

1999 AUTOMATIC TRANSMISSIONS

Ford F4E-III (Mazda FA4A-EL) Overhaul

APPLICATION

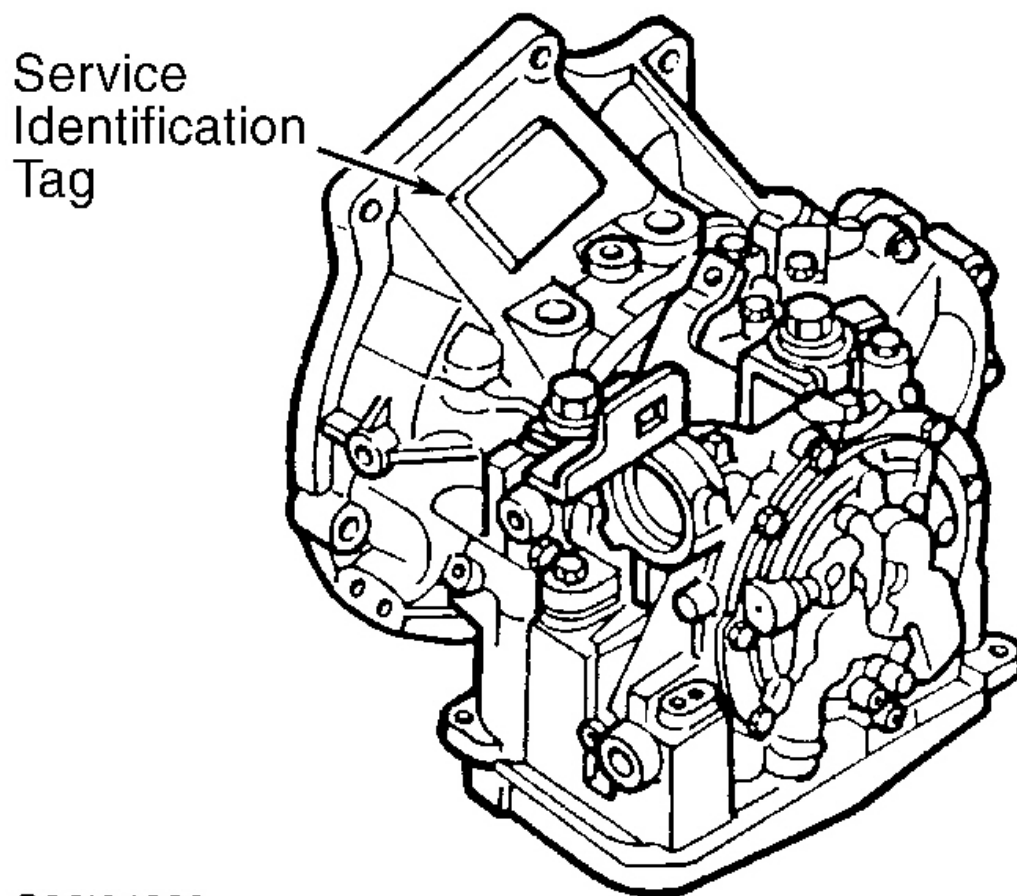
TRANSAXLE APPLICATIONS

Vehicle Model	Transaxle
Ford	
Escort 2.0L (VIN P)	F4E-III
Escort 2.0L DOHC (VIN 3)	F4E-III
Kia	
Sephia	FA4A-EL
Mercury	
Tracer 2.0L (VIN P)	F4E-III

IDENTIFICATION

NOTE: Ford F4E-III transaxle is a Mazda built unit used in Escort and Tracer vehicles. It is also referred to as an FA4A-EL in the Kia Sephia. The Mazda built FN4A-EL used in the Mazda Protege is similar externally, but has changes to the internal hardware. See MAZDA FN4A-EL OVERHAUL article in AUTOMATIC TRANSMISSIONS in MITCHELL® TRANSMISSION SERVICE & REPAIR for IMPORTED VEHICLES.

On Ford and Mercury vehicles, transaxle is identified on vehicle certification label by "E" designation under TR space. Label is attached to driver-side door jamb, below the latch striker. On all models, assembly and serial number information is on service identification tag attached to transaxle. See **Fig. 1** and **Fig. 2**.



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Fig. 1: F4E-III Transaxle Service Identification Tag Location
Courtesy of FORD MOTOR CO.



Fig. 2: F4E-III Transaxle Service Identification Tag Coding
Courtesy of FORD MOTOR CO.

GEAR RATIOS

TRANSAXLE GEAR RATIOS

Application	Ratio
Transaxle Gear Ratios (All Models)	
1st	2.80:1
2nd	1.54:1
3rd	1.00:1
4th	.70:1
Reverse	2.33:1
Final Drive Gear Ratio	
F4E-III	3.736
FA4A-EL	3.833

DESCRIPTION & OPERATION

The F4E-III and FA4A-EL are 4-speed transaxle assemblies controlled by both electronic and mechanical systems. On Escort and Tracer models, input signals from sensors are sent to Powertrain Control Module (PCM). On Sephia, input signals from sensors are sent to the Transmission Control Module (TCM).

The PCM and TCM have built-in self-diagnosis, fail-safe mode and warning code display for the main input

sensors and solenoid valves. On Escort and Tracer, gear selection and TCC operation is controlled by the EEC-V microprocessor. For electronic component diagnostic procedures, see FORD F4E-III ELECTRONIC CONTROLS article. On Sephia, gear selection and TCC operation are controlled by the TCM. For electronic component diagnostic procedures, see appropriate ELECTRONIC CONTROLS article in AUTOMATIC TRANSMISSIONS in TRANSMISSION SERVICE & REPAIR for IMPORTED VEHICLES.

The valve body has 5 solenoids: 3 shift solenoids, an Electronic Pressure Control (EPC) solenoid and a Torque Converter Clutch (TCC) solenoid. Shift solenoid valves actuate shifting and TCC solenoid actuates torque converter lock-up by switching oil flow through passages in the valve body.

When TCC solenoid is switched on, fluid pressure holding the lock-up control valve is drained, allowing valve to open. When valve opens, hydraulic pressure from the rear chamber causes the converter clutch to press tightly against the converter cover. Lock-up occurs and force is transmitted directly to the transaxle with no fluid slippage.

When the PCM switches TCC solenoid off, hydraulic pressure in the front chamber becomes greater than pressure in the rear chamber. The converter clutch then moves away from the converter cover and lock-up is released.

LUBRICATION

RECOMMENDED FLUID

Use only MERCON (XT-2-QDX) or equivalent automatic transmission fluid.

FLUID CAPACITIES

TRANSAXLE FLUID CAPACITIES⁽¹⁾

Application	Refill - Qts. (L)
F4E-III & FA4A-EL	⁽²⁾ 5.7 (5.4)
(1) Approximate quantity listed.	
(2) Without torque converter drained.	

ON-VEHICLE SERVICE

DIFFERENTIAL OIL SEALS

NOTE: Support engine with appropriate 3-bar engine support if rear engine mount removal is necessary.

Removal

1. Raise and support vehicle. Remove front wheels and splash shields. Drain transaxle fluid. Disconnect tie rods from steering arms. Disconnect stabilizer link (if equipped).

2. Remove ball joint pinch bolts and nuts. Pull down lower control arms to separate lower arms from knuckles. If replacing left-side differential seal, remove transaxle support crossmember. If replacing the right-side differential seal, remove right joint shaft bracket (if equipped).
3. Remove axle shafts from transaxle by carefully prying between axle shaft and transaxle case. Support axle shafts using wire. Remove oil seals.

Installation

1. Using appropriate seal installation tool, install oil seals. Replace circlip on end of axle shafts. Install axle shafts. Install right joint shaft bracket (if equipped). Install transaxle support crossmember (if removed). Attach ball joints to knuckles. Install tie rod ends, and tighten nuts to specification. See **TORQUE SPECIFICATIONS**.
2. Install ball joint pinch bolts and nuts. Tighten nuts to specification. See **TORQUE SPECIFICATIONS**. Install stabilizer link assemblies (if applicable). Turn nuts on each link assembly until 1.00 (25.4 mm) of bolt thread can be measured from upper nut. Secure upper nut, and back off lower nut until torque of 12-17 ft. lbs. (16-23 N.m) is reached.
3. Install splash shields and front wheels. Lower vehicle and remove engine support (if necessary). Fill transaxle with Mercon ATF. Check for leaks.

TRANSMISSION RANGE (TR) SENSOR**Removal (Escort & Tracer)**

Disconnect negative battery cable. Remove air cleaner outlet tube. Remove shift cable, bracket nut and control cable front clamp. Remove manual control lever nut and manual control lever. Disconnect TR sensor electrical connector. Remove 2 TR sensor retaining bolts and remove TR sensor.

Removal (Sephia)

Disconnect negative battery cable. Pull data link connector upwards from Mass Air Flow (MAF) sensor. Disconnect air temperature sensor connector and MAF sensor connector. Remove fresh air duct and air cleaner assembly. Remove nut retaining shift cable and remove shift cable. Disconnect TR sensor electrical connector. Remove 2 TR sensor retaining bolts and TR sensor.

Installation (Escort & Tracer)

1. Place transaxle in Neutral position and align marks on TR sensor and manual lever. Install and hand tighten 2 TR sensor retaining bolts. Adjust TR sensor. See **TR SENSOR** under ADJUSTMENTS. Ensure TR sensor electrical connector is connected.
2. Position manual control lever into place and tighten manual control lever nut to specification. See **TORQUE SPECIFICATIONS**. Install shift cable and bracket and tighten nut to specification. Install air cleaner outlet tube. Reconnect negative battery cable. Ensure vehicle starts ONLY when shift selector is in "P" and "N" position.

Installation (Sephia)

1. Place transaxle in Neutral position. Install TR sensor. Install 2 retaining bolts hand tight. Adjust TR

sensor. See **TR SENSOR** under ADJUSTMENTS. Ensure TR sensor electrical connector is connected. Position manual control lever into place and tighten manual control lever nut to specification. See **TORQUE SPECIFICATIONS**.

2. Install shift cable and bracket and tighten nut to specification. Connect air temperature sensor connector and MAF sensor connector. Place data link connector back into original position. Install fresh air duct and air cleaner assembly. Reconnect negative battery cable. Ensure vehicle starts **ONLY** when shift selector is in "P" and "N" position.

TURBINE SHAFT SPEED (TSS) SENSOR

Removal (Escort & Tracer)

Disconnect negative battery cable. Remove air cleaner outlet tube and air cleaner. Remove battery hold down clamp, battery cover and battery. Remove battery tray. Disconnect TSS sensor harness connector and remove sensor.

Removal (Sephia)

Disconnect negative battery cable. Pull data link connector upwards from Mass Air Flow (MAF) sensor. Disconnect air temperature sensor connector and MAF sensor connector. Remove fresh air duct and air cleaner assembly. Disconnect TSS sensor harness connector and remove sensor.

Installation (Escort, Sephia & Tracer)

To install, reverse removal procedure. Always use a NEW TSS sensor "O" ring. Tighten TSS sensor bolt to 71-97 INCH lbs. (8-11 N.m).

VALVE BODY

Removal (Escort & Tracer)

Raise and support vehicle. Remove transaxle pan bolts and drain fluid. Remove pan. Disconnect harness connectors at valve body assembly. See **Fig. 48**. Remove 2 valve body bolts securing wiring harness. Remove 8 remaining bolts and remove valve body assembly. See **Fig. 47**.

Removal (Sephia)

1. Support engine with appropriate 3-bar engine support. Raise and support vehicle. Remove both gravel shields from under engine. Remove 2 rear engine mount nuts, 2 crossmember nuts and bolts and remove crossmember. Remove transaxle pan bolts and drain fluid. Remove oil pan and gasket.
2. Disconnect harness connectors at valve body assembly. See **Fig. 48**. Remove 2 valve body bolts securing wiring harness. Remove 8 remaining bolts and remove valve body assembly. See **Fig. 47**.

Installation (Escort, Sephia & Tracer)

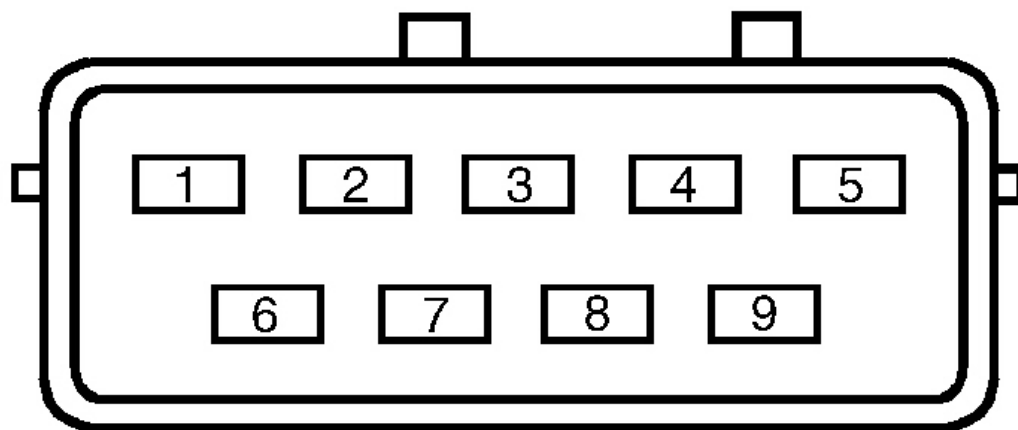
1. Place shift selector lever in "R" position. Install valve body using a mirror to align groove of manual valve with manual valve detent lever. Install valve body into transaxle case and install valve body bolts in correct locations. See **Fig. 47** and **Fig. 48**. Tighten bolts to specification. See **TORQUE**

SPECIFICATIONS.

2. To complete installation, reverse removal procedure. On Sephia, tighten crossmember bolts to specification. See **TORQUE SPECIFICATIONS**. Fill transaxle with fluid. Confirm shift selector lever is indexed correctly. Test drive vehicle to ensure shift feel is correct and shift points are accurate.

ADJUSTMENTS**TR SENSOR****Escort, Sephia & Tracer**

1. Place transaxle in Neutral position. Ensure TR sensor electrical connector is disconnected and TR sensor retaining bolts are hand tight. Using DVOM, connect leads between TR sensor 9-pin connector terminals No. 6 and 9. See [Fig. 3](#).
2. Rotate TR sensor until continuity is present between terminals No. 6 and 9. Tighten 2 TR retaining bolts to specification. See **TORQUE SPECIFICATIONS**. Reconnect TR sensor electrical connector. Ensure vehicle starts **ONLY** when shift selector lever is in "P" and "N" position.



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Fig. 3: Identifying Transmission Range (TR) Sensor Connector Terminals
Courtesy of FORD MOTOR CO.

TROUBLE SHOOTING**PRELIMINARY INSPECTION**

Always check fluid levels and selector linkage. Visually inspect for vehicle modifications, electronic add-ons,

fluid leaks and/or incorrect linkage adjustment. Check for trouble codes before any mechanical repair is performed. For trouble code diagnosis and repair procedures, see FORD F4E-III ELECTRONIC CONTROLS article for Escort and Tracer models. For Sephia, see appropriate ELECTRONIC CONTROLS article in AUTOMATIC TRANSMISSIONS in appropriate MITCHELL® TRANSMISSION SERVICE & REPAIR for IMPORTED VEHICLES. If no trouble codes are present, see appropriate symptom in **SYMPTOM DIAGNOSIS**.

SYMPTOM DIAGNOSIS

NOTE: **Service or repair the systems or the components listed for each symptom.**

No Forward Gears, Reverse Okay

Fluid level and condition, shift linkage, valve body, incorrectly tightened valve body bolts (cross-leaks), 1-2 shift valve, pump assembly, pressure regulator valve, Neutral-Drive accumulator, forward clutch, coasting clutch, reverse clutch, low one-way clutch and forward one-way sprag assembly.

No Reverse, Forward Gears Okay

Fluid level and condition, shift linkage, low line pressure, valve body, incorrectly tightened valve body bolts (cross-leaks), 1-2 shift valve, Neutral-Reverse accumulator, pump assembly, reverse clutch and low/reverse clutch.

Harsh Reverse Engagement

High line pressure, valve body, incorrectly tightened valve body bolts (cross-leaks), pump assembly, Neutral-Reverse accumulator and reverse clutch assembly.

Harsh Forward Engagement

High line pressure, valve body (check ball stuck, gaskets damaged or off location), incorrectly tightened valve body bolts (cross-leaks), pump assembly, Neutral-Drive accumulator and forward clutch assembly.

Delayed Or Soft Engagement Into Reverse

Fluid level and condition, shift linkage, low line pressure, valve body, incorrectly tightened valve body bolts (cross-leaks), pump assembly, Neutral-Reverse accumulator, forward/coasting/reverse clutch assembly or low/reverse clutch.

Delayed Or Soft Engagement Into Forward Gears

Fluid level and condition, shift linkage, low line pressure, valve body (EPC solenoid stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), pump assembly, Neutral-Drive accumulator or forward/coasting/reverse clutch assembly.

Delayed Or Soft Forward & Reverse Engagement

Fluid level and condition, shift linkage, low line pressure, oil filter plugged or damaged, valve body, incorrectly

tightened valve body bolts (cross-leaks), pump assembly or forward/coasting/reverse clutch assembly.

Some Or All Shifts Missing

Fluid level and condition, shift linkage or speedometer input missing (drive or driven gear damaged or retainer clip missing).

Shift Timing Early Or Late

Tire size change, speedometer input missing (drive or driven gear damaged or retainer clip missing) or valve body (shift valves stuck or damaged).

Erratic Or Hunting Shifts

Fluid level and condition, shift linkage, speedometer input missing (drive or driven gear damaged or retainer clip missing), valve body (low reducing valve stuck or damaged) or incorrectly tightened valve body bolts (cross-leaks).

No Forward & No Reverse

Fluid level and condition, shift linkage, low line pressure, oil filter plugged or damaged, valve body, incorrectly tightened valve body bolts (cross-leaks), pump assembly, pump shaft broken or damaged, flexplate, idler gear, park mechanism stuck or damaged, final drive and differential assembly or planetary gearsets.

Soft Or Slipping Upshifts Or Downshifts

Fluid level and condition, shift linkage, low line pressure, valve body, incorrectly tightened valve body bolts (cross-leaks) or pump assembly.

Soft Or Slipping 1-2 Shift In "D" Position

1-2 accumulator, valve body (1-2 shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), 2-4 band or servo, forward one-way clutch, forward clutch assembly, low one-way clutch assembly and low/reverse clutch assembly.

Soft Or Slipping 2-3 Shift In "D" Position

Pump assembly, valve body (check balls worn or damaged), incorrectly tightened valve body bolts (cross-leaks), 2-3 accumulator, 3-4 clutch assembly or 2-4 band or servo.

Soft Or Slipping 3-4 Shift In "D" Position

Valve body (1-2 or 3-4 shift valves damaged or assembled incorrectly or check balls missing or damaged), incorrectly tightened valve body bolts (cross-leaks), coasting clutch assembly (not releasing, damaged), 3-4 clutch assembly or 2-4 band or servo.

Soft Or Slipping 4-3 Shift In "D" Position

Valve body (check balls missing or damaged), incorrectly tightened valve body bolts (cross-leaks), 3-4 clutch assembly or 2-4 band or servo.

Soft Or Slipping 3-2 Shift In "D" Position

Pump assembly, valve body (check balls missing or damaged), incorrectly tightened valve body bolts (cross-leaks), 3-4 clutch assembly or 2-4 band or servo.

Soft Or Slipping 2-1 Shift In "D" Position

Pump assembly, 2-4 band or servo, forward clutch assembly and low one-way clutch assembly.

Harsh Upshifts Or Downshifts

Fluid level and condition, axle shaft splines, CV joints, engine or transaxle mounts, high line pressures, valve body (solenoid reducing valve, pressure modifier valve or TCC valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks) or TCC applied during shifts.

Harsh 1-2 Upshift In "D" Position

Pump assembly, valve body (TCC shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), 1-2 accumulator or 2-4 band and servo.

Harsh 2-3 Upshift In "D" Position

Valve body (check balls missing or damaged or TCC shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), pump assembly or 3-4 clutch assembly.

Harsh 3-4 Upshift In "D" Position

Valve body (TCC shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), 1-2 accumulator assembly, pump assembly, 2-4 band and servo or coasting clutch assembly.

Harsh 4-3 Downshift In "D" Position

Valve body (TCC shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), 2-4 band and servo, coasting clutch or TCC assembly not releasing.

Harsh 3-2 Downshift In "D" Position

Valve body (check balls missing or damaged or TCC shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), pump assembly, 2-4 band and servo or 3-4 clutch assembly.

Harsh 2-1 Downshift In "D" Position

Valve body (TCC shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), 1-2 accumulator or 2-4 band and servo.

No 1st Gear, Engages In Higher Gear

Shift linkage damaged or adjusted incorrectly or valve body (check balls, springs or clips missing, stuck or damaged), incorrectly tightened valve body bolts (cross-leaks).

No Manual Low Gear

Shift linkage damaged or adjustment incorrect or valve body (low reducing valve or 1-2 shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks).

No 1-2 Upshift In "D" Position

Low line pressure, 1-2 accumulator, valve body (1-2 shift valve stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), 2-4 band and servo or low one-way clutch assembly.

No 2-3 Upshift In "D" Position

Low line pressures, pump assembly, valve body (2-3 or 3-4 shift valves stuck or damaged or check balls missing or damaged), incorrectly tightened valve body bolts (cross-leaks), 2-3 accumulator, 3-4 clutch assembly or 2-4 band or servo.

No 3-4 Upshift In "D" Position

Low line pressure, valve body (3-4 or 1-2 shift valves stuck or damaged), incorrectly tightened valve body bolts (cross-leaks), coasting clutch assembly or 2-4 band or servo.

TCC Does Not Apply

Valve body (converter relief or TCC control valves stuck or damaged), incorrectly tightened valve body bolts (cross-leaks) or TCC assembly internal damage.

TCC Always Applied/Engine Stalls

Fluid level and condition, valve body (converter relief or TCC control valves stuck or damaged), incorrectly tightened valve body bolts (cross-leaks) or TCC assembly internal damage.

TCC Cycles, Shudders &/Or Chatters

Fluid level and condition, low line pressures, valve body (converter relief or TCC control valves stuck or damaged), incorrectly tightened valve body bolts (cross-leaks) or TCC assembly internal damage.

No Engine Braking In Manual Low

Shift linkage damaged or adjustment incorrect, valve body (manual valve, low reducing, 1-2 shift, 2-3 shift or 3-4 shift valves stuck or damaged or check balls damaged or missing), incorrectly tightened valve body bolts (cross-leaks), coasting clutch or low/reverse clutch assembly.

High Shift Lever Efforts

Shift linkage damaged or incorrectly adjusted, valve body (manual valve stuck or incorrectly tightened valve

body bolts).

Poor Vehicle Performance

Engine performance, shift linkage damaged or incorrectly adjusted, TCC always applied. See **TCC ALWAYS APPLIED/ENGINE STALLS**. Torque converter one-way clutch is damaged. Perform **STALL SPEED TEST** under PERFORMANCE TESTS.

Noise Or Vibration In Forward &/Or Reverse

Loose flexplate-to-converter nuts, fluid level low (oil pump cavitation), engine drive accessories, fluid cooler lines, oil pump worn or torque converter failure.

Engine Will Not Crank

Shift linkage adjustment and TR sensor adjustment. Transmission Range (TR) sensor malfunction or disconnected. See **TR SENSOR** under ADJUSTMENTS.

No Park Range

Shift control selector or linkage adjustment, parking pawl damaged.

Transaxle Overheating

Fluid level and condition, poor engine performance, clutch assemblies (worn), band application, TCC not applying, oil pressure, fluid flow or cooler flow (restriction).

CLUTCH & BAND APPLICATIONS

CLUTCH & BAND APPLICATIONS

Selector Lever Position	Elements In Use
"P" & "N"	No Elements
"R" (Reverse)	Low-Reverse Clutch & Reverse Clutch
"D" Or "OD" (Drive)	
1st Gear	Forward Clutch, One-Way Clutch (Sprag) & One-Way Clutch (Roller)
2nd Gear	2-4 Band, Forward Clutch & One-Way Clutch (Sprag)
3rd Gear	⁽¹⁾ Coasting Clutch, Forward Clutch, 3-4 Clutch & One-Way Clutch (Sprag)
4th Gear	2-4 Band, 3-4 Clutch, ⁽²⁾ Forward Clutch & ⁽³⁾ One-Way Clutch (Sprag)

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"2"	2-4 Band, Forward Clutch, One-Way Clutch (Sprag) & ⁽¹⁾ Coasting Clutch
"1"	Forward Clutch, One-Way Clutch (Sprag), ⁽¹⁾ Coasting Clutch, One-Way Clutch (Roller) & Low/Reverse Clutch

(1) For engine braking only.

(2) Does not transmit power.

(3) Overrunning on drive and coast.

PERFORMANCE TESTS

ROAD TEST

1. Drive vehicle with transaxle in "OD" position to normal operating temperature. Check minimum throttle upshifts in "OD". Transaxle should start in 1st gear, shift to 2nd, 3rd, and 4th gear at approximate speeds shown in **F4E-III SHIFT SPEEDS** or **FA4A-EL SHIFT SPEEDS** tables.
2. With transaxle in 4th gear (Overdrive), press Transmission Control Switch (TCS). Transaxle should downshift to 3rd gear. Release accelerator pedal. Engine braking should occur.
3. Press accelerator pedal to WOT. Transaxle should shift from 3rd to 2nd gear, or 3rd to 1st gear depending on vehicle speed. Torque converter clutch should disengage and then reapply.
4. With transaxle in "OD" position, and vehicle speed more than 50 MPH, move transaxle selector lever to manual "2" position. Release accelerator pedal. Transaxle should immediately downshift to 2nd gear. Move transaxle selector lever to manual "1" position. Transaxle should downshift to 1st gear at speeds less than 30-35 MPH.
5. If transaxle fails to operate normally or torque converter does not apply and release properly, diagnose problem by symptom. See **SYMPTOM DIAGNOSIS** under TROUBLE SHOOTING.

