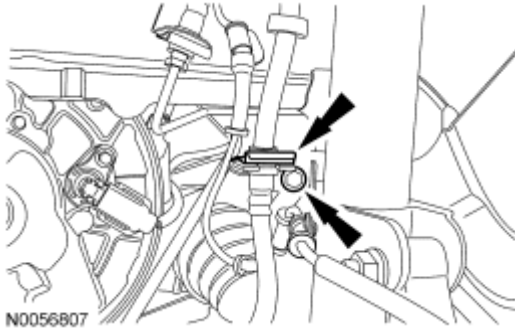


Fig. 208: Identifying Bolt
Courtesy of FORD MOTOR CO.

32. Using a pry bar between the transaxle case and the LH halfshaft, carefully disconnect the halfshaft from the transaxle case and secure the halfshaft aside.
33. Remove the 2 intermediate shaft retaining nuts.

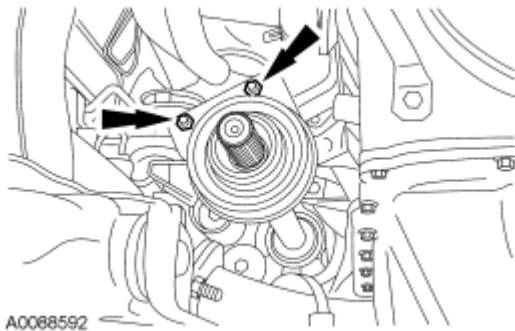


Fig. 209: Locating Intermediate Shaft Retaining Nuts
Courtesy of FORD MOTOR CO.

34. Remove the intermediate shaft.

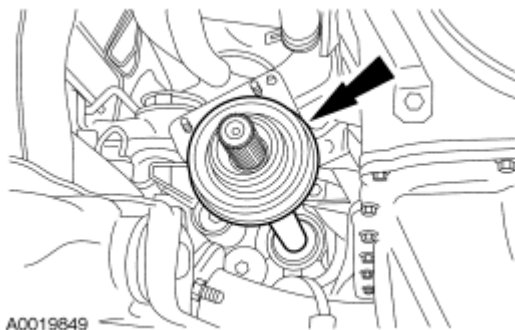


Fig. 210: Locating Intermediate Shaft

Courtesy of FORD MOTOR CO.

35. Remove the 3 nuts and separate the flexpipe from the exhaust manifold.

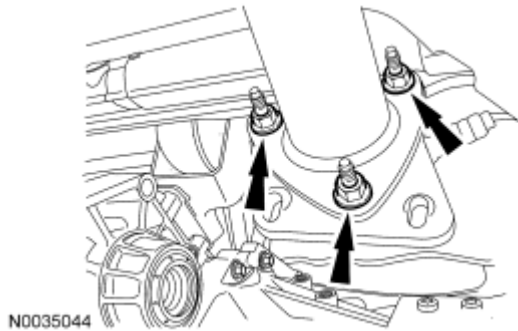


Fig. 211: Locating Flexpipe On Exhaust Manifold & Nuts
Courtesy of FORD MOTOR CO.

AWD vehicles

36. Remove the 2 exhaust bracket-to-intermediate shaft bracket bolts.

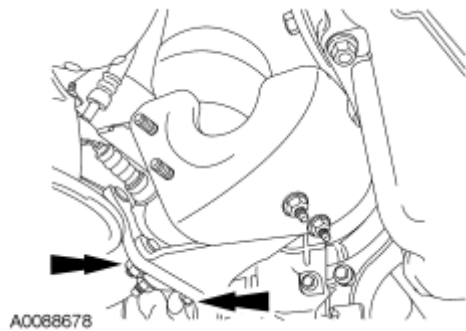


Fig. 212: Locating Bolts On Rear Of Exhaust-To-Intermediate Shaft Bracket
Courtesy of FORD MOTOR CO.

37. Remove the 2 exhaust-to-intermediate shaft bracket nuts and remove the bracket.

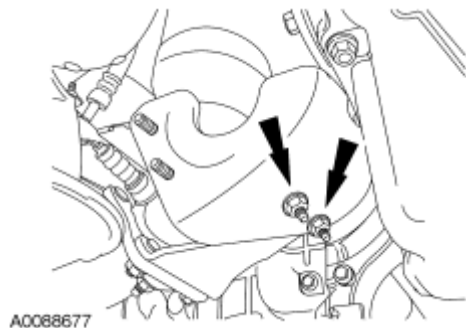


Fig. 213: Locating Exhaust-To-Intermediate Shaft Bracket Nuts
Courtesy of FORD MOTOR CO.

38. Remove the 6 PTU bracket bolts and remove the bracket.

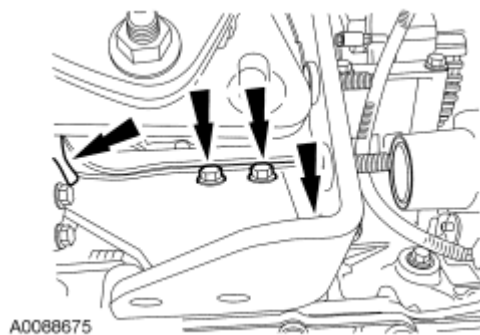


Fig. 214: Locating Engine Mounting Bracket Bolts
Courtesy of FORD MOTOR CO.

39. Remove the bolts from the PTU.

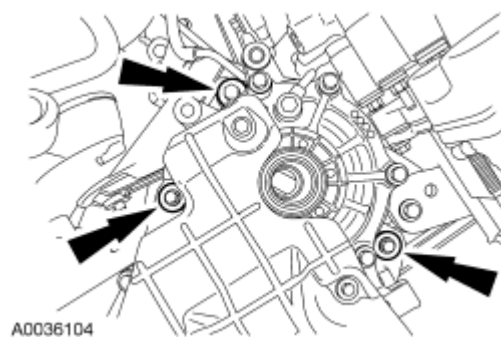


Fig. 215: Locating PTU Bolts
Courtesy of FORD MOTOR CO.

40. Remove the bolt and remove the PTU.

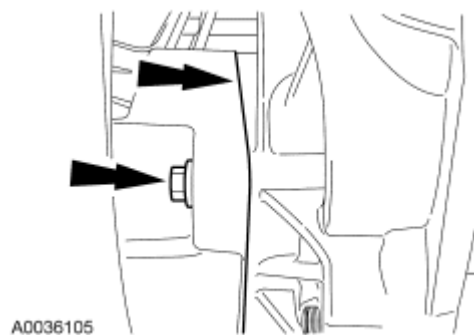


Fig. 216: Locating Transfer Case Bolt & Transfer Case Unit
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

41. Remove the 3 bolts and the dampener.

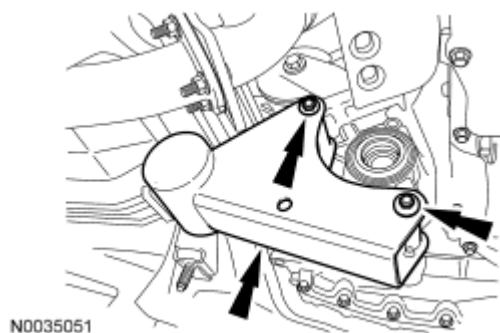


Fig. 217: Locating Bolts & Dampener
Courtesy of FORD MOTOR CO.

All vehicles

42. Remove the 3 bolts holding the transaxle front mount bracket.

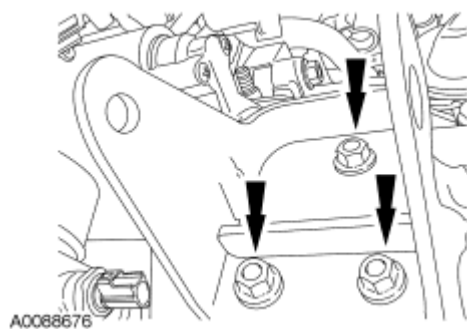


Fig. 218: Locating Transaxle Front Mount Plate Bolts
Courtesy of FORD MOTOR CO.

43. Remove the transmission fluid cooler tubes.

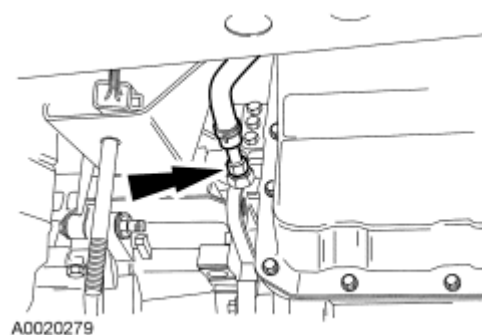


Fig. 219: Locating Transmission Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

44. Remove the transmission fluid cooler tube.

1. Disconnect the output shaft speed (OSS) sensor electrical connector (black).
2. Disconnect the turbine shaft speed (TSS) sensor electrical connector (white).
 - Disconnect the wiring harness retainer from the transaxle case and position the harness aside.
3. Remove the transmission fluid cooler tube retaining bracket bolt.
4. Remove the transmission fluid cooler tube and position it aside.

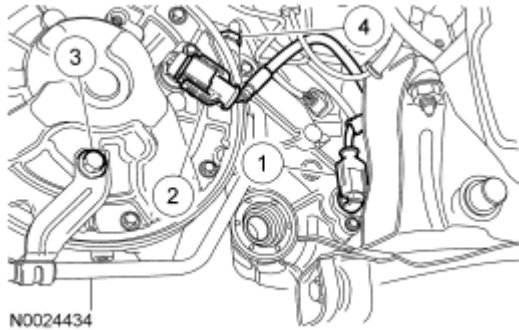


Fig. 220: Locating Turbine Shaft Speed Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

45. Remove the OSS sensor.

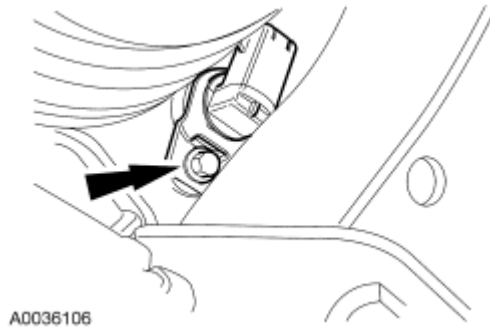


Fig. 221: Locating OSS Sensor Bolt
Courtesy of FORD MOTOR CO.

46. Disconnect the starter terminals.

1. Remove the battery cable nut.
2. Remove the starter solenoid terminal nut.

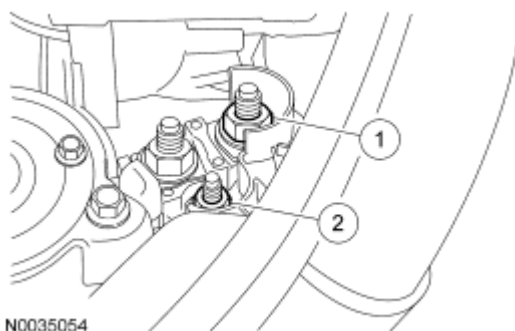


Fig. 222: Identifying Battery Cable & Starter Solenoid Terminal Nut
Courtesy of FORD MOTOR CO.

47. Remove the wire harness clip retainer and the ground wire from the starter bolts.

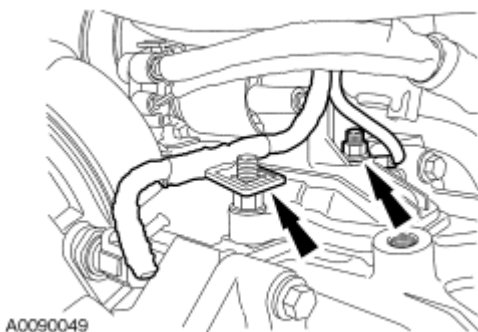


Fig. 223: Locating Wire Harness Clip Retainer & Starter Bolts
Courtesy of FORD MOTOR CO.

48. Remove the 2 bolts and remove the starter.

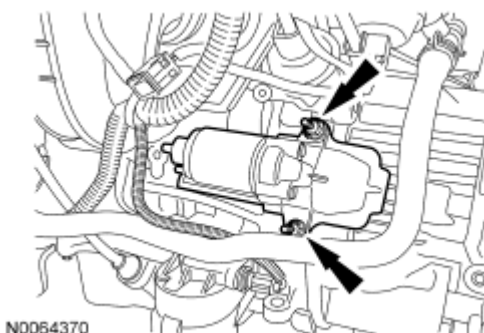


Fig. 224: Identifying Bolts
Courtesy of FORD MOTOR CO.

49. Remove the starter motor isolator.

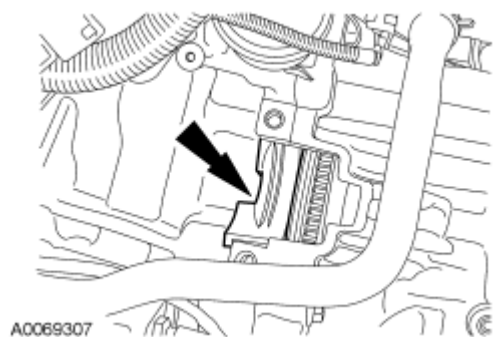


Fig. 225: Identifying Starter Motor Isolator
Courtesy of FORD MOTOR CO.

50. Remove and discard the 4 torque converter nuts.

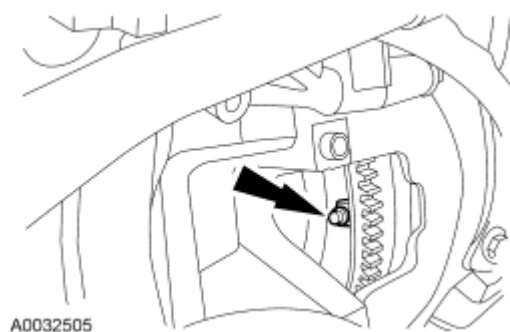


Fig. 226: Locating Torque Converter Nut
Courtesy of FORD MOTOR CO.

51. Using the special tool, lower the transmission.

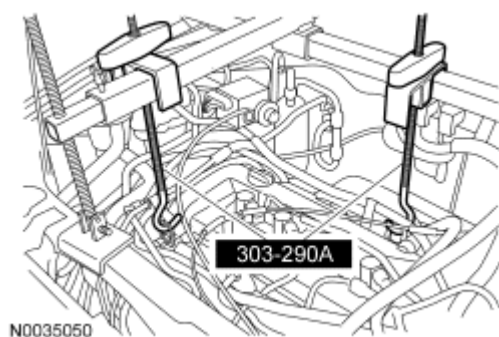


Fig. 227: Special Tool
Courtesy of FORD MOTOR CO.

52. Push the converter back from the flexplate. Use a suitable transmission jack to support the transaxle and remove the 3 rear bellhousing bolts.

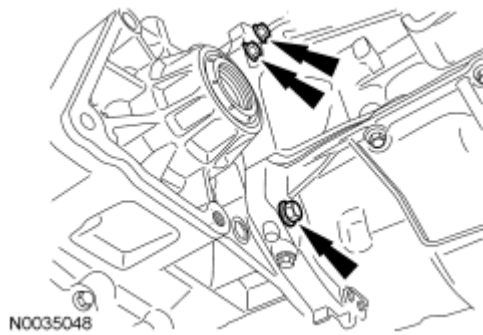


Fig. 228: Locating Rear Bellhousing Bolts
Courtesy of FORD MOTOR CO.

53. Remove the 4 remaining transaxle-to-engine bolts.

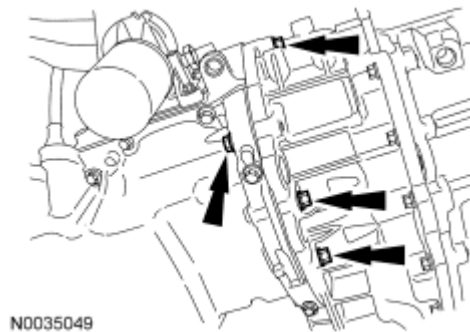


Fig. 229: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

CAUTION: The torque converter is heavy. Install the special tool before lowering the transaxle.

54. Move the transaxle back far enough to install the special tool.

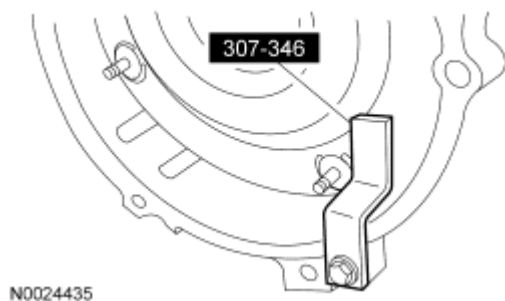


Fig. 230: Identifying Special Tool
Courtesy of FORD MOTOR CO.

55. Lower the transaxle from the engine compartment.

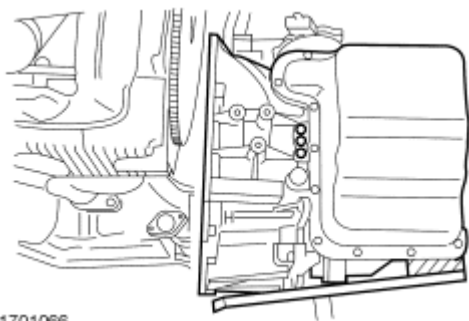
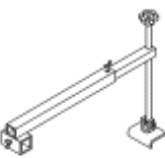
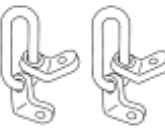


Fig. 231: Lowering Transaxle From Engine Compartment
Courtesy of FORD MOTOR CO.

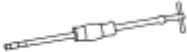
TRANSAXLE - 3.0L

Special Tools

Illustration	Tool Name	Tool Number
 ST2378-A	Adapters for 303-290	303-290A-01
 ST2379-A	Adapter for 303-290-A (Support Leg)	303-290A-03A
 ST2524-A	Engine Lifting Chains (Part of Spreader Bar)	303-D089 (D93P-6001-A3) or equivalent
 ST2793-A	Lifting Bracket, Engine	303-050 (T70P-6000)
 ST1582-A	Remover, Halfshaft	205-241 (T86P-3541-A)

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

 ST1636-A	Retainer, Torque Converter	307-346 (T97T-7902-A)
 ST1185-A	Slide Hammer	100-001 (T50T-100-A)
 ST2363-A	Support Bar, Engine	303-290A
 ST1408-A	Tie-Rod End Remover	211-105 (T85M-3395-A)

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the battery and the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
3. Remove the air cleaner as an assembly.
 1. Disconnect the breather tube.
 2. Disconnect the mass air flow (MAF) sensor electrical connector and the wiring harness fastener.
 3. Remove the air intake tube.
 4. Remove the air cleaner assembly retaining bolt.
 5. Remove the air cleaner assembly.

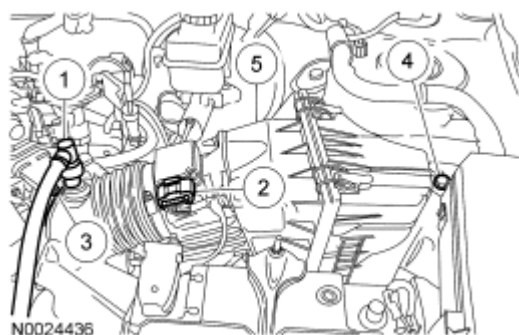


Fig. 232: Identifying Air Cleaner Assembly
Courtesy of FORD MOTOR CO.

4. Disconnect the transmission range (TR) sensor.

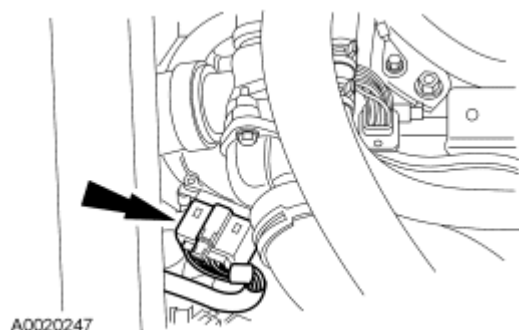


Fig. 233: Locating Transmission Range (TR) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

5. Disconnect the transaxle harness connector, remove the wire harness bracket nut and position the harness bracket aside.



Fig. 234: Locating Transaxle Harness Connector & Nut
Courtesy of FORD MOTOR CO.

6. Remove the main control cover vent tube.

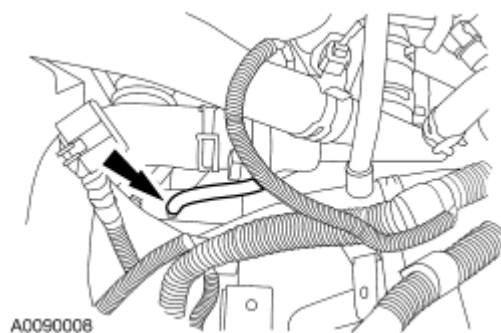


Fig. 235: Locating Main Control Cover Vent Tube
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

7. Disconnect the power transfer unit (PTU) vent hose from the transmission fluid filler tube.



Fig. 236: Identifying PTU Vent Hose
Courtesy of FORD MOTOR CO.

All vehicles

8. Disconnect the wire harness from the battery tray hold-down bracket.

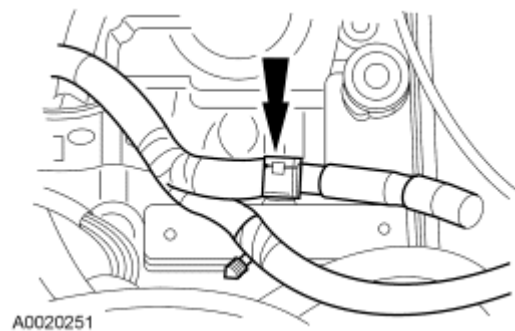


Fig. 237: Locating Wire Harness Bracket
Courtesy of FORD MOTOR CO.

9. Disconnect the shift cable from the manual lever.

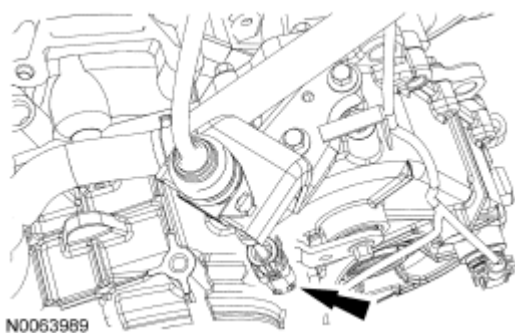


Fig. 238: Identifying Gearshift Cable
Courtesy of FORD MOTOR CO.

10. Disconnect the wire harness retainer from the shift cable bracket, remove the 2 retaining bolts, and position the cable and bracket aside.

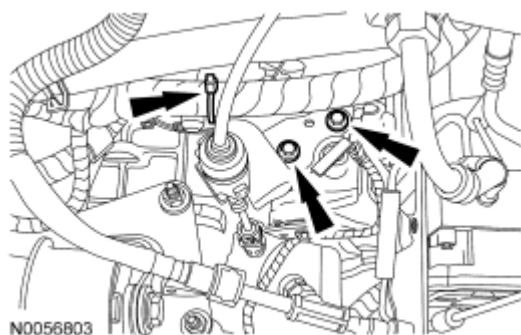


Fig. 239: Identifying Harness Retainer And Bolts
Courtesy of FORD MOTOR CO.

11. Remove the selector lever cable retainer from the transmission fluid filler tube.

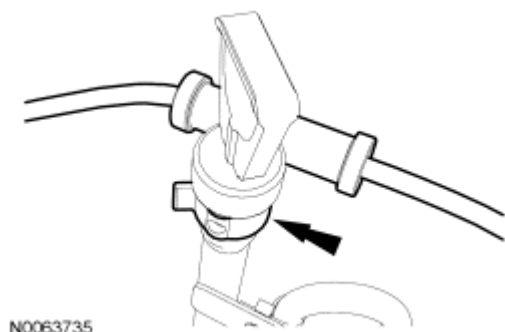


Fig. 240: Identifying Selector Lever Cable Retainer
Courtesy of FORD MOTOR CO.

12. Disconnect the starter motor harness connector.



Fig. 241: Locating Starter Motor Harness Connector
Courtesy of FORD MOTOR CO.

13. Disconnect the ground wire.

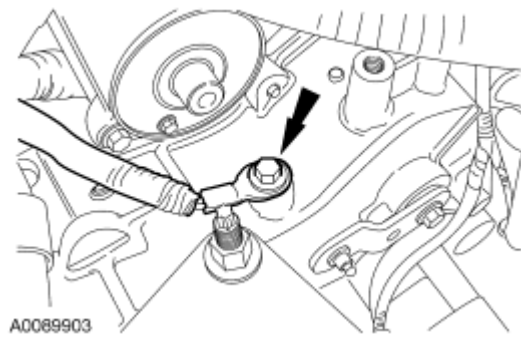


Fig. 242: Locating Ground Cable
Courtesy of FORD MOTOR CO.

14. Remove the 2 starter bolts and remove the starter motor.

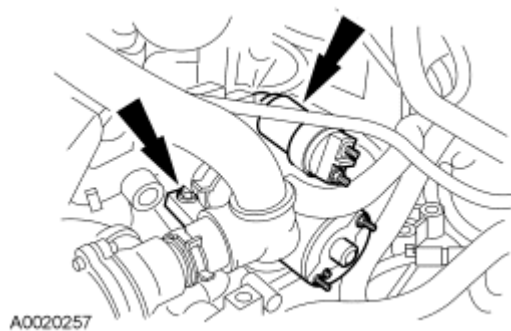


Fig. 243: Locating Starter Bolts & Starter Motor
Courtesy of FORD MOTOR CO.

15. Remove and disconnect both electrical connectors from the upper intake to gain access to the engine for installing the lifting bracket.

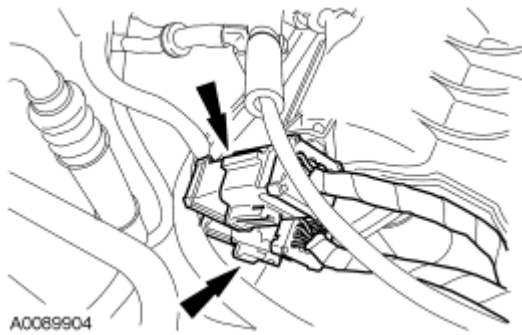


Fig. 244: Locating Electrical Connectors
Courtesy of FORD MOTOR CO.

16. Install the special tool on the RH cylinder head.

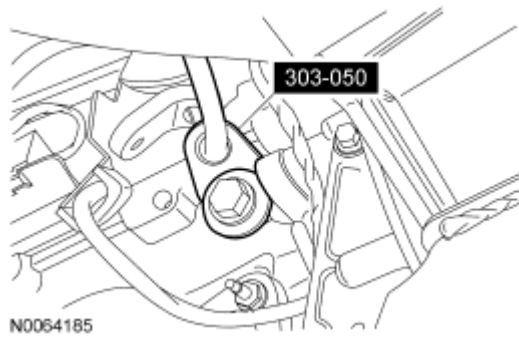


Fig. 245: Identifying Special Tool
Courtesy of FORD MOTOR CO.

17. Install the special tools.

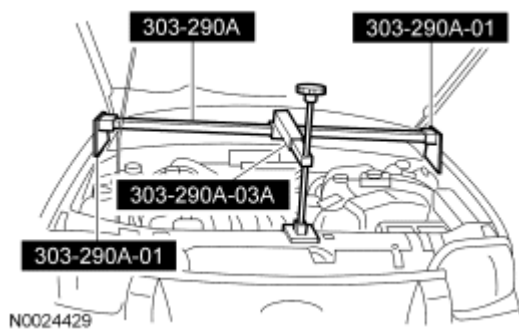


Fig. 246: Drivetrain Support Tool
Courtesy of FORD MOTOR CO.

18. Install the special tools.

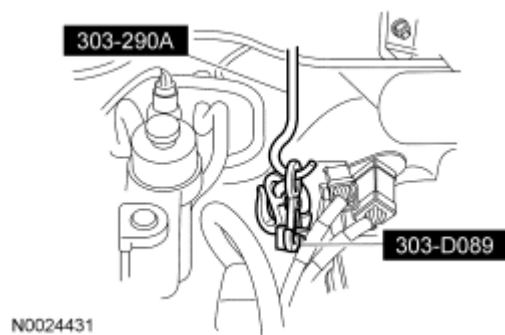


Fig. 247: Identifying Special Tools
Courtesy of FORD MOTOR CO.

19. Install the special tools.

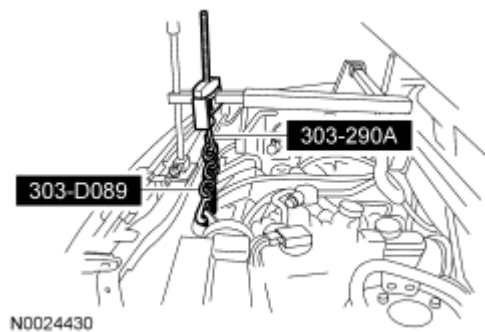


Fig. 248: Identifying Special Tools
Courtesy of FORD MOTOR CO.

20. Remove the 4 upper transaxle retaining bolts.

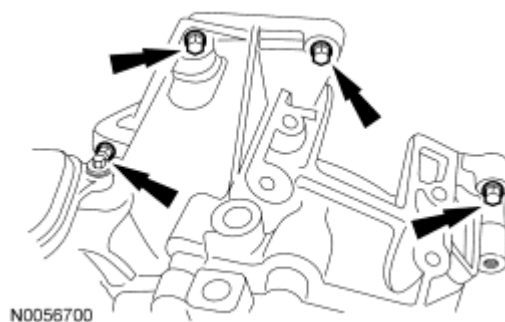


Fig. 249: Identifying Bolts
Courtesy of FORD MOTOR CO.

21. Loosen, but do not remove, the 4 retaining nuts holding the bracket to the transaxle case. Remove the LH upper transaxle mount bolt.



Fig. 250: Locating LH Upper Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

22. Remove the RH upper engine mount bolt.

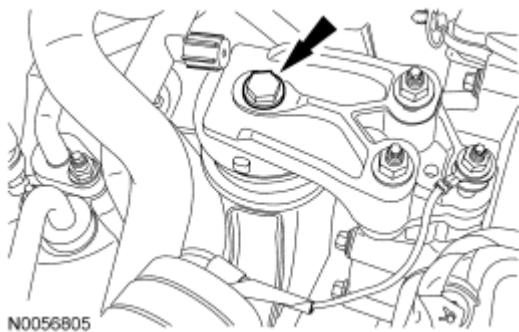


Fig. 251: Identifying Mount Bolt
Courtesy of FORD MOTOR CO.

23. Remove the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.
24. Remove the 7 retainers and the LH splash shield.

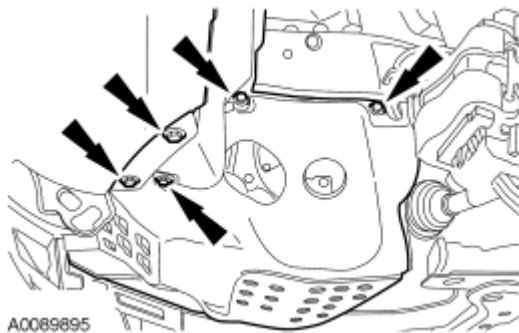


Fig. 252: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

25. Remove the 6 retainers and the RH splash shield.

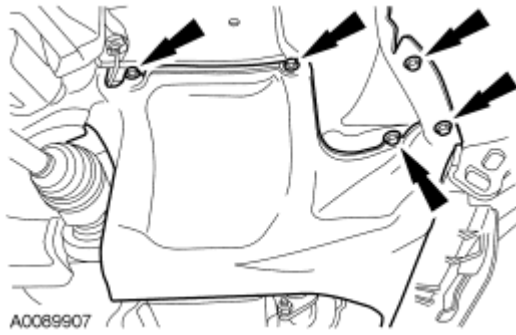


Fig. 253: Right Splash Shield Bolts
Courtesy of FORD MOTOR CO.

26. If transaxle disassembly is necessary, remove the drain plug and drain the transmission fluid. After the fluid has drained, install the drain plug.

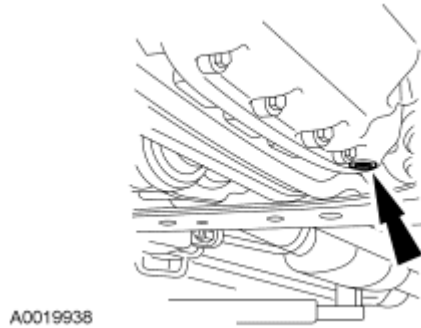


Fig. 254: Locating Drain Plug
Courtesy of FORD MOTOR CO.

27. Disconnect the LH suspension.
1. Disconnect the sway bar link.
 2. Remove the tie-rod end retaining nut.
 3. Remove the lower control arm knuckle bolt.

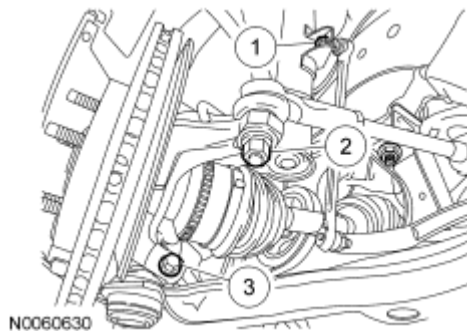


Fig. 255: Identifying Sway Bar Link, Nut And Bolt
Courtesy of FORD MOTOR CO.

28. Disconnect the RH suspension.
1. Disconnect the sway bar link.
 2. Remove the tie-rod end retaining nut.
 3. Remove the lower control arm knuckle bolt.

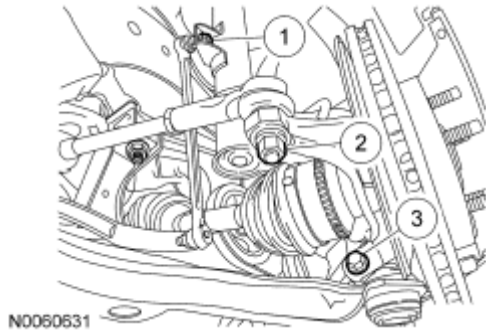


Fig. 256: Identifying Sway Bar Link, Nut And Bolt
Courtesy of FORD MOTOR CO.

29. Using the special tool, disconnect the LH and RH tie-rod end from the steering knuckle.

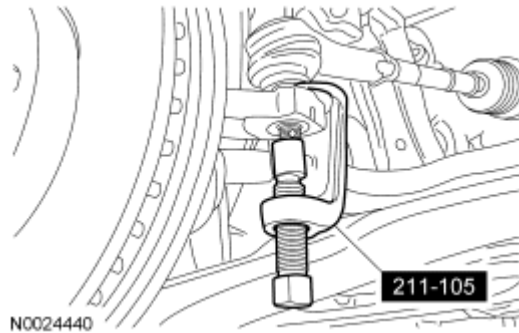


Fig. 257: Disconnecting LH And RH Tie Rod End From Steering Knuckle
Courtesy of FORD MOTOR CO.

30. Carefully pry down on the LH and RH lower control arms and disconnect the steering knuckle from the lower ball joint and position the steering knuckle aside.
31. Remove the brake hose retainer and the ABS sensor retaining bolt from the RH strut.

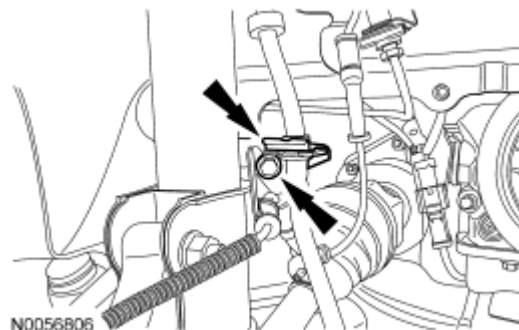


Fig. 258: Identifying Retainer And Bolt
Courtesy of FORD MOTOR CO.

32. Using the special tool, remove the RH halfshaft from the intermediate shaft and secure the halfshaft aside.

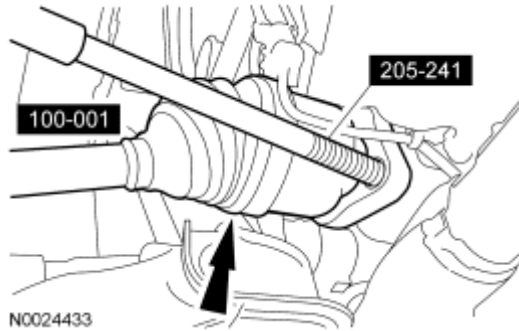


Fig. 259: Removing RH Outer Halfshaft Using Special Tools
Courtesy of FORD MOTOR CO.

33. Remove the brake hose retainer and the ABS sensor retaining bolt from the LH strut.

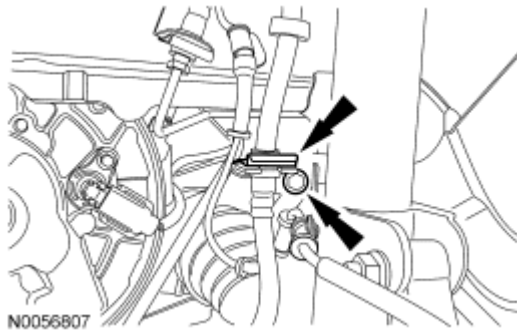


Fig. 260: Identifying Retainer And Bolt
Courtesy of FORD MOTOR CO.

34. Using a pry bar between the transaxle case and the LH halfshaft, carefully disconnect the halfshaft from the transaxle case and secure the halfshaft aside.
35. Disconnect the heated oxygen sensor (HO2S) connector and remove the 2 clips from the oil pan bolt studs.

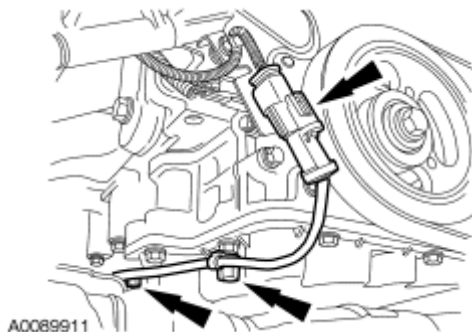


Fig. 261: Locating HO2S Sensor Connector
Courtesy of FORD MOTOR CO.

36. Remove the 2 intermediate shaft retaining nuts.

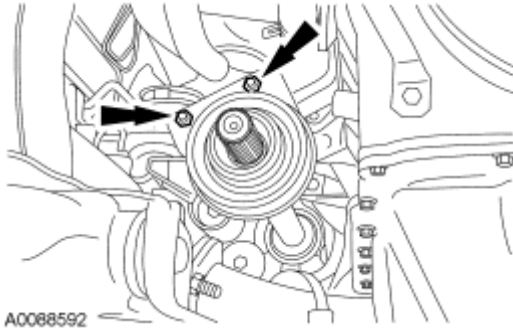


Fig. 262: Locating Intermediate Shaft Retaining Nuts
Courtesy of FORD MOTOR CO.

37. Remove the intermediate shaft.

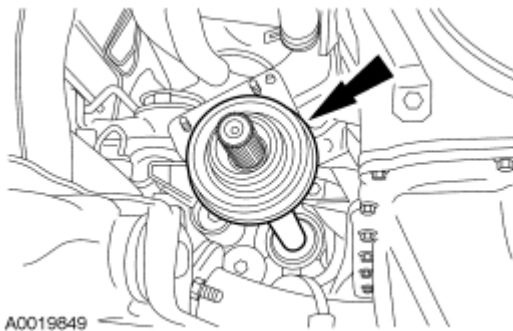


Fig. 263: Locating Intermediate Shaft
Courtesy of FORD MOTOR CO.

38. Remove the cross brace.

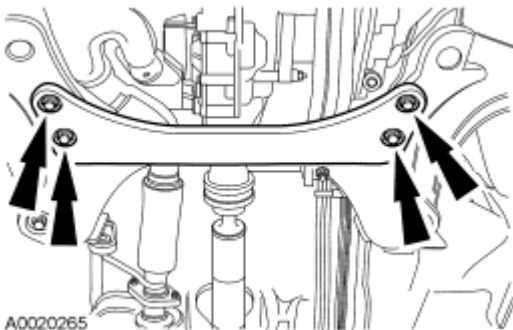


Fig. 264: Locating Cross Brace & Bolts
Courtesy of FORD MOTOR CO.

39. Disconnect the Y-pipe.
1. Remove the rubber hanger.
 2. Remove the nuts and disconnect the pipe.

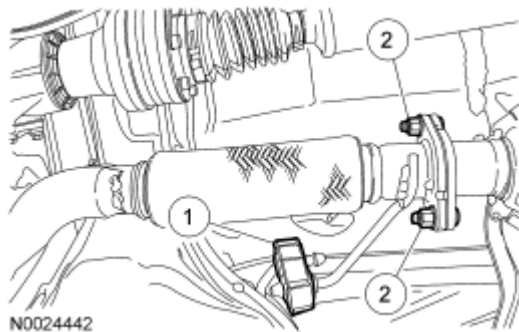


Fig. 265: Exhaust Hanger & Nuts
Courtesy of FORD MOTOR CO.

40. Remove the front Y-pipe flange nuts.

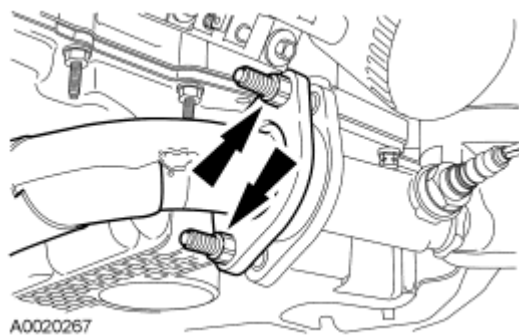


Fig. 266: Front Exhaust Pipe Flange Nuts
Courtesy of FORD MOTOR CO.

41. Remove the rear exhaust pipe flange nuts and remove the Y-pipe.

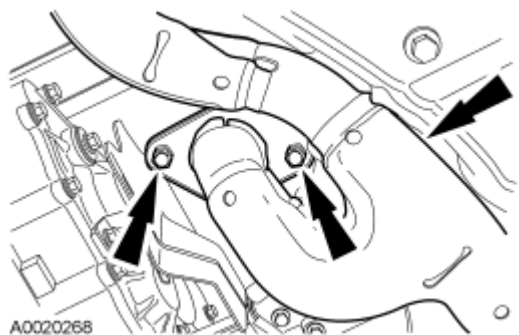


Fig. 267: Rear Exhaust Pipe Flange & Nuts
Courtesy of FORD MOTOR CO.

AWD vehicles

42. Index the driveshaft to the yoke and remove the 6 bolts holding the driveshaft to the PTU.

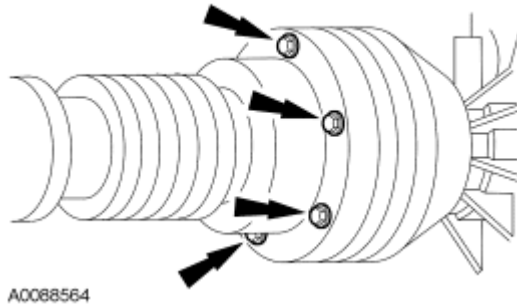


Fig. 268: Locating Driveshaft & Bolts
Courtesy of FORD MOTOR CO.

43. Remove the 2 center bearing nuts and position the driveshaft aside with mechanic's wire.

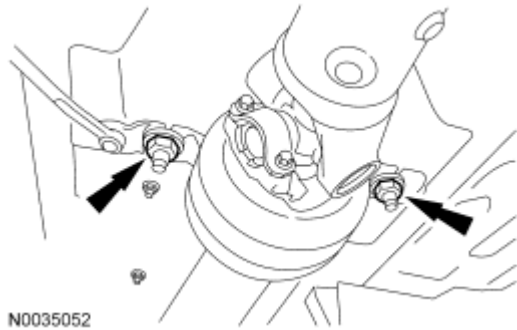


Fig. 269: Locating Center Bearing Nuts
Courtesy of FORD MOTOR CO.

44. Remove the RH catalytic converter to gain access to the PTU bracket. For additional information, refer to **EXHAUST SYSTEM** article.
45. Remove the bolts and the PTU support bracket.

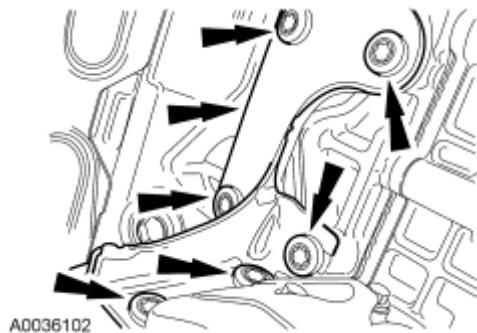


Fig. 270: Locating Bolts & Bracket
Courtesy of FORD MOTOR CO.

All vehicles

46. Remove the bolt for the mount and the 2 bolts for the cross brace.

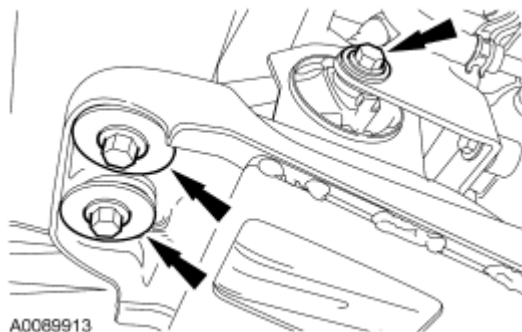


Fig. 271: Identifying Front Roll Restrictor Bolt & Bolts For Engine Support Crossmember
Courtesy of FORD MOTOR CO.

47. Remove and discard the nut and remove the cross brace.

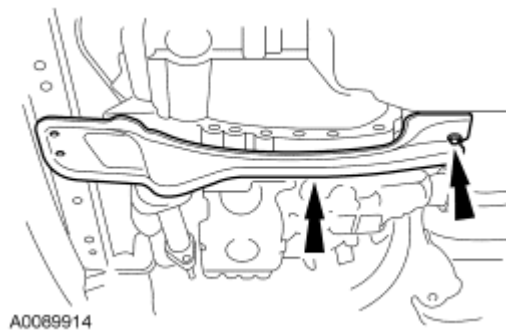


Fig. 272: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

48. Remove the electrical connectors and harness fastener from the lower mount bracket.

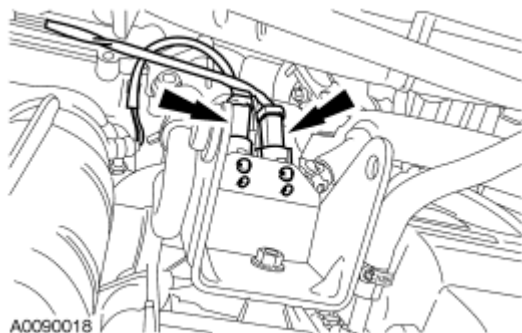


Fig. 273: Locating Electrical Connectors At Lower Mount Bracket
Courtesy of FORD MOTOR CO.

AWD vehicles

49. Remove the bolts from the PTU.

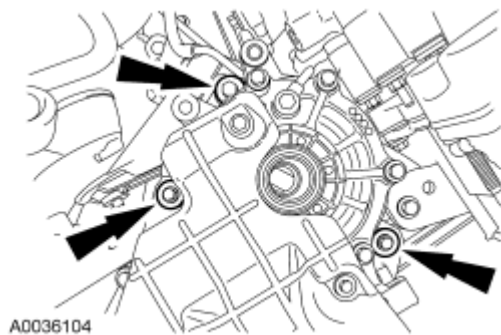


Fig. 274: Locating PTU Bolts
Courtesy of FORD MOTOR CO.

50. Remove the bolt and remove the PTU.

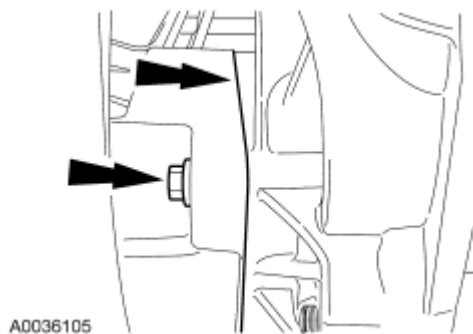


Fig. 275: Locating Transfer Case Bolt & Transfer Case Unit
Courtesy of FORD MOTOR CO.

All vehicles

51. Remove the through bolt from the rear transaxle mount.

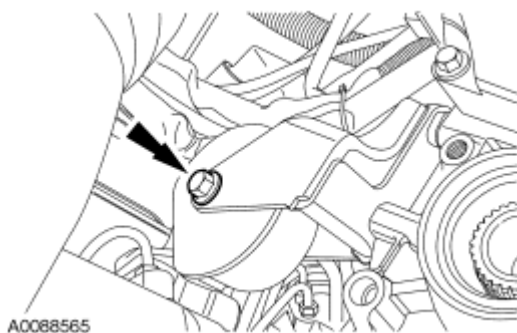


Fig. 276: Transaxle Rear Mount Bolt
Courtesy of FORD MOTOR CO.

52. Disconnect the electrical connector and remove the bolt and output shaft speed (OSS) sensor.

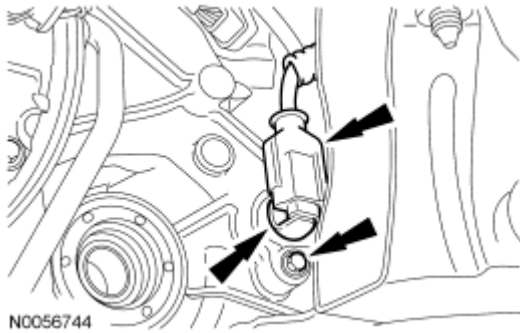


Fig. 277: Identifying Connector And Bolt
Courtesy of FORD MOTOR CO.

NOTE: It is necessary to raise the engine a couple of inches in order to remove the transaxle.

53. Using the special tool, raise the front of the engine.

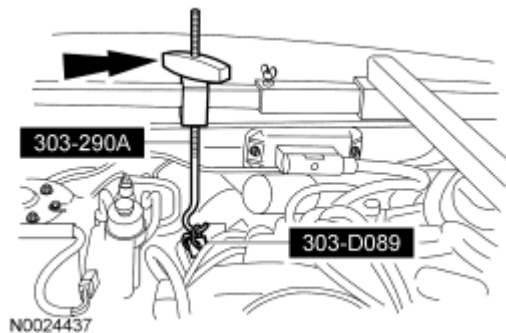


Fig. 278: Locating Lowering Engine Onto RH Engine Mount
Courtesy of FORD MOTOR CO.

NOTE: It is necessary to lower the transaxle in order to clear the subframe to remove the transaxle.

54. Lower the transaxle enough to clear the frame.

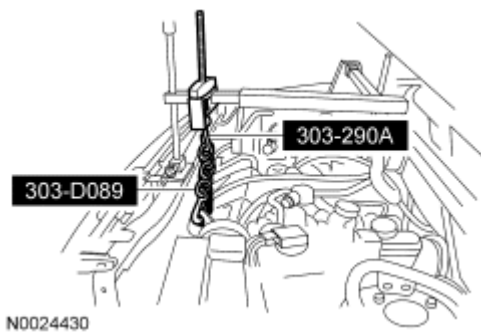


Fig. 279: Identifying Special Tools
Courtesy of FORD MOTOR CO.

55. Remove the access cover.

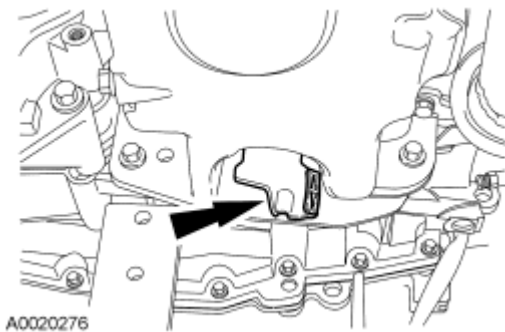


Fig. 280: Locating Access Cover
Courtesy of FORD MOTOR CO.

56. Remove and discard the 4 torque converter nuts.

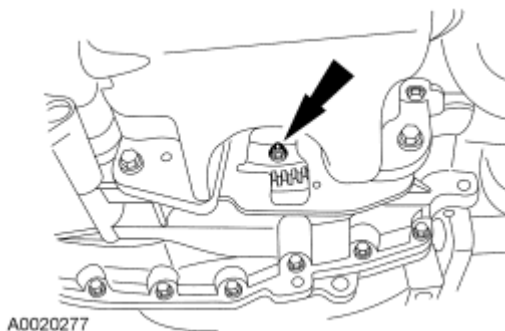


Fig. 281: Locating Torque Converter Nuts
Courtesy of FORD MOTOR CO.

57. Remove the fluid cooler tube.
1. Disconnect the turbine shaft speed (TSS) sensor and the harness retainers.
 2. Remove the bolt.
 3. Remove the fluid cooler tube and position it aside.

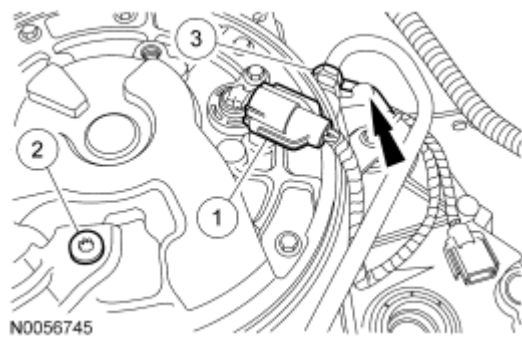


Fig. 282: Identifying Retainers, Bolt And Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

58. Remove the fluid cooler tube.

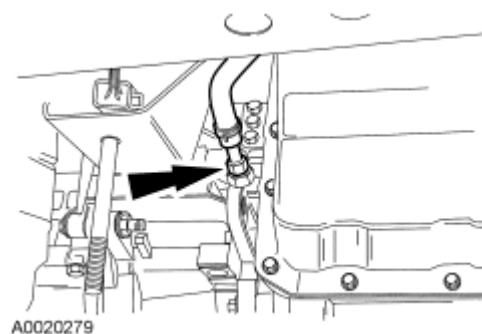


Fig. 283: Locating Transmission Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

59. Support the transaxle with a high-lift jack.
60. Remove the bolts.

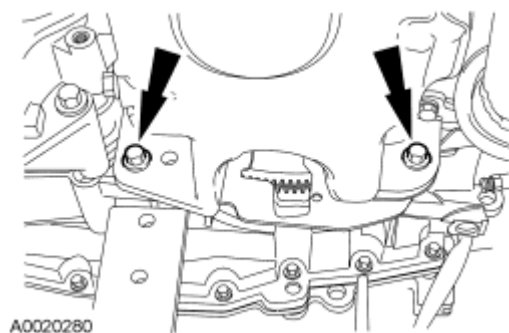


Fig. 284: Locating Lower Transaxle Bolts
Courtesy of FORD MOTOR CO.

61. Remove the 2 nuts and the stud.

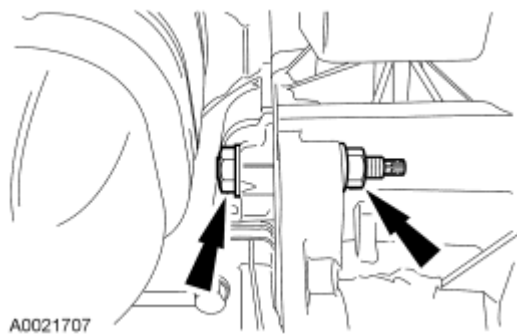


Fig. 285: Locating Transaxle Bolt
Courtesy of FORD MOTOR CO.

62. Remove the bolt.



Fig. 286: Locating Bolt
Courtesy of FORD MOTOR CO.

CAUTION: The torque converter is heavy. Install the special tool before lowering the transaxle.

63. Move the transaxle back far enough to install the special tool.

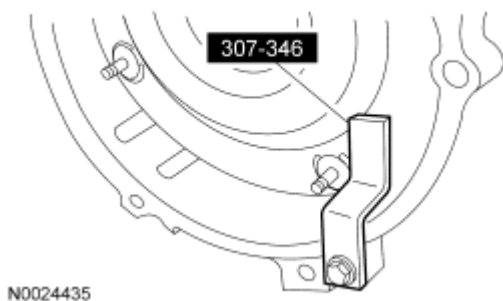
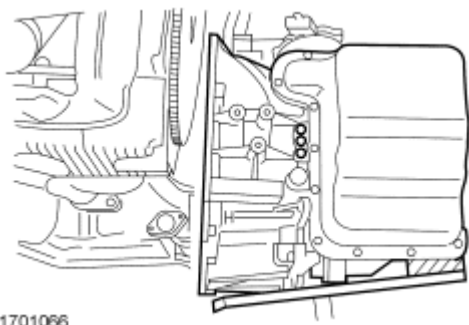


Fig. 287: Identifying Special Tool
Courtesy of FORD MOTOR CO.

