

## 1986-93 AUTOMATIC TRANSMISSIONS

General Motors Corp./Isuzu - KF100, KF400 &amp; RMC

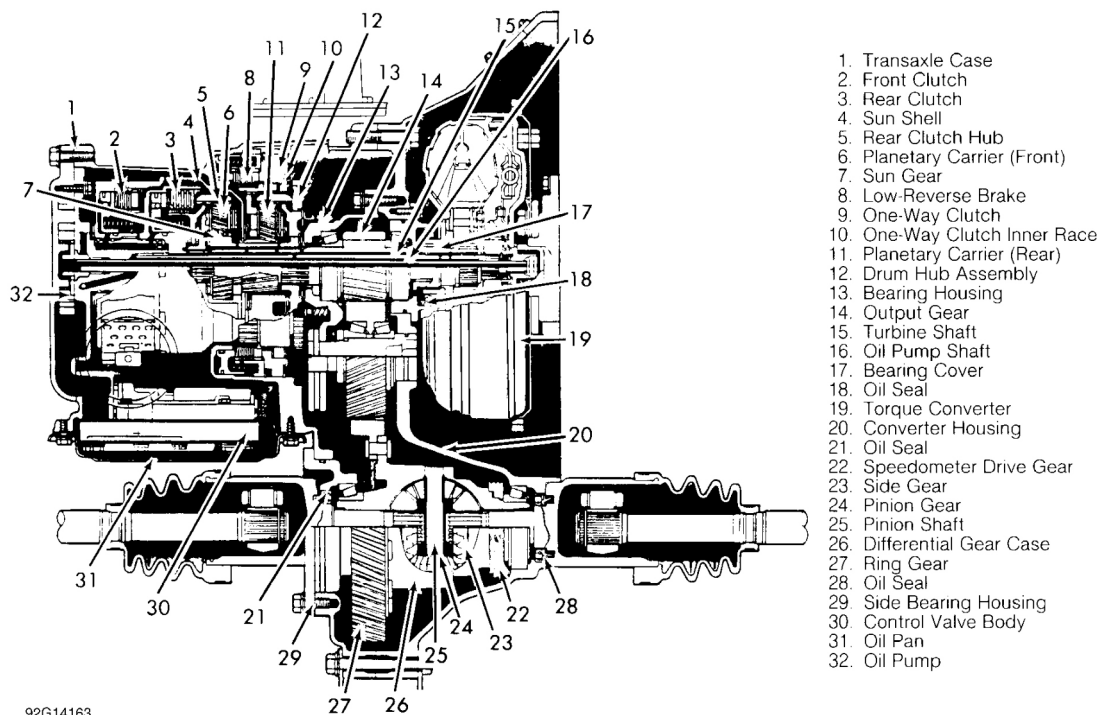
## APPLICATION

## TRANSMISSION APPLICATIONS

Vehicle Application	Transaxle Model
1986-89 Chevrolet/Geo Spectrum	KF100
1986-89 Isuzu I-Mark	KF100/RMC
1990-93 Geo Storm	KF400
1991-93 Isuzu Stylus	KF400

## DESCRIPTION

The transaxle consists of 3 main units: automatic transaxle, torque converter and differential assembly. The automatic transaxle consists of front and rear clutches, one-way clutch, low-reverse brake assembly, oil pump and hydraulic controls (valve body and servo piston assemblies). The valve body is controlled by the governor valve, vacuum throttle valve diaphragm (modulator) and kickdown solenoid. See **Fig. 1**.



**Fig. 1: Transaxle Component Identification**  
Courtesy of FORD MOTOR CO.

## LUBRICATION & ADJUSTMENTS

See the appropriate SERVICING - A/T article in this section. Refer to the following menu:

- 1986-89 Chevrolet/Geo Spectrum, see: SERVICING - A/T
- 1990-93 Geo Storm, see: SERVICING - A/T
- 1986-89 Isuzu I-Mark, see: SERVICING - A/T
- 1991-93 Isuzu Stylus, see: SERVICING - A/T

## TROUBLESHOOTING

### PRELIMINARY INSPECTION

1. Ensure vehicle is thoroughly road tested to verify driver's complaint. Determine if problem occurs during upshift, downshift, coasting or engagement. If noise is diagnosed, check if noise is affected by RPM, vehicle speed, gear selection or temperature. Ensure vehicle is at normal operating temperature when checking.
2. Inspect fluid level and condition. Visually inspect for vehicle modifications, electronic add-ons, fluid leaks and/or incorrect linkage adjustment. See applicable symptom diagnosis.

### SYMPTOM DIAGNOSIS

#### Engine Starts in "D", "2", "1" OR "R", or will not start in "N" OR "P"

Check ignition and starter circuit. Shift linkage faulty or installed improperly. Park/Neutral switch and/or wiring faulty.

#### No Movement In Any Gear

Incorrect fluid level. Shift linkage faulty or out of adjustment. Incorrect oil pressure. Manual control valve faulty. Faulty oil pump. Leak in hydraulic system. Parking linkage improperly adjusted.

#### No Movement In "D", Okay In Other Gears

Shift linkage faulty, out of adjustment or improperly installed. Incorrect oil pressure. Manual control valve faulty. Faulty one-way clutch.

#### No Movement In "D", "2" Or "1", Okay In "R"

Incorrect fluid level. Shift linkage faulty, out of adjustment or incorrectly installed. Incorrect oil pressure. Manual control valve faulty. Engine performance poor or brakes improperly adjusted. Rear clutch faulty. Leak in hydraulic system.

#### No Movement In "R", Okay In Other Gears

Incorrect fluid level. Shift linkage faulty, out of adjustment or incorrectly installed. Incorrect oil pressure.

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Manual control valve faulty. Faulty rear clutch, front clutch or low-reverse brake. Leak in hydraulic system.

### Slippage

ATF level incorrect or contaminated. Manual valve out of adjustment. Vacuum modulator faulty or leak in vacuum circuit. Fluid pressures incorrect. Oil pump faulty. Leak in hydraulic circuit.

### Vehicle Creeps In "N" Position

Shift linkage faulty, out of adjustment or incorrectly installed. Manual control valve faulty. Contaminated fluid. Faulty rear clutch.

### Vehicle Creeps Excessively

Engine idle speed too high.

### Vehicle Will Not Creep

Fluid level incorrect or fluid contaminated. Shift linkage faulty, out of adjustment or incorrectly installed. Engine idle too low. Manual control valve faulty. Faulty oil pump. Leak in hydraulic system. Faulty front or rear clutch.

### Low Maximum Speed & Poor Acceleration

Incorrect ATF level or contaminated fluid. Selector linkage out of adjustment. Engine stall speed incorrect. Poor engine performance. Brake band faulty or out of adjustment. Faulty low-reverse brake, front clutch, rear clutch or hydraulic circuit.

### Harsh "N" To "D" Engagement

Engine idle too high. Leak in vacuum circuit. Incorrect oil pressure. Manual control valve faulty. Faulty rear clutch. Low fluid level.

### Harsh 1-2 Shift

Leak in vacuum circuit. Engine stall speed incorrect. Contaminated fluid. Manual control valve faulty. Band servo faulty. Brake band damaged or out of adjustment.

### Harsh 2-3 Shift

Leak in vacuum circuit. Incorrect oil pressure. Manual control valve faulty. Band servo or front clutch faulty. Brake band faulty.

### Shift Shock Felt On Kickdown Downshift

Shift linkage damaged, out of adjustment or incorrectly installed. Leak in vacuum circuit. Kickdown solenoid, switch or wiring faulty. Incorrect oil pressure. Manual control valve or governor valve faulty. Leak in hydraulic system.

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### 2-1 Shift Shock With Lever In "1" Position

Leak in vacuum circuit. Engine stall speed incorrect. Manual control valve faulty. Contaminated fluid. Low-reverse brake faulty. Line pressure high.

### Shift Shock On Deceleration

Range selector out of adjustment. Vacuum diaphragm or piping faulty. Kickdown solenoid out of adjustment or faulty. Excessive line pressure. Manual valve faulty. Governor valve faulty.

### Vehicle Brakes In "R" Position

Band servo faulty. Contaminated fluid. Faulty rear clutch. Brake band damaged or out of adjustment. Parking linkage damaged or improperly adjusted.

### Vehicle Brakes On 1-2 Shift

Manual control valve faulty. Contaminated fluid. Front clutch or low-reverse brake faulty. One-way clutch faulty.

### Vehicle Brakes On 2-3 Shift

Manual control valve faulty. Band servo faulty. Contaminated fluid. Brake band out of adjustment or damaged.

### No Engine Braking In "1" Position

Shift linkage damaged, out of adjustment or installed incorrectly. Incorrect oil pressure. Manual control valve faulty. Contaminated fluid. Low-reverse brake faulty. Leak in hydraulic system.

### No Shift Shock; Slippage On 1-2 Shift

Incorrect fluid level. Shift linkage damaged, out of adjustment or incorrectly installed. Leak in vacuum circuit. Oil pressure incorrect. Manual control valve faulty. Band servo faulty. Contaminated fluid. Brake band faulty. Leakage in hydraulic system.

### No Shift Shock; Slippage When Manually Shifted From "1" To

#### "2" Position

Incorrect fluid level. Shift linkage damaged, out of adjustment or installed incorrectly. Leak in vacuum circuit. Engine idle speed incorrect. Engine stall speed incorrect. Manual control valve faulty. Contaminated fluid. Brake band out of adjustment or damaged. Oil pump faulty.

### No Shift Shock; Slippage On 2-3 Shift

ATF contaminated or level incorrect. Shift linkage faulty. Vacuum modulator faulty or leak in vacuum circuit. Line pressure not correct. Band servo faulty. Front clutch faulty. Leak in hydraulic system.

### Slippage On 3-2 Kickdown

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Leak in vacuum circuit. Oil pressure incorrect. Manual valve faulty. Band servo faulty. Contaminated fluid. Front clutch faulty. Brake band out of adjustment or damaged. Leak in hydraulic system.

### **Transaxle Slips In 1st Gear**

Incorrect fluid level. Shift linkage faulty, out of adjustment or incorrectly installed. Incorrect oil pressure. Manual control valve faulty. Contaminated fluid. Incorrect idle speed. Faulty kickdown solenoid, switch or wiring.

### **No 1-2 Shift**

Shift linkage defective, out of adjustment or incorrectly installed. Leak in vacuum circuit. Faulty kickdown solenoid, switch or wiring. Contaminated fluid. Manual control valve faulty. Governor valve faulty. Band servo faulty. Brake band out of adjustment. Leak in hydraulic system. Rear clutch faulty.

### **No 2-3 Shift**

Shift linkage defective, out of adjustment or incorrectly installed. Leak in vacuum circuit. Faulty kickdown solenoid, switch or wiring. Contaminated fluid. Manual control valve, governor valve or band servo faulty. Leak in hydraulic system. Front clutch faulty.

### **No Lock-Up**

Faulty torque converter, wiring or solenoid.

### **1-3 Shift; Skips 2nd**

Contaminated fluid. Brake band out of adjustment or damaged. Leak in hydraulic system.

### **No 3-2 Downshift**

Leak in vacuum circuit. Manual control valve, governor valve or band servo faulty. Contaminated fluid. Faulty front clutch. Brake band out of adjustment or damaged. Leak in hydraulic system.

### **No 2-1 or 3-1 Downshift**

Leak in vacuum circuit. Manual control valve, governor valve or band servo faulty. Contaminated fluid. Brake band out of adjustment or damaged. One-way clutch faulty.