F4E-III & FA4A-EL SHIFT SPEEDS

Ensure engine and transaxle is at normal operating temperature. Road test vehicle with transaxle shift selector in gear specified in shift tables. Apply throttle and observe speeds at which upshift and downshift occurs and torque converter is applied. See **F4E-III SHIFT SPEEDS** or **FA4A-EL SHIFT SPEEDS** table. If shift points are not within specification, go to **SYMPTOM DIAGNOSIS** under TROUBLE SHOOTING.

F4E-III SHIFT SPEEDS

Operating Condition	Shift Speed MPH
"OD" & "D" ⁽¹⁾ Range - Half Throttle ⁽²⁾	
1-2	17-21
2-3	33-41
3-4	51-61

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"OD" & "D" Range - WOT ⁽³⁾

1-2	34-38
2-3	65-70
3-4	82-88

"OD" & "D" Range - Coast ⁽⁴⁾

4-3	17-20
3-2	6-10
2-1	6-10

"OD" & "D" Range - Kickdown

4-3	78-84
3-2	60-64
2-1	24-27

"OD" & "D" Range To "L" Range

1-2 - Half Throttle ⁽²⁾	27-30
2-1 - WOT ⁽³⁾	27-30

(1) Highest gear available in this position is 3rd.

(2) TP sensor voltage is 1.6-2.2 volts.

(3) TP sensor voltage is 4.0 volts.

(4) TP sensor voltage is .5 volts. Closed throttle, coasting condition. Downshift is gradual and may not be felt.

FA4A-EL SHIFT SPEEDS

Operating Condition	(1) Shift Speed MPH
"D" Range "OD" Switch ON (Power Mode) Half Throttle	
1-2	28
2-3	50
3-4	81
"D" Range "OD" Switch ON (Power Mode) WOT	
1-2	34
2-3	62
3-4	95
"D" Range "OD" Switch ON (Power Mode) - Kickdown WOT	
4-3	91
3-2	60
2-1	28
"D" Range "OD" Switch ON (Power Mode) - Kickdown Coast	
4-3	25
3-2	7
2-1	7

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"OD" & "D" Range To "L" Range

2-1

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(1) Approximate speeds.

HYDRAULIC PRESSURE TEST

CAUTION: DO NOT allow engine to run at maximum stall speed for more than 5 seconds. Run engine in "N" position for one minute to cool transaxle after each test is completed.

F4E-III & FA4A-EL

1. Block wheels. Connect tachometer to engine. Connect appropriate pressure gauge to line pressure port (square head plug, marked "L"). See **Fig. 4**.
2. Run engine until normal operating temperature is obtained. Ensure engine is idling within specification. Consult underhood emissions label. Shift transaxle into gear as applicable and record line pressure. Firmly apply brake pedal. Steadily increase engine RPM to WOT and record line pressure. Release accelerator. DO NOT allow engine to operate at full stall speed for more than 5-seconds limit.
3. Before shifting into each selector position, run engine in Neutral for one minute to cool transaxle. Repeat step 2) for each gear. If line pressure is within specification, go to **STALL SPEED TEST**. See **LINE PRESSURE SPECIFICATIONS (PSI)** table. If line pressure is not within specification, go to **HYDRAULIC PRESSURE TEST RESULTS**.

LINE PRESSURE SPECIFICATIONS (PSI)

Selector Position	@ Idle RPM	@ WOT Stall RPM
"R"	71-142	199-270
"D", "2" & "1"	57-128	114-185

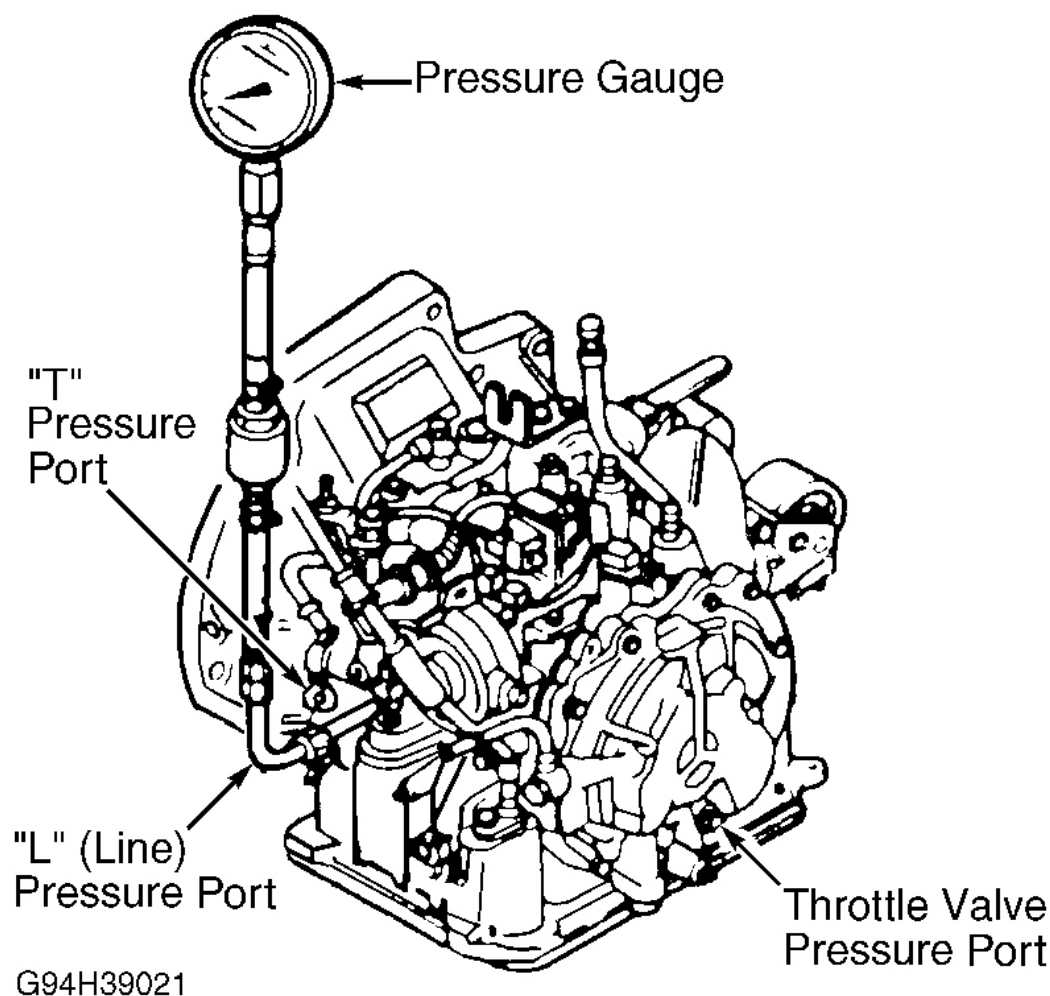


Fig. 4: Connecting Pressure Gauge
Courtesy of FORD MOTOR CO.

HYDRAULIC PRESSURE TEST RESULTS

Ensure line pressure is correct. If line pressure is not to specification, use following list to determine cause of trouble. If line pressure is low, ensure fluid filter is not obstructed.

Low In All Ranges

Worn or leaking oil pump, pressure regulator valve sticking and/or EPC solenoid/circuit failure.

Low In "D" & "2" Only

Fluid leaking from forward clutch circuit.

Low In "R" Only

Fluid leaking from low/reverse clutch circuit.

High In All Ranges

Pressure regulator valve, EPC solenoid valve or pressure modifier sticking.

STALL SPEED TEST

CAUTION: DO NOT allow engine to run at maximum stall speed for more than 5 seconds. Run engine in "N" position for one minute to cool transaxle after each test is completed.

1. Engine coolant and transaxle fluid must be at proper levels and normal operating temperatures. Connect tachometer to engine. Apply parking and service brakes firmly. Block wheels and place shift selector lever in "R" position.
2. While observing tachometer, steadily increase engine RPM to WOT and release within 5 seconds. DO NOT exceed 5-second limit. Engine speed should be 2200-2500 RPM.
3. Run engine in "N" position for one minute to cool transaxle. Repeat procedure in each gear. If engine speed is not within specification, release accelerator immediately. See **STALL SPEED TEST RESULTS**. If engine speed is within specification, go to **TIME LAG TEST**.

STALL SPEED TEST RESULTS**High In All Ranges**

Insufficient line pressure due to worn or leaking oil pump, control valve and/or case. Pressure regulator valve sticking.

High In "D" Only

Forward clutch slipping or one-way sprag or roller clutch slipping.

High In "2" Range

2-4 brake band slipping.

High In "R"

Low/reverse clutch or reverse clutch slipping. Check for engine braking in manual low to determine low/reverse clutch or reverse clutch fault.

Low In All Ranges

Poor engine performance. One-way clutch slipping in torque converter.

TIME LAG TEST

1. Engine coolant and transaxle fluid must be at proper levels and normal operating temperature. Block wheels, apply parking and service brake firmly. Start engine, and ensure idle is within specification. See underhood emissions label.
2. Shift from "N" to "D" position while measuring elapsed time until transaxle engages in gear. Run engine in "N" position for one minute to cool transaxle. Repeat procedure shifting from "N" to "R" position.
3. Repeat 3 times, and average results. See **TIME LAG** table. If transaxle engagement time is within specification, go to **HYDRAULIC PRESSURE TEST**. If transaxle engagement time is not within specification, go to **TIME LAG TEST RESULTS**.

TIME LAG

Selector Lever Position	(1) Seconds
"N" To "D"	.5-.6
"N" To "R"	.6-.7
(1) If transaxle engagement is not within specification, see TIME LAG TEST RESULTS .	

TIME LAG TEST RESULTS**High "N" To "D" (O/D ON)**

Insufficient line pressure. Forward clutch or one-way clutch (sprag) slipping and/or one-way clutch (roller) slipping.

Low "N" To "D" (O/D ON)

Neutral-Drive accumulator faulty. Excessive line pressure.

High "N" To "D" (O/D OFF)

Excessive line pressure. Insufficient line pressure. Forward clutch, 2-4 band or one-way clutch (sprag) slipping.

Low "N" To "D" (O/D OFF)

1-2 accumulator faulty. Excessive line pressure.

High "N" To "R"

Insufficient line pressure. Low-reverse clutch or reverse clutch slipping.

Low "N" To "R"

Neutral-Reverse accumulator faulty. Excessive line pressure.

COMPONENT TESTS

TORQUE CONVERTER

Cleaning & Inspection

NOTE: **DO NOT clean torque converter by hand using solvent.**

1. Torque converter is a sealed unit and cannot be disassembled for service. Replace torque converter if it is found to be defective. Remove any rust from pilot hub and boss of converter. Measure pilot bushing inner diameter. If measurement exceeds 2.090" (53.07 mm), replace torque converter.
2. Using Rotunda Converter Cleaner (014-00028), flush torque converter. After converter is removed from cleaner, thoroughly drain solvent through hub. Add about .53 qt. (.5 L) of clean ATF to converter. Agitate fluid by hand. Thoroughly drain ATF through converter hub.

End Play Check

Insert fingers into converter hub opening and move one-way clutch up and down. If end play is greater than .020" (.50 mm), replace converter.

REMOVAL & INSTALLATION

TRANSAXLE

For Escort and Tracer models, see appropriate AUTOMATIC TRANSMISSION REMOVAL article in TRANSMISSION SERVICING. For Sephia, see appropriate AUTOMATIC TRANSMISSION REMOVAL article in TRANSMISSION SERVICING in appropriate MITCHELL® TRANSMISSION SERVICE & REPAIR for IMPORTED VEHICLES.

TRANSAXLE DISASSEMBLY

1. Mount transaxle on stand. Carefully remove torque converter from case. Remove oil pump drive shaft. Remove turbine shaft seal ring located on end of turbine shaft. Remove dipstick tube from case. Remove Transmission Range (TR) sensor and Turbine Shaft Speed (TSS) sensor. Remove Vehicle Speed Sensor (VSS).
2. Remove solenoid valve connector retaining clip. Disconnect solenoid valve connector. Remove oil cooler line tube bolt, washer, securing bolt, spring and steel ball. Remove oil pan and gasket. Disconnect all solenoid valve wiring connectors. Remove EPC solenoid. Remove retaining bolts from valve body, and carefully remove valve body.
3. Remove manual control lever and manual valve detent lever. Remove parking rod support plate. Remove park actuator support and parking lever actuating rod as an assembly. See **Fig. 5**. Remove park lever plate, parking plate torsion spring and support.
4. Remove oil pump and gasket. Remove forward/coasting/reverse clutch thrust washer and needle bearing. See **Fig. 20** and **Fig. 45**. Remove turbine shaft retaining ring. Remove forward/coasting/reverse clutch assembly and needle bearing. Depress servo assembly with large pair of slide-lock pliers. Remove retaining ring. Remove servo assembly and servo piston.
5. Remove primary sun gear and one-way clutch assembly. Remove needle bearing from primary sun gear and one-way clutch assembly. Remove thrust washer from carrier hub. Remove 2-4 band and secure

using wire to prevent stretching. Remove servo band lever by pulling upwards on band actuating lever shaft, allowing servo band lever to be removed from case. See **Fig. 5**.

6. Remove one-way clutch retaining ring. Remove one-way clutch outer race. Remove waved washer from case. Remove one-way clutch and carrier hub assembly. Remove low/reverse clutch pressure plate retaining ring. Remove low/reverse clutch pressure plate and clutch pack. See **Fig. 5**. Remove ring gear retaining ring. Remove ring gear from front sun shell.
7. Pull out turbine shaft and 3-4 clutch assembly. Remove 3-4 clutch needle bearings and slide 3-4 clutch off turbine shaft. See **Fig. 26**. Remove 13 transaxle case-to-converter housing bolts. Using a plastic hammer, tap lightly to separate transaxle case from converter housing. Remove output shell from output gear, along with thrust washer and needle bearing.
8. Using appropriate spring compressor, compress low/reverse clutch return spring assembly and remove retaining ring. See **Fig. 18**. Remove low/reverse clutch return spring assembly and piston. Remove parking pawl shaft E-clip, parking pawl return spring, parking pawl shaft and parking pawl. See **Fig. 5**. Remove differential assembly.
9. If bearing housing requires disassembly, remove roll pin by using a pin punch and discard roll pin. See **Fig. 6**. Remove bearing housing bolts. Using a plastic hammer, tap lightly to remove bearing housing. Using drift punch, remove idler gear and output gear assemblies by lightly tapping on idler gear shaft from torque converter side of housing.
10. Remove converter housing from holding fixture. Remove torque converter stator support bolts. See **Fig. 5**. Press torque converter stator support out of torque converter housing using appropriate step plate. Using slide hammer and appropriate puller, remove rear bearing cup and shims from case.

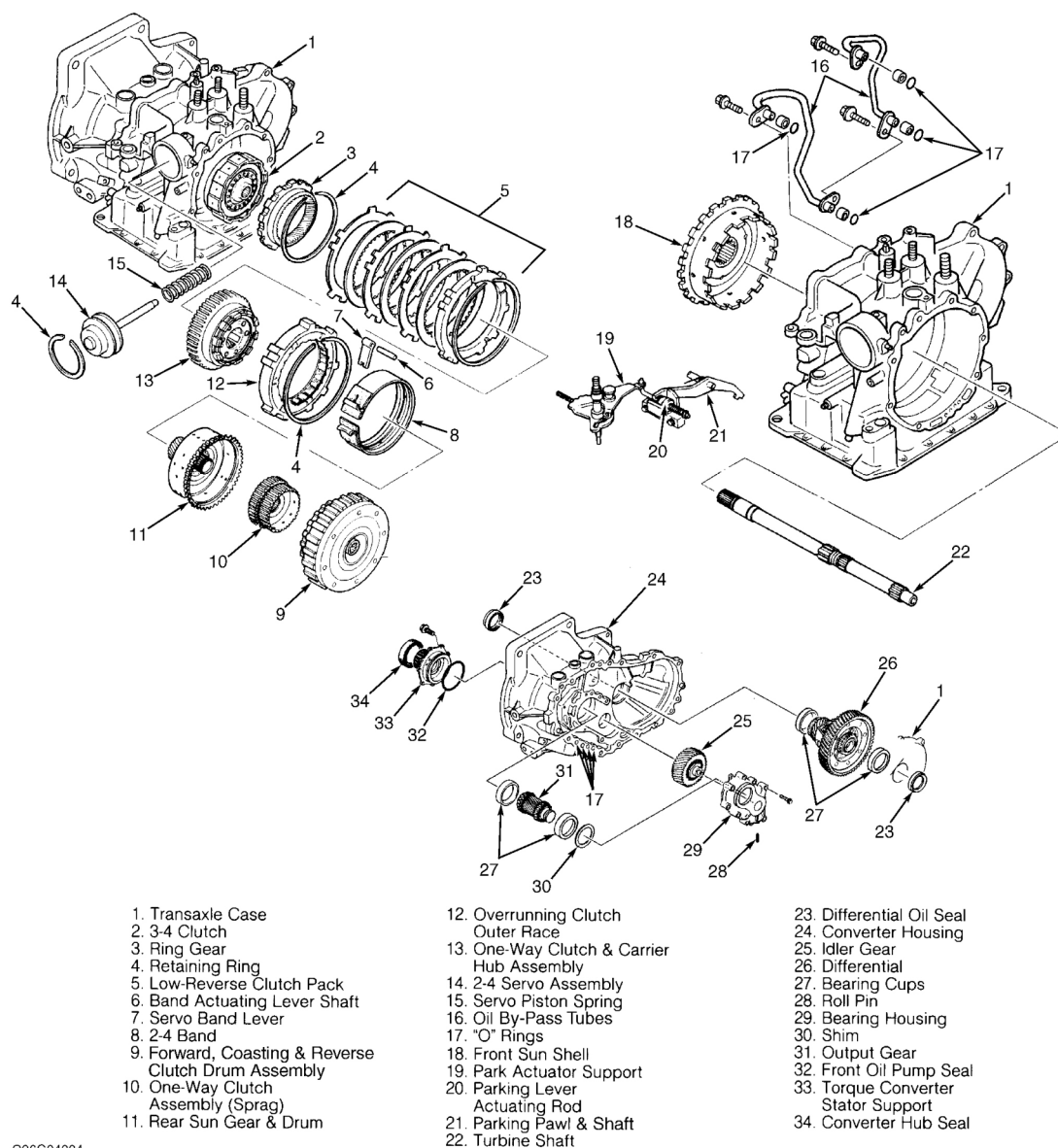


Fig. 5: Exploded View Of F4E-III Transaxle Assembly
 Courtesy of FORD MOTOR CO.

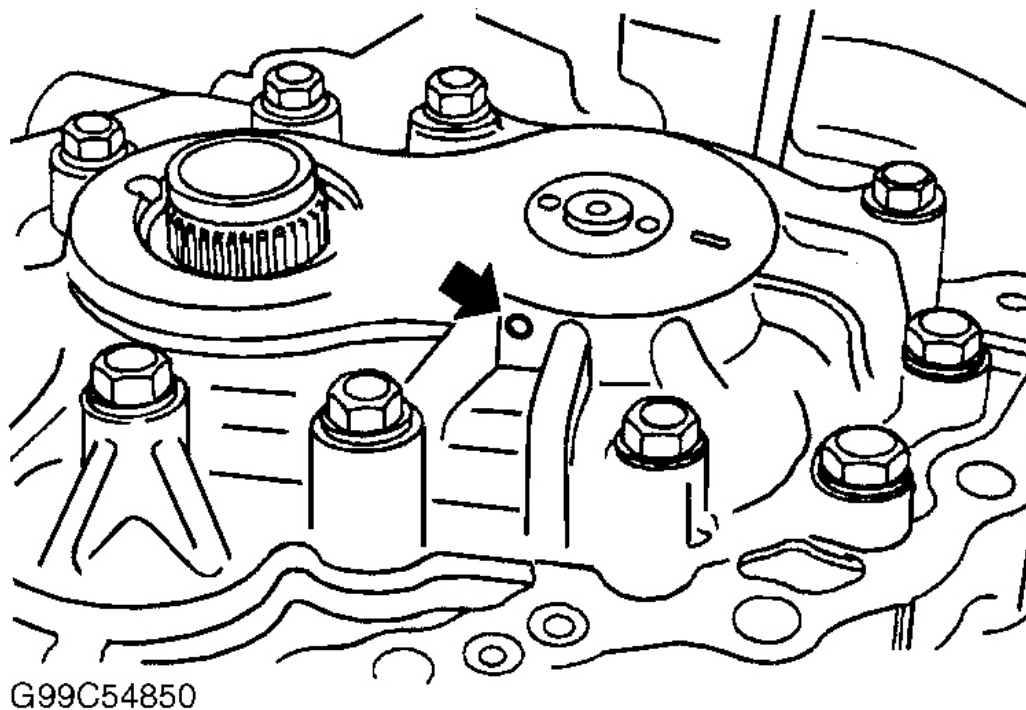


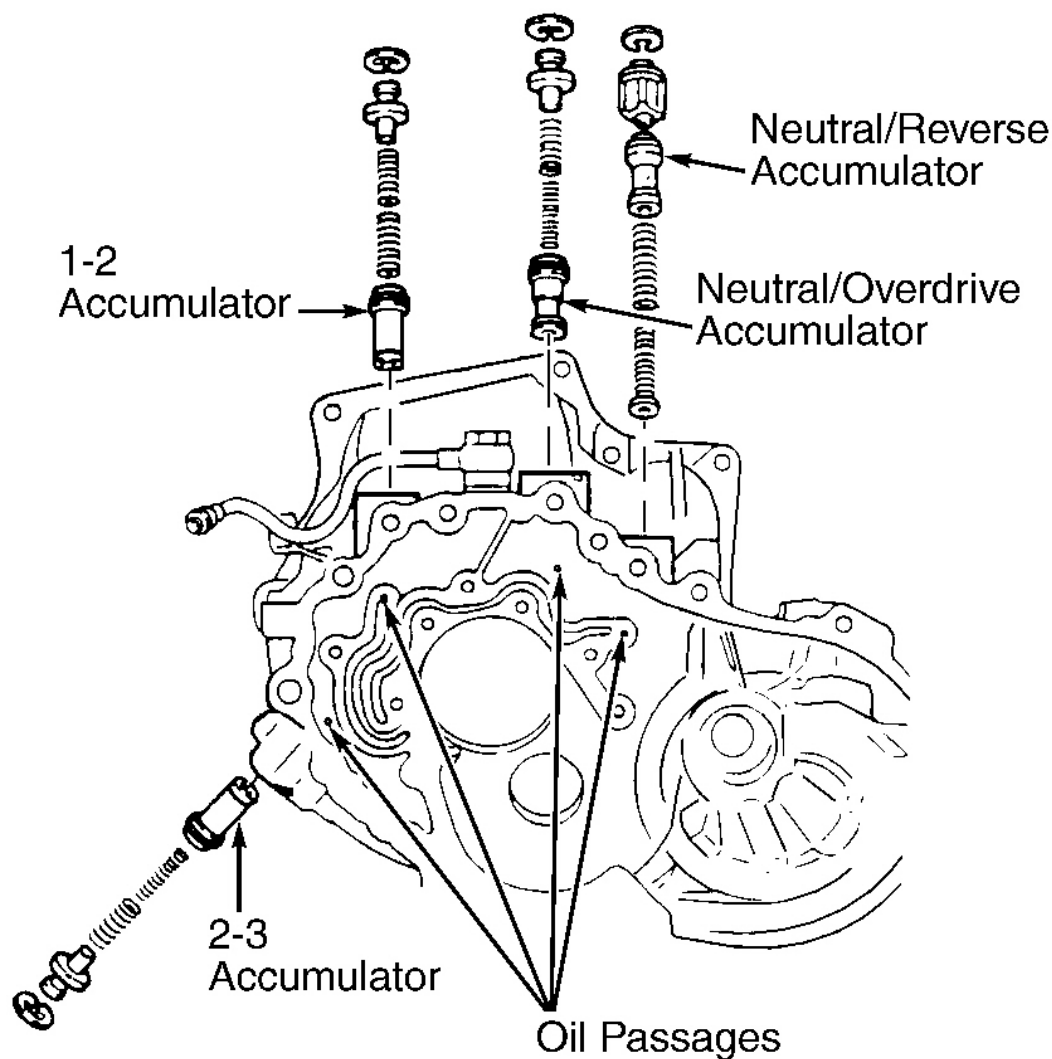
Fig. 6: Location Of Bearing Housing Roll Pin
Courtesy of FORD MOTOR CO.

COMPONENT DISASSEMBLY & REASSEMBLY

ACCUMULATORS

Disassembly & Reassembly

For exploded view of accumulator assemblies, see **Fig. 7**. Lubricate all seals and "O" rings with transmission fluid before reassembly.



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Fig. 7: Exploded View Of Accumulator Assemblies
 Courtesy of FORD MOTOR CO.

BEARING HOUSING

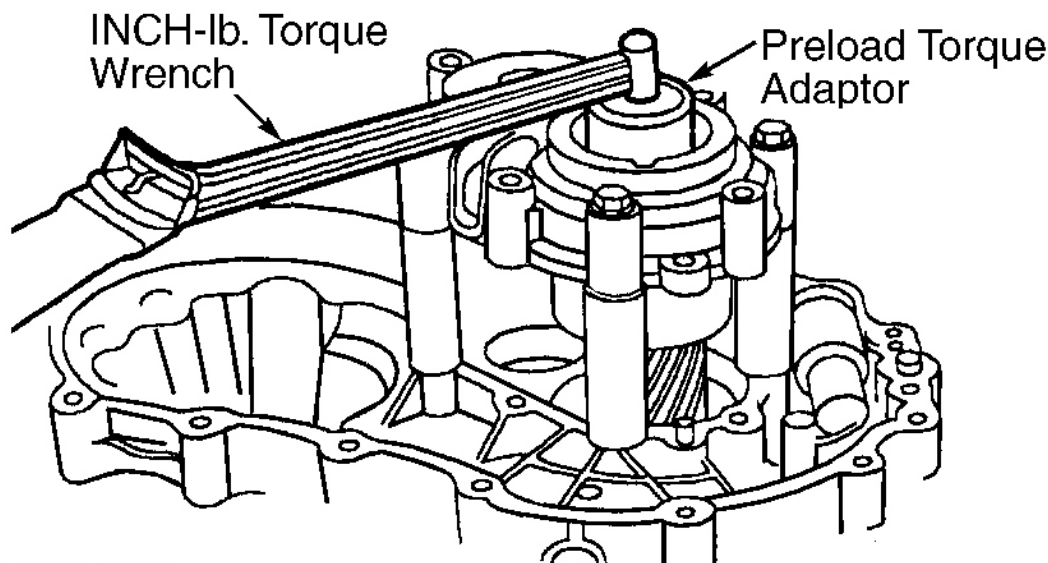
NOTE: When transaxle is disassembled, output gear bearing preload **MUST** be adjusted by selecting shims to insert under bearing cup.

