1993-94 AUTOMATIC TRANSMISSIONS

Ford AODE & AODE-W Overhaul

APPLICATION

APPLICATION

Application	Transmission
1993	
Crown Victoria	AODE
Crown Victoria (Police)	AODE
Crown Victoria (Tow Pkg)	AODE
E-150	AODE-W
Grand Marquis	AODE
Grand Marquis (Tow Pkg)	AODE
Mark VIII	AODE-W
Town Car	AODE
Town Car (Tow Pkg)	AODE
1994	
Cougar/Thunderbird	AODE-W
Cougar/Thunderbird	AODE-W
Crown Victoria	AODE
Crown Victoria (Police)	AODE
E-150	AODE-W
F-150	AODE-W
Grand Marquis	AODE
Mark VIII	AODE-W
Mustang	AODE
Mustang	AODE
Thunderbird	AODE-W
Town Car	AODE
Town Car (Tow Pkg)	AODE

IDENTIFICATION

Transmission AODE/AODE-W is identified by the code letter on the lower line of Vehicle Certification Label under TR. This label is attached to the left (driver's) side door lock post. Refer to the **TRANSMISSION IDENTIFYING CODE LETTER CHART**.

The transmission model may be identified by a metal tag attached to transmission on passenger side of transmission case. Tag shows transmission model, assembly number, serial number and engine size. See **Fig. 1**.

TRANSMISSION IDENTIFYING CODE LETTER CHART

Application	Letter ID
Cougar/Thunderbird	L
Crown Victoria, Grand Marquis, Mustang & Town Car	P
Mark VIII	L
E, F Series	U

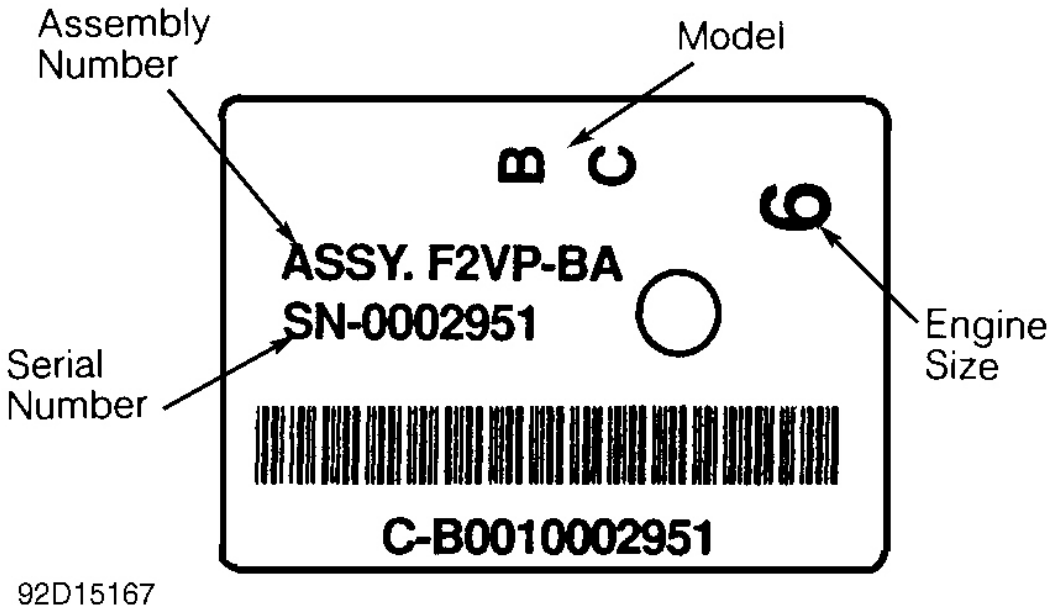


Fig. 1: Service Identification Tag
Courtesy of FORD MOTOR CO.

DESCRIPTION

NOTE: The Ford AODE-W (wide gear ratio) transmission is also known as 4R70W.

NOTE: For testing and diagnostic procedures of electronic components, refer to:

- For models with the EEC-IV Engine Control system, see **AUTO TRANS DIAGNOSIS - AODE & AODE-W W/EEC-IV**
- For models with the EEC-V Engine Control system, see **AUTO TRANS DIAGNOSIS - AODE & AODE-W W/EEC-V**

AODE/AODE-W is a 4-speed, fully automatic transmission with electronic shift, converter clutch and line pressure controls. The AODE/AODE-W uses a double-pinion compound gearset to produce 4 forward speeds and reverse. The transmission uses 2 bands, 2 one-way roller clutches and 4 friction clutches to hold or drive the

planetary gearset members. See **Fig. 2**.

Shift control solenoids provide gear selection and are controlled by the EEC-IV microprocessor. For additional information on the EEC-IV system, refer to the appropriate G - TESTS W/ CODES article in ENGINE PERFORMANCE section.

The EEC-IV system has self-diagnostic capabilities. Fault codes for faulty engine and transmission sensors, switches and circuits are stored in the PCM and may be retrieved to aid diagnosis and repair.

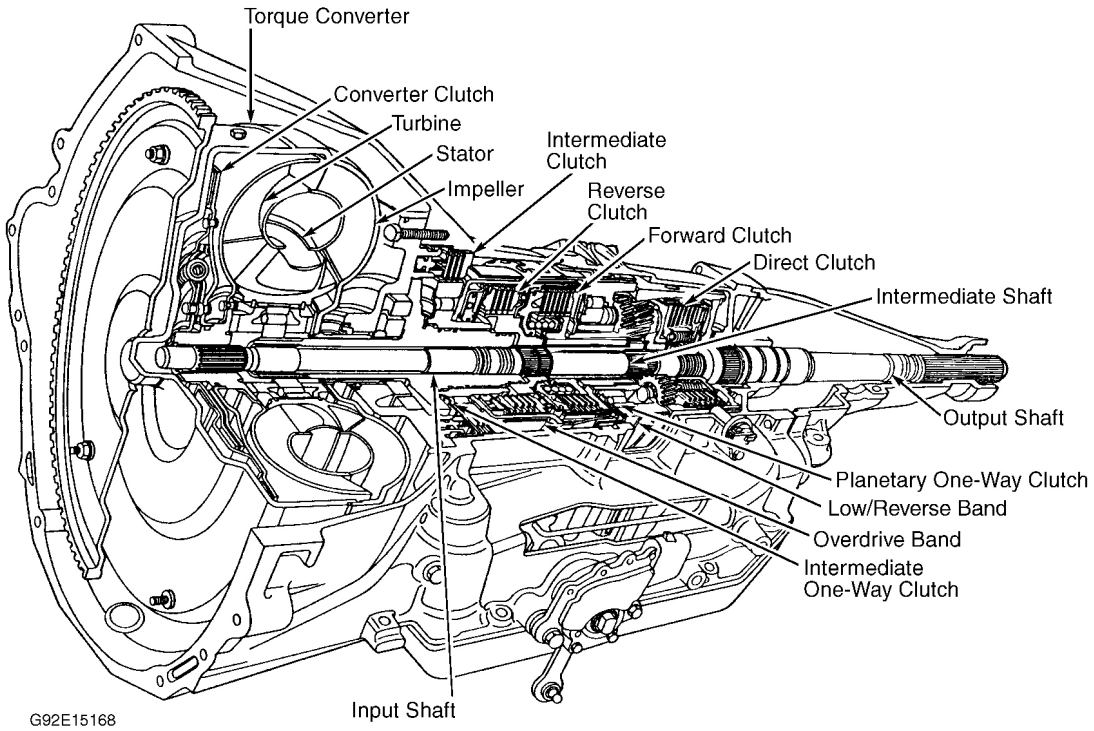


Fig. 2: Cross-Sectional View Of AODE/AODE-W
Courtesy of FORD MOTOR CO.

LUBRICATION & ADJUSTMENTS

See appropriate **TRANSMISSION SERVICING - A/T** article in this section.

ON-VEHICLE SERVICE

VALVE BODY (MAIN CONTROL) ASSEMBLY

Removal

1. Raise and support vehicle. Remove exhaust system as necessary. Loosen oil pan retaining bolts and allow transmission fluid to drain. Remove oil pan and gasket. Discard gasket.

2. Remove transmission oil filter. Remove manual lever detent spring. Remove valve body bolts. Note position lengths of bolts for reassembly reference. Remove valve body and gasket from transmission.

Installation

1. Using 2 alignment bolts as guides, position valve body (with new gasket) in case. Ensure check balls are in proper locations. Loosely install remaining valve body bolts. Install detent spring and roller.
2. Tighten valve body retaining bolts to specification. See **TORQUE SPECIFICATIONS**. Install filter and grommet. Install pan gasket and oil pan. To complete installation, reverse removal procedure. Refill with fluid. Install exhaust system, if removed.

MANUAL LEVER POSITION (MLP) SENSOR

Removal

Raise and support vehicle. Disconnect linkage and electrical connector from sensor. Remove bolts and MLP from case.

Installation

1. Install MLP onto transmission case and install bolts but **DO NOT** tighten. Place manual lever in Neutral position (2 detent positions back from Park).
2. Insert Gear Position Sensor Adjuster (T71P-70010-A) into slots. See **Fig. 3**. Align the three slots on MLP with tabs on adjuster. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**.

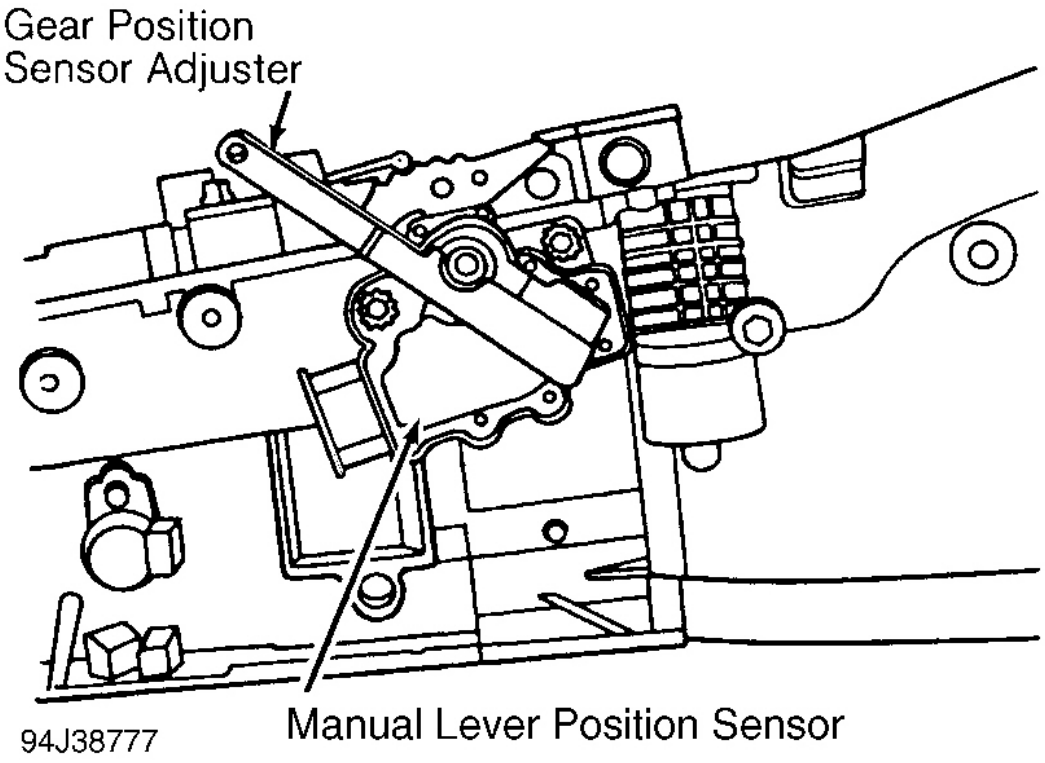


Fig. 3: Adjusting Manual Lever Position (MLP) Sensor
Courtesy of FORD MOTOR CO.

OVERDRIVE SERVO ASSEMBLY

Removal

Remove valve body, see **VALVE BODY (MAIN CONTROL) ASSEMBLY**. Locate overdrive servo. See **Fig. 4**. Using Servo Piston Remover/ Replacer (T92P-70023-A), depress overdrive servo piston and remove retaining ring. See **Fig. 5**. Remove piston assembly and spring.

Installation

1. Using ATF, lubricate overdrive servo pocket in trans-mission case. Assemble spring to piston. Install assembly into case pocket. Ensure servo rod contacts overdrive band apply pocket.
2. Using remover/replacer, depress piston and install retaining ring. See **Fig. 5**. Install valve body. To complete installation, reverse removal procedure.

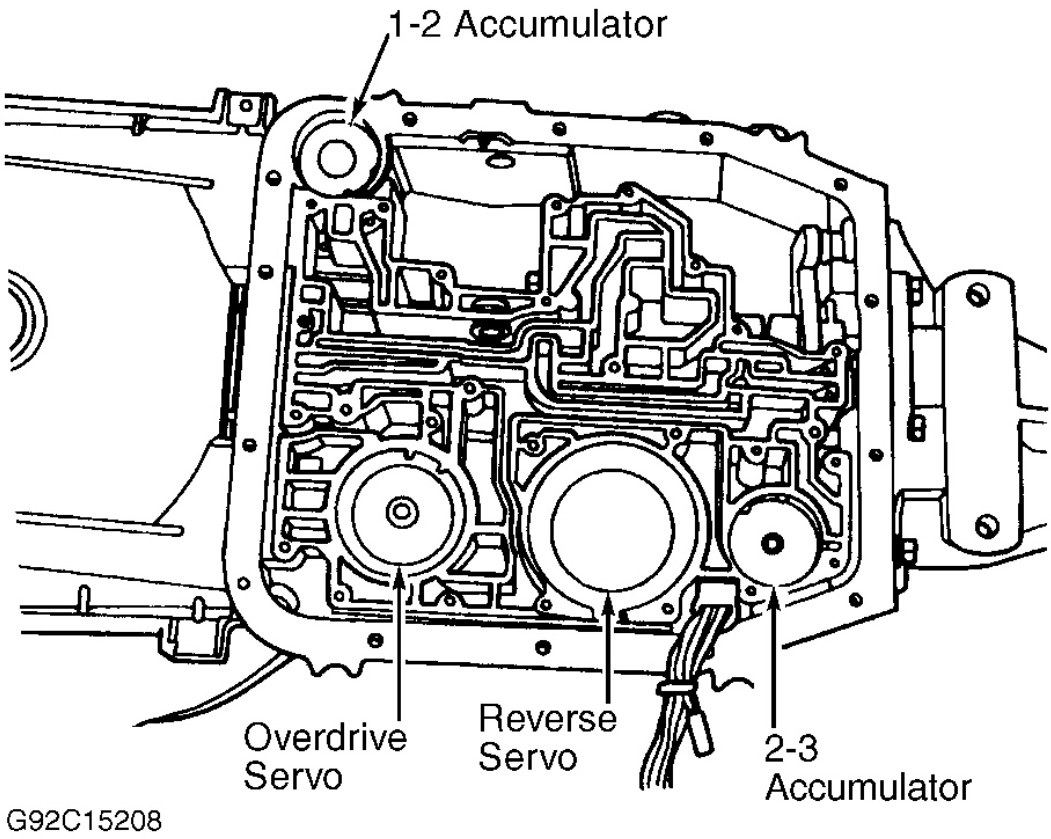


Fig. 4: Identifying Accumulator & Servo Locations
Courtesy of FORD MOTOR CO.