### **Slippage When Accelerating In 3rd Gear Above Kickdown Speed**

Shift linkage damaged, out of adjustment or installed incorrectly. Leak in vacuum circuit. Oil pressure incorrect. Manual control valve or governor valve faulty. Contaminated fluid. Front clutch faulty. Leak in hydraulic system.

### **No Kickdown At Normal Speeds In 3rd Gear**

Leak in vacuum circuit. Kickdown solenoid, switch or wiring faulty. Manual control valve or governor valve

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faulty. Contaminated fluid. Brake band out of adjustment or damaged. Leak in hydraulic system.

### 1-2 & 2-3 Shift Points Too High

ATF contaminated or level incorrect. Vacuum modulator faulty or leak in vacuum circuit. Line pressures incorrect. Manual valve out of adjustment. Governor valve faulty. Hydraulic circuit leaking.

### 3-2 & 2-1 Shift Points Too High

Shift linkage damaged, out of adjustment or incorrectly installed. Kickdown solenoid, switch or wiring faulty. Leak in vacuum circuit. Incorrect oil pressure. Manual control valve or governor valve faulty. Leak in hydraulic system.

### 1-2 Or 2-3 Shifts With Shift Lever In "1" Position

Shift linkage damaged, out of adjustment or installed incorrectly. Manual control valve faulty. Leak in hydraulic system.

### 2-1 or 2-3 Shifts With Shift Lever In "2" Position

Shift linkage damaged, out of adjustment or installed incorrectly. Incorrect oil pressure. Manual control valve faulty.

### Vehicle Moves In "P" Or Parking Gear Remains Engaged When Shifted Out Of "P" Position

Shift linkage damaged, out of adjustment or incorrectly installed. Parking linkage out of adjustment or damaged.

### Transaxle Noisy In "P" Or "N" Position

Incorrect fluid level. Incorrect oil pressure. Faulty rear clutch, oil pump, one-way clutch or planetary gear.

### Transaxle Noisy In "D", "1", "2" or "R"

Oil pressure incorrect. Rear clutch, oil pump, one-way clutch or planetary gears faulty.

### Transmission Overheats

ATF level incorrect. Engine stall speed and/or line pressure incorrect. Faulty band servo, front clutch, rear clutch, brake band, low-reverse brake, oil pump, torque converter or planetary gear. Leak in hydraulic circuit.

### Differential Noise

ATF contaminated or level incorrect. Bearings worn or has excessive preload. Teeth on gears worn or damaged or has excessive backlash.

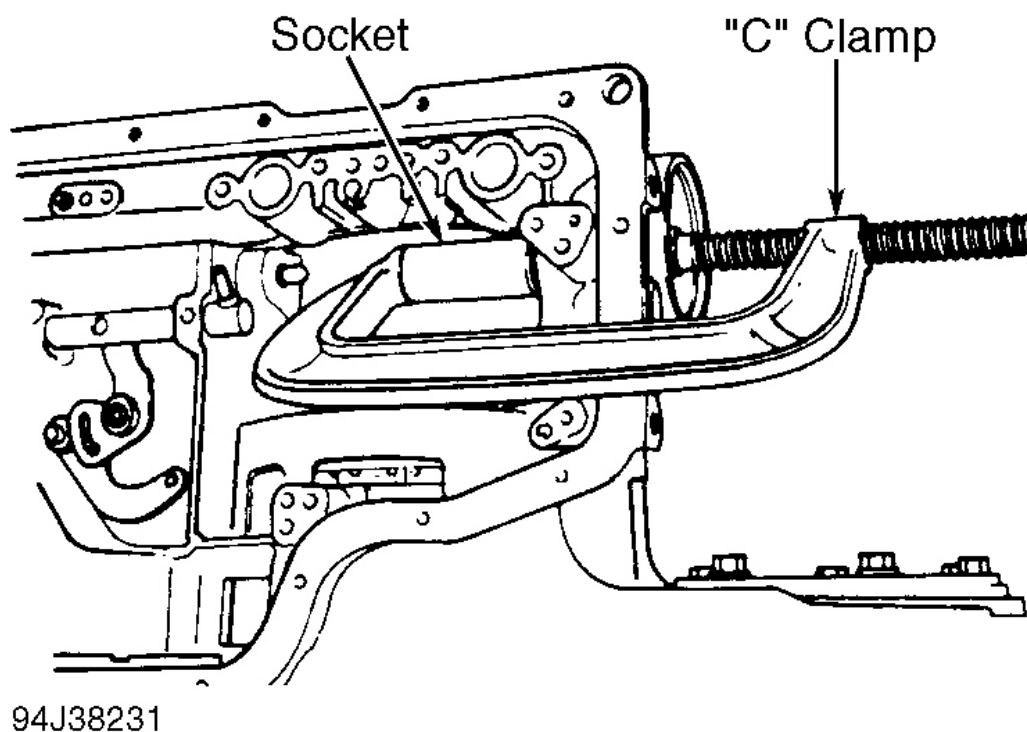
## ON-VEHICLE SERVICE

**BAND APPLY SERVOR & I****Removal**

1. Raise and support vehicle. Remove left front wheel. Drain transaxle fluid. Remove valve body. See **VALVE BODY** . Remove front stabilizer frame brackets. Carefully raise staked portion of left axle nut. Apply brakes and loosen, but **DO NOT** remove, axle nut. Remove left lower control arm ball joint clamp bolt. Pry downward on lower control arm to separate control arm from knuckle.
2. Insert pry bar between transaxle case and left axle flange. Carefully apply force to pry bar until axle circlip is disengaged. Slide knuckle assembly off axle shaft, and remove axle from vehicle. Quickly install appropriate plug in transaxle.
3. Loosen band adjusting stop and band adjusting stop nut. Remove band strut. Using "C" clamp and socket, compress servo piston into transaxle case. See **Fig. 2** . Remove snap ring. Remove servo retainer, servo piston and spring.

**Installation**

1. Lubricate servo piston with ATF. Assemble servo retainer, piston, piston large seal and spring. Insert assembly into transaxle. Using "C" clamp and socket, compress assembly and install snap ring. See **Fig. 2** . Install band strut to intermediate band. Install band adjusting stop to band and tighten to 9-10 ft. lbs. (12-15 N.m). Loosen adjusting stop 3 turns. Install and tighten band adjusting stop nut. See **TORQUE SPECIFICATIONS** .
2. Install remaining components in reverse order of disassembly. Fill transaxle with fluid.



**Fig. 2: Compressing Band Apply Servo**  
 Courtesy of FORD MOTOR CO.

## DIFFERENTIAL OIL SEALS R & I

### Removal

1. Raise and support vehicle. Drain transaxle fluid. Carefully raise staked portion of axle nut. Apply brakes and loosen, but **DO NOT** remove, axle nut. Remove lower control arm ball joint clamp bolt. Pry downward on lower control arm to separate control arm from knuckle.
2. Insert pry bar between transaxle case and axle flange. Carefully apply force to pry bar until axle circlip is disengaged. Slide knuckle assembly off axle shaft, and remove axle from vehicle. Quickly install appropriate plug in transaxle. Using appropriate puller, remove seal.

### Installation

1. Apply lubrication to new seal. Using appropriate driver, install seal. Install new circlip on transaxle end of axle. Remove transaxle plug, and carefully install axle into transaxle. Ensure circlip snaps into retaining groove.
2. Install axle into hub. Install NEW axle nut. Tighten bolts to specifications. See **TORQUE SPECIFICATIONS**. Stake NEW axle nut with blunt nose chisel. To complete installation, reverse



removal procedure. Fill transaxle fluid to correct level.

## OIL COOLER FLUSHING

Contaminates **MUST** be removed from oil cooler before transmission is put back into service. Replace cooler supply tubes if leaking. Thoroughly flush oil cooler and lines if a major service or transaxle removal has occurred. It is recommended that a mechanically agitated cleaner, such as Rotunda (014-00028), be used.

## VACUUM THROTTLE VALVE DIAPHRAGM (MODULATOR) R & I

**NOTE:** If replacing modulator, it is necessary to replace throttle control valve rod.

### Removal

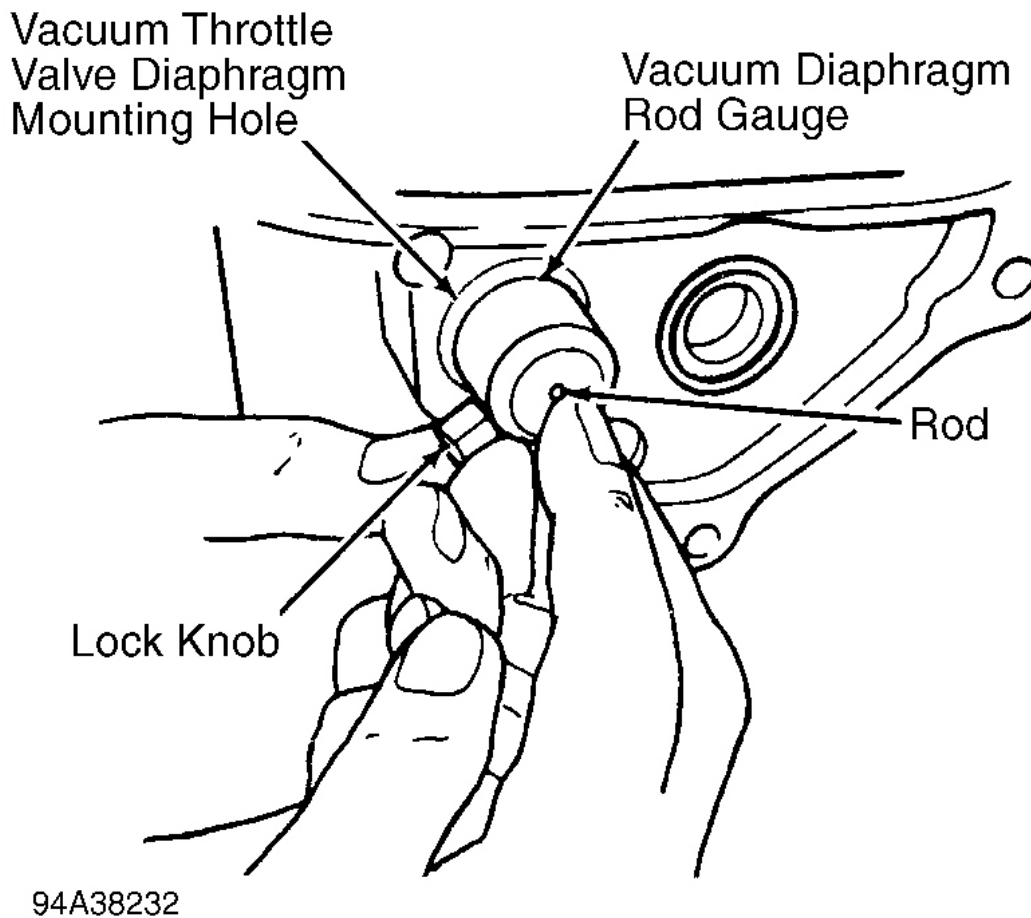
1. Drain transaxle fluid. Disconnect vacuum hose from modulator. Unscrew modulator from transaxle. Remove control rod. With beveled side out, insert Vacuum Diaphragm Rod Gauge (T87C-77000-A) into mounting hole until gauge bottoms out.
2. Place gauge rod through opening of gauge until rod bottoms out against vacuum throttle valve. Tighten lock knob on gauge and remove tool. Using depth gauge, measure distance from flat surface of gauge to end of rod. See [Fig. 3](#) . Select proper length throttle valve rod. See **THROTTLE VALVE ROD DIMENSION CHART** .