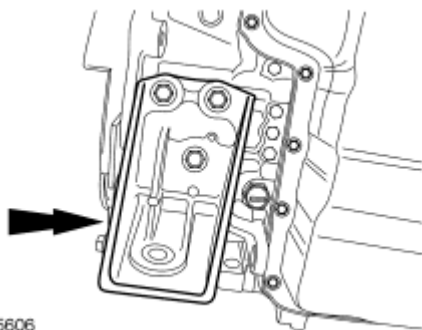
64. Lower the transaxle from the engine compartment.



M1701066

Fig. 288: Lowering Transaxle From Engine Compartment
 Courtesy of FORD MOTOR CO.

65. If it is necessary to install a new transaxle, remove the 3 bolts and the mount bracket.



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Fig. 289: Locating Transaxle Mount Bracket
 Courtesy of FORD MOTOR CO.

DISASSEMBLY

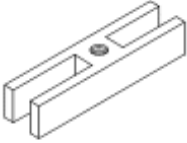
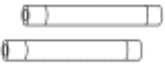
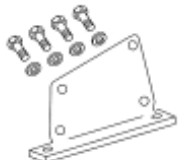
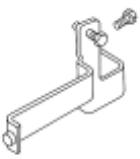
TRANSAXLE

Special Tools

Illustration	Tool Name	Tool Number
 ST1987-A	Actuator Pin (Dia 3/16 Inch)	303-D011 (D80L-100-G)
 ST1988-A	Collet, 3/4 to 7/8 Inch	303-D019 (D80L-100-Q)

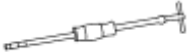
2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

 ST2066-A	Cross Block	307-109 (T81P-78103-A)
 ST1631-A	Handle, Torque Converter	307-091 (T81P-7902-C)
 ST1186-A	Holding Fixture, Transmission	307-003 (T57L-500-B)
 ST2529-A	Holding Fixture, Transmission	307-288 (T94P-77000-F)
 ST2381-A	Remover, Input Shaft Oil Seal	308-375
 ST1845-A	Remover/Installer, Servo Cover	307-295 (T94P-77000-L)
 ST2526-A	Remover, RH Halfshaft Fluid Seal	307-429
 ST1990-A	Remover, Transmission Fluid Pump	307-289 (T94P-77000-G)

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

 ST1636-A	Retainer, Torque Converter	307-346 (T97T-7902-A)
 ST1185-A	Slide Hammer	100-001 (T50T-100-A)

DISASSEMBLY

NOTE: Clean the transaxle assembly to prevent the entry of dirt when reassembling.

1. Inspect transaxle during disassembly.
2. Remove the special tool.

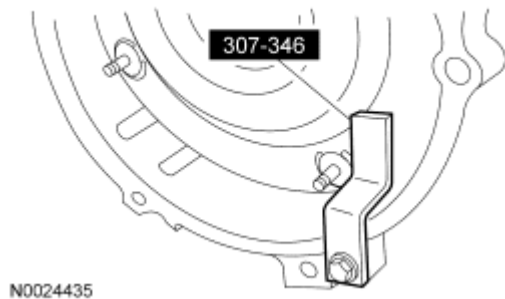


Fig. 290: Identifying Special Tool
Courtesy of FORD MOTOR CO.

CAUTION: Do not tilt the torque converter when removing it. This can damage the torque converter hub.

NOTE: The torque converter is filled with fluid. Position it on a table so that fluid will drain out of the torque converter into a drain pan.

3. Using the special tool, remove the torque converter.

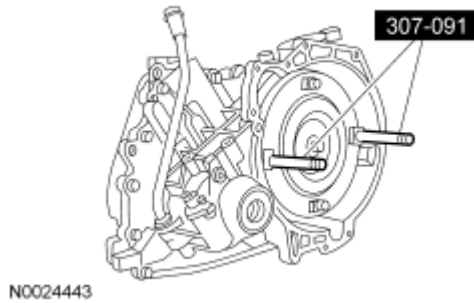


Fig. 291: Installing/Removing Torque Converter Using Special Tools
 Courtesy of FORD MOTOR CO.

4. Remove the turbine shaft speed (TSS) sensor.
 1. Remove the bolt.
 2. Remove the TSS sensor.

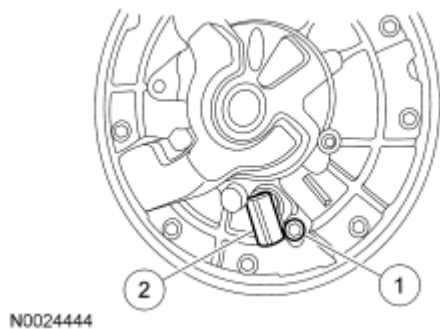


Fig. 292: Identifying Turbine Shaft Speed Sensor
 Courtesy of FORD MOTOR CO.

5. Remove and discard the TSS and OSS sensor O-ring seals.

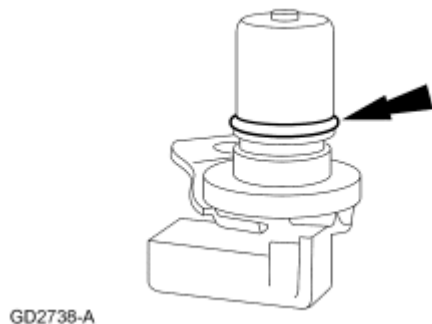


Fig. 293: O-Ring Seal
 Courtesy of FORD MOTOR CO.

6. Remove the transmission range (TR) sensor.
 1. Remove the bolts.

2. Remove the TR sensor from the manual valve detent lever shaft.

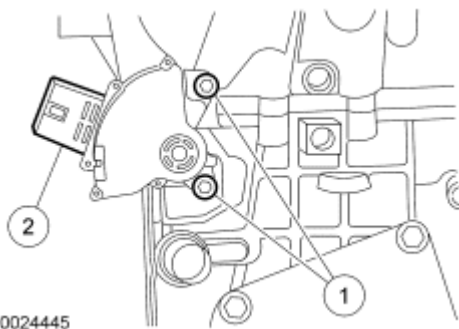


Fig. 294: Identifying Transmission Range (TR) Sensor
Courtesy of FORD MOTOR CO.

7. Using the special tool, secure the transaxle to the bench.

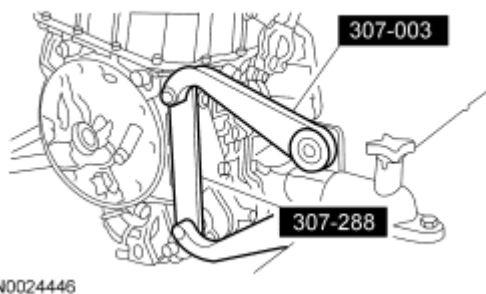


Fig. 295: Securing Transaxle To Bench
Courtesy of FORD MOTOR CO.

8. Position the drain pan under the transaxle, remove the drain plug, and drain the transmission fluid.

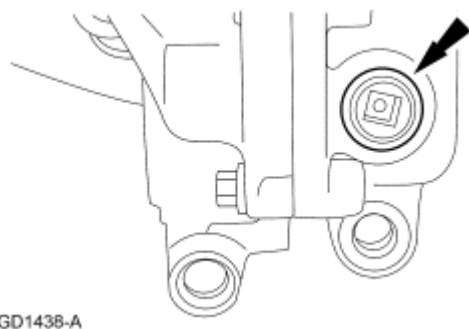


Fig. 296: Transaxle Drain Plug
Courtesy of FORD MOTOR CO.

9. Remove the pump assembly driveshaft.

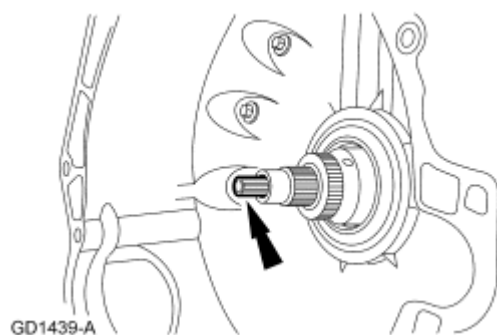


Fig. 297: Pump Assembly Driveshaft
Courtesy of FORD MOTOR CO.

10. Using the special tools, remove and discard the torque converter impeller hub seal.

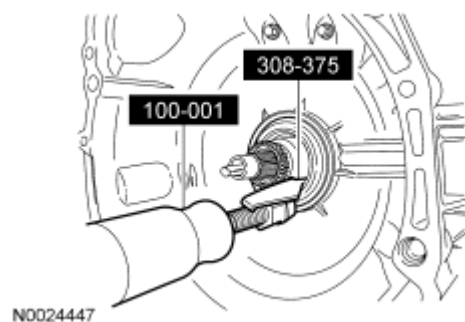


Fig. 298: Removing Torque Converter Impeller Hub Seal
Courtesy of FORD MOTOR CO.

11. Using the special tools, remove the LH differential seal.

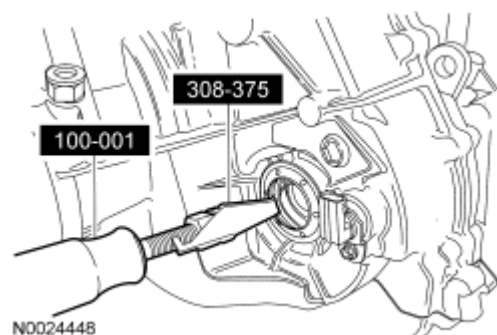


Fig. 299: Removing LH Differential Seal Using Special Tools
Courtesy of FORD MOTOR CO.

12. If the vehicle is equipped with a power transfer unit (PTU), use the special tools to remove the RH differential seal.

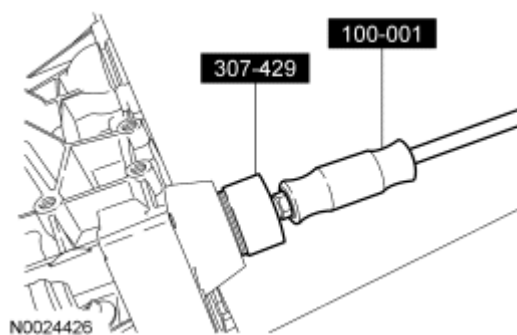


Fig. 300: Removing RH Differential Seal Using Special Tools (1 Of 2)
Courtesy of FORD MOTOR CO.

13. If the vehicle is not equipped with a PTU, use the special tools to remove the RH differential seal.

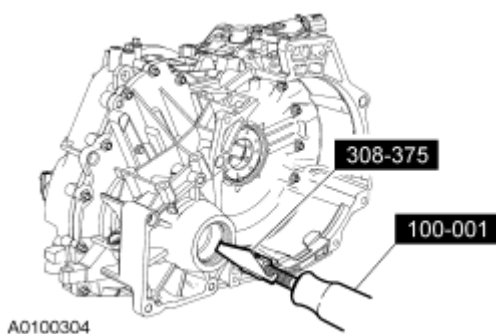


Fig. 301: Removing RH Differential Seal Using Special Tools (2 Of 2)
Courtesy of FORD MOTOR CO.

14. Remove the transaxle fluid filler tube bolt.

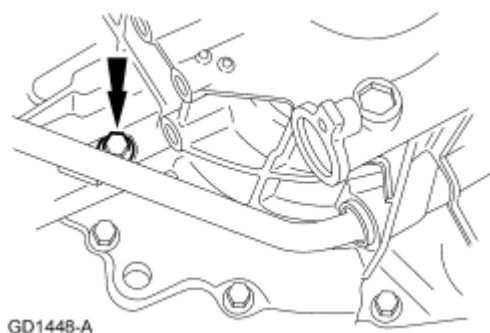
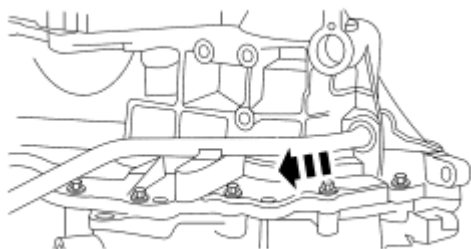


Fig. 302: Transaxle Fluid Filler Tube Bolt
Courtesy of FORD MOTOR CO.

15. Remove the transaxle fluid filler tube.



GD1449-A

Fig. 303: Transaxle Fluid Filler Tube
Courtesy of FORD MOTOR CO.

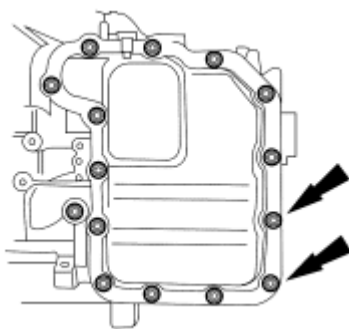
16. Remove and discard the transaxle filler tube grommet.



GD1450-A

Fig. 304: Transaxle Fluid Filler Tube Grommet
Courtesy of FORD MOTOR CO.

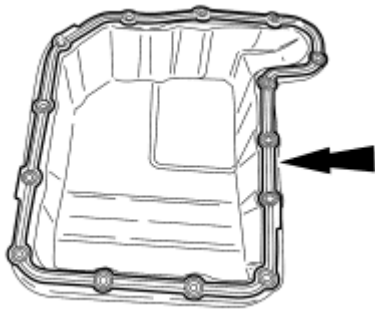
17. Remove the main control cover bolts, studs and cover.



N0014663

Fig. 305: Locating Main Control Cover Bolts, Studs & Cover
Courtesy of FORD MOTOR CO.

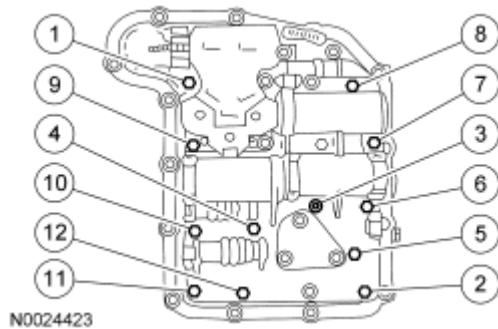
18. Remove the gasket.



A0075576

Fig. 306: Locating Main Control Cover Gasket
Courtesy of FORD MOTOR CO.

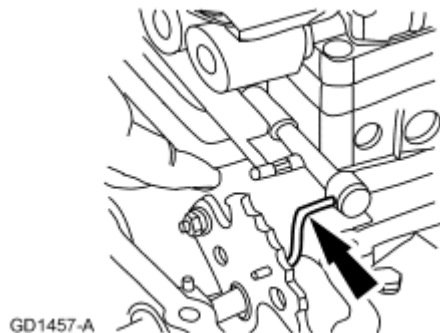
19. Inspect the fitting of the main control cover vent tube for blockage.
20. Remove the main control valve body bolts.



N0024423

Fig. 307: Main Control Valve Body Mounting Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

21. Disconnect the manual valve link from the manual valve when lifting the main control valve body from the case.



GD1457-A

Fig. 308: Manual Valve Link At Main Control Valve Body
Courtesy of FORD MOTOR CO.

CAUTION: Do not pull on solenoid body electrical connector wires, or use a hammer on the electrical connector.

22. Remove the solenoid body electrical connector.
- Release the retaining tabs and push the connector through the transaxle case.

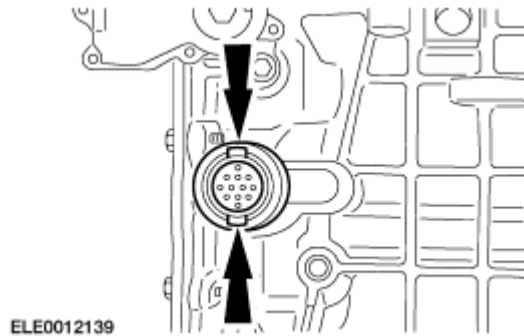


Fig. 309: Solenoid Body Electrical Connector Retaining Tabs
Courtesy of FORD MOTOR CO.

23. Support the manual valve and remove the main control.

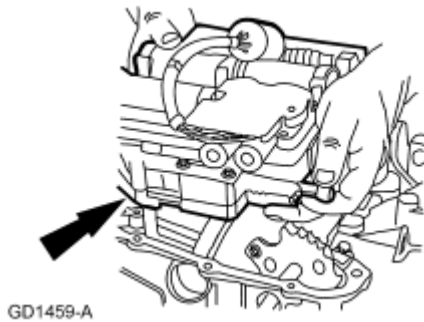


Fig. 310: Manual Valve Body & Main Control
Courtesy of FORD MOTOR CO.

24. Remove the thermostatic fluid level control valve bracket.
1. Remove the bolt.
 2. Remove the bracket.

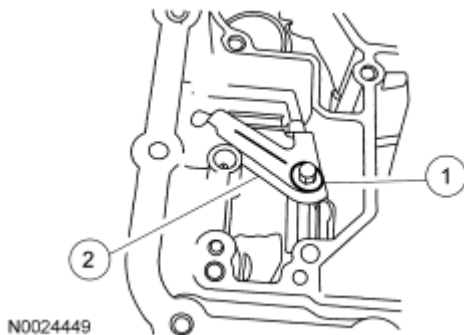


Fig. 311: Thermostatic Fluid Level Control Valve Bracket & Bolt
Courtesy of FORD MOTOR CO.

25. Remove the thermostatic fluid level control valve.

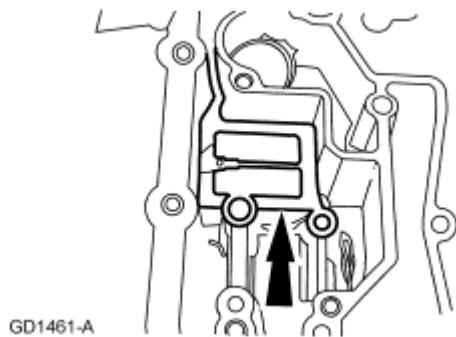


Fig. 312: Thermostatic Fluid Level Control Valve
Courtesy of FORD MOTOR CO.

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.

CAUTION: Do not use a screwdriver to remove the retaining ring or damage to the case can occur. Use only snap ring pliers to remove the retaining ring.

26. Using the special tool, remove the servo assembly.
 1. Install the special tool.
 2. Compress the servo assembly by tightening the bolt.
 3. Remove the retaining ring.

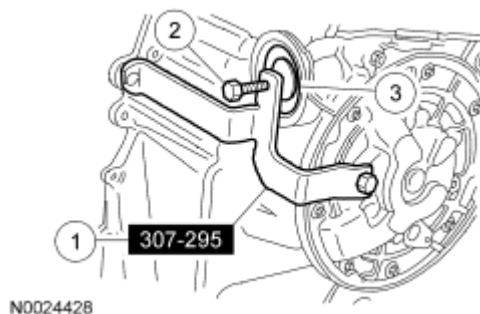


Fig. 313: Removing Servo Retaining Ring Using Special Tools
Courtesy of FORD MOTOR CO.

27. Remove the servo cover assembly.
28. Remove the intermediate and overdrive servo piston and return spring.

NOTE: If the bonded seal is damaged, install a new servo assembly.

29. Inspect the intermediate and overdrive servo assembly and bore for damage or wear.

1. Servo cover with bonded seal.
2. Cushion spring
3. Servo apply rod
4. Servo return spring
 - Case servo bore

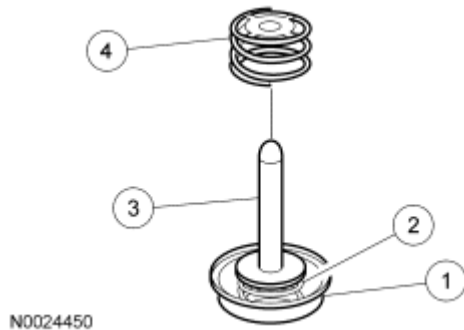


Fig. 314: Identifying Intermediate & Overdrive Servo Assembly Components
Courtesy of FORD MOTOR CO.

NOTE: Position the transaxle with the torque converter housing facing upward.

30. Remove the 20 bolts.

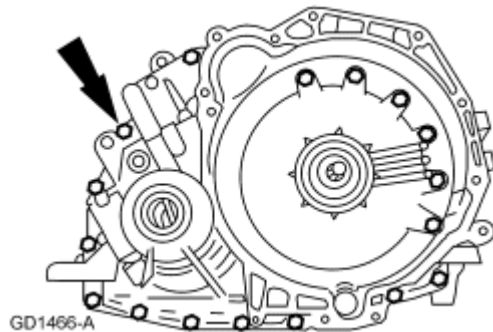
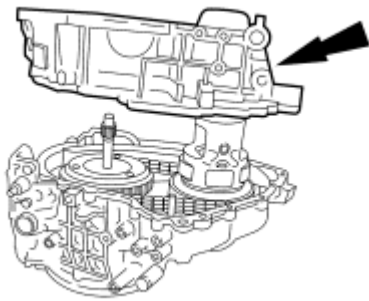


Fig. 315: Torque Converter Housing Bolts
Courtesy of FORD MOTOR CO.

NOTE: Place the torque converter housing on the engine flange side after removal to prevent damage to the lube tube.

31. Separate the torque converter housing from the transaxle case.

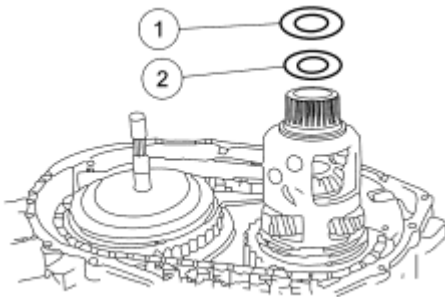
- Remove and discard the transaxle split flange gasket.



GD3391-A

Fig. 316: Torque Converter Housing
Courtesy of FORD MOTOR CO.

32. Remove the differential bearing and shim.
 1. Remove the No. 15 differential bearing.
 2. Remove the No. 14 differential bearing shim.

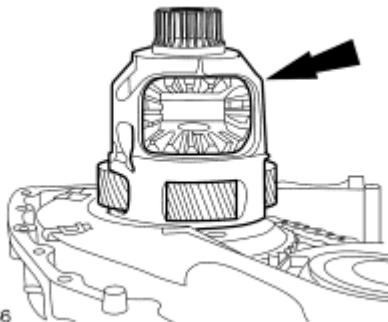


N0024451

Fig. 317: No. 15 Differential Bearing & No. 14 Differential Bearing Shim
Courtesy of FORD MOTOR CO.

NOTE: The all wheel drive differential is shown. The front wheel drive differential may or may not have splines.

33. Remove the final drive carrier and differential assembly.



A0039966

Fig. 318: Final Drive Carrier & Differential Assembly
Courtesy of FORD MOTOR CO.

34. Remove the No. 13 driven sprocket thrust bearing.

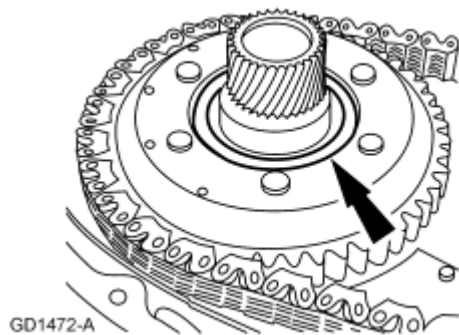


Fig. 319: No. 13 Driven Sprocket Thrust Bearing
Courtesy of FORD MOTOR CO.

35. Unclip and remove the chain pan cover.

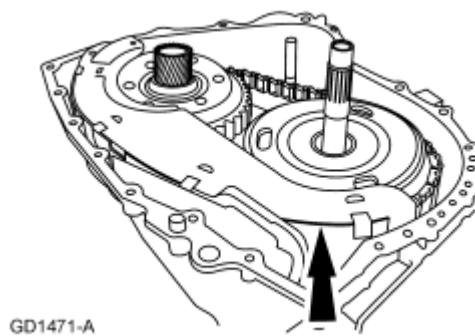


Fig. 320: Chain Pan Cover
Courtesy of FORD MOTOR CO.

NOTE: The driven sprocket thrust washer may adhere to the converter housing.

36. Remove the No. 10 driven sprocket thrust washer from the reverse/overdrive ring gear assembly.

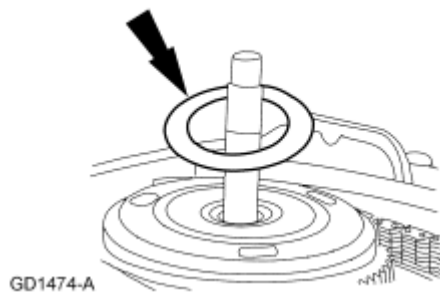


Fig. 321: No. 10 Driven Sprocket Thrust Washer
Courtesy of FORD MOTOR CO.

37. Remove the chain drive, reverse/overdrive ring gear and driven sprocket assembly.

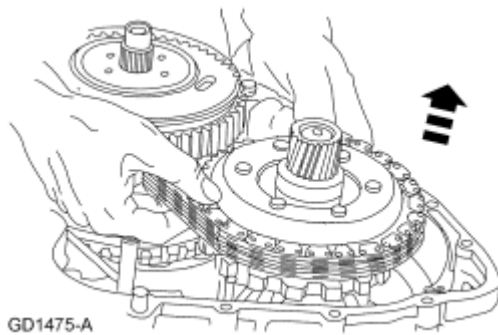


Fig. 322: Chain Drive, Reverse/Overdrive Ring Gear & Driven Sprocket Assembly
Courtesy of FORD MOTOR CO.

38. Separate the drive chain assembly from the driven sprocket assembly and reverse/overdrive ring gear assembly.

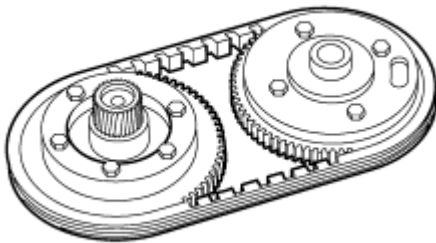


Fig. 323: Drive Chain Assembly
Courtesy of FORD MOTOR CO.

NOTE: Inspect the magnet located on the chain pan for excessive metal particles.

39. Remove the chain pan (with the magnet retained) from the transaxle case.

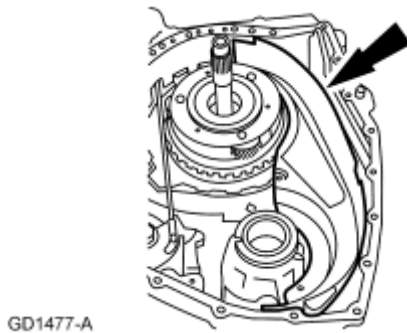
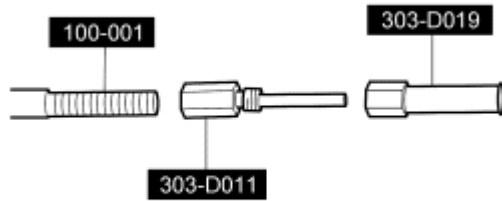


Fig. 324: Chain Pan
Courtesy of FORD MOTOR CO.

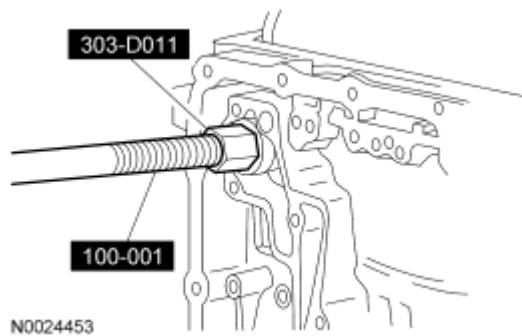
40. Assemble the special tools.



N0024452

Fig. 325: Assembling Special Tools
Courtesy of FORD MOTOR CO.

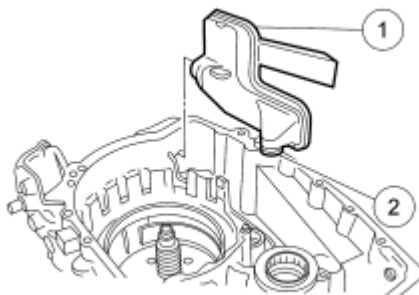
41. Using the special tools, remove and discard fluid filter recirculating regulator exhaust seal.



N0024453

Fig. 326: Removing Fluid Filter Recirculating Regulator Exhaust Seal Using Special Tools
Courtesy of FORD MOTOR CO.

42. Remove the fluid filter and seal assembly.
1. Discard the fluid filter.
 2. Discard the fluid filter seal.



N0024454

Fig. 327: Identifying Fluid Filter & Seal Assembly
Courtesy of FORD MOTOR CO.

43. Remove the No. 12 driven sprocket bearing.

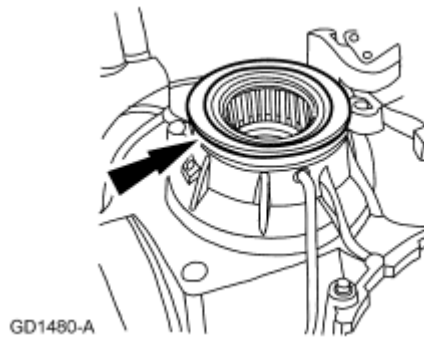


Fig. 328: No. 12 Driven Sprocket Bearing
Courtesy of FORD MOTOR CO.

44. Remove the No. 11 driven sprocket shim (selective fit).

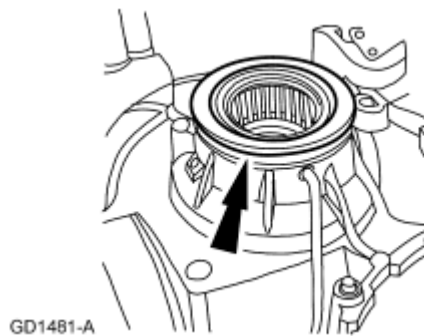


Fig. 329: No. 11 Driven Sprocket Shim
Courtesy of FORD MOTOR CO.

45. Disconnect the parking lever actuating rod from the parking cam actuator lever assembly.

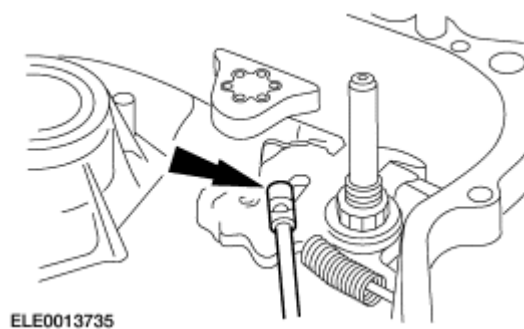


Fig. 330: Parking Lever Actuating Rod & Parking Cam Actuator Lever Assembly
Courtesy of FORD MOTOR CO.

46. Disconnect the parking lever actuation rod from the manual valve detent lever, and remove the parking lever actuation rod.

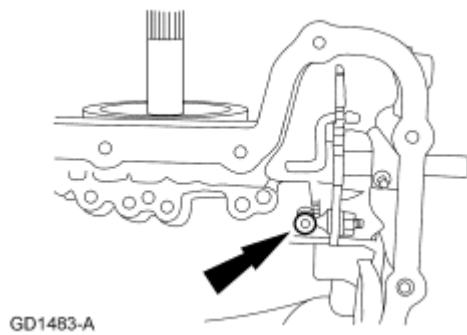


Fig. 331: Parking Lever Actuation Rod At Manual Valve Detent Lever
Courtesy of FORD MOTOR CO.

NOTE: The thrust bearing may adhere to the reverse/overdrive sprocket.

47. Remove the No. 9 reverse/overdrive ring gear thrust bearing.

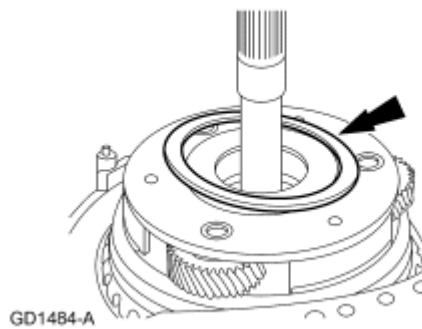


Fig. 332: No. 9 Reverse/Overdrive Ring Gear Thrust Bearing
Courtesy of FORD MOTOR CO.

NOTE: The thrust bearing is part of the reverse/overdrive carrier assembly.

48. Remove the reverse/overdrive carrier assembly with captured No. 8 thrust bearing.

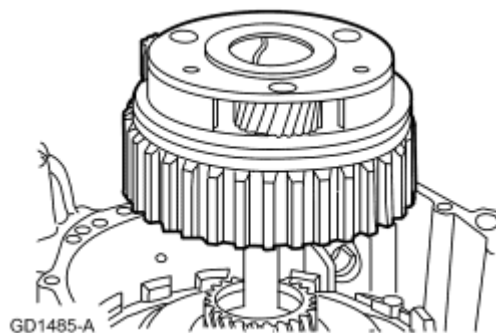


Fig. 333: Reverse/Overdrive Carrier Assembly
Courtesy of FORD MOTOR CO.

49. Remove the reverse/overdrive sun gear and shell assembly.

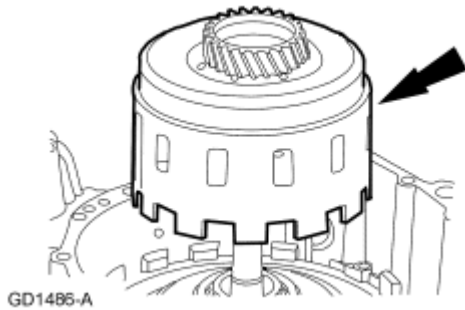


Fig. 334: Reverse/Overdrive Sun Gear & Shell Assembly
Courtesy of FORD MOTOR CO.

NOTE: The thrust bearing may adhere to the reverse/overdrive sun gear and shell.

50. Remove the reverse/overdrive sun gear and No. 7 shell thrust bearing.

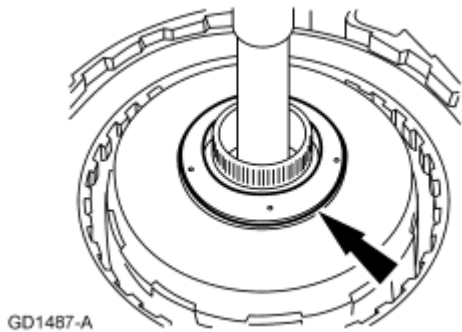


Fig. 335: Reverse/Overdrive Sun Gear & No. 7 Shell Thrust Bearing
Courtesy of FORD MOTOR CO.

51. Remove the low/intermediate ring gear assembly.

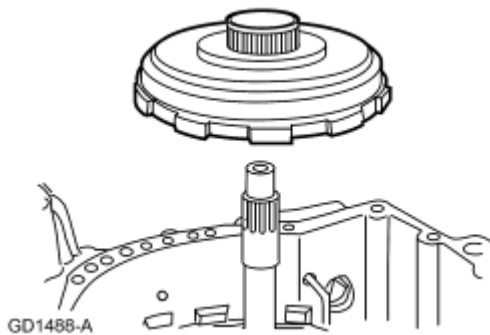


Fig. 336: Low/Intermediate Ring Gear Assembly
Courtesy of FORD MOTOR CO.

NOTE: The low/intermediate carrier thrust bearing may adhere to the low/intermediate ring gear.

52. Remove the No. 6 low/intermediate carrier thrust bearing.

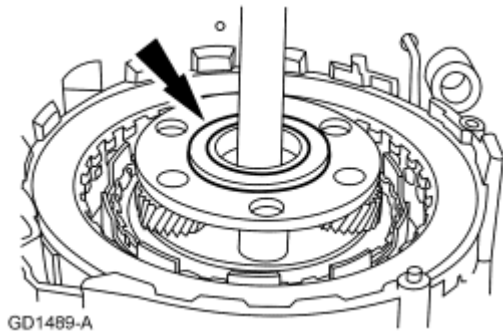


Fig. 337: No. 6 Low/Intermediate Carrier Thrust Bearing
Courtesy of FORD MOTOR CO.

53. Remove the low/intermediate carrier assembly.

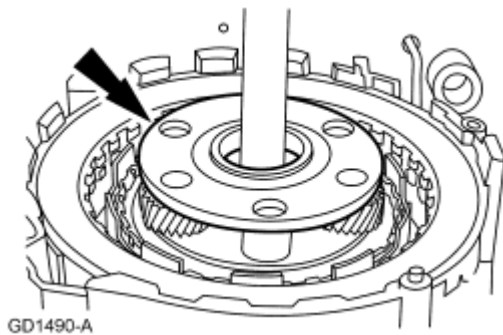


Fig. 338: Low/Intermediate Carrier Assembly
Courtesy of FORD MOTOR CO.

54. Remove the No. 5 low/intermediate sun gear thrust bearing and tag for installation.

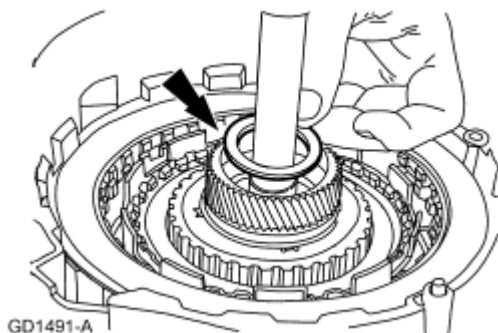


Fig. 339: No. 5 Low/Intermediate Sun Gear Thrust Bearing
Courtesy of FORD MOTOR CO.

55. Remove the forward one-way clutch and low/intermediate sun gear.

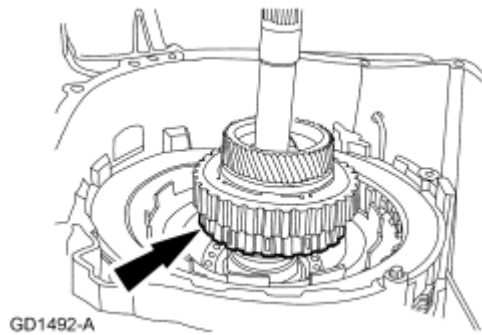


Fig. 340: Forward One-Way Clutch & Low/Intermediate Sun Gear
Courtesy of FORD MOTOR CO.

NOTE: The turbine shaft thrust bearing may adhere to the forward one-way clutch and low/intermediate sun gear.

56. Remove the No. 4 turbine shaft thrust bearing.

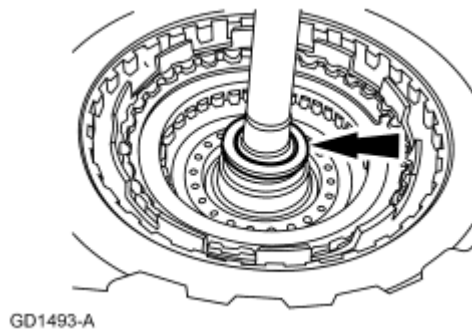


Fig. 341: No. 4 Turbine Shaft Thrust Bearing
Courtesy of FORD MOTOR CO.

57. Remove the turbine shaft assembly.

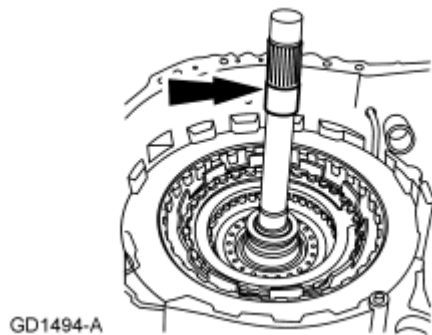
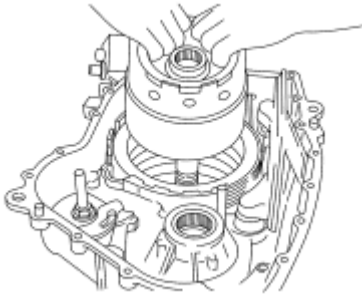


Fig. 342: Turbine Shaft Assembly
Courtesy of FORD MOTOR CO.

58. Remove the forward/coast/direct cylinder assembly and reverse clutch drum assembly from the transaxle.

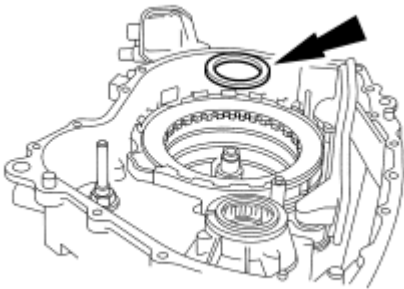


GD3394-A

Fig. 343: Forward/Coast/Direct Cylinder Assembly & Reverse Clutch Drum Assembly
Courtesy of FORD MOTOR CO.

NOTE: The pump support thrust bearing assembly may adhere to the reverse clutch drum assembly.

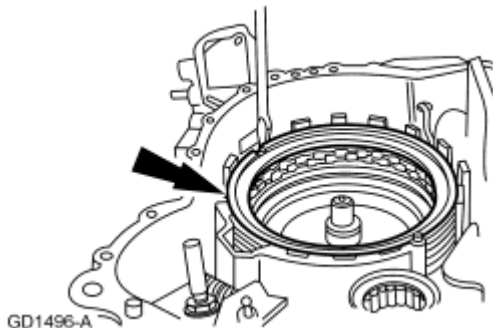
59. Remove the No. 1 pump support thrust bearing and tag for installation.



GD3392-A

Fig. 344: No. 1 Pump Support Thrust Bearing
Courtesy of FORD MOTOR CO.

60. Remove the low one-way clutch retaining ring.



GD1496-A

Fig. 345: Low One-Way Clutch Retaining Ring
Courtesy of FORD MOTOR CO.

61. Remove the mechanical diode assembly.

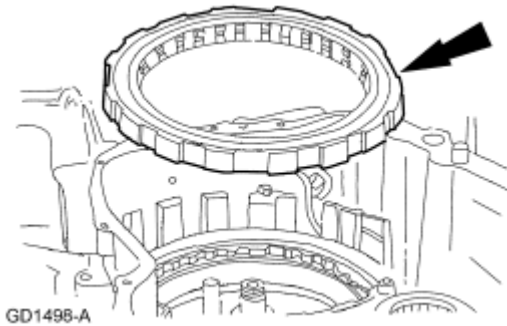


Fig. 346: Mechanical Diode Assembly
Courtesy of FORD MOTOR CO.

62. Remove the thin, 8-wave low/reverse clutch wave spring.

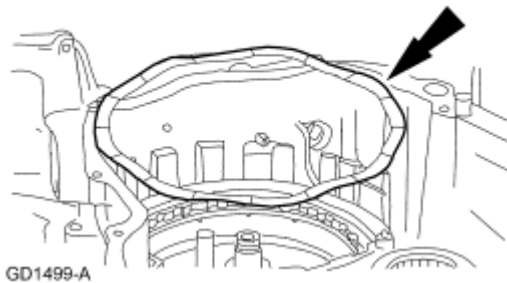


Fig. 347: Thin Low/Reverse Clutch Wave Spring
Courtesy of FORD MOTOR CO.

63. Remove the low/reverse clutch plates.

- Inspect the friction plates for partially stripped, broken or bent spline teeth, burnt, worn or flaked-off friction material and warped or bent friction discs.
- Inspect the steel plates for heat discoloration or warpage.

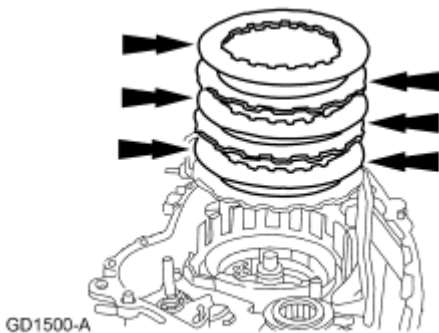


Fig. 348: Low/Reverse Clutch Plates
Courtesy of FORD MOTOR CO.

64. Remove the thick, 10-wave low/reverse clutch wave spring.

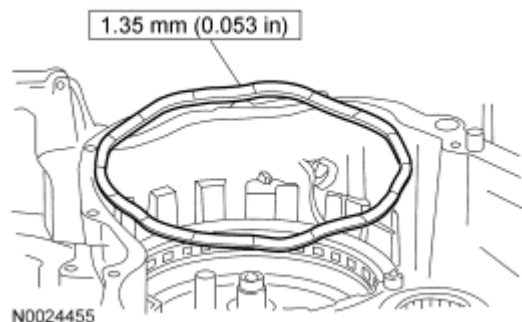


Fig. 349: Thick Low/Reverse Clutch Wave Spring
Courtesy of FORD MOTOR CO.

65. Remove and discard the low/reverse clutch return spring retaining ring.

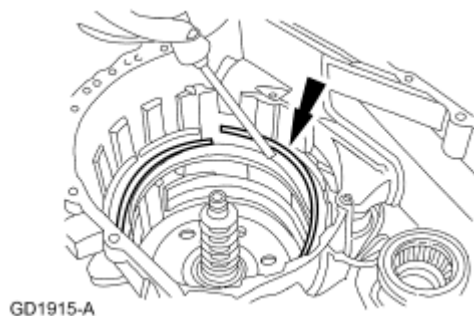


Fig. 350: Low/Reverse Clutch Return Spring Retaining Ring
Courtesy of FORD MOTOR CO.

66. Remove the low/reverse clutch return spring assembly.

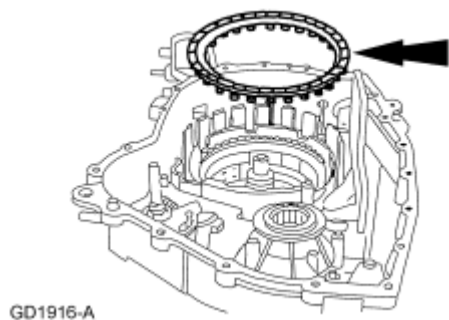
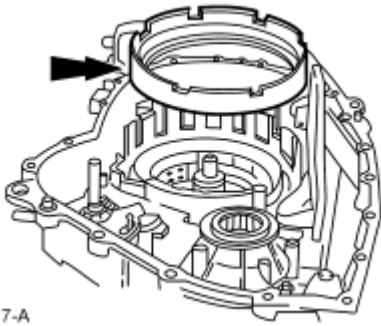


Fig. 351: Low/Reverse Clutch Return Spring Assembly
Courtesy of FORD MOTOR CO.

NOTE: Rotate the low/reverse clutch piston while pulling upward.

67. Remove the low/reverse clutch piston.

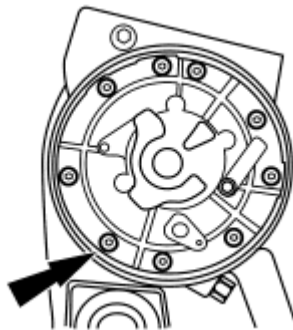


GD1917-A

Fig. 352: Low/Reverse Clutch Piston
Courtesy of FORD MOTOR CO.

NOTE: Position the transaxle so the pump assembly is facing upward.

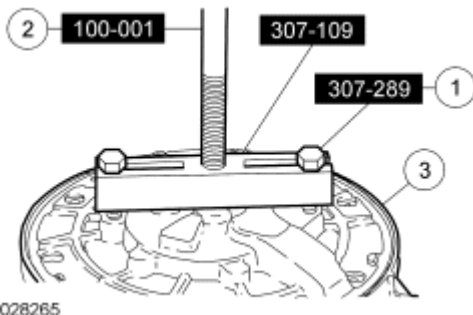
68. Remove the pump assembly bolts.



GD1919-A

Fig. 353: Pump Assembly Bolts
Courtesy of FORD MOTOR CO.

69. Using the special tools, remove the pump assembly.
1. Install the special tool.
 2. Assemble the special tools.
 3. Using the special tools, remove the pump assembly.



N0028265

Fig. 354: Removing Pump Assembly Using Special Tools
Courtesy of FORD MOTOR CO.

70. Remove the intermediate and overdrive band assembly from the case.
 - Inspect the intermediate and overdrive band assembly for damage and wear.

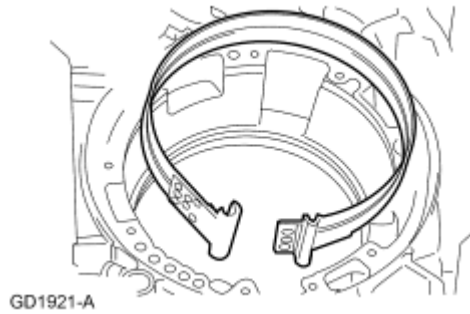


Fig. 355: Intermediate & Overdrive Band Assembly
Courtesy of FORD MOTOR CO.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

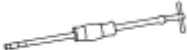
CHAIN SPROCKETS

Special Tools

Illustration	Tool Name	Tool Number
ST1255-A	Adapter for 303-224 (Handle)	205-153 (T80T-4000-W)
ST1955-A	Installer, Needle Bearing	307-294 (T94P-77000-K)
ST2058-A	Remover, Input Shaft Bearing	308-201 (T91T-7127-A)
	Remover, Transfer Case Bearing Cup	308-125 (T87P-7120-D)

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

 ST2059-A		
 ST1185-A	Slide Hammer	100-001 (T50T-100-A)

DISASSEMBLY

CAUTION: Clamp the sprocket in a soft-jawed vise or damage to the sprocket can occur.

1. Using the special tools, remove the No. 16 reverse/overdrive ring gear bearing, as necessary.

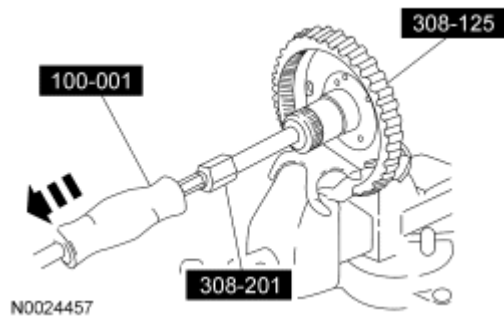


Fig. 356: Removing No. 16 Reverse/Overdrive Ring Gear Bearing Using Special Tools
Courtesy of FORD MOTOR CO.

2. Using the special tools, remove the No. 17 stator support bearing, as necessary.

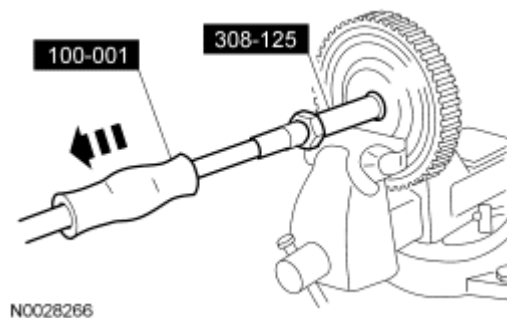
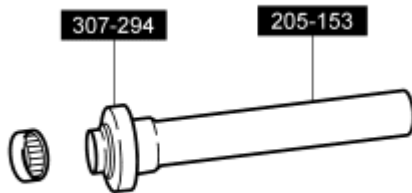


Fig. 357: Removing No. 17 Stator Support Bearing Using Special Tools
Courtesy of FORD MOTOR CO.

ASSEMBLY

1. Position the No. 16 reverse/overdrive ring gear bearing on the special tools.
 - Position the bearing with the part number facing toward the handle of the special tool.

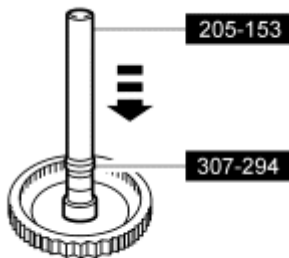


N0028267

Fig. 358: Positioning No 16 Reverse/Overdrive Ring Gear Bearing On Special Tools
 Courtesy of FORD MOTOR CO.

NOTE: The identification stamping of the bearing goes to the outboard side of the reverse/overdrive ring gear.

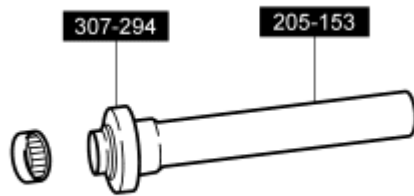
2. Using the special tools, install the No. 16 reverse/overdrive ring gear bearing.



N0028268

Fig. 359: Installing No. 16 Reverse/Overdrive Ring Gear Bearing Using Special Tools
 Courtesy of FORD MOTOR CO.

3. Position the No. 17 stator support bearing on the special tools.
 - Position the bearing with the part number facing toward the handle of the special tool.

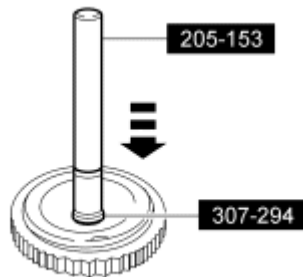


N0028267

Fig. 360: Positioning No 17 Stator Support Bearing On Special Tools
Courtesy of FORD MOTOR CO.

NOTE: The identification stamping of the bearing goes to the outboard side of the reverse/overdrive ring gear.

- Using the special tools, install the No. 17 stator support bearing into the stator support sprocket.



N0024461

Fig. 361: Installing No. 17 Stator Support Bearing Into Stator Support Sprocket Using Special Tools
Courtesy of FORD MOTOR CO.

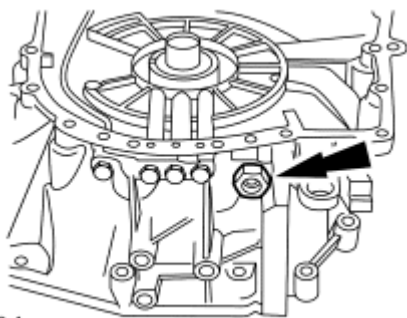
TORQUE CONVERTER HOUSING

Special Tools

Illustration	Tool Name	Tool Number
 ST1848-A	Installer, Lube Tube	307-306 (T94P-77000-U1)

DISASSEMBLY

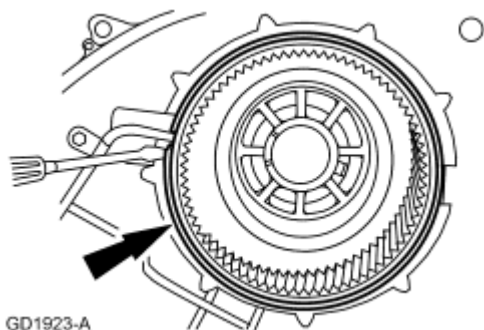
- Remove and discard the cooler tube fitting.



GD1922-A

Fig. 362: Cooler Tube Fitting
Courtesy of FORD MOTOR CO.

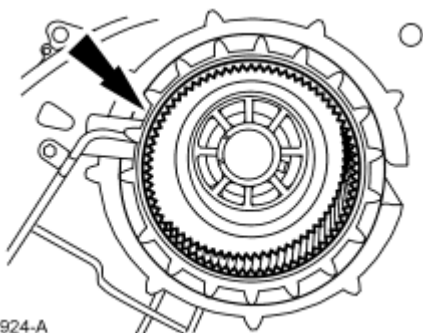
2. Remove the final drive ring gear retaining ring.



GD1923-A

Fig. 363: Final Drive Ring Gear Retaining Ring
Courtesy of FORD MOTOR CO.

3. Remove the final drive ring gear.



GD1924-A

Fig. 364: Final Drive Ring Gear
Courtesy of FORD MOTOR CO.

4. Inspect the final drive ring gear, housing lug teeth and final drive ring gear teeth for damage or wear.

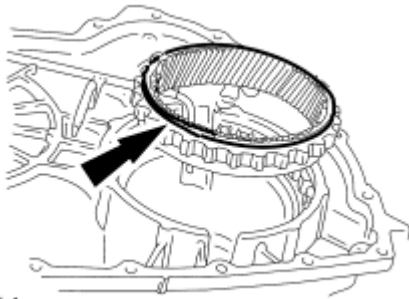


Fig. 365: Inspecting Final Drive Ring Gear
Courtesy of FORD MOTOR CO.