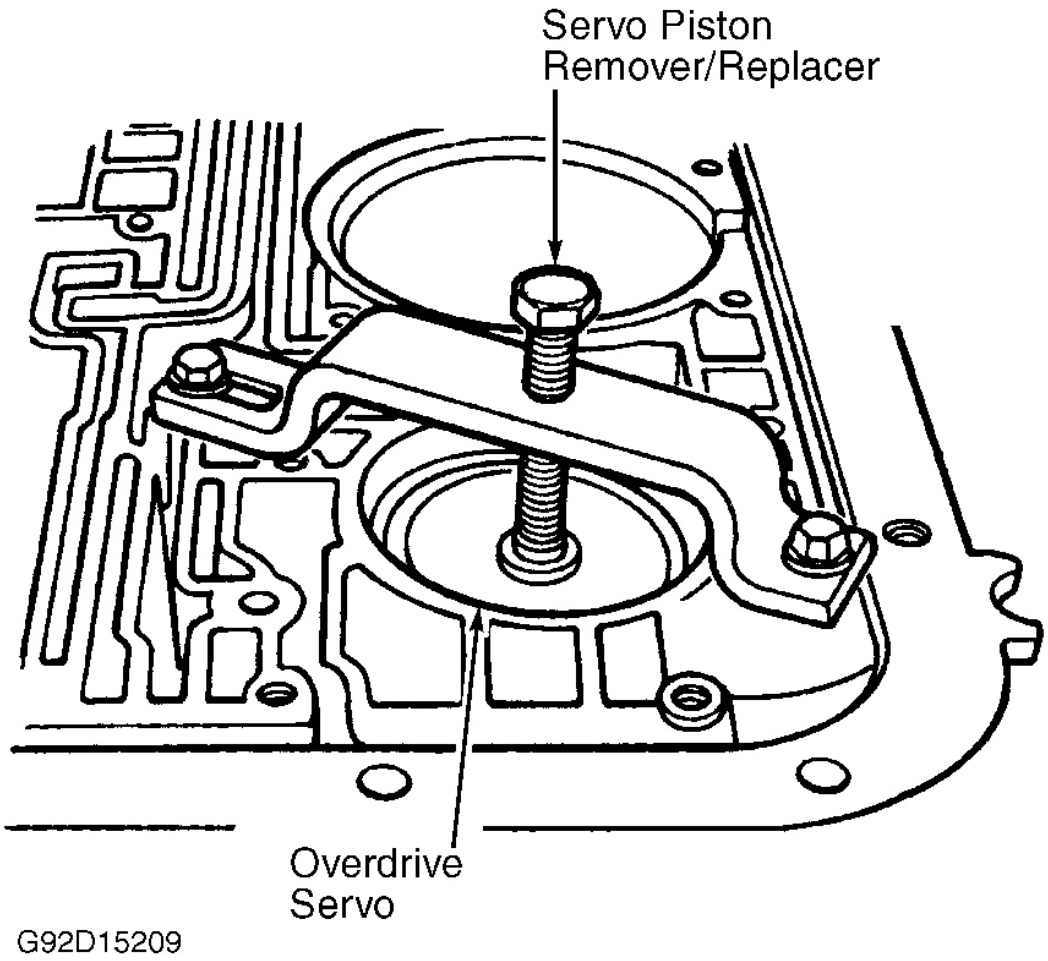


Fig. 5: Removing & Replacing Overdrive Servo
Courtesy of FORD MOTOR CO.

REVERSE SERVO ASSEMBLY

Removal

Remove valve body, see **VALVE BODY (MAIN CONTROL) ASSEMBLY**. Locate reverse servo. See **Fig. 4**. Using Remover/Replacer (T92P-70023-A), depress reverse servo piston cover and remove retaining snap ring and cover. Remove piston and spring from case.

Installation

To install, reverse removal procedure. Ensure servo piston is installed with the same length rod as was removed.

1-2 & 2-3 ACCUMULATOR PISTON

NOTE: Note location and number of springs during removal for re-assembly reference.

Removal

Remove valve body, see **VALVE BODY (MAIN CONTROL) ASSEMBLY**. Locate 1-2 or 2-3 accumulator. See **Fig. 5**. Using Remover/Replacer (T92P-70023-A), depress piston cover and remove retaining snap ring and cover or remove spring cover. Remove spring(s) and related components.

2) Remove accumulator piston (reverse snap ring pliers can be used, if necessary). Remove accumulator seals from piston.

Installation

To install, reverse removal procedure. Using ATF, lubricate piston seals and piston pocket in case prior to installation.

EXTENSION HOUSING BUSHING & REAR OIL SEAL

Removal

1. Raise vehicle on hoist. Mark drive shaft yoke and axle companion flange for reassembly reference. Disconnect drive shaft from transmission. Remove oil seal using Puller (T74P-77248-A).
2. Remove bushing using Puller (T77L-7697-A), taking care not to damage output shaft splines.

Installation

Install new bushing into extension housing using Driver (T80L-77034-A). Install new seal into housing using appropriate seal installer. Coat inside diameter of rubber portion of seal and yoke splines with lubricant. Install drive shaft.

EXTENSION HOUSING

Removal

1. Raise and support vehicle. Remove exhaust system components as necessary for access. Disconnect parking brake cable from equalizer (if equipped). Mark drive shaft yoke and axle companion flange for reassembly reference. Remove drive shaft and disconnect speedometer cable from extension housing.
2. Remove engine rear support-to-extension housing retaining bolts. Raise transmission just enough to remove weight from rear support. Remove rear support-to-crossmember retaining bolt and remove rear support.
3. Lower transmission and remove extension housing retaining bolts. Slide housing off output shaft and allow fluid to drain. Remove and discard extension housing-to-case gasket.

Installation

1. Clean mating surface on transmission and extension housing. Position new gasket on transmission. Slide extension housing into place.

2. Clean bolts and case holes for 2 bottom bolts and lower right hand corner bolt (as viewed from rear of extension housing). Coat bolts with Teflon tape and install. Install remaining bolts and tighten all to specification. See **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure.

TROUBLE SHOOTING

NOTE: In addition to transmission fault codes, engine-related fault codes may be output during QUICK TEST procedure. These fault codes pertain to engine performance and must be repaired first as engine performance will greatly affect transmission operation. For information and testing procedures of engine-related fault codes and components, see the appropriate G - TESTS W/ CODES article in the ENGINE PERFORMANCE section.

NOTE: Always check fluid level and condition. Ensure linkage is correctly adjusted and not damaged. Ensure electronic component connectors are tight and free from damage or contamination.

SYMPTOM DIAGNOSIS

No Forward Engagement

Fluid level and condition, shift linkage, low forward clutch pressure, low line pressure, filter (plugged or damaged), valve body (3-4 shift valve, main regulator valve, orifice control valve, manual valve), incorrectly tightened valve body (cross-leaks), 2-3 accumulator, pump assembly, forward clutch assembly, low one-way clutch assembly (planetary) and output shaft.

No Reverse Engagement

Fluid level and condition, shift linkage, low reverse clutch pressure, low reverse band pressure, low line pressure, filter (plugged), valve body (No. 6 shuttle ball, manual valve, main regulator valve), 1-2 accumulator, incorrectly tightened valve body (cross-leaks), low reverse servo, pump assembly, reverse clutch assembly and low reverse band.

Harsh Reverse Engagement

Fluid level and condition, shift linkage, high line pressure, high Electronic Pressure Control (EPC) pressure, oil filter (plugged), valve body (No. 6 shuttle ball, No. 5 check ball, manual valve, main regulator valve), incorrectly tightened valve body (cross-leaks), low reverse servo, pump assembly, reverse clutch assembly and low reverse band.

Harsh Forward Engagement

Fluid level and condition, high forward clutch pressure, high line pressure, high Electronic Pressure Control (EPC) pressure, valve body (main regulator valve, 2-3 backout valve, 2-3 accumulator), incorrectly tightened valve body (cross-leaks), pump assembly and forward clutch assembly.

Delayed/Soft Reverse Engagement

Fluid level and condition, shift linkage, low reverse clutch pressure, low reverse band pressure, low line pressure, filter (plugged), valve body (No. 6 shuttle ball, 1-2 accumulator, manual valve, main regulator valve), incorrectly tightened valve body (cross-leaks), low reverse servo, pump assembly, reverse clutch assembly and low reverse band.

Delayed/Soft Forward Engagement

Fluid level and condition, shift linkage, low forward clutch pressure, low line pressure, low Electronic Pressure Control (EPC) pressure, filter (plugged), valve body (3-4 shift valve, main regulator valve, orifice control valve), incorrectly tightened valve body (cross-leaks), 2-3 or 1-2 accumulator, pump assembly and forward clutch assembly.

Some Or All Shifts Missing

Fluid level and condition, shift linkage and Manual Lever Position (MLP) sensor.

Early/Late Shift Speeds

Incorrect tire size, incorrect axle ratio, fluid level and condition, line pressure, Electronic Pressure Control (EPC) pressure and valve body (EPC solenoid, miscellaneous components stuck, blocked solenoid screen).

Erratic/Hunting Shifting

Fluid level and condition, valve body (miscellaneous valves, accumulators-stuck), blocked valve body solenoid screen and Torque Converter Clutch (TCC).

Soft/Slipping Shift Feel

Fluid level and condition, low line pressure, Low Electronic Pressure Control (EPC) pressure, valve body (1-2 accumulator, 2-3 backout valve, main regulator valve, orifice control valve, overdrive servo regulator) and EPC solenoid (stuck).

Harsh Shift Feel

Fluid level and condition, high line pressure, high Electronic Pressure Control (EPC) pressure, valve body (1-2 accumulator, 2-3 backout valve, main regulator valve, orifice control valve, overdrive servo regulator) and EPC solenoid (stuck).

2nd Or 3rd Gear Starts In Drive (Or OD)

Shift linkage, Manual Lever Position (MLP) sensor, low reverse clutch pressure, low reverse band pressure, low line pressure and miscellaneous internal failures.

No Manual Low Gear

Shift linkage, Manual Lever Position (MLP) sensor, low reverse clutch pressure, low reverse band pressure, low line pressure, low Electronic Pressure Control (EPC) pressure, filter (plugged), valve body (No. 6 shuttle ball, manual valve, main regulator valve, low servo modulator valve), incorrectly tightened valve body (cross-leaks)

and low reverse servo.

No Manual 2nd Gear

Shift linkage or cable, Manual Lever Position (MLP) sensor, valve body (orifice control valve, 3-4 shift valve, 1-2 and 2-3 shift valve, 3-4 capacity modulator valve) and incorrectly tightened valve body (cross-leaks).

No 1-2 Automatic Shift

Shift linkage, Manual Lever Position (MLP) sensor, intermediate clutch pressure, line pressure, valve body (1-2 shift valve, 1-2 accumulator valve), Shift Solenoid No. 1 (SS1) failure, damaged No. 8 check ball, incorrectly tightened valve body (cross-leaks), pump assembly, intermediate clutch assembly, intermediate one-way clutch assembly and low one-way clutch assembly.

No 2-3 Automatic Shift

Shift linkage, direct clutch pressure, valve body (2-3 shift valve, No. 1 or No. 3 check ball, solenoid pressure regulator valve, 2-3 backout valve, 2-3 modulator valve, orifice control valve), Shift Solenoid No. 2 (SS2) failure, output shaft seals, missing or leaking cup plug, 2-3 accumulator, blocked valve body solenoid screen, intermediate overrunning clutch assembly, direct clutch assembly and case (damaged output shaft seal area).

No 3-4 Automatic Shift

Shift linkage, Manual Lever Position (MLP) sensor, forward clutch pressure, direct clutch pressure, line pressure, valve body (3-4 shift valve, solenoid pressure regulator valve, OD servo regulator, 3-4 capacity modulator valve, 2-3 backout valve, orifice control valve, 1-2 and 2-3 shift valves), incorrectly tightened valve body (cross-leaks), Shift Solenoid No. 1 or 2 (SS1 or SS2) failure, OD servo cover, OD rod and piston cushion spring, No. 1, 2, 4 and/or 7 valve body check balls, blocked valve body solenoid screen, pump, OD Band and/or reverse clutch drum assembly, intermediate overrunning clutch assembly, forward clutch assembly and input shaft.

No 4-3 Automatic Downshift

Forward clutch pressure, line pressure, valve body (3-4 shift valve, solenoid pressure regulator valve, OD servo regulator, 3-4 capacity modulator valve, 2-3 backout valve, orifice control valve, 1-2 and 2-3 shift valves), incorrectly tightened valve body (cross-leaks), Shift Solenoid No. 1 (SS1) failure, OD servo, No. 1, 2, and/or 7 valve body check balls, blocked valve body solenoid screen, pump, OD Band and/or reverse clutch drum assembly, intermediate overrunning clutch assembly, forward clutch assembly and input shaft.

No 3-2 Automatic Downshift

Direct clutch pressure, valve body (2-3 shift valve, No. 1 or No. 3 check ball), Shift Solenoid No. 2 (SS2) failure, intermediate one-way clutch assembly and direct clutch assembly.

No 2-1 Automatic Downshift

Intermediate clutch pressure, valve body (1-2 shift valve, 1-2 accumulator solenoid pressure regulator valve), Shift Solenoid No. 1 (SS1) failure, incorrectly tightened valve body (cross-leaks), pump assembly, intermediate

clutch assembly, intermediate one-way clutch assembly and low one-way clutch assembly.

No Torque Converter Clutch Application

Shift linkage, low line pressure, low Electronic Pressure Control (EPC) pressure, valve body (solenoid pressure regulator valve, manual valve, bypass clutch control valve and plunger, converter pressure limit valve, drain back valve), incorrectly tightened valve body (cross-leaks), blocked valve body solenoid screen, TCC solenoid failure, pump assembly, input shaft and torque converter assembly.

Torque Converter Clutch Always Applied

Valve body (drain back valve, TCC valve and plunger), incorrectly tightened valve body (cross-leaks), blocked valve body solenoid screen, No. 7 valve body check ball, pump assembly, input shaft and torque converter assembly.

Torque Converter Clutch Cycling/Shudder/Chatter

Fluid condition, valve body (solenoid pressure regulator valve, No. 7 check ball, bypass clutch control valve and plunger, converter pressure limit valve), incorrectly tightened valve body (cross-leaks), blocked valve body solenoid screen, TCC solenoid failure, pump assembly, input shaft and torque converter.

MISCELLANEOUS FAULTS

No Engine Braking In 2nd Gear, Manual 2nd Gear Or

Manual 1st Gear

Shift linkage, valve body (3-4 shift valve, 1-2 and 2-3 shift valve, orifice control valve, 3-4 capacity valve), OD band, reverse clutch drum assembly and intermediate overrunning clutch assembly.

Poor Vehicle Performance

Shift linkage, Manual Lever Position (MLP) sensor, incorrect shift speed or engagement, TCC always applied and torque converter.

Transmission Overheating

Fluid level and condition, poor fluid flow (cooler lines, auxiliary oil cooler, engine performance, valve body (drain back valve, TCC control valve, converter limit valve) and torque converter.

CLUTCH & BAND APPLICATION CHART

CLUTCH & BAND APPLICATION CHART

Selector Lever Position	Elements In Use
"OD" (Overdrive)	
1st Gear	Forward Clutch, Planetary One-Way

	Clutch
2nd Gear	Intermediate Clutch, Forward Clutch & Intermediate One-Way Clutch
3rd Gear	Forward Clutch, Intermediate Clutch & Direct Clutch
4th Gear	OD Band, Intermediate Clutch & Direct Clutch
"D" (Drive)	
1st Gear	Forward Clutch, Planetary One-Way Clutch
2nd Gear	Intermediate Clutch, Forward Clutch & Intermediate One-Way Clutch
3rd Gear	Forward Clutch, Intermediate Clutch & Direct Clutch
"2" (Downshift)	Forward Clutch, Intermediate Clutch, Intermediate One-Way Clutch & OD Band
"1" (Low)	Forward Clutch, Planetary One-Way Clutch & Low Reverse Band
"R" (Reverse)	Reverse Clutch & Low Reverse Band

TESTING

ROAD TEST

1. Check minimum throttle upshifts in "OD". Transmission should start in 1st gear, shift to 2nd, then shift to 3rd, and finally shift to 4th gear at approximately the speeds shown. See appropriate SHIFT SPEEDS SPECIFICATIONS table. Refer to the following:
   - For AODE, see **SHIFT SPEEDS SPECIFICATIONS (AODE)**.
   - For AODE-W, see **SHIFT SPEEDS SPECIFICATIONS (AODE-W)**.
2. With transmission in 4th gear (Overdrive), completely depress accelerator pedal. Transmission should downshift to 3rd or 2nd gear, depending on vehicle speed. The AODE/AODE-W will not make a 4th to 1st gear downshift. See SHIFT SPEEDS SPECIFICATIONS tables. Refer to the following menu. The AODE/AODE-W will not shift into 4th gear at WOT.
   - For AODE, see **SHIFT SPEEDS SPECIFICATIONS (AODE)**.

- For AODE-W, see **SHIFT SPEEDS SPECIFICATIONS (AODE-W)**.