### THROTTLE VALVE ROD DIMENSION CHART

Measurement In. (mm)	Applicable Rod Length In. (mm)
1.0 (25.4)	1.16 (29.5)
1.0-1.02 (25.4-25.9)	1.18 (30.0)
1.02-1.04 (25.9-26.4)	1.20 (30.5)
1.04-1.06 (25.9-26.4)	1.22 (31.0)
1.06-1.08 (26.9-27.4)	1.24 (31.5)

### Installation

Install selected throttle valve rod. Coat threads of modulator with appropriate sealant. To install, reverse removal procedures.



**Fig. 3: Identifying Vacuum Diaphragm Rod Gauge**  
 Courtesy of FORD MOTOR CO.

## VALVE BODY R & I

### Removal & Installation

Disconnect battery ground cable. Raise and support vehicle. Remove front fender splash shield and front splash shield. Drain transaxle fluid. Unbolt and remove oil pan. Remove 9 valve body bolts. Remove valve body. Ensure care is used not to loose check ball and detent spring. To install, reverse removal procedure. Fill transaxle with fluid. Check for leaks.

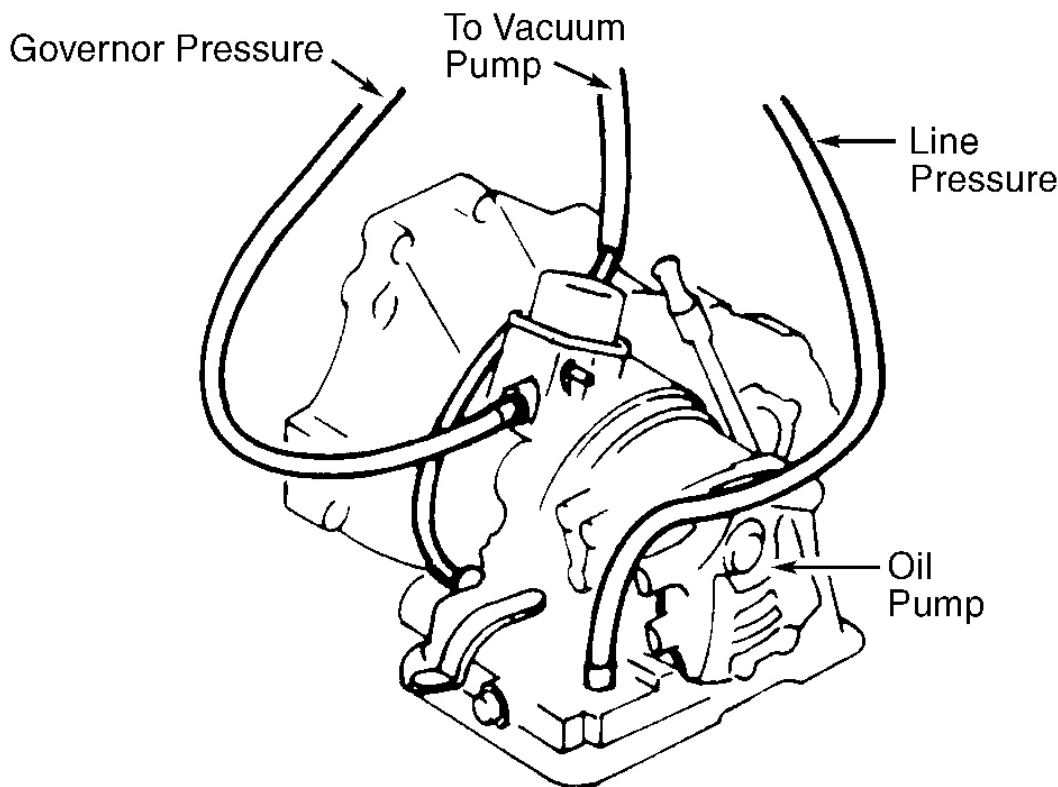
## PERFORMANCE TESTS

**NOTE:** DO NOT hold throttle open longer than 5 seconds. Shift to "N" and allow engine to idle for at least 2 minutes between tests to cool transaxle. If engine speed

**exceeds specification, release accelerator immediately as clutch or band slippage is indicated.**

## LINE PRESSURE TEST

1. Attach oil pressure gauge at line pressure checking port. See **Fig. 4** . Attach tachometer to engine. Position gauge so it can be seen from driver's seat.
2. With engine at normal operating temperature, transaxle fluid level correct and transaxle in "D", check line pressure at idle and at stall speed. Repeat test in "2", "1", and "R", allowing sufficient time for engine and transaxle to cool between tests. Record results. See **LINE PRESSURE TEST SPECIFICATIONS** table.
3. If Line Pressure Is Low In "D", "2", "1" & "R", check for worn oil pump, oil leaking from oil pump, control valve body or transaxle case and sticking pressure regulator valve.
4. If Line Pressure Is Low In "D" & "2", check for oil leakage from hydraulic circuit of rear clutch or governor.
5. If Line Pressure Is Low In "R", check for oil leakage from hydraulic circuit of low-reverse brake.
6. If Line Pressure Is High At Idle, check for vacuum tube broken or disconnected or faulty vacuum modulator.



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**Fig. 4: Identifying Hydraulic Pressure Test Ports**  
Courtesy of FORD MOTOR CO.

#### LINE PRESSURE TEST SPECIFICATIONS

Application	psi (kg/cm <sup>2</sup> )
At Idle	
"D"	43-57 (3.0-4.0)
"2"	114-171 (8.0-12.0)
"R"	57-110 (4.0-7.0)
At Stall Speed	
"D"	128-156 (9.0-11.0)
"2"	114-171 (8.0-12.0)
"R"	228-270 (16.0-19.0)

#### LINE PRESSURE CUT-BACK TEST

1. Connect oil pressure gauges to line pressure and governor pressure ports. See **Fig. 4** . Position gauges so they can be seen from driver's seat.
2. Connect a hand-held vacuum pump to vacuum modulator. See **Fig. 4** . Position vacuum pump so it can be operated from driver's seat. With shift lever in "D", gradually increase engine RPM and observe pressure gauge readings. Record results.
3. With shift lever in "D", gradually increase engine RPM, and apply 8 in. Hg to vacuum modulator. When line pressure reading suddenly decreases, observe the governor pressure gauge. Refer to the **LINE PRESSURE CUT-BACK TEST SPECIFICATIONS** table.
4. If governor pressure gauge readings are not within specifications, ensure rod in vacuum modulator is installed. If a rod is installed, rod length may be incorrect or vacuum throttle valve is sticking. See **VACUUM THROTTLE VALVE DIAPHRAGM (MODULATOR)** under TESTING.

#### LINE PRESSURE CUT-BACK TEST SPECIFICATIONS

Vacuum Pump Reading	Governor Pressure psi (kg/cm <sup>2</sup> )
0 in. Hg (Atmosphere)	14-23 (.98-1.6)
8 in. Hg	6-14 (.42-.98)

#### GOVERNOR PRESSURE TEST

1. Attach oil pressure gauge to governor pressure check port. See **Fig. 4** . Position gauge so that it may be seen from driver's seat. Shift transaxle into "D" and road test vehicle.
2. Accelerate vehicle smoothly and record governor pressure readings at 20, 35 and 55 MPH. See **GOVERNOR PRESSURE SPECIFICATIONS** table. If pressure gauge readings are not within specifications, check for fluid leakage in line pressure hydraulic circuit and/or governor pressure hydraulic circuit. Also check for a faulty governor.

#### GOVERNOR PRESSURE SPECIFICATIONS

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Application	psi (kg/cm <sup>2</sup> )
Chevrolet/Geo Spectrum, Geo Storm & Isuzu I-Mark	
20 MPH	13-21 (.9-1.5)
35 MPH	25-35 (1.8-2.5)
55 MPH	44-56 (3.1-3.9)
Isuzu Stylus	
20 MPH	13-21 (.9-1.5)
35 MPH	25-35 (1.8-2.5)
55 MPH	44-56 (3.1-3.9)

### STALL TEST

#### Testing Precautions

When testing, **DO NOT** hold throttle open longer than five (5) seconds. Shift to "N" and allow engine to idle for at least two (2) minutes between tests to cool transaxle. If engine speed exceeds specification, release accelerator immediately as clutch or band slippage is indicated. See **STALL SPEED SPECIFICATIONS** table.

#### Testing Procedures

1. With engine at normal operating temperature, tachometer installed and parking and service brakes applied, perform transaxle stall test in "D", "2", "1" and "R" ranges at full throttle and note maximum RPM obtained. Correct stall speed should occur at specified RPM. See the **STALL SPEED SPECIFICATIONS** table.

#### STALL SPEED SPECIFICATIONS

Application	Engine RPM
All Models	2050-2350

2. If stall speed is too high in all shift ranges, the following components may be faulty:
  - Worn Oil Pump.
  - Oil leakage from oil pump, valve body or transaxle case.
  - Sticking pressure regulator valve.
3. If stall speed is too high in "D", "2" and "1", the following component may be faulty:
  - Slipping rear clutch.
4. If stall speed is too high in "D", the following component may be faulty:
  - Slipping one-way clutch.
5. If stall speed is too high in "2", the following components may be faulty:
  - Slipping intermediate band.
6. If stall speed is too high in "R", the following components may be faulty:
  - Slipping Low/Reverse Clutch.

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- Slipping Front Clutch.
7. If stall speed is too low in all shift ranges, the following components may be faulty:
- Slipping torque converter one-way clutch.

### ROAD TEST

1. Before road test, ensure that fluid level, fluid condition and control linkage adjustments are okay. During test, transaxle should upshift or downshift at about same speed as specified. See appropriate **VEHICLE SHIFT SPEED SPECIFICATIONS** table below.
2. All shifts may vary slightly due to production tolerances or tire size. The quality of the shifts are more important. All shifts should be smooth, responsive and with no slippage or engine flare. Slippage or engine flare in any gear usually indicates clutch or band problems.
3. The slipping clutch or band in a particular gear can usually be identified by noting transaxle operation in other selector positions and comparing internal units which are applied in these positions. See **CLUTCH & BAND APPLICATION** table below.

### VEHICLE SHIFT SPEED SPECIFICATIONS (STORM)

#### VEHICLE SHIFT SPEED SPECIFICATIONS (STORM)

Operating Condition <sup>(1)</sup>	Shift Speed MPH (km/h)
Half Throttle (50%) <sup>(1)</sup>	
1-2	15-21 (24-33)
2-3	33-39 (53-62)
3-2	18-12 (28-19)
2-1	12-7 (21-12)
Full Throttle (WOT) <sup>(2)</sup>	
1-2	32-38 (52-61)
2-3	67-73 (108-117)
3-2	71-59 (114-95)
2-1	22-28 (36-45)
Fully Closed Throttle	
1-2	22-28 (36-45)
<sup>(1)</sup> Transmission is in "D" range.	
<sup>(2)</sup> To determine deceleration shift speeds, release throttle once transaxle has shifted into 3rd gear. 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.	