5. Remove the differential lube tube bolt.

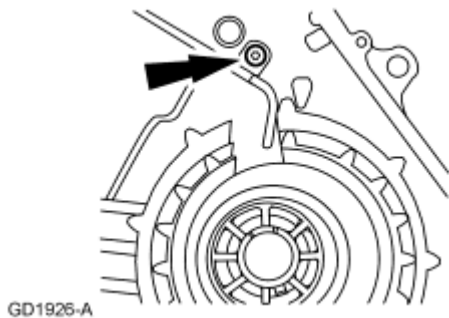


Fig. 366: Differential Lube Tube Bolt
Courtesy of FORD MOTOR CO.

6. Pull the differential lube tube from the housing.

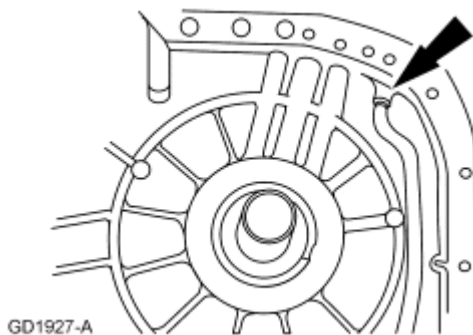
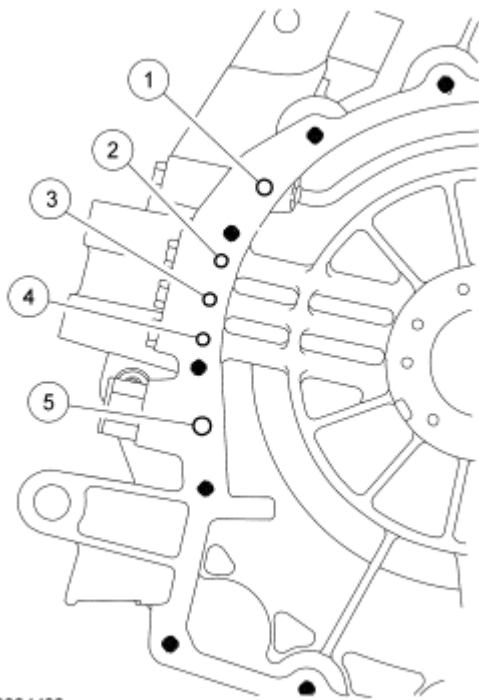


Fig. 367: Differential Lube Tube
Courtesy of FORD MOTOR CO.

WARNING: When using compressed air, never let air pressure exceed 172 kPa (25 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.

NOTE: Clean all components with a suitable solvent and use moisture-free compressed air to dry all parts and clean fluid passages.

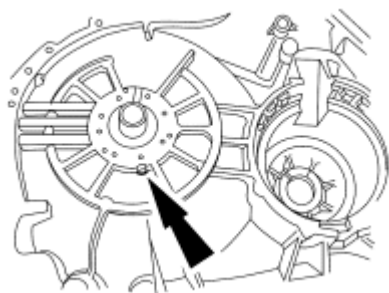
7. Inspect the converter housing for:
 - stator support area wear.
 - case mating surfaces for nicks or deformation.
 - differential bushing wear.
8. Check the converter housing hydraulic passages for blockage.
 1. Differential lubrication passage
 2. Front lubrication passage
 3. Converter turbine passage
 4. Converter impeller passage
 5. Cooler passage



N0024462

Fig. 368: Checking Converter Housing Hydraulic Passages
Courtesy of FORD MOTOR CO.

9. Check for blockage at the converter seal return hole.

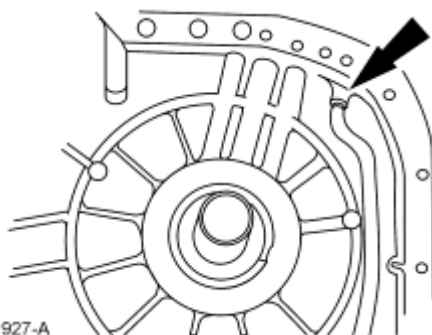


GD3831-A

Fig. 369: Converter Seal Return Hole
Courtesy of FORD MOTOR CO.

ASSEMBLY

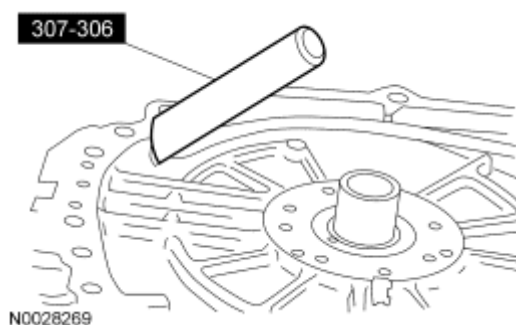
1. Position a new differential lube tube in the torque converter housing.



GD1927-A

Fig. 370: Differential Lube Tube
Courtesy of FORD MOTOR CO.

2. Using the special tool, install the differential lube tube.



N0028269

Fig. 371: Installing Differential Lube Tube Using Special Tools
Courtesy of FORD MOTOR CO.

3. Install the differential lube tube bolt.
 - Tighten to 13 Nm (10 lb-ft).

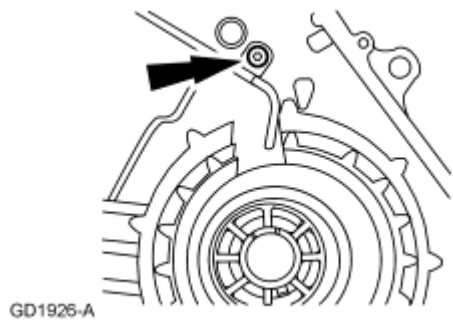


Fig. 372: Differential Lube Tube Bolt
Courtesy of FORD MOTOR CO.

NOTE: The final drive ring gear is installed with the lug end up.

4. Install the final drive ring gear.

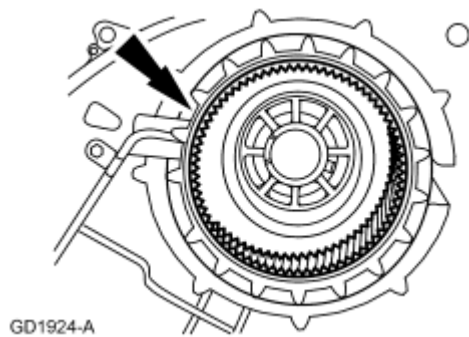


Fig. 373: Final Drive Ring Gear
Courtesy of FORD MOTOR CO.

5. Install the final drive ring gear retaining ring.

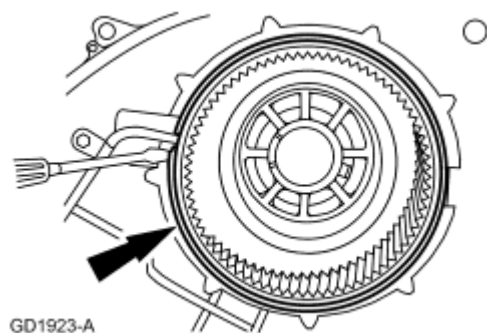


Fig. 374: Final Drive Ring Gear Retaining Ring
Courtesy of FORD MOTOR CO.

6. Install the cooler tube fitting.
 - Tighten to 48 Nm (35 lb-ft).

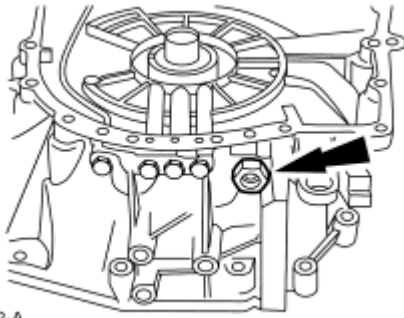


Fig. 375: Cooler Tube Fitting
Courtesy of FORD MOTOR CO.

FINAL DRIVE CARRIER AND DIFFERENTIAL ASSEMBLY

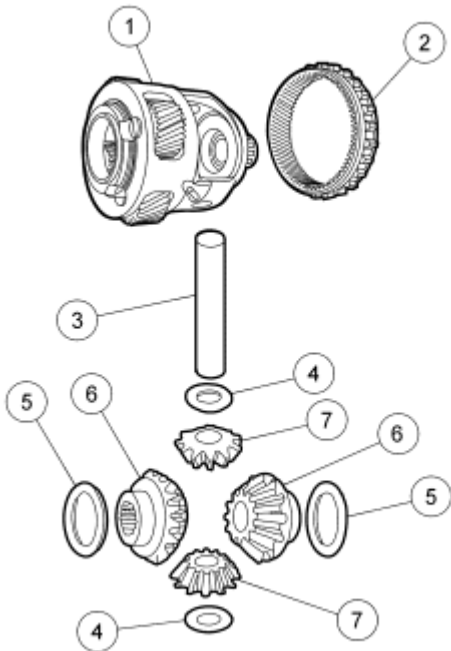


Fig. 376: Exploded View Of Final Drive Carrier & Differential Assembly
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	4204	Differential case (with final drive carrier)
2	7F453	Ring gear - final drive
3	4211	Pinion shaft - differential
4	4230	Pinion thrust washers - differential
5	4228	Side gear thrust washers - differential
6	4236	Side gears - differential

DISASSEMBLY

1. Inspect the differential for wear or damage. Install new components as required.

CAUTION: Do not disassemble the planet carrier.

NOTE: If the measurement exceeds specification, install a new complete final drive carrier. If the measurement is within specification, continue with the diagnostic procedure.

2. Measure the final drive planet gear end play with a feeler gauge.

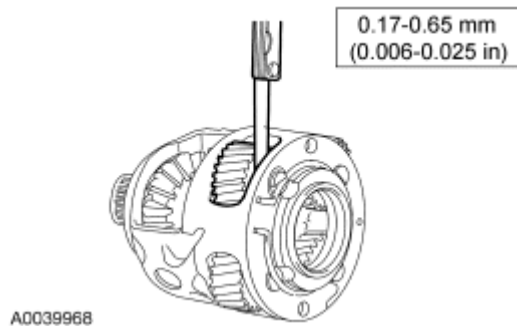


Fig. 377: Measuring Final Drive Planet Gear End Play With Feeler Gauge With Specification
Courtesy of FORD MOTOR CO.

NOTE: Do not remove the final drive pinion shaft retaining ring.

3. Remove the differential pinion shaft.
 1. Remove the pinion shaft roll pin.
 2. Remove the differential pinion shaft.

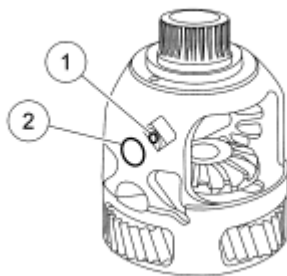
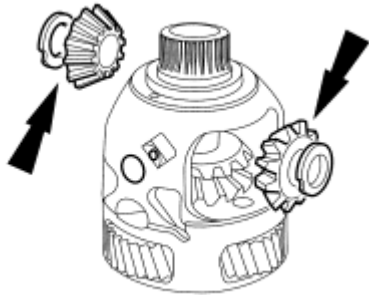


Fig. 378: Identifying Differential Pinion Shaft & Pinion Shaft Roll Pin

Courtesy of FORD MOTOR CO.

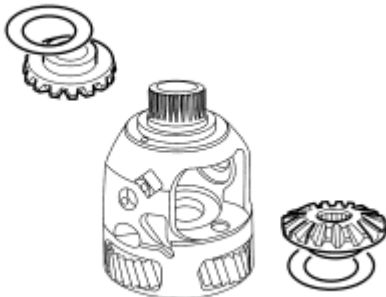
4. Remove the pinion gears and thrust washers.
 - Turn the differential pinion gears 90 degrees and remove.



A0039995

Fig. 379: Locating Differential Pinion Gears & Thrust Washers
 Courtesy of FORD MOTOR CO.

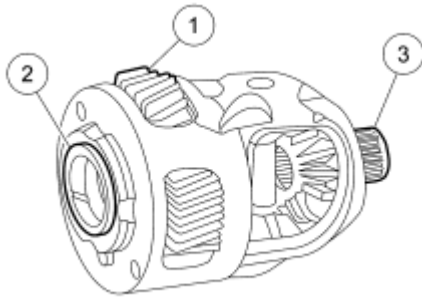
5. Remove the differential side gears and differential side gear thrust washers.



A0039996

Fig. 380: Identifying Differential Side Gears & Differential Side Gear Thrust Washers
 Courtesy of FORD MOTOR CO.

6. Clean all parts thoroughly in clean solvent and blow dry with moisture-free regulated compressed air.
7. Inspect the differential parts for damage and wear.
 - Gear teeth
 - Thrust washer surface
 - Thrust bearing surface
 - Pinion shaft
8. Inspect the final drive planet and carrier.
 1. Pinion gear teeth
 2. Thrust bearing surfaces
 3. Bushing surfaces

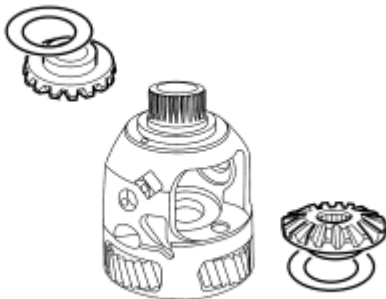


N0024465

Fig. 381: Inspecting Final Drive Planet And Carrier
Courtesy of FORD MOTOR CO.

ASSEMBLY

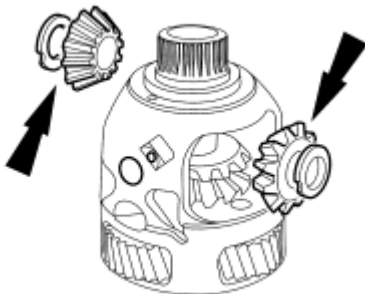
1. Install the differential side gears and thrust washers.



A0039996

Fig. 382: Identifying Differential Side Gears & Differential Side Gear Thrust Washers
Courtesy of FORD MOTOR CO.

2. Install the differential pinion gears and thrust washers.
 - Rotate the differential pinion gears 90 degrees.

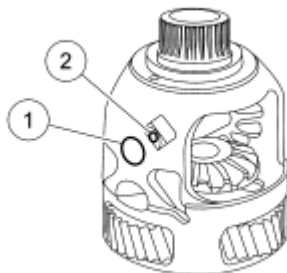


A0039995

Fig. 383: Locating Differential Pinion Gears & Thrust Washers
Courtesy of FORD MOTOR CO.

3. Install the differential pinion shaft.

1. Push the pinion shaft in place.
2. Install the roll pin.



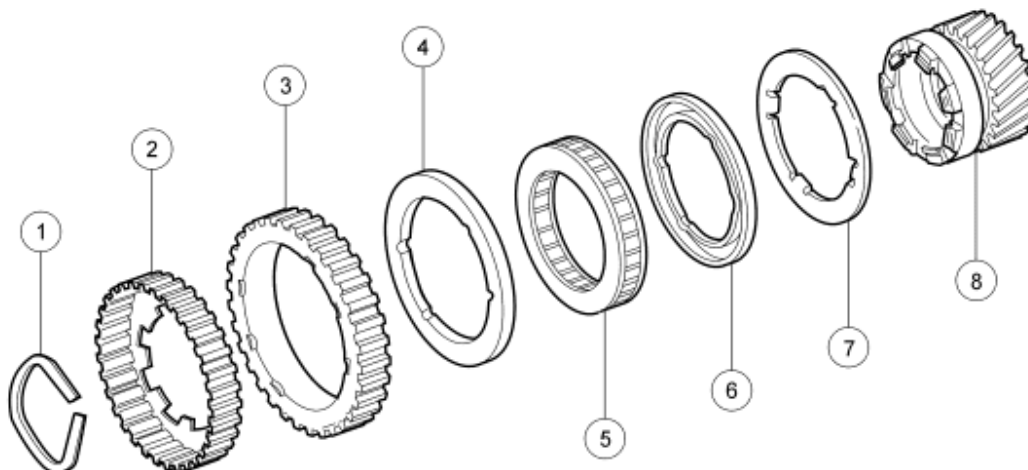
N0024470

Fig. 384: Identifying Differential Pinion Shaft & Roll Pin
Courtesy of FORD MOTOR CO.

FORWARD ONE-WAY CLUTCH - SPRAG TYPE

Special Tools

Illustration	Tool Name	Tool Number
 ST1967-A	Installer, Transmission Sprag	307-293 (T94P-77000-J)



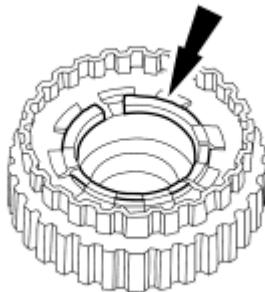
N0024466

Fig. 385: Exploded View Of Forward One-Way Clutch - Sprag Type
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7C122	Coast clutch hub retaining ring
2	7H214	Coast clutch hub
3	7G439	Forward one-way clutch outer race
4	-	Forward one-way clutch end cap (part of 7H218)
5	7H218	Forward one-way clutch sprag assembly
6	-	Forward one-way clutch end cap (part of 7H218)
7	7H219	Forward one-way clutch retainer
8	7H229	Low and intermediate sun gear, race and bushing assembly

DISASSEMBLY

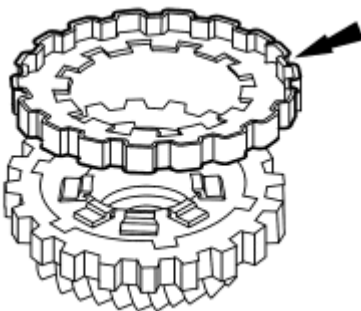
1. Remove the coast clutch hub retaining ring.



GD2781-A

Fig. 386: Coast Clutch Hub Retaining Ring
Courtesy of FORD MOTOR CO.

2. Remove the coast clutch hub.



GD2782-A

Fig. 387: Coast Clutch Hub

Courtesy of FORD MOTOR CO.

3. Remove the forward one-way clutch outer race and sprag assembly with end caps.

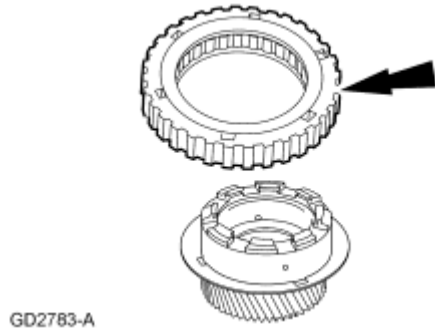


Fig. 388: Forward One-Way Clutch Outer Race & Sprag Assembly
Courtesy of FORD MOTOR CO.

NOTE: Orientation of end caps to sprag assembly. New design end caps are the same thickness and interchangeable (but not reversible).

4. Remove the forward one-way clutch end caps from the sprag assembly.

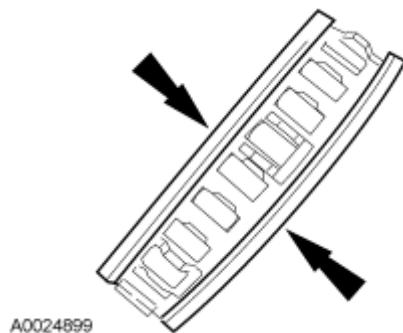


Fig. 389: Forward One-Way Clutch End Caps
Courtesy of FORD MOTOR CO.

5. Remove the forward one-way clutch retainer.

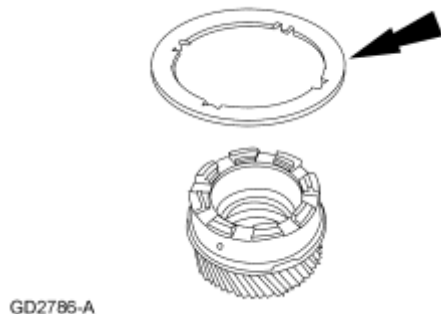


Fig. 390: Forward One-Way Clutch Retainer
Courtesy of FORD MOTOR CO.

6. Remove the retaining ring down over the gear.

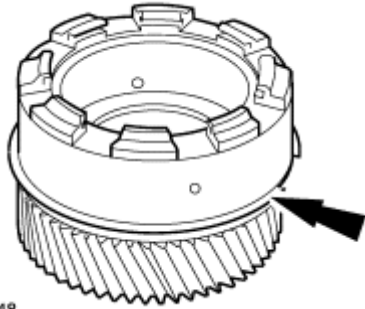


Fig. 391: Retaining Ring
Courtesy of FORD MOTOR CO.

WARNING: Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air. Failure to follow these instructions can result in personal injury.

7. Clean all parts thoroughly in clean solvent and blow dry with moisture-free compressed air.
8. Inspect the forward one-way clutch parts for damage and wear.
 - Outer race
 - Sprag assembly and end caps
 - Inner race and low-intermediate sun gear assembly
 - Lube holes
 - Coast clutch hub

ASSEMBLY

1. Install the retaining ring.

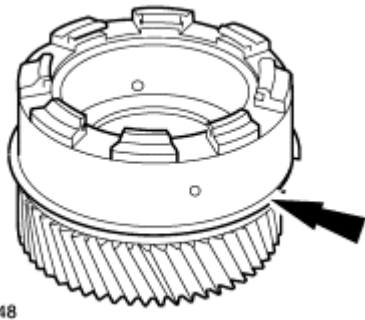


Fig. 392: Retaining Ring
Courtesy of FORD MOTOR CO.

NOTE: The tabs on the retainer face downward.

2. Install the forward one-way clutch retainer.

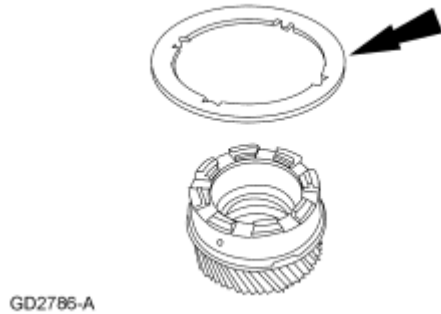


Fig. 393: Forward One-Way Clutch Retainer
Courtesy of FORD MOTOR CO.

3. Install the forward one-way clutch end caps onto the sprag assembly.

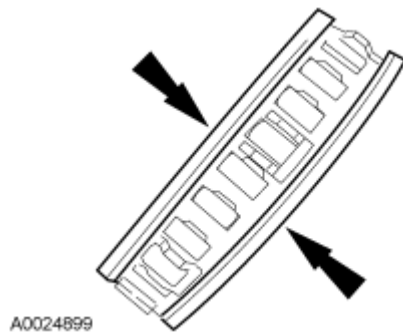


Fig. 394: Forward One-Way Clutch End Caps
Courtesy of FORD MOTOR CO.

4. Using the special tool, install the one-way clutch bearing into the one-way outer race.

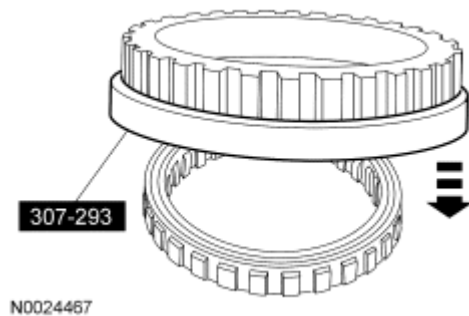


Fig. 395: Installing One-Way Clutch Bearing Into One-Way Outer Race Using Special Tools
Courtesy of FORD MOTOR CO.

5. Install the sprag assembly and end caps in the outer race.

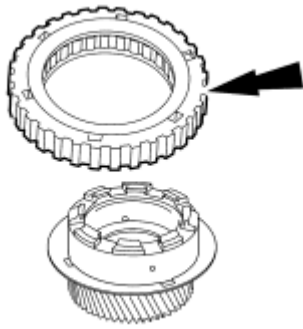


Fig. 396: Forward One-Way Clutch Outer Race & Sprag Assembly
Courtesy of FORD MOTOR CO.

NOTE: Lube grooves face upward (away from the sun gear).

6. Rotate the outer race and sprag assembly (with end caps) over and install it on the forward one-way clutch inner race.

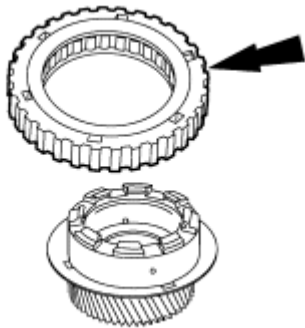


Fig. 397: Lube Grooves Facing Upward
Courtesy of FORD MOTOR CO.

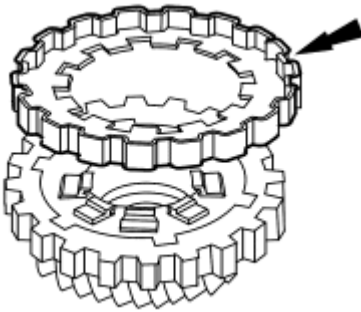
7. Check the operation of the forward one-way clutch with the low/intermediate sun gear facing upward.
 - Hold the outer race firmly.
 - Rotate the low/intermediate sun gear clockwise.
 - The low/intermediate sun gear should rotate with a slight drag without attempting to rotate the outer race.
 - Rotate the low/intermediate sun gear counterclockwise. The low/intermediate sun gear should rotate the outer race.



GD2790-A

Fig. 398: Checking Forward One-Way Clutch Operation
Courtesy of FORD MOTOR CO.

8. Install the coast clutch hub.



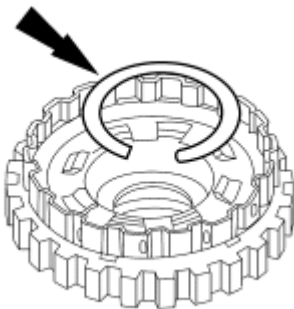
GD2782-A

Fig. 399: Coast Clutch Hub
Courtesy of FORD MOTOR CO.

NOTE: The ends of the retaining ring should point toward the coast clutch hub.

NOTE: Make sure the retaining ring is fully seated upon installation.

9. Install the coast clutch hub retaining ring.



GD2789-A

Fig. 400: Coast Clutch Hub Retaining Ring
Courtesy of FORD MOTOR CO.

LOW ONE-WAY CLUTCH - MECHANICAL DIODE TYPE

CAUTION: Do not clean in water or with water-based solvents.

NOTE: The mechanical diode type one-way clutch does not use a thrust plate.

NOTE: The mechanical diode type one-way clutch cannot be disassembled.

1. Inspect the one-way clutch for cracks and damaged splines. Make sure 3 rubber insulators are present. Install new rubber insulators if any damage is found. The internal splined section should rotate clockwise and lock when rotated counterclockwise. If any damage is found or the clutch does not rotate or lock, install a new mechanical diode type one-way clutch.

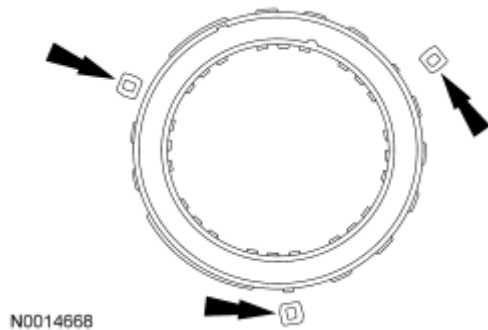
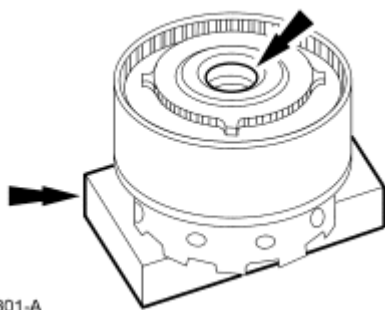


Fig. 401: Inspecting One-Way Clutch For Cracks And Damaged Splines
Courtesy of FORD MOTOR CO.

**FORWARD/COAST/DIRECT CLUTCH CYLINDER AND REVERSE CLUTCH DRUM -
DISASSEMBLY****DISASSEMBLY**

NOTE: Support the assembly of the forward/coast/direct clutch cylinder assembly and reverse clutch drum assembly on a block of wood so that the reverse clutch hub faces upward. This will ease the reverse clutch hub retaining ring removal.

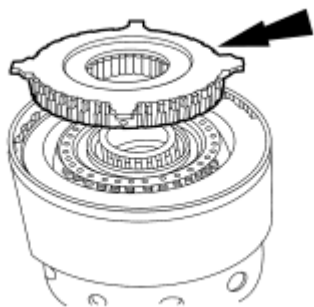
1. Remove the reverse clutch hub retaining ring.



GD2801-A

Fig. 402: Reverse Clutch Hub Retaining Ring & Block Of Wood
Courtesy of FORD MOTOR CO.

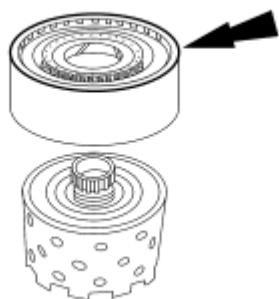
2. Remove the reverse clutch hub.



GD2802-A

Fig. 403: Reverse Clutch Hub
Courtesy of FORD MOTOR CO.

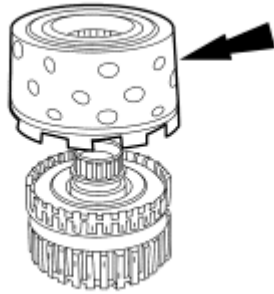
3. Remove the reverse clutch drum assembly.



GD2803-A

Fig. 404: Reverse Clutch Drum Assembly
Courtesy of FORD MOTOR CO.

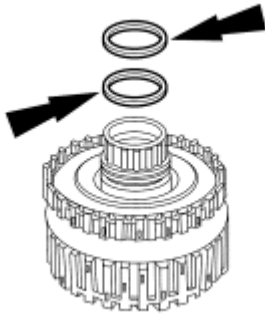
4. Remove the direct clutch hub and shell from the forward/coast/direct clutch cylinder.



GD2804-A

Fig. 405: Direct Clutch Hub & Shell
Courtesy of FORD MOTOR CO.

5. Remove and discard the 2 reverse clutch cylinder seals from the forward/coast/direct clutch cylinder assembly.

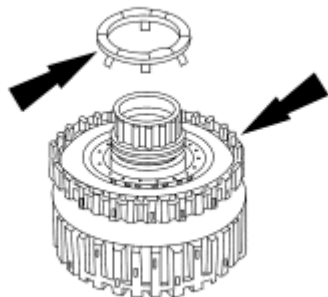


GD2805-A

Fig. 406: Reverse Clutch Cylinder Seals
Courtesy of FORD MOTOR CO.

NOTE: Observe the tab orientation of the No. 2 direct clutch thrust washer during disassembly for correct installation.

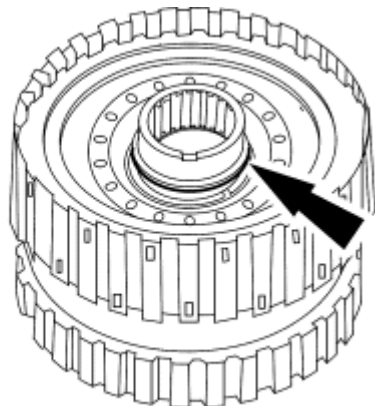
6. Remove the No. 2 direct clutch thrust washer from the forward/coast/direct clutch cylinder.



GD2806-A

Fig. 407: No. 2 Direct Clutch Thrust Washer
Courtesy of FORD MOTOR CO.

7. Remove and discard the forward/coast/direct clutch cylinder hub seal ring.

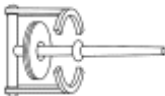


GD3841-A

Fig. 408: Forward/Coast/Direct Clutch Cylinder Hub Seal Ring
Courtesy of FORD MOTOR CO.

FORWARD/COAST/DIRECT CLUTCHES

Special Tools

Illustration	Tool Name	Tool Number
 ST1190-A	Compressor, Clutch Spring	307-015 (T65L-77515-A)
 ST1266-A	Dial Indicator Gauge with Holding Fixture	100-D002 (D78P-4201-B)
 ST1989-A	Protector, Piston Seal	307-282 (T94P-77000-D3)
 ST1219-A	Remover, O-Ring Seal	100-010 (T71P-19703-C)

Material

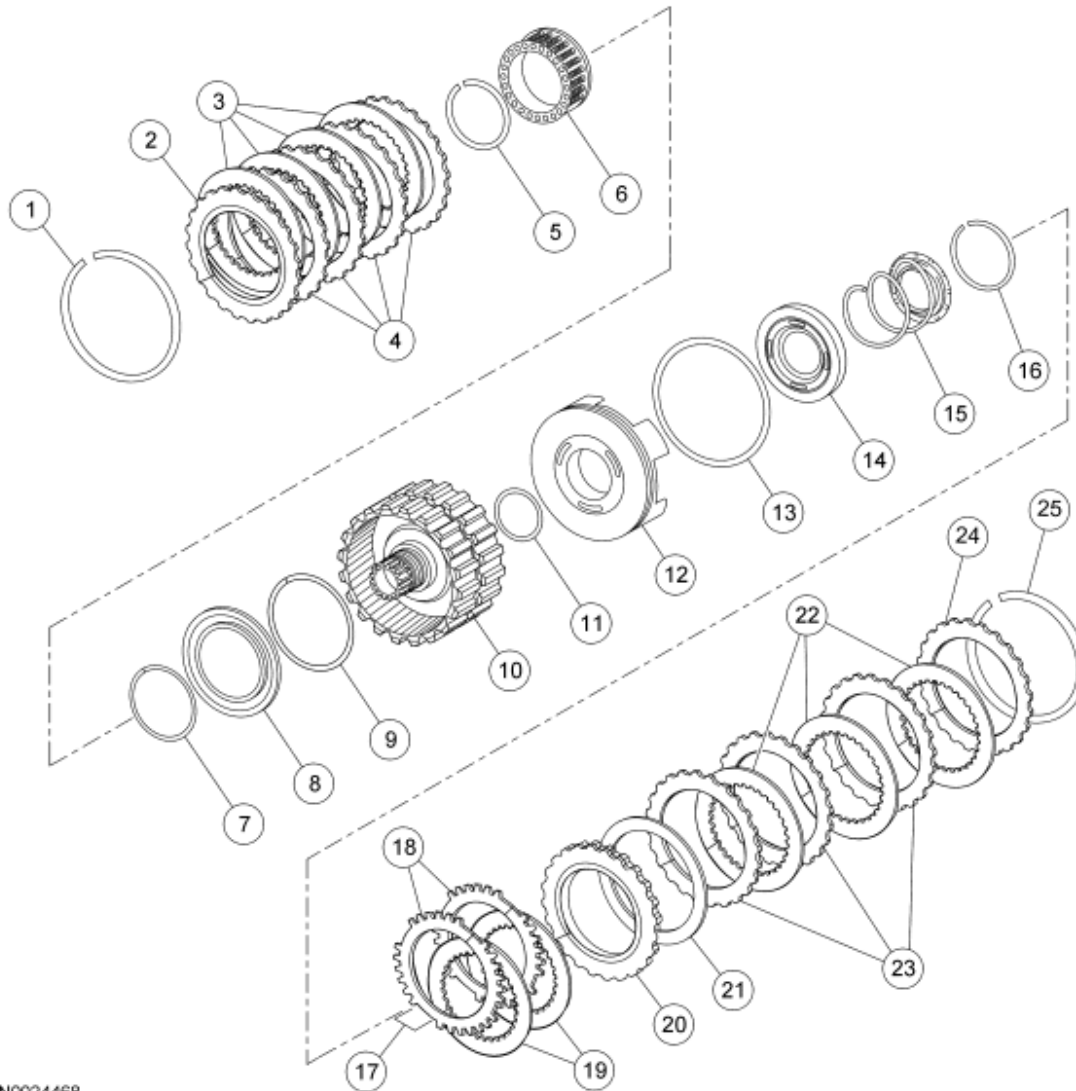
Item	Specification
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2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

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

MERCON® V



N0024468

Fig. 409: Exploded View Of Forward/Coast/Direct Clutches
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7D483	Retaining ring - direct clutch pressure plate
2	7B477	Pressure plate - direct clutch
3	7B164	Clutch plates - direct clutch internal spline (friction)
4	7B442	Clutch plates - direct clutch external spline (steel)
5	7C122	Retaining ring - direct clutch spring

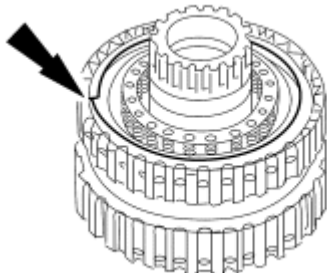
2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

6	7F235	Return spring - direct clutch
7	7F225	Piston inner lip seal - direct clutch
8	7A262	Piston assembly - direct clutch
9	7A548	Piston outer lip seal - direct clutch
10	7G120	Cylinder assembly - forward/coast/direct clutch
11	7A548	Piston inner lip seal - forward clutch
12	7A262	Piston assembly - forward clutch
13	7A548	Piston outer lip seal - forward clutch
14	7A262	Piston and seal assembly - coast clutch
15	7G299	Return spring - forward/coast clutch
16	7N169	Retaining ring - forward clutch spring
17	-	Clearance for fingers on the forward clutch piston
18	7B442	Clutch plates - coast clutch external spline (steel)
19	7B164	Clutch plates - coast clutch internal spline (friction)
20	7B066	Pressure plate - coast clutch
21	74159	Wave spring - forward clutch
22	7B164	Internal spline clutch plates - forward clutch (friction)
23	7B442	External spline clutch plates - forward clutch (steel)
24	7B066	Pressure plate - forward clutch
25	7D483	Retaining ring - forward clutch pressure plate

DISASSEMBLY

1. Remove the direct clutch pressure plate retaining ring.

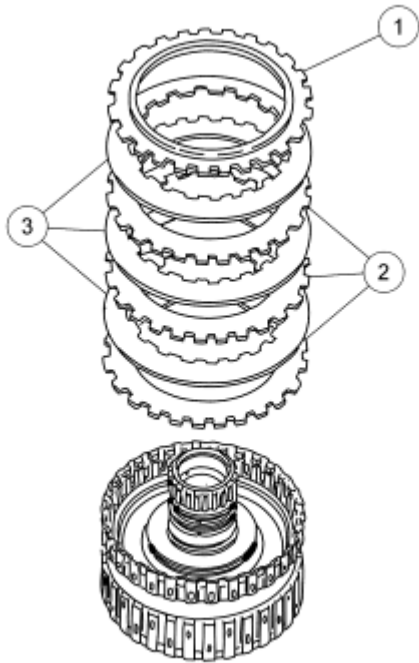


GD2832-A

Fig. 410: Direct Clutch Pressure Plate Retaining Ring
Courtesy of FORD MOTOR CO.

2. Disassemble the direct clutch pack.

1. Remove the direct clutch pressure plate.
2. Remove the direct clutch steel plates.
3. Remove the direct clutch friction plates.



N0024469

Fig. 411: Direct Clutch Pack Components
Courtesy of FORD MOTOR CO.

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.

CAUTION: Do not compress the direct clutch return springs completely.

3. Remove the direct clutch spring retaining ring.
 1. Using the special tool, compress the direct clutch return springs.
 2. Remove the direct clutch return spring retaining ring.

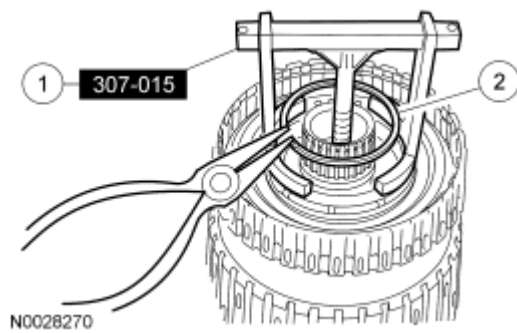


Fig. 412: Forward/Coast Clutch Return Spring Retaining Ring & Special Tools
Courtesy of FORD MOTOR CO.

4. Remove the direct clutch return spring assembly.

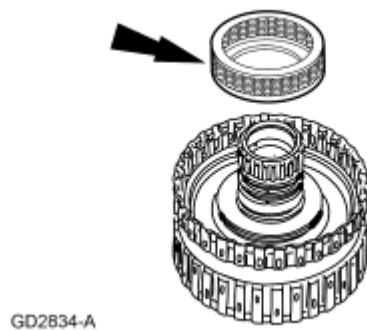
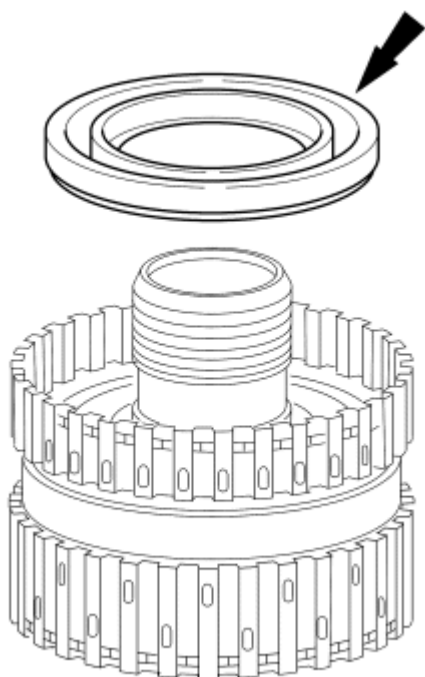


Fig. 413: Direct Clutch Return Spring Assembly
Courtesy of FORD MOTOR CO.

5. Remove the direct clutch piston assembly.



ELV9010202

Fig. 414: Direct Clutch Piston Assembly
Courtesy of FORD MOTOR CO.

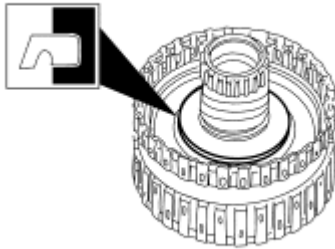
6. Remove and discard the direct clutch piston outer lip seal.



GD2836-A

Fig. 415: Direct Clutch Piston Outer Lip Seal
Courtesy of FORD MOTOR CO.

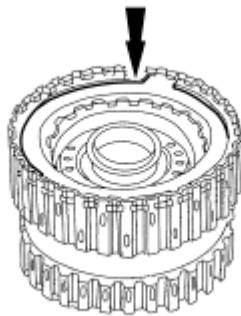
7. Remove and discard the direct clutch piston inner lip seal from the forward/coast/direct clutch cylinder assembly.



GD2837-A

Fig. 416: Direct Clutch Piston Inner Lip Seal
Courtesy of FORD MOTOR CO.

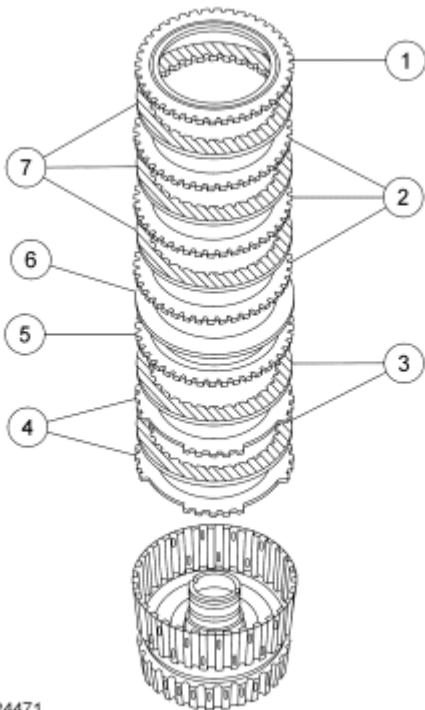
8. Remove the forward clutch pressure plate retaining ring.



GD2838-A

Fig. 417: Forward Clutch Pressure Plate Retaining Ring
Courtesy of FORD MOTOR CO.

9. Remove the forward and coast clutch plates.
1. Forward clutch pressure plate
 2. Forward clutch external spline clutch plates (steel)
 3. Coast clutch internal spline clutch plates (friction)
 4. Coast clutch external spline clutch plates (steel)
 5. Coast clutch pressure plate
 6. Forward clutch wave spring
 7. Forward clutch internal spline clutch plates (friction)



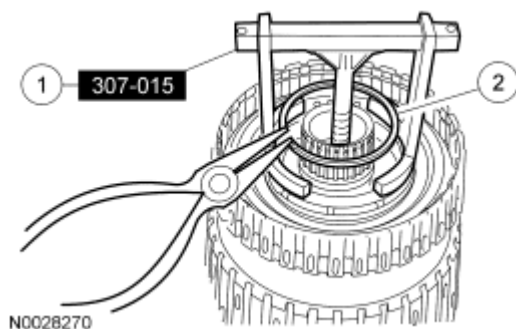
N0024471

Fig. 418: Forward & Coast Clutch Plates
Courtesy of FORD MOTOR CO.

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.

CAUTION: Do not compress the return springs completely.

10. Remove the forward/coast clutch return spring retaining ring.
 1. Using the special tool, compress the return spring.
 2. Remove the retaining ring.



N0028270

Fig. 419: Forward/Coast Clutch Return Spring Retaining Ring & Special Tools
Courtesy of FORD MOTOR CO.

11. Remove the forward/coast clutch return spring assembly.

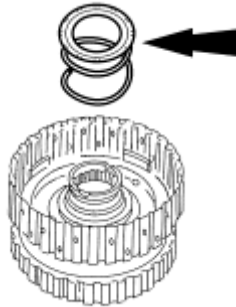


Fig. 420: Forward/Coast Clutch Return Spring Assembly
Courtesy of FORD MOTOR CO.

12. Remove the forward and coast clutch pistons.

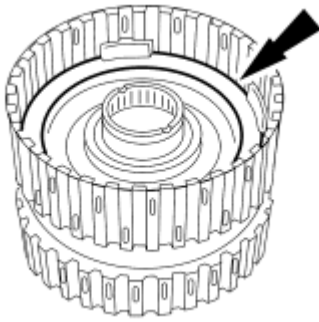


Fig. 421: Forward Clutch Piston Assembly
Courtesy of FORD MOTOR CO.

13. Using the special tool, remove and discard the forward clutch piston inner seal from the forward/coast/direct clutch cylinder assembly.

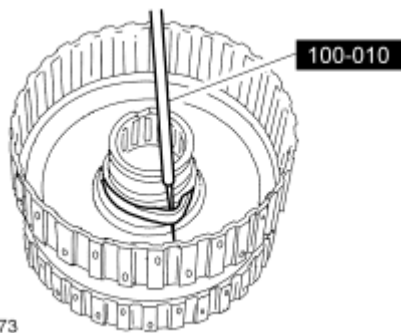
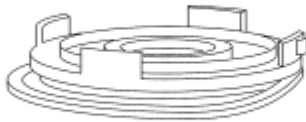


Fig. 422: Installing/Removing Forward Clutch Piston Inner Seal On Forward/Coast/Direct Clutch Cylinder Assembly

Courtesy of FORD MOTOR CO.

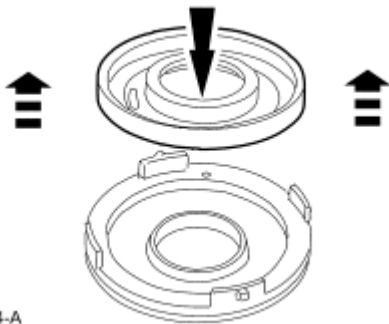
14. Remove and discard the forward clutch piston outer lip seal.



GD3335-A

Fig. 423: Forward Clutch Piston Outer Lip Seal
Courtesy of FORD MOTOR CO.

15. Separate the coast clutch piston assembly from the forward clutch piston assembly.



GD2844-A

Fig. 424: Coast Clutch Piston Assembly
Courtesy of FORD MOTOR CO.

WARNING: When using compressed air, never let air pressure exceed 172 kPa (25 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.

NOTE: Do not clean the clutch plates in a vapor degreaser or in any other type of detergent solution.

16. Clean all parts thoroughly in a clean automatic transmission fluid and blow dry with moisture-free regulated compressed air.
 - Clean the steel clutch plates with a lint-free cloth.
 - Soak the new clutch plates in the specified transmission fluid before assembly.
17. Inspect the parts for damage, cracks or wear.
 - Spline teeth

- Clutch plates
- Seals
- Bushing
- Check balls in pistons
- Piston bore
- Passages and lubrication holes in the forward/coast/direct clutch cylinder
- Center hub weld
- Large snap ring grooves

ASSEMBLY

1. Soak the internal spline clutch plates in clean automatic transmission fluid.
2. Install the forward clutch piston inner seal on the forward/coast/direct clutch cylinder assembly.

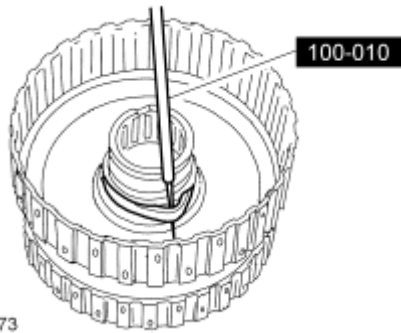


Fig. 425: Installing/Removing Forward Clutch Piston Inner Seal On Forward/Coast/Direct Clutch Cylinder Assembly

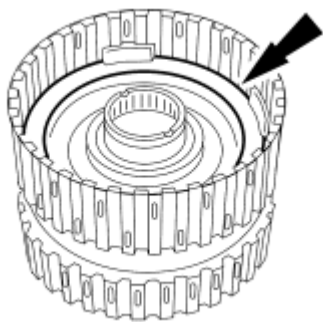
Courtesy of FORD MOTOR CO.

3. Install the forward clutch piston outer lip seal on the forward clutch piston assembly.



Fig. 426: Forward Clutch Piston Outer Lip Seal
Courtesy of FORD MOTOR CO.

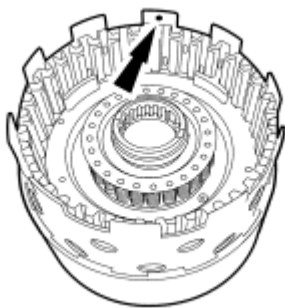
4. Install the forward clutch piston assembly in the forward/coast/direct clutch cylinder assembly.



GD2842-A

Fig. 427: Forward Clutch Piston Assembly
Courtesy of FORD MOTOR CO.

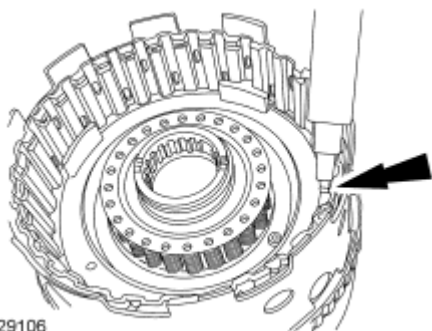
5. Mark the center of 2 adjacent legs on the top of the cylinder.



A0087486

Fig. 428: Marking Center Of 2 Adjacent Legs
Courtesy of FORD MOTOR CO.

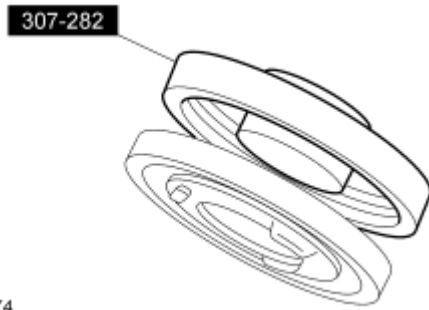
6. Find the center between the marks (45 degrees from either leg) and mark the cylinder.



A0029106

Fig. 429: Marking Cylinder
Courtesy of FORD MOTOR CO.

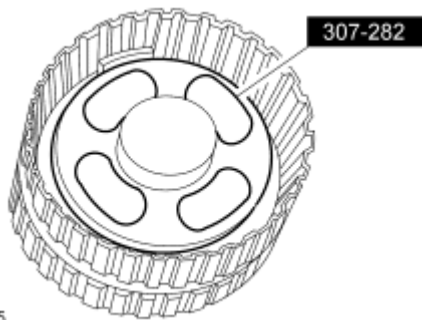
7. Install the coast clutch piston assembly onto the special tool.



N0024474

Fig. 430: Installing Coast Clutch Piston Assembly Onto Special Tool
Courtesy of FORD MOTOR CO.

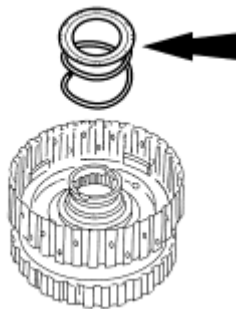
8. Using the special tool, install the coast clutch piston into the forward clutch piston assembly.



N0024475

Fig. 431: Installing Coast Clutch Piston Into Forward Clutch Piston Assembly Using Special Tools
Courtesy of FORD MOTOR CO.

9. Install the forward/coast clutch return spring assembly.



ELV9010153

Fig. 432: Forward/Coast Clutch Return Spring Assembly
Courtesy of FORD MOTOR CO.

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.

10. Install the forward/coast clutch return spring retaining ring.
 1. Using the special tool, compress the return spring.
 2. Install the forward/coast clutch retaining ring.
 - Orient the gap between the piston legs.

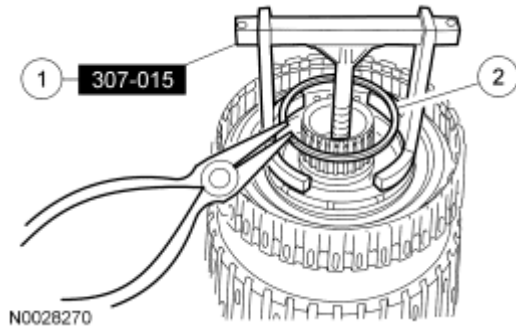
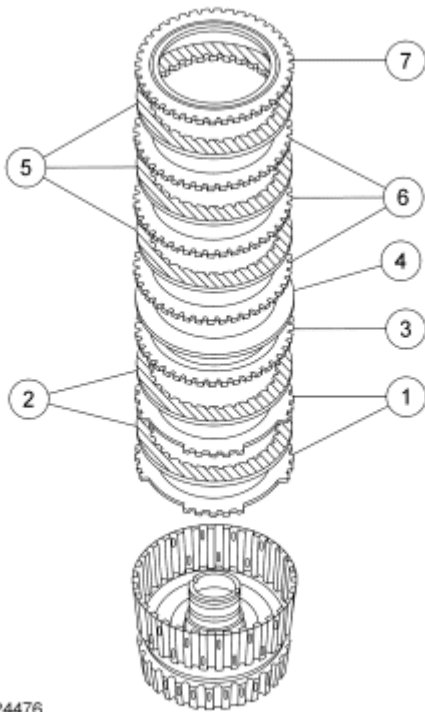


Fig. 433: Forward/Coast Clutch Return Spring Retaining Ring & Special Tools
 Courtesy of FORD MOTOR CO.

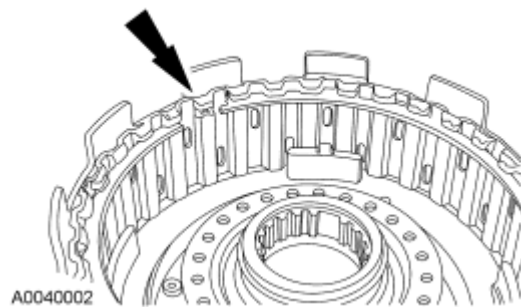
11. Install the forward and coast clutch plates in the sequence shown.
 1. Coast clutch external spline clutch plates (steel)
 2. Coast clutch internal spline clutch plates (friction)
 3. Coast clutch pressure plate
 4. Forward clutch wave spring
 5. Forward clutch internal spline clutch plates (friction)
 6. Forward clutch external spline clutch plates (steel)
 7. Forward clutch pressure plate



N0024476

Fig. 434: Identifying Forward & Coast Clutch Pressure Plates
Courtesy of FORD MOTOR CO.

12. Install the forward clutch pressure plate retaining ring.
 - Center the select fit retaining ring on the 45 degree mark between the 2 adjacent legs.



A0040002

Fig. 435: Locating Clutch Pressure Plate Retaining Ring
Courtesy of FORD MOTOR CO.

13. Using a feeler gauge, measure the clearance between the forward clutch pressure plate and the forward clutch pressure plate retaining ring.
 - Take a second measurement on the opposite side.
 - Average the 2 measurements to get the clearance.
 - If the clearance is not within specification, select and install the correct thickness retaining ring to obtain the standard clearance.
 - Retaining ring sizes:

- 1.43-1.53 mm (0.056-0.060 in).
- 1.59-1.69 mm (0.062-0.066 in).
- 1.75-1.85 mm (0.069-0.073 in).
- 1.92-2.02 mm (0.075-0.079 in).