3. Since closed throttle downshifts are extremely difficult to detect, it may be necessary to attach 0-100 psi (0-7.0 kg/cm^2) pressure gauges to forward and direct clutch pressure taps in order to detect Overdrive to 3rd gear and 3rd to 2nd gear coast downshifts. See **Fig. 6**.
4. With gauges attached, a 4th to 3rd gear coast (closed throttle) downshift is detected by the application of the forward clutch. Pressure will increase from 0-60 psi (0-4.2 kg/cm^2). The 3rd to 2nd gear downshift is detected by release of direct clutch pressure. Pressure will decrease from 60-0 psi (4.2-0 kg/cm^2).
5. When selector lever is moved from either "OD" or "D" ranges to "1" position, transmission should downshift into 2nd gear if vehicle speed is above 25 MPH, and into 1st gear if speed is less than 25 MPH.

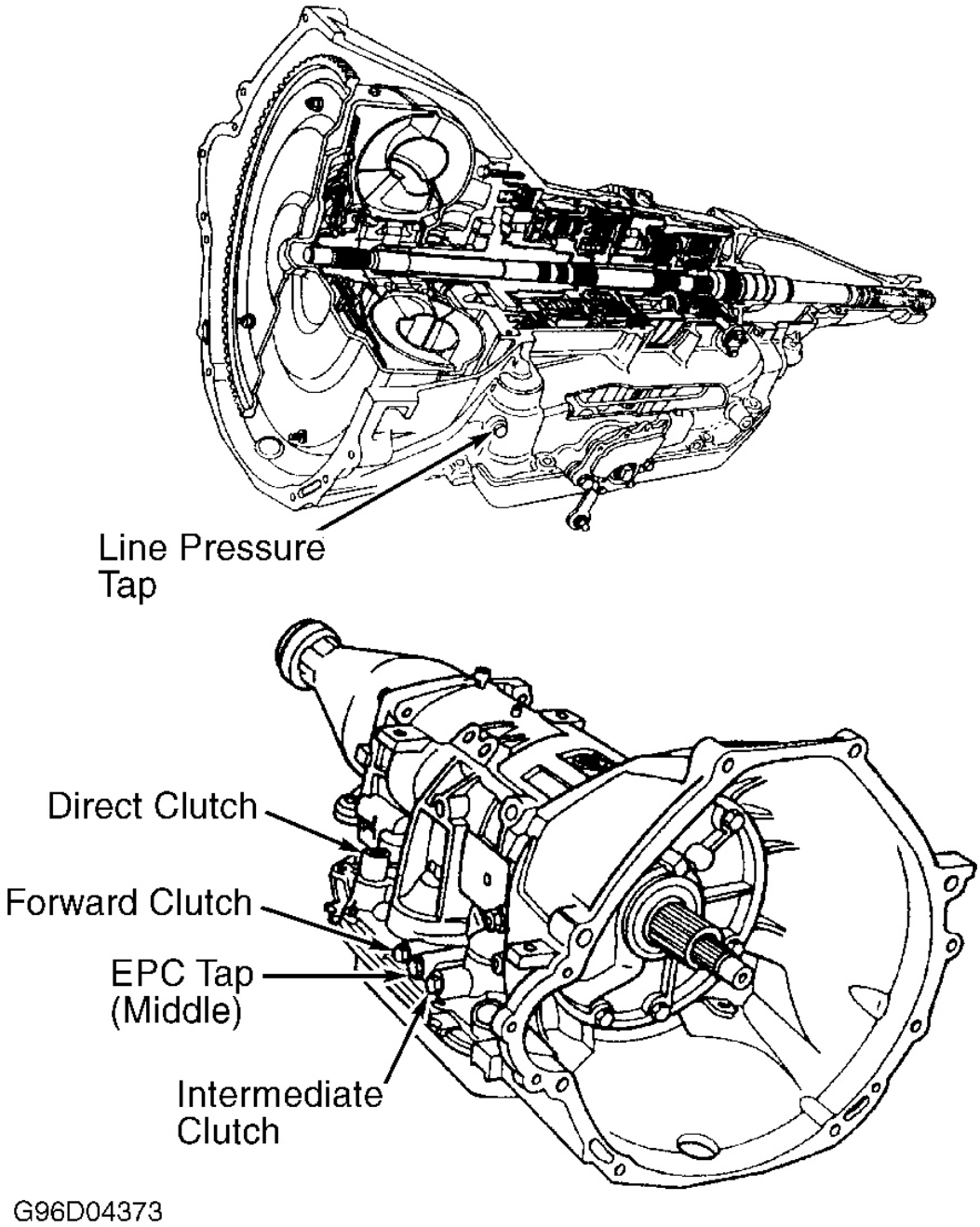


Fig. 6: Identifying Control Pressure Taps
Courtesy of FORD MOTOR CO.

CONTROL PRESSURE TEST

NOTE: When testing line pressure, 2 readings must be taken: one at Idle position and

the other at WOT.

1. Connect a 0-300 psi (0-21.1 kg/cm^2) pressure gauge to main line pressure port tap on left side of transmission case just above control levers. See **Fig. 6**. Gauge hose must be long enough to read gauge while operating engine.
2. Connect a 0-100 psi (0-7.0 kg/cm^2) pressure gauge to throttle pressure tap at right side of transmission case. See **Fig. 6**. Gauge hose must be long enough to read gauge while operating engine. Ensure shift linkage is properly adjusted.

CAUTION: Pressure gauges affect transmission shift quality. DO NOT accelerate or decelerate rapidly. Possible transmission failure could result.

3. With engine at normal operating temperature, apply parking and service brakes. Check line pressure and throttle pressure in all ranges. Pressure should be approximately as specified. See appropriate **CONTROL PRESSURE SPECIFICATIONS**.

NOTE: Pressure test at idle position must be taken with engine at normal operating temperature. Pressure test at WOT position should be taken at full stall conditions. Run engine at a fast idle in "N" for 2 minutes to cool fluid between tests.

CONTROL PRESSURE SPECIFICATIONS

AODE CONTROL PRESSURE SPECIFICATIONS

Throttle Position	Line Pressure psi (kPa)	Throttle Pressure psi (kPa)
Idle - Reverse Range		
Mustang	54-92 (372-634)	0-7 (0-48)
All Others	67-109 (462-752)	0-9 (0-62)
Idle - All Other Ranges		
Mustang	31-65 (214-448)	0-7 (0-48)
All Others	41-74 (283-510)	0-9 (0-62)
WOT @ Stall - Reverse Range		
Mustang	207-267 (1427-1841)	83-93 (572-641)
All Others	220-280 (1517-1931)	83-93 (572-641)
WOT @ Stall - All Other Ranges		
Mustang	160-210 (1103-1448)	83-93 (572-641)
All Others	160-210 (1103-1448)	83-93 (572-641)

AODE-W CONTROL PRESSURE SPECIFICATIONS

Throttle Position	Line Pressure psi (kPa)	Throttle Pressure psi (kPa)
Idle - Reverse Range		
Cougar/T-Bird (1)	60-104 (413-717)	3-13 (21-90)
Cougar/T-Bird (2)	54-92 (372-634)	0-7 (0-48)
Thunderbird SC	54-92 (372-634)	0-7 (0-48)
Mark VIII	54-92 (372-634)	0-7 (0-48)
E & F Series	54-96 (372-662)	0-9 (0-62)
Idle - All Other Ranges		
Cougar/T-Bird (1)	31-69 (214-476)	0-9 (0-62)
Cougar/T-Bird (2)	31-65 (214-448)	0-7 (0-48)
Thunderbird SC	31-65 (214-448)	0-7 (0-48)
Mark VIII	35-73 (241-503)	2-12 (13-83)
E & F Series	36-75 (248-448)	3-13 (21-90)
WOT @ Stall		
Reverse Range	207-267 (1427-1841)	83-93 (572-641)
All Other Ranges	160-210 (1103-1448)	83-93 (572-641)

(1) 3.8L engine.

(2) 4.6L engine.

CONTROL PRESSURE TEST RESULTS

Low In "P"

Valve body loose, faulty main oil regulator valve sticking or low-reverse servo leakage.

Low In "R"

Reverse clutch or low-reverse servo leakage. Valve body loose.

Low In "N"

Loose valve body or main oil regulator valve sticking.

Low In "O/D"

Faulty forward clutch, Overdrive servo, main oil regulator valve or loose valve body.

Low In "D"

Forward clutch leakage. Overdrive servo leakage.

Low In "1st"

Leakage at forward clutch or low-reverse servo or overdrive servo.

Low At Idle In All Ranges

Low fluid level, restricted intake screen or filter, loose valve body bolts, pump leakage, case leakage, faulty valve body, excessively low engine idle, fluid too hot or main regulator valve sticking.

DIRECT CLUTCH PRESSURE TEST

NOTE: Shift quality is affected when test gauges are attached to transmission. DO NOT accelerate or decelerate rapidly during test. Transmission failure could result.

1. Attach pressure gauges capable of reading 300 psi (21.1 kg/cm^2) to the forward clutch pressure tap and the direct clutch pressure tap. See **Fig. 6**. Mount gauges inside vehicle.
2. Drive vehicle. When pressure is applied to the direct clutch, note pressure difference between forward clutch pressure reading and direct clutch pressure reading.
3. If the difference is less than 15 psi (1.05 kg/cm^2), direct clutch circuit is okay. If difference is greater than specification, there is a leak in direct clutch pressure circuit. Repair as necessary.

AODE SHIFT SPEED SPECIFICATIONS

NOTE: Shift speeds shown are approximate. All shift speeds may vary somewhat due to production tolerances and emission control equipment.

NOTE: To determine deceleration shift speeds, release throttle once transaxle has shifted into 4th gear (O/D). Manually downshift shift lever into next lower gear and record speed at which downshift occurs. Continue downshifting and recording vehicle speed until transaxle has downshifted into low gear.

SHIFT SPEEDS SPECIFICATIONS (AODE)

3.8L MUSTANG SHIFT SPEEDS (2.73 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	11-14 (18-23)
2-3	19-22 (31-35)
3-4	38-44 (61-71)
4-3	27-25 (43-40)
3-2	16-14 (26-23)
2-1	9-7 (14-11)

Full Throttle (WOT)	
1-2	44-49 (71-79)
2-3	N/A
3-2	65 Max. (105 Max.)
2-1	35 Max. (56 Max.)

4.6L TOWN CAR SHIFT SPEEDS (3.08 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	9-12 (14-19)
2-3	13-17 (21-27)
3-4	33-38 (53-61)
4-3	33-31 (53-50)
3-2	14-12 (23-19)
2-1	9-7 (14-11)
Full Throttle (WOT)	
1-2	45-50 (72-80)
2-3	76-82 (122-132)
3-2	65 Max. (105 Max.)
2-1	38 Max. (61 Max.)

4.6L TOWN CAR SHIFT SPEEDS (TOW PACKAGE - 3.55 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	8-11 (13-18)
2-3	15-19 (24-31)
3-4	30-36 (48-58)
4-3	30-28 (48-45)
3-2	12-10 (19-16)
2-1	7-5 (11-8)
Full Throttle (WOT)	
1-2	42-47 (68-76)
2-3	68-74 (109-119)
3-2	60 Max. (97 Max.)
2-1	35 Max. (56 Max.)

4.6L CROWN VICTORIA/GRAND MARQUIS SHIFT SPEEDS (3.08 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	9-12 (14-19)
2-3	19-22 (31-35)

3-4	36-40 (58-64)
4-3	33-31 (53-51)
3-2	19-17 (31-27)
2-1	9-7 (14-11)
Full Throttle (WOT)	
1-2	46-51 (74-82)
2-3	78-84 (119-130)
3-2	65 Max. (105 Max.)
2-1	39 Max. (63 Max.)

4.6L CROWN VICTORIA/GRAND MARQUIS W/TOW PACKAGE (3.27 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	8-11 (13-18)
2-3	18-21 (29-34)
3-4	35-38 (56-61)
4-3	34-32 (55-51)
3-2	18-16 (29-26)
2-1	8-6 (13-10)
Full Throttle (WOT)	
1-2	44-50 (71-80)
2-3	75-81 (120-130)
3-2	67-63 (92-102)
2-1	36-33 (58-53)

4.6L CROWN VICTORIA SHIFT SPEEDS (POLICE WITH 3.27 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	8-11 (13-18)
2-3	18-21 (29-34)
3-4	37-40 (59-64)
4-3	36-34 (48-51)
3-2	18-16 (29-28)
2-1	8-6 (13-10)
Full Throttle (WOT)	
1-2	43-49 (70-79)
2-3	75-81 (120-130)
3-2	70-66 (113-106)
2-1	38-35 (61-57)

5.0L MUSTANG SHIFT SPEEDS (2.73 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	12-15 (19-24)
2-3	23-26 (37-42)
3-4	41-45 (66-72)
4-3	28-26 (45-42)
3-2	17-15 (27-24)
2-1	9-7 (14-11)
Full Throttle (WOT)	
1-2	52-57 (84-92)
2-3	89-94 (143-151)
3-2	80 Max. (129 Max.)
2-1	45 Max. (72 Max.)

5.0L MUSTANG SHIFT SPEEDS (3.27 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	9-12 (14-19)
2-3	19-22 (31-35)
3-4	36-40 (58-64)
4-3	24-23 (39-37)
3-2	16-14 (26-23)
2-1	9-7 (14-11)
Full Throttle (WOT)	
1-2	39-44 (63-71)
2-3	74-79 (119-127)
3-2	68 Max. (109 Max.)
2-1	38 Max. (61 Max.)

SHIFT SPEEDS SPECIFICATIONS (AODE-W)

NOTE: Shift speeds shown are approximate. All shift speeds may vary somewhat due to production tolerances and emission control equipment.

NOTE: To determine deceleration shift speeds, release throttle once transaxle has shifted into 4th gear (O/D). Manually downshift shift lever into next lower gear and record speed at which downshift occurs. Continue downshifting and recording vehicle speed until transaxle has downshifted into low gear.

3.8L COUGAR/THUNDERBIRD SHIFT SPEEDS (3.27 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	

1-2	8-14 (14-23)
2-3	18-23 (29-37)
3-4	28-36 (45-58)
4-3	32-28 (51-45)
3-2	16-12 (26-19)
2-1	10-6 (16-10)
Full Throttle (WOT)	
1-2	34-44 (55-71)
2-3	62-72 (100-116)
3-2	62-25 (100-40)
2-1	25-10 (40-16)

3.8L THUNDERBIRD SC SHIFT SPEEDS (3.27 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	7-10 (11-16)
2-3	16-20 (26-32)
3-4	31-34 (50-55)
4-3	32-30 (51-48)
3-2	18-16 (29-26)
2-1	9-7 (14-11)
Full Throttle (WOT)	
1-2	38-43 (61-69)
2-3	70-75 (113-121)
3-2	65 Max. (105 Max.)
2-1	27 Max. (43 Max.)

4.6L COUGAR/THUNDERBIRD SHIFT SPEEDS (3.08 & 3.27 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	10-13 (16-21)
2-3	19-23 (31-37)
3-4	32-37 (51-60)
4-3	33-29 (53-47)
3-2	19-18 (31-29)
2-1	12-9 (19-14)
Full Throttle (WOT)	
1-2	38-47 (61-76)
2-3	71-83 (114-134)
3-2	69-62 (111-100)
2-1	35-30 (56-48)

4.6L MARK VIII SHIFT SPEEDS (3.07 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	7-10 (11-16)
2-3	16-20 (26-32)
3-4	32-37 (51-59)
4-3	32-30 (51-48)
3-2	15-13 (24-21)
2-1	8-6 (13-10)
Full Throttle (WOT)	
1-2	50-55 (80-88)
2-3	94-100 (151-160)
3-2	76 Max. (122 Max.)
2-1	40 Max. (64 Max.)