### VEHICLE SHIFT SPEED SPECIFICATIONS (STYLUS)

#### VEHICLE SHIFT SPEED SPECIFICATIONS (STYLUS)

Operating Condition <sup>(1)</sup>	Shift Speed MPH (km/h)
Half Throttle (50%) <sup>(1)</sup>	

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1-2	15-21 (24-33)
2-3	33-39 (53-62)
3-2	18-12 (28-19)
2-1	12-7 (21-12)
Full Throttle (WOT) <sup>(2)</sup>	
1-2	32-38 (52-61)
2-3	67-73 (108-117)
3-2	71-59 (114-95)
2-1	28-22 (45-36)
(1) Transmission is in "D" range. (2) To determine deceleration shift speeds, release throttle once transaxle has shifted into 3rd gear. 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.	

**VEHICLE SHIFT SPEED SPECIFICATIONS (I-MARK & SPECTRUM)****VEHICLE SHIFT SPEED SPECIFICATIONS (I-MARK & SPECTRUM)**

Operating Condition <sup>(1)</sup>	Shift Speed MPH
Half Throttle (50%) <sup>(1)</sup>	
1-2	8-13
2-3	34-39
3-2	17-22
2-1	6-11
Full Throttle (WOT) <sup>(2)</sup>	
1-2	32-37
2-3	63-68
3-2	56-62
2-1	25-30
Fully Closed Throttle	
1-1	25-30
(1) Transmission is in "D" range. (2) To determine deceleration shift speeds, release throttle once transaxle has shifted into 3rd gear. 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.	

**CLUTCH & BAND APPLICATION CHART****CLUTCH & BAND APPLICATION CHART**

Selector Lever Position	Elements In Use
"P" (Park)	Low-Reverse Brake

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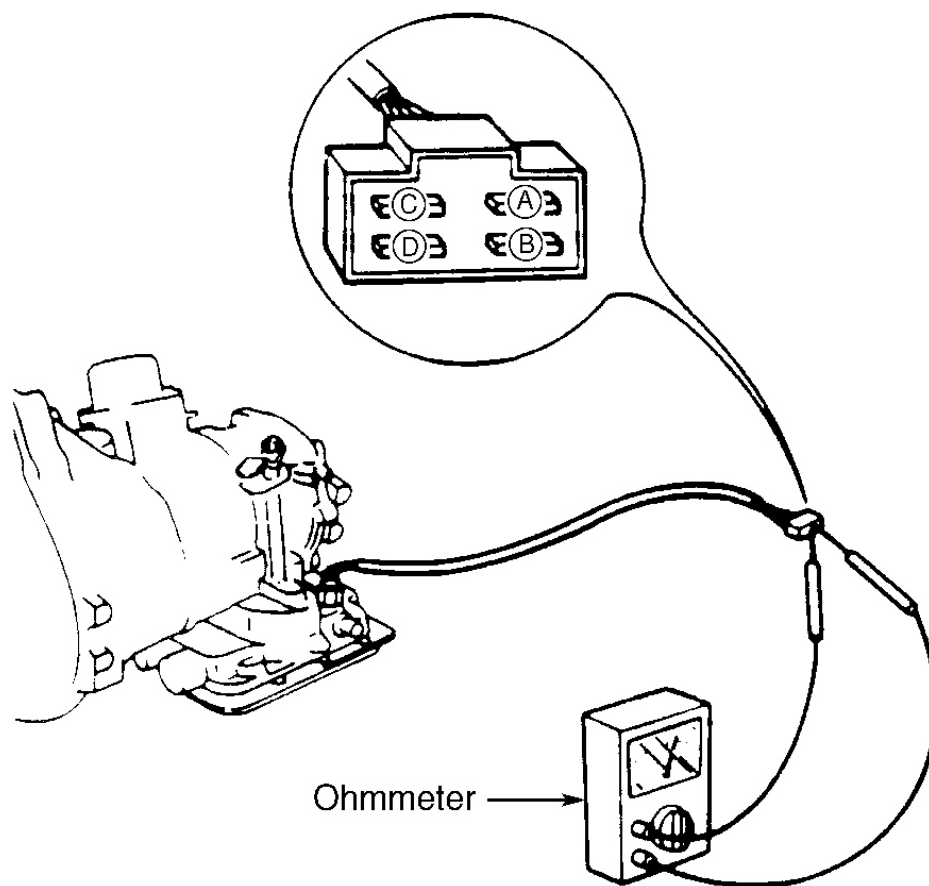
"R" (Reverse)	Front Clutch & Low-Reverse Brake
"D" (Drive)	
First Gear	Rear Clutch & One-Way Clutch
Second Gear	Rear Clutch & Brake Band
Third Gear	Front Clutch & Rear Clutch
"2" (Intermediate)	
First Gear	Rear Clutch & One-Way Clutch
Second Gear	Rear Clutch & Brake Band
"1" (Low)	
First Gear	Rear Clutch & Low-Reverse Brake
"N" (Neutral)	All Clutches & Bands Released or Ineffective

## TESTING

### PARK/NEUTRAL SWITCH TEST

1. Ensure engine starts in "P" or "N". Ensure back-up lights glow when ignition is on and selector lever in "R". If park/neutral switch is not operating properly, disconnect connector at transaxle and check continuity between terminals. See **Fig. 5** . If continuity is not as indicated, replace park/neutral switch.





Shift Position	Coupler Terminal			
	A	B	C	D
P	O — O			
R			O — O	
N	O — O			

O — O: Indicates continuity

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**Fig. 5: Testing Park/Neutral Switch**  
Courtesy of FORD MOTOR CO.

**KICKDOWN (DOWNSHIFT) SOLENOID TEST****1. Check Fuse**

Ensure ignition is off. Inspect condition of 15 amp METER fuse located in interior fuse junction panel. If fuse is okay, go to step 4). If fuse is blown, go to next step.

**2. Check System**

Ensure ignition is off. Replace 15 amp fuse. Turn ignition on. If fuse blows, go to next step. If fuse is okay, go to step 4).

**3. Check For Short To Ground**

Turn ignition off. Remove 15 amp METER fuse. Disconnect kickdown switch harness connector. Check continuity between Black/Yellow wire terminal of interior fuse holder and ground. If continuity exists, inspect and repair short circuit as needed. If continuity does not exist, replace 15 amp fuse. Go to next step.

**4. Check Power Supply To Kickdown Switch**

Ensure ignition is off. Disconnect kickdown switch harness connector. Turn ignition on. Measure voltage between Black/Yellow wire terminal of kickdown switch harness connector and ground. If voltage is more than 10 volts, go to next step. If voltage is 10 volts or less, inspect and repair circuit between switch harness connector and fuse panel.

**5. Check Kickdown Switch**

Turn ignition off. Check continuity between kickdown switch terminals. Continuity should only exist with accelerator fully depressed. If switch is functioning correctly, go to next step. Replace switch if it failed testing. Road test vehicle to verify repair.

**6. Check Circuit Between Kickdown Switch & Kickdown Solenoid**

Ensure ignition is off. Disconnect kickdown switch harness connector. Disconnect kickdown solenoid harness connector. Check continuity of White/Black wire between switch harness connector and solenoid harness connector. If continuity does not exist, inspect and repair open circuit as needed. If continuity exists, check continuity between White/Black wire terminal at solenoid harness connector and ground. If continuity exists, inspect and repair short circuit as needed. If continuity does not exist, replace kickdown solenoid.

**VACUUM THROTTLE VALVE DIAPHRAGM (MODULATOR) TEST****1. Check System Integrity**

Inspect all vacuum hoses and connections for leaks or damage. Disconnect vacuum hose at diaphragm connection and inspect for leaking ATF. Repair as needed. Go to next step.

## 2. Check Vacuum At Modulator

Ensure ignition is off. Disconnect vacuum hose at modulator valve and connect vacuum gauge to hose. Start and run engine at idle. Vacuum should be 15-22 In. Hg. If vacuum is not within specification, inspect and repair vacuum hose. If vacuum is within specification, go to next step.

## 3. Check Modulator Valve Function

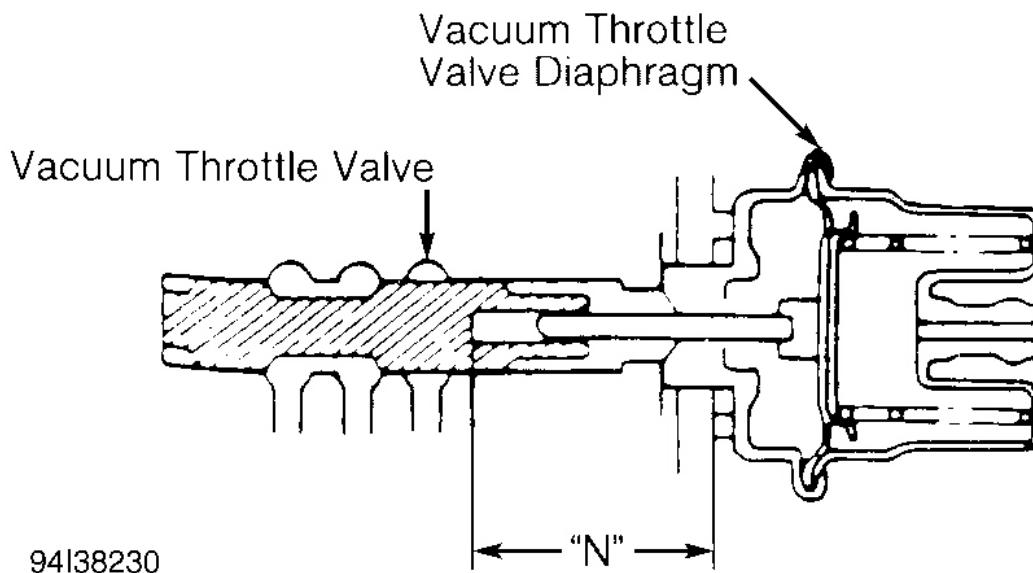
Turn ignition off. Remove modulator valve from transaxle. Connect hand-held vacuum pump to valve. Apply 16-20 In. Hg of vacuum. Ensure vacuum is held by valve. Release vacuum and verify that valve moves freely. If valve is functioning correctly, go to next step. Replace valve if it fails testing.

## 4. Check Vacuum Diaphragm Rod

With modulator removed, measure depth of vacuum throttle valve (dimension "N"). See **Fig. 6** . Measure length of throttle control valve rod. Ensure correct length rod is installed. Refer to the **THROTTLE VALVE ROD DIMENSION CHART** . If correct rod is installed in transaxle, inspect operation of vacuum throttle valve in valve body. Install correct rod length as needed.

### THROTTLE VALVE ROD DIMENSION CHART

"N" Dimension In. (mm)	Applicable Rod Length In. (mm)
1.0 (25.4)	1.16 (29.5)
1.0-1.02 (25.4-25.9)	1.18 (30.0)
1.02-1.04 (25.9-26.4)	1.20 (30.5)
1.04-1.06 (25.9-26.4)	1.22 (31.0)
1.06-1.08 (26.9-27.4)	1.24 (31.5)



**Fig. 6: Measuring Vacuum Throttle Valve Depth**  
Courtesy of FORD MOTOR CO.

## REMOVAL & INSTALLATION

See the appropriate REMOVAL & INSTALLATION - A/T article in this section. Refer to the following menu:

- 1986-89 Chevrolet/Geo Spectrum: REMOVAL & INSTALLATION - A/T
- 1990-93 Geo Storm: REMOVAL & INSTALLATION - A/T
- 1986-89 Isuzu I-Mark: **REMOVAL & INSTALLATION - A/T**
- 1991-93 Isuzu Stylus: **REMOVAL & INSTALLATION - A/T**

## TORQUE CONVERTER

The torque converter is a sealed unit and cannot be serviced. Check for cracked or worn ring in seal area. Measure bushing in converter boss. If I.D. is larger than 1.302" (33.075 mm) on Festiva, Storm and Stylus, replace torque converter. If metal particles are found in ATF, replace torque converter.