Output Gear Bearing Preload

1. Align bearing stator support using Guide Pins (T80L-77100-A). Press support into converter housing using Step Plate (D80L-630-6). Install stator support bolts and tighten to specification. See **TORQUE**

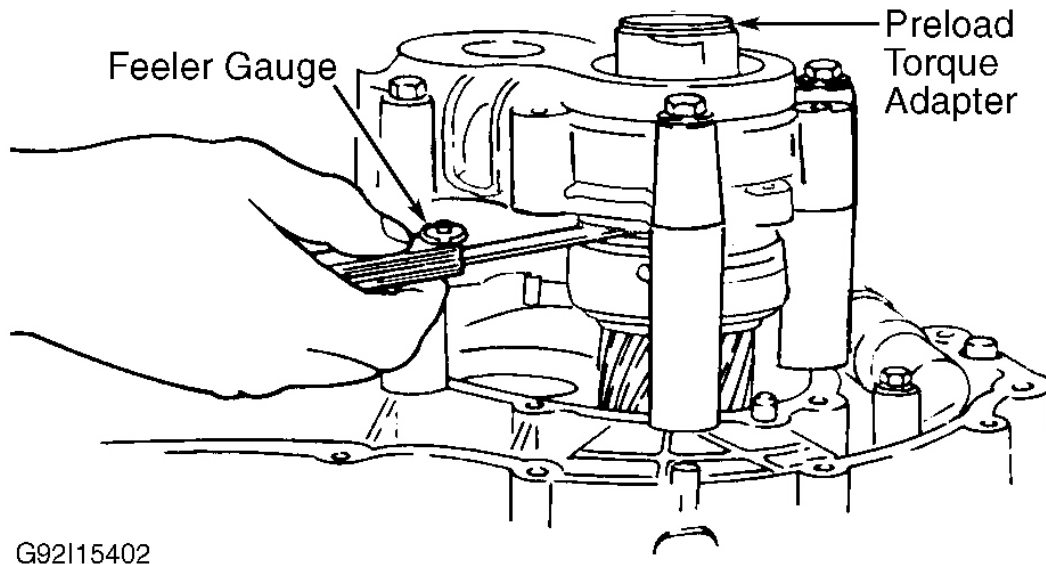
SPECIFICATIONS.

2. Remove bearing cup and adjustment shim(s) from bearing housing. Insert output gear into converter housing. Place bearing cup over output gear bearing and 4 collars of Shim Selector Set (T88C-77000-JF) on converter housing.
3. Install Shim Selector Gauge (T91P-77000-B) on output gear. Turn both halves of gauge to eliminate any gap. Place bearing housing on collars. Install 4 bolts with washers. Tighten bolts to 14-18 ft. lbs. (19-25 N.m).
4. Install Preload Torque Adapter (T90P-77000-BH) on output gear. See **Fig. 8**. Using rods provided in Shim Selector Set (T88C-77000-JF), loosen gauge halves until all free play is removed and bearing cup is seated.
5. Measure drag on output gear bearing using an INCH-lb. torque wrench. Read preload when output gear starts to turn. Turn gauge halves using rods to obtain specified preload of .26-7.8 INCH lbs. (.03-.9 N.m).
6. Using a feeler gauge, measure gap between 2 halves of shim selection gauge in 4 locations at 90 degree intervals. See **Fig. 9**. Using largest measurement, select no more than 7 shims to maintain clearance. Shims are available in thicknesses of .020-.057" (.50-1.45 mm) in .001" (.025 mm) increments.
7. Remove bolts, washers, bearing housing, gauge and bearing cup. Install selected shim(s) and bearing cup into bearing housing. Install bearing housing. Tighten retaining bolts to 14-18 ft. lbs. (19-25 N.m). Measure bearing preload. If preload is not .26-7.8 INCH lbs. (.03-.9 N.m), repeat steps 1 -7 . Remove bearing housing when proper preload specification is obtained.



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Fig. 8: Measuring Output Gear Bearing Preload
Courtesy of FORD MOTOR CO.



G92I15402

Fig. 9: Measuring Output Gear Bearing Clearance
 Courtesy of FORD MOTOR CO.

FORWARD/COASTING/REVERSE CLUTCH ASSEMBLY

NOTE: Coast clutch return spring also serves as forward clutch return spring.

Disassembly (Forward Clutch)

Remove retaining ring and pressure plate. Remove forward clutch pack and dished plate. See **Fig. 11**.

Disassembly (Coasting Clutch)

Remove coasting clutch retaining ring, pressure plate, coasting clutch pack and dished plate. See **Fig. 12**. Install appropriate spring compressor, and compress return spring and retainer. Remove retaining ring. Remove spring compressor. Remove return spring and retainer. Remove coasting clutch drum from forward and reverse clutch drum assembly using compressed air. See **Fig. 10**.

Disassembly (Reverse Clutch)

Remove retaining ring, pressure plate, reverse clutch pack and dished plate. See **Fig. 13**. Using appropriate spring compressor, compress piston return spring. Remove retaining ring from groove using snap ring pliers. Place forward/coasting/reverse clutch drum assembly on oil pump. Carefully remove reverse clutch piston by applying compressed air to reverse clutch fluid passage in oil pump. See **Fig. 10**.

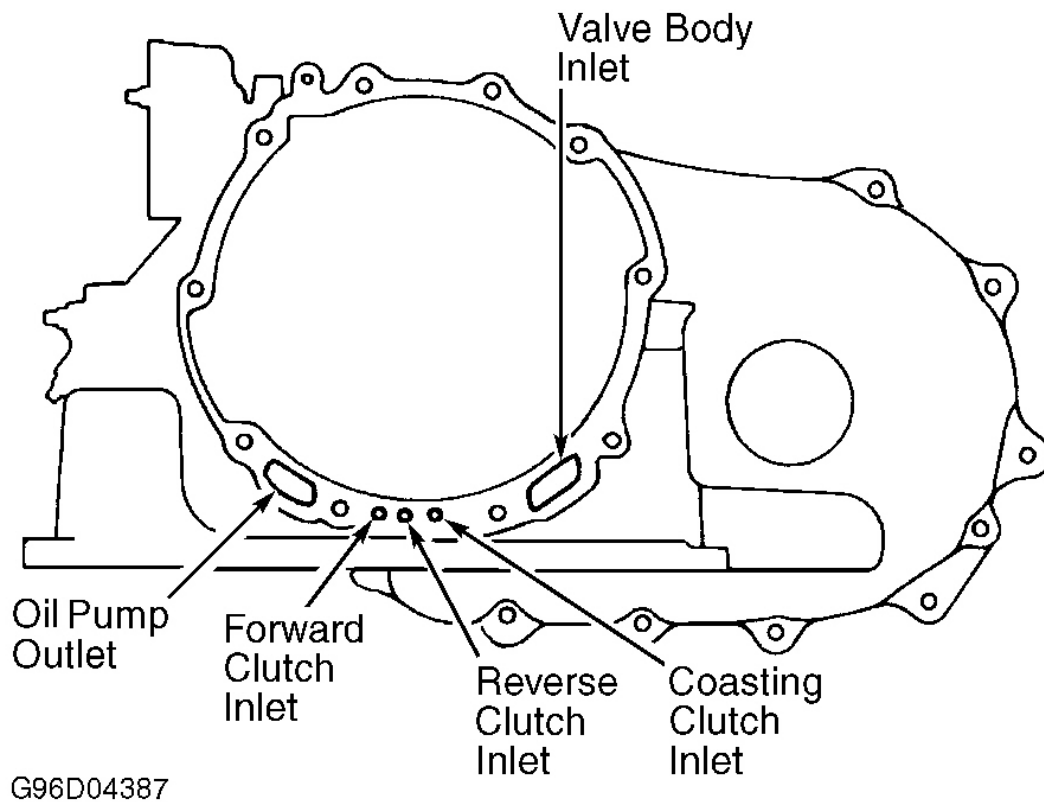
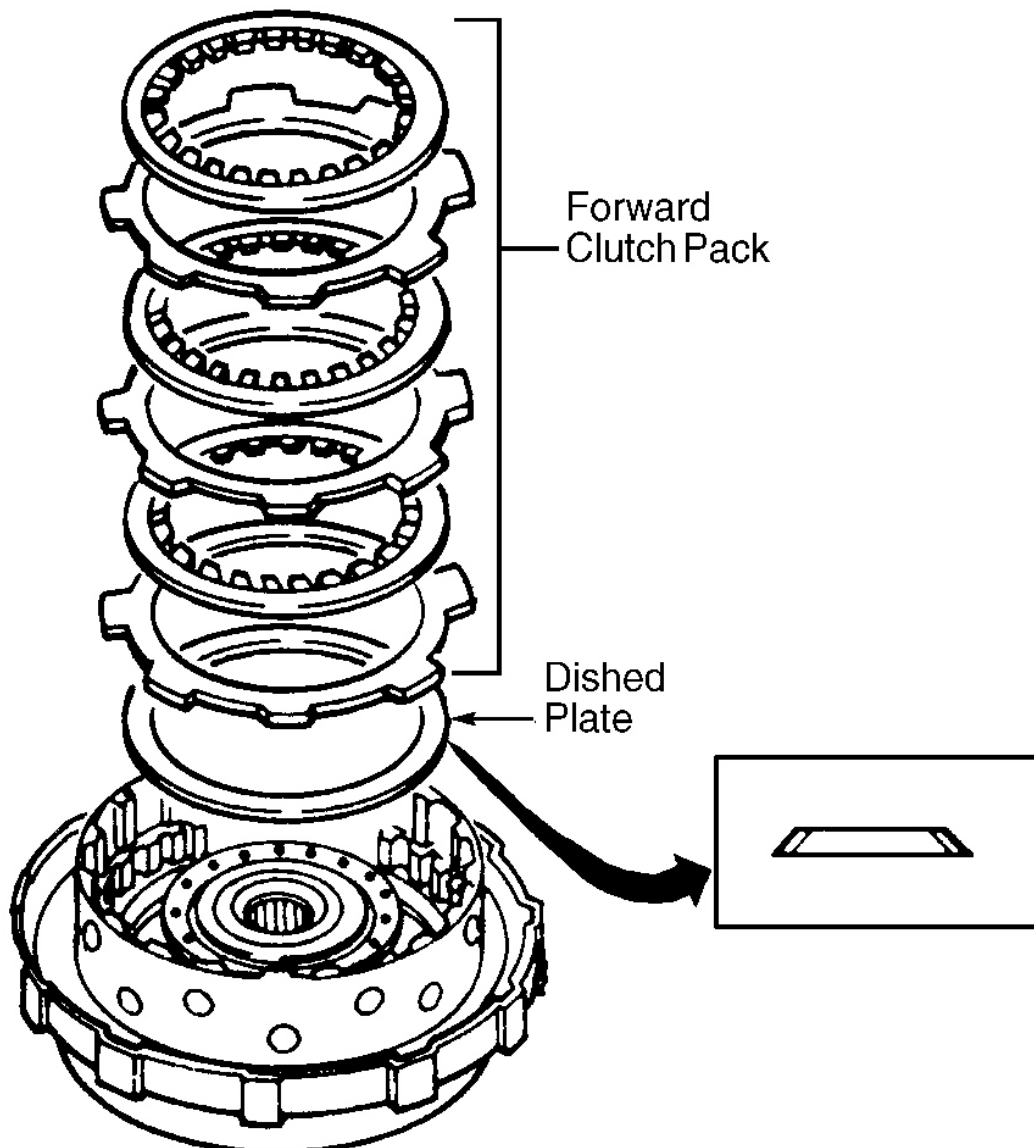


Fig. 10: Identifying Transaxle Case-To-Oil Pump Oil Passages
Courtesy of FORD MOTOR CO.



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Fig. 11: Exploded View Of Forward Clutch
Courtesy of FORD MOTOR CO.

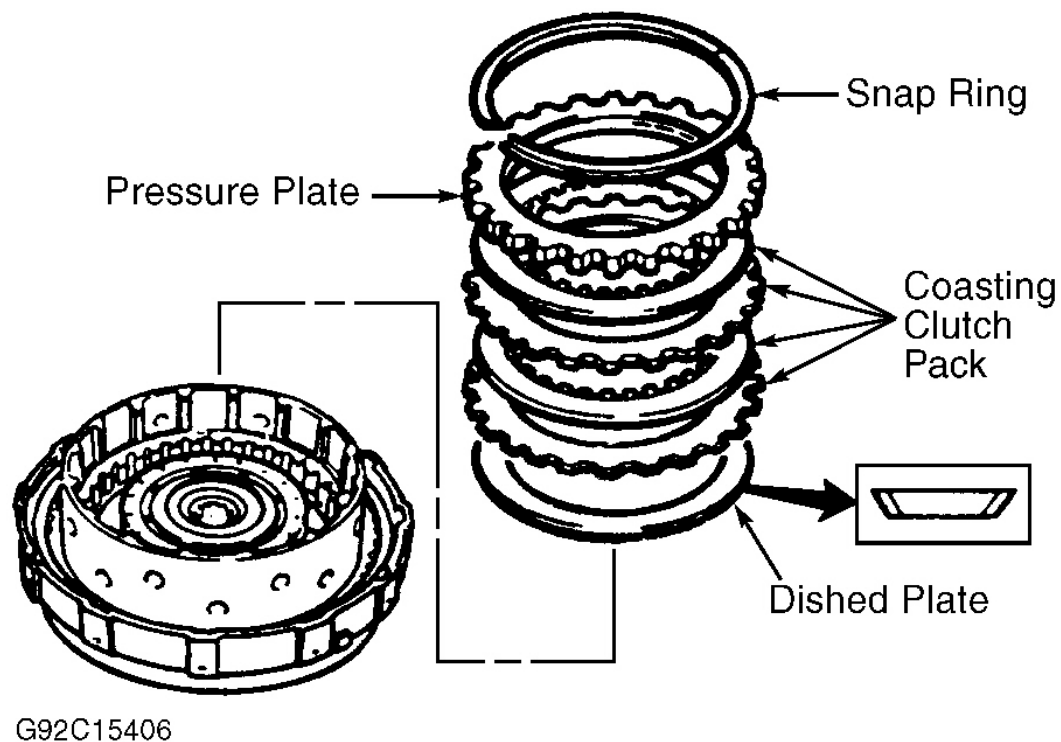


Fig. 12: Exploded View Of Coasting Clutch
Courtesy of FORD MOTOR CO.

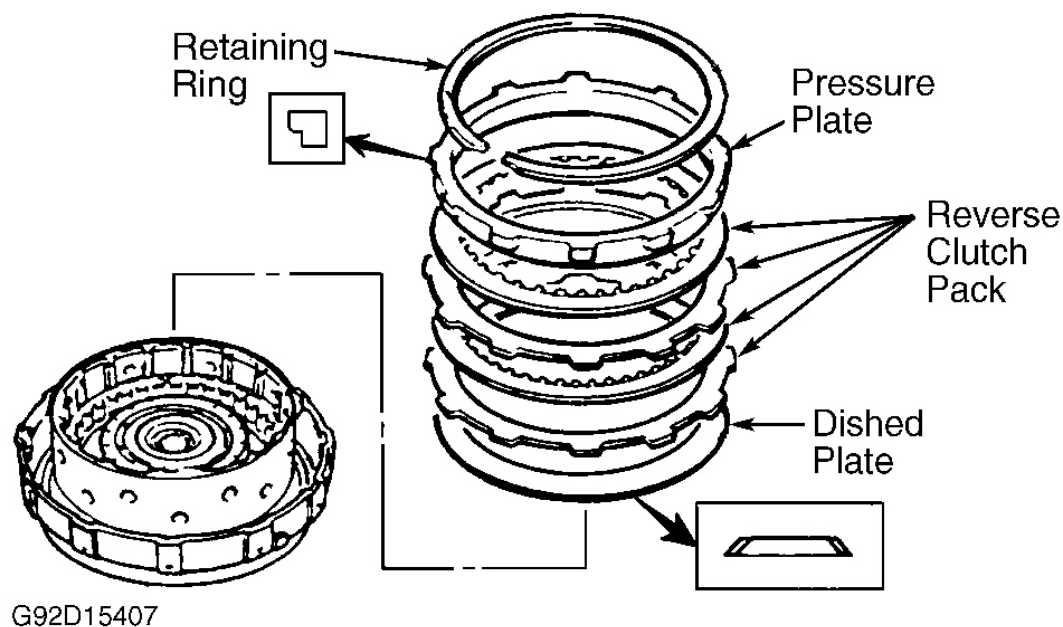


Fig. 13: Exploded View Of Reverse Clutch
Courtesy of FORD MOTOR CO.

Inspection

Inspect all parts for wear, damage and effects of overheating. Inspect drum body for damage and wear. Replace as necessary.

NOTE: Forward/coasting/reverse clutch reassembly procedure is in reverse order from disassembly procedure.

Reassembly (Reverse Clutch)

1. Install NEW "O" rings on reverse clutch piston. Apply transmission fluid to "O" rings. Using appropriate seal protector, install piston into forward and reverse drum. If necessary, use a screwdriver to seat piston.
2. Remove seal protector. Install reverse clutch piston return spring with tabs facing away from piston. Install return spring spacer with step side facing upward. Install retaining ring half-way down reverse and forward drum.
3. Using spring compressor, compress spring. Install retaining ring using a screwdriver. Remove spring compressor. Install dished plate with beveled side facing upward. See **Fig. 13**. Install reverse clutch pack.
4. Install pressure plate with step side facing down. Install retaining ring. Using a feeler gauge, check clearance between retaining ring and pressure plate. If clearance is not .039-.051" (1.0-1.3 mm), install correct thickness retaining ring. Retaining rings are available in the following thicknesses: .079" (2.00 mm), .087" (2.20 mm), .094" (2.40 mm), .102" (2.60 mm), .110" (2.80 mm) and .118" (3.00 mm).
5. Ensure oil seal rings are installed onto oil pump assembly and place reverse clutch on oil pump. Carefully

check clutch operation by applying air pressure through reverse clutch feed passage. See **Fig. 10**. Apply short burst of air through reverse clutch feed passage. Clutch pack should make a solid apply sound, with no whistles or leaks. Pressure should not exceed 57 psi (4 kg/cm²).

Reassembly (Coasting Clutch)

1. Install NEW "O" rings on coasting clutch piston. Apply transmission fluid to "O" rings, and install piston into coasting clutch drum. Gently roll outer "O" ring lip down to ease installation of coasting clutch piston.
2. Install coasting clutch drum into forward clutch drum assembly. Install return spring and retainer. Use appropriate spring compressor to compress spring and retainer. Install retaining ring.
3. Carefully remove spring compressor. Install dished plate with beveled side down. See **Fig. 12**. Install coasting clutch pack. Install pressure plate, and secure pack using retaining ring.
4. Using a feeler gauge, measure clearance between retaining ring and pressure plate. Clearance should be .039-.047" (1.00-1.20 mm). If clearance is not as specified, install correct thickness retaining ring. Retaining rings are available in the following thicknesses: .063" (1.60 mm), .069" (1.75 mm), .075" (1.90 mm), .081" (2.05 mm), .087" (2.20 mm), .093" (2.35 mm), .098" (2.50 mm) and .104" (2.65 mm).
5. Ensure oil seal rings are installed onto oil pump assembly and place coasting clutch on oil pump. Carefully check clutch operation by applying air pressure through coasting clutch feed passage. See **Fig. 10**. Apply short burst of air through fluid passage. Clutch pack should make a solid apply sound, with no whistles or leaks. Pressure should not exceed 57 psi (4 kg/cm²).

Reassembly (Forward Clutch)

1. Install dished plate with beveled side facing up. See **Fig. 11**. Install forward clutch pack starting with a steel plate. Install pressure plate and retaining ring.
2. Using a feeler gauge, check clearance between retaining ring and pressure plate. If clearance is not .039-.047" (1.00-1.20 mm), install correct thickness retaining ring. Retaining rings are available in the following thicknesses: .071" (1.80 mm), .077" (1.95 mm), .083" (2.10 mm), .089" (2.25 mm), .094" (2.40 mm), .100" (2.55 mm), .106" (2.70 mm) and .112" (2.85 mm).
3. Ensure oil seal rings are installed onto oil pump assembly and place forward and reverse drum on oil pump. Carefully check clutch operation by applying air pressure through forward clutch feed passage. See **Fig. 10**. Apply short burst of air through fluid passages. Clutch pack should make a solid apply sound, with no whistles or leaks. Pressure should not exceed 57 psi (4 kg/cm²).

DIFFERENTIAL ASSEMBLY

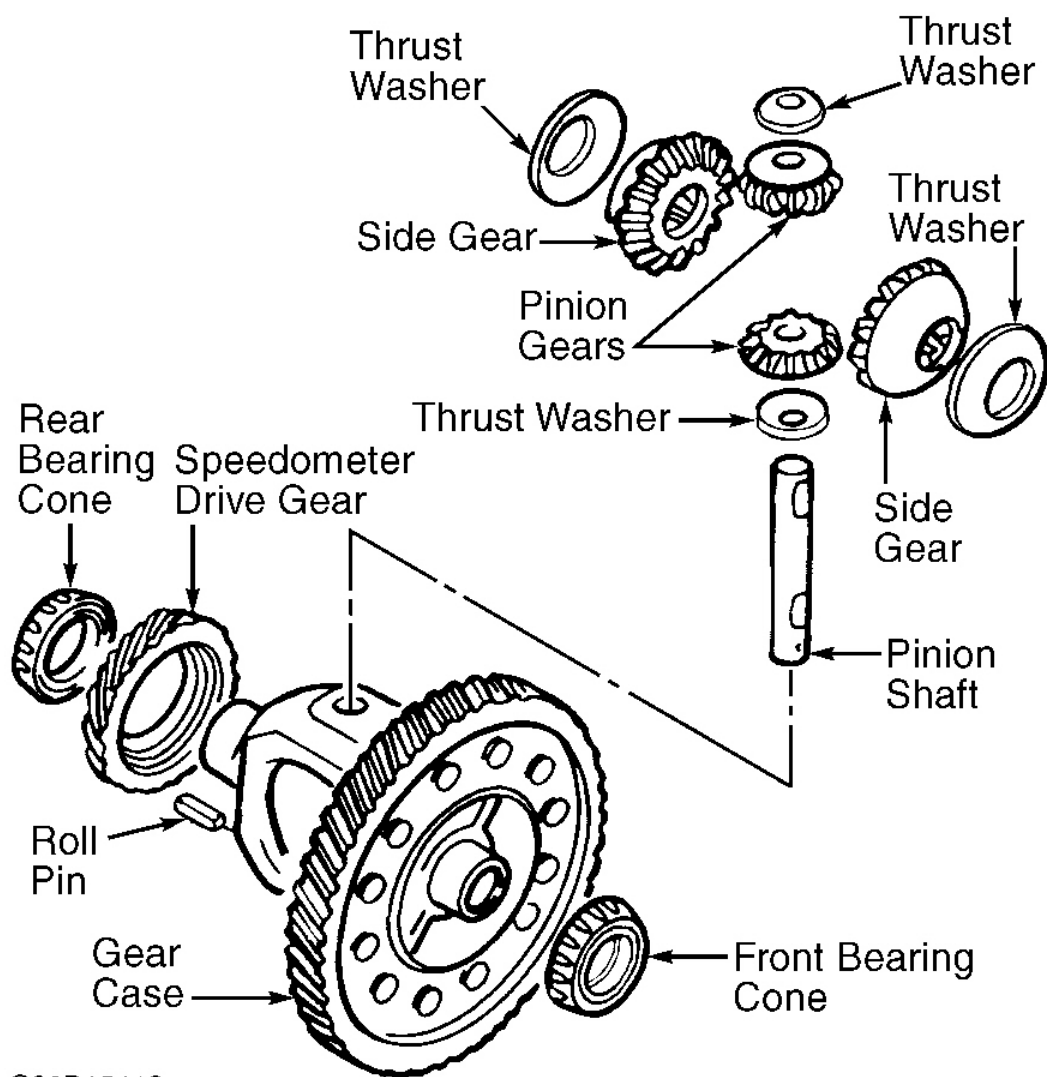
Disassembly

Using pin punch and hammer, drive out roll pin and remove pinion shaft. See **Fig. 14**. Remove pinion gears, side gears and thrust washers from differential case. Using a bearing splitter and appropriate puller, remove differential case side bearings and speedometer drive gear.

Reassembly

1. Install speedometer drive gear. Using a press and appropriate adapter, install replacement case side

- bearings. Install thrust washers, pinion gears and side gears. Install pinion shaft. Install and crimp roll pin.
2. Install left and right axle shafts into differential assembly. Support axle shafts on "V" blocks. See **Fig. 15**. Using a dial indicator, measure backlash of differential pinion gears. Differential pinion gear backlash should be .001-.004" (.02-.10 mm). Measure backlash of side gears. Side gear backlash should be .020" (.50 mm). Replace differential assembly if either specification is exceeded.



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Fig. 14: Exploded View Of Differential Assembly
 Courtesy of FORD MOTOR CO.