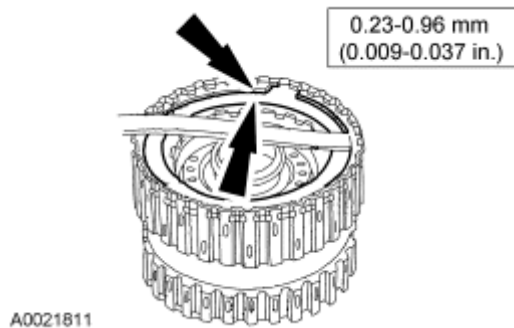


Fig. 436: Checking Clearance With Specification
Courtesy of FORD MOTOR CO.

14. Install the direct clutch piston inner lip seal on the direct clutch cylinder assembly.

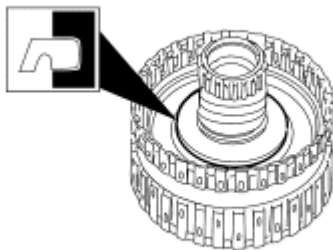


Fig. 437: Direct Clutch Piston Inner Lip Seal
Courtesy of FORD MOTOR CO.

15. Install the direct clutch piston outer seal on the direct clutch piston assembly.

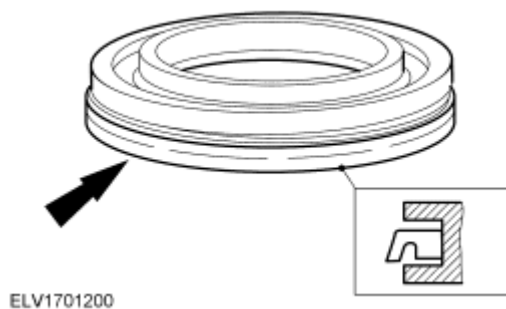


Fig. 438: Direct Clutch Piston Outer Seal
Courtesy of FORD MOTOR CO.

NOTE: Position the lip seal facing down.

16. Install the direct clutch piston assembly in the forward/coast/direct clutch cylinder assembly.

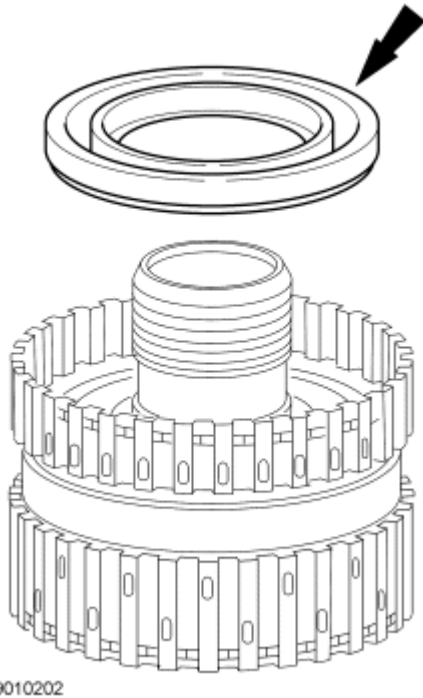


Fig. 439: Direct Clutch Piston Assembly
Courtesy of FORD MOTOR CO.

17. Install the direct clutch return spring assembly.

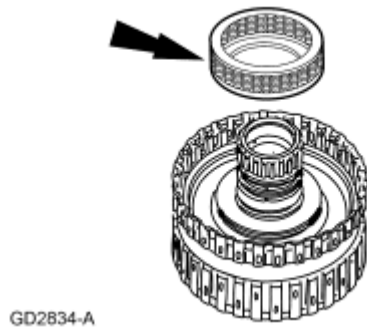


Fig. 440: Direct Clutch Return Spring Assembly
Courtesy of FORD MOTOR CO.

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.

CAUTION: Do not compress the direct clutch return springs completely.

18. Install the direct clutch return spring retaining ring.
 1. Using the special tool, compress the direct clutch return springs.
 2. Install the direct clutch return spring retaining ring.

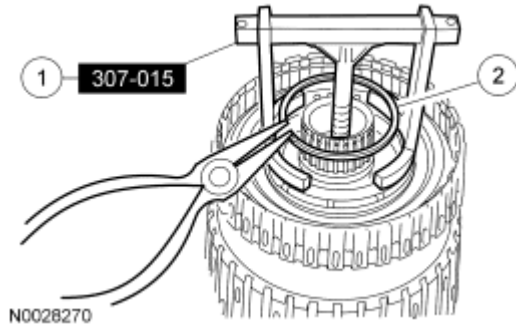


Fig. 441: Forward/Coast Clutch Return Spring Retaining Ring & Special Tools
Courtesy of FORD MOTOR CO.

NOTE: Quantity of plates are model dependent.

19. Install the direct clutch plates.
 1. Install the direct clutch external spline (steel) clutch plates.
 2. Install the direct clutch internal spline (friction) clutch plates.
 3. Install the direct clutch pressure plate.

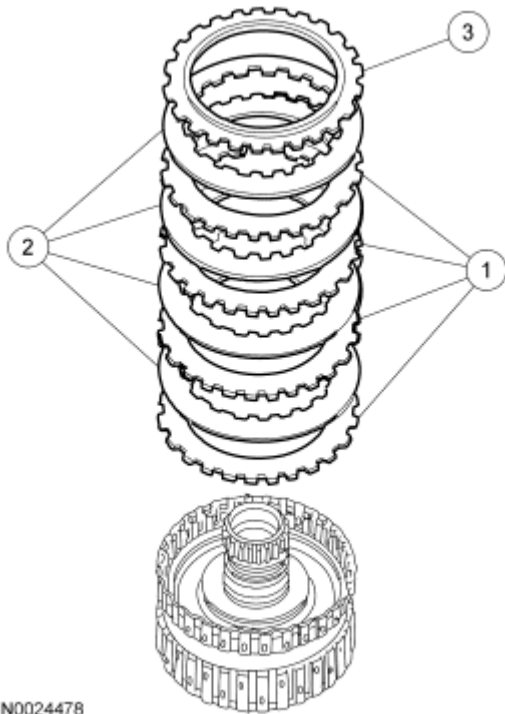


Fig. 442: Identifying Clutch Pressure Plate
Courtesy of FORD MOTOR CO.

20. Install the direct clutch pressure plate retaining ring.

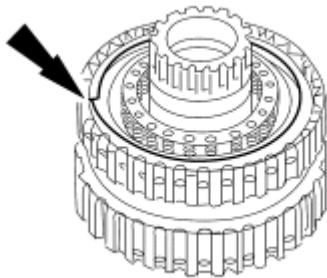


Fig. 443: Direct Clutch Pressure Plate Retaining Ring
Courtesy of FORD MOTOR CO.

21. Measure the direct clutch clearance as follows:
 - Install the special tool.
 - Zero the dial on the direct clutch pressure plate.
 - Pull the direct clutch pressure plate upward, and record the reading.

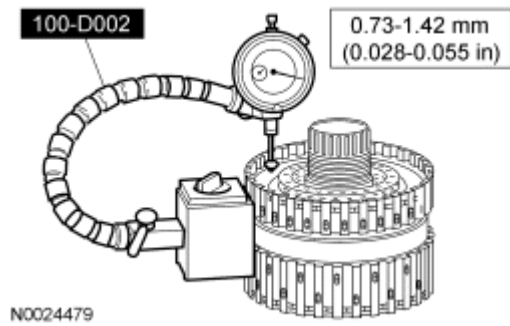


Fig. 444: Measuring Direct Clutch Clearance With Specification
Courtesy of FORD MOTOR CO.

22. Make a second measurement on the opposite side. Average the 2 measurements to get the clearance. If the clearance is not within the specification, select and install, using the special tool, the correct thickness direct clutch pressure plate retainer snap ring to obtain the standard clearance.

- Retaining ring sizes:
 - 1.28-1.38 mm (0.050-0.054 in).
 - 1.39-1.49 mm (0.054-0.058 in).
 - 1.52-1.62 mm (0.059-0.063 in).
 - 1.65-1.75 mm (0.064-0.069 in).

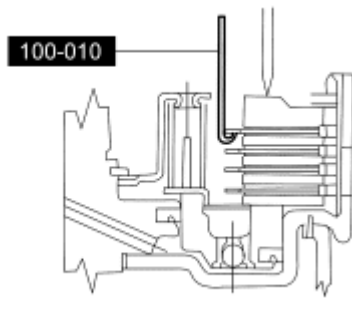


Fig. 445: Inspecting Correct Thickness Direct Clutch Pressure Plate Retainer Snap Ring
Courtesy of FORD MOTOR CO.

FORWARD/COAST/DIRECT CLUTCH CYLINDER AND REVERSE CLUTCH DRUM - ASSEMBLY

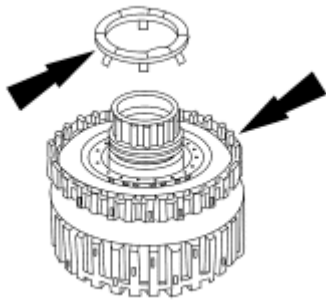
Special Tools

Illustration	Tool Name	Tool Number
	Sizer, Hub Seal	307-283 (T94P-77000-D4)

ASSEMBLY

CAUTION: The tabs on the No. 2 direct clutch thrust washer must be seated in the direct clutch support and spring.

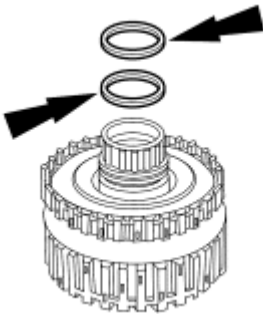
1. Install the No. 2 direct clutch thrust washer on the forward/coast/direct clutch cylinder with the tabs facing downward.



GD2806-A

Fig. 446: No. 2 Direct Clutch Thrust Washer
Courtesy of FORD MOTOR CO.

2. Install the 2 reverse clutch cylinder seals.

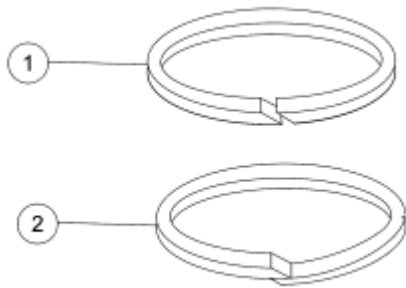


GD2805-A

Fig. 447: Reverse Clutch Cylinder Seals
Courtesy of FORD MOTOR CO.

NOTE: Make sure that the reverse clutch cylinder seals are overlapped correctly.

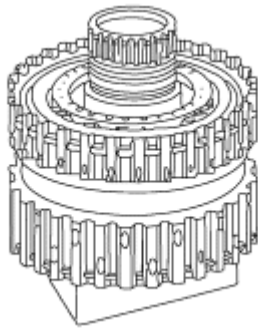
3. Position the reverse clutch cylinder seals.
 1. Correct installation.
 2. Incorrect installation.



N0024481

Fig. 448: Identifying Reverse Clutch Cylinder Seals
Courtesy of FORD MOTOR CO.

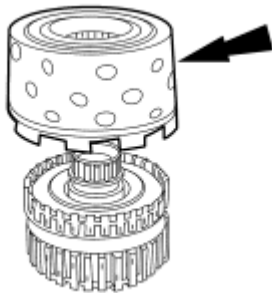
4. Support the forward/coast/direct clutch cylinder assembly on a block of wood so that the direct clutch faces upward.



ELE0012152

Fig. 449: Forward/Coast/Direct Clutch Cylinder Assembly On Block Of Wood
Courtesy of FORD MOTOR CO.

5. Install the direct clutch hub and shell on the forward/coast/direct clutch cylinder.



GD2804-A

Fig. 450: Direct Clutch Hub & Shell
Courtesy of FORD MOTOR CO.

6. Install the reverse clutch drum assembly.

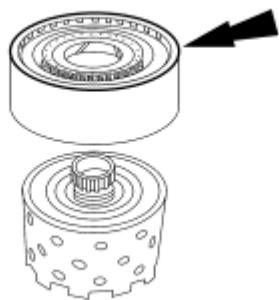


Fig. 451: Reverse Clutch Drum Assembly
Courtesy of FORD MOTOR CO.

7. Install the reverse clutch hub.

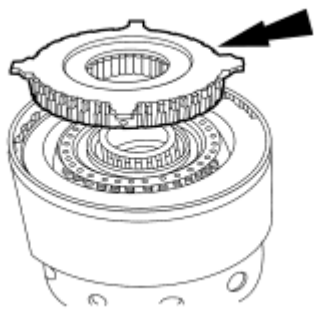


Fig. 452: Reverse Clutch Hub
Courtesy of FORD MOTOR CO.

8. Support the reverse clutch drum on a block of wood while installing the reverse clutch hub retaining ring.

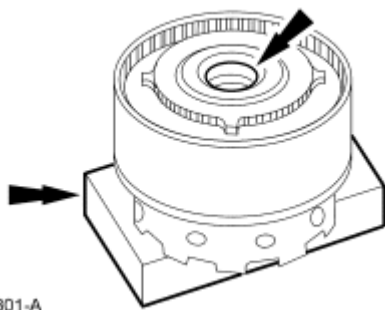


Fig. 453: Reverse Clutch Hub Retaining Ring & Block Of Wood
Courtesy of FORD MOTOR CO.

9. Install the forward/coast/direct clutch cylinder hub seal.

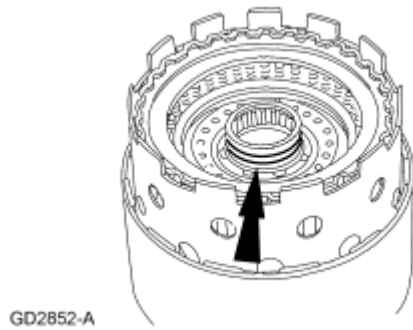


Fig. 454: Forward/Coast/Direct Clutch Cylinder Hub Seal
Courtesy of FORD MOTOR CO.

10. Leave special tool attached until the forward/coast/direct clutch cylinder is installed into the transaxle housing.

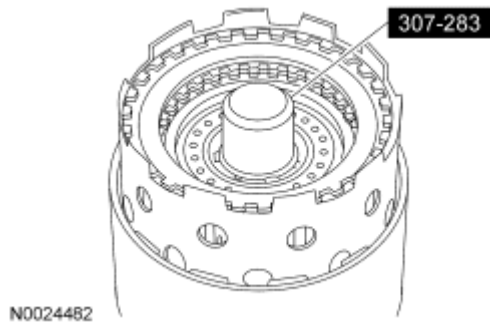


Fig. 455: Special Tool
Courtesy of FORD MOTOR CO.

LOW/REVERSE PISTON

DISASSEMBLY

1. Remove and discard the low/reverse clutch piston outer seal on the low/reverse clutch piston.

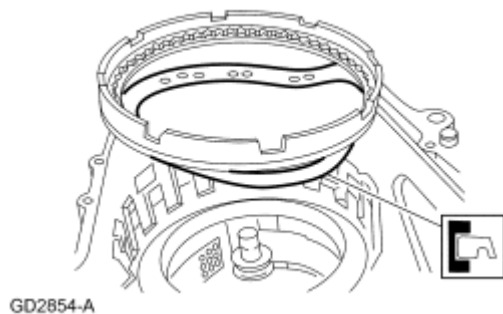
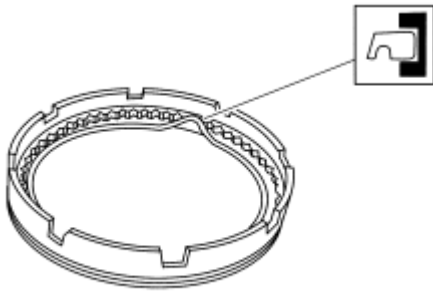


Fig. 456: Low/Reverse Clutch Piston Outer Seal
Courtesy of FORD MOTOR CO.

2. Remove and discard the low/reverse clutch piston inner seal on the low/reverse clutch piston.

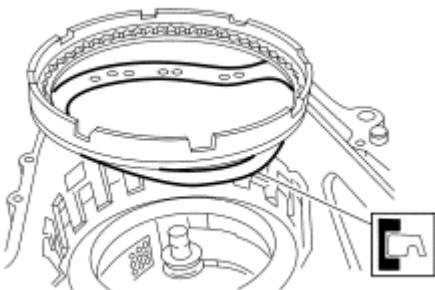


GD2855-A

Fig. 457: Low/Reverse Clutch Piston Inner Seal
Courtesy of FORD MOTOR CO.

ASSEMBLY

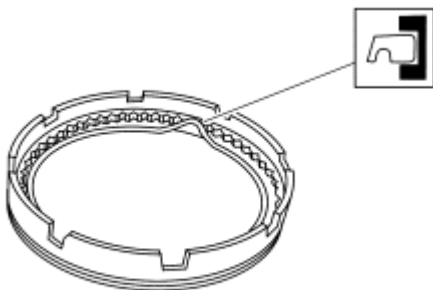
1. Install the low/reverse clutch piston outer seal on the low/reverse clutch piston.



GD2854-A

Fig. 458: Low/Reverse Clutch Piston Outer Seal
Courtesy of FORD MOTOR CO.

2. Install the low/reverse clutch piston inner seal on the low/reverse clutch piston.



GD2855-A

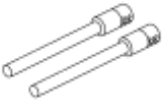
Fig. 459: Low/Reverse Clutch Piston Inner Seal
Courtesy of FORD MOTOR CO.

MAIN CONTROL VALVE BODY

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

Special Tools

Illustration	Tool Name	Tool Number
 ST2535-A	Alignment Pins, Valve Body	307-299 (T94P-77000-N)

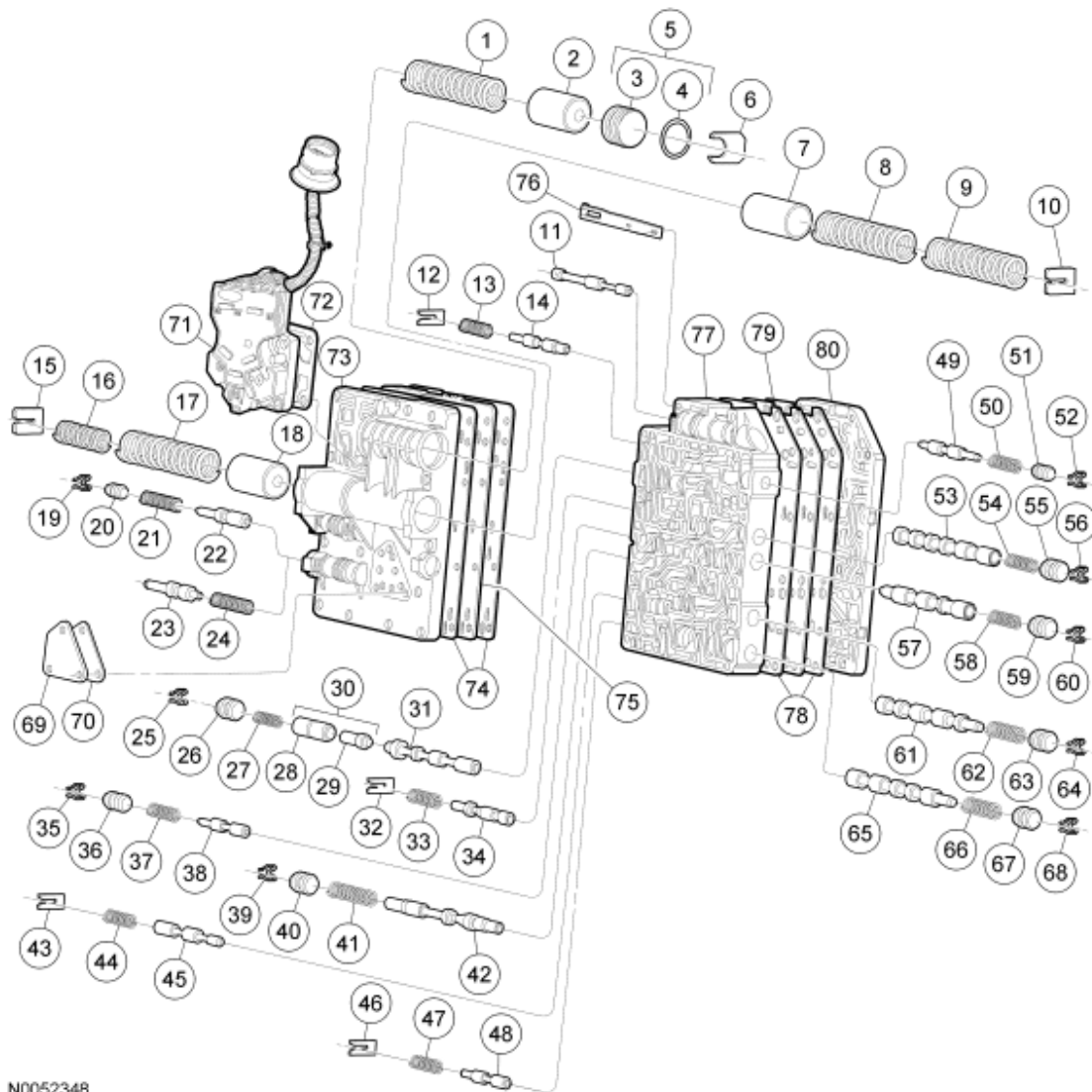


Fig. 460: Exploded View Of Main Control Valve Body Components
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Spring - 2/4 accumulator valve
2	-	Accumulator - main control

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

3	-	Plug - 2/4 accumulator valve
4	7H223	Seal - 2/4 accumulator body
5	-	Plug assembly - 2/4 accumulator valve
6	-	Plate - spring retaining
7	-	Accumulator - main control
8	-	Spring - forward accumulator (outer)
9	-	Spring - forward accumulator (inner)
10	-	Plate - spring retainer
11	-	Valve - manual control
12	-	Plate - spring retaining
13	-	Spring - solenoid regulator valve
14	-	Valve - solenoid regulator
15	-	Spring - retaining
16	-	Spring - low/reverse accumulator (inner)
17	-	Spring - low/reverse accumulator (outer)
18	-	Accumulator - main control
19	-	Retainer - valve plug
20	-	Plug - valve retainer
21	-	Spring - 3-2 timing valve (2.3L engine)
22	-	Valve - 3-2 timing (2.3L engine)
23	-	Valve - 3-2 timing (3.0L engine)
24	-	Spring - 3-2 timing valve (3.0L engine)
25	-	Retainer - valve plug
26	-	Plug - valve retainer
27	-	Spring - bypass clutch control valve
28	-	Sleeve - bypass clutch control
29	-	Plunger - clutch control valve
30	-	Valve assembly - bypass control valve
31	-	Valve - bypass clutch control
32	-	Plate - spring retaining
33	-	Spring - converter regulator valve
34	-	Valve - converter regulator
35	-	Retainer - valve plug
36	-	Plug - valve retainer
37	-	Spring - coast clutch shift
38	-	Valve - line modulator
39	-	Retainer - valve plug
40	-	Plug - valve retainer
41	-	Spring - fluid pressure regulator valve
42	-	Valve - main regulator
43	-	Plate - spring retaining
...		

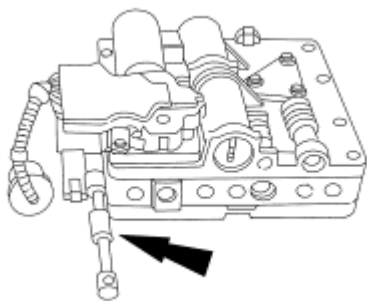
2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

	-	Spring - servo release shuttle valve
45	-	Valve - servo release shuttle
46	-	Plate - spring retaining
47	-	Spring - coast clutch shift valve
48	-	Valve - line modulator
49	-	Valve - low/reverse modulator
50	-	Spring - modulator valve
51	-	Plug - valve retainer
52	-	Retainer - valve plug
53	-	Valve - 1-2 shift
54	-	Spring - valve
55	-	Plug - valve retainer
56	-	Retainer - valve plug
57	-	Valve - 3-2 control
58	-	Spring - valve
59	-	Plug - valve retainer
60	-	Retainer - valve plug
61	-	Valve - 2-3 shift
62	-	Spring - valve
63	-	Plug - valve retainer
64	-	Retainer - valve plug
65	-	Valve - 3-4 shift
66	-	Spring - valve shift
67	-	Plug - valve retainer
68	-	Retainer - valve plug
69	-	Plate - pressure tap
70	7H251	Gasket - pressure tap plate
71	7G391	Solenoid valve body - transmission control
72	7H200	Gasket - electronic control body
73	-	Body - accumulator
74	7H202	Gasket - accumulator body separator plate
75	-	Plate - accumulator body separator
76	-	Spring assembly - manual valve detent
77	-	Body - main control lower
78	7D100	Gasket - control valve body separator plate
79	-	Plate - control valve separator
80	-	Plate - case-to-main control transfer

DISASSEMBLY

1. Remove the manual valve.

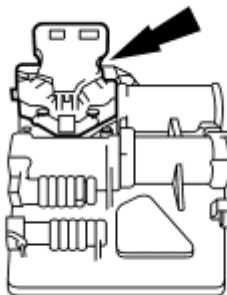


GD2879-A

Fig. 461: Manual Valve
Courtesy of FORD MOTOR CO.

CAUTION: Do not attempt to remove the solenoid valve body wiring cover.

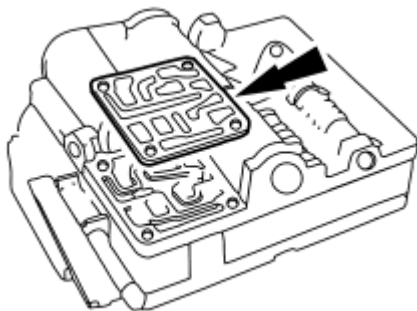
2. Remove the 2 solenoid valve body bolts and the solenoid valve body.



GD2880-A

Fig. 462: Solenoid Valve Body
Courtesy of FORD MOTOR CO.

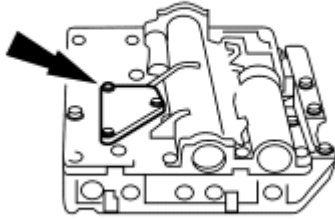
3. Remove and discard the solenoid valve body gasket.



GD2881-A

Fig. 463: Solenoid Valve Body Gasket
Courtesy of FORD MOTOR CO.

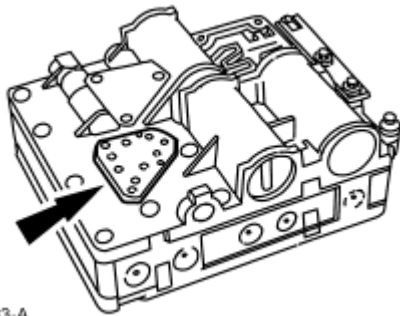
4. Remove the 3 pressure tap plate bolts and the pressure tap plate.



GD2882-A

Fig. 464: Pressure Tap Plate
Courtesy of FORD MOTOR CO.

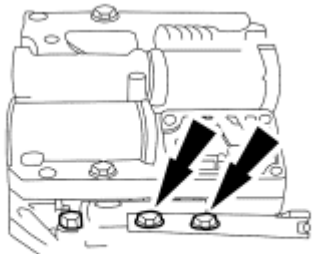
5. Remove and discard the pressure plate tap gasket.



GD2883-A

Fig. 465: Pressure Plate Tap Gasket
Courtesy of FORD MOTOR CO.

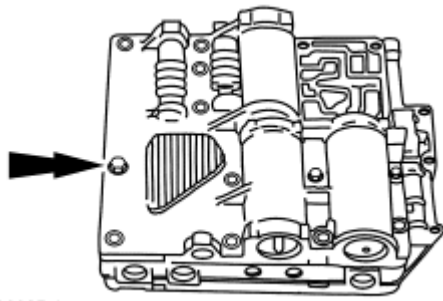
6. Remove the control valve body to transfer plate bolts, and remove the manual valve detent spring assembly.



A0054780

Fig. 466: Control Valve Body-To-Transfer Plate Bolts
Courtesy of FORD MOTOR CO.

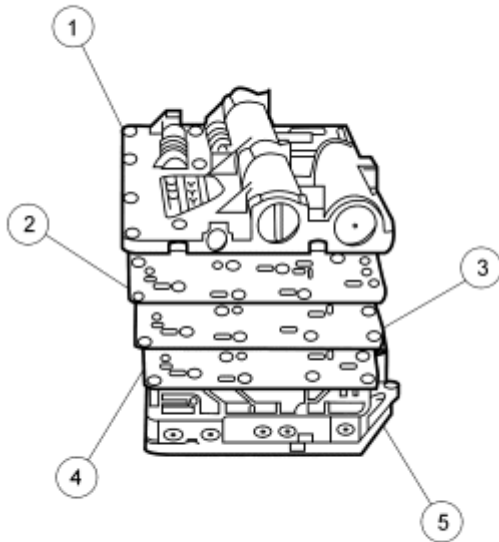
7. Remove the accumulator body-to-transfer plate bolts.



GD2885-A

Fig. 467: Accumulator Body-To-Transfer Plate Bolts
Courtesy of FORD MOTOR CO.

8. Separate the accumulator body from the main control valve body.
 1. Remove the accumulator body assembly.
 2. Remove and discard the accumulator body separator gasket.
 3. Remove the accumulator body separator plate.
 4. Remove and discard the accumulator body separator gasket.
 5. Remove the main control valve body.



N0024485

Fig. 468: Identifying Accumulator Body Assembly
Courtesy of FORD MOTOR CO.

9. Separate the transfer plate from the main control valve body.
 1. Remove the main control valve body.

2. Remove and discard the valve body separator plate gasket.
3. Remove the valve body separator plate.
4. Remove and discard the valve body separator plate gasket.
5. Remove the transfer plate.

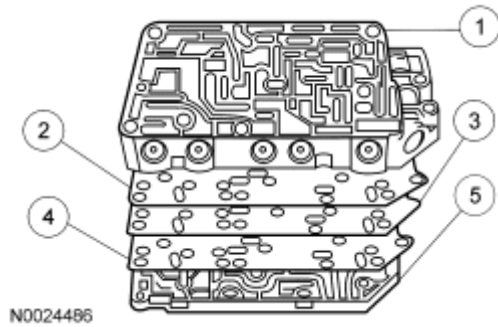
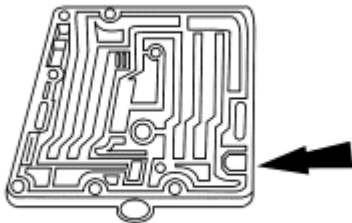


Fig. 469: Identifying Transfer Plate Main Control Valve Body Parts
Courtesy of FORD MOTOR CO.

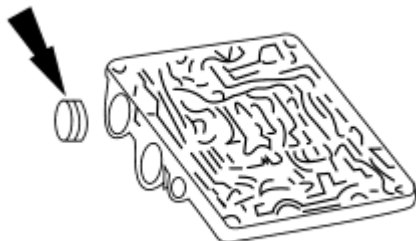
10. Remove the intermediate and overdrive accumulator valve plug retaining plate from the accumulator body assembly.



GD2894-A

Fig. 470: Accumulator Body Assembly
Courtesy of FORD MOTOR CO.

11. Remove the intermediate and overdrive accumulator valve plug.



GD2895-A

Fig. 471: Intermediate & Overdrive Accumulator Valve Plug

Courtesy of FORD MOTOR CO.

12. Remove and discard the intermediate and overdrive accumulator plug seal.



GD2895-A

Fig. 472: Intermediate & Overdrive Accumulator Plug Seal
Courtesy of FORD MOTOR CO.

CAUTION: Remove, note location and clean one valve at a time to avoid incorrect installation.

13. As necessary, disassemble the parts of the accumulator body and main control valve body assemblies.
 - Lubricate and reassemble the parts as soon as possible to avoid accidental damage or incorrect installation.

ASSEMBLY

WARNING: When using compressed air, never let air pressure exceed 172 kPa (25 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.

CAUTION: If the valve sticks in its bore and cannot be freed, install a new main control valve body.

NOTE: Clean the main control valve body and accumulator body assembly of the main control in cleaning solvent. Blow dry with moisture-free regulated compressed air. The solenoid valve body should not be cleaned in cleaning solvent. It may be blown clean with compressed air or wiped clean with a lint-free cloth.

1. Install a new intermediate and overdrive accumulator plug seal and coat with petroleum jelly.

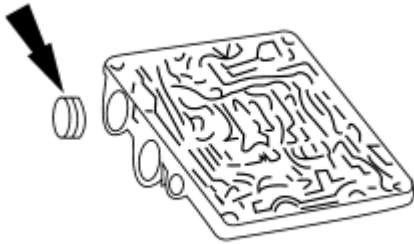


GD2895-A

Fig. 473: Intermediate & Overdrive Accumulator Plug Seal
Courtesy of FORD MOTOR CO.

CAUTION: Do not install the intermediate and overdrive accumulator valve plug and seal too far into the bore and damage the seal. Only push the intermediate and overdrive accumulator valve plug until it is flush with the accumulator body assembly.

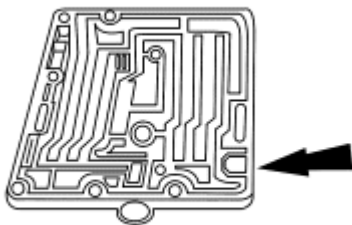
2. Install the intermediate and overdrive accumulator valve plug.



GD2895-A

Fig. 474: Intermediate & Overdrive Accumulator Valve Plug
Courtesy of FORD MOTOR CO.

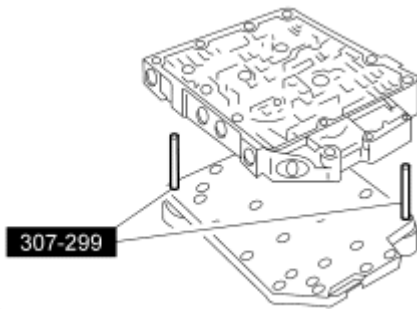
3. Install the intermediate and overdrive accumulator valve plug retaining plate.



GD2894-A

Fig. 475: Accumulator Body Assembly
Courtesy of FORD MOTOR CO.

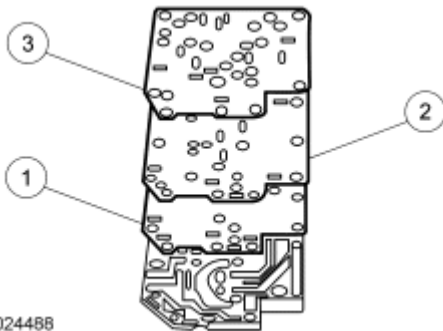
4. Install the special tool.



N0024487

Fig. 476: Installing Special Tool
Courtesy of FORD MOTOR CO.

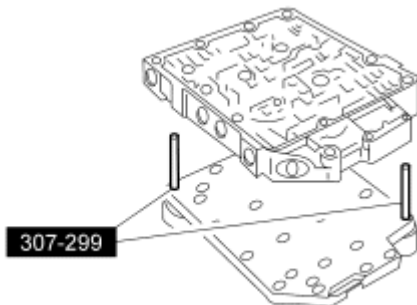
5. Using the special tool, install the valve body separator plate gaskets and valve body separator plate.
 1. Install a new valve body separator plate gasket.
 2. Install the valve body separator plate.
 3. Install a new valve body separator plate gasket.



N0024488

Fig. 477: Installing Valve Body Separator Plate Gaskets & Valve Body Separator Plate
Courtesy of FORD MOTOR CO.

6. Using the special tool, install the main control valve body.



N0024487

Fig. 478: Installing Special Tool
Courtesy of FORD MOTOR CO.

7. Using the special tool, install the accumulator body separator plate and gaskets.
 1. Install a new accumulator body separator plate gasket.
 2. Install the accumulator body separator plate.
 3. Install a new accumulator body separator plate gasket.

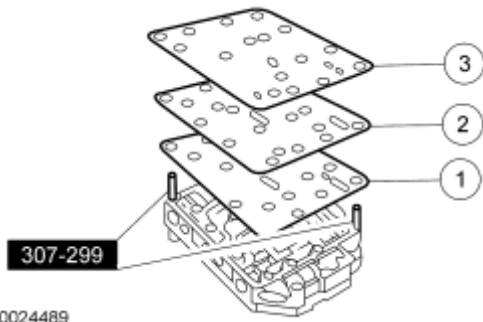


Fig. 479: Installing Accumulator Body Separator Plate & Gaskets
Courtesy of FORD MOTOR CO.

8. Using the special tool, install the accumulator body assembly.

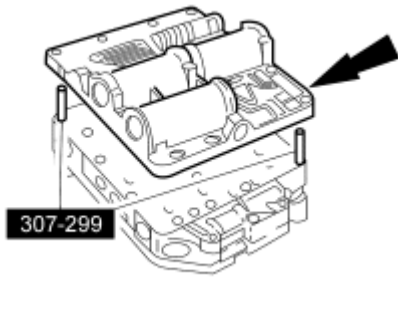


Fig. 480: Installing Accumulator Body Assembly
Courtesy of FORD MOTOR CO.

9. Starting with the bolts in the middle and working outward, install the accumulator body transfer plate.
 - Tighten to 12 Nm (9 lb-ft).

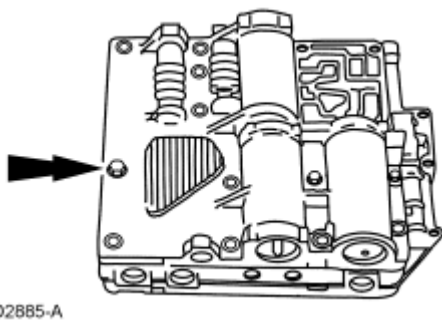
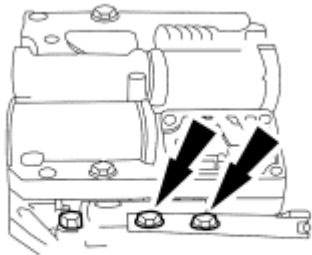


Fig. 481: Accumulator Body-To-Transfer Plate Bolts

Courtesy of FORD MOTOR CO.

10. Starting with the bolts in the middle and working outward, install the main control valve body to transfer plate and install the detent spring.
 - Tighten to 12 Nm (9 lb-ft).

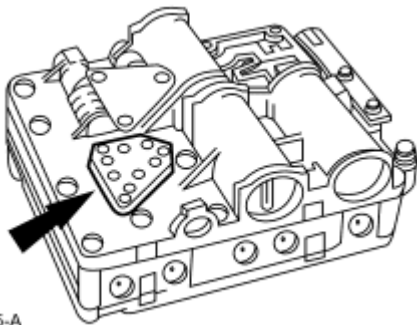


A0054780

Fig. 482: Control Valve Body-To-Transfer Plate Bolts

Courtesy of FORD MOTOR CO.

11. Install a new pressure tap plate gasket.

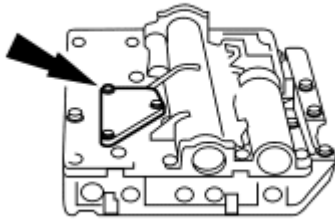


GD2905-A

Fig. 483: Pressure Tap Plate Gasket

Courtesy of FORD MOTOR CO.

12. Install the pressure tap plate and bolts.
 - Tighten to 8 Nm (71 lb-in).

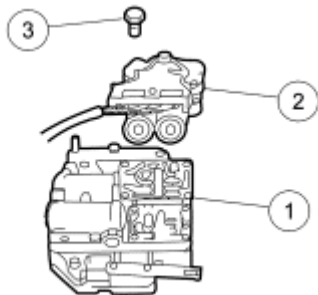


GD2862-A

Fig. 484: Pressure Tap Plate
Courtesy of FORD MOTOR CO.

NOTE: Match the solenoid valve body gasket to passages.

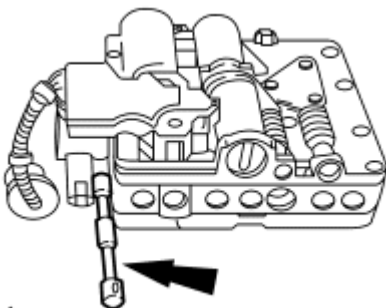
13. Install the solenoid valve body.
 1. Install the solenoid valve body gasket.
 2. Install the solenoid valve body.
 3. Install the 2 solenoid valve body bolts.
 - Tighten to 10 Nm (89 lb-in).



N0024491

Fig. 485: Identifying Solenoid Valve Body Components
Courtesy of FORD MOTOR CO.

14. Install the manual valve.

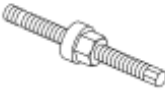


GD2908-A

Fig. 486: Manual Control Lever & Main Control Valve Body
 Courtesy of FORD MOTOR CO.

TRANSAXLE CASE

Special Tools

Illustration	Tool Name	Tool Number
 ST1287-A	Drawbar, Rear Axle	205-098 (T75T-1176-A)
 ST1848-A	Installer, Lube Tube	307-307 (T94P-77000-U2)
 ST2056-A	Installer, Lube Tube Fluid Seal	307-240 (T91P-76085-A)
 ST2536-A	Installer, Throttle Shaft Fluid Seal	307-097 (T81P-70337-A)
 ST2053-A	Remover/Installer, Needle Bearing	307-286 (T94P-77000-E1)
 ST2054-A	Remover/Installer Servo Plug	307-287 (T94P-77000-ER2)

DISASSEMBLY

1. Remove and discard the final drive lube tube.

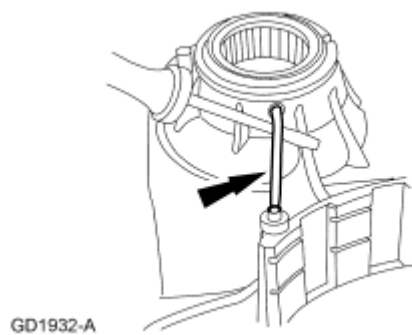


Fig. 487: Final Drive Lube Tube
Courtesy of FORD MOTOR CO.

2. Using the special tool, remove and discard the final drive lube tube seal.

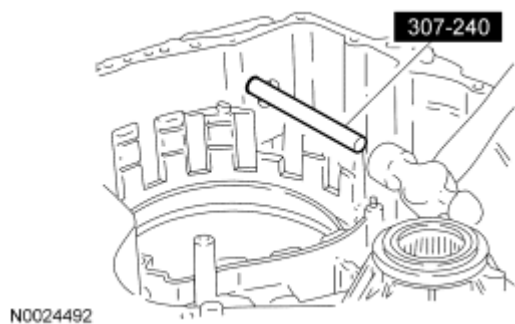


Fig. 488: Removing Final Drive Lube Tube Seal
Courtesy of FORD MOTOR CO.

3. Remove the parking pawl ratchet spring.

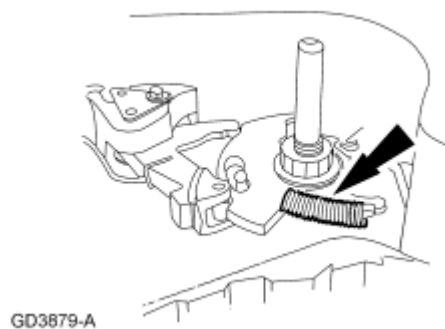


Fig. 489: Parking Pawl Ratchet Spring
Courtesy of FORD MOTOR CO.

4. Remove the manual control lever outer assembly.

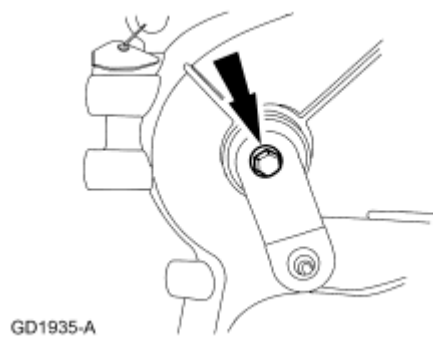


Fig. 490: Manual Control Lever Outer Assembly & Bolt
Courtesy of FORD MOTOR CO.

5. Remove the manual control lever shaft assembly.

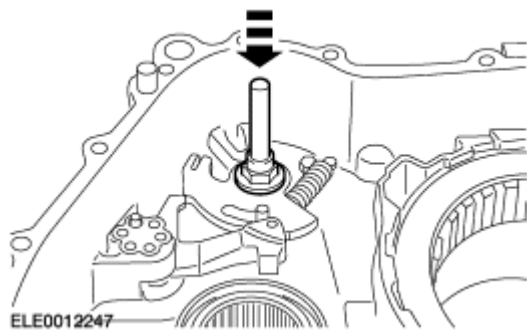


Fig. 491: Manual Control Lever Shaft Assembly
Courtesy of FORD MOTOR CO.

6. Remove the parking pawl shaft retainer and bolt.

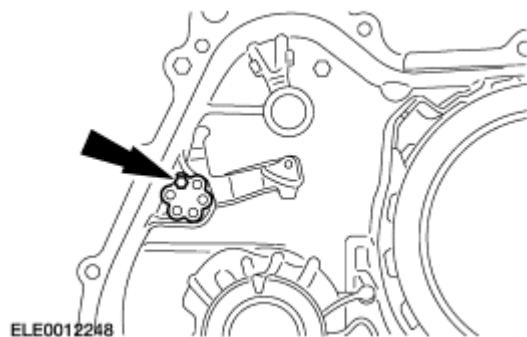


Fig. 492: Parking Pawl Shaft Retainer & Bolt
Courtesy of FORD MOTOR CO.

7. Remove the parking pawl shaft.

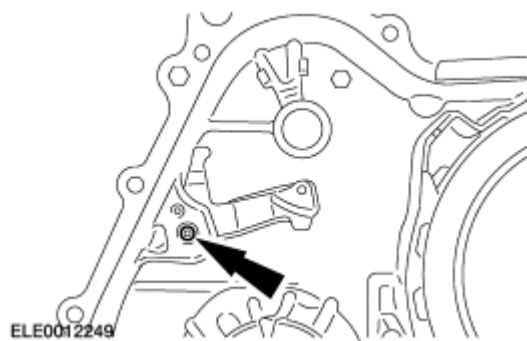


Fig. 493: Parking Pawl Shaft
Courtesy of FORD MOTOR CO.

8. Remove the parking pawl assembly.
 1. Remove the parking pawl.
 2. Remove the parking pawl return spring.

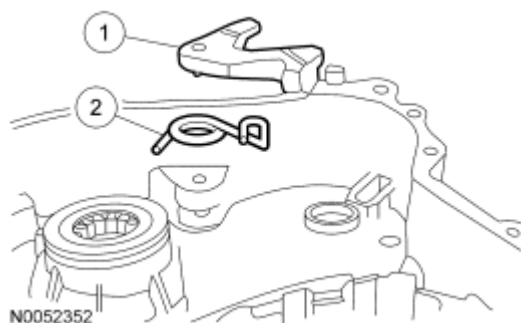


Fig. 494: Parking Pawl & Return Spring
Courtesy of FORD MOTOR CO.

CAUTION: Do not damage the transaxle case bore during seal removal.

9. Remove and discard the manual control lever seal.

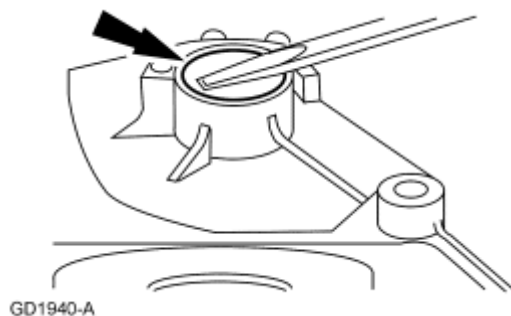


Fig. 495: Manual Control Lever Seal
Courtesy of FORD MOTOR CO.

10. Remove the manual valve actuator rod (manual valve link).

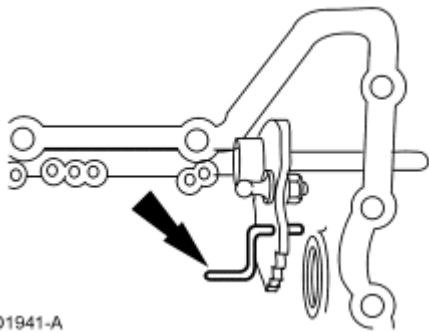


Fig. 496: Manual Valve Actuator Rod
Courtesy of FORD MOTOR CO.

CAUTION: Do not damage the transaxle case sealing surface.

11. Remove and discard the manual valve detent lever shaft retaining pin.



Fig. 497: Manual Valve Detent Lever Shaft Retaining Pin
Courtesy of FORD MOTOR CO.

CAUTION: Do not damage the transaxle case sealing surface.

NOTE: There are 2 retaining pins, one on either side of the manual valve detent lever.

12. Remove the manual valve detent lever shaft retaining pin.

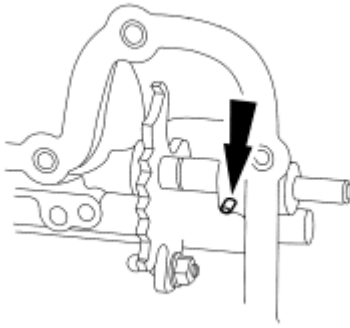


Fig. 498: Manual Valve Detent Lever Shaft Retaining Pin
Courtesy of FORD MOTOR CO.

13. Remove the manual valve detent lever and shaft assembly.
 1. Pull the manual valve detent lever and manual valve detent lever shaft from the transaxle case.
 2. Lift the manual valve detent lever from the transaxle case.

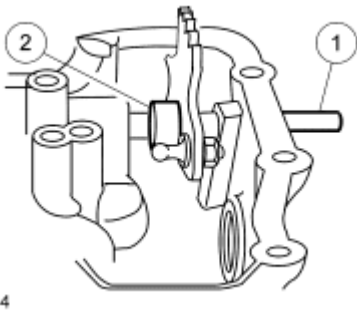


Fig. 499: Manual Valve Detent Lever & Shaft Assembly
Courtesy of FORD MOTOR CO.

CAUTION: Do not damage the seal bore in the case during seal removal.

14. Remove and discard the manual control seal.

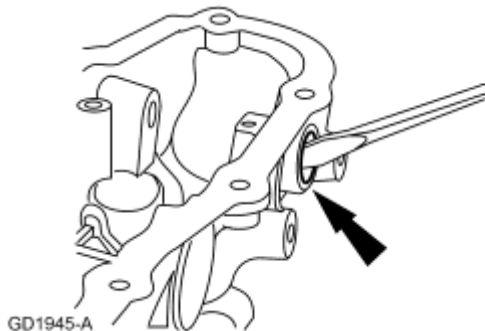


Fig. 500: Manual Control Seal
Courtesy of FORD MOTOR CO.

15. If a new case is being installed, remove the line pressure port plug.

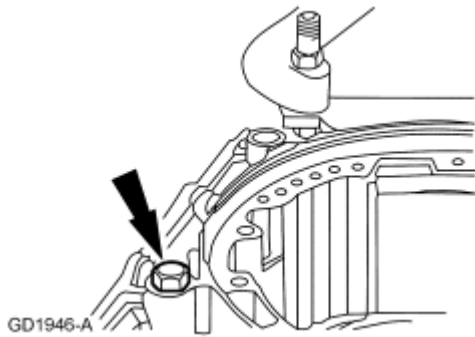


Fig. 501: Line Pressure Port Plug
Courtesy of FORD MOTOR CO.

16. If a new case is being installed, remove and discard the cooler tube fitting.

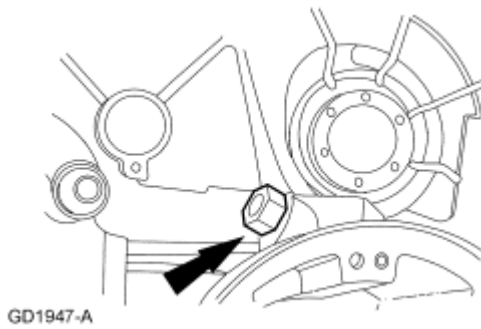


Fig. 502: Cooler Tube Fitting
Courtesy of FORD MOTOR CO.

NOTE: The driven sprocket bearing No. 18 can only be installed new once. If the bearing has been installed new once before, a new transaxle case must be used.

17. As necessary, remove the No. 18 driven sprocket bearing assembly from transaxle case.
1. Install the special tool into the transaxle.
 2. Position the special tool.
 3. Remove the bearing.

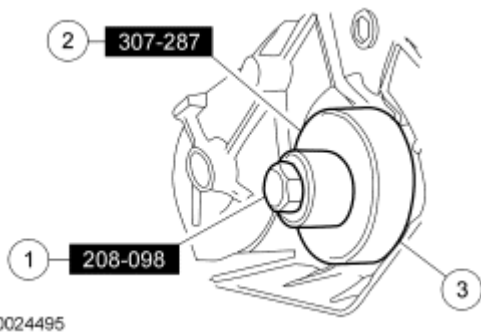


Fig. 503: No. 18 Driven Sprocket Bearing
Courtesy of FORD MOTOR CO.

18. Using the special tools, remove the No. 18 driven sprocket bearing assembly.
 1. Position the special tool.
 2. Position the special tool.
 3. Remove the No. 18 driven sprocket bearing.

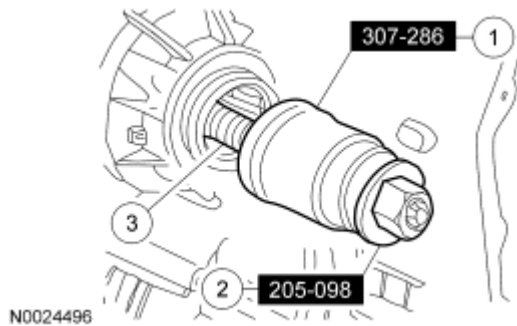


Fig. 504: No. 18 Driven Sprocket Bearing Assembly
Courtesy of FORD MOTOR CO.

WARNING: When using compressed air, never let air pressure exceed 172 kPa (25 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.

19. Clean all components with a suitable solvent and use moisture-free compressed air to dry all parts and clean fluid passages. Check the following before assembling:
 - Final drive lubrication tube for damage
 - Manual control linkage for damage or wear
 - Case mating surfaces for nicks or deformation
 - Bearing wear
 - Support area wear

ASSEMBLY

NOTE: The driven sprocket bearing No. 18 can only be installed new once. If the bearing has been installed new once before, a new transaxle case must be used.

1. As necessary, install the No. 18 driven sprocket bearing into the transaxle case.
 1. Position the special tool.
 2. Position the special tool.
 3. Install new bearing.

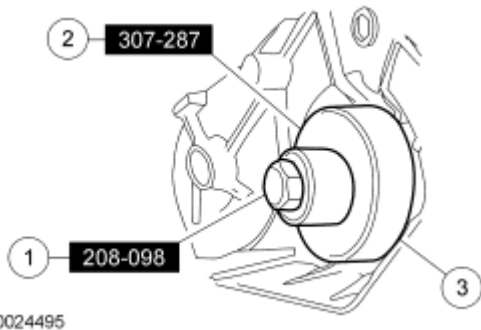


Fig. 505: No. 18 Driven Sprocket Bearing
Courtesy of FORD MOTOR CO.

CAUTION: Do not lubricate the outer surface of the No. 18 driven sprocket bearing assembly.

NOTE: The No. 18 driven sprocket bearing must be installed with the lettering on the needle bearing surface facing toward the needle bearing replacer.

2. Using the special tools, install the No. 18 driven sprocket bearing assembly by pressing it into the transaxle case.
 1. Install the bearing on the special tool.
 2. Position the special tool.
 3. Install the No. 18 driven sprocket bearing.

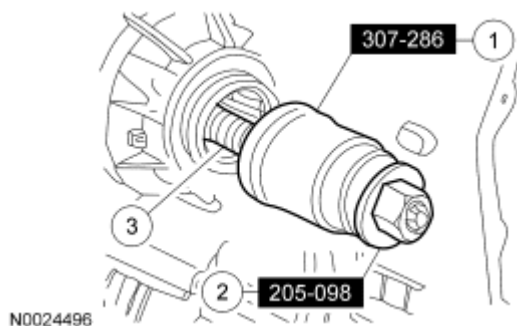


Fig. 506: No. 18 Driven Sprocket Bearing Assembly

Courtesy of FORD MOTOR CO.