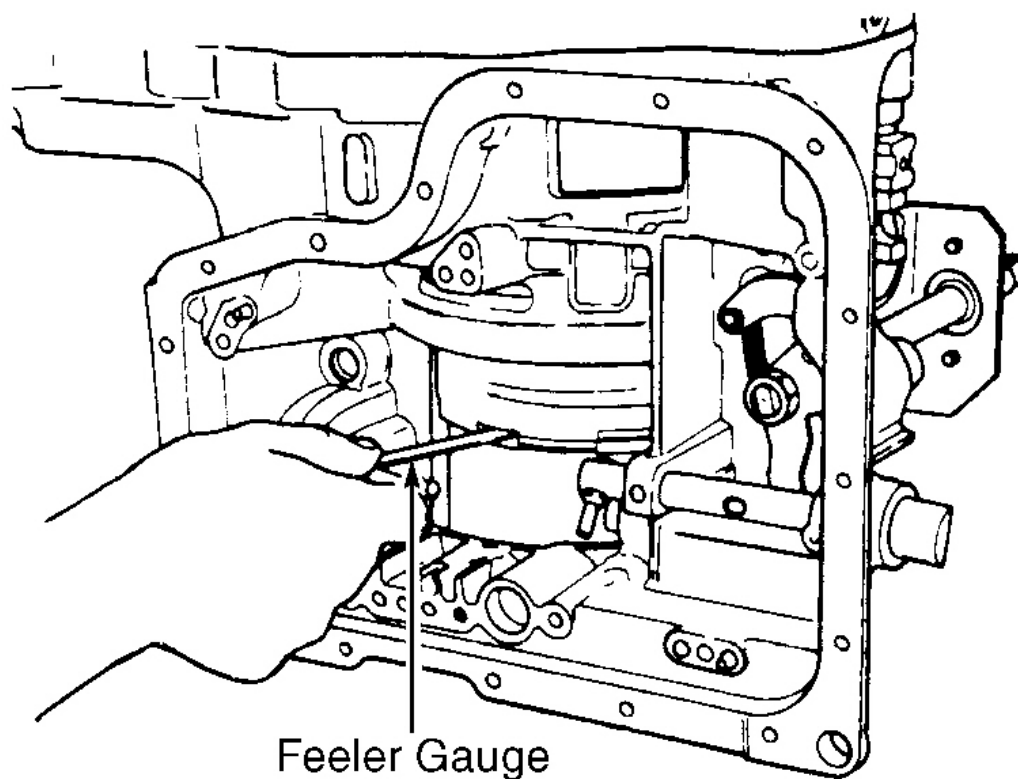
## CLEANING

Flush with solvent, drain and flush with ATF and drain ATF.

## TRANSAXLE DISASSEMBLY

1. Remove torque converter. Attach transaxle to appropriate holding fixture. Remove park/neutral switch,

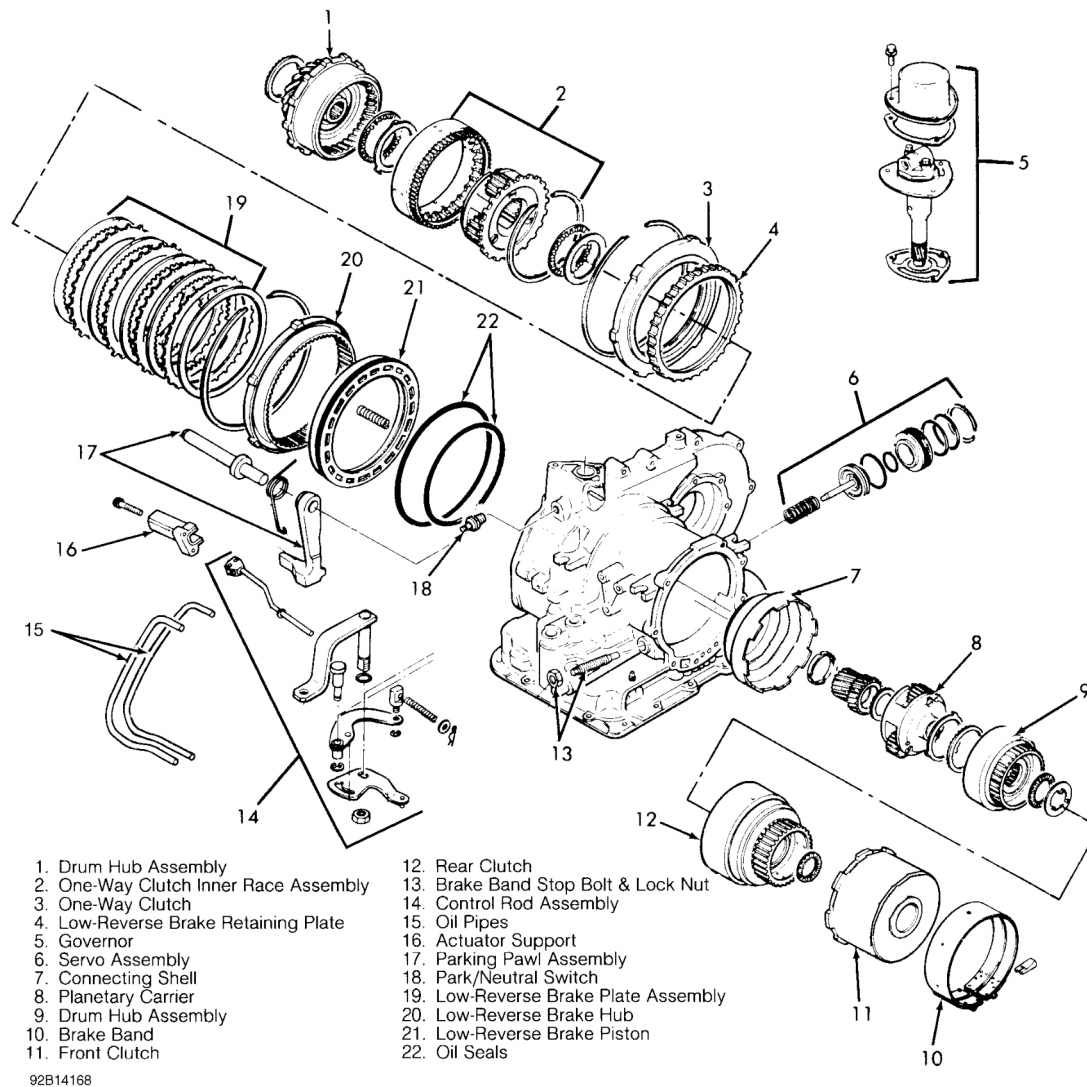
- kickdown solenoid and vacuum modulator with rod. Remove oil dipstick and tube. Remove speedometer driven gear retaining bolt and lift out gear assembly. Remove oil pump drive shaft and turbine shaft.
2. Remove oil pan. Remove valve body. **DO NOT** lose check ball and spring. Position transaxle with oil pump facing downward. With flat-blade screwdriver inserted in wide slot between front clutch drum and sun shell, pry down on front clutch drum. Do this several times as you rotate assembly 2 complete revolutions.
  3. Using a feeler gauge, measure front clutch drum end play. See **Fig. 7**. Check clearance of small slot between front clutch drum tabs and sun shell slots. Record measurement for reassembly reference. End play should be .020-.031" (.5-8 mm).



**Fig. 7: Measuring Front Drum End Play**  
Courtesy of FORD MOTOR CO.

4. Remove oil pump. If oil pump is difficult to remove, tighten band adjusting stop bolt 106-133 INCH lbs. (12-15 N.m) and then remove oil pump. Remove brake band adjustment stop bolt, lock nut, band strut and band. See **Fig. 8**. Store band partially closed with a piece of wire.
5. Remove front clutch assembly. Remove rear clutch needle bearing and rear clutch drum. Remove front ring gear. Remove needle bearing and rear clutch hub assembly. Remove thrust bearing and sun gear

spacer from front planetary gear. Remove planetary gear carrier.