5.0L E-150 SHIFT SPEEDS (3.31 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	8-12 (14-19)
2-3	16-22 (26-35)
3-4	35-40 (56-64)
4-3	35-29 (56-47)
3-2	16-12 (26-19)
2-1	9-5 (14-8)
Full Throttle (WOT)	
1-2	35-45 (56-73)
2-3	63-72 (103-116)
3-2	65-60 (105-97)
2-1	32-28 (51-45)

5.0L F-150 SHIFT SPEEDS (2WD - 3.08, 3.31 & 3.55 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	7-11 (11-18)
2-3	16-22 (26-35)
3-4	39-46 (62-74)
4-3	35-28 (56-45)
3-2	16-12 (26-19)
2-1	9-5 (15-8)
Full Throttle (WOT)	
1-2	36-43 (58-69)

2-3	69-76 (111-122)
3-2	65-59 (105-95)
2-1	34-28 (55-45)

5.0L F-150 SHIFT SPEEDS (4WD - 3.31 & 3.55 AXLE RATIO)

Operating Condition	Shift Speed MPH (km/h)
Closed Throttle	
1-2	6-10 (10-16)
2-3	16-20 (26-32)
3-4	39-45 (64-72)
4-3	35-28 (56-45)
3-2	16-12 (26-19)
2-1	9-5 (14-8)
Full Throttle (WOT)	
1-2	36-40 (58-65)
2-3	65-75 (105-121)
3-2	65-58 (105-93)
2-1	33-28 (53-45)

STALL SPEED TEST

Testing Precautions

When performing stall test, **DO NOT** hold throttle open longer than 5 seconds. Allow a cooling period of 2 minutes with transmission in "N" and engine speed at 1000 RPM between each test. If engine speed exceeds maximum limits shown, release accelerator immediately, as this is an indication of clutch or band slippage.

Testing Procedure

Bring engine to normal operating temperature. Apply parking and service brakes. Stall test transmission in each driving range at WOT. Note maximum RPM obtained. Engine speed should be within limits. See **STALL SPEED SPECIFICATIONS**. If maximum RPM obtained is not within specifications, see **STALL SPEED TEST RESULTS**.

STALL SPEED SPECIFICATIONS

STALL SPEED SPECIFICATIONS (AODE)

Application	Engine	RPM
Crown Victoria/Marquis		
Except Police	4.6L SFI	2326-2728
Police	4.6L SFI	2399-2811
Mustang	3.8L SC SFI	2189-2577
Mustang	5.0L HO SFI	2459-2904
Town Car	4.6L SFI	2326-2728

Town Car (Tow)	4.6L SFI	2397-2809

STALL SPEED SPECIFICATIONS (AODE-W)

Application	Engine	RPM
Cougar & Thunderbird	3.8L SC SFI	2201-2579
Cougar & Thunderbird	4.6L SFI	1977-2337
Mark VIII	4.6L SFI	2343-2734
Thunderbird	3.8L SC SFI	1770-2086
E & F Series	5.0L EFI	2136-2488

STALL SPEED TEST RESULTS

High Stall Speeds Or Slip

- In "OD" or "D" position - Check planetary one-way clutch.
- In "OD", "D" and "1" position - Check forward clutch.
- In "R" position - Check reverse clutch and/or low-reverse band.

Low Stall Speeds

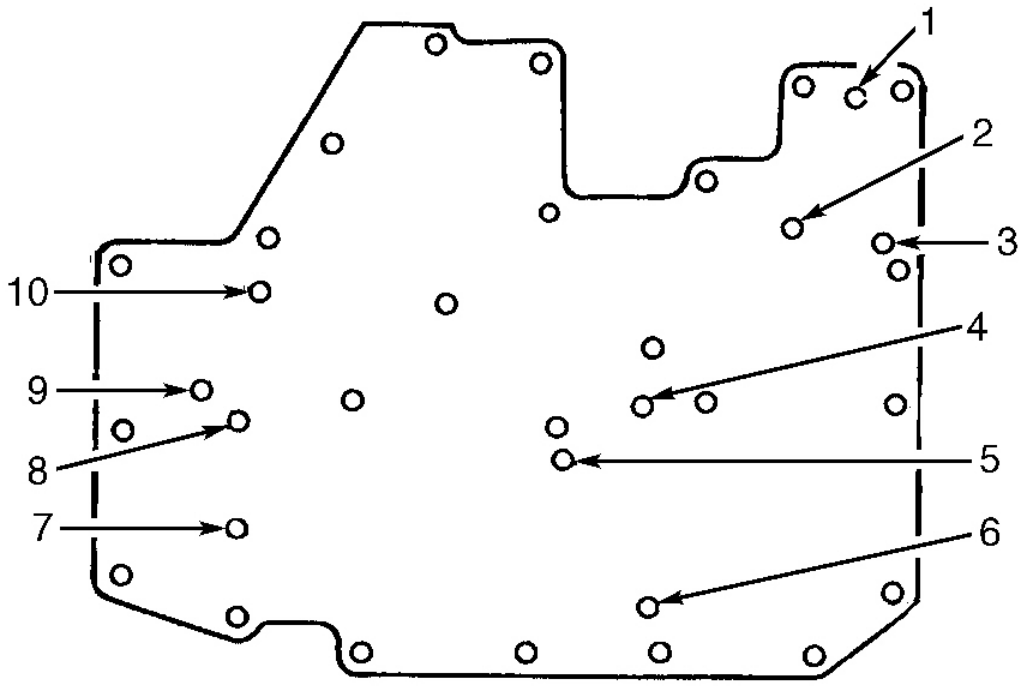
- Check engine tune-up.
- Check torque converter using bench test for stator one-way clutch slippage.

AIR PRESSURE TESTS

Test Procedures

1. A "No Drive" condition can exist even with correct transmission fluid pressure, because of inoperative clutches or bands. The inoperative units can be located by substituting air pressure for fluid pressure to determine location of malfunction.
2. Remove main control (valve body) assembly from transmission. See **ON-VEHICLE SERVICE**. Using attaching screws, install special adapter plate for AODE/AODE-W transmission and valve body gasket in place of valve body.
3. With a rubber-tipped air nozzle, apply air pressure into the appropriate locations specified in the following tests. See **Fig. 7**. If servo or accumulator does not move when air is applied, clean and inspect to locate cause. If during test 2 clutches apply or clutch fails to operate, check fluid passages in case and front pump for blockage or damage.

NOTE: Air pressure should be regulated between 40 psi (2.8 kg/cm^2) and 90 psi (6.3 kg/cm^2). Compressed air used for test should be filtered and dry to avoid contaminating transmission fluid.



1. Converter By-Pass
2. 1-2 Accumulator Apply
3. Intermediate Clutch
4. Overdrive Servo Release
5. Reverse Servo
6. Overdrive Servo Apply
7. 2-3 Accumulator Bottom
8. 2-3 Accumulator Top
9. Forward Clutch
10. Direct Clutch

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Fig. 7: Identifying Air Pressure Test Ports On Adapter Plate
Courtesy of FORD MOTOR CO.

Reverse Clutch

Apply air pressure to reverse clutch passage. A dull thud can be heard when clutch piston is applied, or movement can be felt by placing fingertips on clutch drum.

Forward Clutch

Apply air pressure to the forward clutch apply passage in the adapter plate. A dull thud can be heard when clutch piston is applied, or movement can be felt by placing fingertips on input shell.

Intermediate Clutch

Apply air pressure to intermediate clutch apply passage in the adapter plate. A dull thud can be heard or felt if clutch is operating properly.

Overdrive Servo

Apply air pressure to overdrive servo apply passage. Operation of the band is indicated by tightening of the band around reverse clutch drum. A thud can be felt on the servo cover when the servo returns to the release position as a result of spring force from the release spring. The band will then relax.

Low-Reverse Servo

Apply air pressure to low-reverse servo apply passage. A dull thud can be heard when the low-reverse band tightens around the planetary drum. Movement of the ring gear should also be detected.

Direct Clutch

Apply air pressure to direct clutch passage in the adapter plate. A dull thud can be heard or felt on the drive shaft if clutch is operating properly.

2-3 Accumulator

Apply air pressure to 2-3 accumulator passage. Accumulator piston should unseat and can be detected by inserting a metal rod into 2-3 piston hole. When piston unseats, rod will move.

TORQUE CONVERTER

NOTE: Torque converter is a sealed unit and cannot be disassembled for service. Replace if found to be defective. The following tests will identify a defective converter.

CONVERTER FLUSHING

Whenever transmission has been disassembled to replace worn or damaged parts or because valve body sticks due to foreign material, converter and oil cooler must be cleaned using a mechanically agitated Cleaner (Rotunda 1400028). Under no conditions should converter or oil cooler be cleaned by hand agitation using solvent.

LEAK TEST

If torque converter welds indicate leakage, attach Torque Converter Leak Detector (Rotunda 2100054) to converter and follow detector kit instructions.

END-PLAY CHECK

1. Insert Tester (T80L-7902-A) into converter pump drive hub until hub bottoms. Expand sleeve in turbine spline by tightening threaded inner post of tester until sleeve is securely locked into spline. See **Fig. 8**.
2. Attach a dial indicator to tool with button on indicator on converter pump drive hub. Zero dial face. Lift tool upward as far as tool will go and note indicator reading.
3. Reading is total end play of turbine and stator. If end play exceeds .077" (1.96 mm) for new or rebuilt converter, or .100" (2.54 mm) for used converter, replace torque converter assembly.

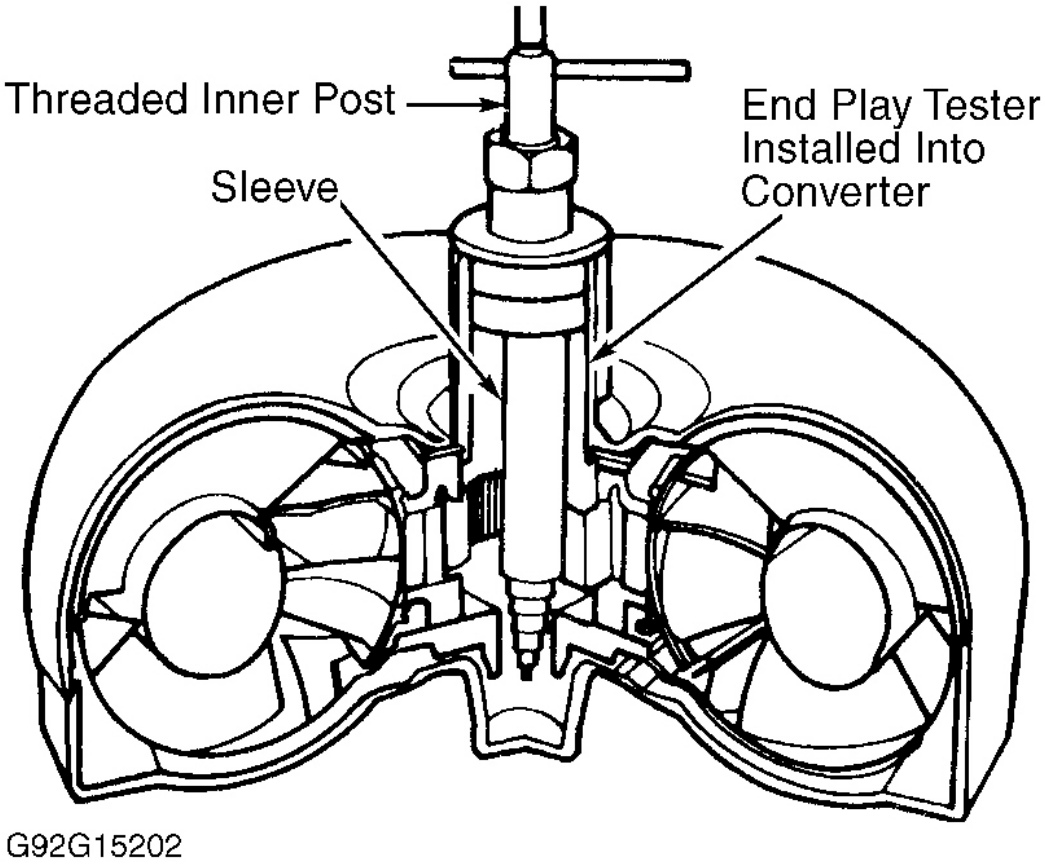


Fig. 8: Installing Torque Converter End Play Tester
Courtesy of FORD MOTOR CO.

ONE-WAY CLUTCH CHECK

Insert fingers into torque converter. Attempt to spin the first splined segment. The segment should spin freely clockwise but not counterclockwise. One-way clutch should rotate freely in a clockwise direction only. If clutch fails to lock-up and hold as specified, replace torque converter.

STATOR INTERFERENCE CHECK

Stator-To-Impeller Interference Check

1. Position stator support shaft on bench with spline end pointing up. Mount converter vertically onto shaft so support shaft splines engage one-way clutch splines. See **Fig. 9**.
2. While holding support shaft stationary, rotate converter counterclockwise. Converter should rotate freely without interference or scraping within assembly. Should interference or a scraping condition within converter exist or converter does not rotate freely, replace converter unit.

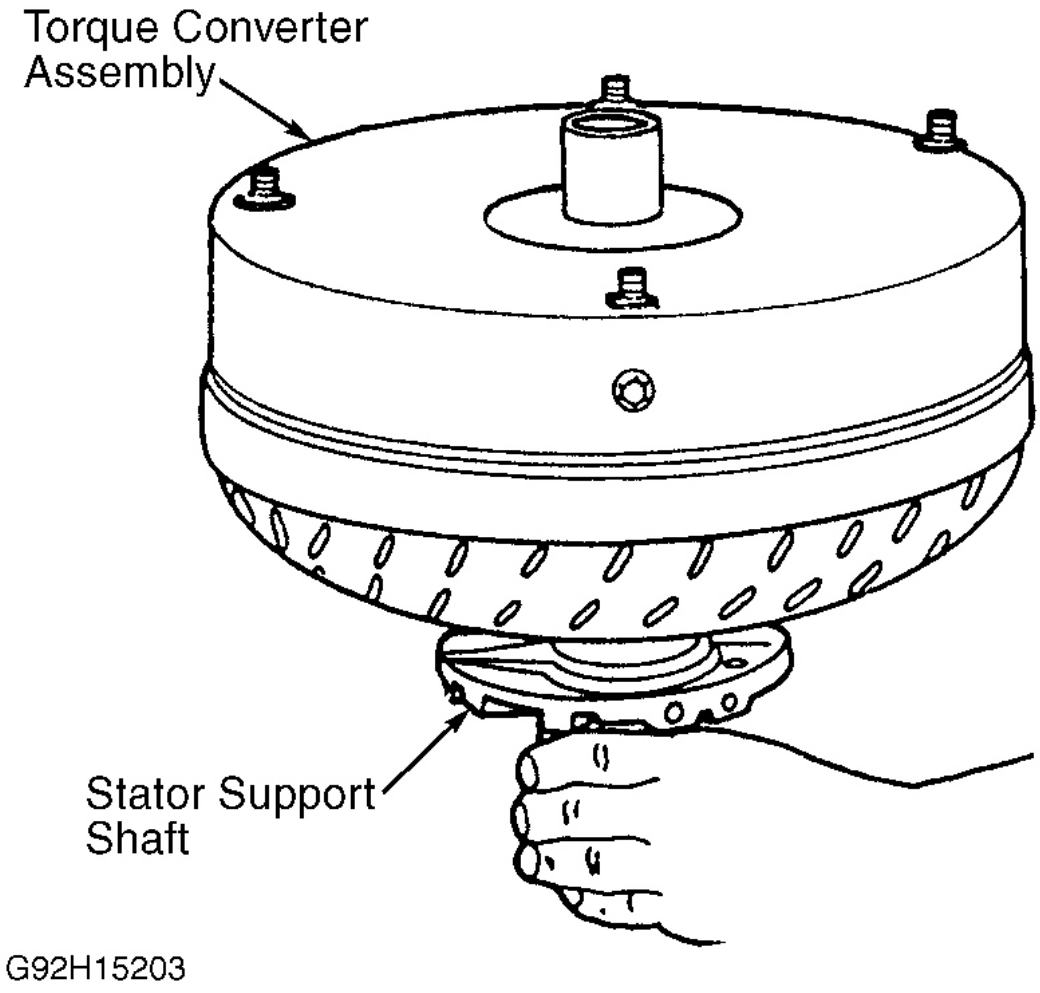


Fig. 9: Checking For Stator-To-Impeller Interference
Courtesy of FORD MOTOR CO.

Stator-To-Turbine Interference Check

1. Place converter on bench, front side down. Install stator support to engage mating splines of stator support shaft.
2. Install input shaft, engaging the splines with turbine hub. While holding stator shaft stationary, rotate turbine with input shaft.
3. Turbine should rotate freely in both directions without interference or noise. Torque required to turn shaft should not exceed 84 INCH lbs. (9.5 N.m) If interference or noise exists, stator front thrust washer may be worn and the converter should be replaced.

REMOVAL & INSTALLATION

See the following articles for removal & installation procedures:

- **TRANSMISSION REMOVAL & INSTALLATION - A/T** For 1993
- **TRANSMISSION REMOVAL & INSTALLATION - A/T** For 1994

TRANSMISSION DISASSEMBLY

NOTE: See Fig. 22 and Fig. 23 for exploded view of internal parts, thrust washer and needle bearing locations.