3. Install the cooler tube fitting.
 - Tighten to 40 Nm (30 lb-ft).

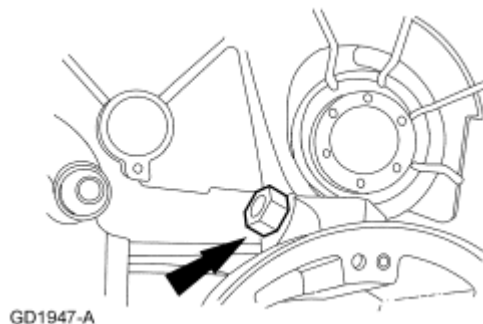


Fig. 507: Cooler Tube Fitting
Courtesy of FORD MOTOR CO.

4. Install the line pressure port plug.
 - Tighten to 24 Nm (18 lb-ft).

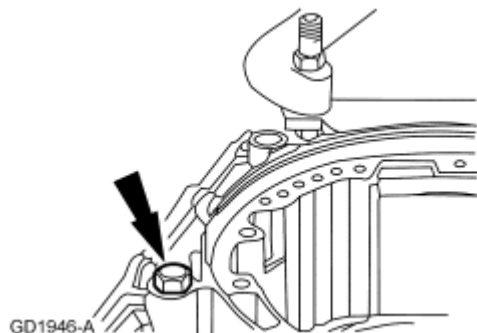


Fig. 508: Line Pressure Port Plug
Courtesy of FORD MOTOR CO.

5. Using the special tool, install a new manual control seal.



Fig. 509: Manual Control Seal

Courtesy of FORD MOTOR CO.

6. Install the manual valve detent lever assembly and the manual valve detent lever shaft assembly.
 1. Position the manual valve detent lever into the transaxle case.
 2. Install the manual valve detent lever shaft into the transaxle case and lever.

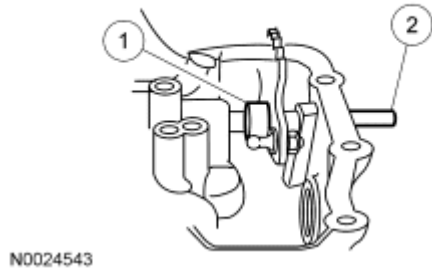


Fig. 510: Manual Valve Detent Lever & Manual Valve Detent Lever Shaft
Courtesy of FORD MOTOR CO.

7. Install a new manual shaft retaining pin.

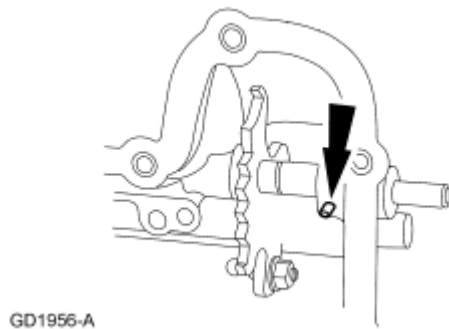


Fig. 511: Manual Valve Detent Lever Shaft Retaining Pin
Courtesy of FORD MOTOR CO.

CAUTION: Do not allow the manual shaft retaining pin to contact the transaxle case. The pin must not protrude more than 8 mm (0.31 inch).

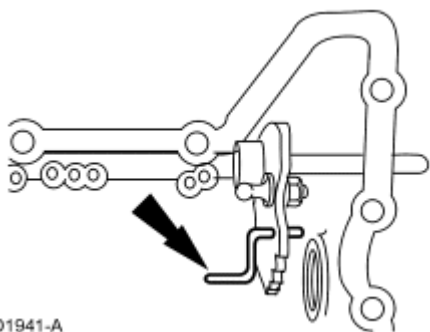
8. Install a new manual valve detent lever shaft retaining pin.
 - Verify that the manual valve detent lever shaft rotates without binding.



GD1957-A

Fig. 512: Manual Valve Detent Lever Shaft Retaining Pin
Courtesy of FORD MOTOR CO.

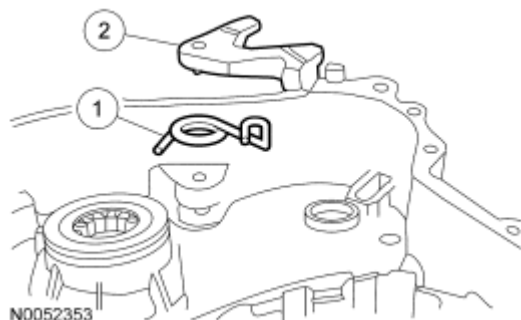
9. Install the manual valve actuator rod (manual valve link).



GD1941-A

Fig. 513: Manual Valve Actuator Rod
Courtesy of FORD MOTOR CO.

10. Install the parking gear and parking pawl spring assembly.
 1. Install the parking pawl return spring onto the parking pawl.
 2. Install the parking gear and parking pawl assembly into the case.



N0052353

Fig. 514: Parking Gear & Parking Pawl Spring Assembly
Courtesy of FORD MOTOR CO.

11. Install the parking pawl shaft.

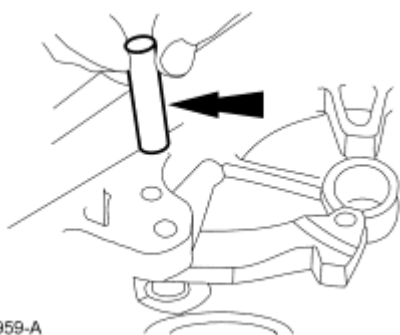


Fig. 515: Parking Pawl Shaft
Courtesy of FORD MOTOR CO.

12. Install the parking pawl shaft retainer and bolt.
 - Tighten to 8 Nm (71 lb-in).

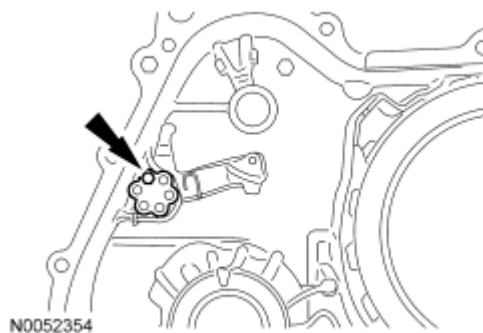


Fig. 516: Parking Pawl Shaft Retainer & Bolt
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the manual control lever inner shaft prior to installation.

13. Install the manual control lever shaft assembly.
 - Tighten to 74 Nm (55 lb-ft).

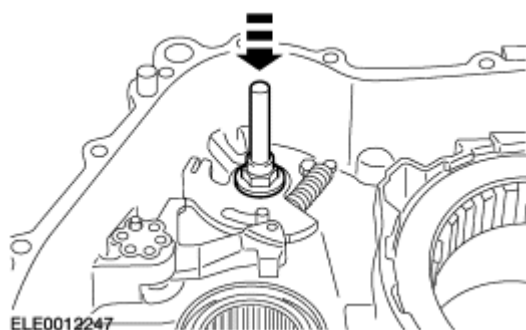


Fig. 517: Manual Control Lever Shaft Assembly
Courtesy of FORD MOTOR CO.

NOTE: **Verify that the actuating cam rotates freely.**

14. Install the parking pawl ratchet spring.

NOTE: **Hand-tighten the manual control lever bolt; it will be tightened after linkage adjustment.**

15. Install the manual control lever outer assembly and bolt.

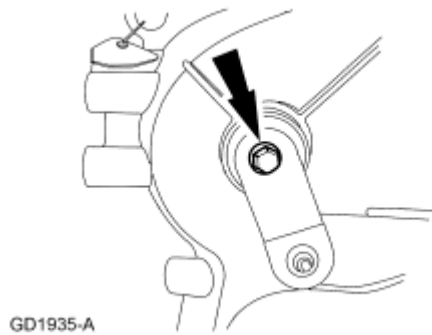


Fig. 518: Manual Control Lever Outer Assembly & Bolt
Courtesy of FORD MOTOR CO.

16. Using the special tool, install a new final drive lube tube seal.

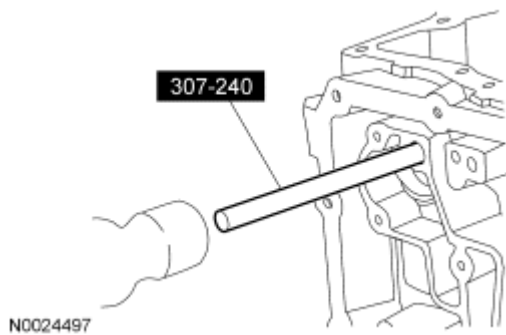


Fig. 519: Final Drive Lube Tube Seal
Courtesy of FORD MOTOR CO.

17. Install the final drive lube tube into the seal.



Fig. 520: Final Drive Lube Tube
Courtesy of FORD MOTOR CO.

18. Using the special tool, install the final drive lube tube into the case.



Fig. 521: Installing Final Drive Lube Tube Into Case Using Special Tools
Courtesy of FORD MOTOR CO.

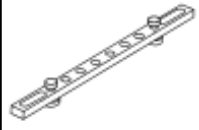
PUMP ASSEMBLY

Special Tools

Illustration	Tool Name	Tool Number
	Alignment Pins, Transmission Main Control Body	307-127 (T94P-77000-P)
	Depth Micrometer	303-D026 (D80P-4201-A)
	Shim Selection Gauge	307-300 (T94P-77000-Q)

2008 Ford Escape

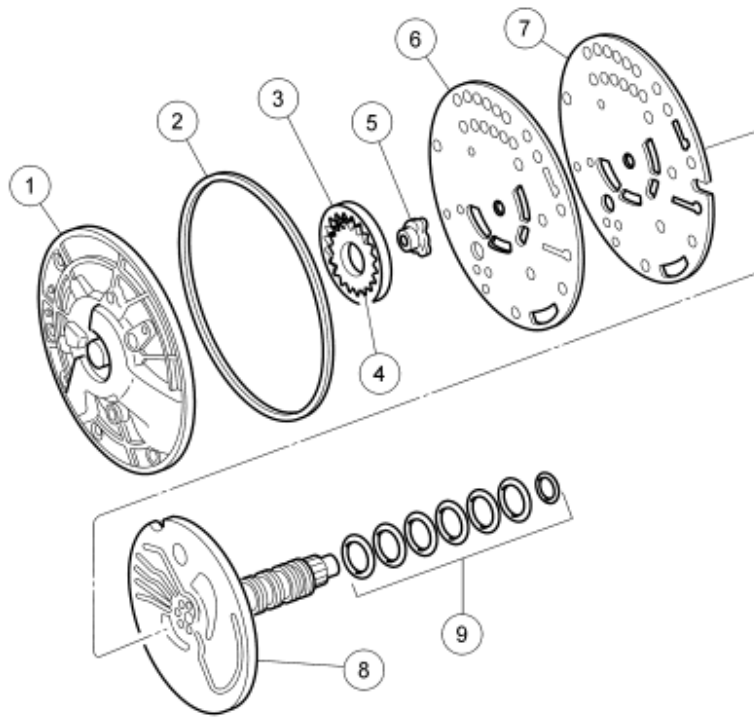
2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner



ST1954-A

Material

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



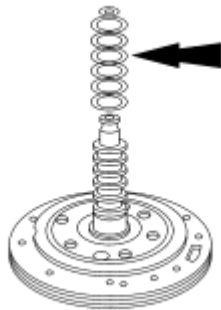
N0024499

Fig. 522: Exploded View Of Pump Assembly Components
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7F370	Pump body - front
2	7A248	O-ring - pump seal
3	7C011	Driven gear - pump
4	7C009	Drive gear - pump
5	7F402	Drive gear insert - pump
6	7A142-AA	Separator plate - pump body
7	7G331-AA	Separator plate gasket - pump body
8	7A108	Pump support - front

DISASSEMBLY

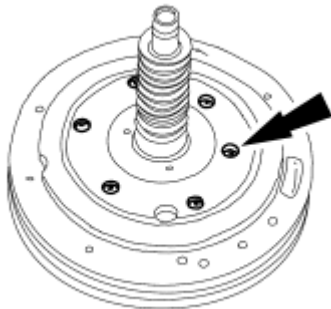
1. Remove and discard the 7 pump support seal rings from the pump support.



GD2856-A

Fig. 523: Pump Support Seal Rings
Courtesy of FORD MOTOR CO.

2. Remove the 6 pump support bolts.



GD2857-A

Fig. 524: Pump Support Bolts
Courtesy of FORD MOTOR CO.

3. Separate the pump support and body assembly.
 1. Remove the pump support.
 2. Remove the pump body separator plate gasket.
 3. Remove the pump body separator plate.
 4. Remove the pump body.

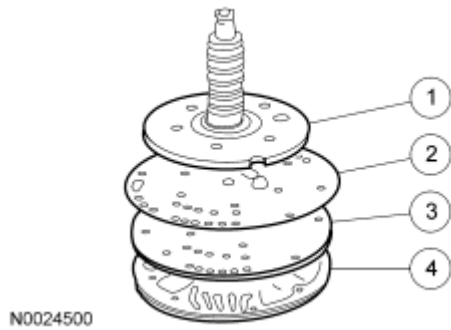


Fig. 525: Pump Support & Body Assembly Components
Courtesy of FORD MOTOR CO.

4. Remove and discard the pump seal.

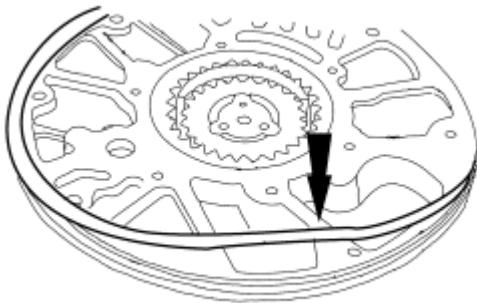


Fig. 526: Pump Seal
Courtesy of FORD MOTOR CO.

5. Remove the pump drive gear assembly.
 1. Remove the pump drive gear insert.
 2. Remove the pump drive gear.
 3. Remove the pump driven gear.

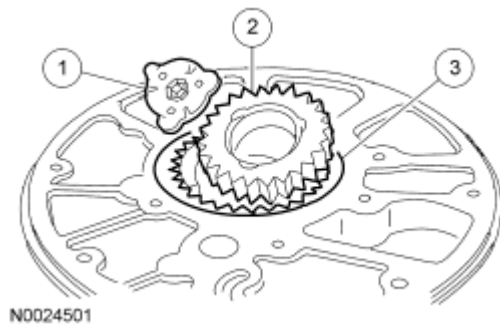
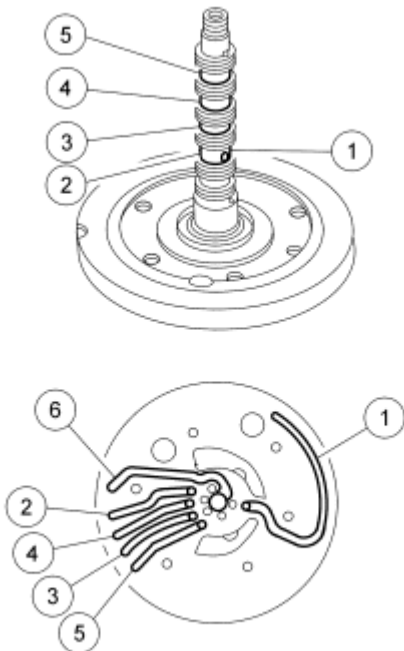


Fig. 527: Pump Drive Gear, Driven Gear & Insert
Courtesy of FORD MOTOR CO.

WARNING: When using compressed air, never let air pressure exceed 172 kPa

(25 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.

6. Clean all parts thoroughly in clean solvent and blow dry with moisture-free regulated compressed air.
7. Inspect the pump body and gears for damage and wear.
 - Driven gear teeth
 - Drive gear teeth
 - Gear bore
 - Crescent
 - Lubrication passages and holes
8. Inspect the pump support apply circuit passages and lubrication passages.
 1. Rear lube (from cooler TC circuit)
 2. Reverse clutch (RC)
 3. Direct clutch (DC)
 4. Forward clutch (FC)
 5. Coast clutch (CC)
 6. Converter clutch bypass (CBY)



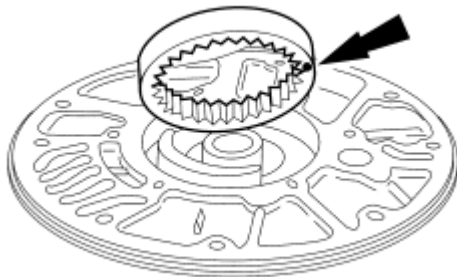
N0024502

Fig. 528: Pump Support Apply Circuit Passages & Lubrication Passages
Courtesy of FORD MOTOR CO.

ASSEMBLY

NOTE: The identification dot on the pump driven gear must face downward.

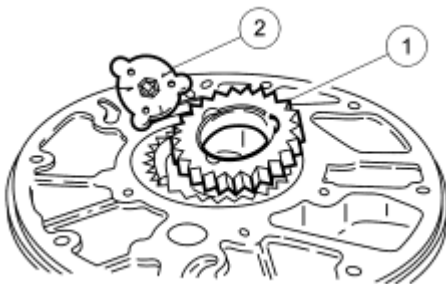
1. Install the pump driven gear.



ELV9410158

Fig. 529: Pump Driven Gear
Courtesy of FORD MOTOR CO.

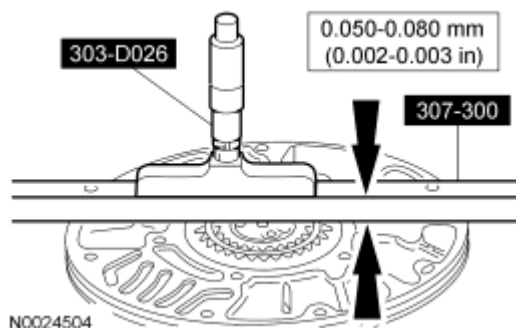
2. Install the pump drive gear assembly.
 1. Install the pump drive gear.
 2. Install the pump drive gear insert.



N0024503

Fig. 530: Pump Drive Gear & Insert
Courtesy of FORD MOTOR CO.

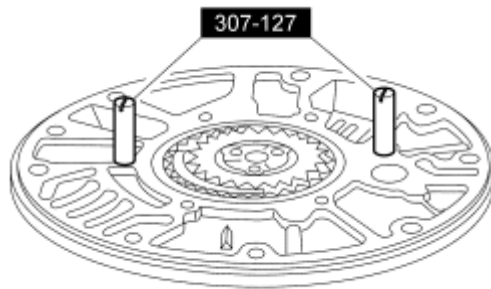
3. Using the special tool, measure the clearance between each gear and the pump body face.
 - If the clearance exceeds specification, install a new pump assembly.



N0024504

Fig. 531: Checking Pump Body Face Clearance With Specification
Courtesy of FORD MOTOR CO.

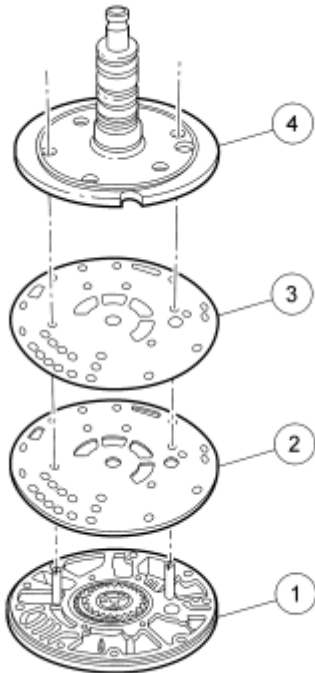
4. Install the special tool.



N0024505

Fig. 532: Special Tool
Courtesy of FORD MOTOR CO.

5. Align the pump support assembly. Fill the pump gear cavity with clean automatic transmission fluid to the top of the gears. Align the pump guide screws.
 1. Install the pump body.
 2. Install the pump body separator plate.
 3. Install the pump body separator plate gasket onto the pump body.
 4. Install the pump support.



N0024506

Fig. 533: Pump Body, Separator Plate, Gasket & Support

Courtesy of FORD MOTOR CO.

NOTE: Install the 4 pump support bolts in the pump support holes, and remove the special tool. Then install the last 2 bolts.

6. Install the 6 pump support bolts.
 - Tighten to 13 Nm (10 lb-ft).

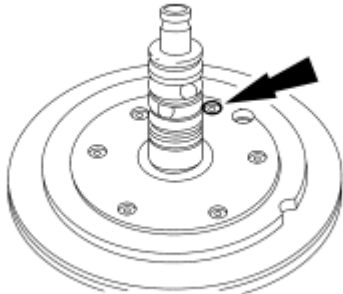


Fig. 534: Pump Support Bolts
Courtesy of FORD MOTOR CO.

NOTE: Make sure that the white stripe on the pump seal is visible around the pump body circumference.

7. Install the pump seal on the pump body.

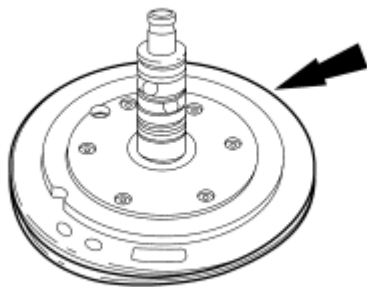


Fig. 535: Pump Seal
Courtesy of FORD MOTOR CO.

NOTE: Make sure the pump support seal rings are overlapped correctly.

8. Install the 7 pump support seal rings.

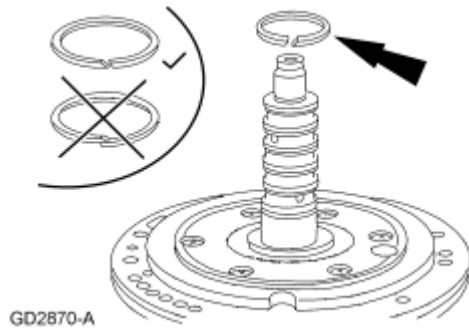


Fig. 536: Pump Support Seal Rings
Courtesy of FORD MOTOR CO.

9. Measure the pump rotational torque.
 1. Install the pump drive shaft.
 2. Measure the pump rotational torque.
 - Tighten to 0.3 Nm (2.65 lb-in).
 3. Remove the pump drive shaft.
 - If rotational torque exceeds the specification, disassemble and inspect the pump assembly for contamination or incorrect end clearance.

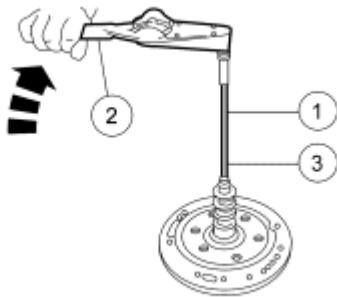
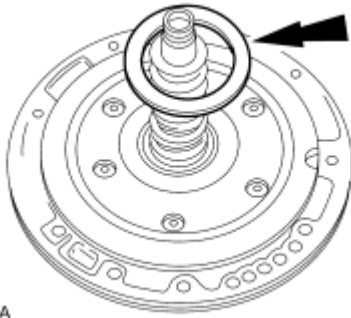


Fig. 537: Measuring Pump Rotational Torque
Courtesy of FORD MOTOR CO.

10. Install the No. 1 pump support thrust bearing.
 - Lubricate the seal rings with clean automatic transmission fluid.



GD2872-A

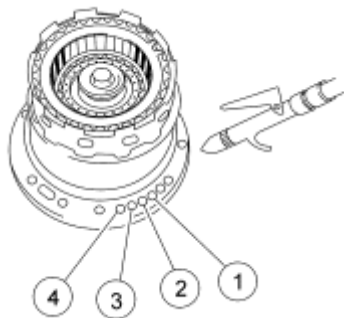
Fig. 538: No. 1 Pump Support Thrust Bearing
Courtesy of FORD MOTOR CO.

11. Install the forward/coast/direct clutch cylinder and reverse clutch drum on the pump support.

WARNING: When using compressed air, never let air pressure exceed 172 kPa (25 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.

NOTE: With each application of air, you should hear the clutch pack apply. A hissing or high-pitched squeal indicates that a seal is damaged or torn. Inspect to find the source and repair as necessary.

12. Check the following passages of the forward/coast/direct clutch cylinder and reverse clutch drum with moisture-free compressed air, regulated to 276 kPa (40 psi).
 1. Reverse clutch passage
 2. Forward clutch passage
 3. Direct clutch passage
 4. Coast clutch passage
 - Converter bypass (located on the bottom)



N0024508

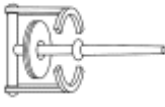
Fig. 539: Forward/Coast/Direct Clutch Cylinder & Reverse Clutch Drum Passages
Courtesy of FORD MOTOR CO.

REVERSE CLUTCH

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

Special Tools

Illustration	Tool Name	Tool Number
 ST1190-A	Compressor, Clutch Spring	307-015 (T65L-77515-A)
 ST2057-A	Protector, Piston Seal	307-281 (T94P-77000-D2)

Material

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

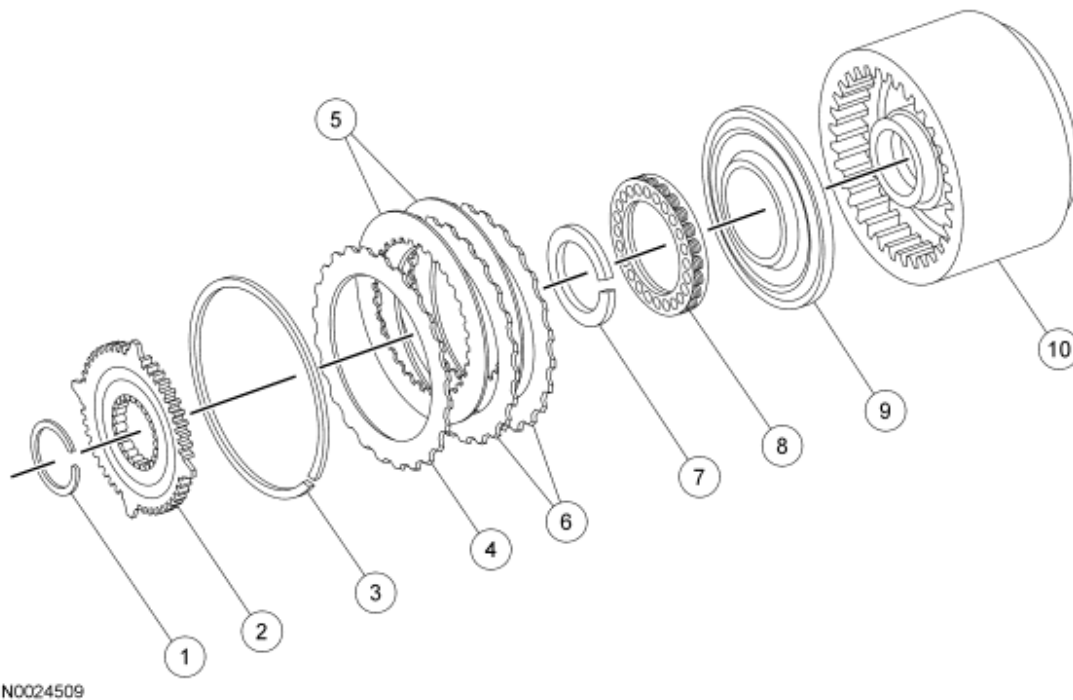


Fig. 540: Exploded View Of Reverse Clutch Components
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7D256	Retaining ring - reverse clutch hub

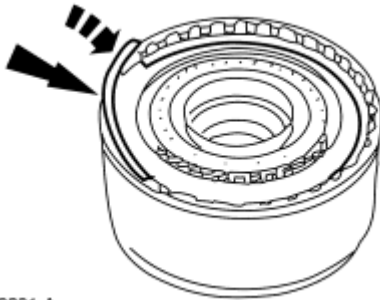
2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

2	7D391	Reverse clutch hub
3	7D483	Snap ring - reverse clutch pressure plate retainer
4	7D408	Pressure plate - reverse clutch
5	7B164	Clutch plates - reverse clutch internal spline (friction)
6	7B442	Clutch plates - reverse clutch external spline (steel)
7	7H225	Retaining ring
8	7G335	Return spring assembly - reverse clutch
9	7E079	Piston assembly - reverse clutch
10	7D044	Drum assembly - reverse clutch

DISASSEMBLY

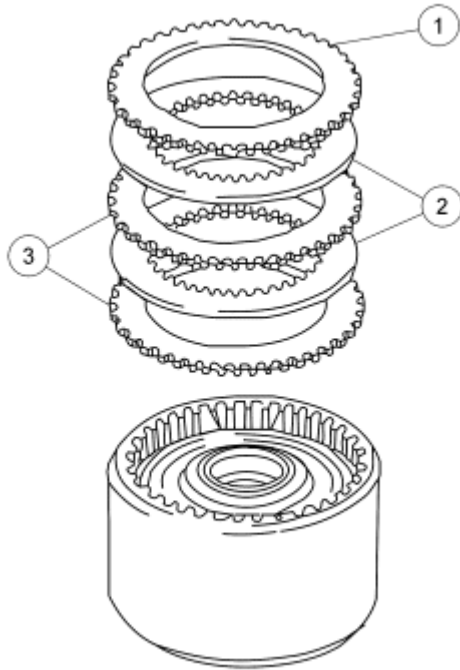
1. Remove the reverse clutch pressure plate retainer snap ring.



GD2831-A

Fig. 541: Reverse Clutch Pressure Plate Retainer Snap Ring
Courtesy of FORD MOTOR CO.

2. Remove the reverse clutch plates.
 1. Remove the pressure plate.
 2. Remove the friction plates.
 3. Remove the steel plates.
 - Remove the inspect for damage or wear.



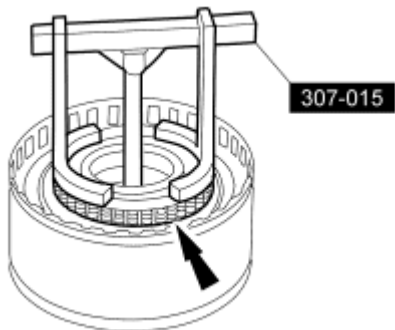
N0024510

Fig. 542: Reverse Clutch Plates
Courtesy of FORD MOTOR CO.

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.

CAUTION: Do not compress the reverse clutch return springs completely.

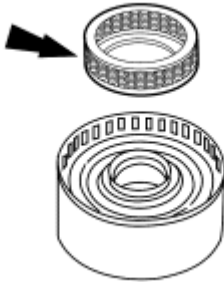
3. Remove the retaining ring.
 - Using the special tool, compress the reverse clutch return springs.



N0029902

Fig. 543: Compressing Reverse Clutch Return Springs
Courtesy of FORD MOTOR CO.

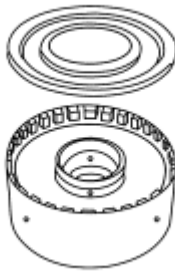
4. Remove the reverse clutch return spring assembly.



GD2824-A

Fig. 544: Reverse Clutch Return Spring Assembly
Courtesy of FORD MOTOR CO.

5. Remove the reverse clutch piston assembly.



GD2825-A

Fig. 545: Reverse Clutch Piston Assembly
Courtesy of FORD MOTOR CO.

WARNING: When using compressed air, never let air pressure exceed 172 kPa (25 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.

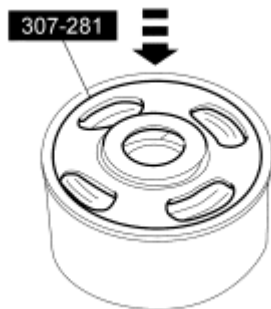
NOTE: Do not clean the clutch plates in a vapor degreaser or with any other type of detergent solution. Clean all parts thoroughly in a clean automatic transmission fluid and blow dry with moisture-free regulated compressed air.

6. Clean the friction steel plates with a lint-free cloth.
7. Inspect the parts for damage and wear:
 - Clutch plates
 - Piston and seals
 - Bushings

- Check ball in drum
- Drum outer surface band contact area
- Piston bore

ASSEMBLY

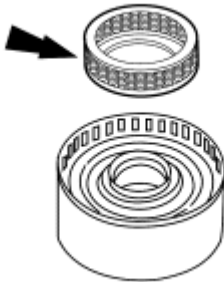
1. Before assembly, soak the internal spline clutch plates in clean automatic transmission fluid for 30 minutes.
2. Using the special tool, install the reverse clutch piston assembly with integral seals.



A0087485

Fig. 546: Installing Reverse Clutch Piston Assembly & Integral Seals
Courtesy of FORD MOTOR CO.

3. Install the reverse clutch return spring assembly.



GD2824-A

Fig. 547: Reverse Clutch Return Spring Assembly
Courtesy of FORD MOTOR CO.

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.

CAUTION: Do not compress the reverse clutch return springs completely.

4. Install the reverse clutch retaining ring.
 - Using the special tool, compress the reverse clutch return springs.

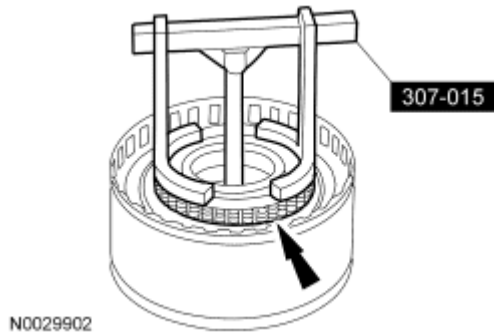


Fig. 548: Compressing Reverse Clutch Return Springs
Courtesy of FORD MOTOR CO.

5. Install the reverse clutch plates.
 1. Install the steel plates.
 2. Install the friction plates.
 3. Install the reverse clutch pressure plate.

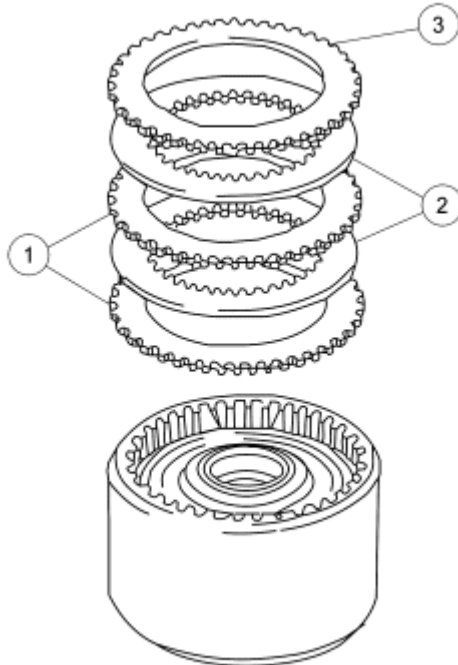
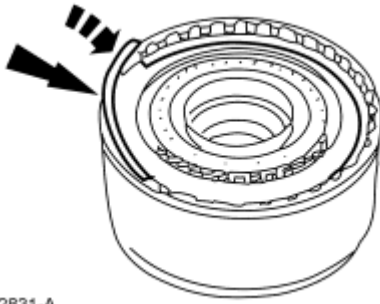


Fig. 549: Reverse Clutch Plates
Courtesy of FORD MOTOR CO.

6. Install the reverse clutch pressure plate retainer snap ring (selective fit).



GD2831-A

Fig. 550: Reverse Clutch Pressure Plate Retainer Snap Ring
 Courtesy of FORD MOTOR CO.

7. Measure the clearance between the reverse clutch pressure plate and the reverse clutch pressure plate retainer snap ring with a feeler gauge.
 - Take a second measurement on the opposite side.
 - Average the 2 measurements to get the clearance.
 - If the clearance is not within the specifications, select and install the correct thickness retaining ring to obtain the specified clearance.
 - Retaining ring sizes:
 - 1.39-1.49 mm (0.054-0.058 in).
 - 1.53-1.63 mm (0.060-0.064 in).
 - 1.68-1.78 mm (0.066-0.070 in).

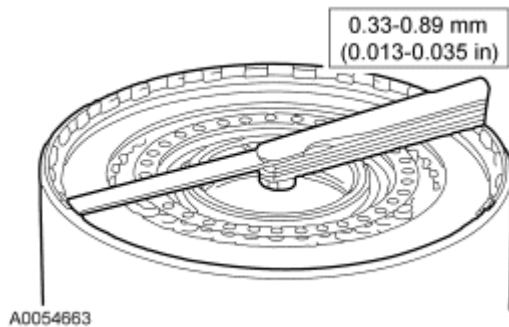


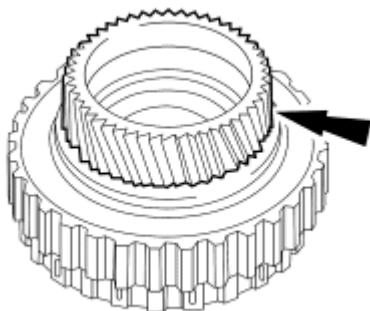
Fig. 551: Measuring Clearance Between Reverse Clutch Pressure Plate & Reverse Clutch Pressure Plate Retainer Snap Ring With Specification
 Courtesy of FORD MOTOR CO.

PLANETARY GEARSETS AND CHAIN DRIVE PARTS

DISASSEMBLY

1. Inspect the low/intermediate sun gear assembly for damage.
 - Gear teeth
 - Thrust bearing surfaces

- Journal surface



GD2742-A

Fig. 552: Low/Intermediate Sun Gear Assembly
Courtesy of FORD MOTOR CO.

2. Inspect the low/intermediate carrier assembly.

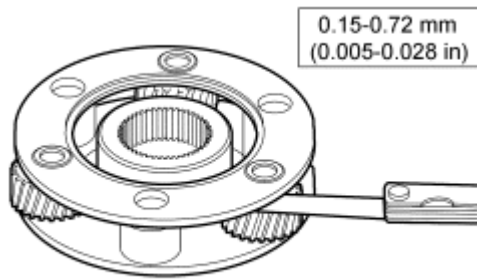
- Pinion gear teeth
- Spline teeth
- Pinion gear surfaces
- Bushing surfaces
- Pinion gear bearings



GD2745-A

Fig. 553: Low/Intermediate Carrier Assembly
Courtesy of FORD MOTOR CO.

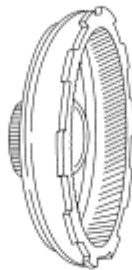
3. Inspect the low/intermediate carrier assembly end play.
 - Use a feeler gauge to measure end play.
 - If end play is out of specification, install a new assembly.



A0021818

Fig. 554: Checking Low/Intermediate Carrier Assembly End Play With Specification
Courtesy of FORD MOTOR CO.

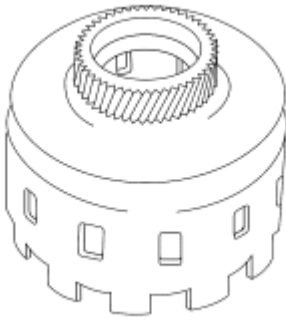
4. Inspect the low/intermediate ring gear.
 - Gear teeth
 - Spline teeth
 - Thrust bearing surfaces
 - Journal surface
 - Lug teeth



GD2746-A

Fig. 555: Low/Intermediate Ring Gear
Courtesy of FORD MOTOR CO.

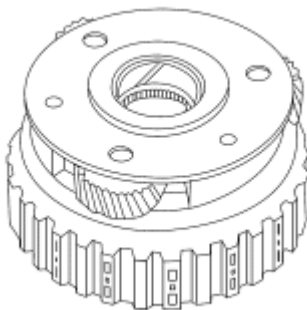
5. Inspect the reverse/overdrive sun gear and shell assembly for damage or wear.
 - Gear teeth
 - Lug teeth
 - Thrust bearing surfaces
 - Bushing surface



GD2747-A

Fig. 556: Reverse/Overdrive Sun Gear & Shell Assembly
Courtesy of FORD MOTOR CO.

6. Inspect the reverse/overdrive carrier assembly.
 - Pinion gear teeth
 - Clutch plate spline teeth
 - Pinion gear bearings
 - Thrust bearing surfaces
 - Bushing surfaces
 - No. 8 thrust bearing captured between the pinions and carrier



GD2748-A

Fig. 557: Reverse/Overdrive Carrier Assembly
Courtesy of FORD MOTOR CO.

7. Inspect the reverse/overdrive carrier assembly end play.
 - Use feeler gauge to measure end play.
 - If end play is out of specification, install a new assembly.

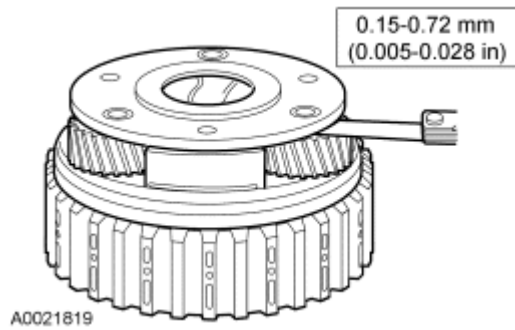


Fig. 558: Checking Reverse/Overdrive Carrier Assembly End Play With Specification
 Courtesy of FORD MOTOR CO.

8. Inspect the reverse/overdrive ring gear.

- Gear teeth
- Spline teeth
- Drive sprocket teeth
- Thrust bearing surfaces
- Journal surface
- Bearings

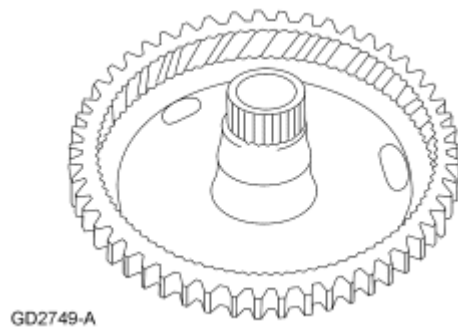
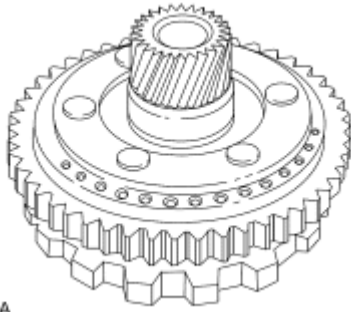


Fig. 559: Reverse/Overdrive Ring Gear
 Courtesy of FORD MOTOR CO.

9. Inspect the driven sprocket assembly.

- Gear teeth
- Parking gear lug teeth
- Driven sprocket teeth
- Thrust bearing surfaces
- Bearing surfaces
- Rivets
- Bushing surfaces
- Lubrication holes

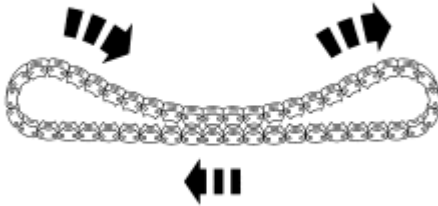


GD2750-A

Fig. 560: Driven Sprocket Assembly
Courtesy of FORD MOTOR CO.

10. Inspect the drive chain.

- Check the drive chain for wear, stretching or tightness of the chain links.
- The chain must move freely.



M1701204

Fig. 561: Drive Chain
Courtesy of FORD MOTOR CO.

ASSEMBLY

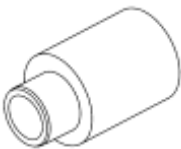
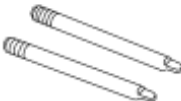
TRANSAXLE

Special Tools

Illustration	Tool Name	Tool Number
 ST1963-A	Adapter for 307-304	307-304-01 (T94P-77000-R2) (17-057-01)
	Adapter for 307-304	307-304-02 (T94P-77000-R3) (17-057-02)

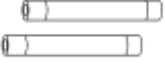
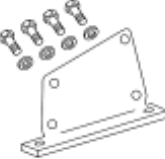
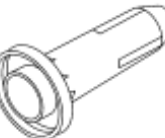
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 ST1964-A		
 ST2539-A	Adapter for 307-304	307-304-03 (T94P-77000-R4)
 ST1801-A	Air Test Plate, Transmission	307-301 (T94P-77000-S) (17-056)
 ST1567-A	Aligner, Pump Housing	307-076 (T80L-77100-A)
 ST1633-A	Alignment Gauge, TR Sensor	307-351 (T97L-70010-A)
 ST1956-A	Alignment Pins, Valve Body	307-299 (T94P-77700-N)
 ST1274-A	Depth Micrometer	303-D026 (D80P-4201-A)
 ST2821-A	End Play Gauge, Transmission	307-519

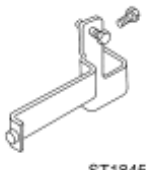
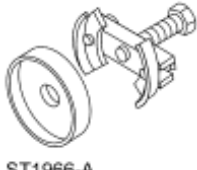
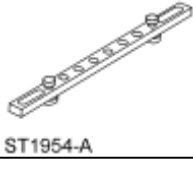
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 ST1631-A	Handle, Torque Converter	307-091 (T81P-7902-C)
 ST1186-A	Holding Fixture, Transmission	307-003 (T57L-500-B)
 ST2529-A	Holding Fixture, Transmission	307-288 (T94P-7700-F)
 ST1957-A	Installer, Halfshaft Output Fluid Seal	307-157 (T86P-1177-B)
 ST2525-A	Installer, RH Halfshaft Fluid Seal	307-428
 ST1958-A	Installer, Shift Shaft Fluid Seal	307-002 (TOOL-77288)
 ST1960-A	Installer, Torque Converter Fluid Seal	307-273 (T94P-77000-C) (17-052)
 ST1967-A	Protector, Piston Seal	307-280 (T94P-77000-D1) (17-060-01)

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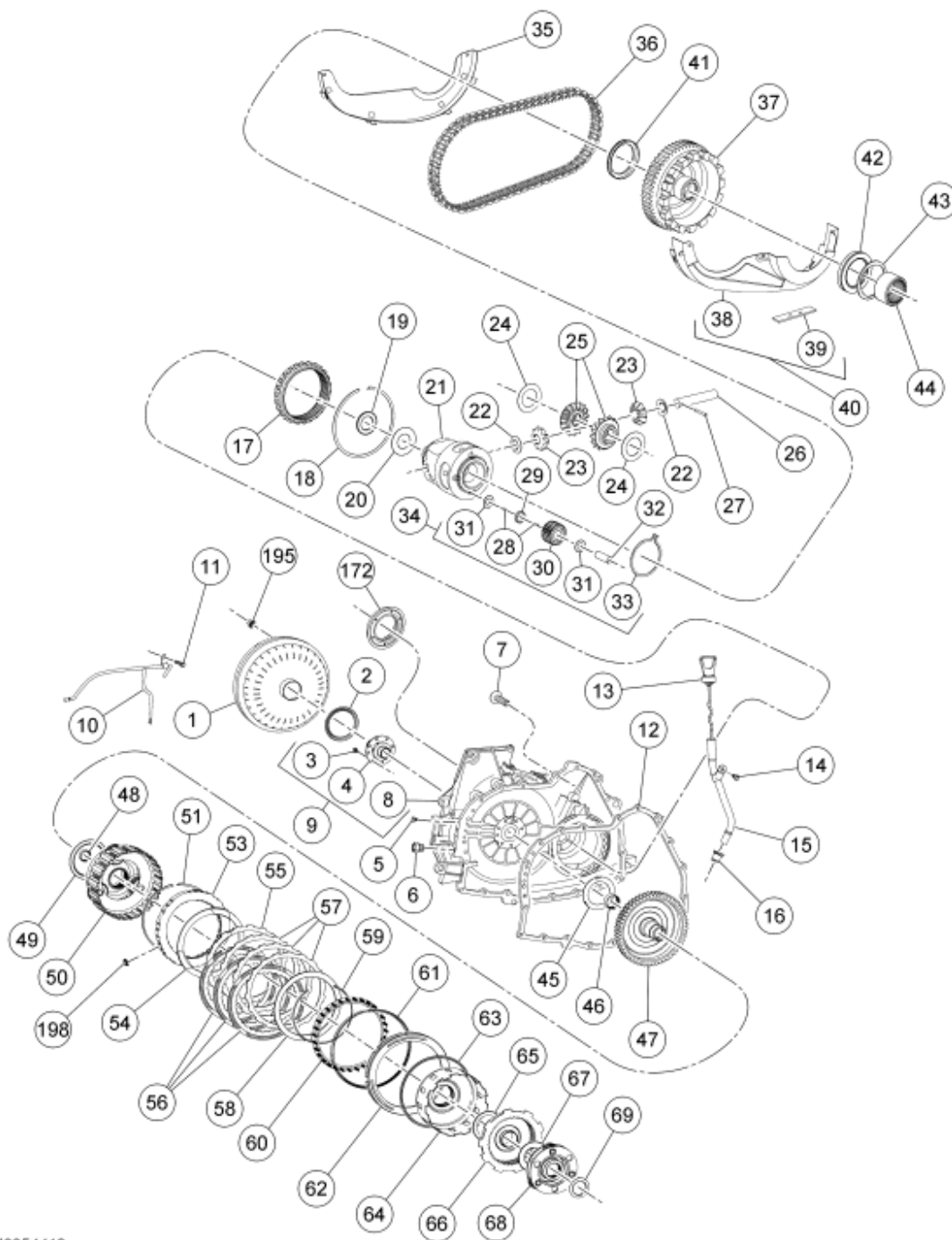
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 ST2530-A	Protector, Piston Seal	307-284 (T94P-77000-D5) (17-060-05)
 ST1845-A	Remover/Installer, Servo Cover	307-295 (T94P-77000-L)
 ST1966-A	Selector, Servo Piston Rod	307-S296 (T94P-77000-M) (17-059)
 ST2537-A	Shim Selection Depth Gauge	307-300-01 (T94P-77000-T) (17-055-01)
 ST1954-A	Shim Selection Gauge	307-300 (T94P-77000-Q) (17-055)
 ST1962-A	Shim Selection Preload Plate	307-304 (T94P-77000-R1) (17-057)
 ST1940-A	Test Plate Screw Set, Transmission	307-126 (T82P-7006-C)

Material

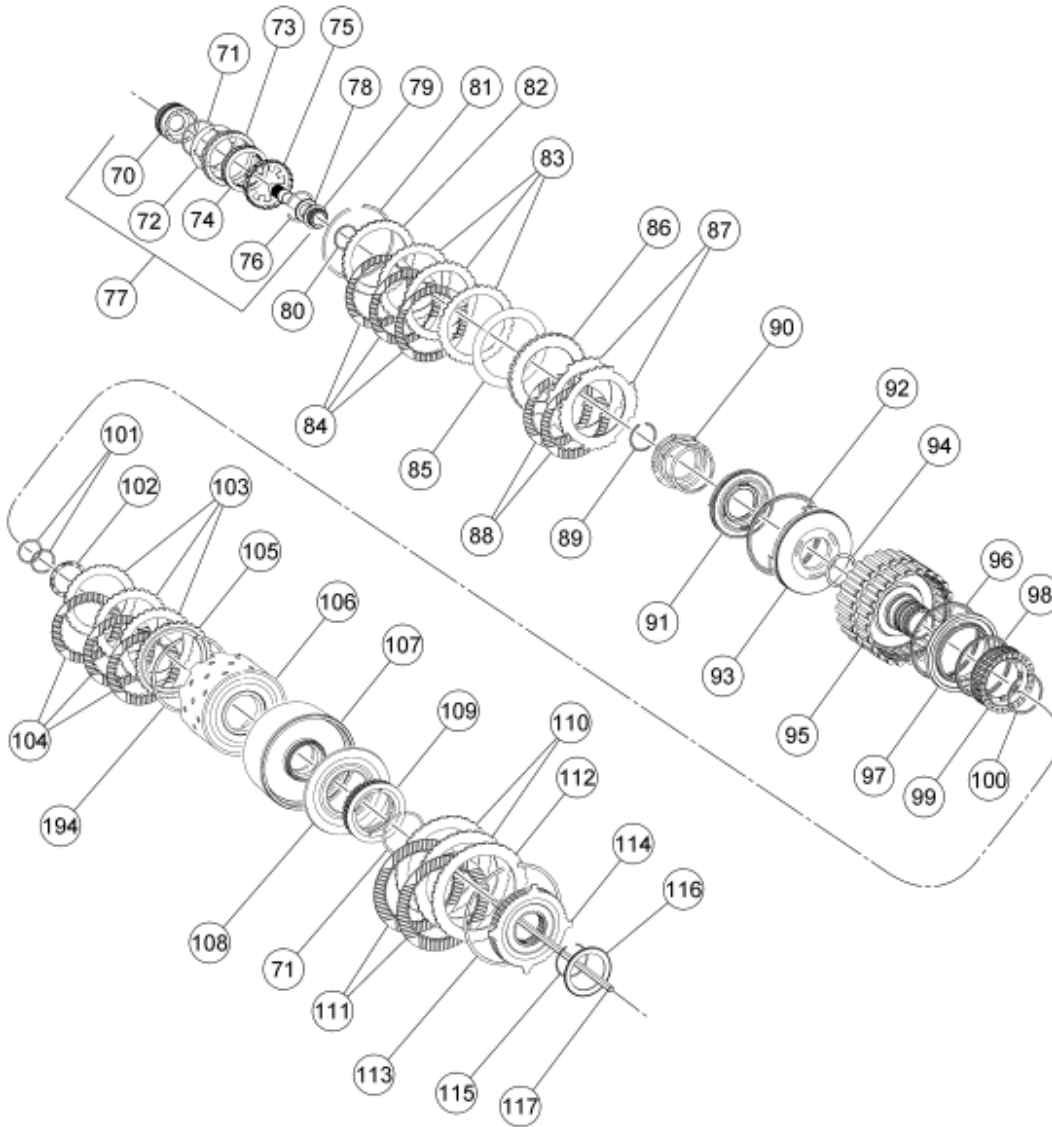
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Multi-Purpose Grease	ESB-M1C93-B

XG-4 and/or XL-5



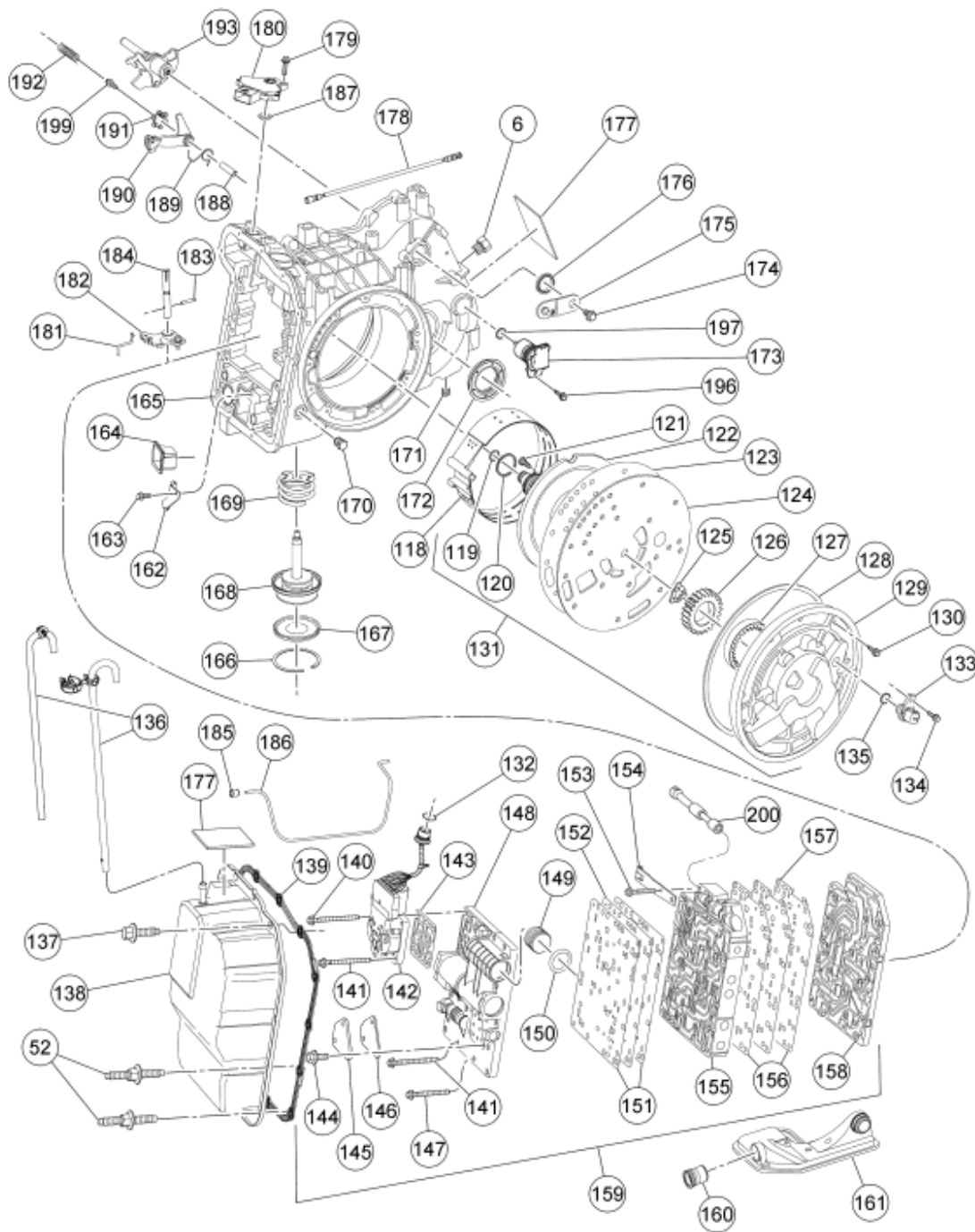
N0054412

Fig. 562: Automatic Transaxle - Disassembled Views (1 Of 3)
 Courtesy of FORD MOTOR CO.