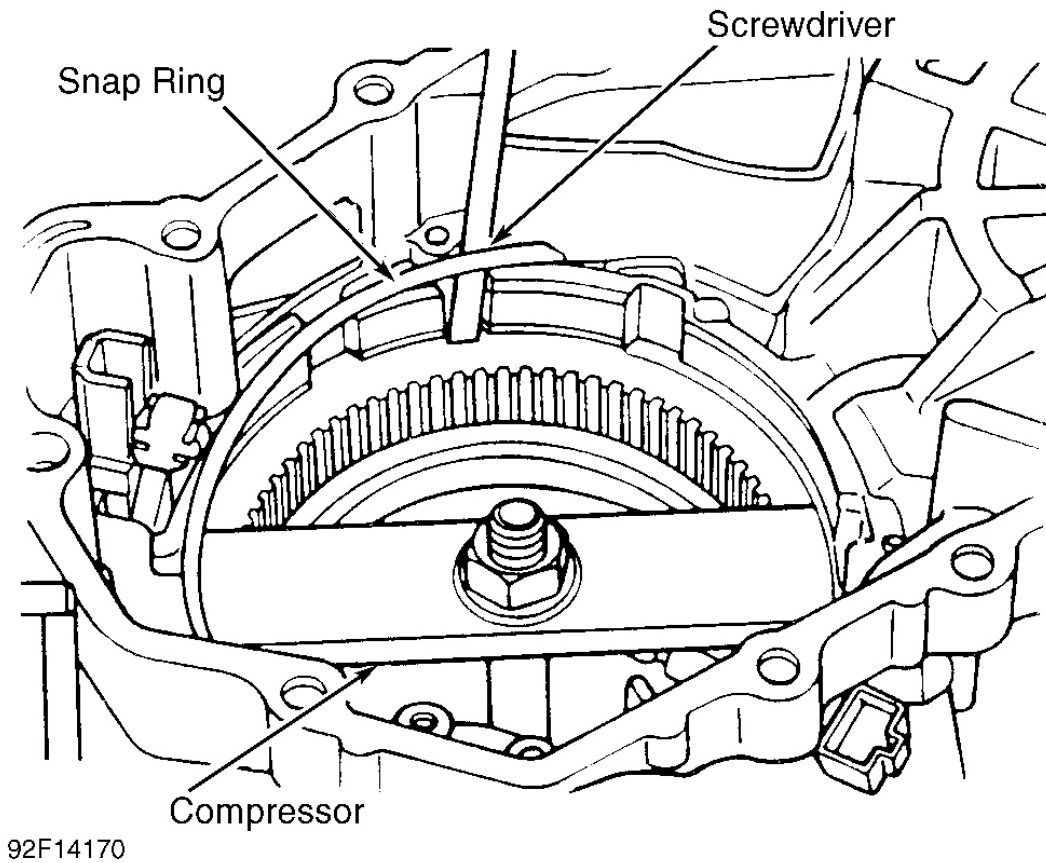


**Fig. 8: Exploded View Of Transaxle Housing & Primary Components**  
Courtesy of FORD MOTOR CO.

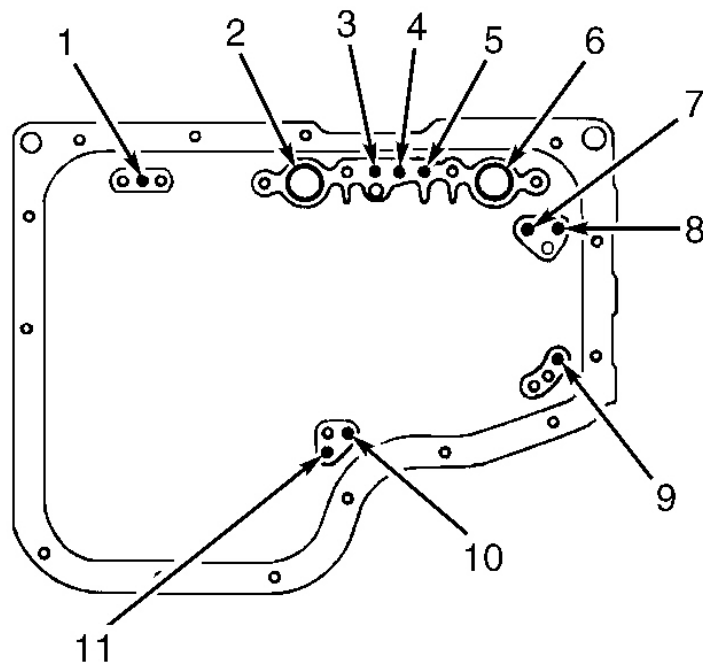
6. Remove the sun gear, spacer and connecting sun shell. See **Fig. 8** . Using "C" clamp and socket, compress servo piston with and remove snap ring. Release the "C" clamp and remove the servo piston. See **Fig. 2** . Remove governor cover and pull governor from transaxle case. Remove transaxle case-to-torque converter housing bolts. Separate case halves.
7. Remove differential assembly. Remove oil pipes and parking pawl assembly. Remove drum hub assembly. Remove one-way clutch inner race assembly. See **Fig. 8** . Remove rear planetary carrier with needle bearing and thrust washer. Before disassembling one-way clutch, measure and record clearance between one-way clutch and low-reverse brake retaining plate. Clearance should .032-.041" (.8-1.05 mm).
8. Remove snap ring, one-way clutch and low-reverse brake retaining plate. Remove low-reverse brake

plates. Compress low-reverse brake piston with appropriate compressor. See **Fig. 9** . Remove snap ring with screwdriver and remove low-reverse brake hub and springs. Apply air pressure to low-reverse oil passage to remove piston. See **Fig. 10** .

9. Remove output bearing and idler support assembly by lightly tapping on idler shaft with a soft-faced hammer. Drive out idler gear roll pin and remove idler gear from output bearing and idler support. See **Fig. 11** . Remove output gear assembly, press out bearing race from output bearing and idler support and save adjusting shim for reassembly.



**Fig. 9: Removing Snap Ring & Low-Reverse Brake**  
Courtesy of FORD MOTOR CO.

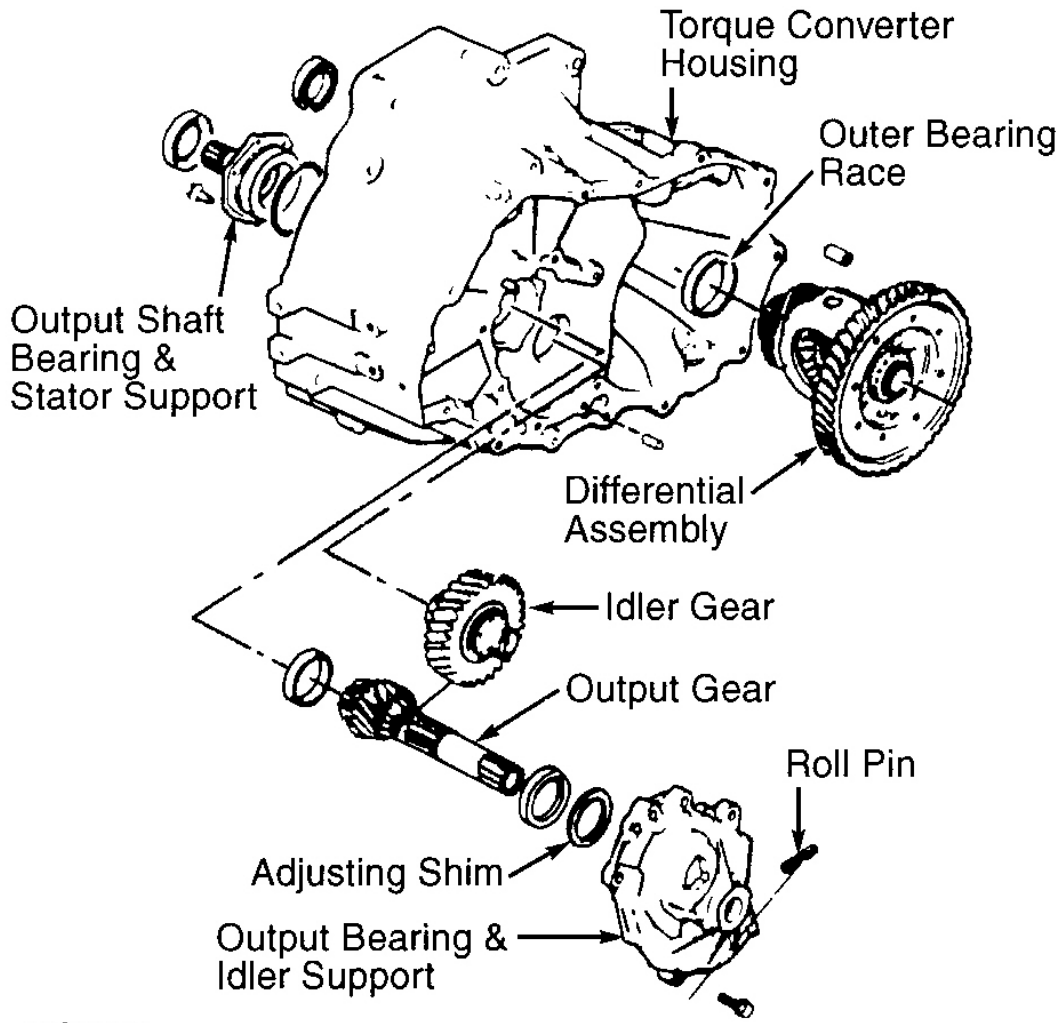


- |                             |                           |
|-----------------------------|---------------------------|
| 1. Line Pressure Check Port | 7. Servo Piston (Release) |
| 2. Oil Pump Outlet          | 8. Servo Piston (Apply)   |
| 3. Torque Converter         | 9. Low-Reverse Clutch     |
| 4. Forward Clutch           | 10. Governor Outlet       |
| 5. Direct Clutch            | 11. Governor Inlet        |
| 6. Oil Pump Inlet           |                           |

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**Fig. 10: Identifying Transaxle Oil Passages**  
Courtesy of FORD MOTOR CO.





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**Fig. 11: Torque Converter Housing Components**  
Courtesy of FORD MOTOR CO.

## COMPONENT DISASSEMBLY & REASSEMBLY

### BAND SERVO

#### Inspection

Remove seal rings and inspect piston for damaged or worn piston. Ensure spring free length is 1.890" (48.00 mm). If less than specified, replace spring. Install new seal rings on piston and servo retainer.

### DIFFERENTIAL

**Disassembly**

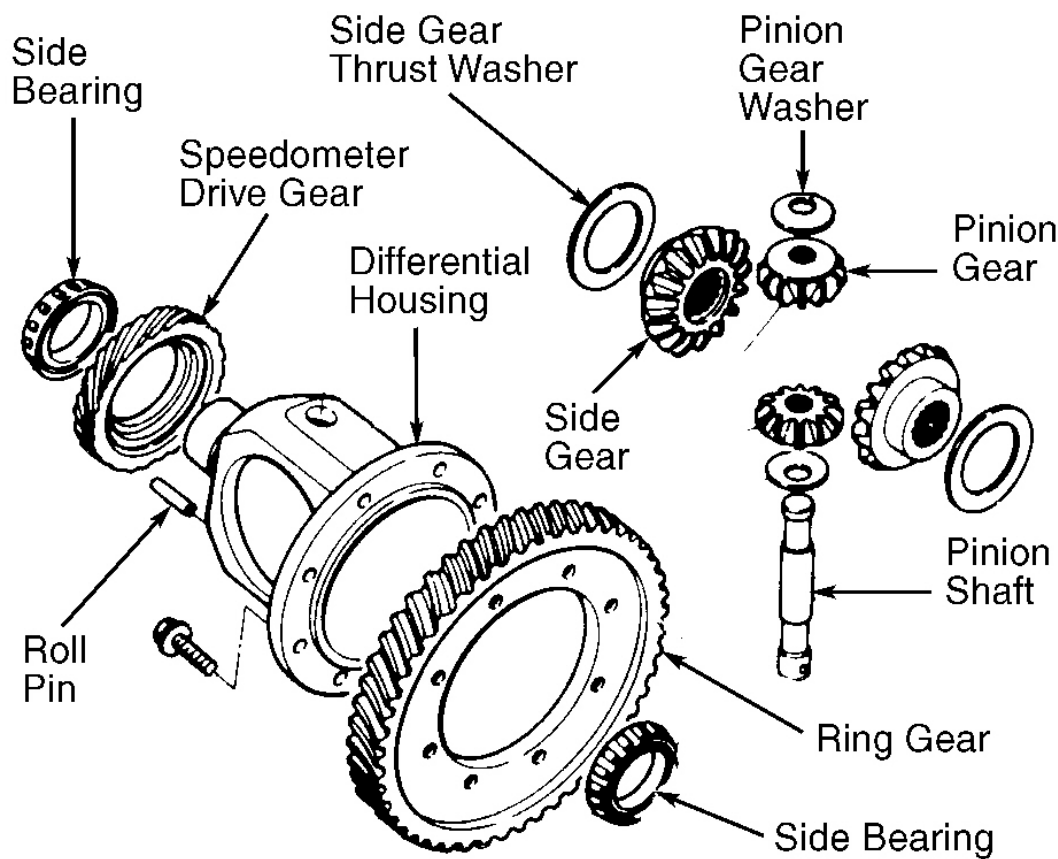
1. Remove ring gear retaining bolts and ring gear. Using hammer and pin punch, drive out roll pin. See **Fig. 12** . Push out pinion gear shaft. Remove pinion and side gears, with washers, from differential housing.
2. Using appropriate puller, remove side bearings from differential housing. **DO NOT** remove speedometer drive gear unless damaged. Removal will damage speedometer drive gear.

**Inspection**

Check all gears for signs of excessive wear or damage. Check differential gear case for cracks or other damage. Replace as needed.