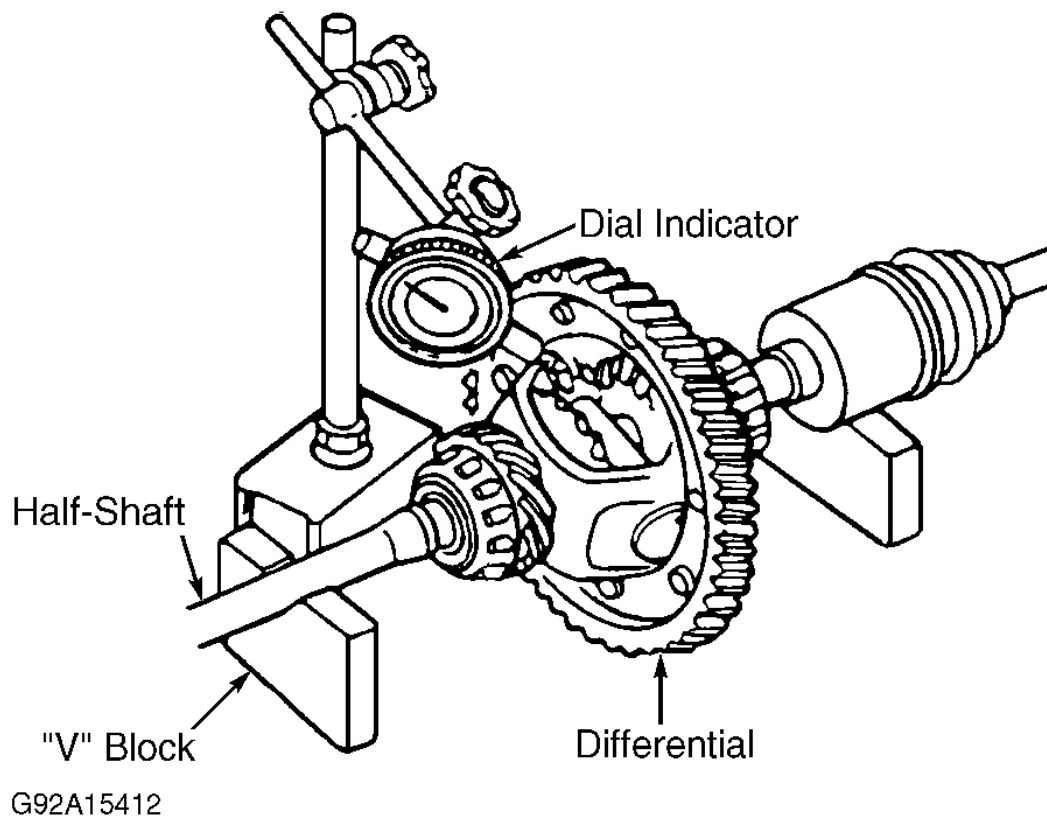


Fig. 15: Checking Differential Pinion Gear Backlash
Courtesy of FORD MOTOR CO.

IDLER GEAR

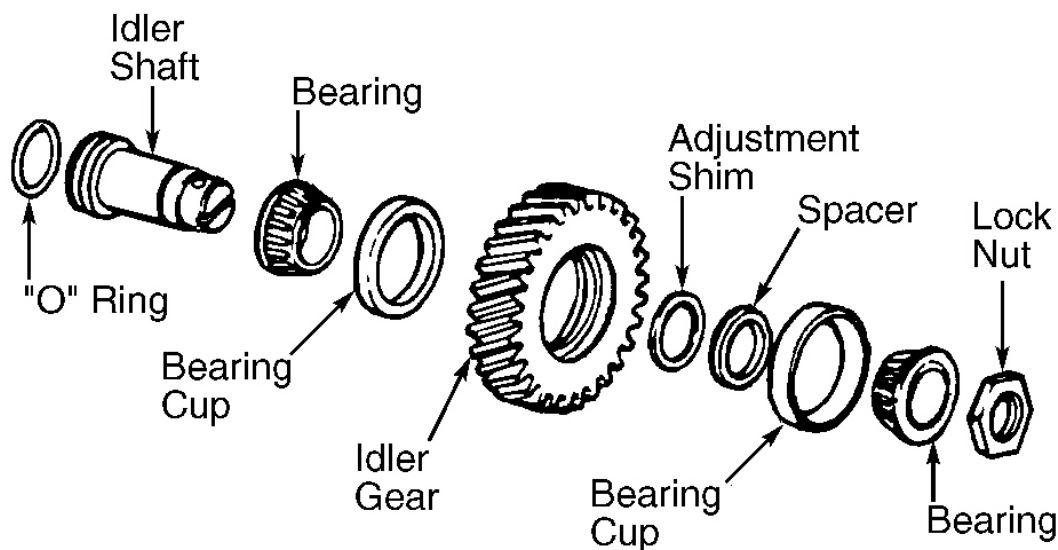
Disassembly

Using appropriate torque adapter, secure idler shaft in a vise. Remove idler gear shaft lock nut. Remove bearing, spacer and idler gear from idler shaft. See **Fig. 16**. Remove adjustment shim and other bearing. Using puller and slide hammer, remove bearing cups.

Reassembly

1. Press bearing cups into idler gear. Install bearing on idler shaft. Install adjustment shim, spacer and idler gear. Install remaining bearing. Secure idler shaft in a vise using adapter. Use protective plates to prevent damage to adapter. Tighten lock nut to 94-130 ft. lbs. (128-176 N.m).
2. Turn idler gear and adapter over, with gear mounted in vise. Measure bearing preload by turning shaft with INCH-lb. torque wrench. Preload should be .27-7.1 INCH lbs. (.03-.80 N.m). If preload is not within specification, adjust it by selecting the proper shim thickness.
3. Preload is reduced by increasing shim thickness and increased by reducing shim thickness. Shims range

in thicknesses between .150-.187" (3.80-4.75 mm) in .002" (.05 mm) increments. DO NOT use more than 7 shims.



G92D15415

Fig. 16: Exploded View Of Idler Gear Components
Courtesy of FORD MOTOR CO.

LOW/REVERSE CLUTCH PISTON

NOTE: Check operation and clearance of low/reverse clutch prior to disassembly.

Disassembly

1. Using appropriate spring compressor, compress clutch support and spring. See **Fig. 18**. Remove retaining ring, low/reverse clutch support and spring. See **Fig. 19**.
2. To prevent damage to low/reverse clutch piston, face transaxle case opening down, over soft surface. Apply 57 psi (4 kg/cm²) of compressed air maximum to low/reverse clutch fluid passage, and remove low/reverse piston. See **Fig. 17**. Remove piston inner and outer seals.

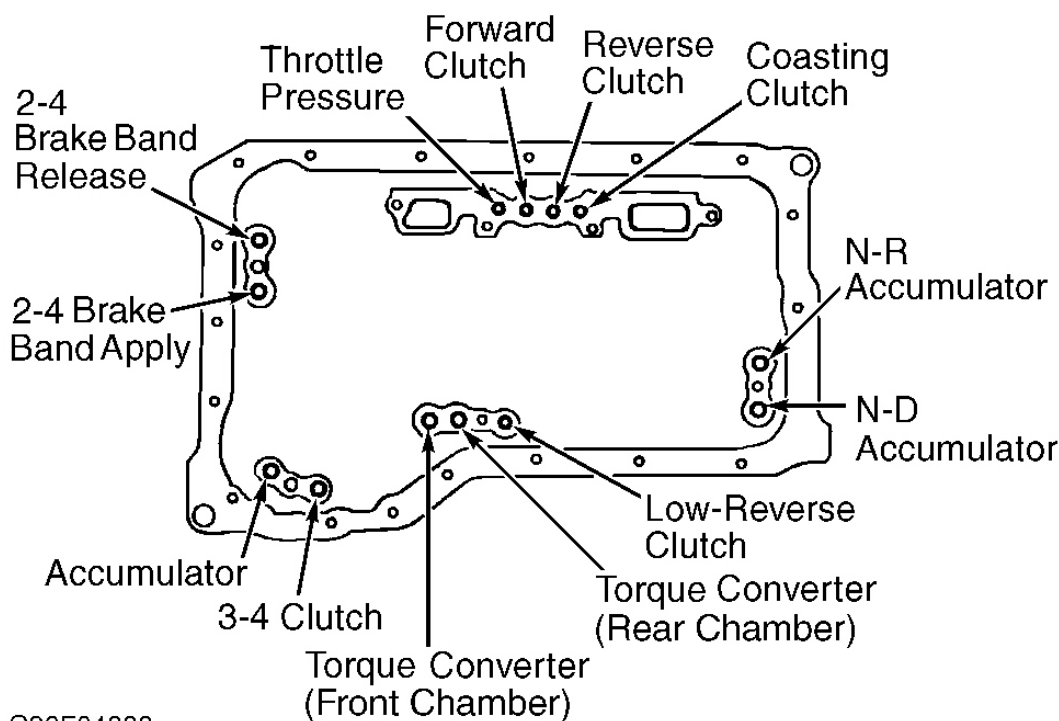


Fig. 17: Identifying Transaxle Case-To-Valve Body Oil Passages
 Courtesy of FORD MOTOR CO.

Inspection

Inspect all parts for wear, damage and effects of overheating. Check case body thoroughly for wear and damage. Replace all parts as necessary.

Reassembly

1. Apply transmission fluid to NEW low/reverse piston seals, and install on low/reverse piston. Using appropriate seal protector, install piston into transaxle case. See **Fig. 19**.
2. Remove seal protector. Install clutch support and spring. Using spring compressor, compress clutch support and spring. Install retaining ring. Remove spring compressor.

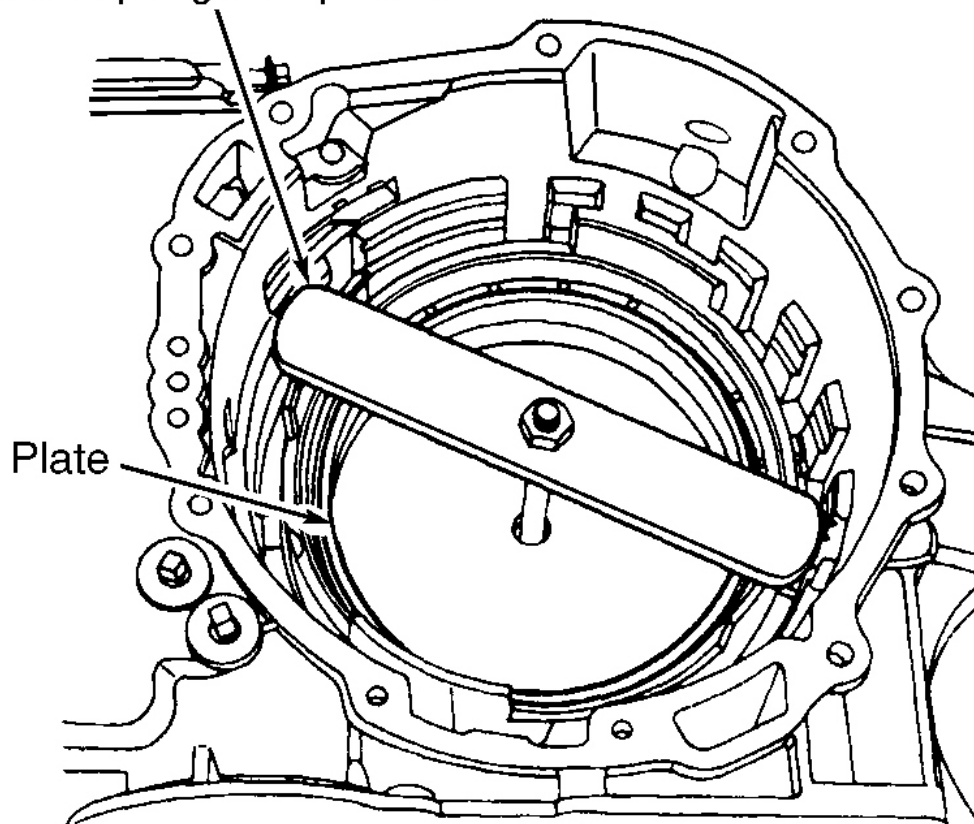
NOTE: Perform following steps to determine proper low/reverse clutch pack selective retaining ring. After correct clearance is obtained, remove low/reverse clutch pack. Ensure selected retaining ring is identified for later assembly.

3. Install low/reverse clutch pack. Install pressure plate and retaining ring. Using a feeler gauge, check clearance between retaining ring and pressure plate. If clearance is not .083-.094" (2.10-2.40 mm), install

correct thickness retaining ring and recheck clearance.

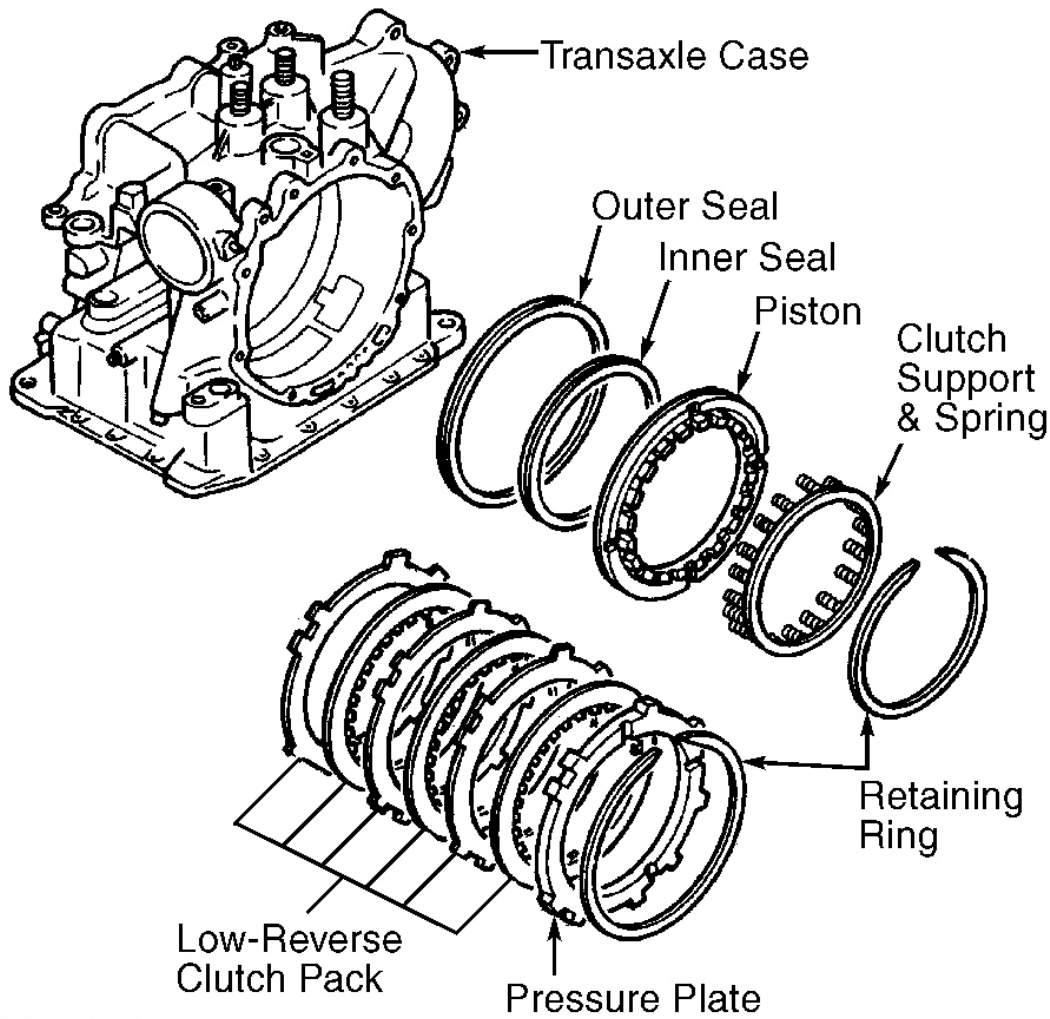
4. Retaining rings are available in the following thicknesses: .079" (2.00 mm), .087" (2.20 mm), .094" (2.40 mm), .102" (2.60 mm), .110" (2.80 mm) and .118" (3.00 mm). Carefully check clutch operation by applying air pressure through low/reverse clutch fluid passage. See **Fig. 17**.
5. Apply short burst of air through low/reverse clutch feed passage. Clutch pack should make a solid apply sound, with no whistles or leaks. Pressure should not exceed 57 psi (4 kg/cm²).
6. Remove low/reverse clutch retaining ring, pressure plate and clutch pack. Identify selected retaining ring for reassembly reference. Low-reverse clutch pack will be installed during transaxle reassembly.

Return Spring Compressor



G92F15425

Fig. 18: View Of Low/Reverse Piston Clutch Spring Compressor
Courtesy of FORD MOTOR CO.



G96H04389

Fig. 19: Exploded View Of Low/Reverse Clutch
 Courtesy of FORD MOTOR CO.

OIL PUMP

Disassembly & Reassembly

Remove thrust washer and seal rings from pump cover. Remove oil pump cover bolts in crisscross pattern. Remove cover and place reference marks on pump gears for reassembly reference. Remove drive flange and gears. See **Fig. 20**. Remove plug, washer, spring and valve from oil pump body. Assemble pump in reverse order of disassembly. Tighten cover bolts to specification. See **TORQUE SPECIFICATIONS**.

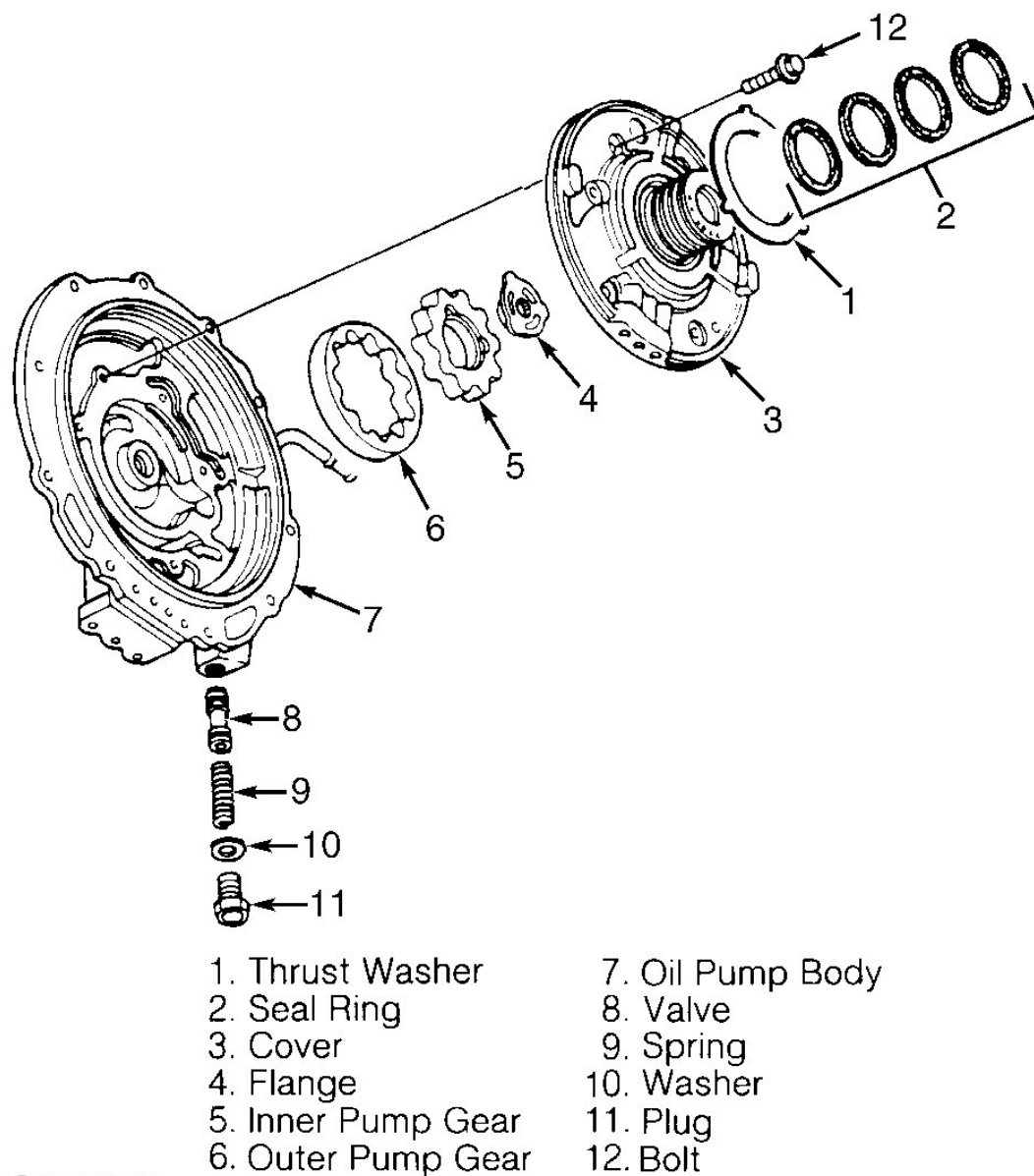
Inspection

1999 Kia Sephia**1999 AUTOMATIC TRANSMISSIONS Ford F4E-III (Mazda FA4A-EL) Overhaul**

Check oil pump for broken or worn seal rings, weak springs and damaged or worn sliding surfaces. Replace as required. Measure oil pump components clearances. See **OIL PUMP COMPONENT CLEARANCES** table. Use appropriate gauge bar, feeler gauge and/or micrometer as needed. If clearances are not within specifications, replace oil pump.

OIL PUMP COMPONENT CLEARANCES

Component	Standard Clearance In. (mm)	Max. Clearance In. (mm)
Gear-To-Housing ⁽¹⁾	.0008-.0020 (.020-.050)	.002 (.05)
Inner Gear-To-Oil Pump Boss	.0016-.0049 (.040-.125)	.0049 (.125)
Spool Valve ⁽²⁾	.550-.551 (13.98-14.00)	N/A
(1) Outer and inner gears.		
(2) Diameter.		



G94A39040

Fig. 20: Exploded View Of Oil Pump
 Courtesy of FORD MOTOR CO.

ONE-WAY (ROLLER) CLUTCH & CARRIER HUB ASSEMBLY

Disassembly

Remove one-way clutch, wave washer, thrust washers and retaining ring. See **Fig. 21**. Remove front planet assembly from inner race. Place one-way clutch on inner race, and ensure clutch rotates smoothly and clockwise

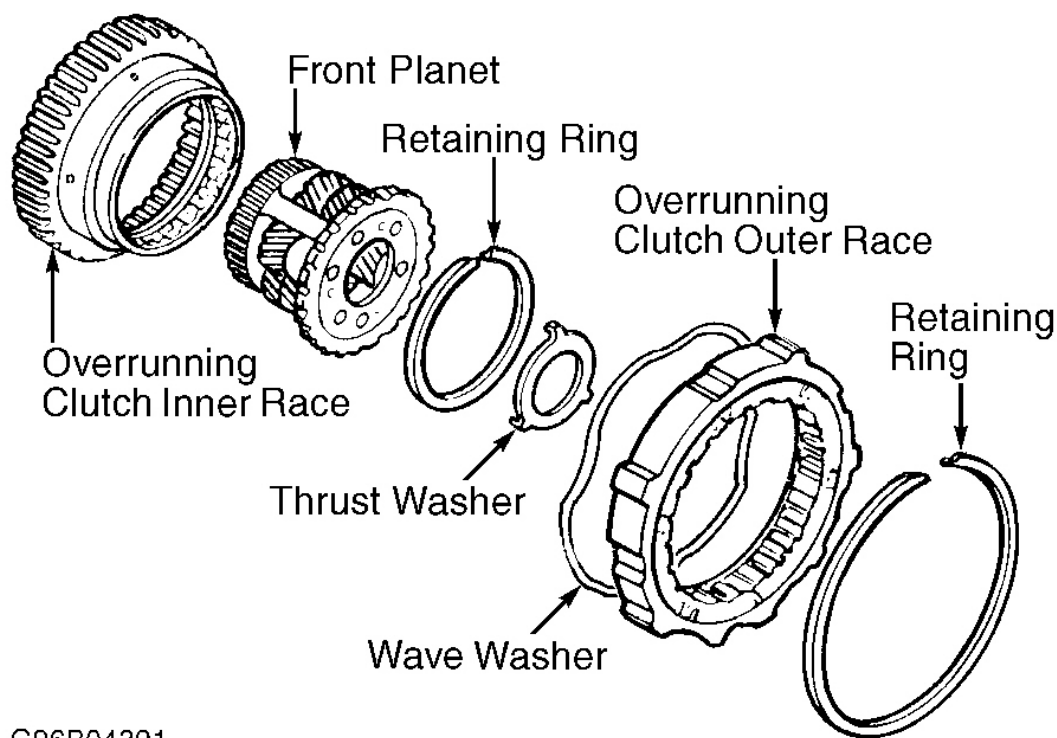
only. See **Fig. 22**.

Inspection

Inspect all parts for wear, damage and effects of overheating. Measure end play clearance between planet pinion gear washers and planet carrier. Clearance should be .008-.028" (.20-.70 mm). If clearance is not as specified, replace front planet assembly. Check planet teeth thoroughly for brinelling, wear and damage.

Reassembly

Assemble planet gear to inner race. Install retaining ring. Apply petroleum jelly to thrust washer, and install washer on front planet assembly. Thrust washer outer diameter on sun gear drum side should be 3.31" (84.0 mm). Install one-way clutch outer race and thrust washer.



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Fig. 21: Exploded View Of One-Way (Roller) Clutch & Planetary Carrier
Courtesy of FORD MOTOR CO.

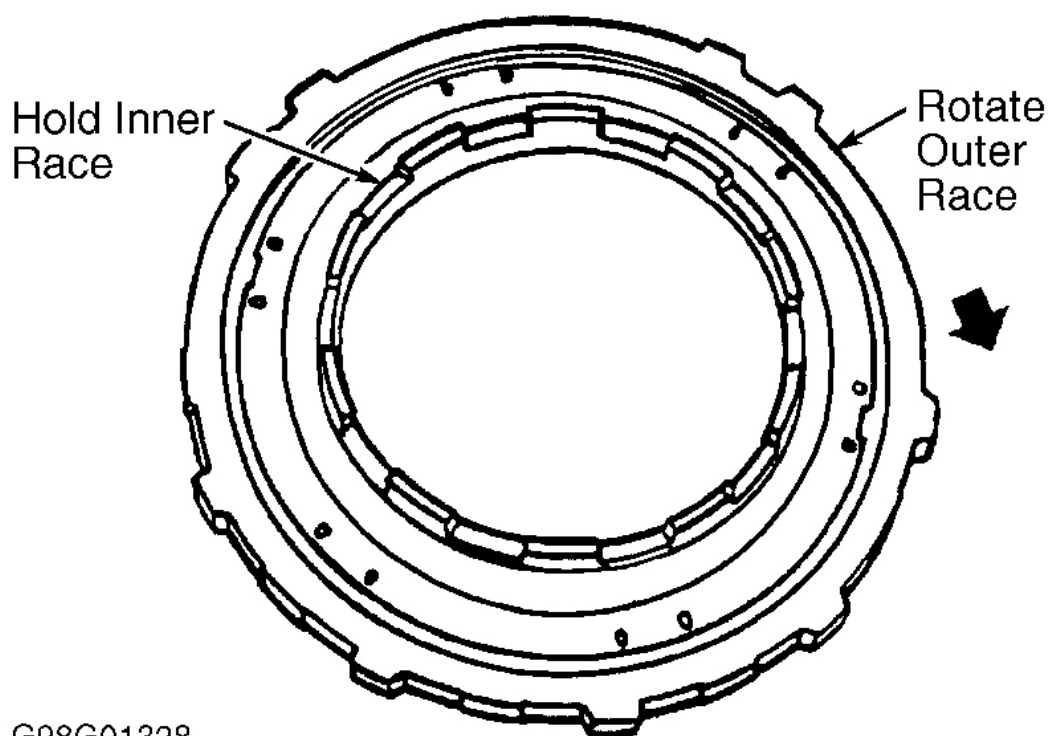


Fig. 22: Identifying One-Way (Roller) Clutch Rotation
 Courtesy of FORD MOTOR CO.