1. Remove torque converter. Mount transmission in appropriate holding fixture. Remove oil pan and gasket. Remove oil filter, grommet, and gasket. Disconnect all solenoid and sensor harness connectors. Unbolt and remove Output Shaft Sensor (OSS).
2. Remove MLP sensor from manual control lever. Remove detent spring and roller assembly. Remove 24 valve body retaining bolts and lift off valve body and gasket. Note bolt positions for reassembly. Using diagonal cutters, remove retaining roll pin from manual shaft lever. Unbolt and disassemble manual lever assembly. Slide out Electronic Pressure Control (EPC) solenoid and remove.
3. Remove 2-3 accumulator assembly, low-reverse servo assembly, overdrive servo and 1-2 accumulator assembly by pushing down on servo covers and removing retaining snap rings. Note length of low-reverse servo piston rod for reassembly reference. See **Fig. 4** and **Fig. 10** .

   NOTE: Length of low-reverse piston rod may vary. Three possible rod lengths are available.

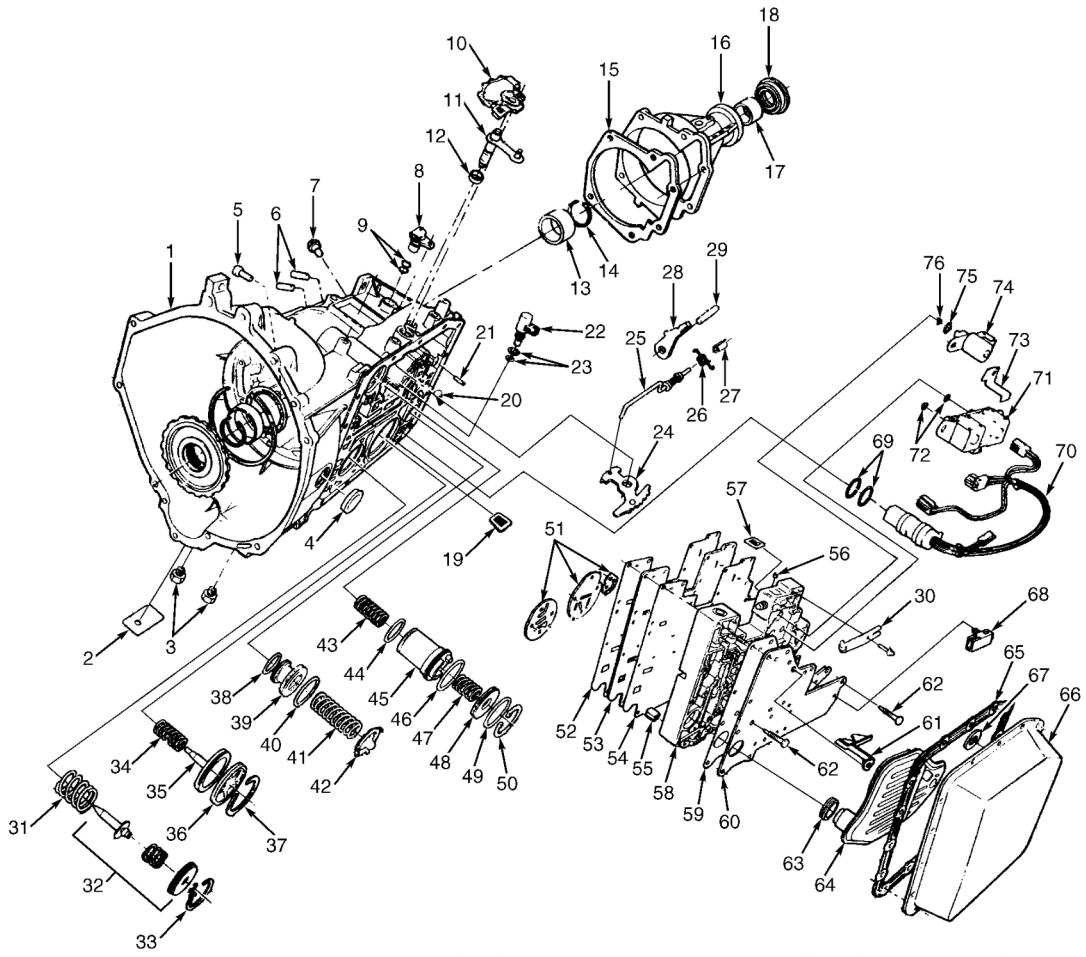
4. Remove oil screen. See **Fig. 10**. Remove retaining bolts and slide extension housing from transmission. Remove and discard housing-to-case gasket. Push transmission harness connector out through bottom of case.

   NOTE: The output shaft may have shipping seal still attached. Remove and discard seal. Seal is not required for assembly.

5. Remove direct drive shaft by pulling it straight out from case. Remove pump body retaining bolts. Remove pump from case using 2 slide hammers installed in opposite pump retaining bolt holes. Remove pump-to-case gasket.
6. Grasp turbine shaft and pull intermediate clutch pack, intermediate one-way clutch, reverse clutch, and forward clutch from transmission case as an assembly. Disconnect overdrive band from anchor pins and remove band from case.
7. Remove forward clutch hub and No. 3 needle bearing as an assembly. Remove intermediate stub shaft. Rotate reverse clutch gear and shell to align indent with overdrive band anchor pin. Remove forward sun gear, No. 5 needle bearing, reverse sun gear and drive shell, and No. 4 needle bearing from case as an assembly.
8. Note position of center support snap ring tangs for installation reference. Remove snap ring. Using a screwdriver, pry anti-clunk spring from between center support and case. Prior to removal, note position of anti-clunk spring to ensure it is reinstalled correctly.
9. Remove center support and planetary carrier from case as an assembly. Remove reverse band from case.

If direct clutch hub did not come out with planetary carrier, remove it from direct clutch.

10. Remove output shaft, ring gear, and direct clutch as an assembly through front of case. Remove output shaft No. 9 needle bearing from rear of case. Remove intermediate clutch pack from one-way clutch. Remove reverse clutch assembly from forward clutch assembly.



1. Case
2. Identification Tag
3. Oil Line Connectors
4. Plug
5. Overdrive Band Pin
6. Reverse Band Pin
7. Case Vent
8. Output Shaft Speed Sensor
9. "O" Rings
10. Manual Lever Position Sensor
11. Manual Control Lever
12. Manual Lever Oil Seal
13. Output Shaft Sleeve
14. Retainer Ring
15. Gasket
16. Extension Housing
17. Bushing
18. Seal
19. Main Control Pump Screen
20. Oil Screen
21. Manual Lever Shaft Pin
22. Pressure Control Solenoid
23. "O" Rings
24. Manual Valve Detent Lever
25. Parking Pawl Actuator Rod
26. Parking Pawl Return Spring
27. Park Rod Guide Cup
28. Parking Brake Pawl
29. Parking Pawl Shaft
30. Manual Valve Detent Spring
31. Overdrive Servo Spring
32. Overdrive Servo Assembly
33. Retainer Ring
34. Reverse Band Servo Spring
35. Reverse Band Servo Assembly
36. Reverse Band Servo Cover
37. Retainer Ring
38. 2-3 Accumulator Upper Seal
39. 2-3 Accumulator Piston
40. 2-3 Accumulator Lower Seal
41. 2-3 Accumulator Piston Spring
42. Retainer Spring
43. 1-2 Accumulator Spring
44. 1-2 Accumulator Upper Seal
45. 1-2 Accumulator Piston
46. 1-2 Accumulator Lower Seal
47. 1-2 Accumulator Spring
48. 1-2 Accumulator Cover
49. 1-2 Accumulator Retainer Seal
50. 1-2 Accumulator Retainer Ring
51. Valve Body Reinforcing Plate
52. Separator Plate Upper Gasket
53. Valve Body Separator Plate
54. Separator Plate Lower Gasket
55. Converter Drainback Valve
56. Coast Booster Valve Shuttle Ball
57. Solenoid Pressure Supply Screen
58. Main Control Assembly (Valve Body)
59. Valve Body Cover Plate Gasket
60. Valve Body Cover Plate
61. Solenoid Retainer
62. Guide Bolts
63. Grommet
64. Filter
65. Oil Pan Gasket
66. Oil Pan
67. Magnet
68. Oil Temperature Sensor
69. "O" Rings
70. Wiring Connector Harness
71. Shift Control Solenoid
72. "O" Rings
73. Shift Control Solenoid Bracket
74. Modulated Converter Clutch Solenoid
75. "O" Rings
76. "O" Rings

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Fig. 10: AODE/AODE-W Valve Body, Servos, Accumulators & Components
Courtesy of FORD MOTOR CO.

COMPONENT DISASSEMBLY & REASSEMBLY

NOTE: See Fig. 22 and Fig. 23 for exploded view of internal parts, thrust washer and needle bearing locations.

CENTER SUPPORT & PLANETARY ONE-WAY CLUTCH

NOTE: If a roller from planetary one-way clutch is lost or damaged, entire one-way clutch assembly must be replaced.

Disassembly

Remove center support from planetary carrier by lifting up on center support while rotating it counterclockwise. Carefully remove planetary one-way clutch from planetary assembly.

Reassembly

If necessary, assemble one-way clutch. Lubricate clutch races and clutch assembly with petroleum jelly to aid in assembly. Install one-way clutch in planetary carrier. Install center support into one-way clutch by rotating center support counterclockwise.

DIRECT CLUTCH ASSEMBLY

Disassembly

1. Remove No. 7 direct clutch hub inner needle bearing and bearing support. Using a screwdriver, remove clutch pack selective retaining snap ring and lift out clutch pack. See **Fig. 11**.
2. Using appropriate compressor, compress piston return springs and remove retaining snap ring. Remove tool and lift spring retainer assembly and piston from clutch drum.
3. If necessary, piston can be removed by applying compressed air to lubrication hole in clutch drum. Note position and direction of lip seals. Remove seals from drum and piston.

Inspection

1. Check piston check ball for freedom of movement. Check for leakage by turning piston upside down (flat side up), allowing check ball to seat in piston.
2. Pour small quantity of solvent over check ball. If solvent drips past check ball, replace piston.

Reassembly

1. Using Seal Protector (T80L-77234-A), install inner seal on clutch drum hub with sealing lip facing down into drum. Lubricate seals and seal protector with petroleum jelly prior to installation. Ensure inner seal is positioned in groove. Install outer seal on piston with lip pointing away from spring posts.
2. Coat piston seals, clutch drum sealing area, and piston inner seal area with petroleum jelly. Install piston into clutch drum using Seal Protector (T80L-77254-A) to prevent damaging seals.
3. Position piston spring and retainer assembly in clutch drum. Compress assembly and install retaining snap ring. Install clutch pack into drum. Install pressure plate on top of clutch pack. Install clutch pack selective retaining ring.

4. Using a feeler gauge, measure clearance between clutch pack retaining ring and pressure plate with pressure plate held down. See **DIRECT CLUTCH PLATE USAGE & CLEARANCE**.
5. If clearance is not within specifications, install correct size snap ring and recheck clearance. Selective snap rings are available in the following sizes: .050-.054" (1.27-1.37 mm), .064-.068" (1.63-1.73 mm), .078-.082" (1.98-2.08 mm) and .092-.096" (2.34-2.44 mm).
6. To check clutch for proper operation, use compressed air at 30 psi (2.1 kg/cm^2). Clutch should apply smoothly and without leakage.

DIRECT CLUTCH PLATE USAGE & CLEARANCE

Application	Steel Plates	Friction Plates	Clearance In. (mm)
All Models	6	6	.060-.092 (1.53-2.34)

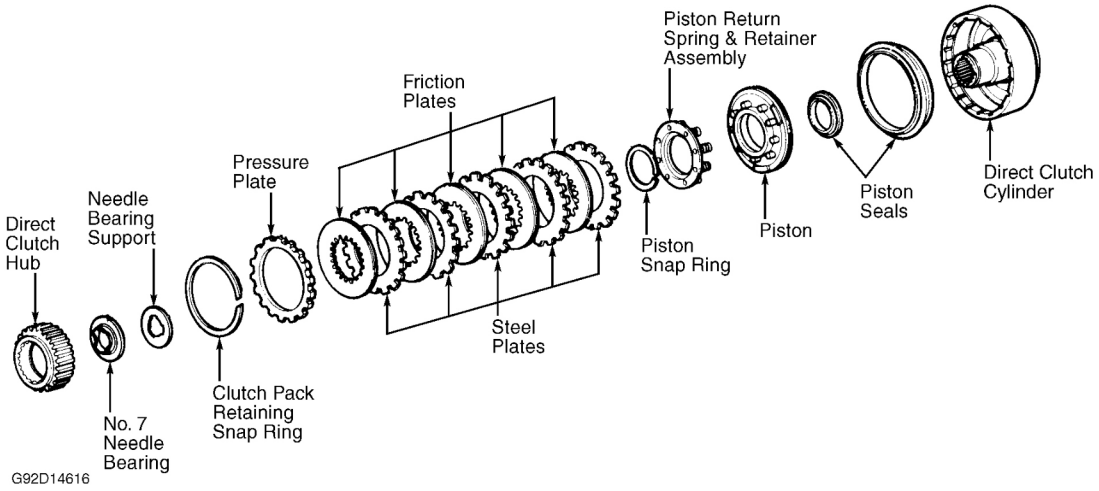


Fig. 11: Exploded View Of Direct Clutch Assembly
Courtesy of FORD MOTOR CO.

FORWARD CLUTCH

Disassembly

1. Lift clutch hub and No. 3 needle bearing from forward clutch assembly. Using a screwdriver, pry clutch pack selective retaining snap ring from drum. Remove clutch pack. See **Fig. 12**.
2. Using appropriate compressor, compress piston return spring and remove retaining snap ring. Lift out retainer and return spring.
3. Remove clutch piston from drum. Note position of inner and outer piston seals, then remove seals. Ensure check balls in piston are move freely.

Reassembly

1. Lubricate and install inner and outer seals on piston with seal lips facing into clutch drum. Lubricate piston seals and drum sealing area with petroleum jelly. Install piston into drum using Seal Protector

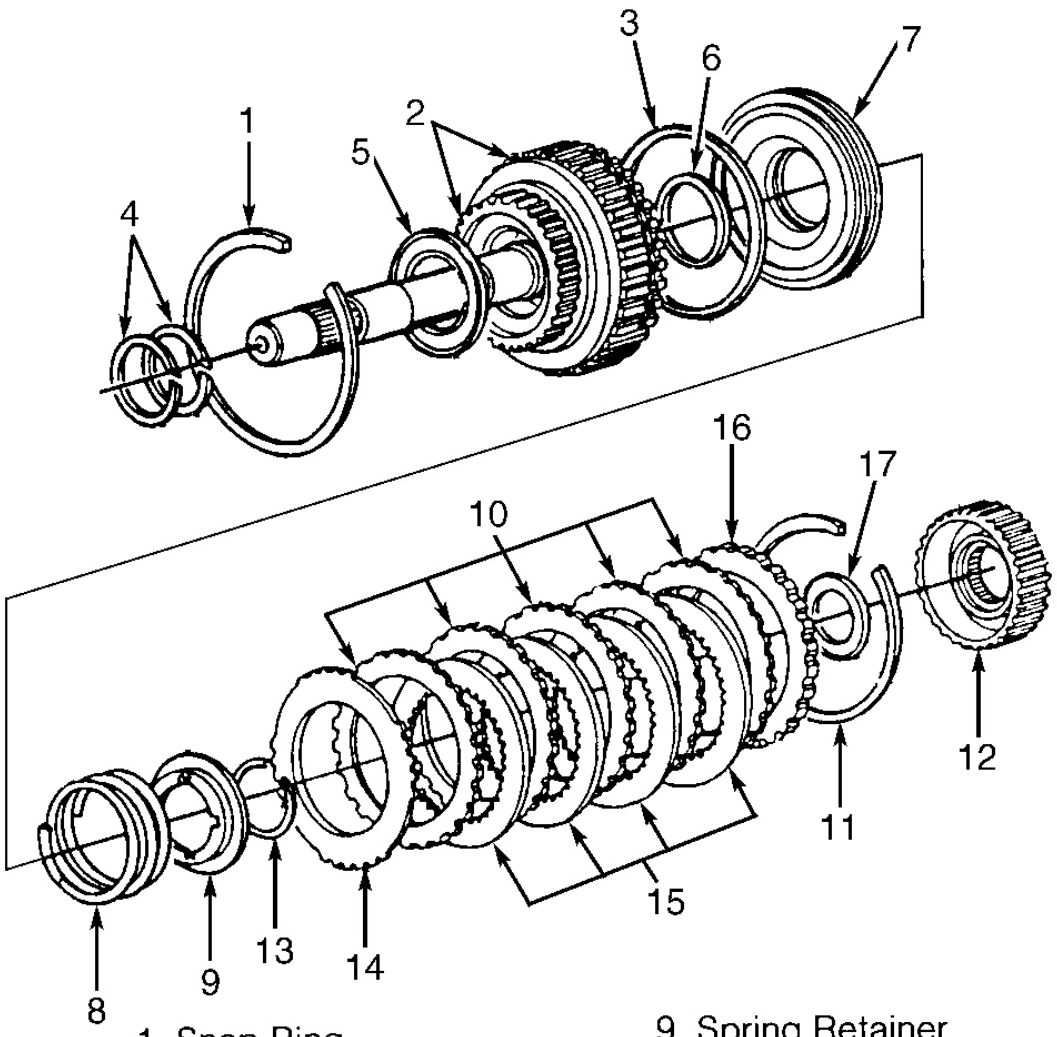
(T80L-77140-A) to prevent damaging seals.