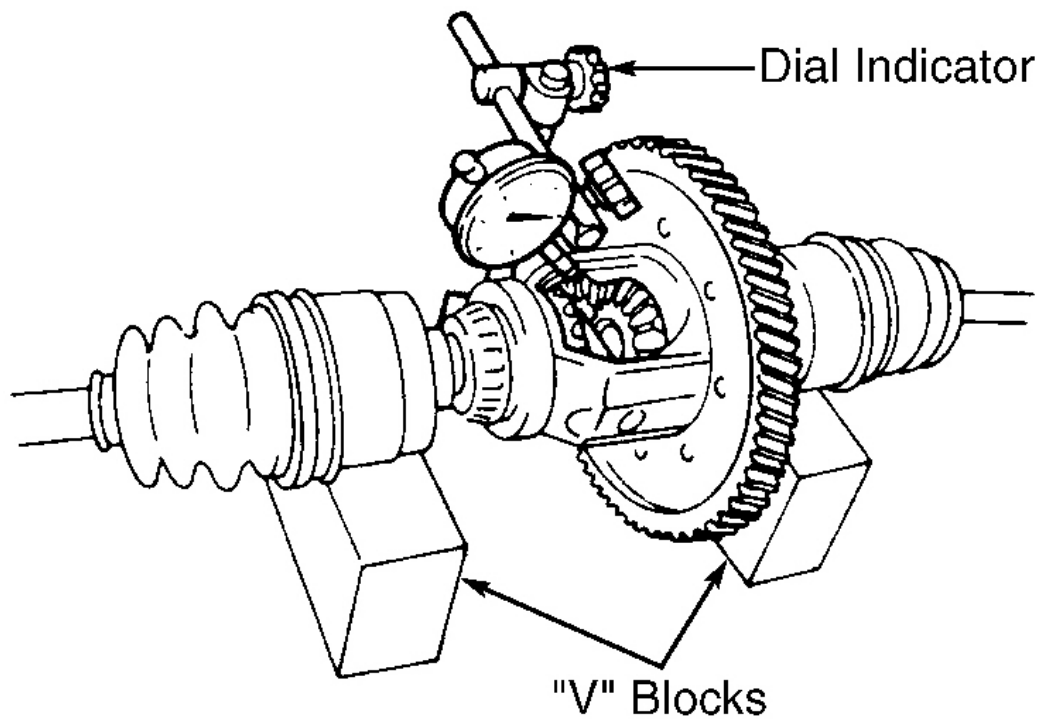
**Reassembly**

1. Reverse removal procedure to reassemble. Measure side gear and pinion gear backlash by inserting drive shafts into differential side gears and supporting shafts in "V" blocks. Position dial indicator with plunger resting on teeth of pinion gear. See **Fig. 13** . Measure backlash. Repeat procedure with plunger on other pinion gear.
2. Backlash readings should be less than .004" (.10 mm). If backlash is not within specification, adjust backlash by changing thrust washers. Thrust washers are available in .079" (2.00 mm), .083" (2.10 mm) and .087" (2.20 mm) thicknesses. Use thrust washers of the same thickness on both sides whenever possible.



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**Fig. 12: Exploded View Of Differential Assembly**  
 Courtesy of FORD MOTOR CO.



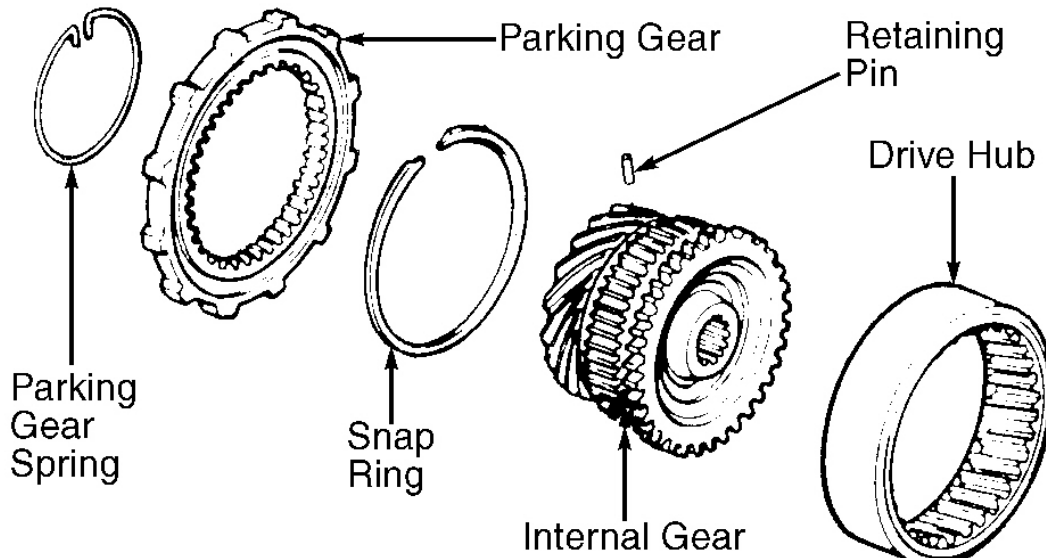
94D38235

**Fig. 13: Measuring Pinion Gear Backlash**  
Courtesy of FORD MOTOR CO.

## DRUM HUB

### Disassembly, Inspection & Reassembly

Remove parking gear spring from park gear. Push in the parking gear retaining pins with screwdriver and remove parking gear. See **Fig. 14**. Remove snap ring and lift internal gear assembly from drive hub. Check gear for excessive wear or damage and replace if needed. Reverse disassembly procedure to reassemble drum hub.



92D14178

**Fig. 14: Exploded View Of Drum Hub Assembly**  
Courtesy of FORD MOTOR CO.

## FRONT CLUTCH

### Disassembly

Remove retainer plate snap ring. Remove retainer plate, drive and driven plates and dished plate. See **Fig. 15**. Note position of dished plate for reassembly. Using appropriate compressor, compress return springs to remove spring retainer snap ring. Remove spring compressor. Remove spring retainer and return springs. Apply air pressure to front clutch oil passage and remove front clutch piston.

### Inspection

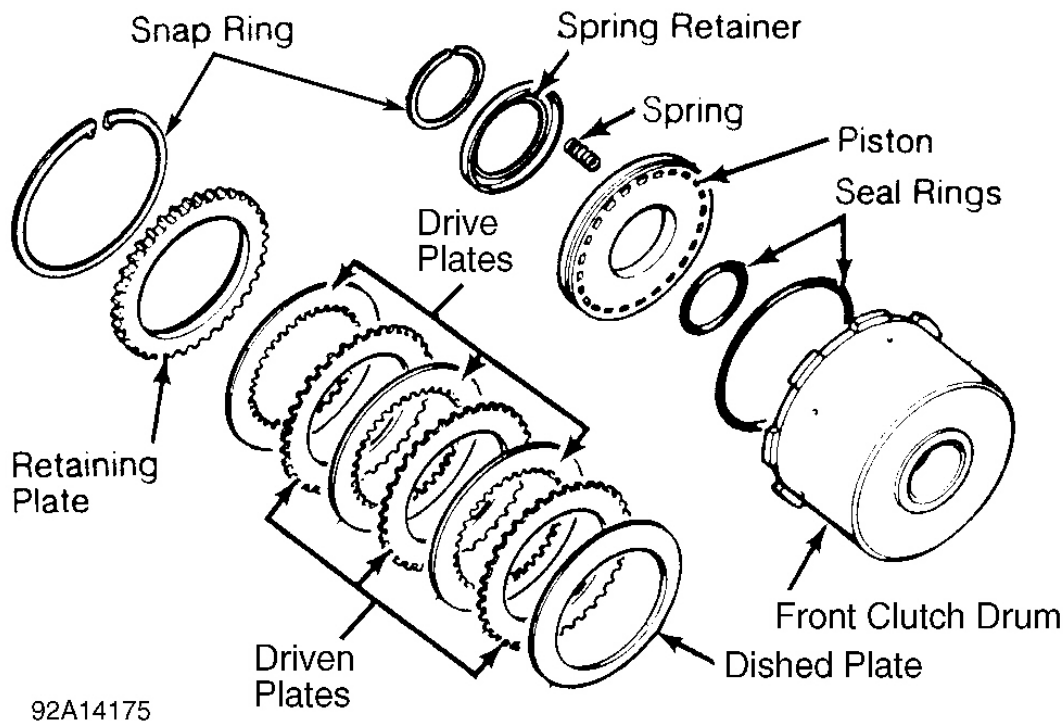
Inspect all parts for wear or damage and replace as needed. Return springs must have free length of .992-1.071" (25.20-27.20 mm). If free length is not within specification, replace spring(s). Check inside diameter of clutch drum bushing. If diameter exceeds 1.735" (44.08 mm), replace bushing.

### Reassembly

1. Reverse disassembly procedure to reassemble. Install new seal rings on piston and install piston by applying even pressure on perimeter while rotating piston. Install front clutch return springs and retainer. Compress spring retainer. Install snap ring.
2. Install dished plate. See **Fig. 15**. Install drive and driven clutch plates, retaining ring and snap ring. Using feeler gauge, measure between snap ring and retaining plate. Clearance should be .063-.071" (1.60-1.80 mm). If clearance is not correct, select correct thickness retaining plate. Retaining plates are available in

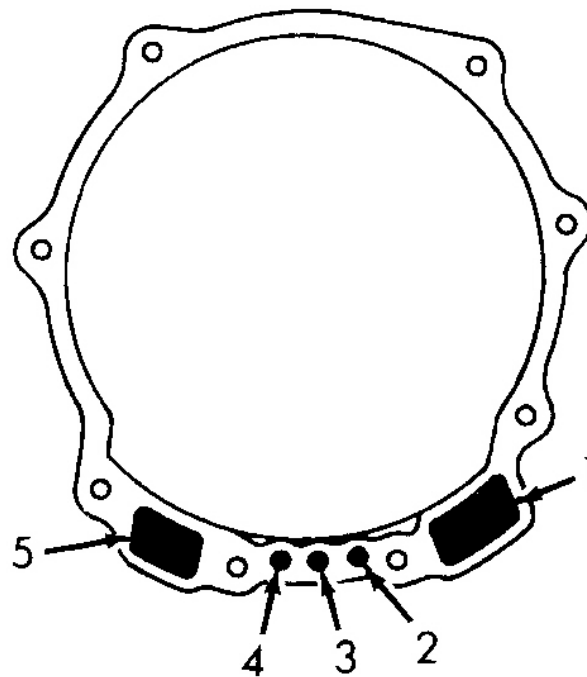
thicknesses of .205" (5.20 mm) to .244" (6.20 mm) in .20 mm increments.

3. Place front clutch assembly over oil pump and apply air pressure (57 psi maximum) to front clutch oil passage in oil pump to check for proper front clutch operation. See **Fig. 16**.