N0015052

Fig. 563: Exploded View Of Automatic Transaxle Component (2 Of 3)
 Courtesy of FORD MOTOR CO.



N0052347

Fig. 564: Exploded View Of Automatic Transaxle Component (3 Of 3)
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7902	Converter assembly
2	7F401	Seal assembly - converter impeller hub
3	N807098-S437	Bolt - M6-1.0 x 16 pan Torx® head

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4	7F363	Support assembly - stator
5	7A137	Pipe plug - 1/8-27 dry seal
6	7D273	Connector assembly - cooler line fitting
7	N605908-S105	Bolt - M8-1.25 x 38 hex flange head (attaches case to converter housing)
8	7975	Converter housing assembly - transaxle
9	7005	Converter housing - case
10	7H207	Tube assembly - differential lube
11	N605891-S102	Bolt - M6-1.0 x 18.5 hex flange head
12	7B333	Gasket - transaxle split flange
13	7A020	Indicator assembly - fluid level
14	W500215-S439	Bolt - M6-1.0 x 19.25 hex flange head
15	7A228	Tube assembly - fluid filler
16	7N243	Grommet - fluid filler tube
17	7F343	Gear - final drive
18	7H106	Ring - final drive retaining
19	4221	Bearing assembly - differential carrier (No. 15)
20	4067	Shim - differential bearing (selective fit No. 14)
21	4204	Case assembly - differential gear
22	4230	Washer - rear axle differential pinion
23	4215	Gear - differential pinion
24	4228	Washer - differential side gear thrust
25	4236	Gear - differential side
26	4211	Shaft - differential pinion
27	67847-S	Pin - coiled spring (attaches differential pinion shaft)
28	7G216	Bearing - final drive planet gear needle
29	7G217	Spacer - final drive planet gear
30	7G214	Gear - final drive planet
31	7G215	Washer - final drive planet gear
32	7G213	Shaft - final drive pinion
33	W706051-S	Ring - 77.3 retaining, external (retains pinion shaft in 7F465)
34	7F465	Planet and carrier assembly - final drive
35	7H245	Pan - chain cover
36	7G249	Chain assembly - drive
37	7G132	Sprocket assembly - driven
38	7H245	Pan - chain cover
39	7E290	Magnet - case
40	7H293	Pan assembly - chain cover
41	7G233	Bearing assembly - driven sprocket thrust (drive No. 13)

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42	7G247	Bearing assembly - driven sprocket (outer No. 12)
43	7H086	Shim - driven sprocket (select fit No. 11)
44	7G355	Bearing assembly - driven sprocket (inner No. 12)
45	7G099	Washer - drive sprocket thrust (select fit No. 10)
46	7H032	Bearing assembly - stator support (No. 17) (part of 7A153)
47	7A153	Gear assembly - overdrive reverse ring
48	7H029	Bearing assembly - drive sprocket (driven No. 16) (part of 7A153)
49	7F240	Bearing assembly - reverse overdrive ring gear thrust (No. 9)
50	7D006	Planet assembly - overdrive reverse (captured No. 8 bearing)
51	7D483	Ring - low one-way clutch retaining
52	N811449-S437	Stud - M6 x 1
53	7A089	Clutch assembly - low one-way mechanical diode
54	7J071	Spring - light weight 8-wave
55	7B066	Plate - low/reverse clutch pressure
56	7B164	Plate assembly - low/reverse clutch (friction)
57	7B442	Plate - low/reverse clutch (steel)
58	7B070	Spring - low/reverse clutch wave
59	7D483	Ring - low/reverse clutch return spring retaining
60	7H064	Spring assembly - low/reverse clutch return
61	7D403	Seal - low/reverse clutch piston outer (large)
62	7D402	Piston - low/reverse clutch
63	7D404	Seal - low/reverse clutch piston inner (small)
64	7A626	Gear assembly - overdrive/reverse sun
65	7G178	Bearing assembly - reverse/overdrive sun gear thrust (No. 7)
66	7A153	Gear assembly - low/intermediate ring
67	7H028	Bearing assembly - low/intermediate carrier thrust (outer No. 6)
68	7A398	Planet assembly - low/intermediate
69	7H027	Bearing assembly - low/reverse sun gear thrust (inner No. 5)
70	7H229	Gear, race and bushing assembly - low/intermediate sun
71	7H225	Ring - forward one-way clutch and reverse clutch spring retaining
72	7H219	Retainer - forward one-way clutch
73	7G439	Race - forward one-way clutch outer
74	7H218	Clutch assembly - forward one-way sprag

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75	7H214	Hub - coast clutch
76	7C122	Ring - coast clutch hub retaining
77	7A089	Clutch and sun gear assembly - forward one-way
78	7H026	Bearing assembly - turbine shaft thrust (No. 4)
79	7F213	Shaft assembly - turbine
80	7C099	Seal - forward/direct clutch hub
81	7D483	Ring - forward/direct clutch plate retaining
82	7B066	Plate - forward clutch pressure
83	7B442	Plate - forward clutch (steel)
84	7B164	Plate assembly - forward clutch (friction)
85	7E085	Spring - forward clutch wave
86	7B066	Plate - coast clutch pressure
87	7B442	Plate assembly - coast clutch (steel)
88	7B164	Plate assembly - coast clutch (friction)
89	7N169	Ring - forward clutch spring retaining
90	7G299	Spring assembly - forward coast clutch return
91	7A262	Piston and seal assembly - coast clutch
92	7A548	Seal - forward clutch piston outer lip
93	7A262	Piston assembly - forward clutch
94	7A548	Seal - forward clutch piston inner lip
95	7G120	Cylinder assembly - forward/direct/coast clutch
96	7A548	Seal - direct clutch piston outer lip
97	7A262	Piston and seal assembly - direct clutch
98	7F225	Seal - direct clutch piston inner lip
99	7F235	Spring assembly - direct clutch return
100	7C122	Ring - direct clutch spring retaining
101	7D020	Seal - reverse clutch cylinder
102	7G116	Washer - direct clutch thrust
103	7B442	Plate - direct clutch (steel)
104	7B164	Plate assembly - direct clutch (friction)
105	7B477	Plate - direct clutch pressure
106	7D064	Shell assembly - direct clutch
107	7D044	Drum assembly - reverse clutch
108	7E079	Piston assembly - reverse clutch
109	7G335	Spring assembly - reverse clutch return
110	7B442	Plate - reverse input clutch (steel)
111	7B164	Plate assembly - reverse input clutch (friction)
112	7D408	Plate - reverse input clutch pressure
113	7D483	Ring - reverse clutch retaining (select fit)
114	7D391	Hub - reverse clutch
115	7D256	Ring - reverse clutch hub retaining

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	7H241	Bearing assembly - pump support thrust (No. 1)
117	7B328	Shaft - pump drive
118	7D034	Band assembly - intermediate/overdrive
119	7H114	Seal - multiple clutch cooling
120	7H114	Seal - pump support clutch inner
121	N807099-S1000	Bolt - M6-1.0 x 18.5 pan head Torx® (attaches pump support to pump body)
122	7A108	Support assembly - pump
123	7G331	Gasket - pump body separator
124	7A142	Plate - pump body separator
125	7F402	Insert - pump drive gear
126	7C009	Gear assembly - pump drive
127	7C011	Gear - pump driven
128	7A248	Seal - pump O-ring
129	7F370	Body - front pump
130	N605893-S437	Bolt - M6-1.0 x 27.5 hex head (attaches pump body to case)
131	7A103	Pump assembly - front
132	7B329	Seal - solenoid valve body O-ring
133	7M101	Sensor assembly - transmission turbine shaft speed (TSS)
134	W500213-S439	Bolt - M6-1.0 x 16 hex head flange (attaches TSS sensor to case)
135	7Z101	Seal - transmission turbine shaft speed (TSS) sensor O-ring
136	7034	Vent assembly - main control cover
137	N808664-S1101	Bolt - M6-1.0 x 20.5 hex head flange (attaches main control cover to case)
138	7G004	Cover assembly - main control
139	7F396	Gasket - main control cover
140	N807073-S1100	Bolt - M6-1.0 x 88.5 hex head flange
141	N807072-S1100	Bolt - M6-1.0 x 74.5 hex head flange
142	7G391	Body assembly - transmission control solenoid (TCS)
143	7H200	Gasket - electronic control body
144	N807078-S100	Bolt - M5-0.8 x 15 hex head flange
145	7H250	Plate - pressure tap
146	7H251	Gasket - pressure tap plate
147	N807077-S1100	Bolt - M6-1.0 x 61.5 hex head flange
148	7G422	Body assembly - accumulator
149	7F187	Plug - 2/4 accumulator valve
150	7H332	Seal - 2/4 accumulator body

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151	7H202	Gasket - accumulator body separator plate
152	7H201	Plate - accumulator body separator
153	N807076-S1100	Bolt - M6-1.0 x 45 hex head flange
154	7E332	Spring assembly - manual valve detent
155	7G423	Body assembly - main control lower
156	7D100	Gasket - separator plate
157	7A008	Plate - control valve separator
158	7H195	Plate - case to main control transfer
159	7A100	Control and pressure tap assembly - main
160	7H249	Seal - recirculating regulator exhaust
161	7A098	Filter and seal assembly - fluid
162	7H264	Bracket - thermal valve
163	N605890-S2	Bolt - M6-1.0 x 16.5 hex head flange
164	7H237	Valve - thermostatic fluid level assembly
165	7005	Case assembly - transaxle
166	7H074	Ring - intermediate/overdrive servo cylinder cover
167	7D027	Cover assembly - intermediate/overdrive servo
168	7H188	Piston and rod assembly - intermediate/overdrive servo
169	7H073	Spring assembly - intermediate overdrive servo piston return
170	7N279	Plug - 1/4-18 dry seal tapered thread (line pressure)
171	7010	Plug - 1/2-14 transaxle drain
172	1177	Seal assembly - differential
173	7H103	Sensor assembly - output shaft speed (OSS)
174	N605903-S437	Bolt - M8-1.25 x 17 hex head flange
175	7A256	Lever assembly - manual control
176	7B498	Seal - manual control lever
177	7B148	Tag - transaxle identification
178	7A232	Rod assembly - manual valve detent lever actuating
179	N807079-S437	Bolt and washer assembly - M6-1 x 25 hex head flange
180	7F293	Sensor assembly - transmission range
181	7E335	Rod - manual valve actuator
182	7A115	Lever assembly - manual valve detent inner
183	7G100	Pin - shaft retainer
184	7D261	Shaft - manual valve detent inner
185	7H205	Seal - final drive lube tube
186	7H204	Tube - final drive lube
187	7F337	Seal assembly - manual control

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188	7D071	Shaft - parking pawl
189	7D070	Spring - parking pawl return
190	7A441	Pawl assembly - parking brake
191	7D419	Retainer and bolt assembly - parking pawl shaft
192	7A180	Spring - parking pawl ratchet
193	7R392	Lever assembly - parking brake
194	7D483	Ring - direct clutch plate retaining
195	6641	Nut - M10 x 1.0
196	W500213-S439	Bolt - M6 x 1.0
197	W704804	O-ring
198	7J361	Isolator - mechanical diode (3 required)
199	N807078-S100	Bolt, park pawl retainer to case
200	7C389	Valve - manual control

ASSEMBLY

1. Prepare the transaxle for assembly by proceeding with the following steps:
 - Clean all parts (except the friction plates, seals and intermediate/overdrive band) in solvent.
 - Dry all parts with moisture-free regulated compressed air (do not use shop towels).
 - Lubricate all internal parts (including friction plates) with clean automatic transmission fluid.
 - Make sure the complete assortment of selective thickness parts are on hand for adjustments during assembly:
 - Drive sprocket thrust washers.
 - Driven sprocket thrust bearing shims.
 - Differential case thrust bearing shims.
 - Low/reverse clutch pressure plates.
 - During assembly, use petroleum jelly to hold the parts in place (do not use grease).
 - Lightly coat bolt and nut threads with automatic transmission fluid for correct installation torque specifications.
2. Install intermediate and overdrive band assembly into the transaxle case.

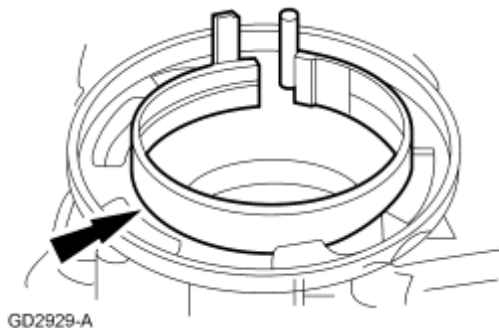


Fig. 565: Band Assembly
Courtesy of FORD MOTOR CO.

NOTE: Apply a thin coat of petroleum jelly to the pump support seals and to the pump bore in the transaxle. Lubricate the seal rings with clean automatic transmission fluid.

3. Install the pump assembly into the case.

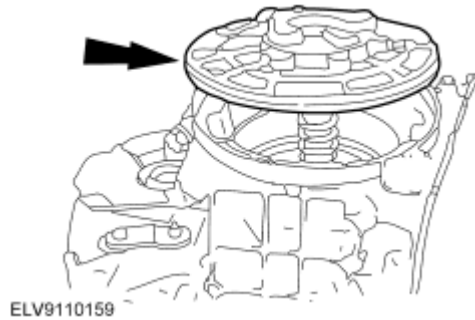


Fig. 566: Pump Assembly
Courtesy of FORD MOTOR CO.

NOTE: Tighten the bolts in the indicated sequence.

4. Install the pump assembly bolts.
 - Tighten to 11 Nm (8 lb-ft).

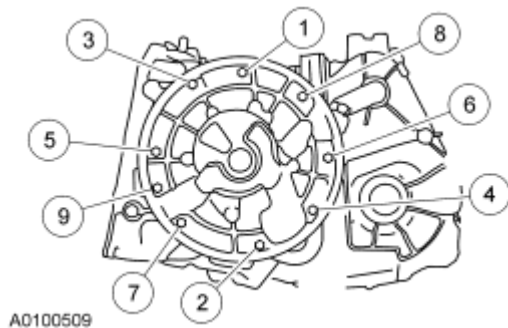


Fig. 567: Pump Assembly Bolt Torque Sequence
Courtesy of FORD MOTOR CO.

5. Using the special tools, install the low/reverse clutch piston.
 - Lubricate seals and piston bore with clean automatic transmission fluid.

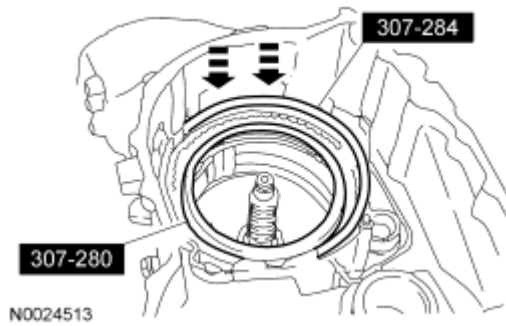


Fig. 568: Installing Low/Reverse Clutch Piston
Courtesy of FORD MOTOR CO.

6. Install the low/reverse clutch return spring assembly.

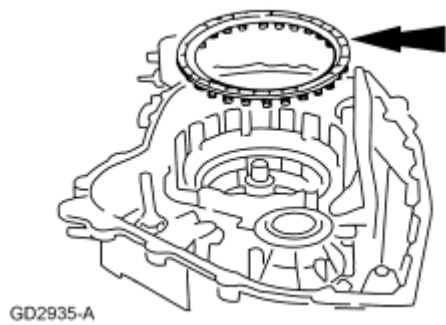


Fig. 569: Low/Reverse Clutch Return Spring Assembly
Courtesy of FORD MOTOR CO.

7. Install a new low/reverse clutch return spring retaining ring.

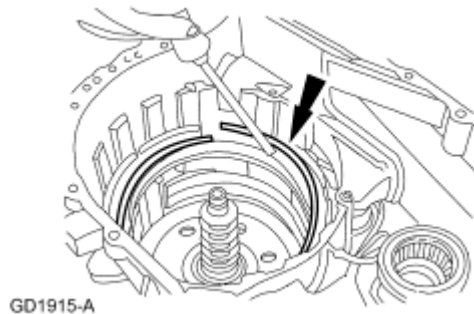


Fig. 570: Low/Reverse Clutch Return Spring Retaining Ring
Courtesy of FORD MOTOR CO.

CAUTION: The low/reverse clutch wave spring is fitted in this position for measurement purposes only.

8. Install the low/reverse clutch wave spring.

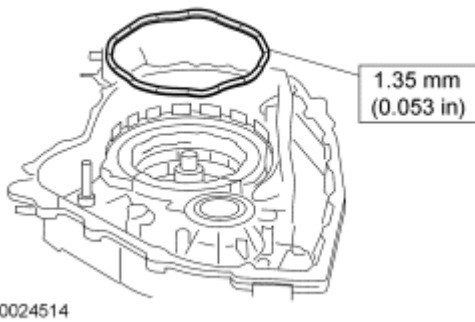


Fig. 571: Identifying Thick, 10-Wave Low/Reverse Clutch Wave Spring With Specification
Courtesy of FORD MOTOR CO.

9. Install the low/reverse clutch plates.
 1. Install the low/reverse clutch external spline (steel) clutch plates.
 2. Install the low/reverse clutch internal spline (friction) clutch plates.
 3. Install the thin 8-wave low/reverse clutch cushion spring.
 4. Install the low/reverse clutch pressure plate.

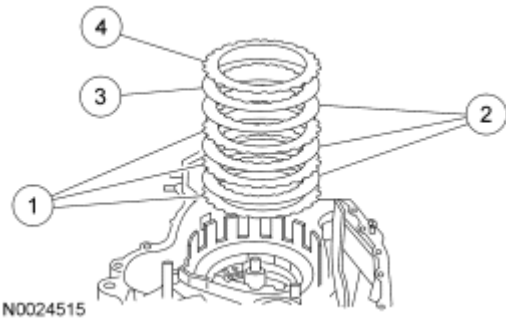


Fig. 572: Identifying Low/Reverse Clutch Plates
Courtesy of FORD MOTOR CO.

10. Install the special tool.

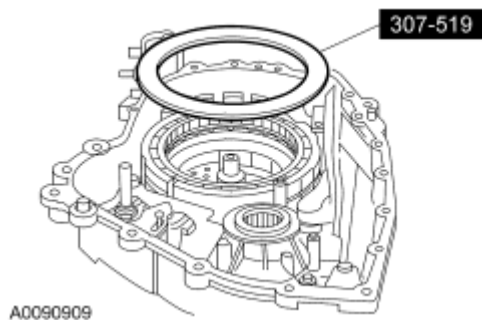


Fig. 573: Installing Special Tool
Courtesy of FORD MOTOR CO.

11. Measure the clearance between the low/reverse clutch pressure plate and the transmission end play gauge.
- Take a second measurement on the opposite side.
 - Average the 2 measurements to get the clearance.
 - If the clearance is not within specification, select and fit the correct thickness pressure plate to obtain the specified clearance.
 - Pressure plate sizes:
 - 2.57-2.46 mm (0.101-0.097 in).
 - 2.36-2.26 mm (0.092-0.089 in).
 - 2.16-2.06 mm (0.085-0.081 in).

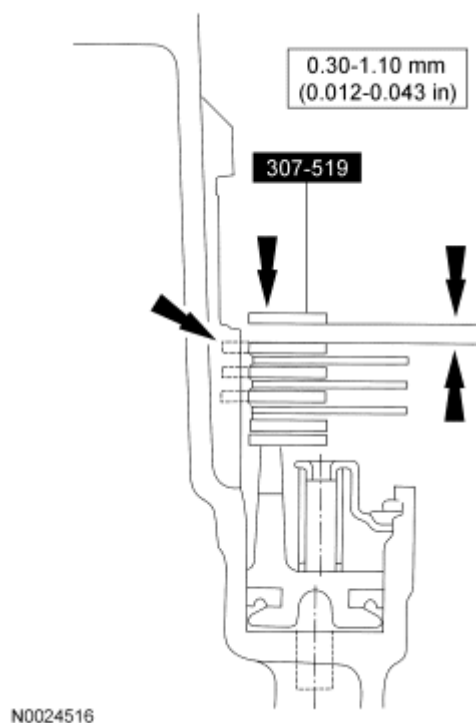


Fig. 574: Measuring Clearance Between Low/Reverse Clutch Pressure Plate And Transmission End Play Gauge With Specification
Courtesy of FORD MOTOR CO.

NOTE: One tooth of the low/reverse clutch pressure plate is notched for identification.

12. Remove the special tool, the low/reverse clutch pressure plate, the low/reverse clutch external spline clutch plates (steel), the low/reverse clutch wave spring and the low/reverse clutch internal spline clutch plates (friction).
1. Low/reverse clutch pressure plate.
 2. Low/reverse clutch external spline clutch plates (steel).
 3. Low/reverse clutch wave spring.

4. Low/reverse clutch internal spline clutch plates (friction).

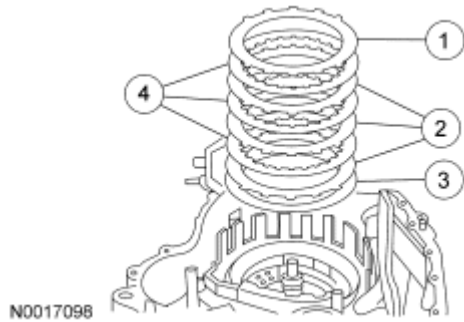


Fig. 575: Identifying Low/Reverse Clutch Pressure Plate, Low/Reverse Clutch External Spline Clutch Plates (Steel)
 Courtesy of FORD MOTOR CO.

13. Install the No. 1 pump support thrust bearing assembly.

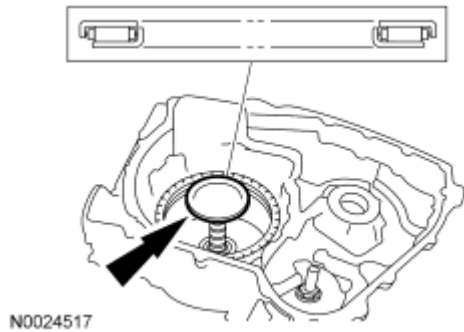


Fig. 576: Locating No. 1 Pump Support Thrust Bearing Assembly
 Courtesy of FORD MOTOR CO.

NOTE: Remove the seal sizer from forward/coast/direct clutch cylinder.

14. Install the forward/coast/direct clutch cylinder assembly and reverse clutch drum assembly.

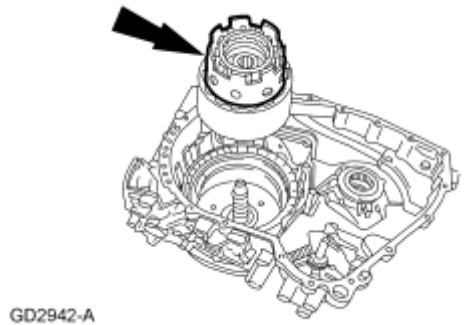


Fig. 577: Forward/Coast/Direct Clutch Cylinder Assembly & Reverse Clutch Drum Assembly
 Courtesy of FORD MOTOR CO.

15. Install the turbine shaft.

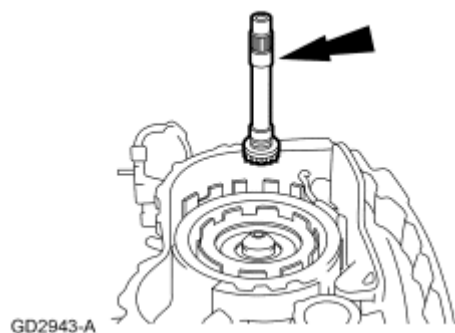


Fig. 578: Turbine Shaft
Courtesy of FORD MOTOR CO.

16. Install the No. 4 turbine shaft thrust bearing.

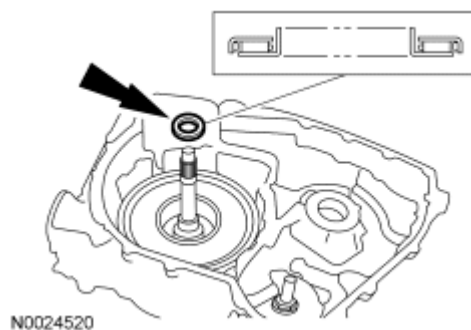


Fig. 579: No. 4 Turbine Shaft Thrust Bearing
Courtesy of FORD MOTOR CO.

17. Install the forward one-way clutch and low/intermediate sun gear assembly.

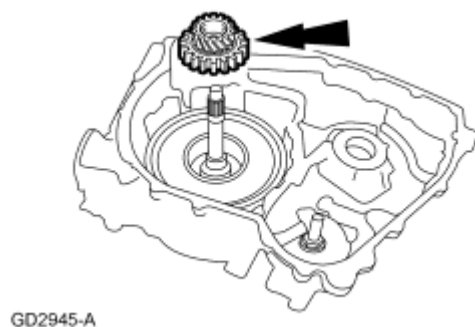


Fig. 580: Forward One-Way Clutch & Low/Intermediate Sun Gear Assembly
Courtesy of FORD MOTOR CO.

18. Install the No. 5 low/intermediate sun gear thrust bearing.

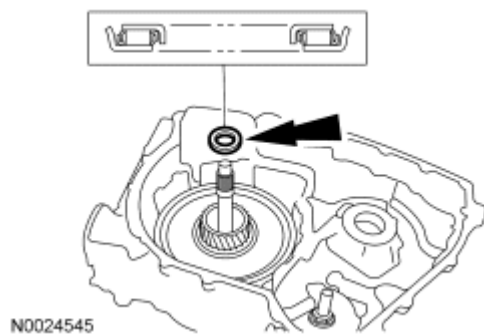


Fig. 581: No. 5 Low/Intermediate Sun Gear Thrust Bearing
Courtesy of FORD MOTOR CO.

19. Install the low/intermediate carrier assembly.

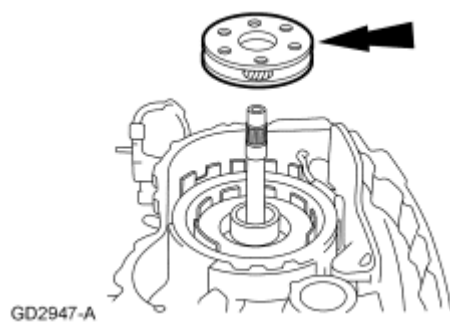


Fig. 582: Low/Intermediate Carrier Assembly
Courtesy of FORD MOTOR CO.

20. Install the No. 6 low/intermediate carrier thrust bearing.

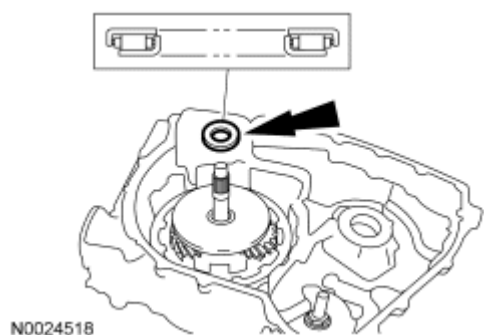


Fig. 583: No. 6 Low/Intermediate Carrier Thrust Bearing
Courtesy of FORD MOTOR CO.

21. Install the low/intermediate ring gear assembly.

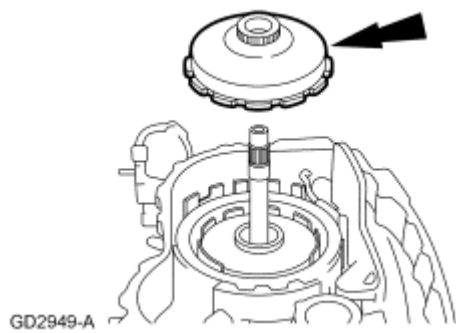


Fig. 584: Low/Intermediate Ring Gear Assembly
Courtesy of FORD MOTOR CO.

22. Install the No. 7 reverse/overdrive sun gear thrust bearing.

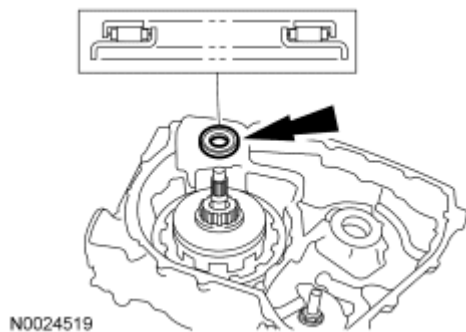


Fig. 585: No. 7 Reverse/Overdrive Sun Gear Thrust Bearing
Courtesy of FORD MOTOR CO.

23. Install the reverse/overdrive sun gear and shell assembly.

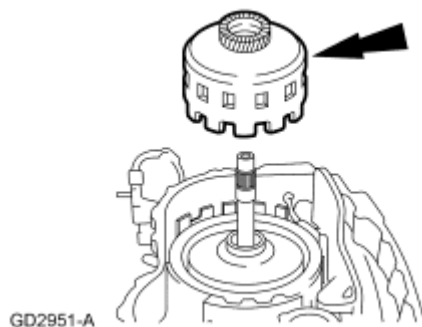


Fig. 586: Reverse/Overdrive Sun Gear & Shell Assembly
Courtesy of FORD MOTOR CO.

24. Install the reverse/overdrive carrier assembly with the captured No. 8 thrust bearing.

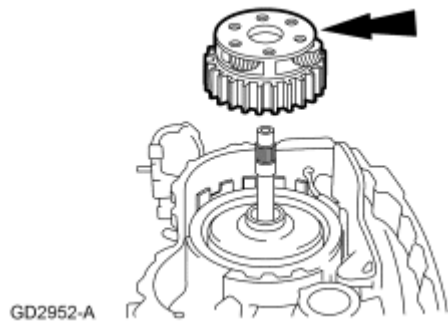


Fig. 587: Reverse/Overdrive Carrier Assembly & No. 8 Thrust Bearing
Courtesy of FORD MOTOR CO.

25. Install the thick, 10-wave low/reverse clutch wave spring.

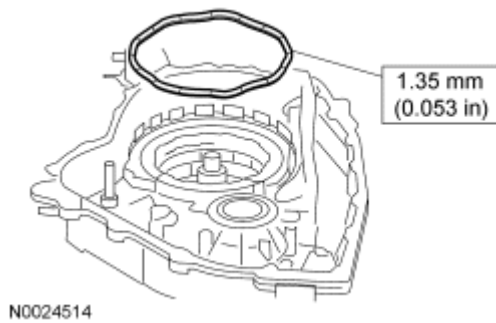


Fig. 588: Identifying Thick, 10-Wave Low/Reverse Clutch Wave Spring
Courtesy of FORD MOTOR CO.

26. Install the low/reverse clutch plates (model dependent).
 1. Install the low/reverse clutch external spline (steel) clutch plates.
 2. Install the low/reverse clutch internal spline (friction) clutch plates.
 3. Install the low/reverse clutch pressure plate previously selected.

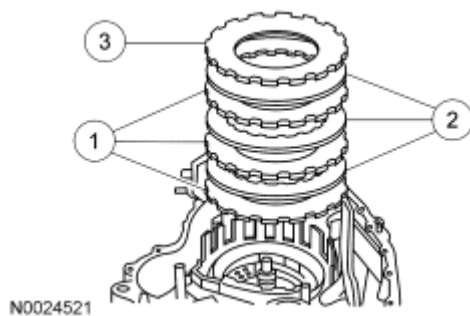
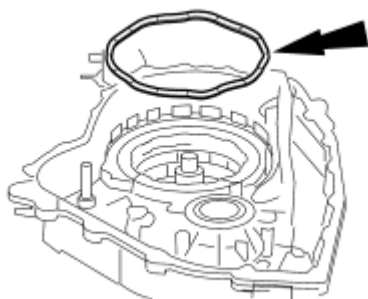


Fig. 589: Identifying Low/Reverse Clutch Plates
Courtesy of FORD MOTOR CO.

27. Install the thin, 8-wave low/reverse clutch wave spring.

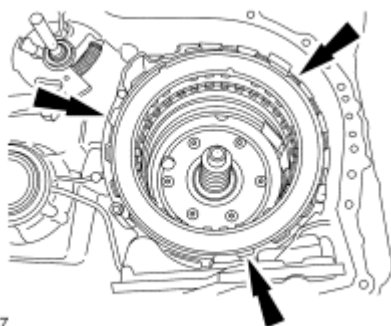


A0043564

Fig. 590: Locating Thin, 8-Wave Low/Reverse Clutch Wave Spring
Courtesy of FORD MOTOR CO.

NOTE: Do not use a thrust plate with the mechanical diode one-way clutch.

28. Install the mechanical diode one-way clutch with the rubber isolators in the positions indicated.

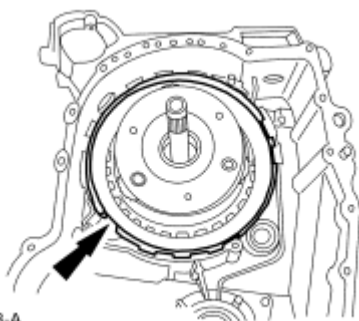


N0014667

Fig. 591: Locating Mechanical Diode One-Way Clutch With Rubber Isolators
Courtesy of FORD MOTOR CO.

NOTE: Make sure to position the low one-way clutch retaining ring as shown.

29. Install the low one-way clutch retaining ring.



GD3488-A

Fig. 592: Low One-Way Clutch Retaining Ring
Courtesy of FORD MOTOR CO.

30. Install the manual valve detent lever actuating rod assembly.
- Install the parking cam actuator lever.

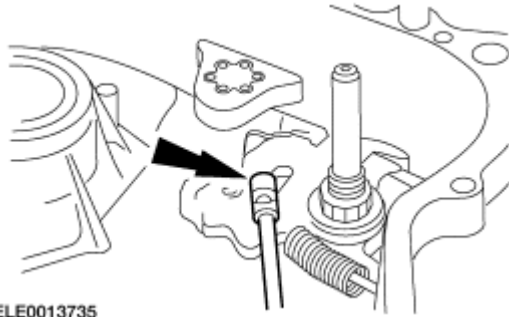


Fig. 593: Parking Lever Actuating Rod & Parking Cam Actuator Lever Assembly
Courtesy of FORD MOTOR CO.

31. Install the manual valve detent lever.

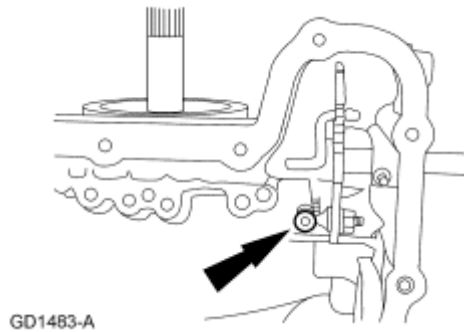
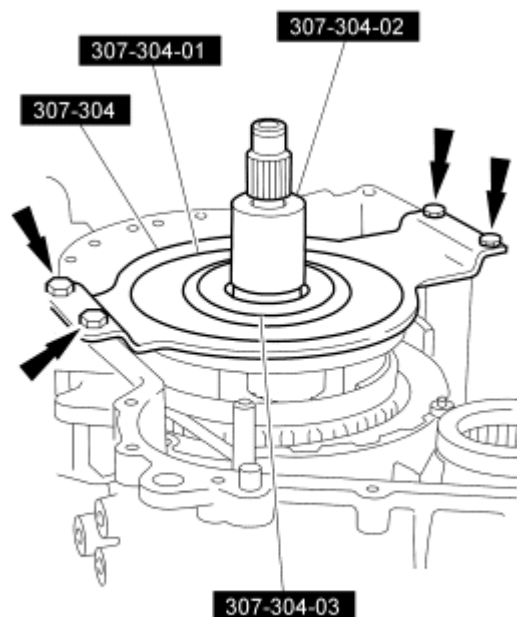


Fig. 594: Parking Lever Actuation Rod At Manual Valve Detent Lever
Courtesy of FORD MOTOR CO.

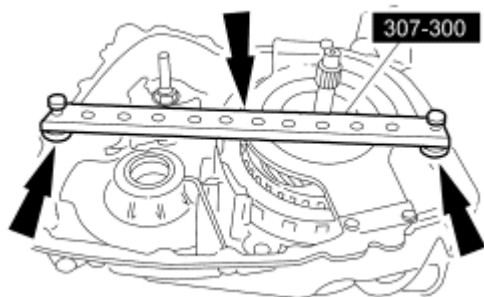
32. Install the special tools.
- Tighten to 13 Nm (10 lb-ft).



A0100510

Fig. 595: Installing Special Tools
Courtesy of FORD MOTOR CO.

33. Install the special tool with short spacers.



N0024522

Fig. 596: Installing Special Tool With Short Spacers
Courtesy of FORD MOTOR CO.

34. Using the special tools, measure the distance from the top of special tool to the No. 12 driven sprocket bearing surface area.
- Record this as dimension A.

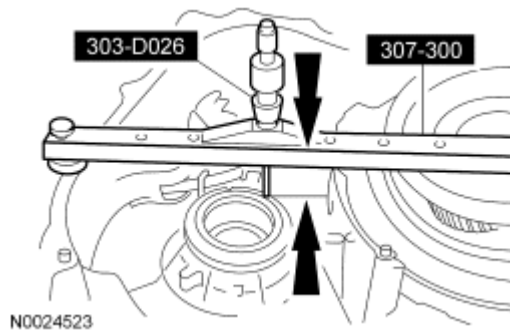


Fig. 597: Measuring Distance From Top Of Special Tool To No. 12 Driven Sprocket Bearing Surface Area
 Courtesy of FORD MOTOR CO.

35. Using the special tools, measure the distance from the top of the special tool to the bearing surface on the reverse/overdrive carrier assembly on one side of the turbine shaft.
- Repeat this measurement on the other side of the turbine shaft 180 degrees from the first measurement.
 - The average of these 2 dimensions is dimension B.
 - Remove the special tools.

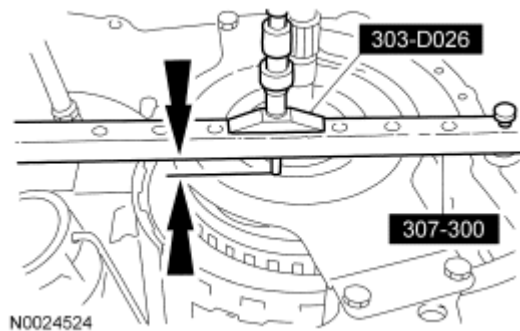


Fig. 598: Measuring Distance From Top Of Special Tool To Bearing Surface On Reverse/Overdrive Carrier Assembly
 Courtesy of FORD MOTOR CO.

36. Subtract dimension B from dimension A to get dimension C.
37. Use dimension C to select the correct No. 11 driven sprocket shim.
- Select a shim from the driven sprocket shim chart.

DRIVEN SPROCKET ALIGNMENT SHIM NO. 11

Shim Size	mm	Inch
Transaxle case to driven sprocket/final drive sun	2.20-2.10	0.086-0.082

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

gear thrust bearing shim AB:		
Transaxle case to driven sprocket/final drive sun gear thrust bearing shim BB:	2.02- 1.92	0.079- 0.075
Transaxle case to driven sprocket/final drive sun gear thrust bearing shim CB:	1.85- 1.75	0.072- 0.068
Transaxle case to driven sprocket/final drive sun gear thrust bearing shim DB:	1.67- 1.57	0.065- 0.061
Transaxle case to driven sprocket/final drive sun gear thrust bearing shim EB:	1.50- 1.40	0.059- 0.052
Transaxle case to driven sprocket/final drive sun gear thrust bearing shim FB:	1.32- 1.22	0.051- 0.048
Distance measured during gauging		

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

procedure and appropriate thrust bearing shim AB:	14.34- 14.1	0.564- 0.557
Distance measured during gauging procedure and appropriate thrust bearing shim BB:	14.16- 14.00	0.557- 0.551
Distance measured during gauging procedure and appropriate thrust bearing shim CB:	13.99- 13.83	0.551- 0.544
Distance measured during gauging procedure and appropriate thrust bearing shim DB:	13.82- 13.66	0.544- 0.537
Distance measured during gauging procedure and appropriate thrust bearing shim EB:	13.65- 13.49	0.537- 0.531
Distance		

measured during gauging procedure and appropriate thrust bearing shim FB:	13.48- 13.32	0.531- 0.524
---	-----------------	-----------------

38. Install and lubricate the following:

1. Lubricate the needles and seals in the No. 18 driven sprocket bearing.
2. Install the selected No. 11 driven sprocket shim.
3. Install the No. 12 driven sprocket bearing.

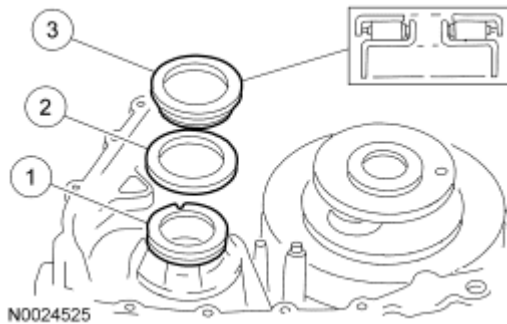


Fig. 599: Identifying Needles & Seals In No. 18 Driven Sprocket Bearing
Courtesy of FORD MOTOR CO.

39. Install the No. 9 reverse/overdrive ring gear thrust bearing.

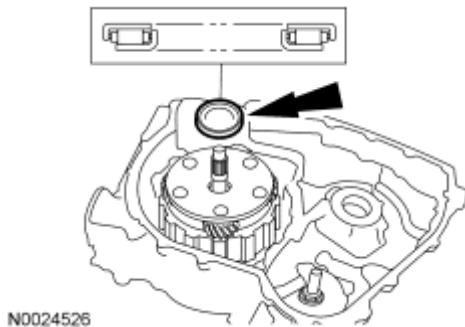


Fig. 600: No. 9 Reverse/Overdrive Ring Gear Thrust Bearing
Courtesy of FORD MOTOR CO.

NOTE: Installation of the reverse/overdrive ring gear assembly at this time is for measurement purposes only.

40. Install the reverse/overdrive ring gear assembly.

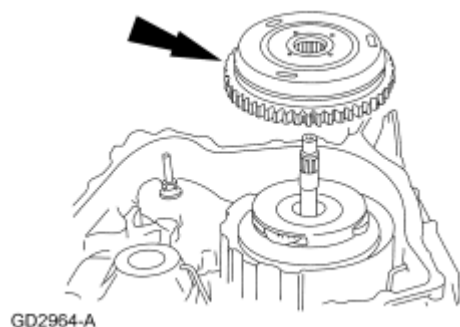
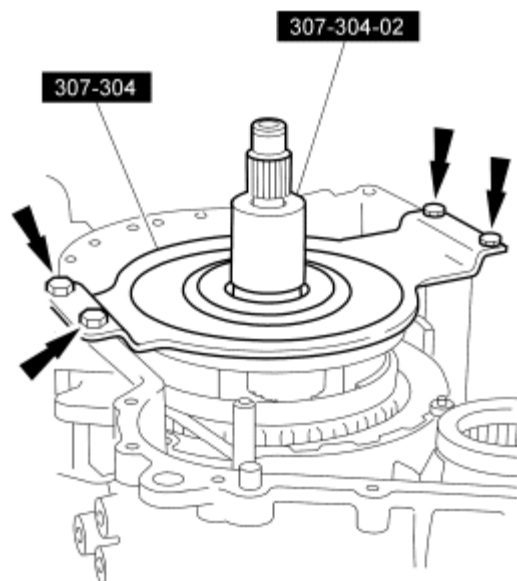


Fig. 601: Reverse/Overdrive Ring Gear Assembly
Courtesy of FORD MOTOR CO.

41. Install the special tools.
- Tighten to 13 Nm (10 lb-ft).



A0100511

Fig. 602: Installing Special Tools
Courtesy of FORD MOTOR CO.

42. Install the special tool with short spacers.

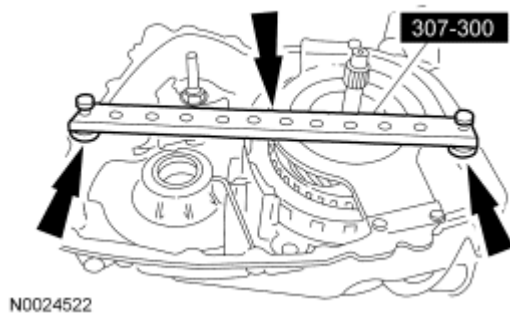


Fig. 603: Installing Special Tool With Short Spacers
Courtesy of FORD MOTOR CO.

43. Using the special tools, measure the distance from the top of the special tool to the face of the reverse/overdrive ring gear assembly surface area.
- Repeat this measurement 180 degrees from the first measurement.
 - The average of these 2 dimensions is dimension A.
 - Remove the special tools.

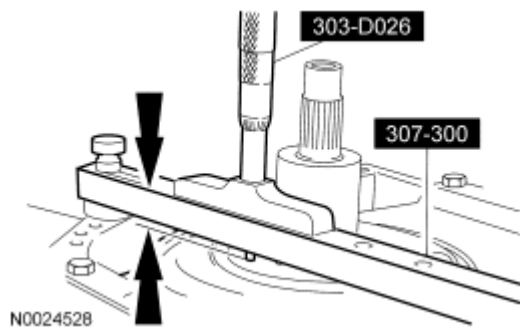


Fig. 604: Measuring Distance From Top Of Special Tool To Face Of Reverse/Overdrive Ring Gear Assembly Surface Area
Courtesy of FORD MOTOR CO.

44. Subtract 25.4 mm (1.00 in) thickness of the special tool and the thickness of the short spacers.
- This is the dimension B.
45. Subtract dimension A from dimension B.
- This is dimension C.
46. Select No. 10 thrust washer from the drive sprocket thrust washer chart.
- Use dimension C to select the No. 10 drive sprocket thrust washer.

DRIVE SPROCKET ALIGNMENT NO. 10 THRUST WASHER

No.10 Thrust Washer	mm	Inch
Drive sprocket-to-converter housing thrust washer AA:	1.51-1.41	0.059-0.052
Drive sprocket-to-converter	1.77-1.67	0.069-0.065

housing thrust washer BA:		
Drive sprocket-to-converter housing thrust washer CA:	2.03-1.93	0.079-0.075
Drive sprocket-to-converter housing thrust washer DA:	2.29-2.19	0.090-0.086
Distance measured during gauging procedure and appropriate thrust washer AA:	1.12-0.86	0.044-0.033
Distance measured during gauging procedure and appropriate thrust washer BA:	0.85-0.60	0.033-0.023
Distance measured during gauging procedure and appropriate thrust washer CA:	0.59-0.34	0.023-0.013
Distance measured during gauging procedure and appropriate thrust washer DA:	0.33-0.08	0.012-0.003

47. Use petroleum jelly and install the selected No. 10 drive sprocket thrust washer on the torque converter housing.

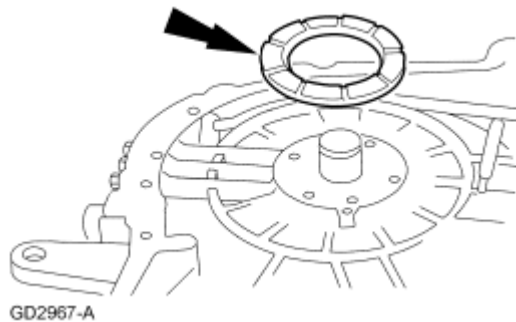


Fig. 605: No. 10 Drive Sprocket Thrust Washer
Courtesy of FORD MOTOR CO.

48. Remove the reverse/overdrive ring gear assembly.

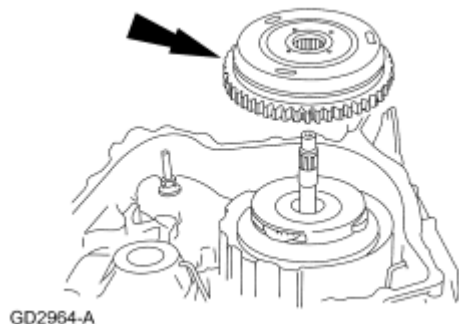


Fig. 606: Reverse/Overdrive Ring Gear Assembly

Courtesy of FORD MOTOR CO.

49. Install the filter and seal assembly.

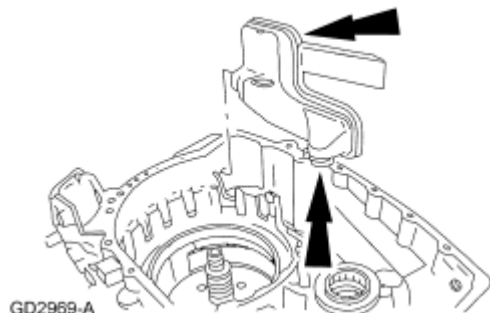


Fig. 607: Filter & Seal Assembly
Courtesy of FORD MOTOR CO.

NOTE: Refer to the following illustration for correct tool usage.

50. Install the special tool in the filter eyelet and transaxle hole.

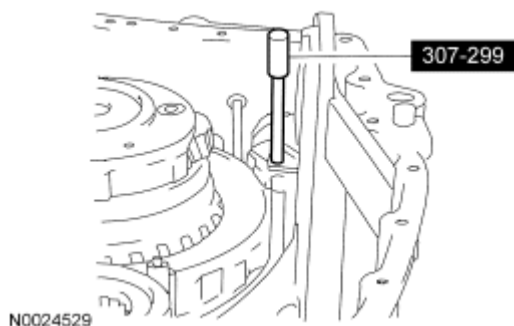


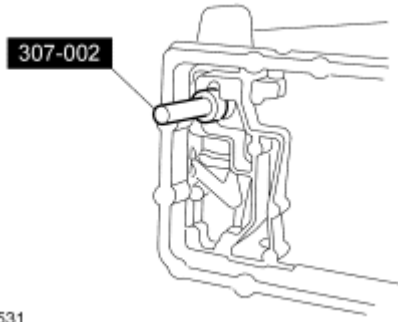
Fig. 608: Special Tool
Courtesy of FORD MOTOR CO.



Fig. 609: Special Tool
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the filter recirculating regulator exhaust seal before installation.

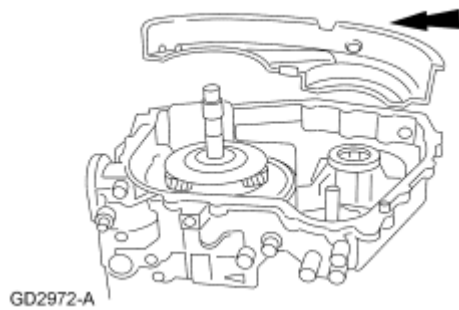
51. Using the special tool, install the filter recirculating regulator exhaust seal.



N0024531

Fig. 610: Installing Filter Recirculating Regulator Exhaust Seal
Courtesy of FORD MOTOR CO.

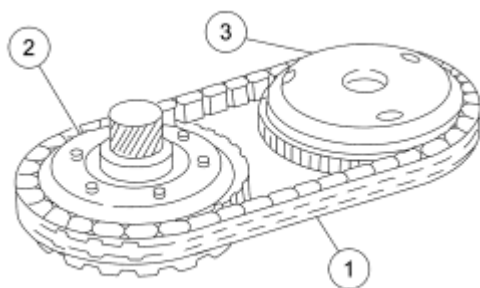
52. Install the chain pan in the transaxle case.



GD2972-A

Fig. 611: Chain Pan
Courtesy of FORD MOTOR CO.

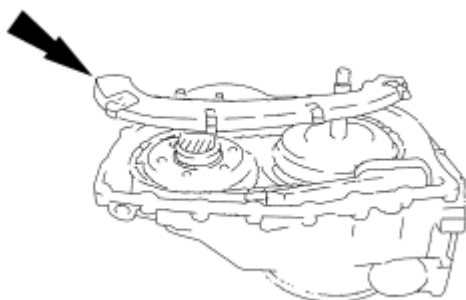
53. Assemble and install the drive chain assembly.
1. Drive chain (copper colored link facing upward).
 2. Driven sprocket assembly.
 3. Reverse/overdrive ring gear assembly.
 - Verify that the driven sprocket assembly and reverse/overdrive ring gear assembly are seated.



N0024532

Fig. 612: Identifying Drive Chain Assembly Components
Courtesy of FORD MOTOR CO.

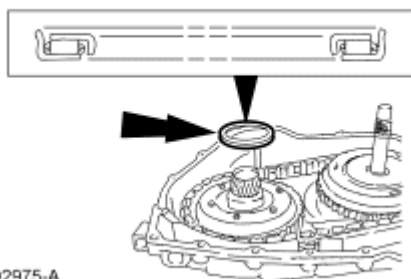
54. Install the chain pan cover by snapping it into place.



GD2974-A

Fig. 613: Chain Pan Cover
Courtesy of FORD MOTOR CO.

55. Install the No. 13 driven sprocket thrust bearing.



GD2975-A

Fig. 614: No. 13 Driven Sprocket Thrust Bearing
Courtesy of FORD MOTOR CO.

NOTE: The all wheel drive differential is shown. The front wheel drive differential may or may not have splines.

56. Install the final drive carrier and differential assembly.



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Fig. 615: Final Drive Carrier & Differential Assembly
Courtesy of FORD MOTOR CO.

NOTE: Plastic washers should be placed between bolt heads and special tool.

57. Install the special tools.
 1. Install the special tool.
 2. Install the special tool and bolts.
 - Tighten to 13 Nm (10 lb-ft).

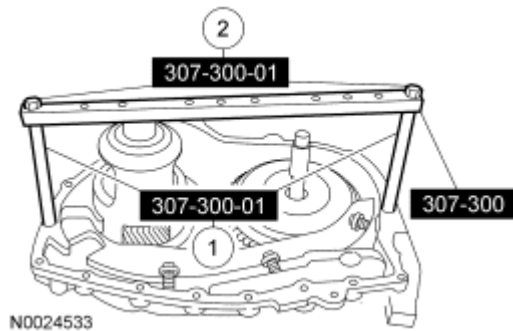


Fig. 616: Installing Special Tools & Bolts
Courtesy of FORD MOTOR CO.

58. Using the special tools, measure the distance from the top of the special tool to the shim surface area of the final drive carrier and the differential assembly on one side of the hub.
 - The special tools must be relocated to carry out the second measurement.
 - Repeat this measurement 180 degrees from the first measurement.
 - The average of these 2 dimensions is dimension B.

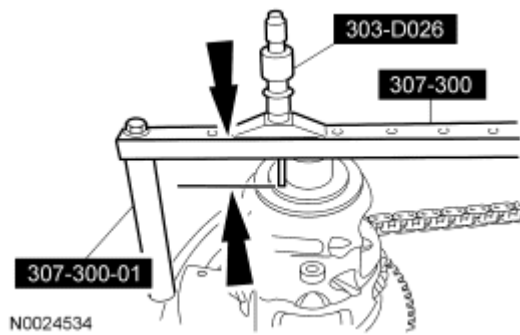


Fig. 617: Measuring Distance From Top Of Special Tool To Shim Surface Area Of Final Drive Carrier

Courtesy of FORD MOTOR CO.