PRIMARY SUN GEAR & ONE-WAY (SPRAG) CLUTCH

Disassembly

Remove needle bearing from 2-4 band drum and rear sun gear. Remove primary sun gear retaining ring holding one-way clutch and outer race. Remove one-way clutch and outer race. See **Fig. 23**. Remove needle bearing. Remove retaining ring holding primary sun gear in rear sun gear. Separate one-way clutch from outer race. Remove inner and outer brass bushings.

Inspection

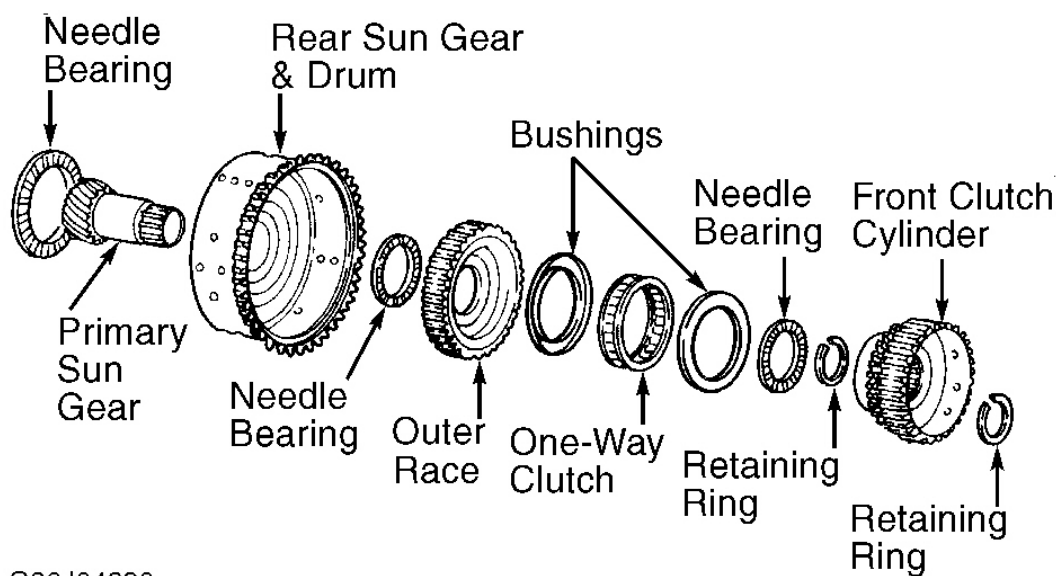
Inspect inner and outer races for wear, scoring or grooves. Inspect all parts for wear, damage and effects of overheating. Check sun gear teeth thoroughly for brinelling, wear and damage. Primary sun gear inner bushing diameter should measure .828" (21.02 mm). The 2-4 band drum and rear sun gear inner bushing diameter should measure 1.198" (30.42 mm). If either measurement is not as specified, replace worn component.

Reassembly

1. Apply petroleum jelly to one-way clutch bearings, and install bearings into inner race. Install one-way

clutch into outer race. Ensure spring cage faces toward outer race.

2. Install one-way clutch into outer race by turning counterclockwise. Ensure one-way clutch turns counterclockwise only (facing upward). See **Fig. 24**. Install primary sun gear into 2-4 band drum, and install a NEW primary sun gear retaining ring.
3. Install needle bearing onto rear sun gear and drum assembly. Install front clutch cylinder and one-way clutch inner and outer race assemblies onto sun gear and drum assembly. Ensure one-way clutch outer race and primary sun gear splines are aligned. Install a NEW primary sun gear retaining ring.
4. Hold primary sun gear, and ensure one-way clutch rotates smoothly and clockwise only. See **Fig. 25**. Apply petroleum jelly to planet gear needle bearing race, and install bearing race to drum.



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Fig. 23: Exploded View Of Primary Sun Gear & One-Way (Sprag) Clutch
Courtesy of FORD MOTOR CO.

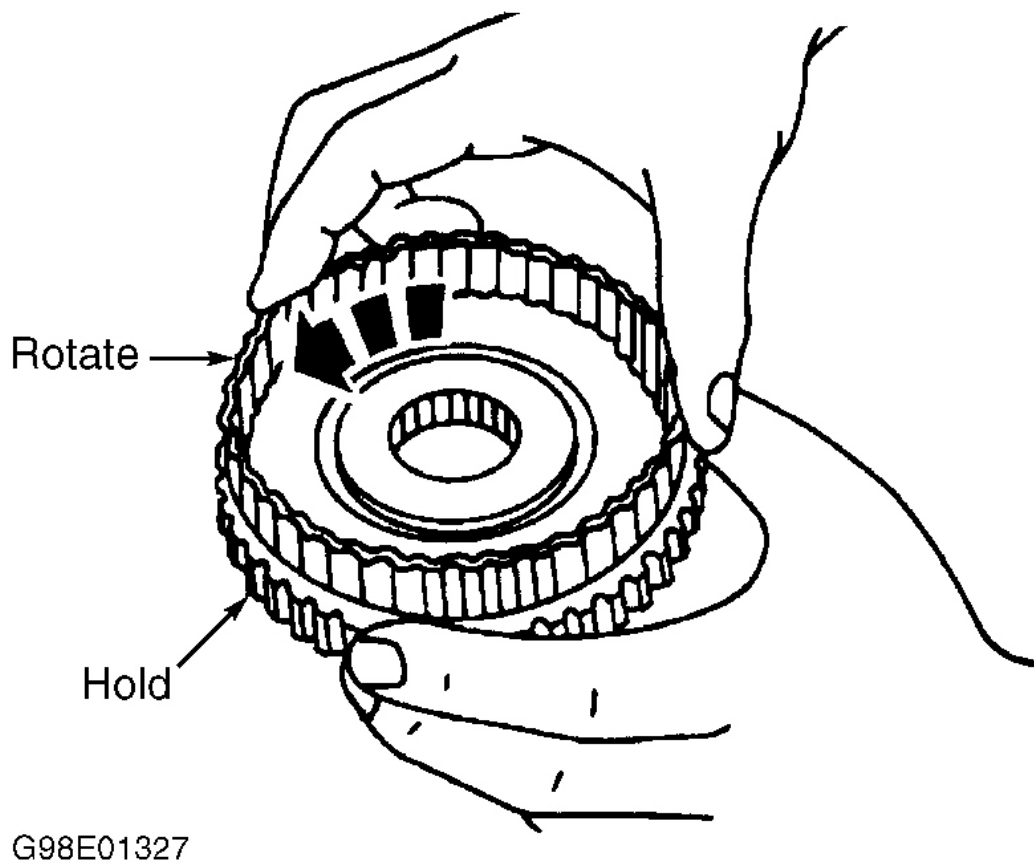


Fig. 24: Identifying One-Way (Sprag) Clutch Rotation
Courtesy of FORD MOTOR CO.

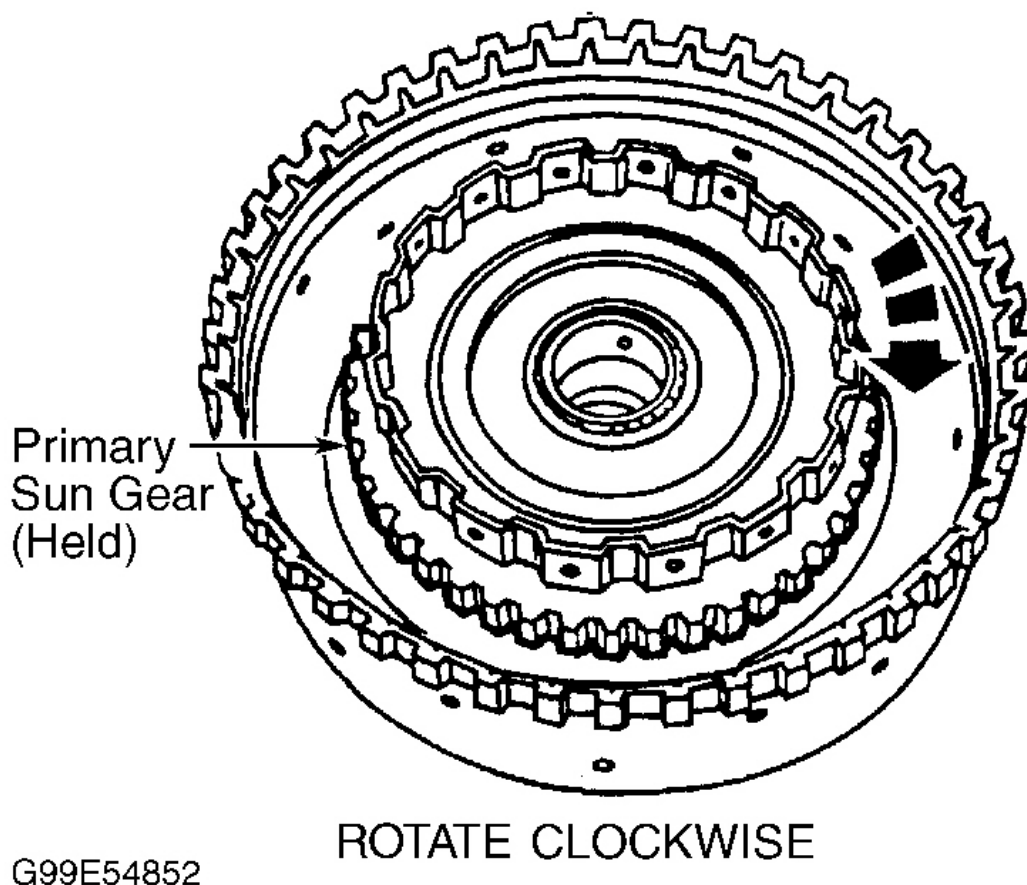


Fig. 25: One-Way (Sprag) Clutch Rotation (Assembled View)
Courtesy of FORD MOTOR CO.

3-4 CLUTCH

Disassembly

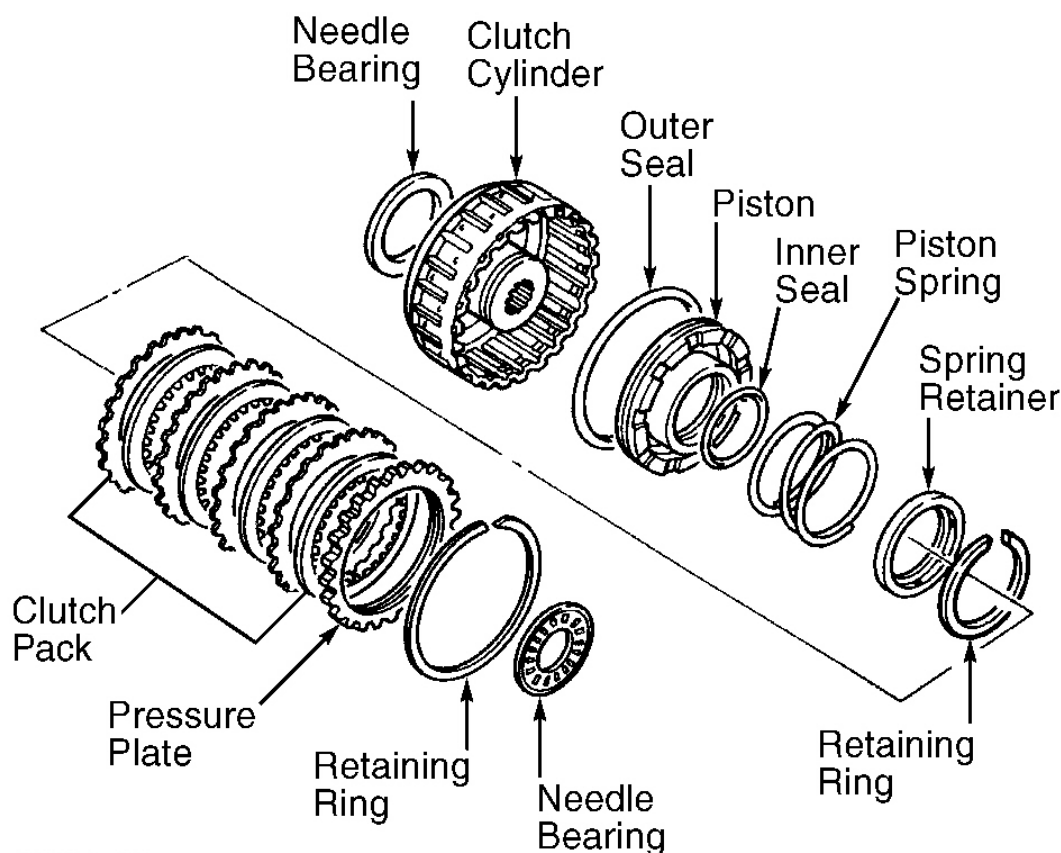
Remove needle bearing. Remove retaining ring, pressure plate and 3-4 clutch pack. See **Fig. 26**. Using appropriate spring compressor, compress 3-4 clutch return spring and retainer assembly and remove retaining ring. Remove compressor. Remove 3-4 clutch piston spring and retainer. Using appropriate leak check adapter, carefully remove piston using compressed air. Remove inner and outer seals from piston.

Reassembly

1. Install NEW seals onto 3-4 clutch piston. Apply transmission fluid to NEW seals and install 3-4 clutch piston into 3-4 clutch cylinder. Seat 3-4 clutch piston by pushing evenly around the edges of piston, being careful not to damage outer seal. Using spring compressor, compress piston spring and spring retainer.

Install retaining ring.

2. Install 3-4 clutch pack and 3-4 clutch pressure plate. Install retaining ring. Using a feeler gauge, check clearance between retaining ring and pressure plate. If clearance is not .051-.063" (1.30-1.60 mm), install correct thickness retaining ring. Retaining rings are available in the following thicknesses: .055" (1.40 mm), .063" (1.60 mm), .071" (1.80 mm), .079" (2.00 mm), .087" (2.20 mm) and .094" (2.40 mm).
3. Install leak check adapter, and apply compressed air to check clutch operation. DO NOT apply over 57 psi (4 kg/cm²) air pressure for more than 3 seconds.
4. Pour MERCON (XT-2-QDX) or equivalent automatic transmission fluid into clutch drum so 3-4 piston is fully submerged. Apply compressed air and ensure no bubbles come from clutch piston seal. Apply petroleum jelly to needle bearings and install onto 3-4 clutch cylinder



G96D04392

Fig. 26: Exploded View Of 3-4 Clutch
Courtesy of FORD MOTOR CO.

TORQUE CONVERTER STATOR SUPPORT

Disassembly & Reassembly

Using pin punch, remove bearing outer race from stator support. Remove converter hub seal and front pump "O" ring. Install converter hub seal and front pump "O" ring. See **Fig. 5**. Using appropriate bearing cup replacer, press bearing outer race into stator support.

TRANSAXLE CASE

Transaxle case and torque converter case oil passages may be checked for porosity or restrictions, by applying compressed air to appropriate ports. See **Fig. 27** and **Fig. 28**.

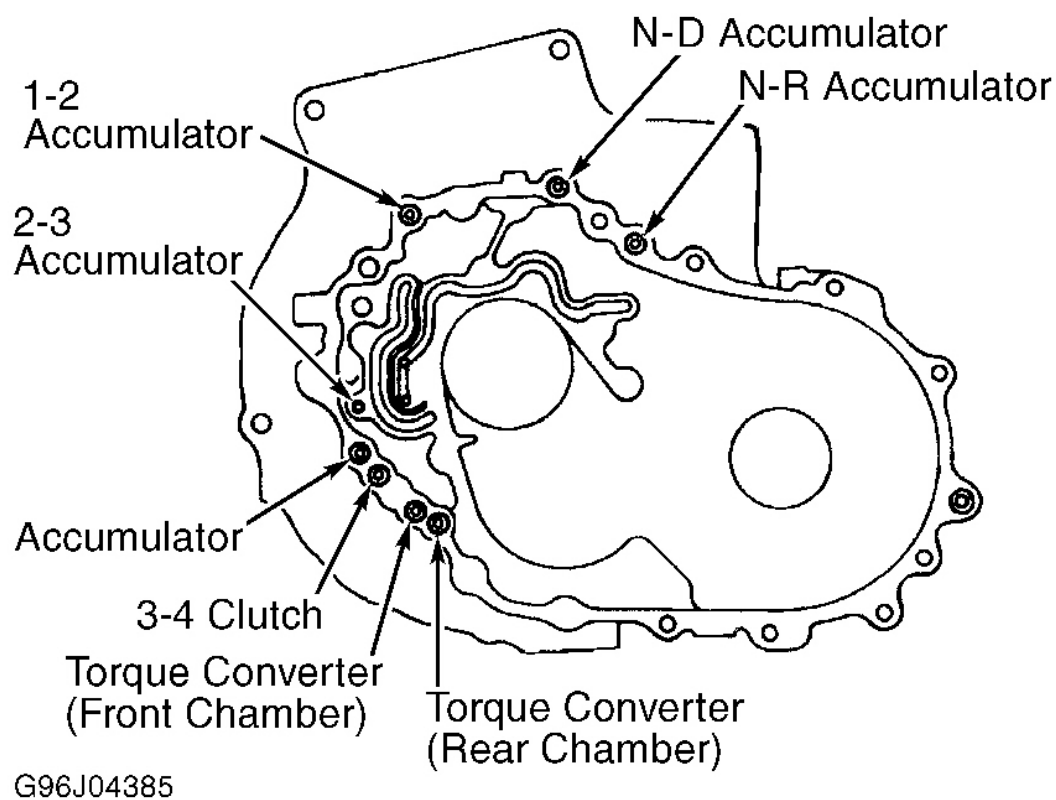


Fig. 27: Identifying Converter Housing-To-Transaxle Case Oil Passages
 Courtesy of FORD MOTOR CO.

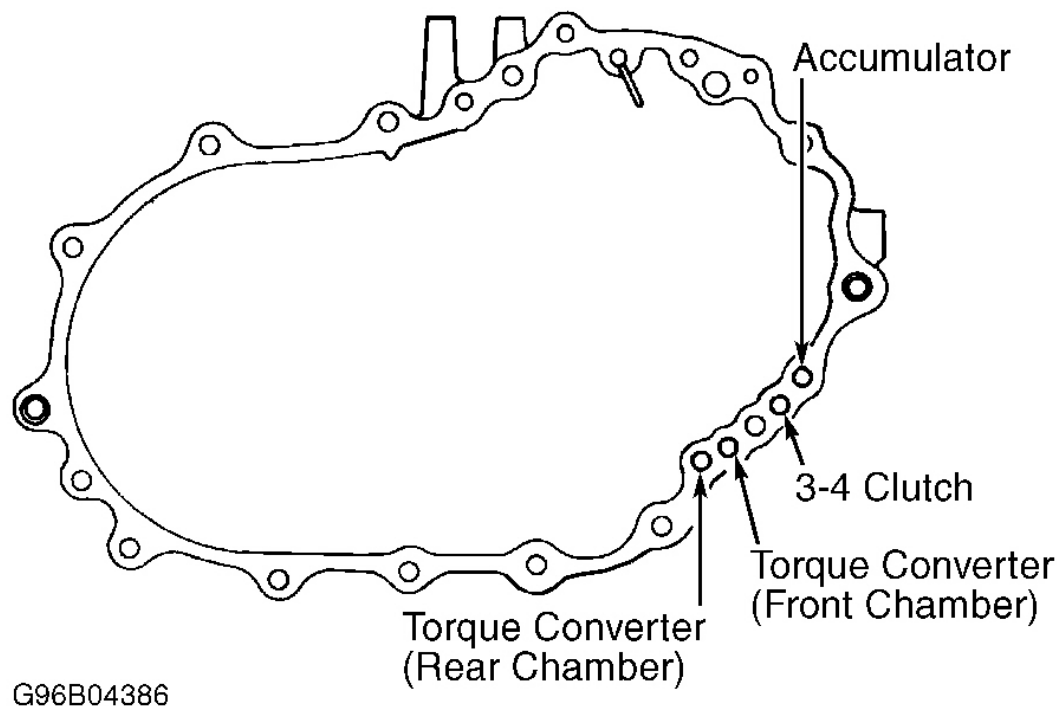


Fig. 28: Identifying Transaxle Case-To-Converter Housing Oil Passages
 Courtesy of FORD MOTOR CO.

VALVE BODY

CAUTION: Disassembly procedures identify valve body components as follows:

TOPSIDE

Side of component facing oil pan.

UNDERSIDE

Side of component facing transaxle case.

Disassembly

1. Remove oil filter and "O" ring. Remove oil pipe from lower valve body. Remove 1-2 shift solenoid and TCC solenoid with "O" rings. Remove 2-3 shift solenoid and 3-4 shift solenoid with "O" rings. See **Fig. 34** and **Fig. 35**.
2. Unbolt and remove upper control valve body. Remove screw retaining upper separator plate and gaskets to upper control valve body. Remove upper gasket, separator plate, filter, main upper gasket and oil strainer from upper control valve body. See **Fig. 29**.

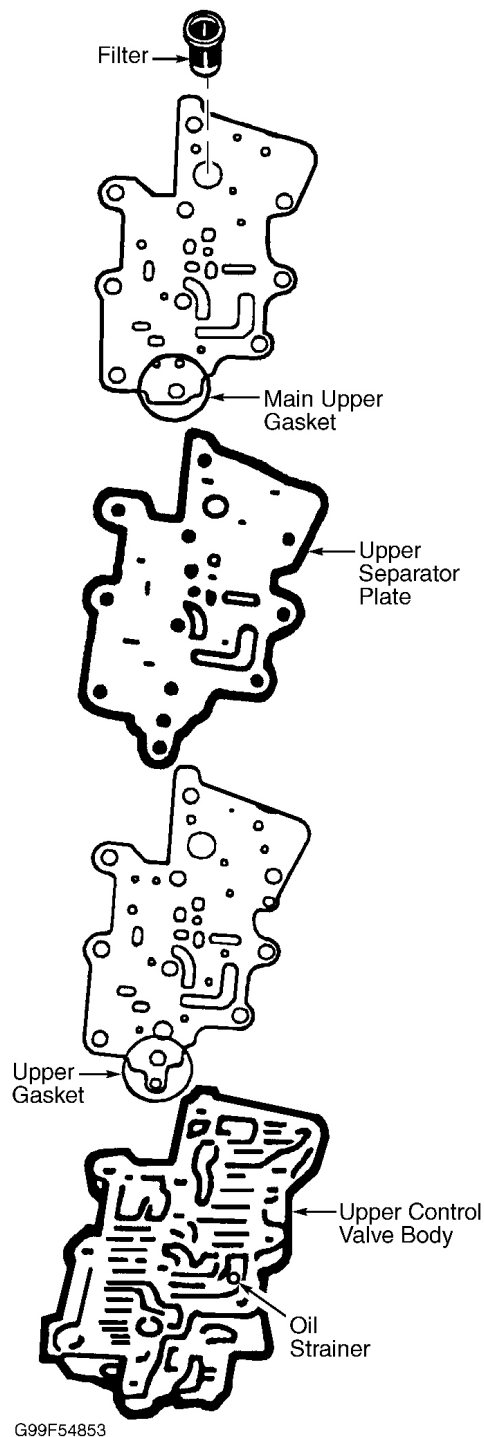


Fig. 29: Identifying Upper Valve Body Filter, Gaskets & Separator Plate
 Courtesy of FORD MOTOR CO.

3. Unbolt and remove main control valve body from premain valve body. Remove 2 screws retaining main separator plate and gaskets to main control valve body. Remove rubber check balls, gaskets and separator

plate from main control valve body. See [Fig. 30](#).

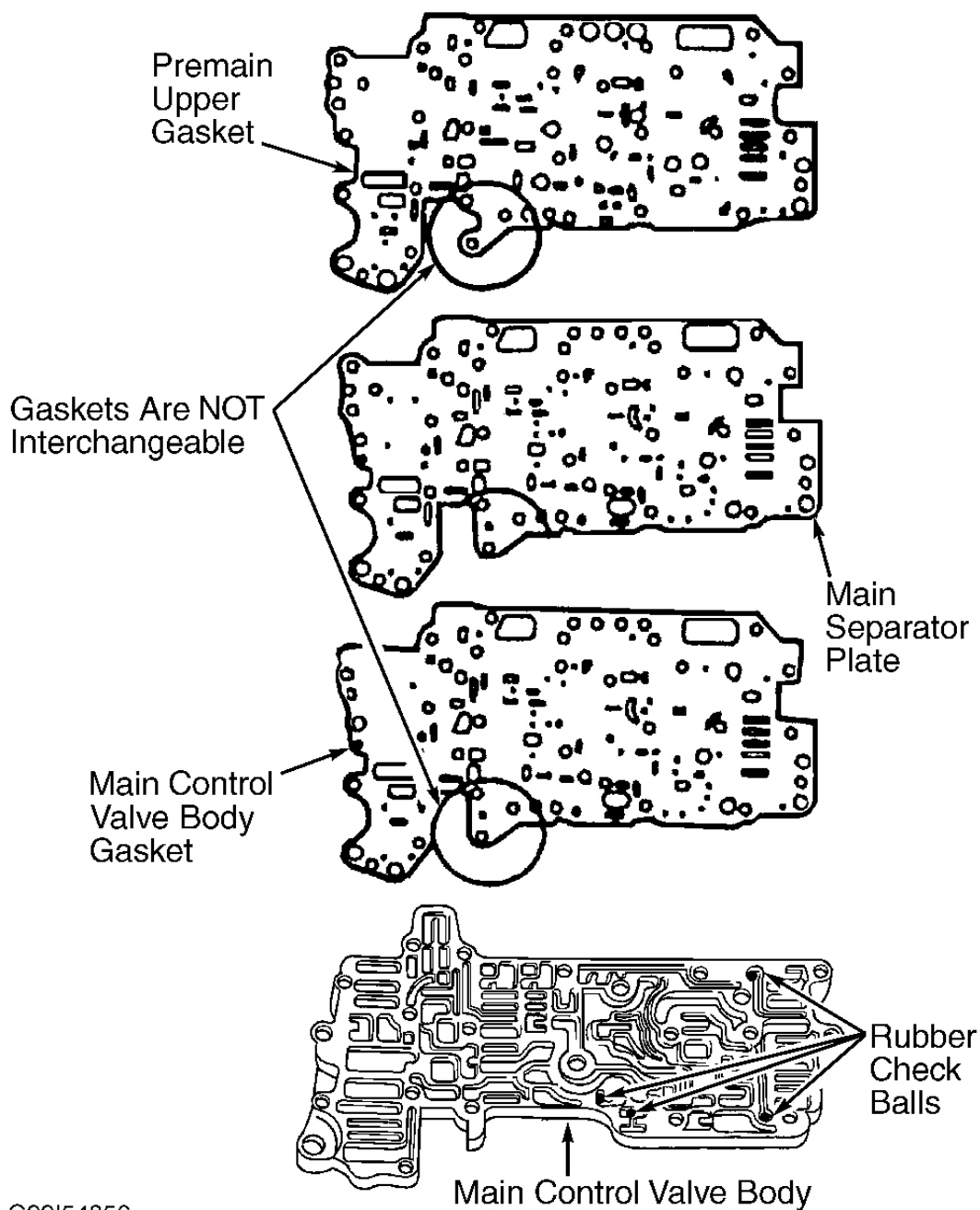


Fig. 30: Identifying Main Control Valve Body Check Balls, Gaskets & Separator Plate
Courtesy of FORD MOTOR CO.