2. Position return spring and retainer on piston. Compress return spring and install retaining snap ring. Install clutch pack into clutch drum starting with waved plate. Install clutch pack retaining snap ring. Using a feeler gauge, measure clearance between retaining snap ring and pressure plate with pressure plate held down. See **FORWARD CLUTCH PLATE USAGE & CLEARANCE**.

FORWARD CLUTCH PLATE USAGE & CLEARANCE

Application	Steel Plates	Friction Plates	Clearance In. (mm)
All Models	5	5	.050-.094 (1.27-2.38)

3. If clearance is not within specification, install correct size snap ring and recheck clearance. Selective snap rings are available in the following sizes: .060-.064" (1.52-1.73 mm), .074-.078" (1.88-1.98 mm), .086-.092" (2.23-2.34 mm) and .102-.106" (2.59-2.69 mm).
4. With reassembly completed, use compressed air and check forward clutch operation. Clutch should apply smoothly and without leakage.



1. Snap Ring
2. Clutch Cylinder & Input Shaft Assembly
3. Outer Seal
4. Input Shaft Seals
5. Bearing
6. Inner Seal
7. Piston
8. Return Spring
9. Spring Retainer
10. Steel Plates
11. Snap Ring
12. Hub
13. Snap Ring
14. Wave Spring
15. Friction Plates
16. Pressure Plate
17. Bearing

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

INTERMEDIATE ONE-WAY CLUTCH

Disassembly & Reassembly

Remove clutch retaining ring and lift off clutch retaining plate. Remove clutch outer race by lifting on race while turning counterclockwise. Carefully lift one-way clutch from inner race. See **Fig. 13**. To reassemble, reverse disassembly procedure.

NOTE: If a roller is damaged or lost, entire one-way clutch assembly must be replaced.

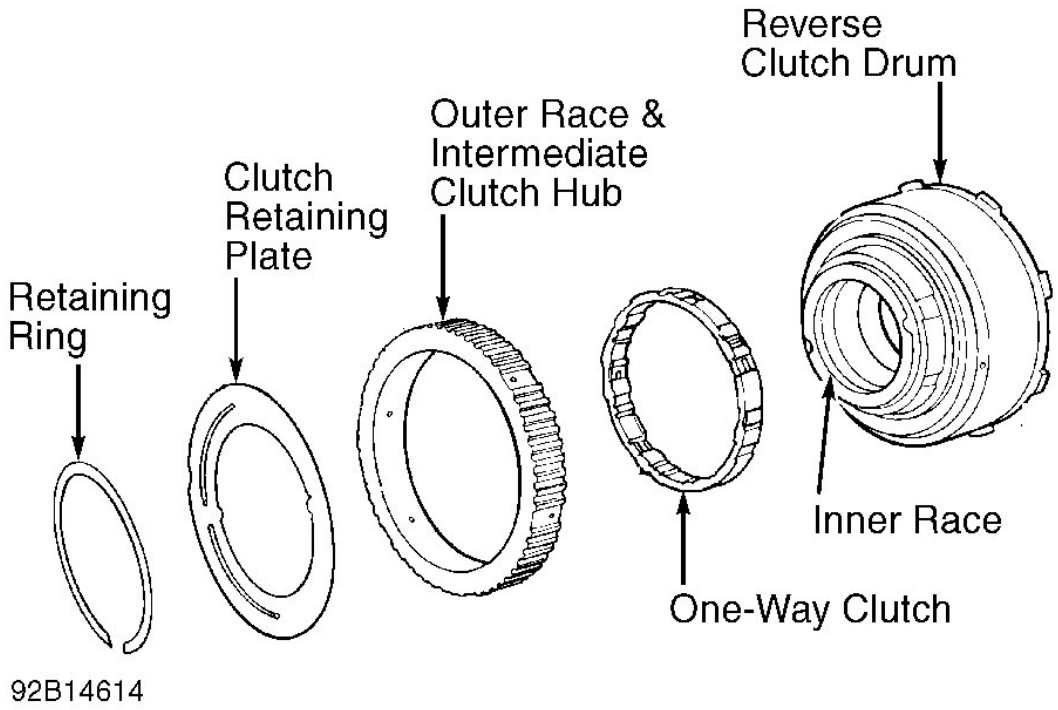


Fig. 13: Exploded View Of Intermediate One-Way Clutch Assembly
Courtesy of FORD MOTOR CO.

OIL PUMP & INTERMEDIATE CLUTCH PISTON

Disassembly

1. Lift No. 1 thrust washer from stator support. Remove four (4) seal rings from stator support. Remove pump body-to-case seal and discard. See **Fig. 14**.
2. Remove spring retainer assembly by carefully dislodging the tabs. Lift intermediate clutch piston from pump assembly. Remove retaining bolts and separate stator support from pump body. Remove drive and driven gears from pump body.

NOTE: Reverse clutch seal rings on stator support are larger than forward clutch seal

rings.

Reassembly

1. Install drive gear and driven gear into pump body with chamfer on both gears facing into pump body. Position stator support on pump body. Install and tighten retaining bolts to specification. See **TORQUE SPECIFICATIONS**. Install pump body-to-case seal around outer diameter of pump body.
2. Install NEW seals on intermediate clutch piston. Seal lips point away from spring posts. Coat piston seal and pump body sealing area with petroleum jelly. Use Seal Protector (T80L-77005-A) and install piston in pump body, ensuring piston bleed hole is located at 12 o'clock position (toward top of transmission case).
3. Snap spring retainer assembly into place on pump body using even pressure. Install seal rings on stator support. The two (2) larger rings are installed closest to pump.

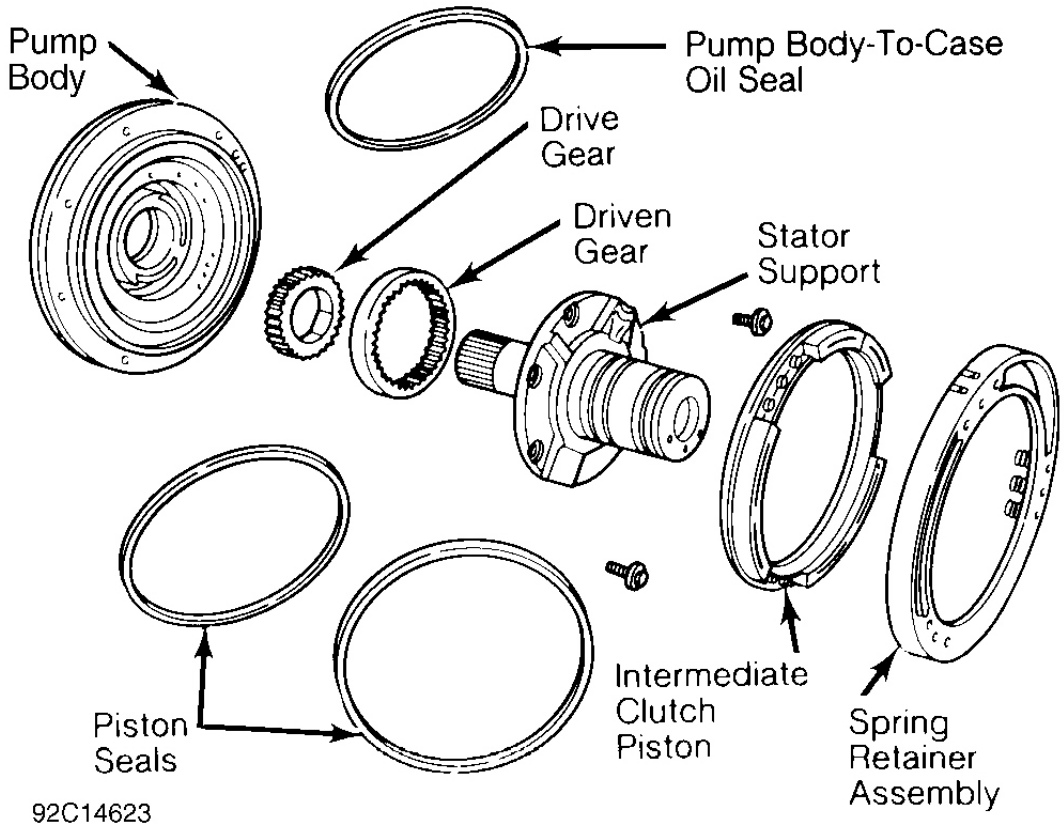
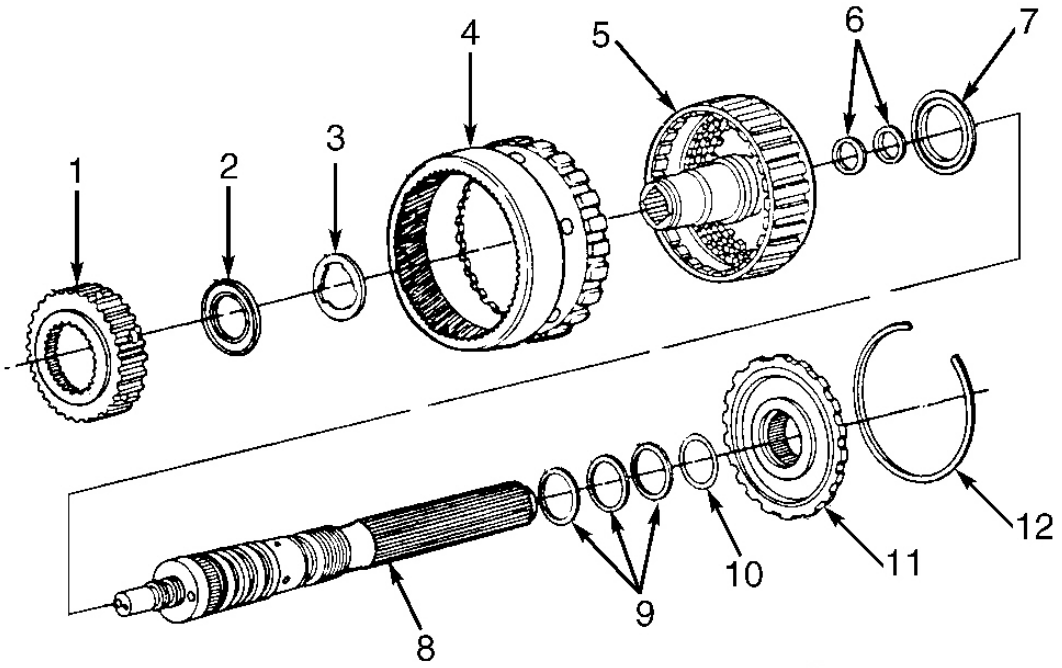


Fig. 14: Exploded View Of Oil Pump & Intermediate Clutch
Courtesy of FORD MOTOR CO.

OUTPUT SHAFT ASSEMBLY

Disassembly & Reassembly

1. Remove retaining ring and separate output hub assembly from ring gear. Remove direct clutch from ring gear and No. 8 needle bearing from rear of direct clutch.
2. Remove 4 output shaft seal rings and hub-to-shaft retaining ring. Separate hub from output shaft. Remove 2 direct clutch seal rings from end of output shaft. See **Fig. 15**. To reassemble, reverse disassembly procedure.



1. Direct Clutch Hub
2. Bearing
3. Washer
4. Ring Gear
5. Clutch Cylinder
6. Seals
7. Bearing/Race
8. Output Shaft
9. Seals
10. Seal
11. Hub
12. Snap Ring

G94E38780

Fig. 15: Exploded View Of Output Shaft Assembly
Courtesy of FORD MOTOR CO.

REVERSE CLUTCH

Disassembly

1. Remove No. 2 needle bearing. Using a screwdriver, pry clutch pack retaining snap ring from clutch drum. Lift out clutch pack. See **Fig. 16**.
2. Compress return spring and remove waved snap ring. Remove return spring and thrust ring. Remove

piston from drum. Remove seals from piston.

3. It may be necessary to apply compressed air to clutch drum lubrication hole to remove piston. Block remaining hole with finger.

Reassembly

1. Prior to reassembly, ensure check ball in inner piston seal is free. Install NEW oil seal on piston. Coat seals and sealing surface in clutch drum with petroleum jelly.
2. Install piston into clutch drum using Inner and Outer Seal Protectors (T80L-77403-B and A) to prevent damaging seals. Seals used on reverse clutch piston are square cut; direction of installation is not important.
3. Install thrust ring and return spring. Compress return spring and install waved snap ring with points facing downward. Install apply plate into clutch drum with dished side facing piston. Install clutch pack and retaining snap ring.
4. Using a feeler gauge, measure clearance between clutch pack snap ring and pressure plate while pushing down on pressure plate. See **REVERSE CLUTCH PLATE USAGE & CLEARANCE**.

REVERSE CLUTCH PLATE USAGE & CLEARANCE

Application	Steel Plates	Friction Plates	Clearance In. (mm)
All Models	3	4	.040-.060 (1.02-1.52)

5. If clearance is not within specification, install correct size snap ring and recheck clearance. Selective snap rings are available in sizes; .060-.064" (1.52-1.73 mm), .074-.078" (1.88-1.98 mm), .088-.092" (2.24-2.34 mm) and .102-.106" (2.59-2.69 mm).
6. With reverse clutch reassembly completed, check clutch operation using compressed air. Ensure clutch applies smoothly and without leakage. Install No. 2 thrust washer or No. 2 needle bearing.