59. Use combined thickness of the special tool with long spacers 177.8 mm (7.0 in) as dimension A.
60. Subtract dimension B from dimension A. This is dimension C.
61. Use dimension C to select the correct No. 14 differential bearing shim from the differential bearing shim chart.

DIFFERENTIAL END PLAY NO. 14 SHIM

If Dimension C is:	Use No. 14 Differential Shim:
130.76 to 130.46 mm (5.148 to 5.136 in)	1.08 to 0.98 mm (0.042 to 0.038 in)
130.45 to 130.16 mm (5.136 to 5.124 in)	1.38 to 1.28 mm (0.054 to 0.050 in)
130.15 to 129.87 mm (5.124 to 5.113 in)	1.67 to 1.57 mm (0.065 to 0.061 in)
129.86 to 129.57 mm (5.113 to 5.101 in)	1.97 to 1.87 mm (0.077 to 0.073 in)
129.56 to 129.27 mm (5.101 to 5.089 in)	2.27 to 2.17 mm (0.089 to 0.085 in)

62. Install the differential bearing assembly.
 1. Install the No. 14 differential bearing shim (selective fit).

2. Install the No. 15 differential bearing.

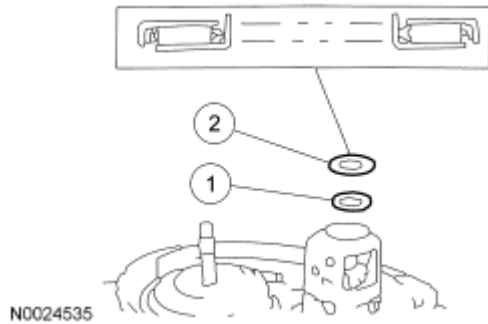


Fig. 618: No. 14 Differential Bearing Shim & No. 15 Differential Bearing
Courtesy of FORD MOTOR CO.

NOTE: Check for correct alignment of the lube tube on the converter housing.

63. Install the torque converter housing onto the transaxle case.
 - Position and install the split flange gasket.

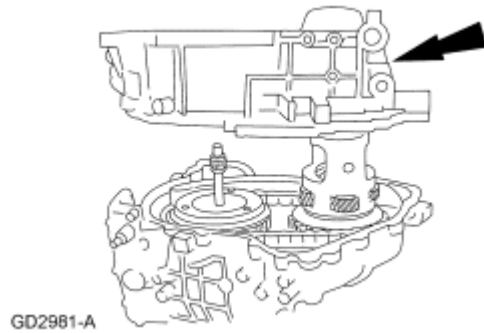
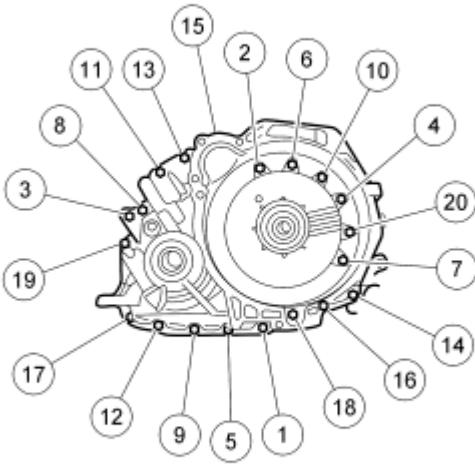


Fig. 619: Torque Converter Housing
Courtesy of FORD MOTOR CO.

NOTE: Tighten the bolts in the indicated sequence.

64. Install the torque converter housing-to-transaxle case bolts.
 - Tighten to 23 Nm (17 lb-ft).



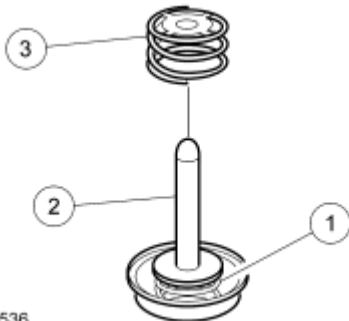
A0100340

Fig. 620: Torque Converter Housing-To-Transaxle Case Bolts Torque Sequence
Courtesy of FORD MOTOR CO.

NOTE: Note the number of grooves on the intermediate and overdrive servo apply rod.

65. Lubricate the assembly with clean transmission fluid.

1. Install the intermediate and overdrive servo return spring assembly onto the servo piston assembly.
2. Install the intermediate and overdrive servo apply rod and piston assembly.
3. Install the overdrive servo apply rod spring.



N0024536

Fig. 621: Servo Piston Assembly
Courtesy of FORD MOTOR CO.

66. Install the special tool.

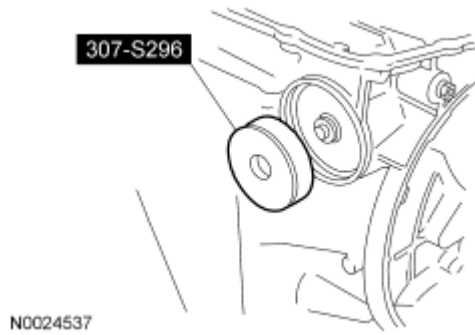


Fig. 622: Installing Special Tool
Courtesy of FORD MOTOR CO.

NOTE: Struts on the special tool fit into the servo cover retaining ring groove.

67. Assemble the special tool.
 1. Install the struts.
 2. Install the bar.
 3. Install the bolts.
 4. Install the center bolt.
 - Tighten to 4 Nm (35 lb-in).

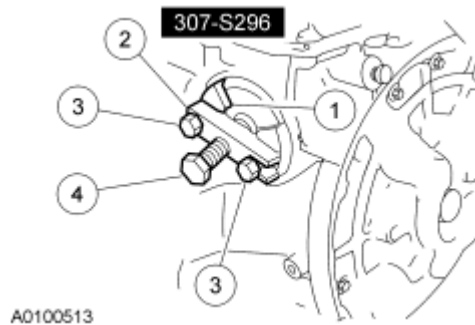


Fig. 623: Assembling Special Tool Into Servo Cover Retaining Ring Groove
Courtesy of FORD MOTOR CO.

68. Using the special tool, measure the distance to the bar of special tool.
 - Record this as dimension A.

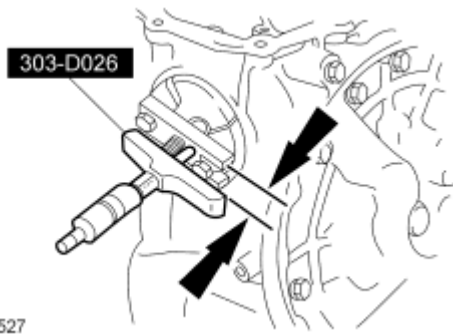


Fig. 624: Measuring Distance To Bar Of Special Tool
Courtesy of FORD MOTOR CO.

69. Back off the center bolt of the special tool until the piston movement stops.

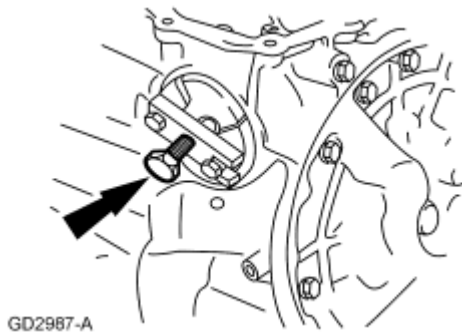


Fig. 625: Center Bolt Of The Special Tool
Courtesy of FORD MOTOR CO.

70. Using the special tool, measure the dimension to the bar of the special tool, record as dimension B.
- Subtract dimension A from B to find the travel.
 - If the travel is not within the specification, select a new intermediate and overdrive servo apply rod assembly.

INTERMEDIATE/OVERDRIVE SERVO APPLY ROD

Part Number	Number of Rings	Rod Length
F3RP-7H188-CB	0	108.1 mm (4.25 in)
F3RP-7H188-BB	1	107.1 mm (4.21 in)
F3RP-7H188-	2	105.7 mm (4.16 in)

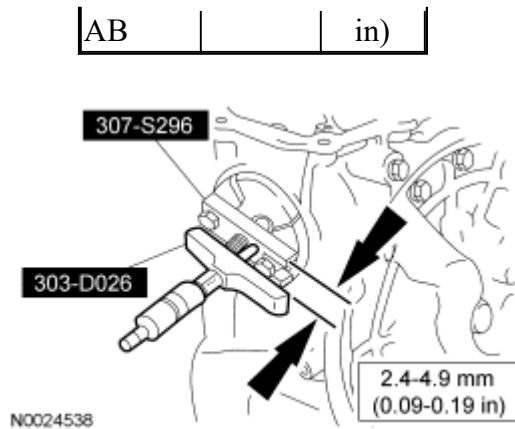


Fig. 626: Measuring Dimension To Bar Of Special Tool With Specification
Courtesy of FORD MOTOR CO.

71. Wipe the servo piston and the servo cover cap with a lint-free cloth.

CAUTION: Do not clean the rubber sealing surfaces of the servo piston and servo cover cap with cleaning solvent, or damage to the sealing surface may result.

72. Inspect the servo piston for cracks on its pressure surfaces and in the sealing area. Look for damage near the point where the servo piston attaches to the servo rod.
73. Squeeze the servo piston lip to check for flexibility. If the lip feels brittle, install a new piston.
74. Inspect the servo retainer spring for cracks, breaks or deformation.
75. Install the special tool.

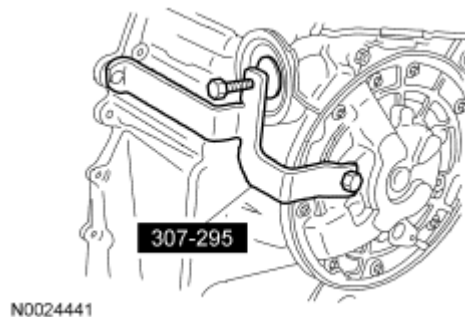


Fig. 627: Identifying Special Tool
Courtesy of FORD MOTOR CO.

CAUTION: If the case is stamped WG, install a wide-groove snap ring or damage to the servo will result.

CAUTION: Do not use a screwdriver to install the retaining ring or damage to the case may occur. Use only snap ring pliers to install the retaining ring.

76. The WG stamp is located on the case toward the passenger side of the overdrive servo. The letters WG are etched into the case and hard to see.

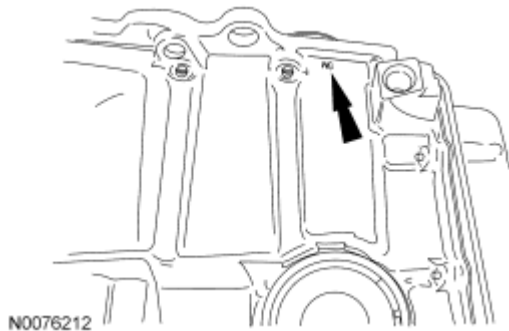


Fig. 628: Locating Stamped Area
Courtesy of FORD MOTOR CO.

NOTE: If the servo cover will not seat deep enough in the bore to install the servo cover retaining ring, use a blunt punch or small hammer and gently tap the cover around the outer edge until the servo cover retaining ring can be installed.

77. Tighten the special tool bolt.
- Install the servo cover retaining ring, using retaining ring pliers.

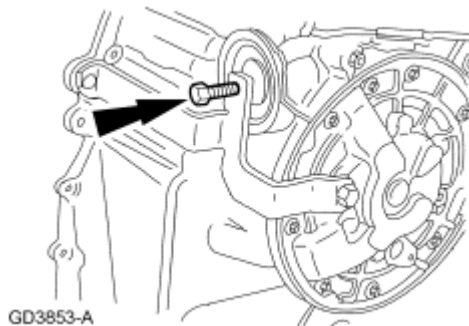


Fig. 629: Special Tool Bolt
Courtesy of FORD MOTOR CO.

78. Loosen the special tool bolt.
- When spring tension is released, remove the special tool.

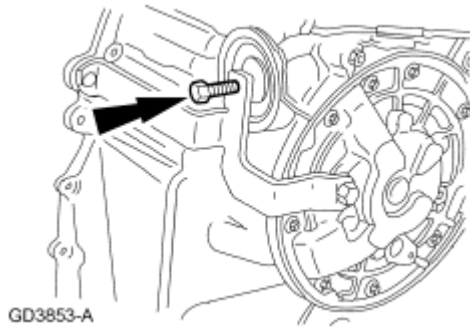
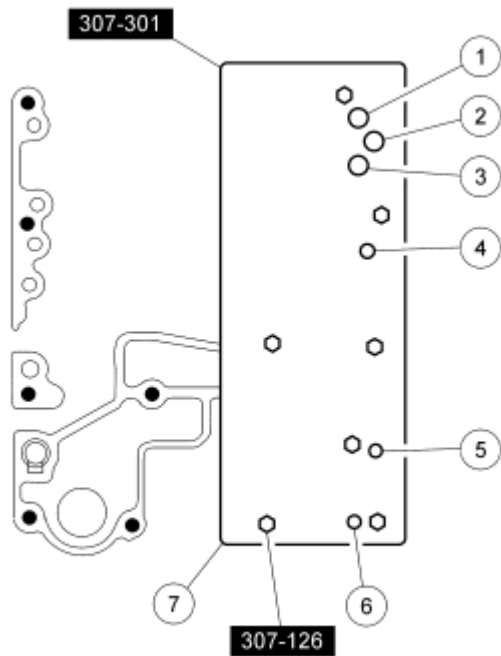


Fig. 630: Special Tool Bolt
Courtesy of FORD MOTOR CO.

CAUTION: Do not check the coast clutch since the piston may be forced out of the forward clutch piston.

NOTE: If any leaks occur, make sure the special tool is correctly seated.

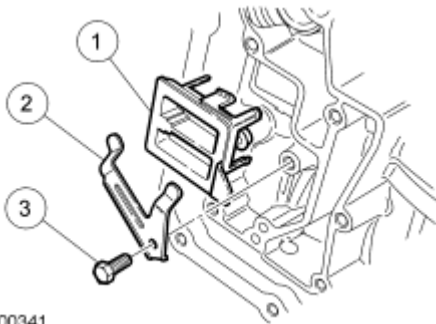
79. Using the special tool, inspect the hydraulic circuits. Use a rubber-tipped blow gun and 276 kPa (40 psi) of moisture-free regulated compressed air.
1. Reverse clutch test port.
 2. Forward clutch test port.
 3. Direct clutch test port.
 4. Low/reverse clutch test port.
 5. Servo release test port.
 6. Servo apply test port.
 7. Transmission air test plate.
 - If air leakage is detected, disassemble the transaxle and locate source of leakage.



N0024540

Fig. 631: Inspecting Hydraulic Circuits Using Special Tools
Courtesy of FORD MOTOR CO.

80. Install the thermostatic fluid level control valve.
 1. Position the thermostatic fluid level control valve.
 2. Install the bracket.
 3. Install the thermostatic fluid level control valve bracket bolt.
 - Tighten to 12 Nm (9 lb-ft).



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Fig. 632: Installing Thermostatic Fluid Level Control Valve
Courtesy of FORD MOTOR CO.

CAUTION: Do not pull wires or damage the solenoid body electrical connector.
Damage to the connector and terminals can result.

81. Install the solenoid body electrical connector O-ring seal and install the electrical connector into its bore in the transaxle case.

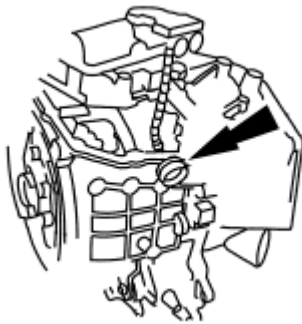


Fig. 633: Solenoid Body Electrical Connector O-Ring Seal
Courtesy of FORD MOTOR CO.

CAUTION: Handle main control valve body with care to prevent manual valve damage.

82. Connect the manual valve.
1. Lift the main control away from the case.
 2. Connect the Z-link to the manual valve.

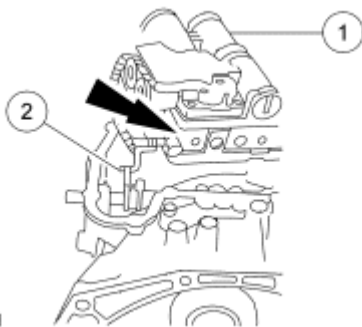


Fig. 634: Locating Z-Link To Manual Valve
Courtesy of FORD MOTOR CO.

NOTE: Tighten bolts in sequence shown. Bolts 1, 7 and 9 are longer than the others.

83. Install the main control valve body mounting bolts.
- Tighten to 10 Nm (89 lb-in).

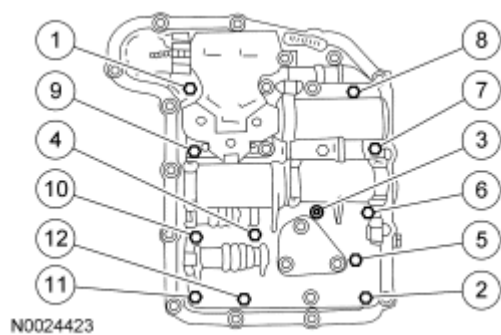


Fig. 635: Main Control Valve Body Mounting Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

84. Install the manual control lever.
 - Tighten to 27 Nm (20 lb-ft).

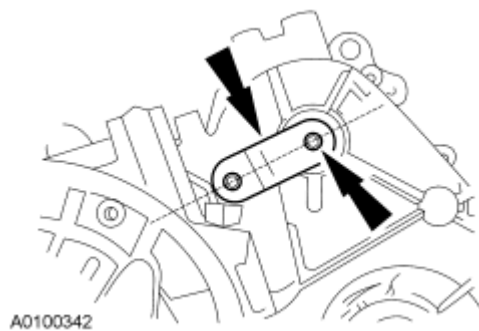


Fig. 636: Locating Manual Control Lever
Courtesy of FORD MOTOR CO.

85. Rotate the manual valve detent lever assembly to the NEUTRAL position.
 1. Low 1.
 2. Low 2.
 3. Drive.
 4. Neutral.
 5. Reverse.
 6. Park.

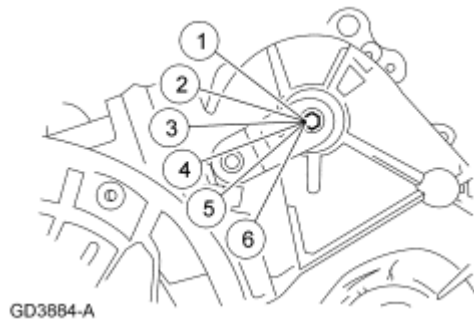


Fig. 637: Identifying Manual Valve Detent Lever Assembly Positions
Courtesy of FORD MOTOR CO.

86. Position the transmission range (TR) sensor.

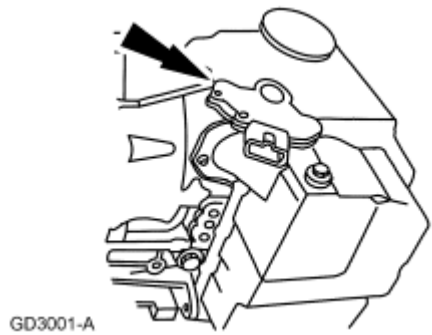


Fig. 638: Transmission Range (TR) Sensor
Courtesy of FORD MOTOR CO.

87. Using the special tool, align the TR sensor and tighten the bolts.

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

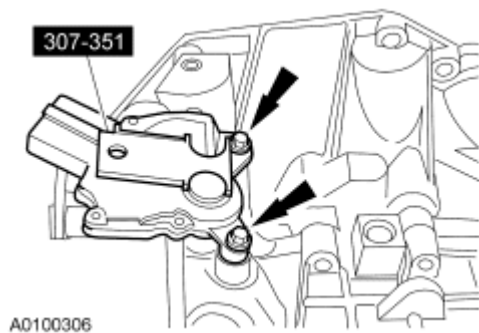


Fig. 639: Aligning TR Sensor Using Special Tools
Courtesy of FORD MOTOR CO.

NOTE: The main control cover gasket is a reusable type. Inspect the gasket for damage. Install a new gasket as necessary.

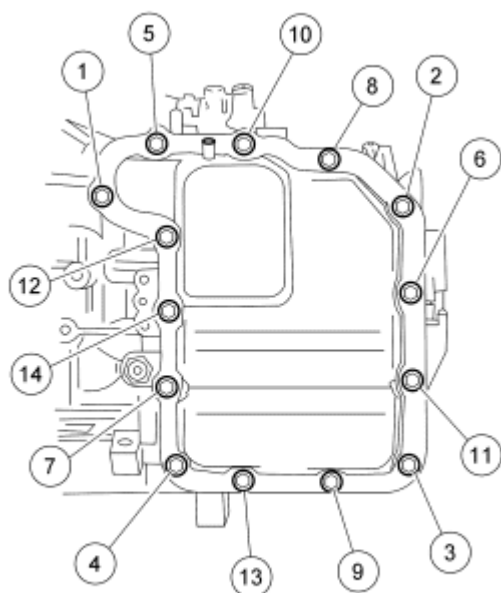
88. Install the main control cover gasket.

NOTE: Tighten the bolts and studs in the indicated sequence.

NOTE: The cooler bypass valve studs are in locations 3 and 11.

89. Install the main control valve body cover and bolts.

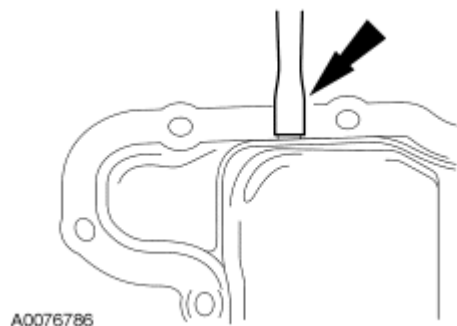
- Tighten to 13 Nm (10 lb-ft).



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Fig. 640: Identifying Main Control Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

90. Install the vent tube.



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Fig. 641: Locating Vent Tube
Courtesy of FORD MOTOR CO.

91. Install a new transmission filler tube grommet.

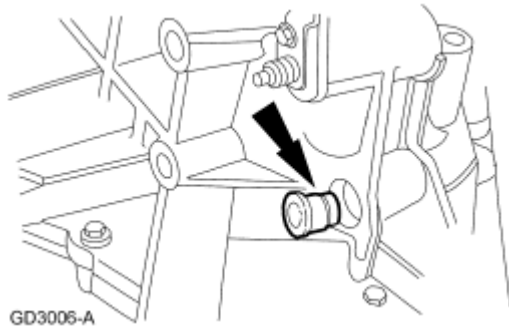


Fig. 642: Transmission Filler Tube Grommet
Courtesy of FORD MOTOR CO.

92. Install the transmission filler tube assembly.
1. Install the tube.
 2. Install the transmission filler tube bolt.
 - Tighten to 8 Nm (71 lb-in).
 - Install the fluid level indicator.

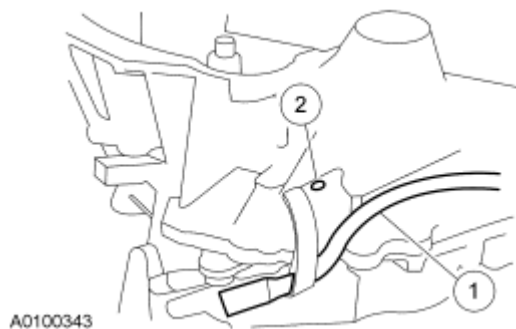


Fig. 643: Transmission Filler Tube & Bolt
Courtesy of FORD MOTOR CO.

93. Install a new O-ring seal on the turbine shaft speed (TSS) sensor and install the sensor.
1. Using petroleum jelly on the O-ring seal, position the TSS sensor into the case.
 2. Install the TSS sensor bolt.
 - Tighten to 12 Nm (9 lb-ft).

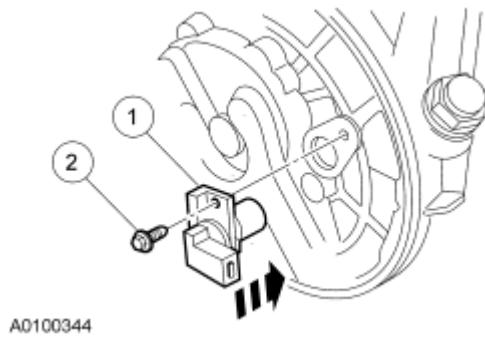


Fig. 644: TSS Sensor & Bolt
Courtesy of FORD MOTOR CO.

94. Using the special tool, install the LH differential seal.

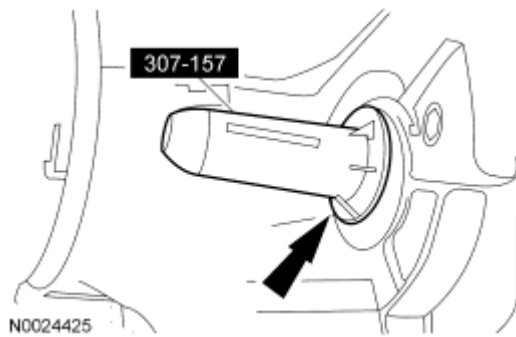


Fig. 645: Installing LH Differential Seal Using Special Tools
Courtesy of FORD MOTOR CO.

95. If the vehicle is equipped with a power transfer unit (PTU), use the special tools to install the RH differential seal.

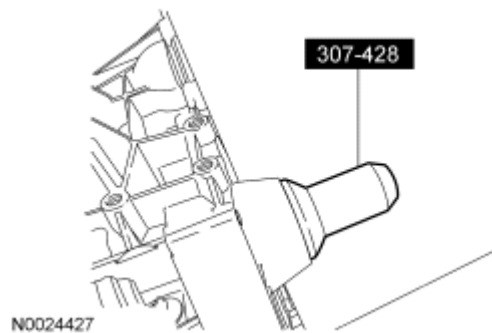


Fig. 646: Installing RH Differential Seal Using Special Tools (1 Of 2)
Courtesy of FORD MOTOR CO.

96. If the vehicle is not equipped with a PTU, use the special tools to install the RH differential seal.

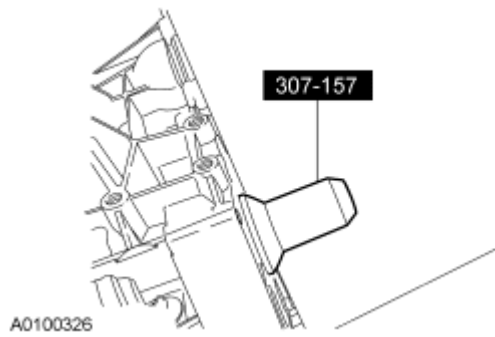


Fig. 647: Installing RH Differential Seal Using Special Tools (2 Of 2)
Courtesy of FORD MOTOR CO.

NOTE: Make sure the torque converter seal garter spring does not become dislodged during fitting. If the garter spring does become dislodged, install a new torque converter seal.

97. Using the special tool, install the torque converter fluid seal.
 - Coat the torque converter seal garter spring with petroleum jelly.

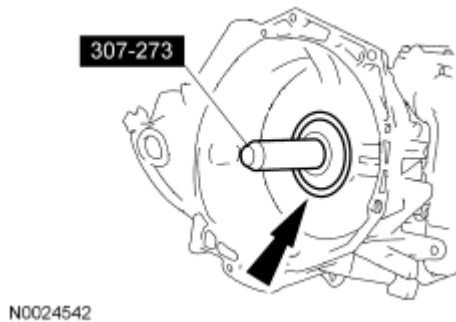


Fig. 648: Installing Torque Converter Fluid Seal Using Special Tools
Courtesy of FORD MOTOR CO.

98. Using a small amount of pipe sealant on the threads, install the transaxle drain plug.
 - Tighten to 25 Nm (18 lb-ft).

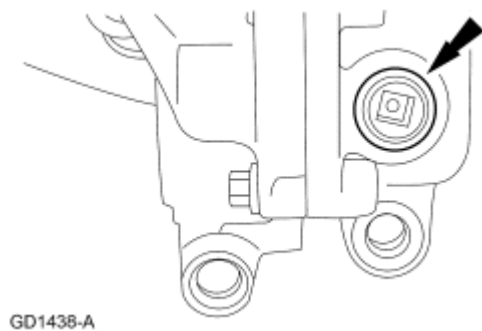


Fig. 649: Transaxle Drain Plug

Courtesy of FORD MOTOR CO.

NOTE: Check for correct rotation of the pump driveshaft.

99. Install the pump driveshaft.

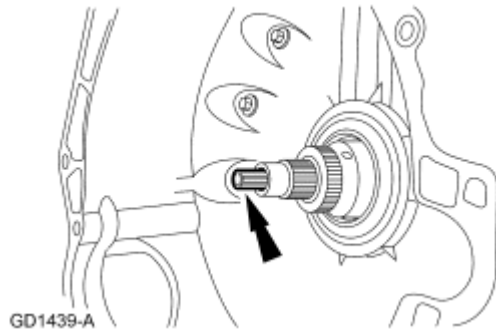


Fig. 650: Pump Assembly Driveshaft
Courtesy of FORD MOTOR CO.

100. Using the special tool, install the torque converter.

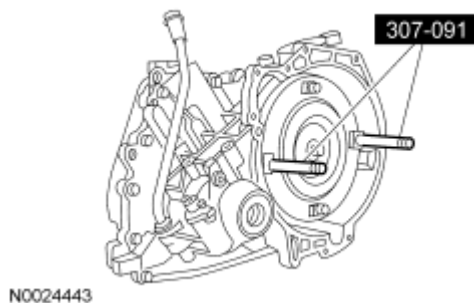
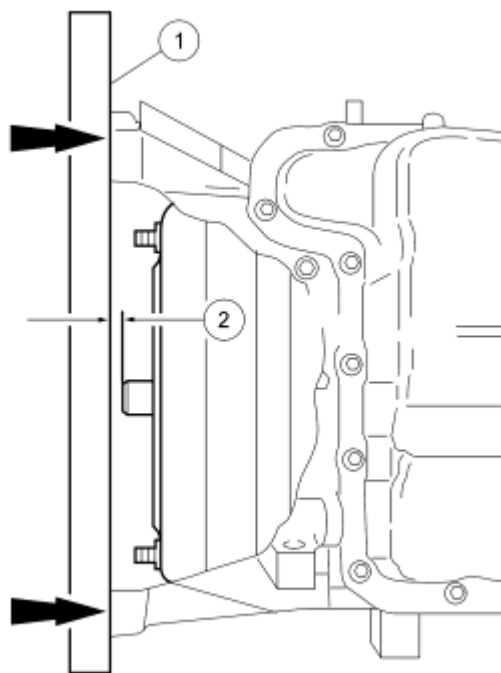


Fig. 651: Installing/Removing Torque Converter Using Special Tools
Courtesy of FORD MOTOR CO.

NOTE: The torque converter hub must be fully seated into the transaxle pump drive gear.

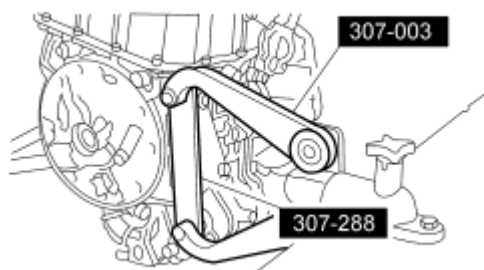
101. Check the installation depth of the torque converter.
1. Lay a straightedge on the transaxle converter housing.
 2. Check the clearance between the straightedge and the pilot hub.
 - Clearance is 17 mm (0.66 in).



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Fig. 652: Checking Installation Depth Of Torque Converter
Courtesy of FORD MOTOR CO.

102. Remove the transaxle from the special tool.



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Fig. 653: Securing Transaxle To Bench
Courtesy of FORD MOTOR CO.

INSTALLATION

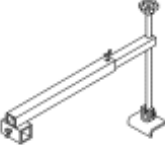
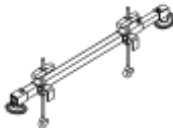
TRANSAXLE - 2.3L

Special Tools

Illustration	Tool Name	Tool Number

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

 ST2378-A	Adapters for 303-290	303-290A-01
 ST2379-A	Adapter for 303-290-A (Support Leg)	303-290A-03A
 ST1636-A	Retainer, Torque Converter	307-346 (T97T-7902-A)
 ST2363-A	Support Bar, Engine	303-290A

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

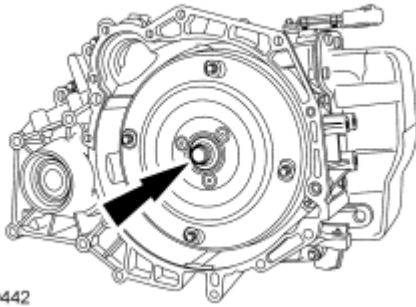
INSTALLATION

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

NOTE: Carry out the transmission fluid cooler flow test if the transaxle is being overhauled or if installing a new or remanufactured transaxle. For additional information, refer to Transmission Fluid Cooler.

All vehicles

1. Lubricate the torque converter pilot hub with grease.



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Fig. 654: Identifying Torque Converter Pilot Hub
Courtesy of FORD MOTOR CO.

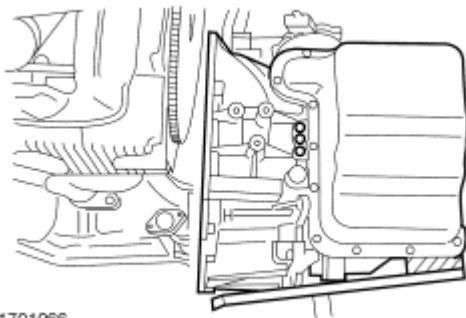
2. Rotate the torque converter to place the paint dot in the 6 o'clock position.
3. Install the special tool.



N0024435

Fig. 655: Identifying Special Tool
Courtesy of FORD MOTOR CO.

4. Position the transaxle in place.



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Fig. 656: Lowering Transaxle From Engine Compartment
Courtesy of FORD MOTOR CO.

5. Once the transaxle is in place, prior to bolting it to the engine, remove the special tool.



Fig. 657: Identifying Special Tool
Courtesy of FORD MOTOR CO.

6. Move the transaxle assembly toward the engine assembly and install the 4 bolts.
 - Tighten to 48 Nm (35 lb-ft).

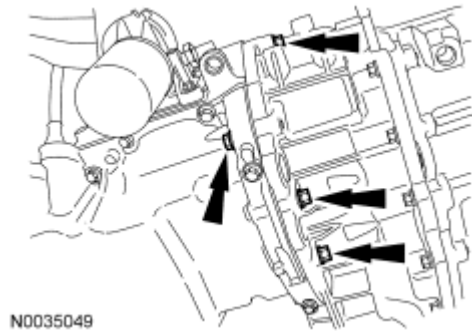


Fig. 658: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

7. Install the transaxle retaining bolts.
 - Tighten to 48 Nm (35 lb-ft).

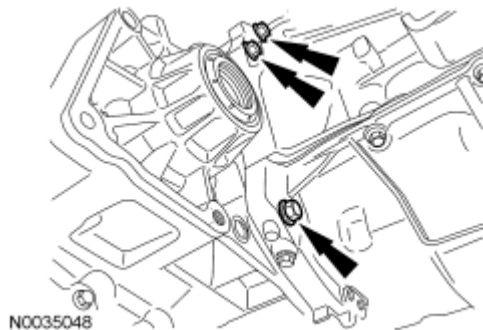


Fig. 659: Locating Rear Bellhousing Bolts
Courtesy of FORD MOTOR CO.

8. Install 4 new torque converter nuts.
 - Tighten to 40 Nm (30 lb-ft).

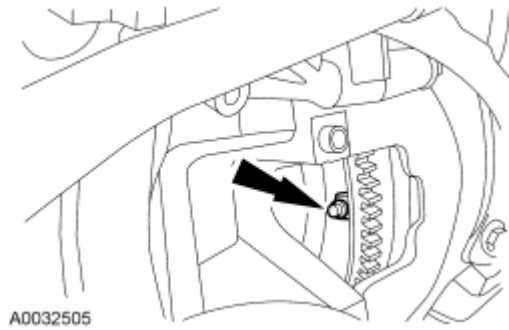


Fig. 660: Locating Torque Converter Nut
Courtesy of FORD MOTOR CO.

9. Install the transmission fluid cooler tube.
 - Tighten to 25 Nm (18 lb-ft).

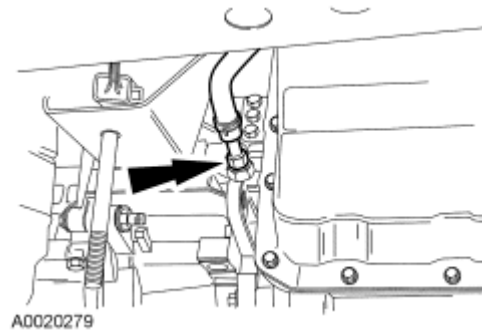


Fig. 661: Locating Transmission Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

10. Install the output shaft speed (OSS) sensor.
 - Tighten to 12 Nm (9 lb-ft).

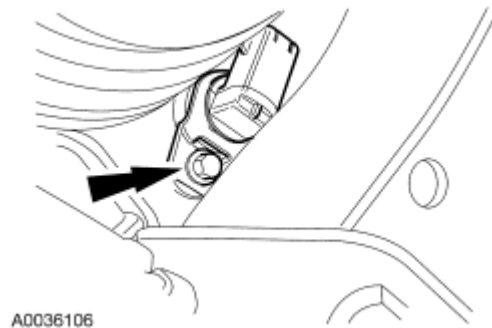


Fig. 662: Locating OSS Sensor Bolt
Courtesy of FORD MOTOR CO.

11. Install the transmission fluid cooler tube.
 1. Connect the OSS sensor connector (black).

2. Connect the turbine shaft speed (TSS) sensor connector (white).
 - Connect the wiring harness retainer to the transaxle case.
3. Install the transmission fluid cooler tube.
 - Tighten to 25 Nm (18 lb-ft).
4. Install the transmission fluid cooler bolt.
 - Tighten to 12 Nm (9 lb-ft).

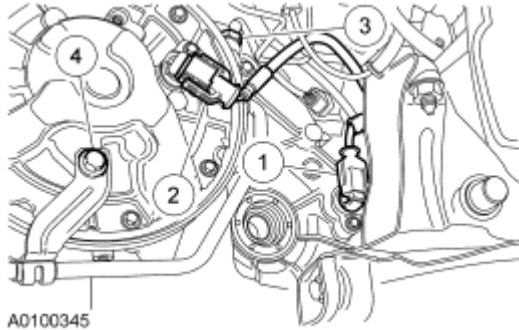


Fig. 663: Identifying Fluid Cooler Tube Components
Courtesy of FORD MOTOR CO.

12. Install the starter motor isolator.

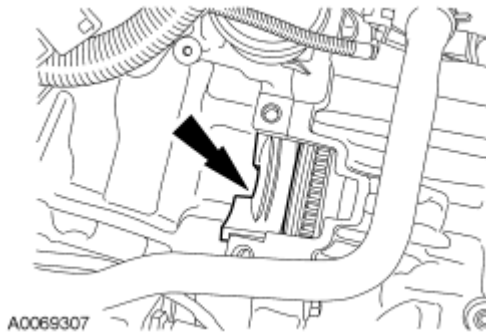


Fig. 664: Identifying Starter Motor Isolator
Courtesy of FORD MOTOR CO.

13. Install the starter motor.
 - Tighten to 35 Nm (26 lb-ft).

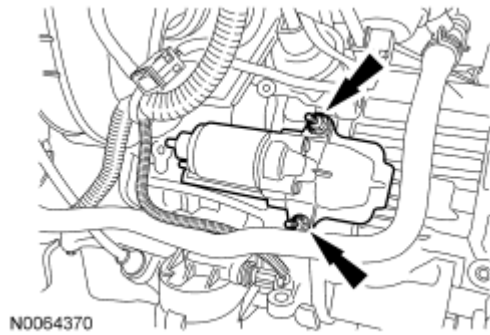


Fig. 665: Identifying Bolts
Courtesy of FORD MOTOR CO.

14. Install the starter motor harness connector.
 1. Install the starter motor solenoid battery nut.
 - Tighten to 12 Nm (9 lb-ft).
 2. Install the starter motor solenoid nut.
 - Tighten to 5 Nm (44 lb-in).

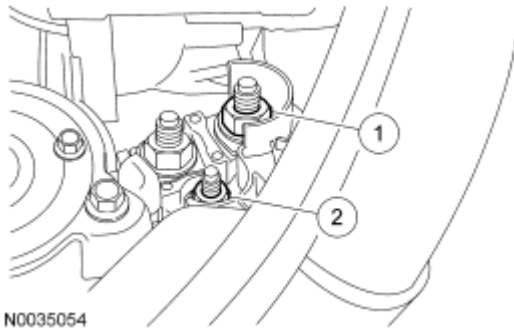


Fig. 666: Identifying Battery Cable & Starter Solenoid Terminal Nut
Courtesy of FORD MOTOR CO.

15. Install the wire harness clip retainer and the ground wire to starter bolts.
 - Tighten to 25 Nm (18 lb-ft).

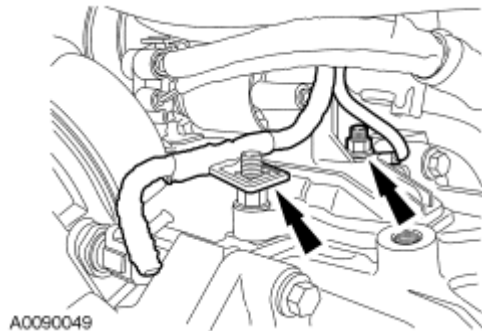


Fig. 667: Locating Wire Harness Clip Retainer & Starter Bolts
Courtesy of FORD MOTOR CO.

16. Install the front mount bracket.
 - Tighten to 48 Nm (35 lb-ft).

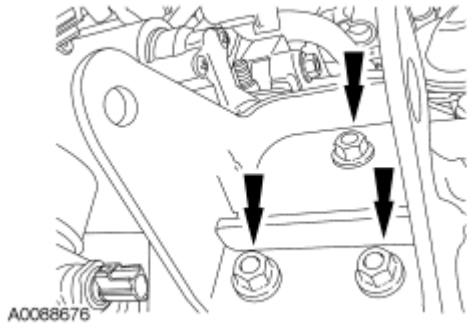


Fig. 668: Locating Transaxle Front Mount Plate Bolts
Courtesy of FORD MOTOR CO.

17. Using the special tools, raise the transaxle.

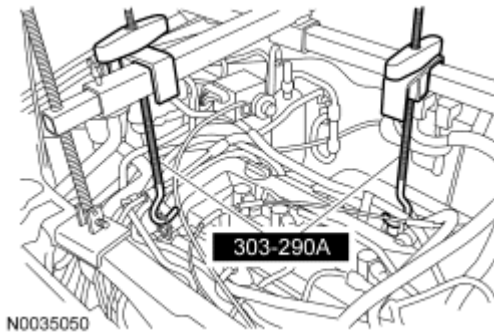


Fig. 669: Special Tool
Courtesy of FORD MOTOR CO.

18. Install the LH upper transaxle mount through bolt.
 - Tighten to 103 Nm (76 lb-ft).

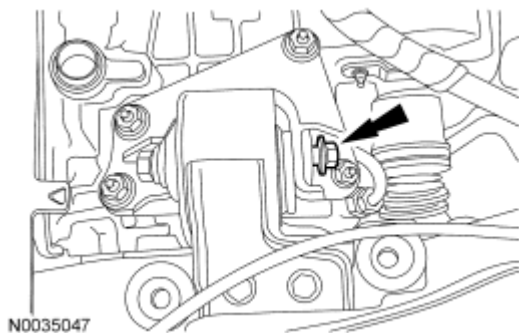


Fig. 670: Locating LH Transaxle Mount Through Bolt
Courtesy of FORD MOTOR CO.

19. Remove the special tools.

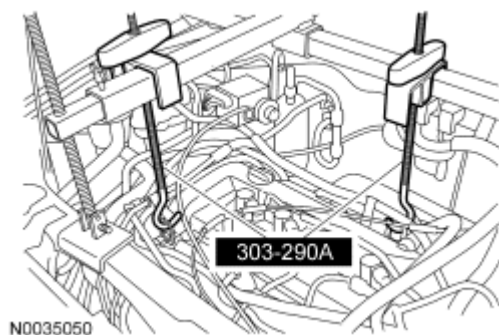


Fig. 671: Special Tool
Courtesy of FORD MOTOR CO.

20. Remove the special tools.

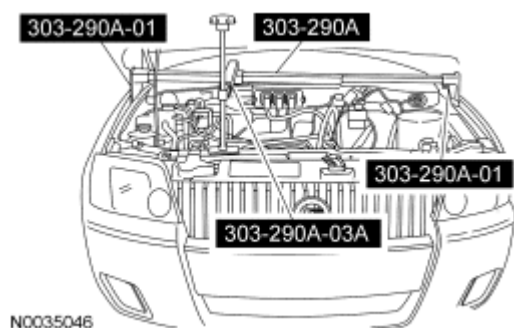


Fig. 672: Special Tool
Courtesy of FORD MOTOR CO.

21. Install the upper transaxle bolts.
- Tighten to 48 Nm (35 lb-ft).

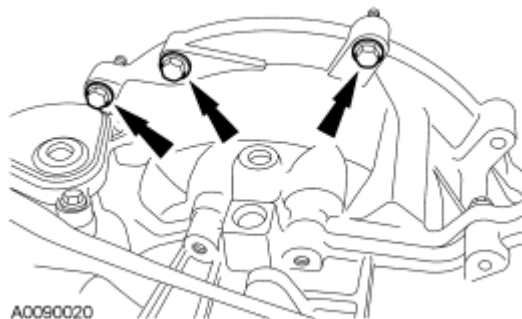


Fig. 673: Locating Upper Transaxle Bolts
Courtesy of FORD MOTOR CO.

22. Connect the transmission range (TR) sensor electrical connector.

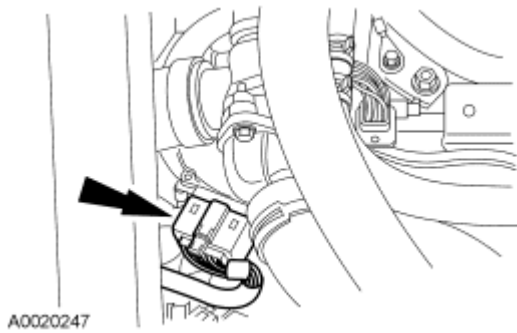


Fig. 674: Locating Transmission Range (TR) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

23. Position the selector lever cable and bracket in place, install the bolts and install the wiring harness retainer.
- Tighten to 23 Nm (17 lb-ft).

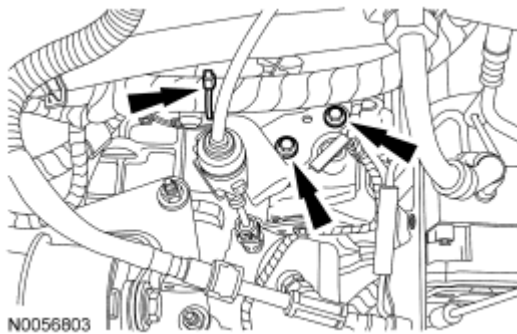


Fig. 675: Identifying Harness Retainer And Bolts
Courtesy of FORD MOTOR CO.

24. Connect the selector lever cable to the manual control lever.

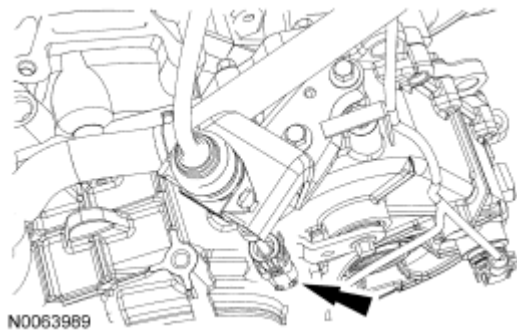


Fig. 676: Identifying Gearshift Cable
Courtesy of FORD MOTOR CO.

25. Install the selector lever cable retainer on the transmission fluid filler tube.

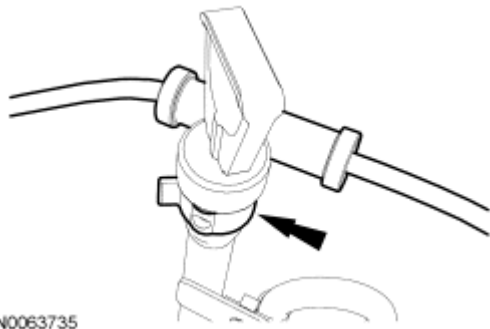


Fig. 677: Identifying Selector Lever Cable Retainer
Courtesy of FORD MOTOR CO.

26. Install the main control cover vent tube.

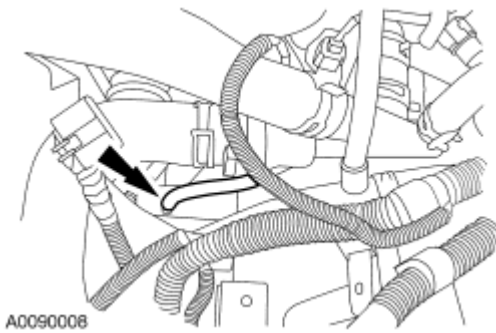


Fig. 678: Locating Main Control Cover Vent Tube
Courtesy of FORD MOTOR CO.

27. Install the wire harness bracket nut and plug in the bulkhead electrical connector.
- Tighten to 25 Nm (18 lb-ft).

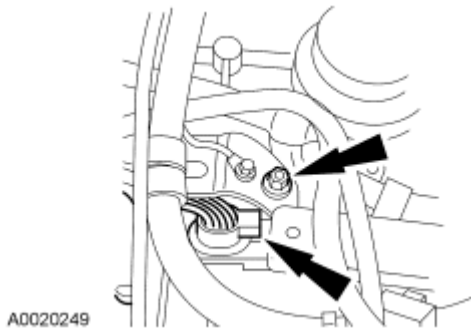


Fig. 679: Locating Wire Harness Bracket Nut & Plug
Courtesy of FORD MOTOR CO.

28. Install the rear transaxle mount, 2 nuts and bolt.
- Tighten to 80 Nm (59 lb-ft).

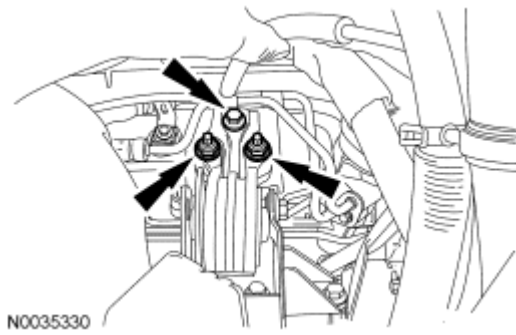


Fig. 680: Locating Rear Transmission Mount Bolts
Courtesy of FORD MOTOR CO.

29. Install the lower support insulator through bolt.
 - Tighten to 115 Nm (85 lb-ft).

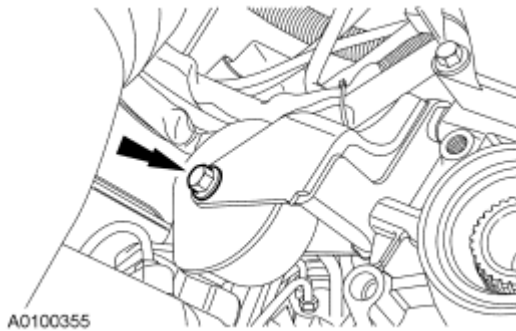


Fig. 681: Locating Rear Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

30. Install the dampener.
 1. Install the bolts.
 - Tighten to 70 Nm (52 lb-ft).
 2. Install the bolt.
 - Tighten to 47 Nm (35 lb-ft).

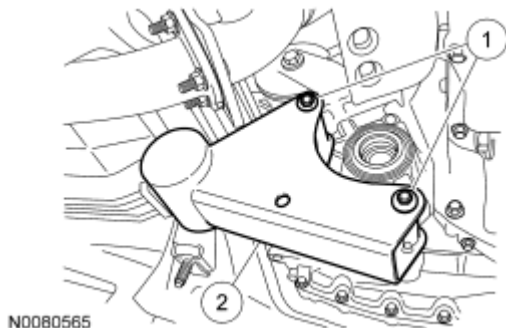


Fig. 682: Identifying Bolts

Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

31. Position the power transfer unit (PTU) in place and install the bolt.
 - Tighten to 47 Nm (35 lb-ft).

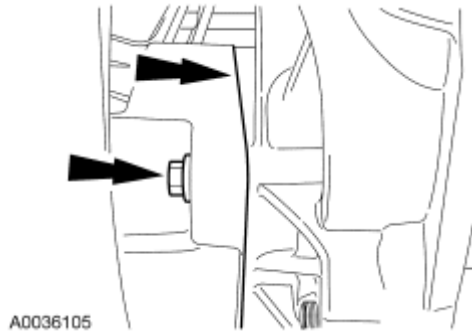


Fig. 683: Locating Transfer Case Bolt & Transfer Case Unit

Courtesy of FORD MOTOR CO.

32. Install the PTU-to-transaxle bolts.
 - Tighten to 70 Nm (52 lb-ft).

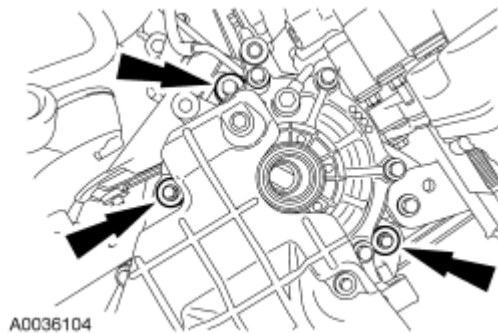


Fig. 684: Locating PTU Bolts

Courtesy of FORD MOTOR CO.

33. Position the driveshaft in place and install the nuts.
 - Tighten to 48 Nm (35 lb-ft).

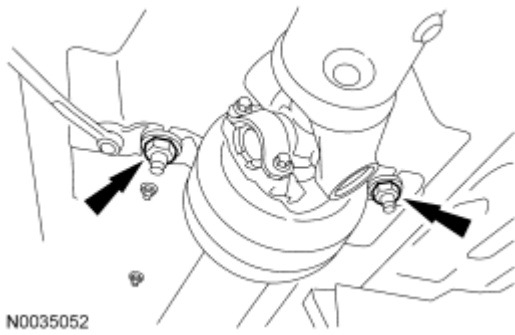


Fig. 685: Locating Center Bearing Nuts
Courtesy of FORD MOTOR CO.

34. Align the index marks and install the driveshaft.
 - Tighten to 20 Nm (15 lb-ft).

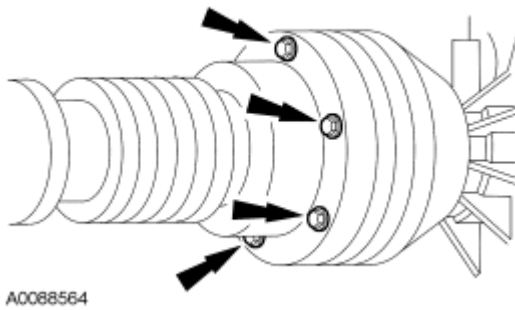


Fig. 686: Locating Driveshaft & Bolts
Courtesy of FORD MOTOR CO.

35. Install the bracket.
 - Tighten to 55 Nm (41 lb-ft).

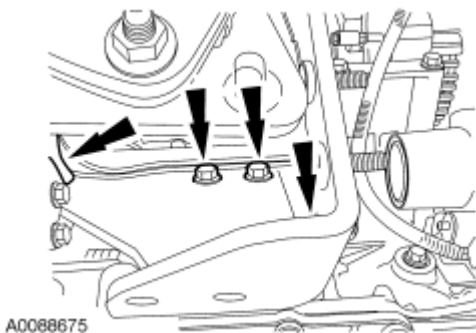


Fig. 687: Locating Engine Mounting Bracket Bolts
Courtesy of FORD MOTOR CO.