4. Remove rubber and steel check balls and oil strainer(s) from topside of premain control valve body. See

Fig. 31. Remove oil strainer from underside (lower control valve body side) of premain valve body. See **Fig. 32.**

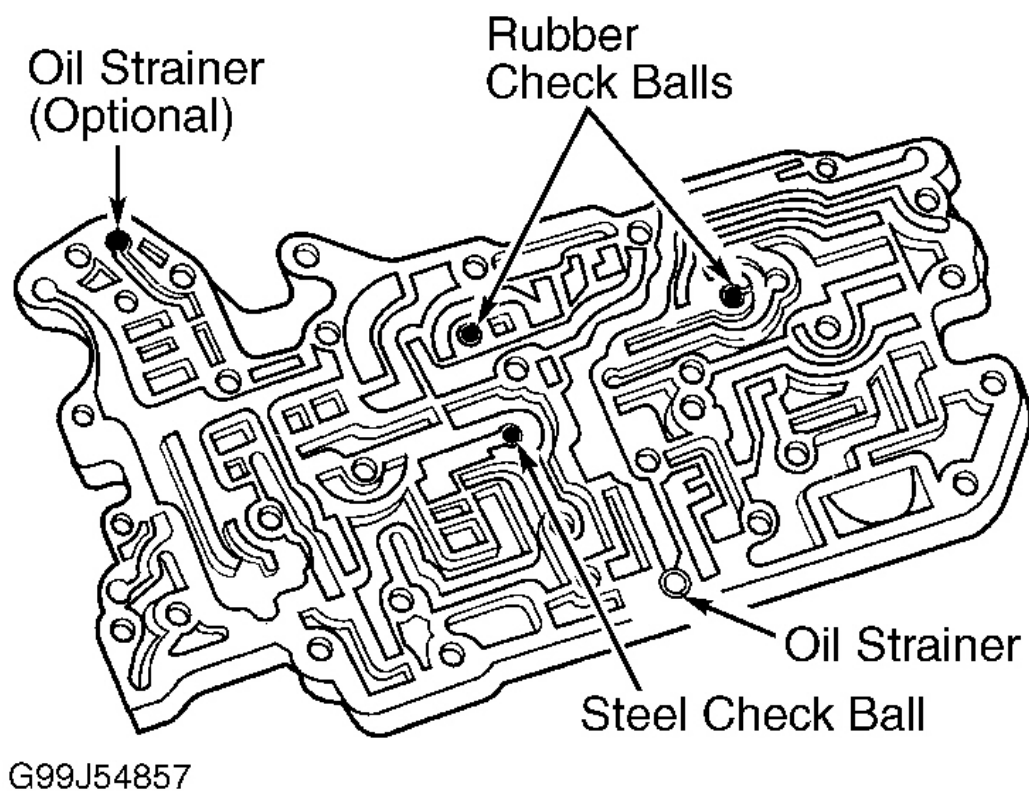


Fig. 31: Identifying Premain Valve Body Check Balls & Oil Strainer(s) (Topside)
Courtesy of KIA MOTORS AMERICA, INC.

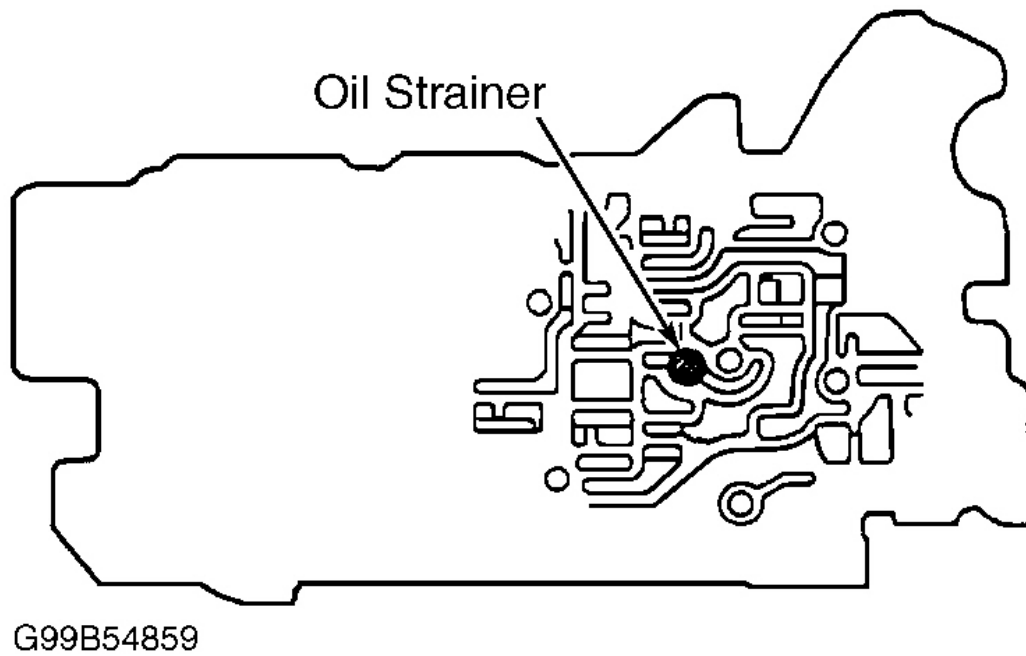
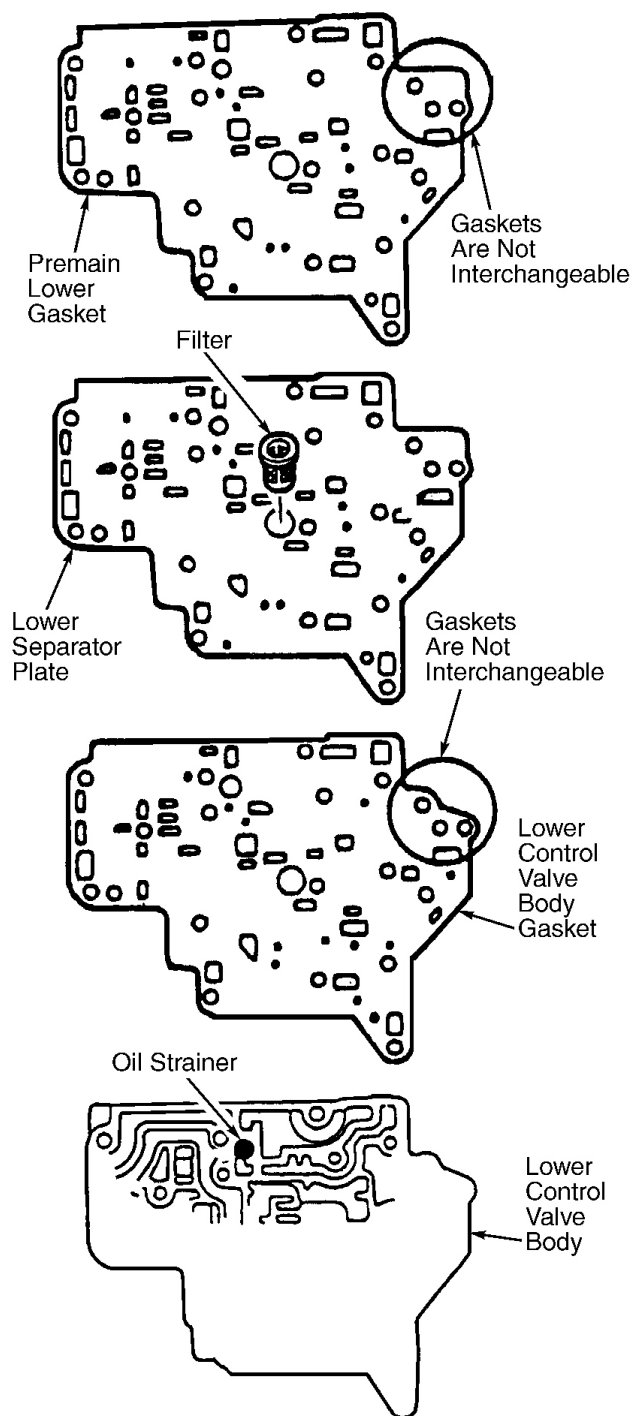


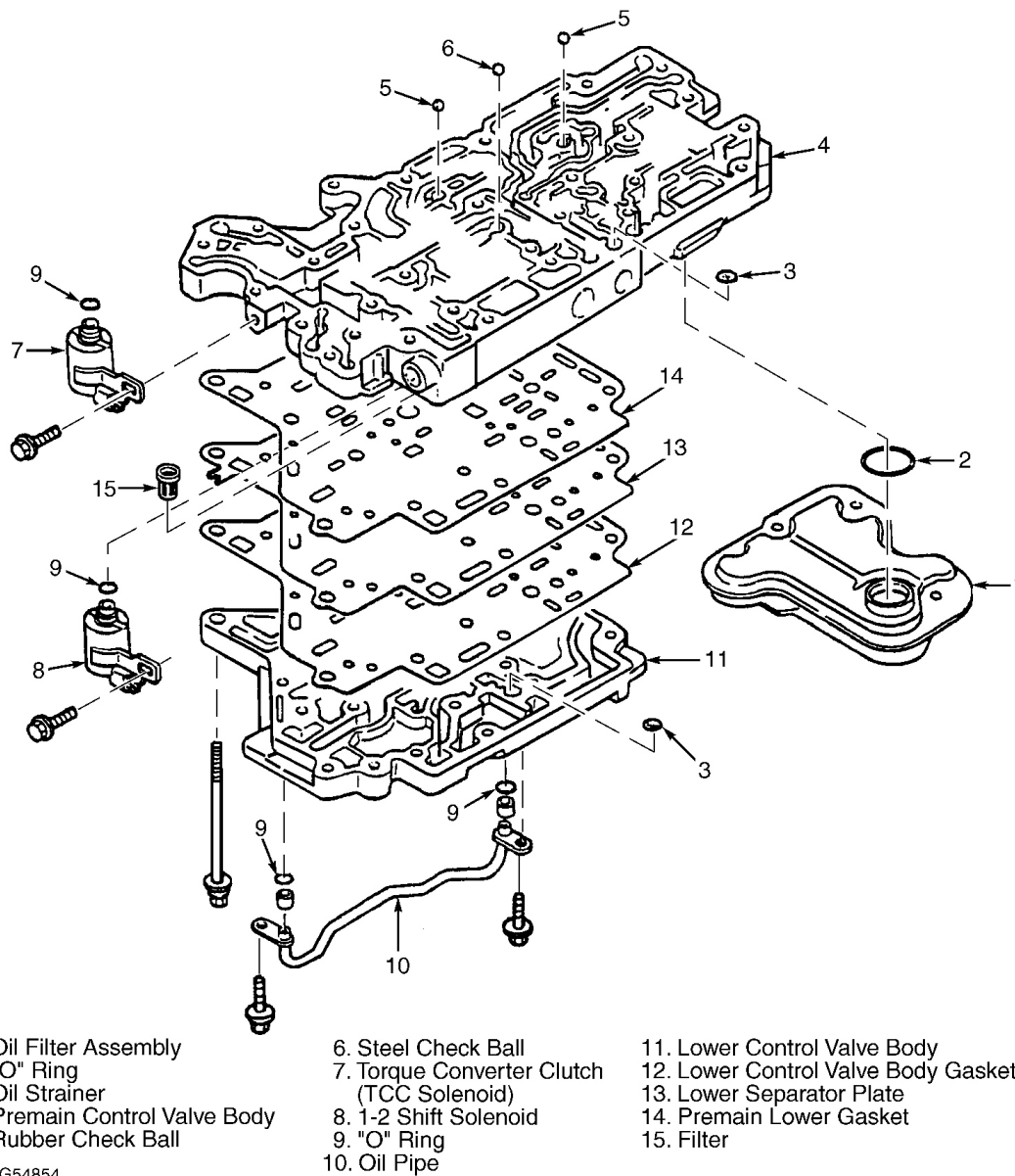
Fig. 32: Identifying Premain Valve Body Oil Strainer (Underside)
Courtesy of FORD MOTOR CO.

5. Remove premain lower gasket, lower separator plate and lower control valve body gasket. Remove filter from lower separator plate and oil strainer from lower control valve body. See **Fig. 33**.



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Fig. 33: Identifying Lower Valve Body Filter, Gaskets & Oil Strainer
 Courtesy of FORD MOTOR CO.



G99G54854

Fig. 34: Exploded View Of Premain & Lower Valve Bodies
Courtesy of FORD MOTOR CO.

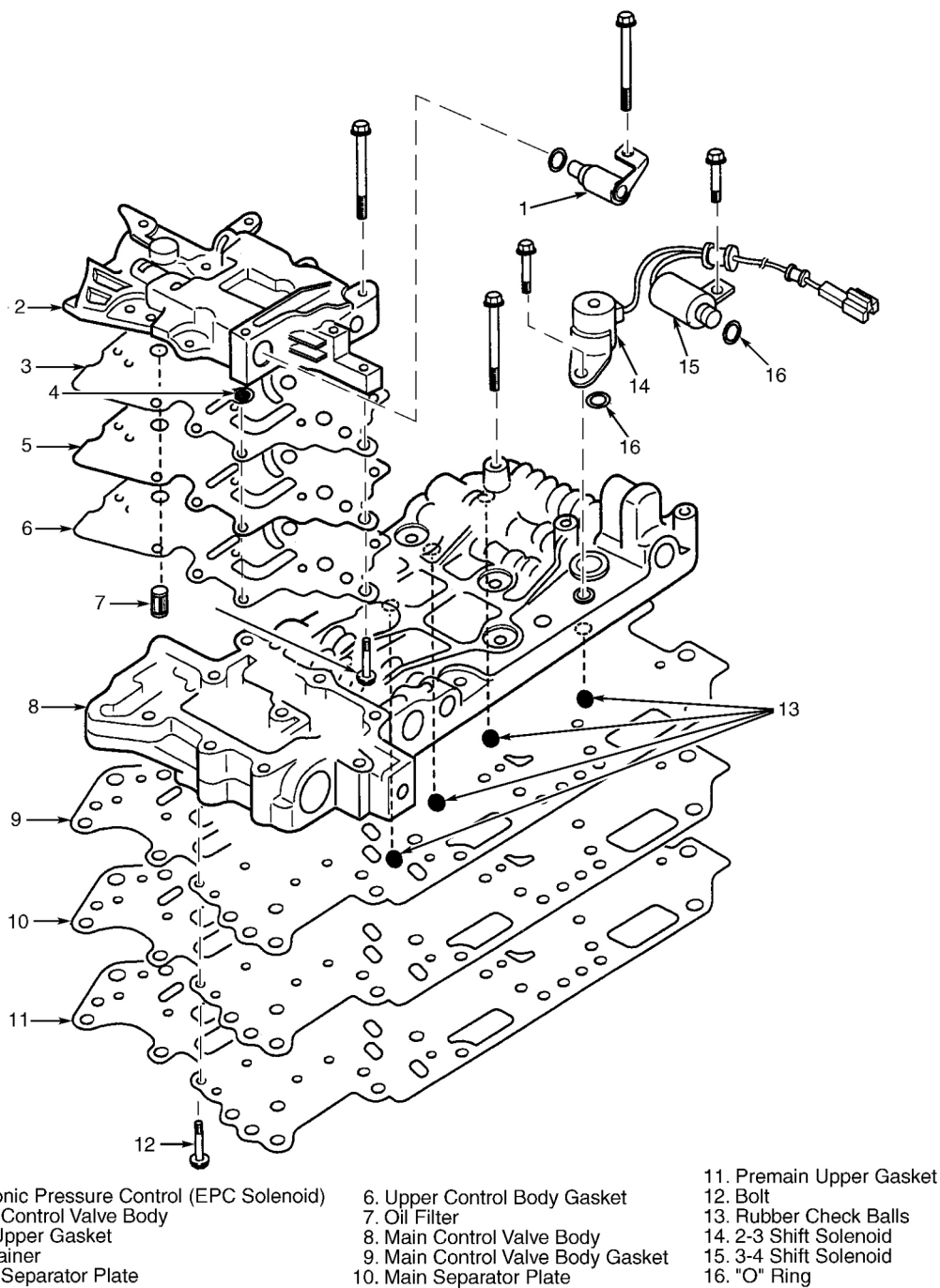


Fig. 35: Exploded View Of Main & Upper Valve Bodies
 Courtesy of FORD MOTOR CO.

Cleaning & Inspection

CAUTION: Avoid rounding off sharp edges of valves and plugs when using crocus

cloth. These edges perform a cleaning action.

1. Clean all parts thoroughly in clean solvent, and blow dry using moisture-free compressed air. Inspect all valves and plug bores for scores. Check all fluid passages for obstructions. Inspect all mating surfaces, plugs and valves for burrs and scores. If necessary, use crocus cloth to polish valves and plugs.
2. Inspect all springs for distortion. Check all valves and plugs for free movement in respective bores. Valves and plugs, when dry, must fall free from their own weight in respective bores.

Reassembly

NOTE: Match bolt head letter with corresponding letter on valve body. **DO NOT** mix gaskets during assembly.

Install all valve trains into respective bores using illustrations as assembly guides. See **Fig. 36-Fig. 38**. Assemble all valve body components in reverse order of disassembly. Coat "O" rings with transmission fluid. Tighten bolts to specifications. See **TORQUE SPECIFICATIONS**.

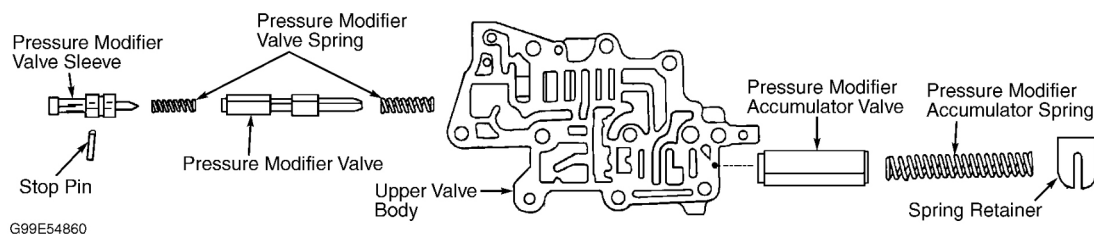
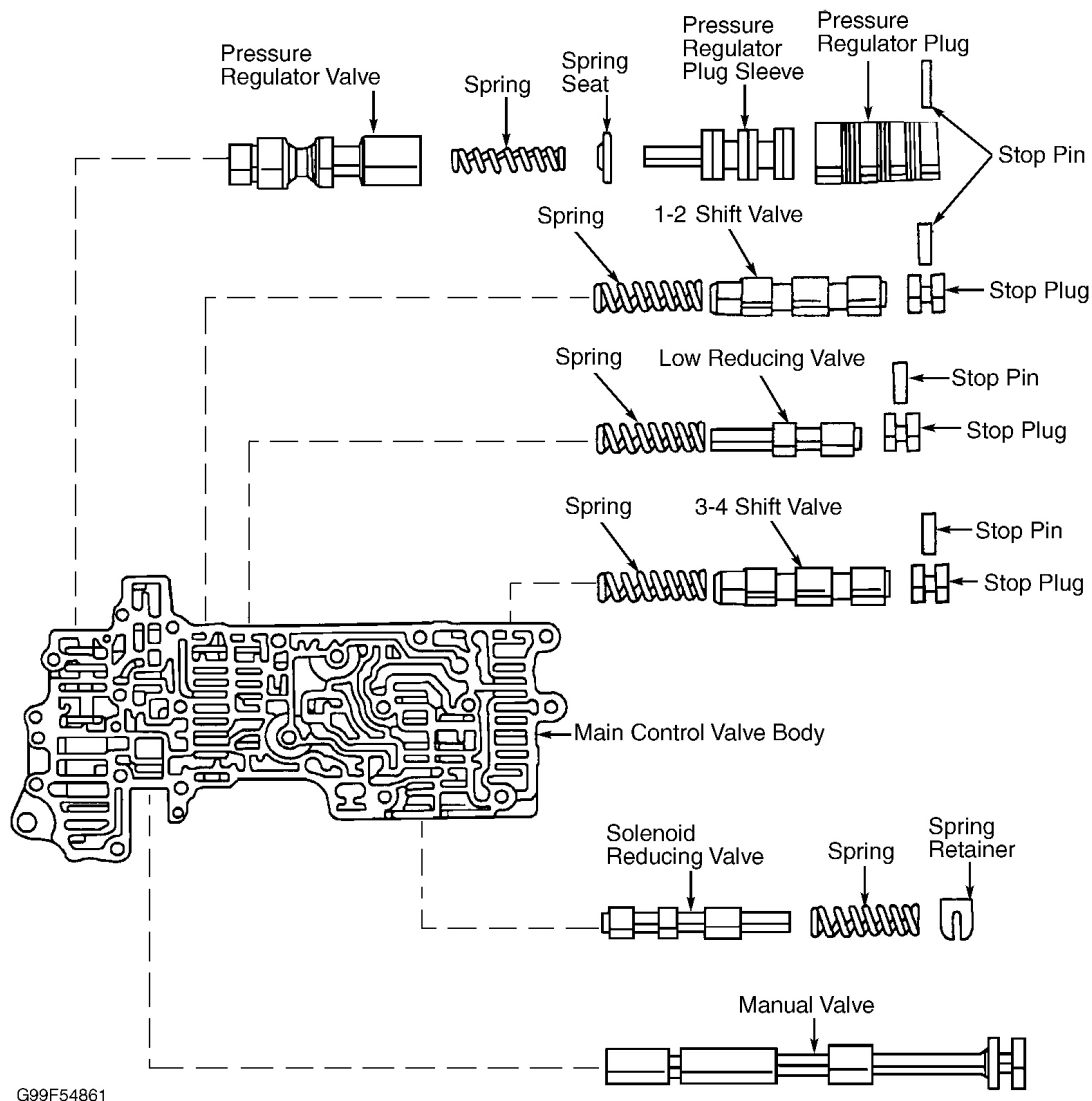
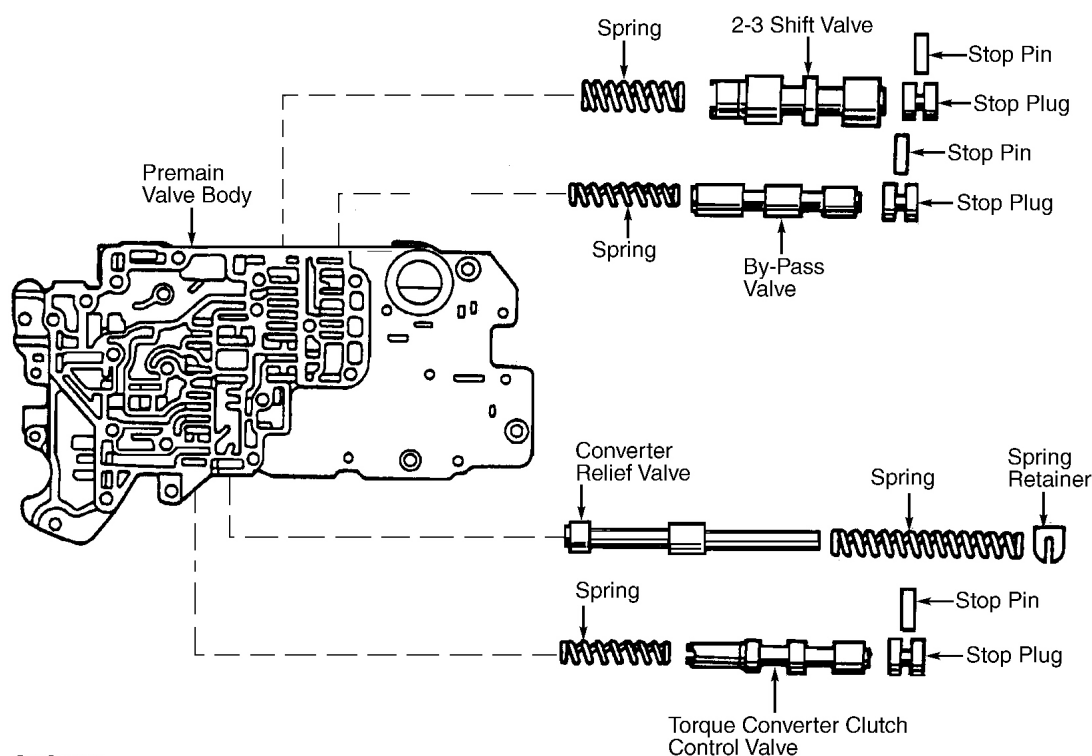


Fig. 36: Exploded View Of Upper Valve Body
Courtesy of FORD MOTOR CO.