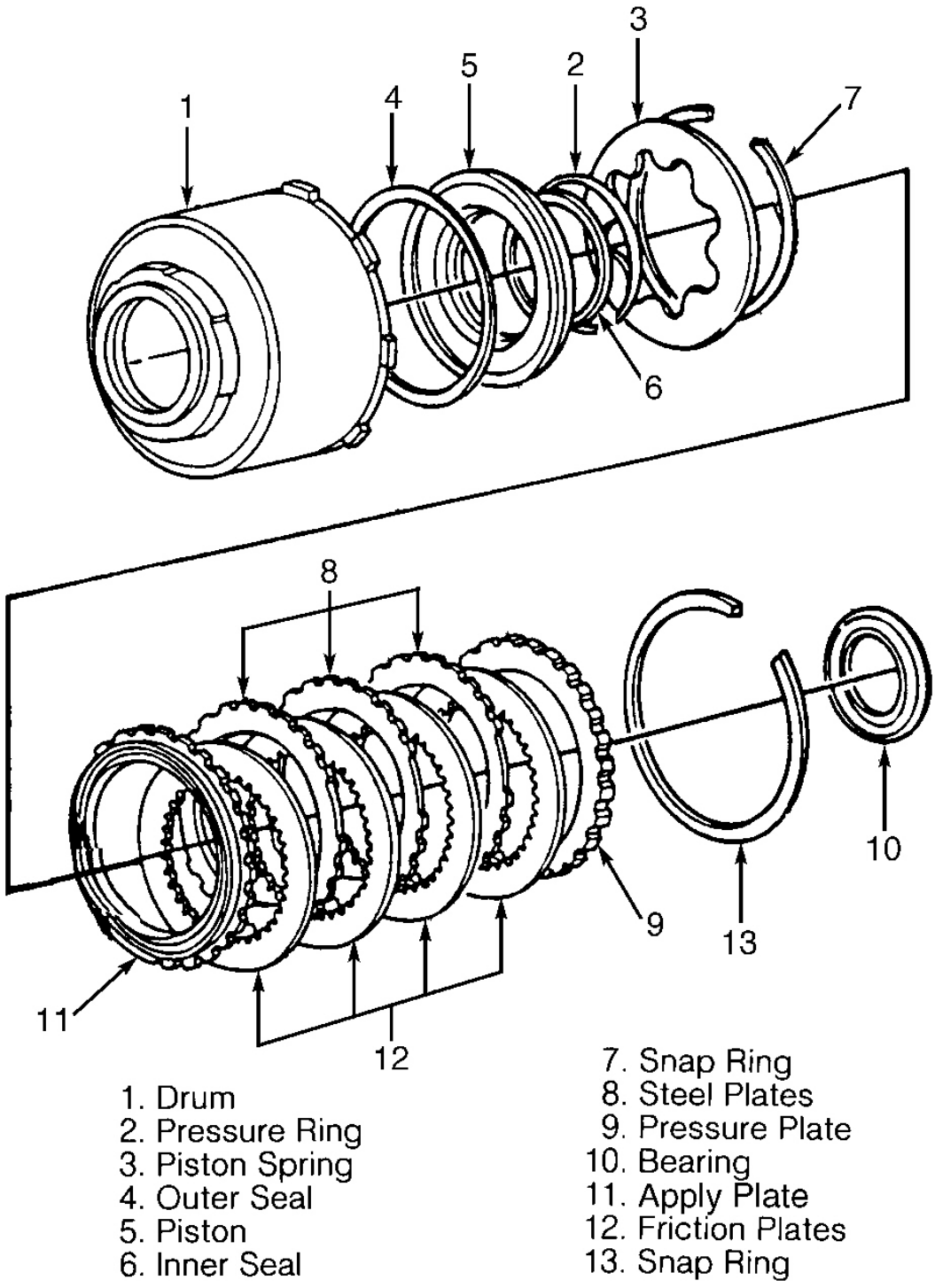


Fig. 16: Exploded View Of Reverse Clutch Assembly
Courtesy of FORD MOTOR CO.

SUN GEAR & DRIVING SHELL

Disassembly

Remove No. 4 needle bearing from driving shell. Remove forward sun gear and No. 5 needle bearing from shell. Remove No. 5 needle bearing from forward sun gear.

Reassembly

Sun gear and driving shell will be reassembled as part of **TRANSMISSION REASSEMBLY**.

VALVE BODY ASSEMBLY

NOTE: As valves are removed from each valve body bore, place individual parts in correct order and in relative position to valve body for reassembly reference. Tag all springs as they are removed for reassembly reference.

Disassembly

1. Remove and discard valve body gasket. Remove retaining bolts. Remove separator plate, reinforcement plates, and separator plate gasket. Discard gasket.
2. Remove 8 check balls from valve body. See **Fig. 17**. Remove retaining plates, valves and springs. Keep all valves and springs in original order for reassembly reference. See **Fig. 18**.

Cleaning & Inspection

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

CAUTION: Avoid rounding off sharp edges of valves and plugs with crocus cloth. These edges perform a cleaning action.

Reassembly

1. Install all valves into their respective bores using illustration as guide. Ensure notch in plugs face bottom of bore.
2. Install valve body check balls. See **Fig. 17**. Install guide pin bolts into holes. These 2 holes align valve body gasket and valve body assembly with case. Using a NEW separator plate gasket, slide plate and gasket over alignment pins. Position 3 reinforcement plates and loosely install retaining bolts. Tighten retaining bolts to specification. See **TORQUE SPECIFICATIONS**.

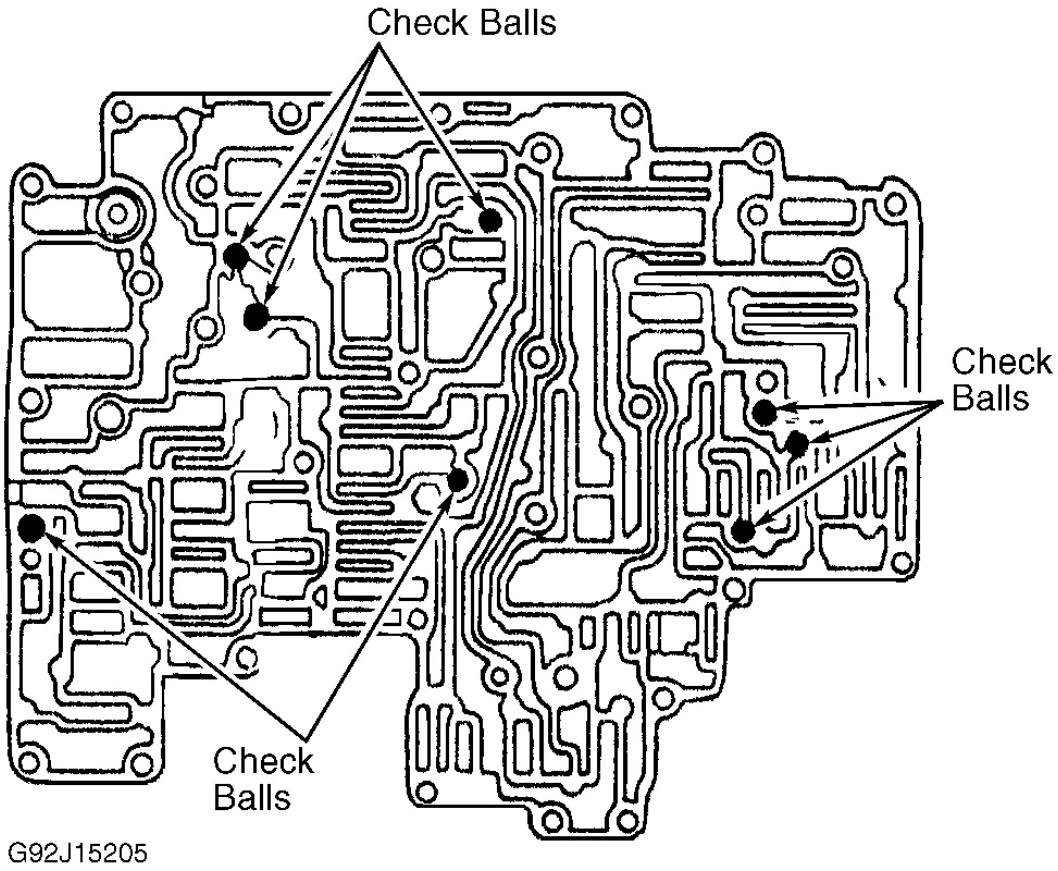


Fig. 17: Locating Check Balls In Valve Body
Courtesy of FORD MOTOR CO.

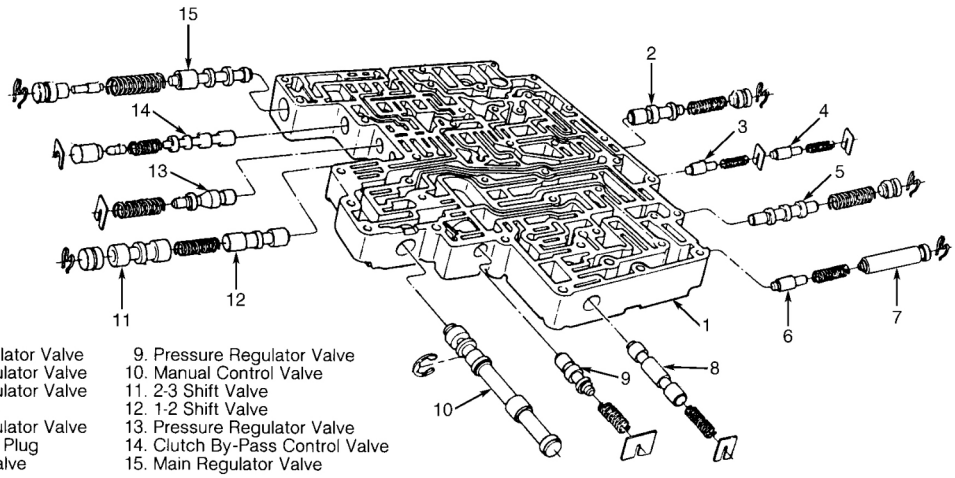


Fig. 18: Exploded View Of Valve Body Components
Courtesy of FORD MOTOR CO.

TRANSMISSION REASSEMBLY

NOTE: See Fig. 22 and Fig. 23 for exploded view of internal parts, thrust washer and needle bearing locations. Lubricate all parts with ATF. Use petroleum jelly on gaskets, thrust washers, and needle bearings to retain in place. Use NEW gaskets and seals.

Initial Reassembly

1. Install No. 9 output shaft needle bearing in transmission case. Install bearing support, No. 7 needle bearing and direct clutch hub in direct clutch assembly. Assemble output shaft hub to output shaft and install retaining snap ring.
2. Place No. 8 needle bearing on rear of direct clutch drum. Slide output shaft into direct clutch drum. Attach output shaft hub to ring gear with retaining ring. Install output shaft, ring gear, and direct clutch assembly into transmission case.
3. Install low-reverse band into transmission case and ensure band is seated on anchor pins. When properly installed, center of band actuating rod seat can be seen through servo piston bore.
4. Install center support and planetary assembly into case. If necessary, rotate output shaft to align planet carrier splines with direct clutch hub splines. Install center support anti-clunk spring using a hammer handle or wooden dowel. Spring tabs must face out.

NOTE: Center support and planet carrier cannot be installed unless notch cut in center support is aligned with overdrive band anchor pin.

Low-Reverse Servo Pin Selection

1. Install center support retaining ring. Determine correct length of low-reverse servo pin to use. Lubricate and install servo piston and return spring. **DO NOT** install cover or retaining ring. Install Servo Selector Gauge (T80L-77030-A) into servo bore.
2. Tighten band apply bolt on tool to 50 INCH lbs. (5.6 N.m). Attach dial indicator. Position indicator stem on flat portion of servo piston. Zero dial indicator. See **Fig. 19**.
3. Thread bolt out of selector tool until piston stops against bottom of tool. Read amount of piston travel on dial indicator. If travel is .112-.237" (2.845-6.020 mm), correct servo pin is installed. If travel is not within specification, selective pistons are available. See **LOW-REVERSE SERVO PISTONS**.

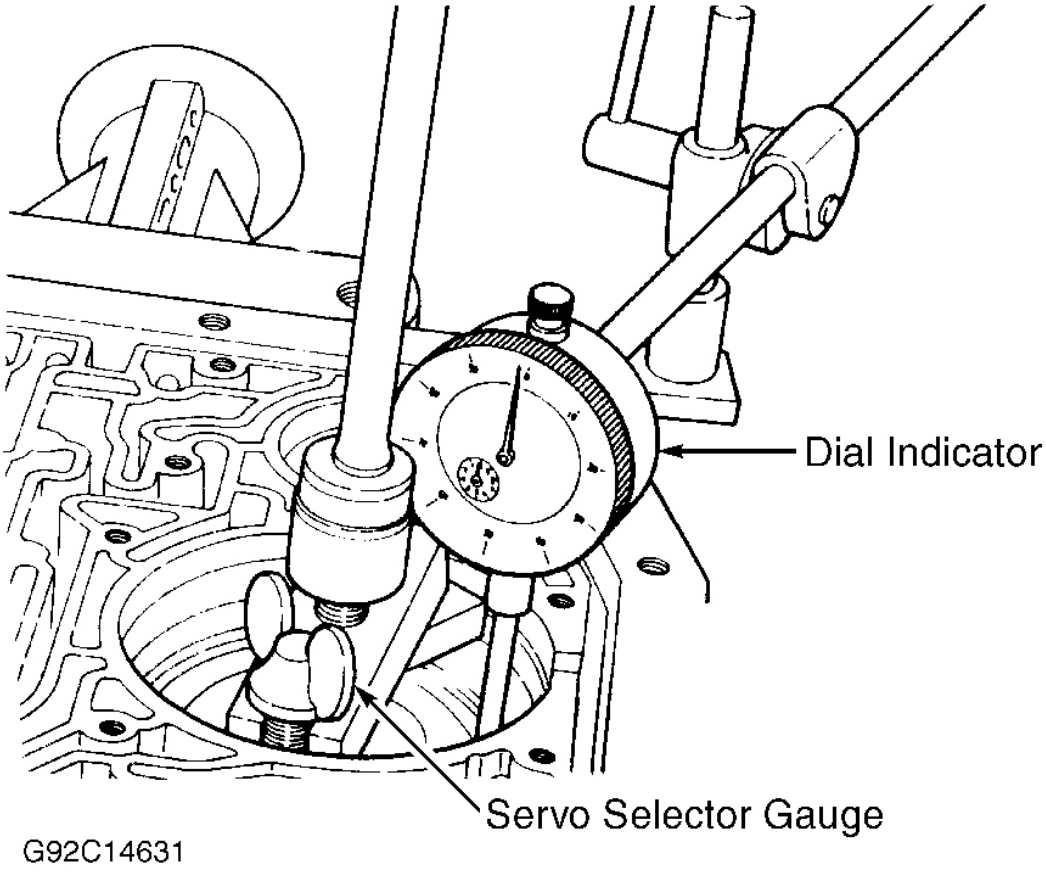


Fig. 19: Measuring Low-Reverse Servo Pin Travel
Courtesy of FORD MOTOR CO.

LOW-REVERSE SERVO PISTONS

Assembly Length	Number Of Grooves
12.936" (74.57 mm)	1
12.989" (75.92 mm)	2
13.043" (77.29 mm)	3

4. Length is measured from base of piston to end of rod. Select servo rod to bring servo travel within specification. Remove selector tool and dial indicator.
5. Install selected low-reverse servo piston. Install servo cover and cover retaining snap ring.

Final Reassembly

1. Install reverse clutch on forward clutch. Ensure No. 2 needle bearing is in position in reverse clutch. Install No. 3 needle bearing and forward clutch hub in forward clutch. Position No. 4 needle bearing on forward clutch hub.

2. Install drive shell over clutch assemblies. Install No. 5 needle bearing and forward sun gear on drive shell. Install complete assembly into case, rotating output shaft to aid in engaging sun gear with planetary gears.
3. Install overdrive band into case and around drive shell assembly. Ensure band anchor is properly positioned on anchor pin. Using a screwdriver to hold overdrive band in position, lubricate and install overdrive servo.
4. With overdrive servo installed, inspect band and apply pin for proper position and engagement. If band anchor and apply pin are not properly engaged, remove servo and re-position band as necessary.
5. Install intermediate clutch pack pressure plate, clutch pack (starting with a friction plate and alternating steel and friction plates) and selective steel plate in this order. Measure intermediate clutch clearance.
6. Intermediate clutch clearance is measured using a depth micrometer and End Play Checking Bar (T80L-77003-A). Set end play tool across pump case mounting surface. Locate micrometer end play bar and read depth. See **Fig. 20**.

NOTE: A downward pressure must be applied to clutch pack while measuring intermediate clutch clearance.

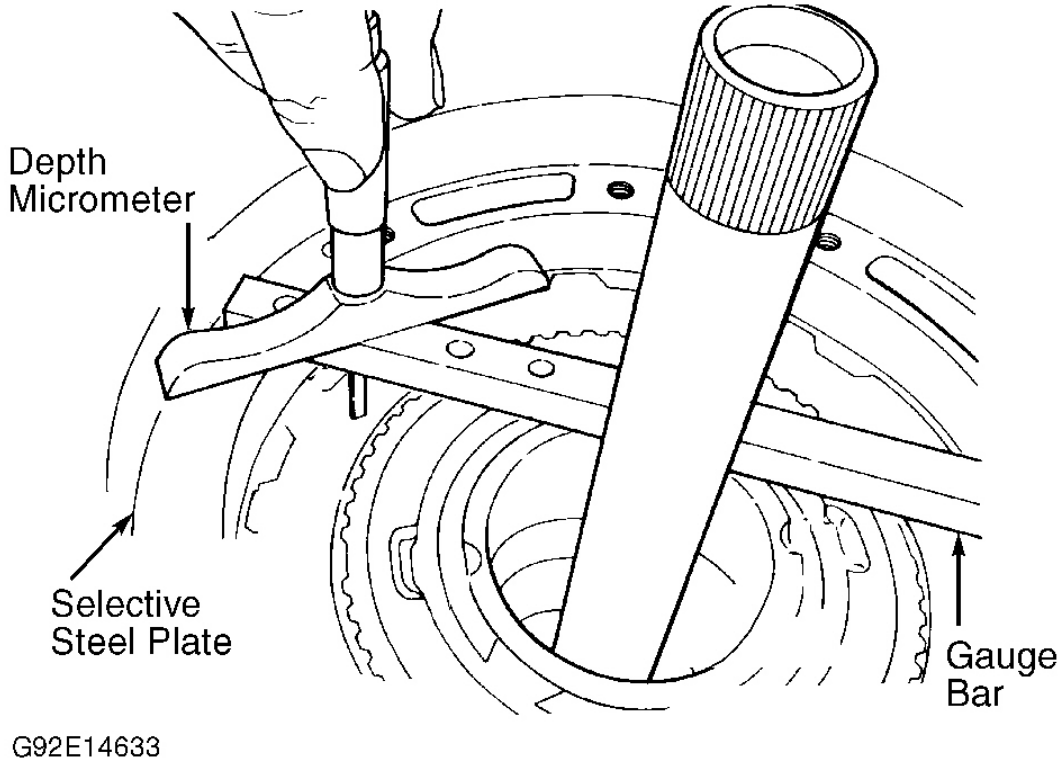


Fig. 20: Measuring Intermediate Clutch Clearance
Courtesy of FORD MOTOR CO.