36. Install the front nuts on the exhaust-to-intermediate shaft bracket.
 - Tighten to 30 Nm (22 lb-ft).

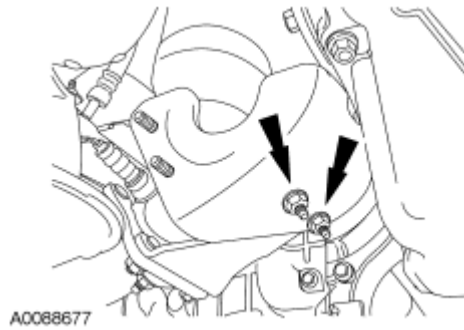


Fig. 688: Locating Exhaust-To-Intermediate Shaft Bracket Nuts
Courtesy of FORD MOTOR CO.

37. Install the bolts on the rear of the exhaust-to-intermediate shaft bracket.
- Tighten to 30 Nm (22 lb-ft).

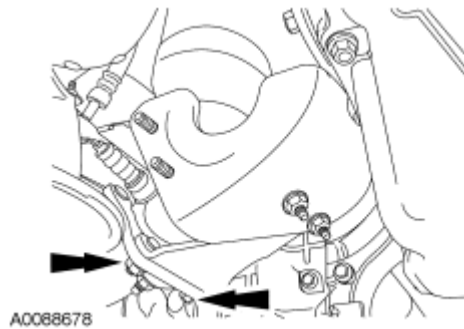


Fig. 689: Locating Bolts On Rear Of Exhaust-To-Intermediate Shaft Bracket
Courtesy of FORD MOTOR CO.

All vehicles

38. Install the flexpipe on the exhaust manifold and install the nuts.
- Tighten to 25 Nm (18 lb-ft).

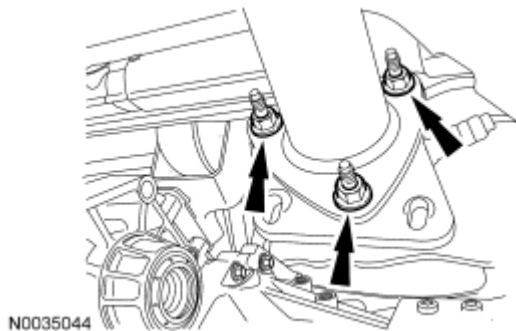


Fig. 690: Locating Flexpipe On Exhaust Manifold & Nuts
Courtesy of FORD MOTOR CO.

39. Install the intermediate shaft.

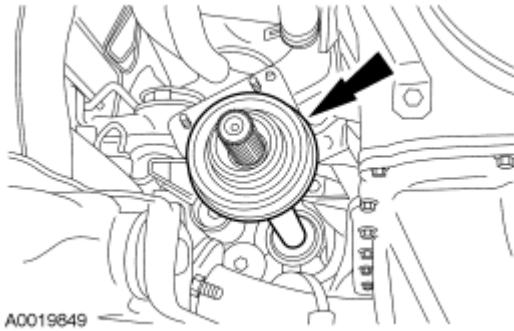


Fig. 691: Locating Intermediate Shaft
Courtesy of FORD MOTOR CO.

40. Install the intermediate shaft retaining nuts.
- Tighten to 27 Nm (20 lb-ft).

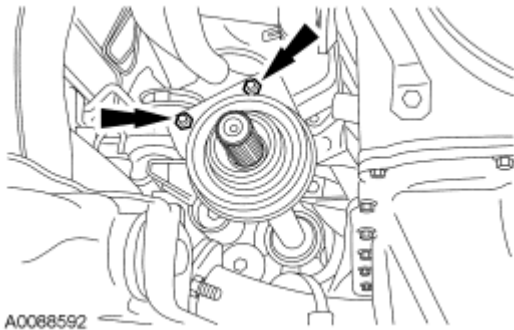


Fig. 692: Locating Intermediate Shaft Retaining Nuts
Courtesy of FORD MOTOR CO.

41. Install the LH and RH halfshafts in the transaxle and install the ball joints in the knuckles.
42. Install the LH brake hose retainer and the ABS sensor bolt.
- Tighten to 15 Nm (11 lb-ft).

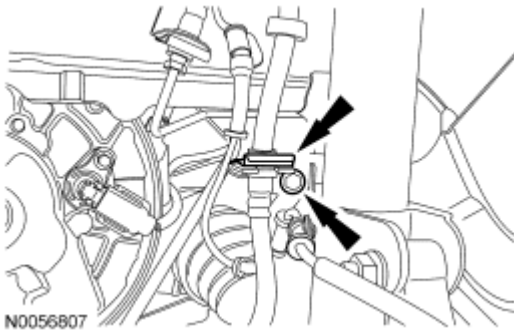


Fig. 693: Identifying Retainer And Bolt
Courtesy of FORD MOTOR CO.

43. Install the RH brake hose retainer and the ABS sensor bolt.
- Tighten to 15 Nm (11 lb-ft).

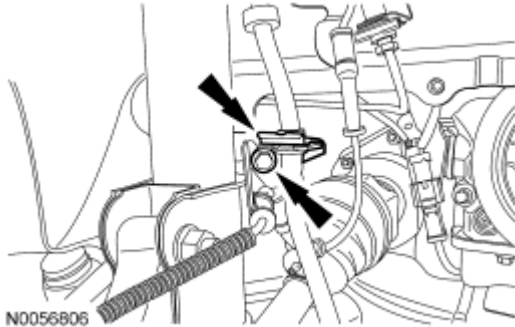


Fig. 694: Identifying Retainer And Bolt
Courtesy of FORD MOTOR CO.

44. Connect the LH suspension.
1. Install the lower ball joint-to-knuckle bolt.
 - Tighten to 63 Nm (46 lb-ft).
 2. Install the tie-rod end retaining nut.
 - Tighten to 55 Nm (41 lb-ft).
 3. Connect the stabilizer bar link.
 - Tighten to 63 Nm (46 lb-ft).

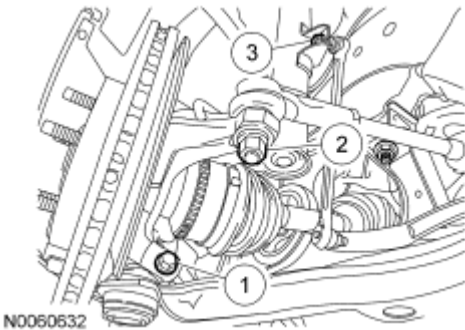


Fig. 695: Identifying Bolt, Nut And Stabilizer Bar Link
Courtesy of FORD MOTOR CO.

45. Connect the RH suspension.
1. Install the lower ball joint-to-knuckle bolt.
 - Tighten to 63 Nm (46 lb-ft).
 2. Install the tie-rod end retaining nut.
 - Tighten to 55 Nm (41 lb-ft).
 3. Connect the stabilizer bar link.
 - Tighten to 63 Nm (46 lb-ft).

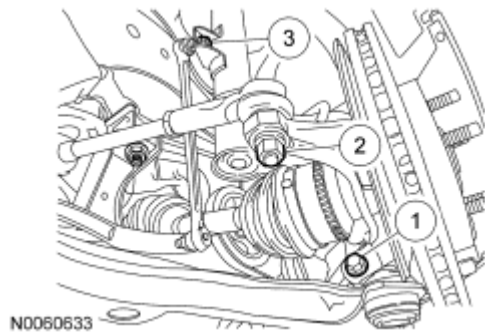


Fig. 696: Identifying Bolt, Nut And Stabilizer Bar Link
Courtesy of FORD MOTOR CO.

46. Position the cross brace in place and install the nut.
 - Tighten to 175 Nm (129 lb-ft).

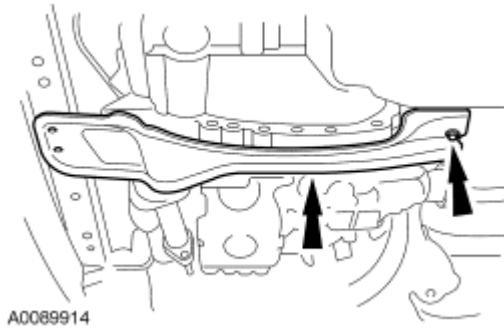


Fig. 697: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

47. Install the 2 bolts for the cross brace.
 - Tighten to 90 Nm (66 lb-ft).

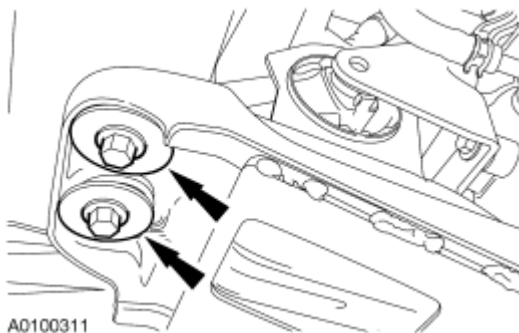


Fig. 698: Locating Cross Brace Bolts
Courtesy of FORD MOTOR CO.

48. Install the lower front support insulator bolt for the mount.
 - Tighten to 103 Nm (76 lb-ft).

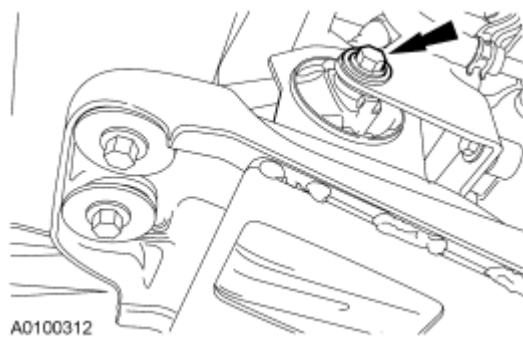


Fig. 699: Locating Mount Through Bolt
Courtesy of FORD MOTOR CO.

49. Install the cross brace and the 4 bolts.
 - Tighten to 115 Nm (85 lb-ft).

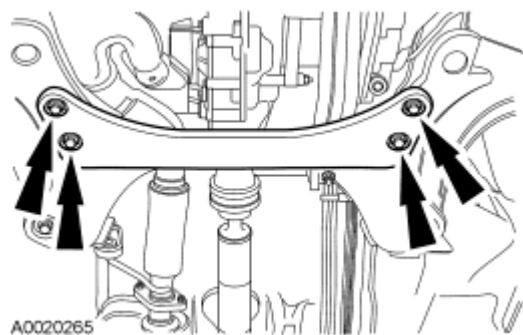


Fig. 700: Locating Cross Brace & Bolts
Courtesy of FORD MOTOR CO.

50. Install the LH splash shield and the 7 retainers.

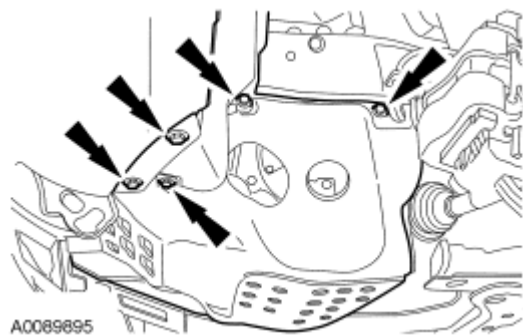


Fig. 701: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

51. Install the RH splash shield and the 5 retainers.

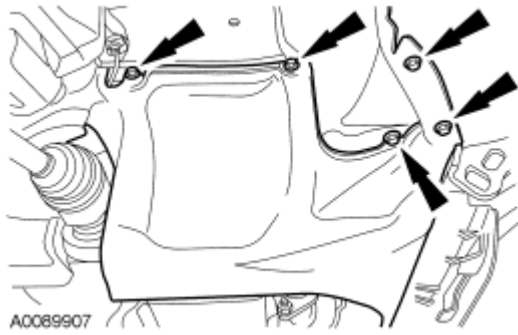


Fig. 702: Right Splash Shield Bolts
Courtesy of FORD MOTOR CO.

52. Install the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.

AWD vehicles

53. Install the vent tube to the transmission fluid filler tube.

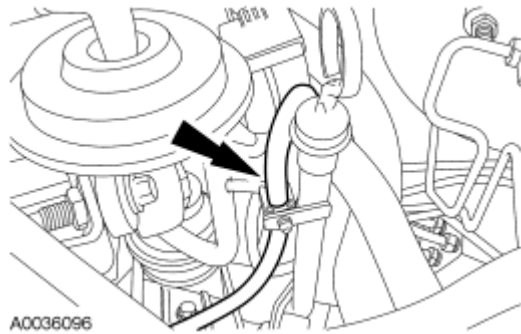


Fig. 703: Locating Power Transfer Unit (PTU) Vent Hose
Courtesy of FORD MOTOR CO.

All vehicles

54. Install the air cleaner assembly.
1. Install the bolt.
 - Tighten to 10 Nm (89 lb-in).
 2. Connect the mass air flow (MAF) sensor.
 3. Connect the brake booster vacuum hose.
 4. Connect the wiring harness retainer.
 5. Connect the breather tube.
 6. Tighten the air cleaner clamp.

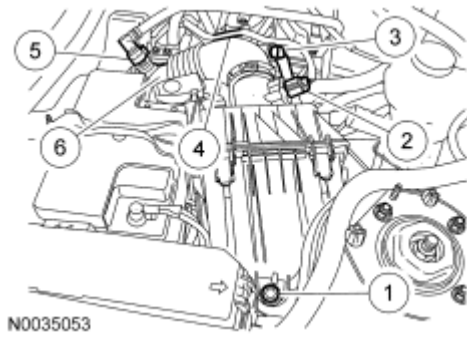
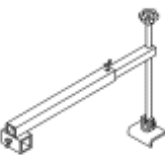


Fig. 704: Identifying Air Cleaner Assembly
Courtesy of FORD MOTOR CO.

55. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
56. Fill the transaxle with clean transmission fluid.
57. Verify that the selector lever cable is correctly adjusted. The vehicle should start in PARK and NEUTRAL and the reverse lamps should illuminate in REVERSE. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E** article.
58. Check the transmission fluid level and correct as necessary.

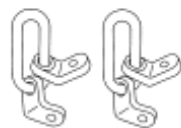
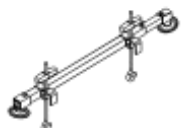
TRANSAXLE - 3.0L

Special Tools

Illustration	Tool Name	Tool Number
 ST2378-A	Adapters for 303-290	303-290A-01
 ST2379-A	Adapter for 303-290-A (Support Leg)	303-290A-03A
 ST1633-A	Alignment Gauge, TR Sensor	307-351 (T97L-70010-A)
	Engine Lifting Chains (Part of Spreader Bar)	303-D089 (D93P-6001-A3) or equivalent

2008 Ford Escape

2008 TRANSMISSIONS Automatic Transaxle/Transmission - CD4E - Escape & Mariner

 ST2524-A		
 ST2793-A	Lifting Bracket, Engine	303-050 (T70P-6000)
 ST1636-A	Retainer, Torque Converter	307-346 (T97T-7902-A)
 ST2363-A	Support Bar, Engine	303-290A

Material

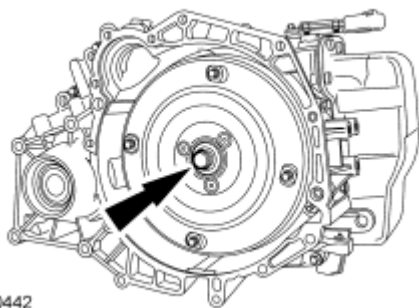
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

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

NOTE: Carry out the transmission fluid cooler flow test if the transaxle is being overhauled or if installing a new or remanufactured transaxle. For additional information, refer to Transmission Fluid Cooler.

All vehicles

1. Lubricate the torque converter pilot hub with grease.



A0020442

Fig. 705: Identifying Torque Converter Pilot Hub
Courtesy of FORD MOTOR CO.

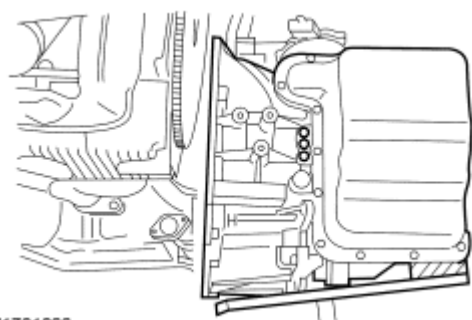
2. Install the special tool.



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Fig. 706: Identifying Special Tool
Courtesy of FORD MOTOR CO.

3. Position the transaxle in place.



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Fig. 707: Lowering Transaxle From Engine Compartment
Courtesy of FORD MOTOR CO.

4. Once the transaxle is in place, before bolting it to the engine, remove the special tool.



Fig. 708: Identifying Special Tool
Courtesy of FORD MOTOR CO.

5. Move the transaxle assembly toward the engine assembly and install the bolt.
 - Tighten to 48 Nm (35 lb-ft).



Fig. 709: Locating Bolt
Courtesy of FORD MOTOR CO.

6. Install the 2 nuts and the stud.
 - Tighten to 48 Nm (35 lb-ft).

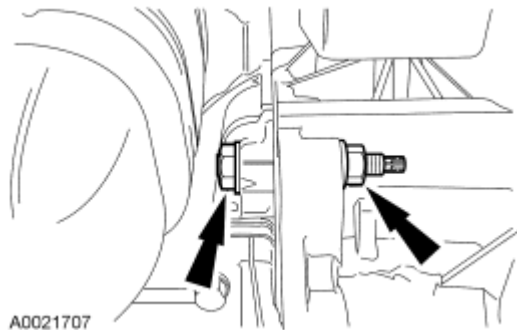


Fig. 710: Locating Transaxle Bolt
Courtesy of FORD MOTOR CO.

7. Install the lower transaxle bolts.
 - Tighten to 48 Nm (35 lb-ft).

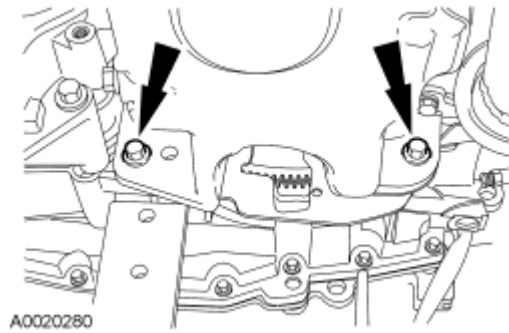


Fig. 711: Locating Lower Transaxle Bolts
Courtesy of FORD MOTOR CO.

8. Install the lower rear mount bracket.
 - Tighten to 55 Nm (41 lb-ft).

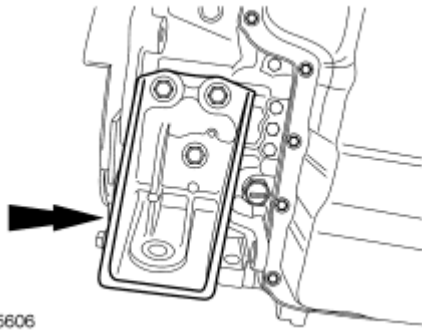


Fig. 712: Locating Transaxle Mount Bracket
Courtesy of FORD MOTOR CO.

9. Loosely install the lower support insulator through bolt.

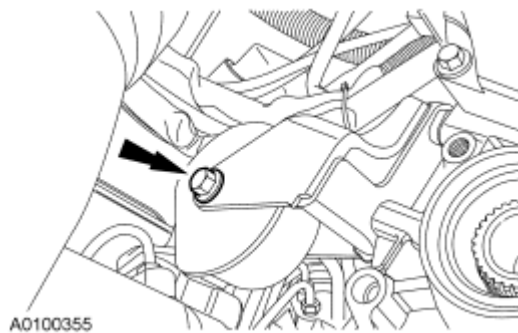


Fig. 713: Locating Rear Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

10. Install the LH transaxle mount through bolt.

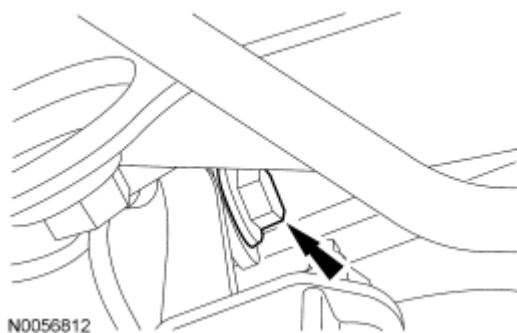


Fig. 714: Identifying Through Bolt
Courtesy of FORD MOTOR CO.

11. Tighten the lower support insulator through bolt.
 - Tighten to 115 Nm (85 lb-ft).

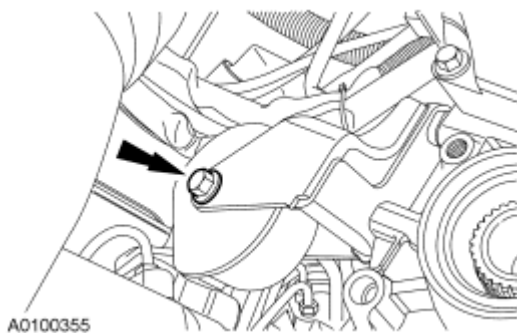


Fig. 715: Locating Rear Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

12. Install the transmission fluid cooler tube.
 - Tighten to 25 Nm (18 lb-ft).



Fig. 716: Locating Transmission Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

13. Install the transmission fluid cooler tube.
 1. Install the fluid cooler tube.

- Tighten to 25 Nm (18 lb-ft).
2. Install the transmission fluid cooler tube bolt.
 - Tighten to 12 Nm (9 lb-ft).

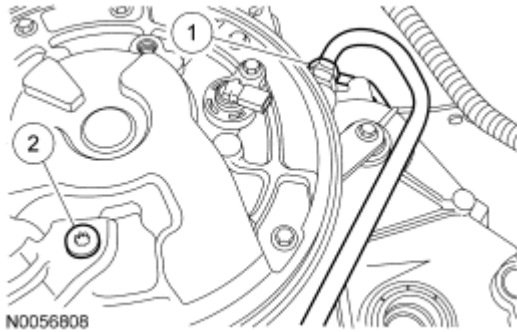


Fig. 717: Identifying Fluid Cooler Tube And Bolt
Courtesy of FORD MOTOR CO.

14. Install the output shaft speed (OSS) sensor and the bolt.
 - Tighten to 12 Nm (9 lb-ft).

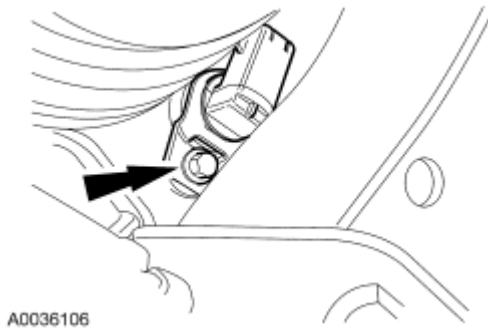


Fig. 718: Locating OSS Sensor Bolt
Courtesy of FORD MOTOR CO.

15. Connect the OSS speed sensor and the turbine shaft speed (TSS) sensor electrical connectors and connect the wiring harness fasteners.
16. Install 4 new torque converter nuts.
 - Tighten to 40 Nm (30 lb-ft).

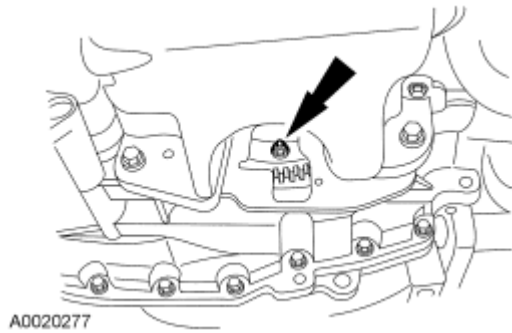


Fig. 719: Locating Torque Converter Nuts
Courtesy of FORD MOTOR CO.

17. Install the access cover.

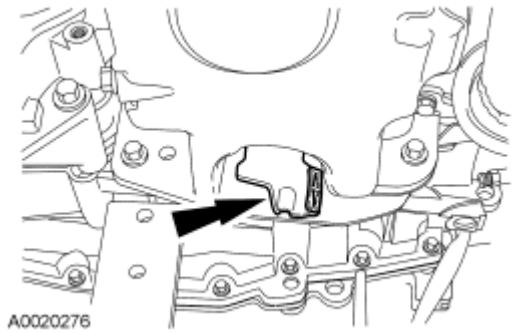


Fig. 720: Locating Access Cover
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

18. Position the power transfer unit (PTU) in place and install the bolt.
- Tighten to 47 Nm (35 lb-ft).

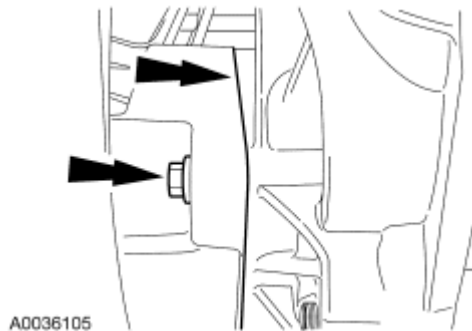


Fig. 721: Locating Transfer Case Bolt & Transfer Case Unit
Courtesy of FORD MOTOR CO.

19. Install the PTU-to-transaxle bolts.

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

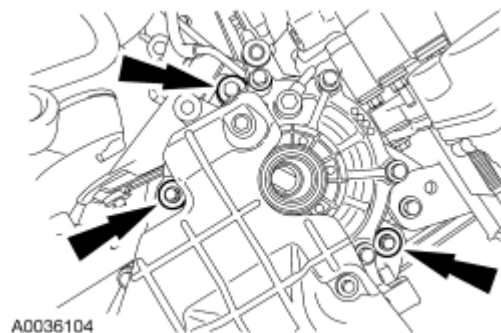


Fig. 722: Locating PTU Bolts
Courtesy of FORD MOTOR CO.

All vehicles

20. Connect the electrical connector fasteners to the lower mount bracket.

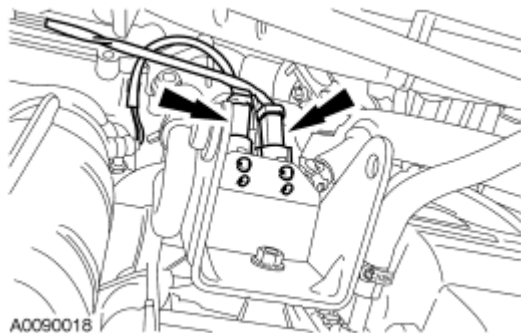


Fig. 723: Locating Electrical Connectors At Lower Mount Bracket
Courtesy of FORD MOTOR CO.

21. Position the cross brace in place and install the nut.
 - Tighten to 175 Nm (129 lb-ft).

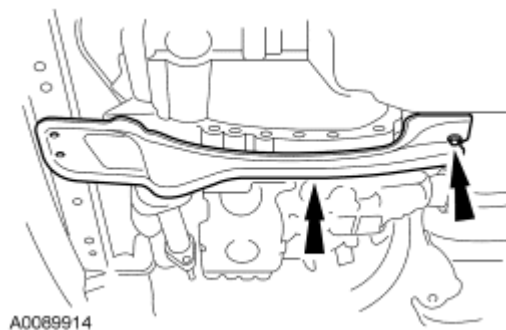


Fig. 724: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

22. Install the 2 bolts for the cross brace.
- Tighten to 90 Nm (66 lb-ft).

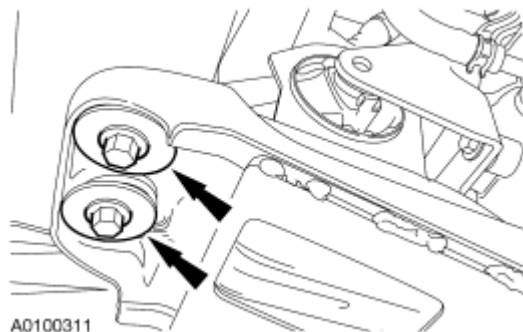


Fig. 725: Locating Cross Brace Bolts
Courtesy of FORD MOTOR CO.

23. Install the lower front insulator bolt for the mount.
- Tighten to 103 Nm (76 lb-ft).

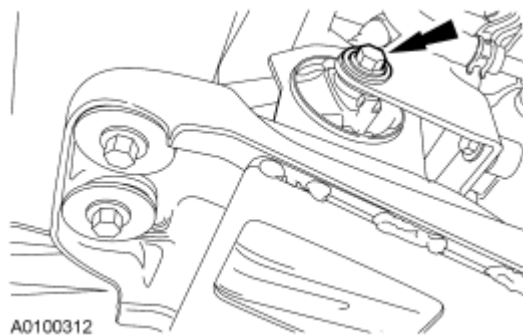


Fig. 726: Locating Mount Through Bolt
Courtesy of FORD MOTOR CO.

AWD vehicles

24. Install the PTU support bracket.
- Tighten to 55 Nm (41 lb-ft).

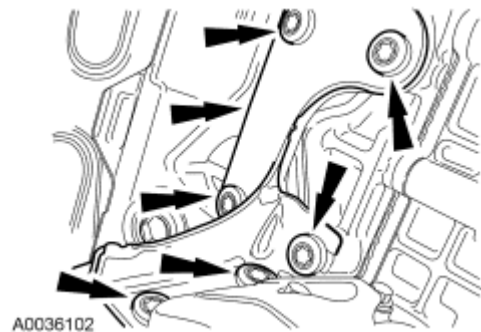


Fig. 727: Locating Bolts & Bracket
Courtesy of FORD MOTOR CO.

25. Install the RH catalytic converter. For additional information, refer to **EXHAUST SYSTEM** article.
26. Position the driveshaft in place and install the nuts.
 - Tighten to 48 Nm (35 lb-ft).

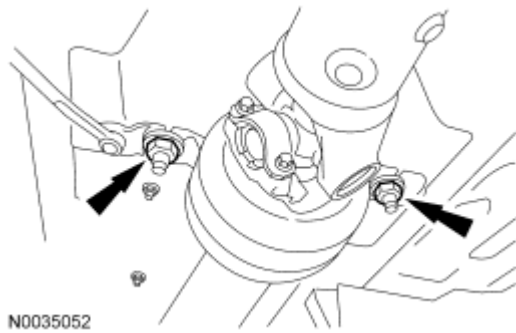


Fig. 728: Locating Center Bearing Nuts
Courtesy of FORD MOTOR CO.

27. Connect the rear driveshaft to the PTU. Install the PTU bolts.
 - Tighten to 37 Nm (27 lb-ft).

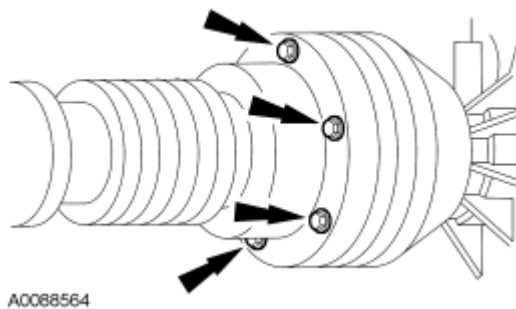


Fig. 729: Locating Driveshaft & Bolts
Courtesy of FORD MOTOR CO.

All vehicles

28. Install the Y-pipe and connect the exhaust pipe flange.
 - Tighten to 29 Nm (21 lb-ft).

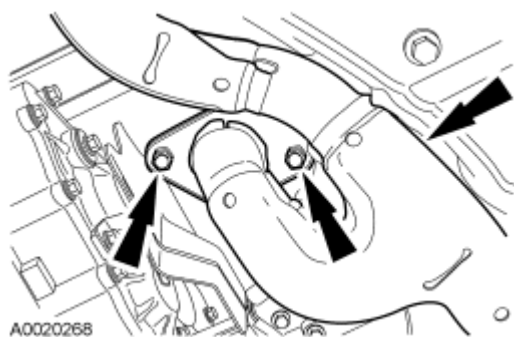


Fig. 730: Rear Exhaust Pipe Flange & Nuts
Courtesy of FORD MOTOR CO.

29. Connect the front flange.
 - Tighten to 29 Nm (21 lb-ft).

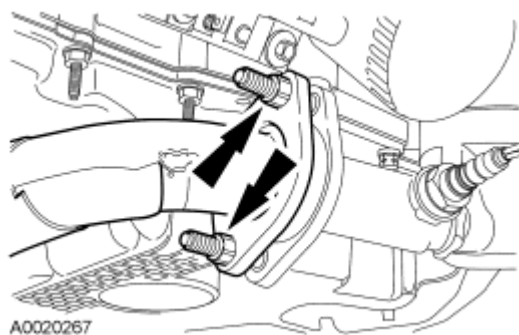


Fig. 731: Front Exhaust Pipe Flange Nuts
Courtesy of FORD MOTOR CO.

30. Install the exhaust pipe.
 1. Install the rubber hanger.
 2. Install the exhaust pipe and install the bolts.
 - Tighten to 29 Nm (21 lb-ft).

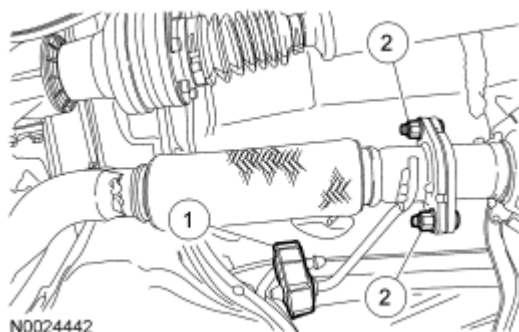


Fig. 732: Exhaust Hanger & Nuts
Courtesy of FORD MOTOR CO.

31. Install the rear cross brace and 4 bolts.
- Tighten to 115 Nm (85 lb-ft).

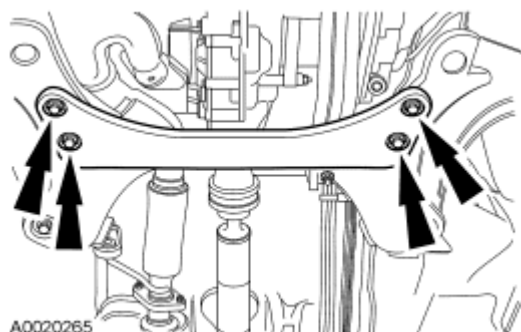


Fig. 733: Locating Cross Brace & Bolts
Courtesy of FORD MOTOR CO.

32. Install the intermediate shaft.

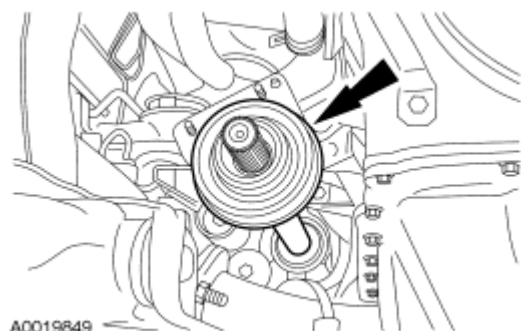


Fig. 734: Locating Intermediate Shaft
Courtesy of FORD MOTOR CO.

33. Install the intermediate shaft retaining nuts.
- Tighten to 27 Nm (20 lb-ft).

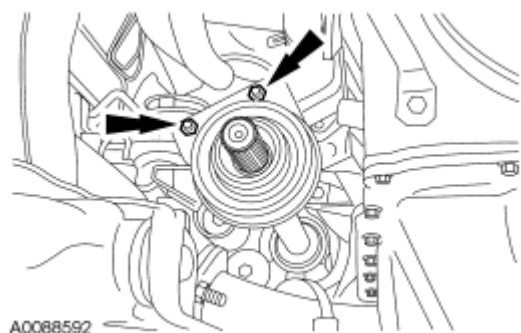


Fig. 735: Locating Intermediate Shaft Retaining Nuts
Courtesy of FORD MOTOR CO.

34. Connect the heated oxygen sensor (HO2S) wire to the oil pan bolt studs and connect the connector.

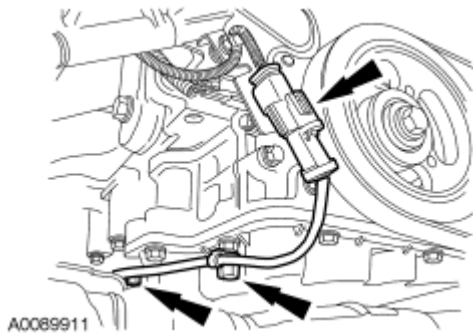


Fig. 736: Locating HO2S Sensor Connector
Courtesy of FORD MOTOR CO.

35. Install the LH halfshaft into the transaxle and the RH halfshafts in the intermediate shaft and install the ball joints in the knuckles.
36. Install the LH brake hose retainer and the ABS sensor bolt.
- Tighten to 15 Nm (11 lb-ft).

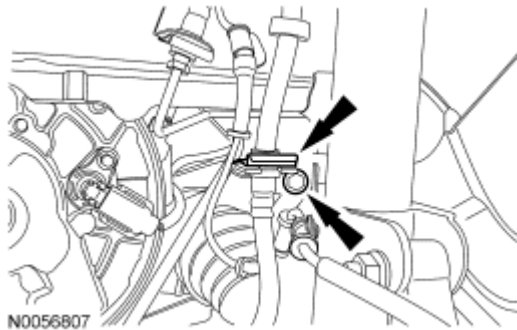


Fig. 737: Identifying Retainer And Bolt
Courtesy of FORD MOTOR CO.

37. Install the RH brake hose retainer and the ABS sensor bolt.
- Tighten to 15 Nm (11 lb-ft).

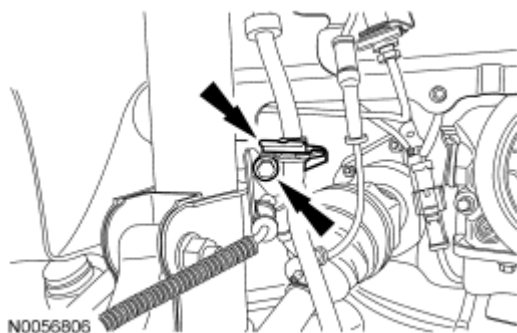


Fig. 738: Identifying Retainer And Bolt

Courtesy of FORD MOTOR CO.

38. Connect the LH suspension.
1. Install the lower ball joint-to-knuckle bolt.
 - Tighten to 63 Nm (46 lb-ft).
 2. Install the tie-rod end retaining nut.
 - Tighten to 55 Nm (41 lb-ft).
 3. Connect the stabilizer bar link.
 - Tighten to 63 Nm (46 lb-ft).

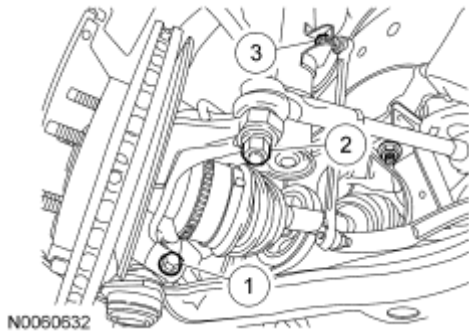


Fig. 739: Identifying Bolt, Nut And Stabilizer Bar Link
Courtesy of FORD MOTOR CO.

39. Connect the RH suspension.
1. Install the lower ball joint-to-knuckle bolt.
 - Tighten to 63 Nm (46 lb-ft).
 2. Install the tie-rod end retaining nut.
 - Tighten to 55 Nm (41 lb-ft).
 3. Connect the stabilizer bar link.
 - Tighten to 63 Nm (46 lb-ft).

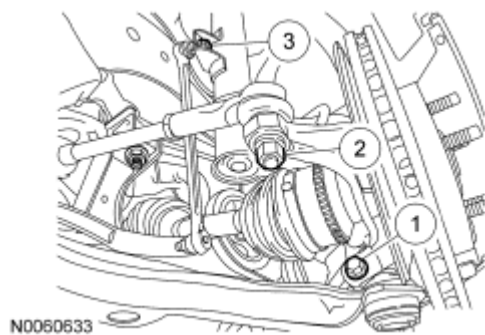


Fig. 740: Identifying Bolt, Nut And Stabilizer Bar Link
Courtesy of FORD MOTOR CO.

40. Install the LH splash shield, the retainer and the 5 bolts.

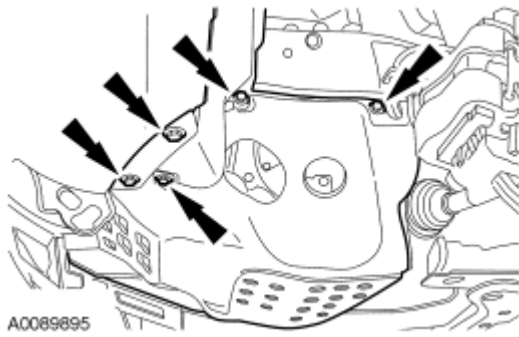


Fig. 741: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

41. Install the RH splash shield, the retainer and the 5 bolts.



Fig. 742: Right Splash Shield Bolts
Courtesy of FORD MOTOR CO.

42. Install the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.
43. Using the special tools, lower the engine onto the RH engine mount.

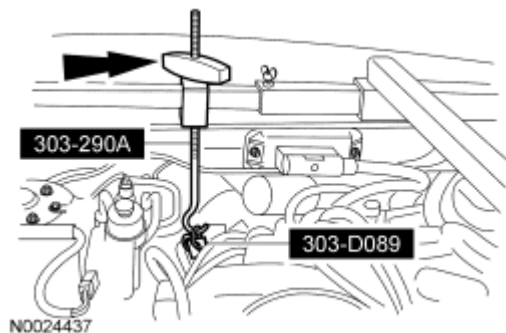


Fig. 743: Locating Lowering Engine Onto RH Engine Mount
Courtesy of FORD MOTOR CO.

44. Install the bolt for the RH engine mount.
- Tighten to 120 Nm (89 lb-ft).

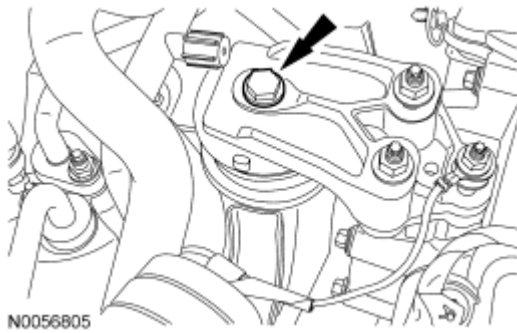


Fig. 744: Identifying Bolt
Courtesy of FORD MOTOR CO.

45. Tighten the LH support insulator mount assembly.
 1. Tighten the 4 nuts for the bracket.
 - Tighten to 40 Nm (30 lb-ft).
 2. Tighten the through bolt.
 - Tighten to 103 Nm (76 lb-ft).

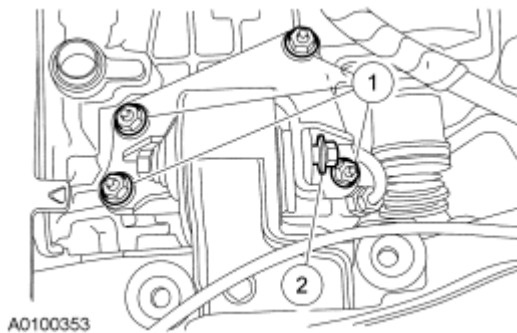


Fig. 745: Locating LH Upper Transaxle Mount Assembly Bolt
Courtesy of FORD MOTOR CO.

46. Install the 4 upper transaxle retaining bolts.
 - Tighten to 48 Nm (35 lb-ft).

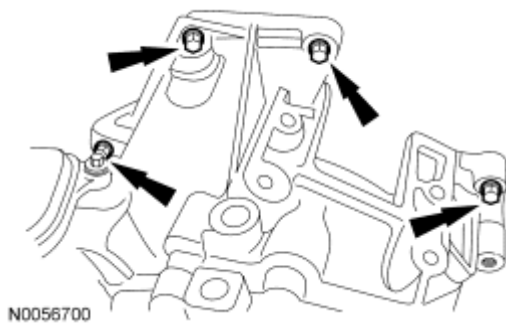


Fig. 746: Identifying Bolts
Courtesy of FORD MOTOR CO.

47. Remove the special tools.

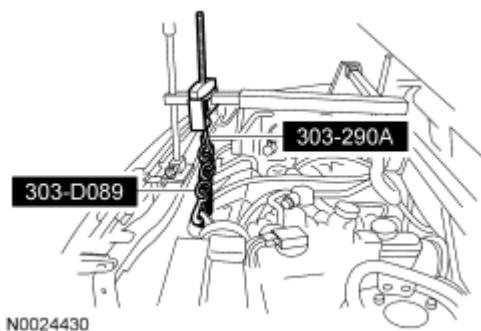


Fig. 747: Identifying Special Tools
Courtesy of FORD MOTOR CO.

48. Remove the special tools.

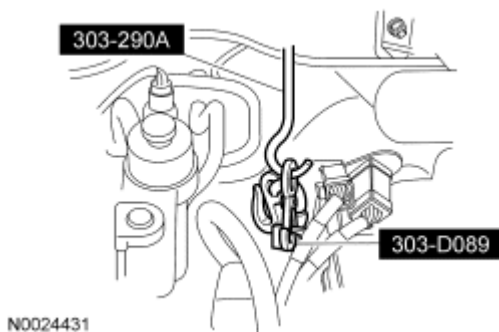


Fig. 748: Identifying Special Tools
Courtesy of FORD MOTOR CO.

49. Remove the special tools.

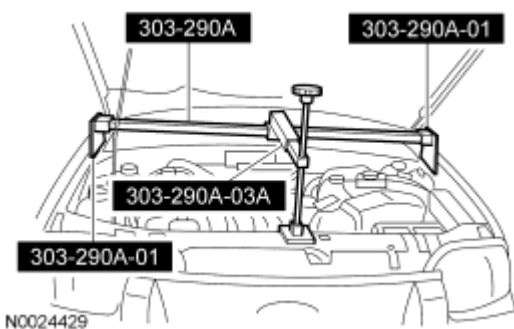


Fig. 749: Drivetrain Support Tool
Courtesy of FORD MOTOR CO.

50. Remove the special tool.

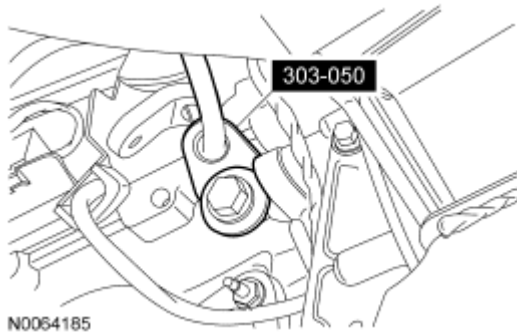


Fig. 750: Identifying Special Tool
Courtesy of FORD MOTOR CO.

51. Connect the electrical connectors together and then connect them to the upper intake manifold.



Fig. 751: Locating Electrical Connectors
Courtesy of FORD MOTOR CO.

52. Install the starter motor and install the bolts.
- Tighten to 25 Nm (18 lb-ft).

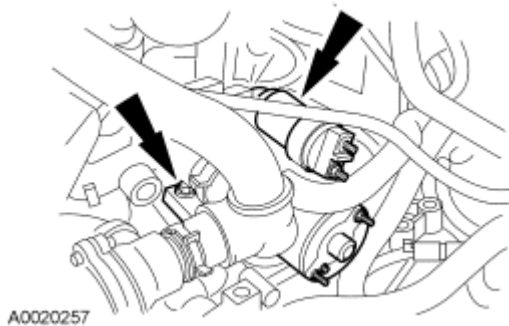


Fig. 752: Locating Starter Bolts & Starter Motor
Courtesy of FORD MOTOR CO.

53. Install the ground cable.
- Tighten to 27 Nm (20 lb-ft).

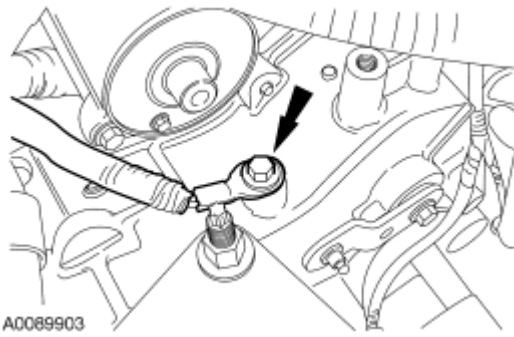


Fig. 753: Locating Ground Cable
Courtesy of FORD MOTOR CO.

54. Install the starter motor solenoid harness connector.
 1. Install the starter motor solenoid battery nut.
 - Tighten to 12 Nm (9 lb-ft).
 2. Install the starter motor solenoid nut.
 - Tighten to 5 Nm (44 lb-in).

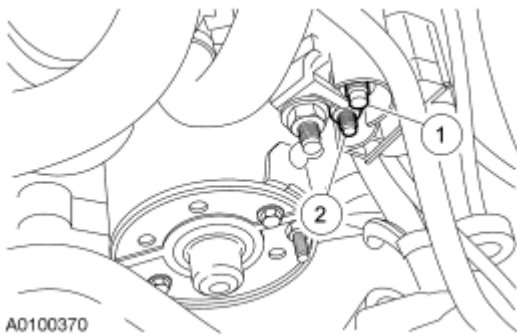


Fig. 754: Locating Starter Motor Harness Connector & Nut
Courtesy of FORD MOTOR CO.

55. Position the selector lever cable and bracket in place, install the bolts and install the wiring harness retainer.
 - Tighten to 23 Nm (17 lb-ft).

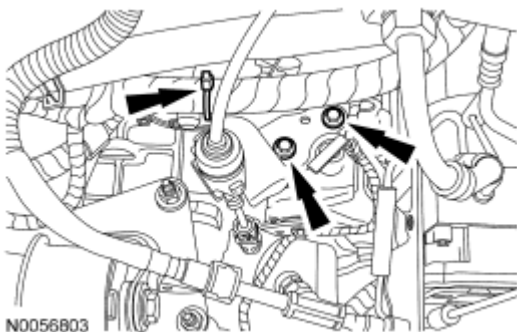


Fig. 755: Identifying Harness Retainer And Bolts

Courtesy of FORD MOTOR CO.

56. Connect the selector lever cable to the manual control lever.

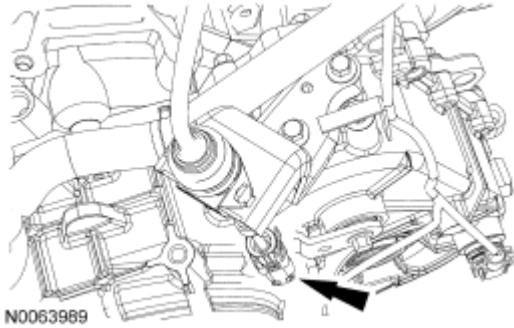


Fig. 756: Identifying Gearshift Cable
Courtesy of FORD MOTOR CO.

57. Install the selector lever cable retainer on the transmission fluid filler tube.

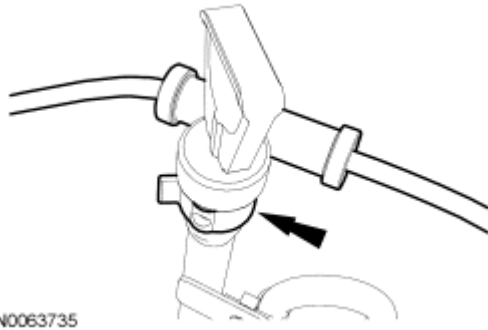


Fig. 757: Identifying Selector Lever Cable Retainer
Courtesy of FORD MOTOR CO.

58. Connect the wire harness to the battery hold-down bracket.

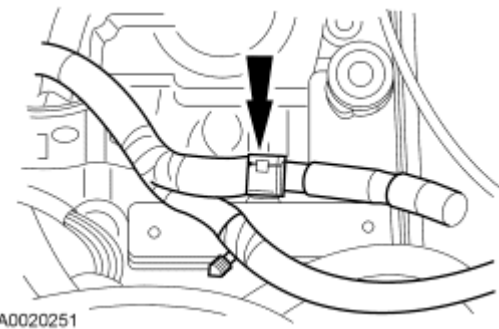


Fig. 758: Locating Wire Harness Bracket
Courtesy of FORD MOTOR CO.

AWD vehicles

59. Connect the evaporative emissions (EVAP) and PTU vent hose to the transmission filler tube bracket.

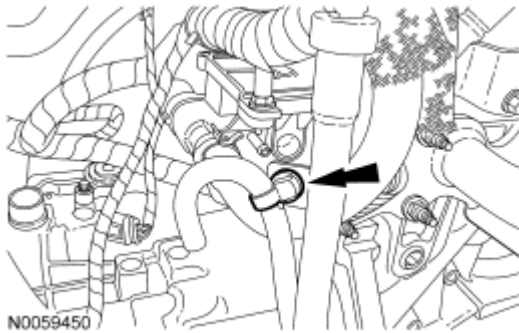


Fig. 759: Identifying PTU Vent Hose
Courtesy of FORD MOTOR CO.

All vehicles

60. Install the main control cover vent tube.

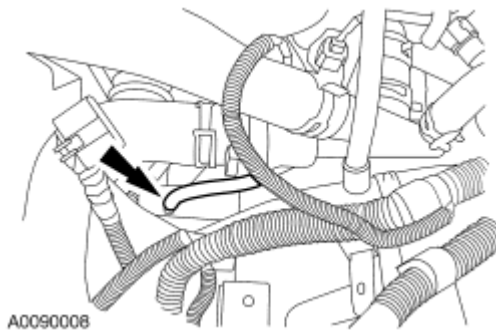


Fig. 760: Locating Main Control Cover Vent Tube
Courtesy of FORD MOTOR CO.

61. Position the bracket in place and install the nut. Connect the transaxle harness connector.
- Tighten to 25 Nm (18 lb-ft).



Fig. 761: Locating Transaxle Harness Connector & Nut
Courtesy of FORD MOTOR CO.

62. Connect the transmission range (TR) sensor.

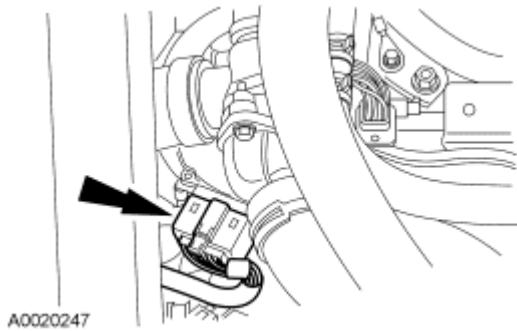


Fig. 762: Locating Transmission Range (TR) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: If installing an exchange transaxle, the digital TR sensor must be aligned.

63. Using the special tool, align the digital TR sensor.
- Tighten to 10 Nm (89 lb-in).

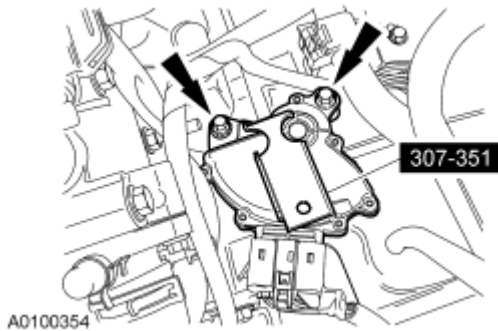


Fig. 763: Aligning Digital TR Sensor
Courtesy of FORD MOTOR CO.

64. Install the air cleaner as an assembly.
1. Install the air cleaner assembly.
 2. Connect the air intake tube.
 3. Install the retaining bolt.
 - Tighten to 10 Nm (89 lb-in).
 4. Install the breather tube.
 5. Connect the mass air flow (MAF) sensor electrical connector.

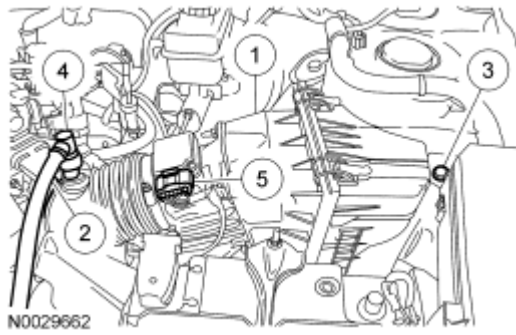


Fig. 764: Identifying Air Cleaner Assembly
Courtesy of FORD MOTOR CO.

NOTE: Before installing the battery tray, check the vent tube hose for any obstructions, kinks or incorrect routing position.

65. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
66. Fill the transaxle with clean transmission fluid.
67. Verify that the selector lever cable is correctly adjusted. The vehicle should start in PARK and NEUTRAL and the reverse lamps should illuminate in REVERSE. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS - CD4E** article.
68. Check the transmission fluid level and correct as necessary.