G99F54861

Fig. 37: Exploded View Of Main Control Valve Body
Courtesy of FORD MOTOR CO.



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Fig. 38: Exploded View Of Premain Valve Body
Courtesy of FORD MOTOR CO.

TRANSAXLE REASSEMBLY

NOTE: Handle all parts carefully to avoid damaging bearings and mating surfaces. Lubricate all parts with clean ATF. Use petroleum jelly on gaskets, thrust washers and needle bearings to retain in place. Use all NEW gaskets and seals. Tighten bolts evenly. For thrust washer and needle bearing location, see [Fig. 50](#).

NOTE: When transaxle is disassembled, differential bearing preload **MUST** be adjusted by selecting shims to insert under bearing cup.

1. Install front bearing cup into converter housing using appropriate bearing cup replacer. Insert differential gear into converter housing. Place rear bearing cup over differential bearing and 6 collars of Shim Selector Set (T88C-77000-JF) on converter housing. See [Fig. 39](#).
2. Install Shim Selector Gauge, part of (T88C-77000-JF) and Shim Gauge Adapter Ring (T90P-7025-AH) on output gear. Turn both halves of gauge to eliminate any gap. Place transaxle case on collars. Install 6 bolts and washers of Shim Selector Set (T88C-77000-JF). Tighten bolts to 27-38 ft. lbs. (37-51 N.m).
3. Install Preload Torque Adapter (T90P-7025-BH) on output gear. Using pins provided in Shim Selector Set (T88C-77000-JF), loosen gauge halves until all free play is removed and bearing cup is seated. Thread gauge halves together.

4. Measure drag on output gear bearing using an INCH-lb. torque wrench. Read preload when output gear starts to turn. Turn gauge using pins until starting preload is 4.3 INCH lbs. (.5 N.m).
5. Using a feeler gauge, measure gap between 2 halves of shim selection gauge in 4 locations at 90 degree intervals. See **Fig. 39**. Add .012" (.30 mm) to the largest measurement. This will provide preload. Select the shim closest in value to the measurement. Use no more than 3 shims. Shims are available in thicknesses of .020-.057" (.50-1.45 mm) in .001" (.025 mm) increments.

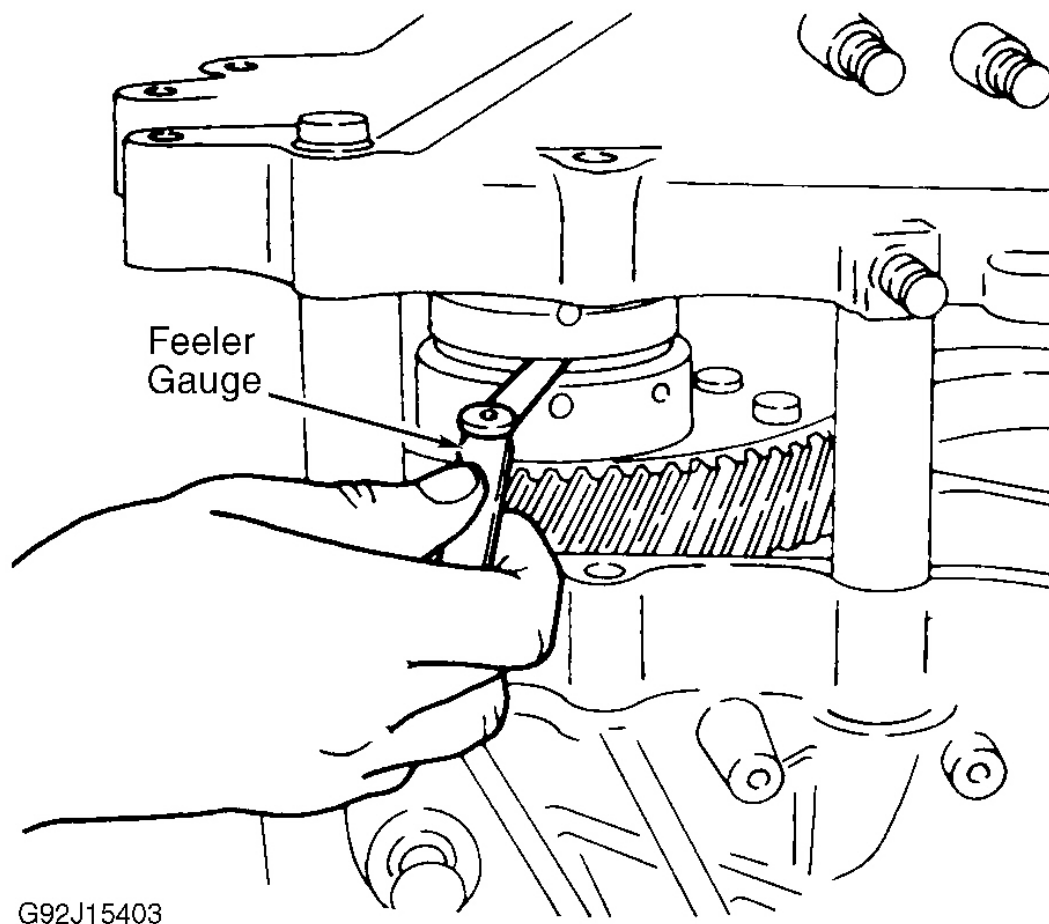


Fig. 39: Measuring Differential Preload
Courtesy of FORD MOTOR CO.

6. Remove bolts, washers, transaxle case, gauge and bearing cup. Install selected shim(s) and bearing cup into bearing housing. Install bearing housing onto transaxle case. Tighten retaining bolts to 28-38 ft. lbs. (37-51 N.m). Rotate gear several times before checking preload. Using an INCH-lb. torque wrench, measure bearing preload. If preload is not 27-35 INCH lbs. (3.0-3.9 N.m), repeat steps 1) through 6) . Remove bearing housing when proper preload specification is obtained.
7. Install output shaft and idler gear as an assembly into converter housing. If necessary, tap lightly on gear

and shaft assembly with a plastic hammer to seat fully into case. Install bearing housing. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Align groove on idler gear shaft with matching mark on bearing housing. Install NEW bearing housing roll pin using pin punch and hammer.

8. Install differential. Install parking pawl return spring, parking pawl and parking pawl shaft. Install park actuator support, using NEW support bolts. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Install park lever plate and parking plate torsion spring.
9. Install manual lever holder, manual shaft plate and lever holder nut. Tighten nut to specification. See **TORQUE SPECIFICATIONS**. Install manual control lever and manual valve detent lever, washer and nut. Tighten nut to specification. Install output shell onto output shaft. Install needle bearing onto output shell.
10. Apply thin bead of silicone sealant to contact surfaces of converter housing and transaxle case. Install NEW "O" rings into oil passage ports. Install converter housing onto transaxle case, and tighten retaining bolts to specification. If necessary, assemble 3-4 clutch and turbine shaft assembly. See **3-4 CLUTCH**.
11. Ensure needle bearing and thrust washer are installed between 3-4 clutch and output shell. See **Fig. 50**. Install 3-4 clutch, needle bearing and turbine shaft assembly into case. See **Fig. 40**. Install Turbine Shaft Holder (T88C-77000-KH) to turbine shaft. Ensure converter turbine shaft seal is installed on inner groove of turbine shaft.
12. Install ring gear with external gear side down, and secure with retaining ring. Install needle bearing and carrier hub assembly into 3-4 clutch cylinder. See **Fig. 41**. Rotate carrier hub to align splines with 3-4 clutch pack. Install low/reverse clutch pack, pressure plate and previously selected retaining ring into transaxle case.

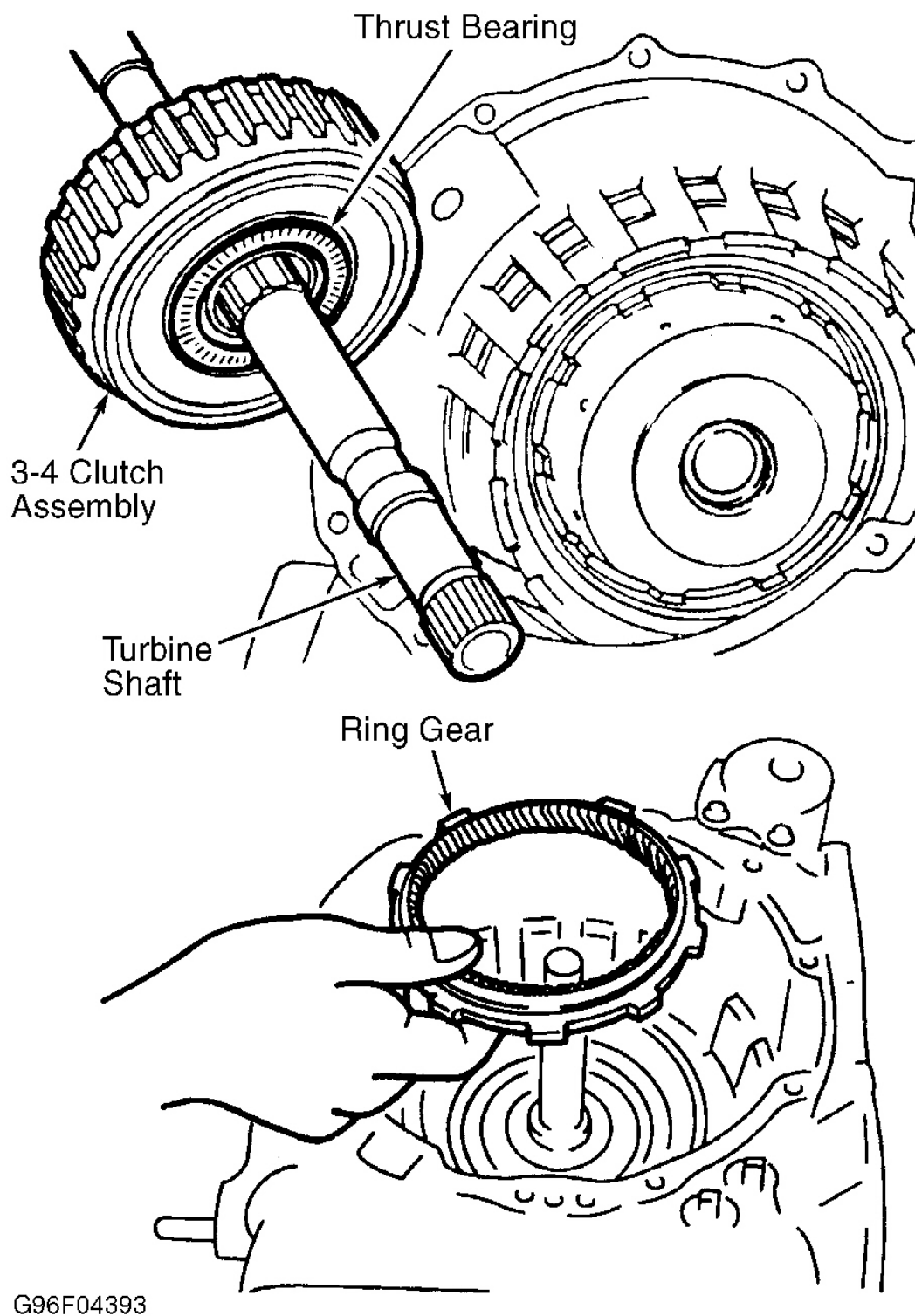


Fig. 40: Installing Turbine Shaft, 3-4 Clutch Assembly & Ring Gear

Courtesy of FORD MOTOR CO.

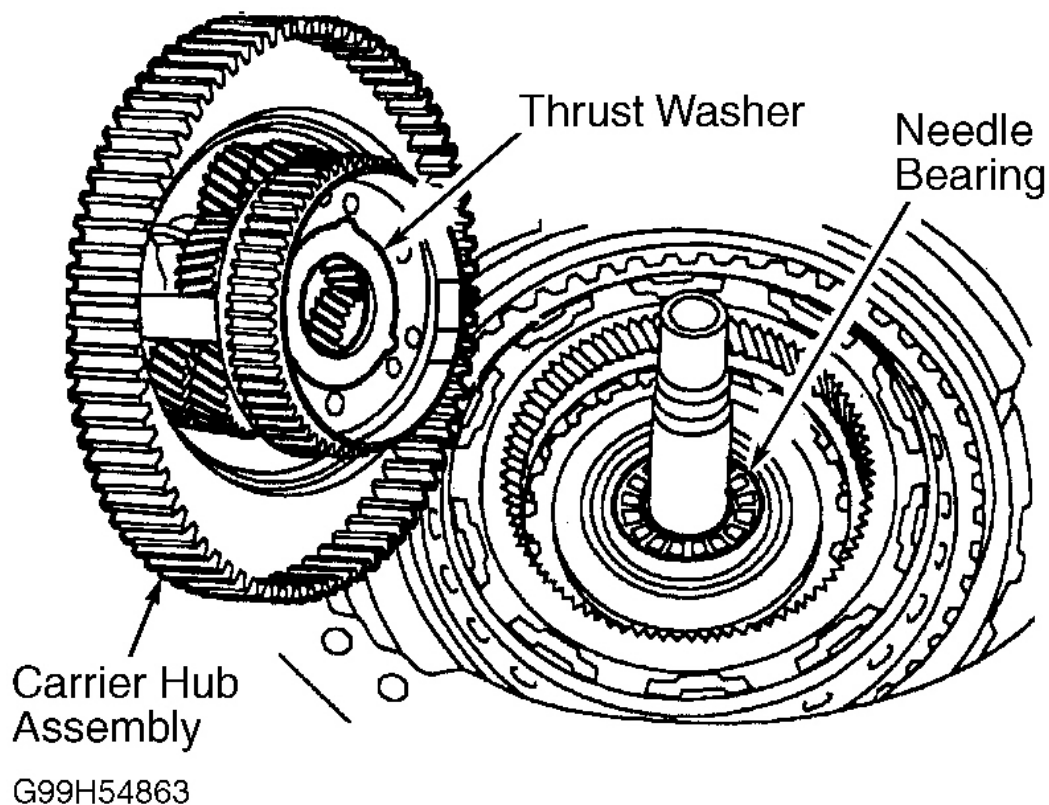
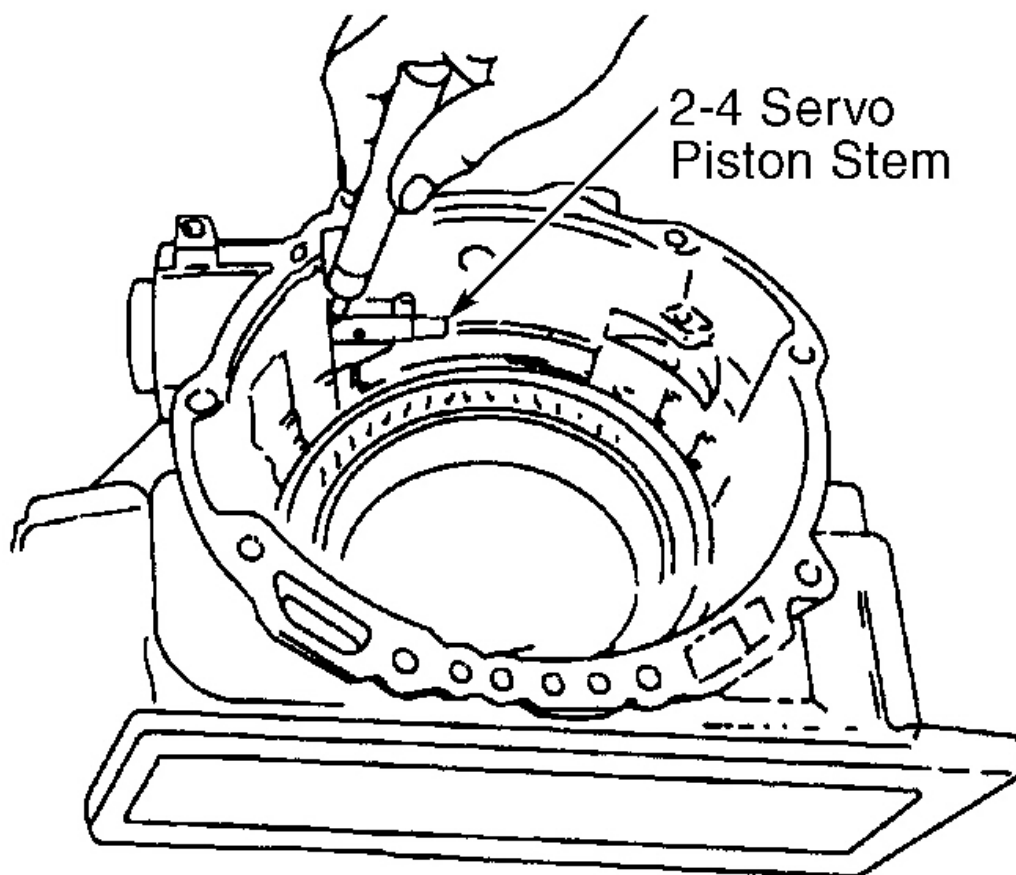


Fig. 41: Installing Carrier Hub Assembly Into 3-4 Clutch
Courtesy of FORD MOTOR CO.

CAUTION: One-way clutch can be installed incorrectly. Ensure carrier hub rotates counterclockwise easily by hand after one-way clutch is installed.

13. Install one-way clutch wave washer. Carefully install one-way clutch while turning carrier hub assembly counterclockwise. Install retaining ring. Install 2-4 servo piston, spring, cover and retaining ring. Mark servo piston stem at point that it meets the case. See **Fig. 42**. Apply compressed air to 2-4 band apply port. See **Fig. 17**. With servo piston stem fully extended, measure stroke of servo piston. Servo piston stroke should be .039-.067" (1.00-1.70 mm).
14. If servo piston stroke is not within specification, disassemble servo assembly and replace with correct length replacement stem. Stem lengths range from 3.74" (95.0 mm) to 3.90" (99.0 mm) in .020" (.50 mm) increments. Recheck servo movement once stem is installed.
15. Install anchor strut and anchor strut shaft into transaxle case. Install 2-4 band in case fully expanded. Interlock 2-4 band and band anchor strut. Install servo assembly and servo piston spring into case. Ensure

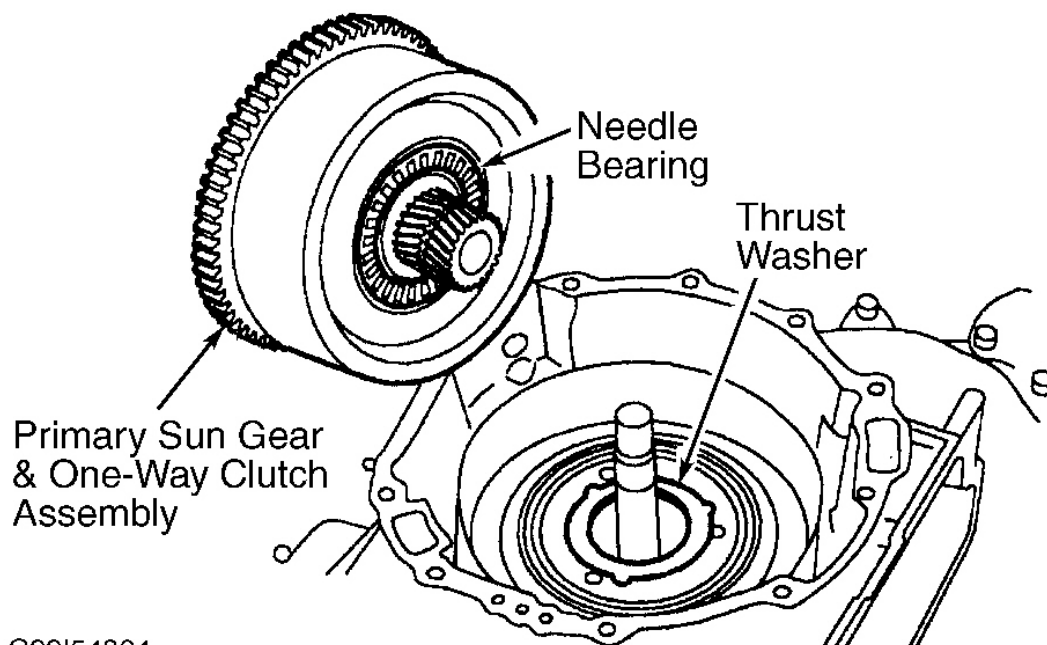
piston stem engages properly in 2-4 band. Compress servo assembly into bore and install servo cover retaining ring.



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Fig. 42: Measuring 2-4 Servo Travel
Courtesy of FORD MOTOR CO.

16. Install primary sun gear and one-way clutch into carrier hub. Ensure planet gear bearing thrust washer and needle bearing are installed between carrier hub assembly and primary sun gear and one-way clutch. See **Fig. 43**. Rotate primary sun gear and one-way clutch for easier assembly.



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Fig. 43: Installing Primary Sun Gear & One-Way Clutch
Courtesy of FORD MOTOR CO.

17. Install forward/coasting/reverse clutch drum assembly. Ensure needle bearing is installed onto forward/coasting/reverse clutch assembly. See **Fig. 44**. Insert 2 screwdrivers through access hole in bottom of case to spread 2-4 band. Rotate one-way clutch and forward/coasting/reverse clutch drum assembly to align clutch pack and gears. Install NEW turbine shaft retaining ring into bottom groove of turbine shaft.

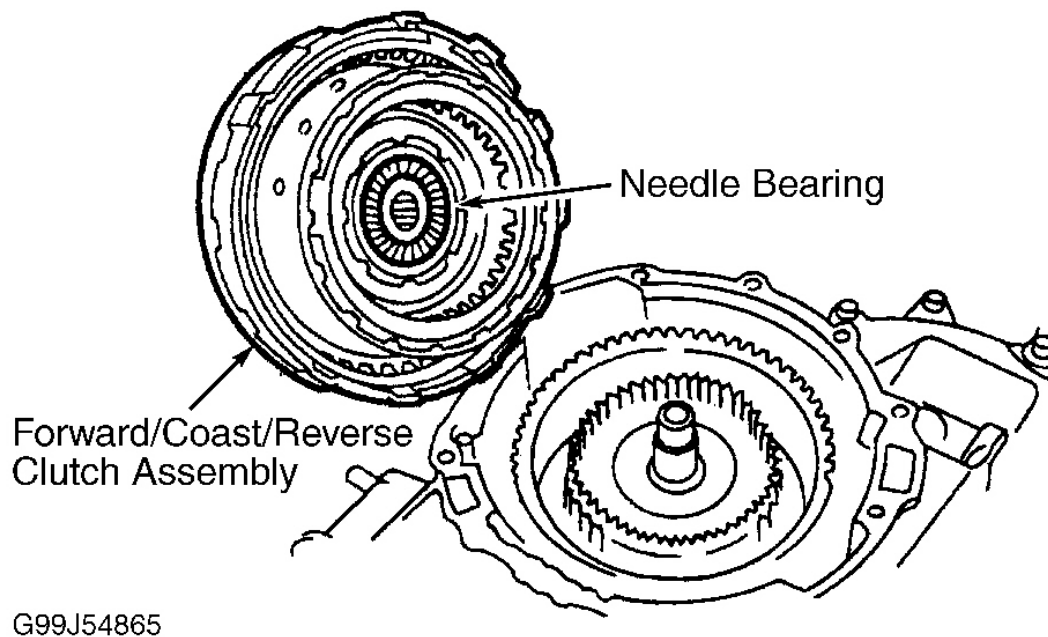
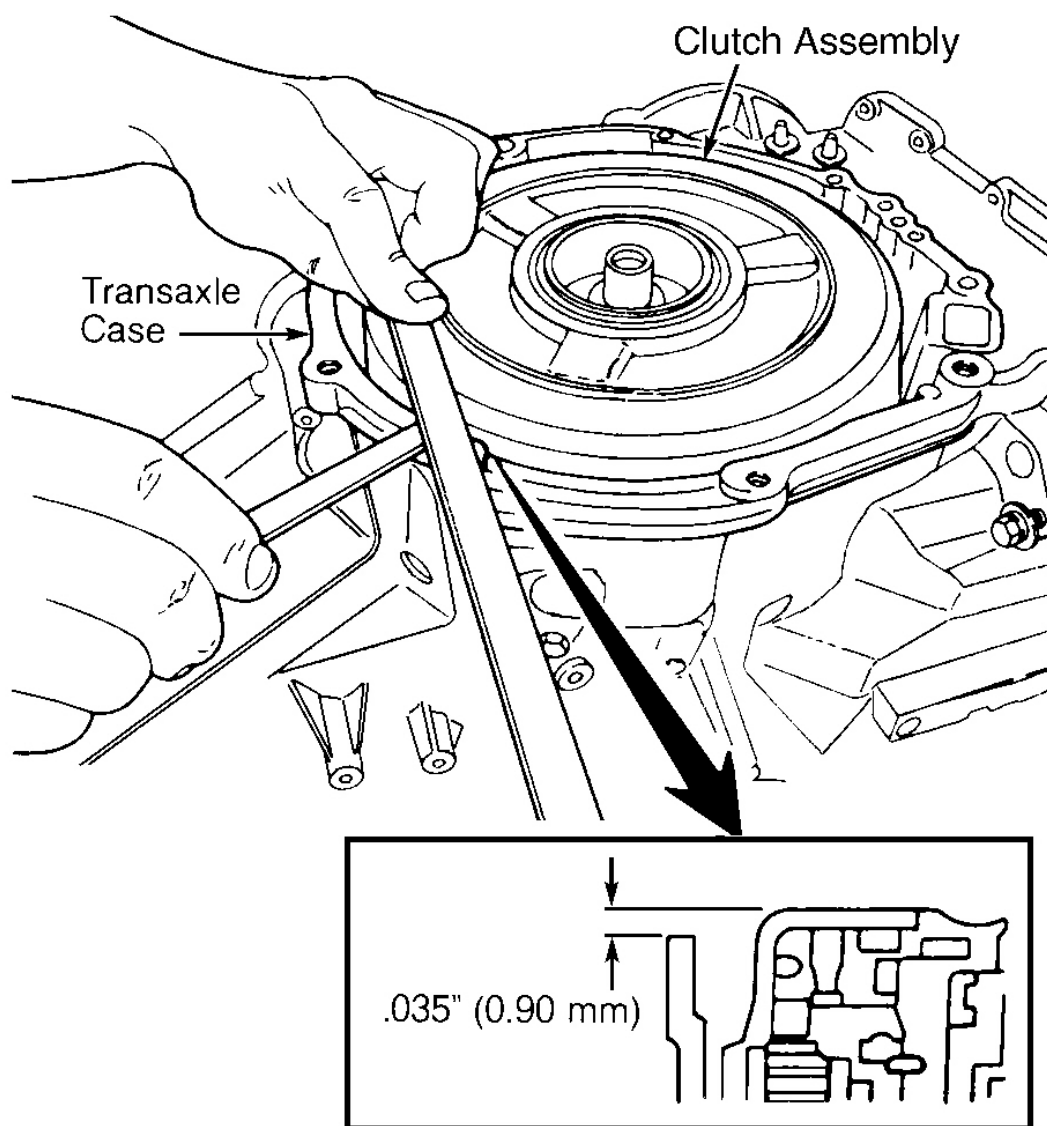


Fig. 44: Installing Forward/Coasting/Reverse Clutch Assembly
Courtesy of FORD MOTOR CO.