7. Check depth again with micrometer 180 degrees opposite from previous measurement. Ensure depth at

intermediate clutch selective steel plate is 1.654-1.670" (42.0-42.4 mm). Ensure average of the 2 measurements is within this range.

8. If intermediate clutch clearance (depth) is not within tolerance, select correct thickness steel separator plate. Selective plates are available in the following thicknesses: .067-.071" (1.70-1.80 mm), .077-.081" (1.95-2.05 mm), .087-.091" (2.20-2.31 mm) and .97-.101 (2.46-2.56 mm).

INTERMEDIATE CLUTCH PLATE USAGE

Model Application	Steel Plates	Friction Plates
Cougar, Mark VIII, Thunderbird, E-150 & F-150	3	3
All Other Models	4	4

9. Check transmission end play by locating depth micrometer on End Play Checking Bar (T80L-77003-A). Ensure depth is measured at reverse clutch drum thrust face. See **Fig. 21**. Standard end play is .004-.044" (.101-1.11 mm).
10. Check end play 180 degrees opposite end of reverse clutch drum thrust face to determine average depth. Thrust washer controlling transmission end play is located on stator support which is attached to back of pump housing.
11. Transmission end play can be adjusted using one of selective thrust washers available for service. After measuring depth, select required thrust washer. See **END PLAY THRUST WASHER SELECTION**.

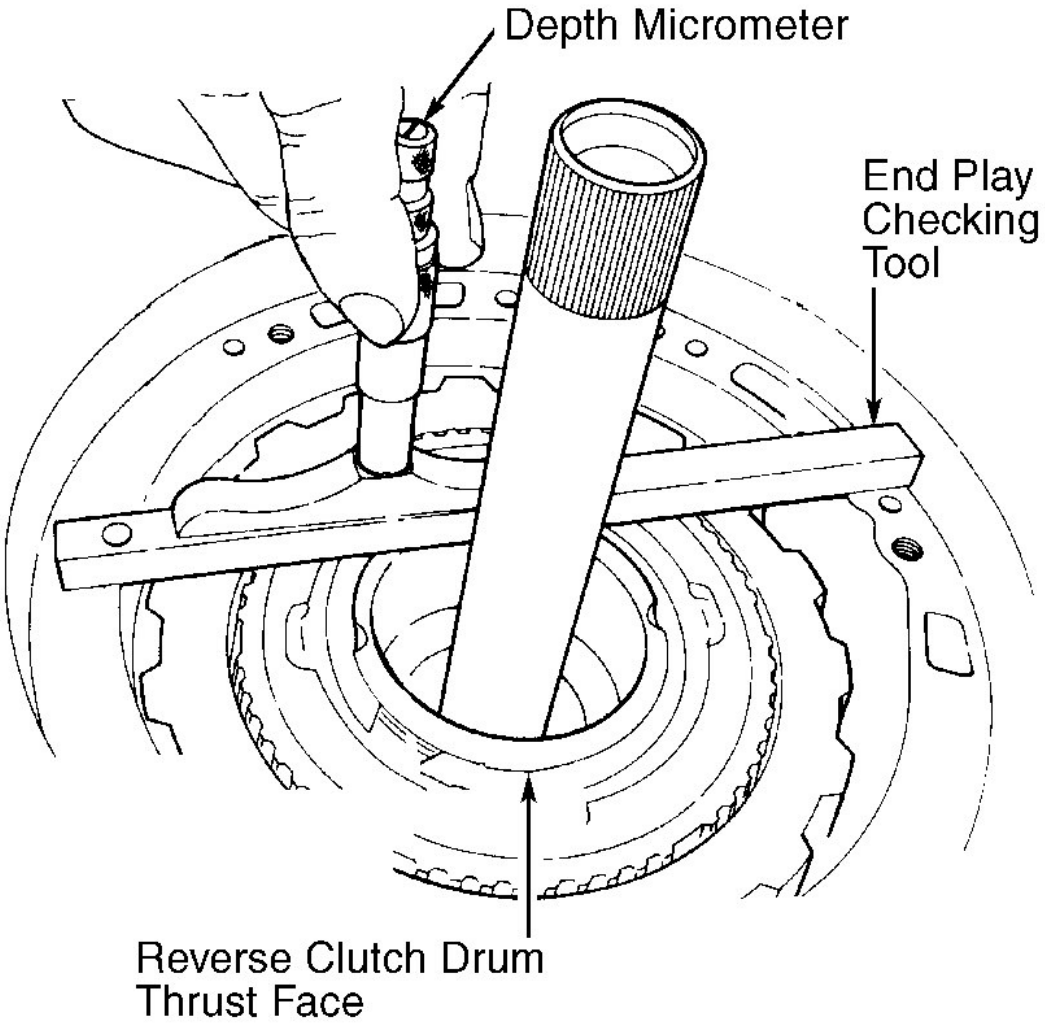


Fig. 21: Measuring Transmission End Play
Courtesy of FORD MOTOR CO.

END PLAY THRUST WASHER SELECTION

Measured Depth In. (mm)	Washer Thickness In. (mm)	Color Code
1.483-1.500 (37.67-38.10)	.050-.054 (1.27-1.37)	Green
1.501-1.517 (38.13-38.53)	.068-.072 (1.73-1.83)	Yellow
1.518-1.534 (38.56-	.085-.089 (2.16-	Natural

38.96)	2.26)	
1.535-1.551 (38.99-39.40)	.102-.106 (2.59-2.69)	Red
1.552-1.568 (39.42-39.83)	.119-.123 (3.02-3.12)	Blue

12. Install selected transmission end play thrust washer on stator support. Use petroleum jelly to hold it in place. Install pump alignment dowel, made by cutting the head from a M8 x 1.25 bolt, into pump mounting bolt hole at 6 o'clock position.
13. Install new pump gasket into case. Install pump assembly into case using 2 slide hammers to lower pump into position. Remove alignment dowel. Coat all pump-to-case bolts with Loctite and install in case.
14. Alternately tighten bolts a few turns at a time to draw pump into case. Tighten retaining bolts to specification. See **TORQUE SPECIFICATIONS**. Install 2-3 accumulator assembly. Install EPC solenoid.
15. Position manual valve detent lever and parking lever actuating rod into case. Parking lever actuating rod must be positioned over parking pawl. Slide manual control lever into case and position through detent. Install and tighten nut. Install manual lever shaft retaining roll pin. Install oil screen into case.
16. Install valve body gasket and valve body assembly using two (2) alignment bolts as guide. Ensure manual and throttle levers are properly positioned before installing valve body retaining bolts.
17. Loosely install valve body retaining bolts. Starting at center and working outward, tighten bolts. Install EPC solenoid bracket. Install detent spring and roller assembly and tighten bolts to specification. See **TORQUE SPECIFICATIONS**.
18. Install filter grommet, new filter gasket, and filter on valve body. Install filter attaching bolts and tighten. Position new pan gasket on case and install oil pan. Clean mating surface on transmission and extension housing. Position new gasket on transmission. Slide extension housing into place.
19. Clean bolts and case holes for 2 bottom bolts and lower right hand corner bolt (as viewed from rear of extension housing). Coat bolts with Teflon tape and install. Install remaining bolts and tighten to specification.
20. Install MLP onto transmission case and install bolts but **DO NOT** tighten. Place manual lever in Neutral position (2 detent positions back from Park).
21. Insert Gear Position Sensor Adjuster (T71P-70010-A) into slots. See **Fig. 3**. Align the three slots on MLP with tabs on adjuster. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**.

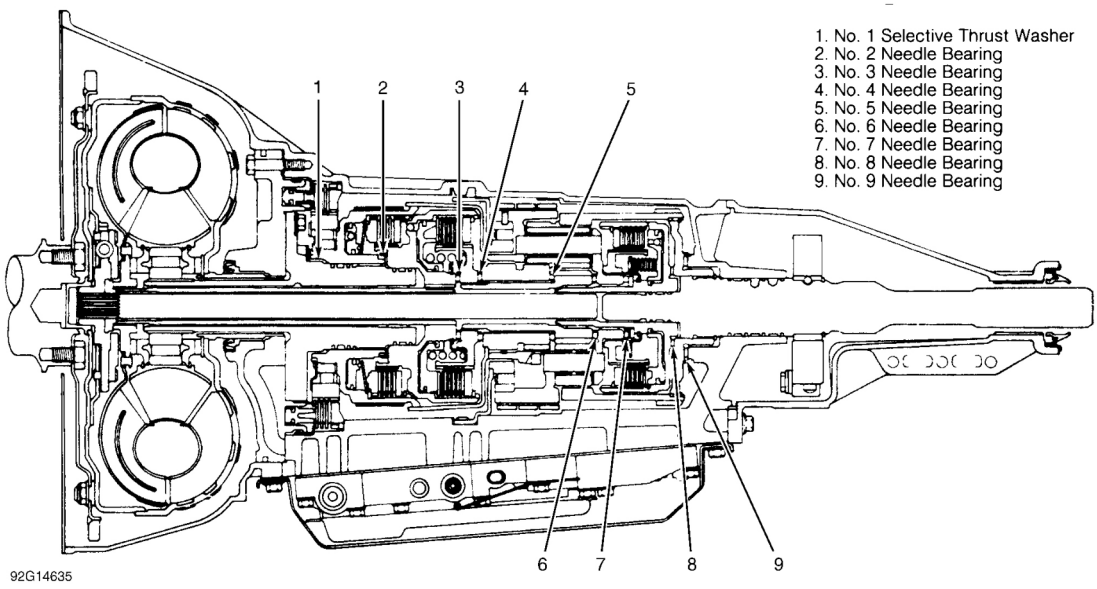


Fig. 22: Locating Needle & Thrust Bearings
Courtesy of FORD MOTOR CO.

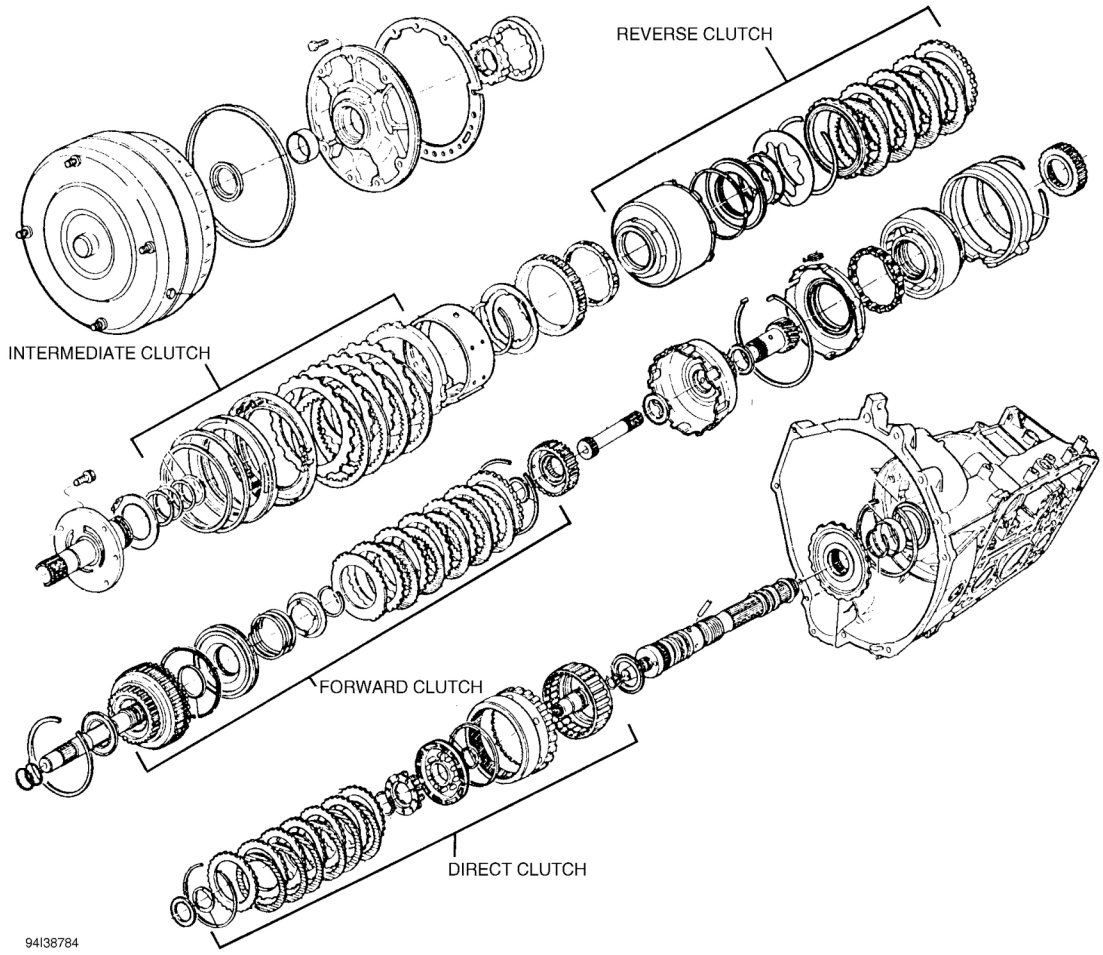


Fig. 23: Exploded View Of AODE/AODE-W Transmission
Courtesy of FORD MOTOR CO.

TRANSMISSION SPECIFICATIONS

TRANSMISSION SPECIFICATIONS

Application	In. (mm)
Converter End Play	.050-.077 (1.27-1.95)
Direct Clutch Pack Clearance	.060-.092 (1.53-2.34)
Forward Clutch Pack Clearance	.050-.094 (1.27-2.38)
Intermediate Clutch Pack Clearance	1.634-1.646 (41.50-41.81)
Reverse Clutch Pack Clearance	.040-.060 (1.02-1.52)

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft Lbs. (N.m)

Converter-To-Flywheel Bolt	20-34 (27-46)
Converter Housing Cover-To-Converter Housing	16 (16-22)
Converter Plug-To-Converter	8-28 (11-38)
Cooler Line-To-Case	18-23 (24-31)
Extension-To-Case Bolt	16-20 (22-27)
Inner Manual Lever-To-Shaft Nut	19-27 (26-37)
Outer Throttle Lever-To-Shaft Nut	12-16 (16-22)
Pump-To-Case Bolt	16-20 (22-27)
Stator Support-To-Pump Bolt	12-16 (16-22)
Stator Support-To-Pump Bolt	12-16 (16-22)
Transmission-To-Engine Bolt	40-50 (54-68)
	INCH lbs. (N.m)
Cover-To-Governor Body Bolt	20-30 (2.3-3.4)
Detent Spring Attaching Bolt	80-120 (9-14)
Filter-To-Valve Body	80-120 (9-14)
Governor Body-To-Counterweight Bolt	50-60 (6-7)
Neutral Start Switch-To-Case	95-130 (11-15)
Oil Pan-To-Case Bolt	72-120 (8-14)
Pressure Plug-To-Case	72-144 (8-16)
Reinforcing Plate-To-Valve Body Bolt	80-120 (9-14)
Separator Plate-To-Valve Body Bolt	80-100 (9-11)
Valve Body-To-Case Bolt	80-100 (9-11)