18. Remove turbine shaft holder. Measure height difference between reverse clutch drum and transaxle case. See **Fig. 45**. If assembled height is more than .035" (.90 mm), recheck all assembled components.



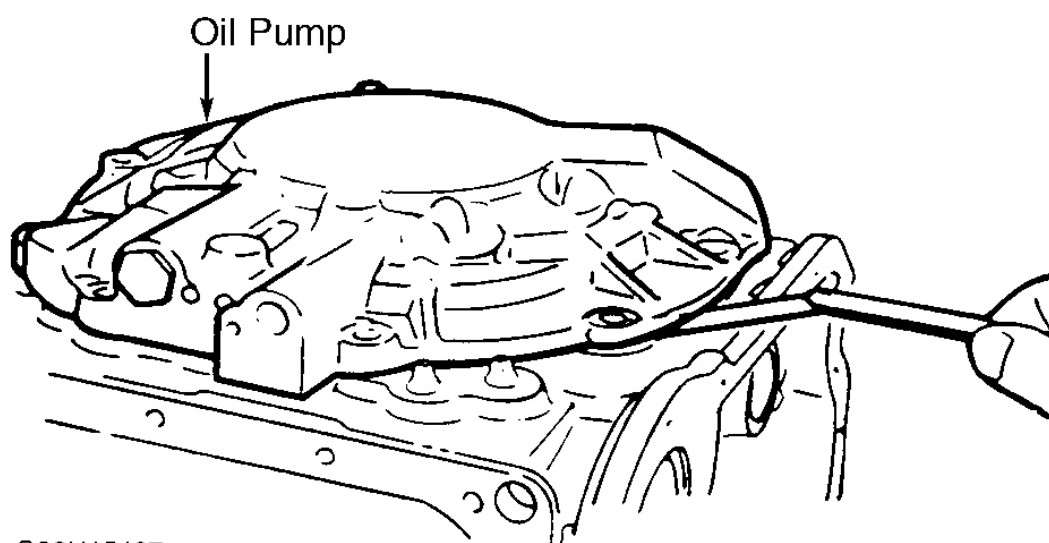
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Fig. 45: Measuring Height Difference Of Case & Clutch
 Courtesy of FORD MOTOR CO.

19. To adjust total end play, place planet gear needle bearing on reverse clutch assembly. Remove previously used thrust washer and gasket from oil pump. Place an .087" (2.2 mm) thrust washer onto oil pump. Set oil pump into forward/coasting/reverse clutch assembly and transaxle case.
20. Using a feeler gauge, measure clearance between transaxle case and oil pump in several locations. See **Fig. 46**. Take an average of the measurements. Correct end play is .010-.020" (.25-.50 mm). Select correct end play thrust washer to install. See **END PLAY THRUST WASHER SELECTION** table.

END PLAY THRUST WASHER SELECTION

Measured Clearance In. (mm)	Thrust Washer Thickness In. (mm)
.000-.004 (0.00-0.10)	.087 (2.20)
.004-.012 (0.11-0.30)	.079 (2.00)
.012-.020 (0.31-0.50)	.071 (1.80)
.020-.027 (0.51-0.70)	.063 (1.60)
.028-.035 (0.71-0.90)	.055 (1.40)
.036-.043 (0.91-1.10)	.047 (1.20)



G92H15427

Fig. 46: Measuring Oil Pump-To-Case Clearance
Courtesy of FORD MOTOR CO.

21. Remove oil pump. Using petroleum jelly, place selected thrust washer and planet gear needle bearing on oil pump. Install NEW gasket and place oil pump on forward/coasting/reverse clutch assembly. Install oil pump-to-transaxle bolts, and tighten to specification. See **TORQUE SPECIFICATIONS**.
22. Install solenoid harness connector with NEW "O" ring, in case. Align manual valve with pin on manual valve detent lever. Install valve body into transaxle case and install valve body bolts in correct locations. See **Fig. 47**. Tighten bolts to 71-97 INCH lbs. (8-11 N.m).

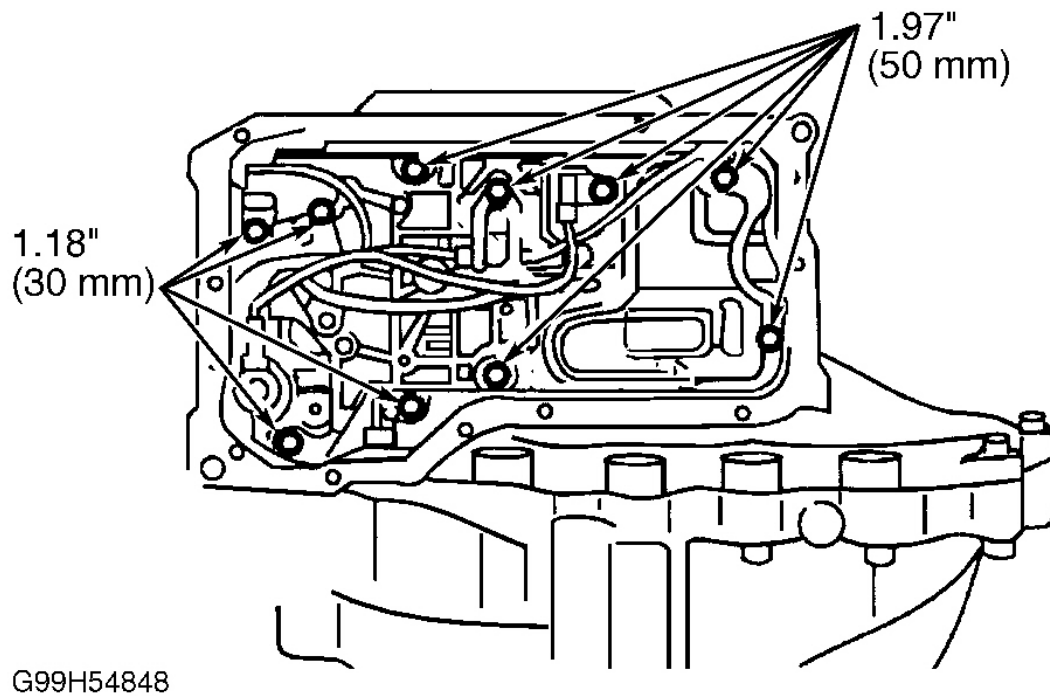


Fig. 47: Locating Valve Body Bolts
Courtesy of FORD MOTOR CO.

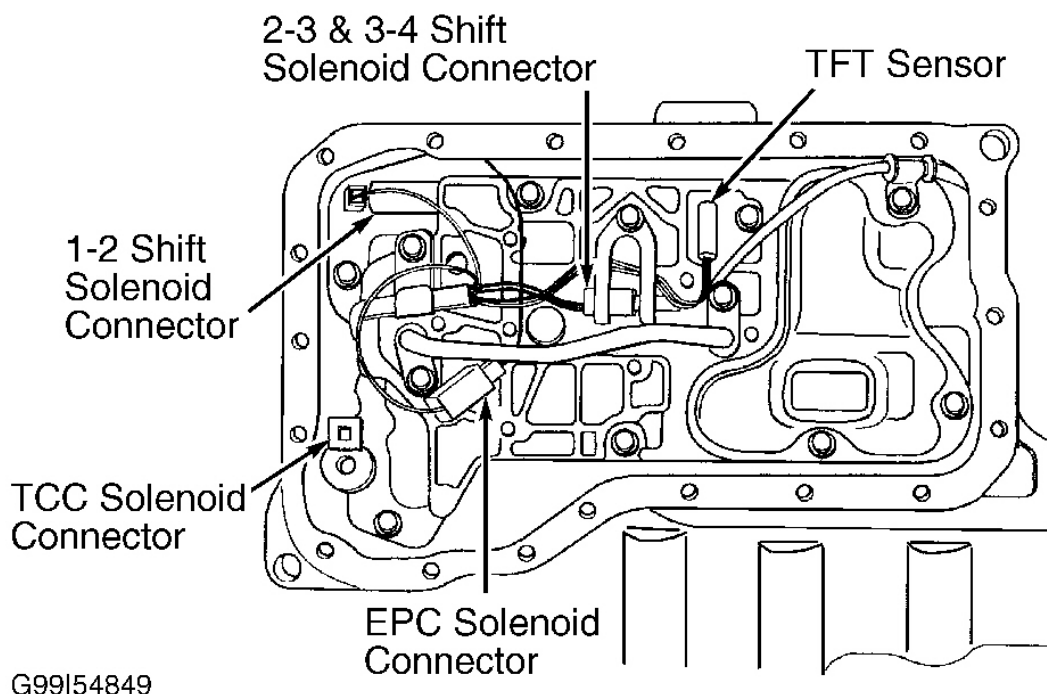
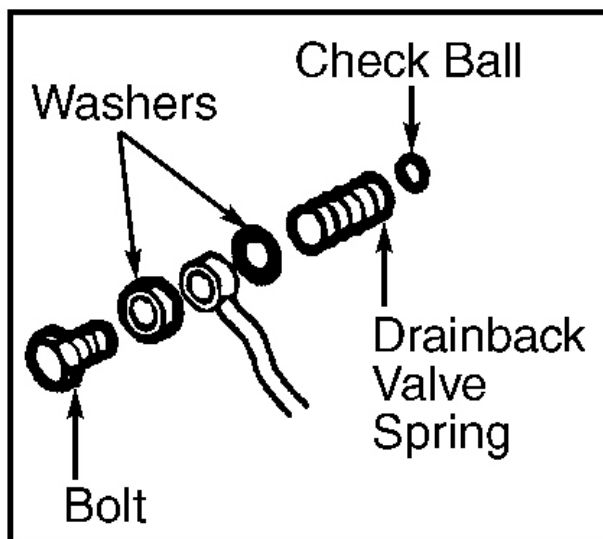
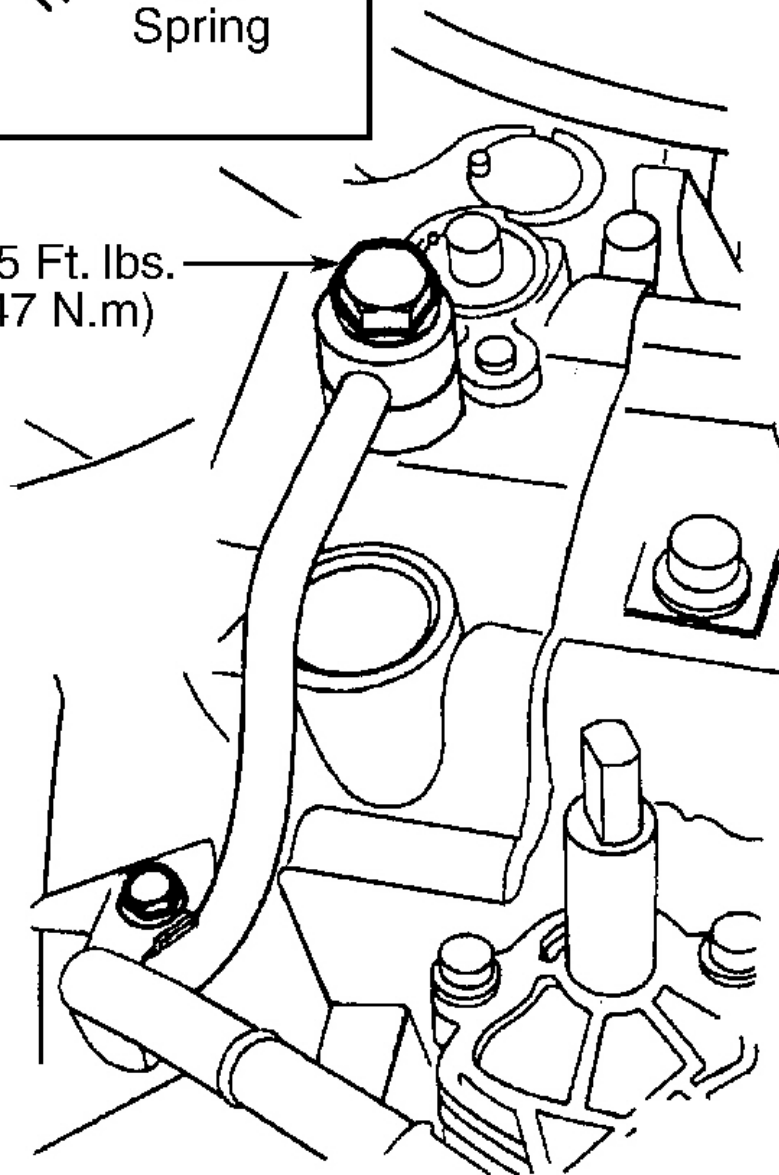


Fig. 48: View Of Valve Body Harness & Connectors
 Courtesy of KIA MOTORS AMERICA, INC.

23. Connect harness to solenoids. See **Fig. 48**. Install EPC solenoid and connect wiring harness. Install oil screen with NEW "O" ring. Ensure magnets are correctly positioned in oil pan. Install oil pan and NEW gasket. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Install TSS and VSS sensors.
24. Turn manual shaft to Neutral position. Install Transmission Range (TR) sensor. Finger tighten retaining bolts. Align TR sensor. See **TR SENSOR** under ADJUSTMENTS.
25. Tighten sensor retaining bolts to 71-97 INCH lbs. (8-11 N.m). Install manual shaft lever and tighten nut to specification. Install dipstick tube using a NEW "O" ring.
26. Install fluid cooler line with check ball, spring, washers and bolt. See **Fig. 49**. Tighten cooler line bolt to specification. Secure fluid cooler line bracket to case with bolt. Using appropriate seal replacer, install converter seal. Install NEW "O" ring on turbine shaft. Fill torque converter with specified transaxle fluid. Install oil pump shaft into torque converter. Carefully install torque converter while rotating to align splines.



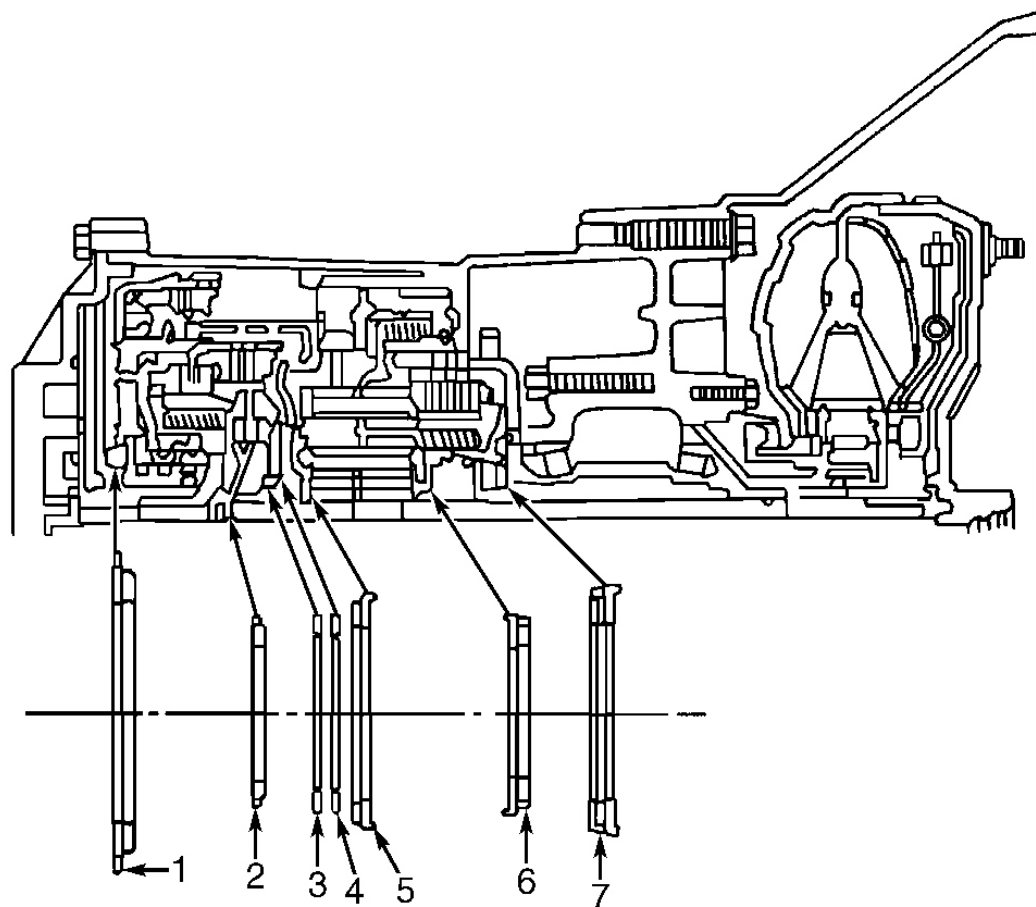
24-35 Ft. lbs.
(32-47 N.m)



G99A54866

Fig. 49: Installing Fluid Cooler Line, Check Ball, Bolt & Spring
Courtesy of FORD MOTOR CO.

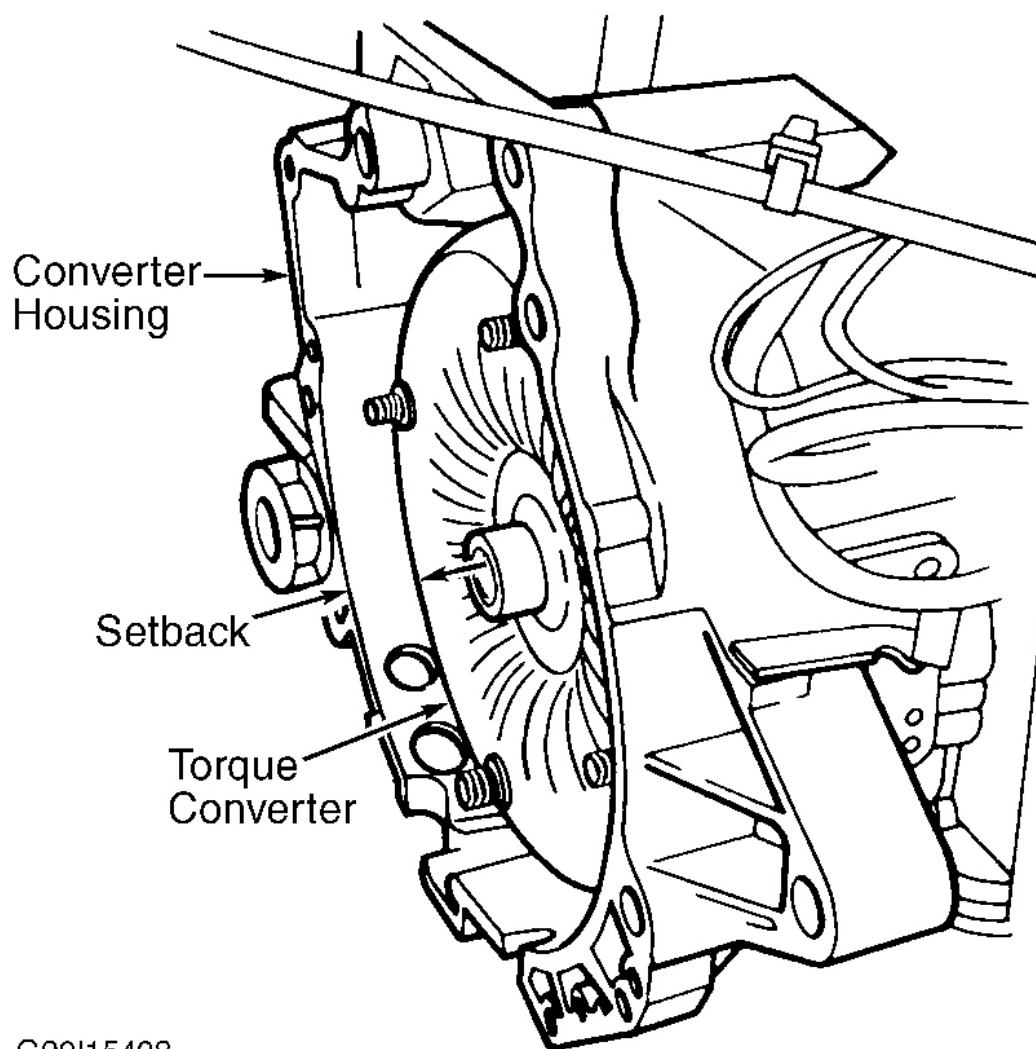
27. Measure distance between torque converter and end of converter housing. Torque converter setback should be at least .54" (13.6 mm). See **Fig. 51**. Remove transaxle from holding fixture. Using appropriate seal installer, install differential oil seals.



- | | |
|-------------------------------|------------------------------------|
| 1. Oil Pump & Clutch Assembly | 5. Small Sun Gear & One-Way Clutch |
| 2. Clutch Assembly | 6. Planetary Carrier Assembly |
| 3. One-Way Clutch Inner Race | 7. 3-4 Clutch Assembly |
| 4. One-Way Clutch Outer Race | |

G92E15424

Fig. 50: Locating Thrust Washers & Needle Bearings
Courtesy of FORD MOTOR CO.



G92I15428

Fig. 51: Measuring Torque Converter Setback
 Courtesy of FORD MOTOR CO.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Actuator Support Bolt	11-13 (15-17)
Ball Joint Pinch Nut	32-43 (43-58)
Bearing Housing Bolts	14-18 (19-25)
Crossmember Bolts	47-66 (64-89)

1999 Kia Sephia

1999 AUTOMATIC TRANSMISSIONS Ford F4E-III (Mazda FA4A-EL) Overhaul

Cooler Line Bolt	24-35 (32-47)
Drain Plug	30-39 (40-53)
Engine Insulator Nut	48-69 (67-93)
Front Engine Mount Nut	28-38 (38-51)
Front Engine Mount Through Bolt	49-69 (67-93)
Idle Gear Shaft Nut	94-130 (128-176)
Left-Side Transaxle Insulator Nut & Bolt	32-44 (44-60)
Left-Side Insulator-To-Transaxle Nut	49-69 (67-93)
Lower Transaxle Insulator Bolt	49-69 (67-93)
Lug Nuts	66-86 (89-117)
Manual Control Lever Nut	24-34 (32-46)
Manual Shaft Nut	31-40 (42-54)
Oil Pump Bolt	14-18 (19-25)
Oil Pump Plug	24-34 (32-46)
Orifice Valve	30-39 (40-53)
Rear Engine Mount Nut	28-38 (38-51)
Rear Engine Mount Through Bolt	49-69 (67-93)
Shift Cable Bracket Nut	12-16 (16-22)
Shim Selection Set Collar Bolt	14-18 (19-25)
Spool Valve Plug	24-34 (32-46)
Tie Rod End Nut	32-41 (43-56)
Torque Converter Nut	26-36 (35-49)
Transaxle Case-To-Converter Housing	28-38 (38-51)
Transaxle Housing Cover Bolt	41-59 (55-80)
Transaxle Support Crossmember Bolt	47-66 (64-89)
Transaxle Support Crossmember Nut	47-66 (64-89)
Transaxle-To-Engine Bolt	41-59 (55-80)
INCH Lbs. (N.m)	
Electronic Pressure Control (EPC) Solenoid Bolt	71-89 (8-10)
Filter Bolt	71-89 (8-10)
Fluid Bypass Tube Bolt	71-89 (8-10)
Fluid Filler Tube Bolt	71-89 (8-10)
Jet Orifice Nut	14-19 (1.6-2.1)
Lever Holder Nut	71-89 (8-10)
Line Pressure Plug	44-89 (5-10)
Main Control Valve Body Bolt	71-89 (8-10)
Main Gasket Screw	12-16 (1.3-1.8)
Main Separator Plate Gasket Screw	12-16 (1.3-1.8)
Parking Rod Support Plate Bolt	71-89 (8-10)
Shift Solenoid Valve Bolt	71-89 (8-10)
Splash Shield Bolt	22-31 (2.5-3.5)
Stator Support Bolts	

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1999 AUTOMATIC TRANSMISSIONS Ford F4E-III (Mazda FA4A-EL) Overhaul

	97-115 (11-13)
Torque Converter Clutch (TCC) Solenoid Bolt	71-89 (8-10)
Transaxle Pan Bolts	80-97 (9-11)
Transmission Range (TR) Sensor Bolt	71-89 (8-10)
TSS Sensor Bolt	71-89 (8-10)
Upper Control Valve Body Gasket Screw	12-16 (1.3-1.8)
VSS Sensor Bolt	71-89 (8-10)

TRANSAXLE SPECIFICATIONS**TRANSAXLE SPECIFICATIONS**

Application	In. (mm)
Coast Clutch Pack Clearance	.039-.047 (1.00-1.20)
Torque Converter Setback	.54 (13.6)
Differential Side Gears Backlash	.020 (.5)
Differential Pinion Gear Backlash	.001-.004 (.02-.10)
Forward Clutch Pack Clearance	.039-.047 (1.00-1.20)
Low/Reverse Clutch Pack Clearance	.083-.094 (2.10-2.40)
Inner Gear-To-Oil Pump Boss Clearance	.0016-.0049 (.040-.125)
Gear-To-Housing Clearance	.0008-.0020 (.020-.050)
Reverse Clutch Drum-To-Transaxle Case Assembled Height Measurement	.035 (.90)
Reverse Clutch Pack Clearance	.039-.051 (1.00-1.30)
Total End Play	.010-.020 (.25-.50)
3-4 Clutch Pack Clearance	.051-.063 (1.30-1.60)