**Fig. 15: Exploded View Of Front Clutch**  
Courtesy of FORD MOTOR CO.

1. Oil Pump Inlet
2. Front Clutch
3. Rear Clutch
4. Torque Converter



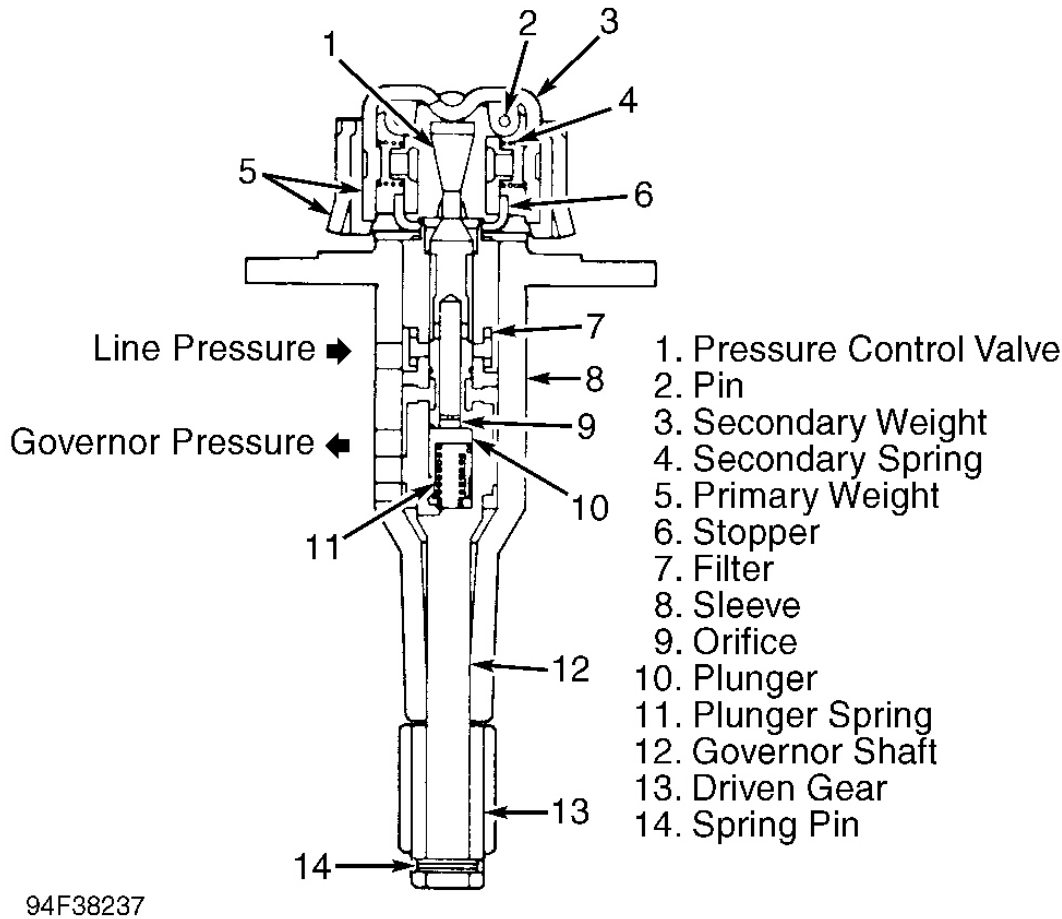
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**Fig. 16: Identifying Oil Pump Oil Passages**  
Courtesy of FORD MOTOR CO.

## GOVERNOR ASSEMBLY

### Disassembly & Reassembly

Secure governor assembly in vise. Using hammer and pin punch, drive out governor shaft gear spring pin. Remove gear. Remove sleeve from shaft. Remove oil screen clamp and screen. See **Fig. 17**. Clean all parts as needed. Lubricate parts with ATF. To assemble, reverse disassembly procedure. Replace spring pin.



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**Fig. 17: Exploded View Of Governor Assembly**  
Courtesy of GENERAL MOTORS CORP.

## IDLER GEAR ASSEMBLY

### Disassembly & Inspection

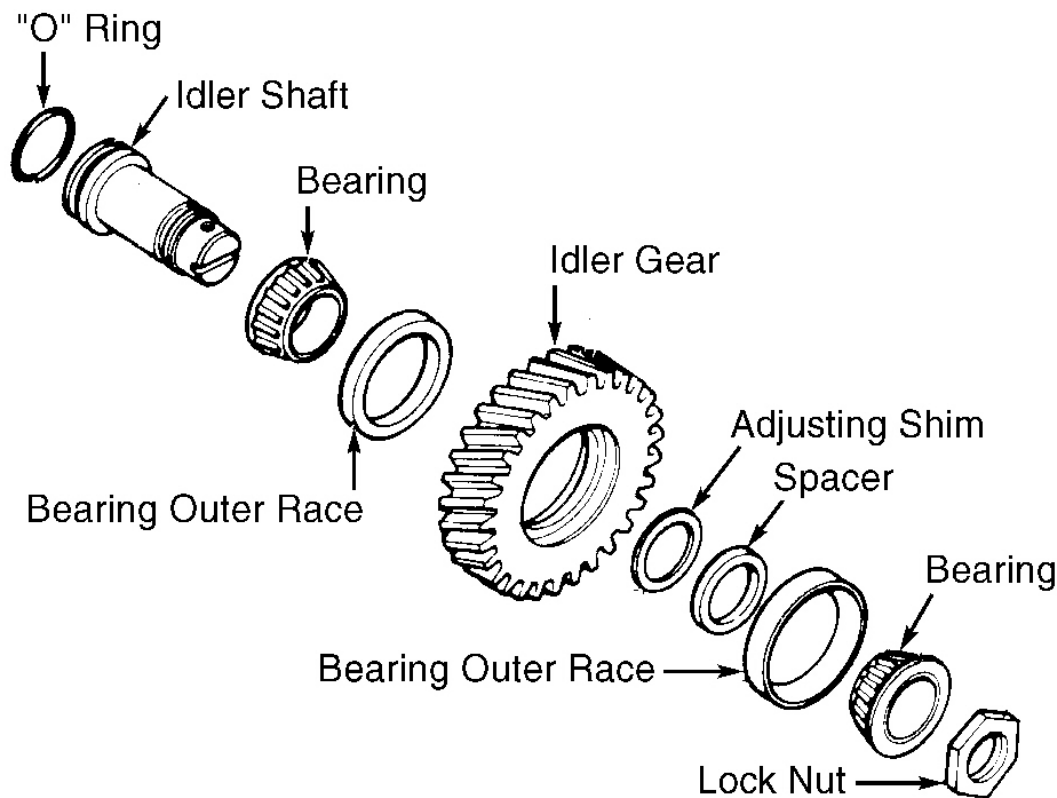
Attach Idler Shaft Holder (J-35286) or hex wrench to idler shaft and support assembly in vise. Remove lock nut. See **Fig. 18**. Remove bearing, spacer, idler gear, adjustment shim(s) and remaining bearing. Press bearing outer races from idler gear. Check all gear teeth for wear or damage and bearings for breakage or unusual wear.

### Reassembly

1. Place idler shaft holder or hex wrench in vise and place idler shaft on wrench. Install outer races in idler gear. Place bearing, idler gear, adjustment shim, spacers, bearing and nut on idler shaft and tighten nut to 94-130 ft. lbs. (127-176 N.m).
2. Measure bearing preload. Mount idler gear in vise. Using INCH lb. torque wrench, measure idler gear shaft turning torque. Turning torque should be .26-8.0 INCH lbs. (.03-.90 N.m). If preload is not within



specification, change selective shims. Selective size shims are available from .004" (.10 mm) to .008" (.20 mm) in .04 mm increments. One .020" (.50 mm) shim is available. **DO NOT** use more than 7 shims. Once correct preload is obtained, retighten idler gear locknut to 94-130 ft. lbs. (128-177 N.m)



92A14183

**Fig. 18: Exploded View Of Idler Gear Assembly**  
Courtesy of FORD MOTOR CO.

## LOW-REVERSE BRAKE

### Inspection

Check all components for signs of damage or excessive wear. Check free length of return springs. See **LOW-REVERSE BRAKE SPRING SPECIFICATIONS** table. If not correct, replace spring(s).

### LOW-REVERSE BRAKE SPRING SPECIFICATIONS

Application	Free Length In. (mm)
Chevrolet/Geo Spectrum & Isuzu I-Mark	1.091 (27.70)
Geo Storm & Isuzu Stylus	1.051-1.130 (26.70-28.70)

## OIL PUMP

### Disassembly

Remove pump cover retaining bolts and separate cover from pump body. Remove pump flange. See **Fig. 19** . If gears are to be reused, match mark gears to reassemble in same position. Remove drive and driven gears.

### Inspection

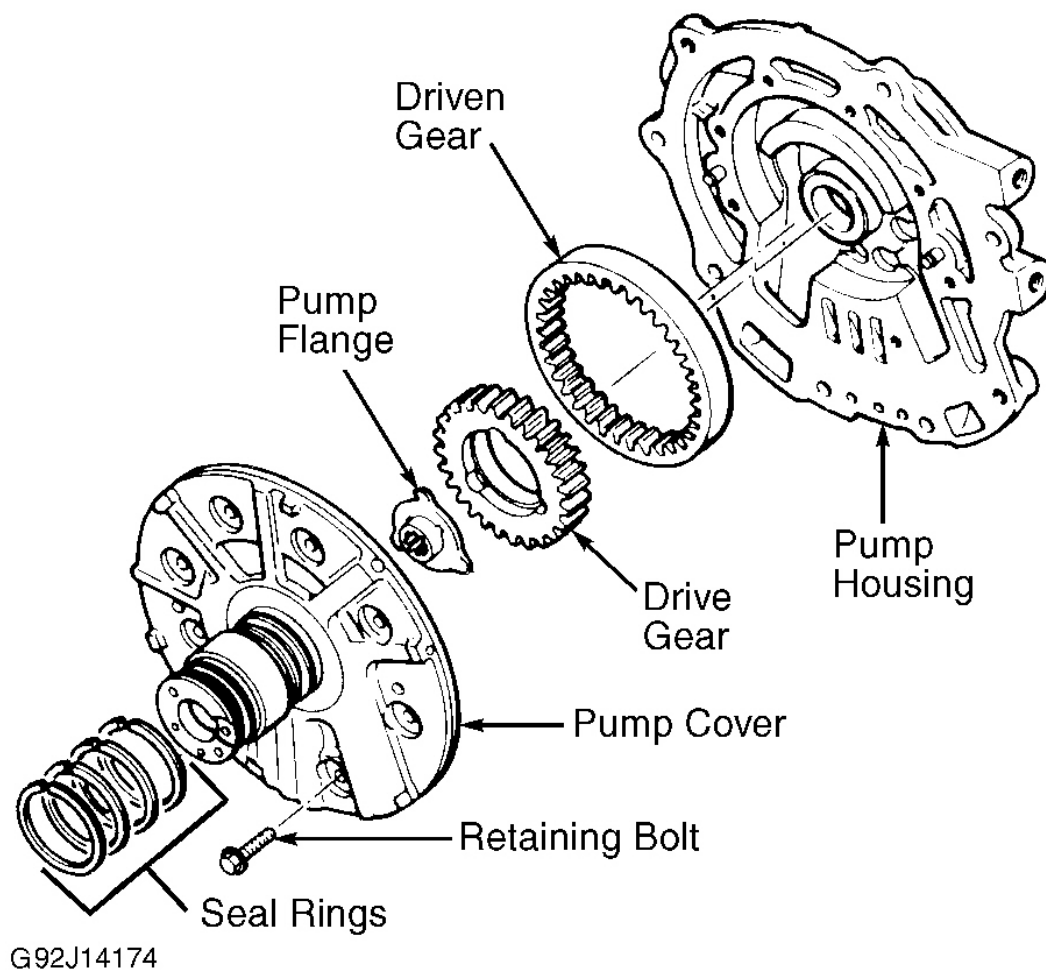
1. Check the condition of the gear teeth and surfaces. Check seal rings for signs of cracks or breaks and replace as needed. Check condition of pump housing sleeve and inner gear bushing. See **Fig. 20** . See the **OIL PUMP SPECIFICATIONS** table. Check sleeve outer diameter and bushing inner diameter.
2. If sleeve diameter is less than 1.492" (37.90 mm) or bushing diameter is greater than 1.499" (38.08 mm) replace sleeve and bushing as a set. Check pump clearances and compare with values shown in the **OIL PUMP SPECIFICATIONS** table.

### Reassembly

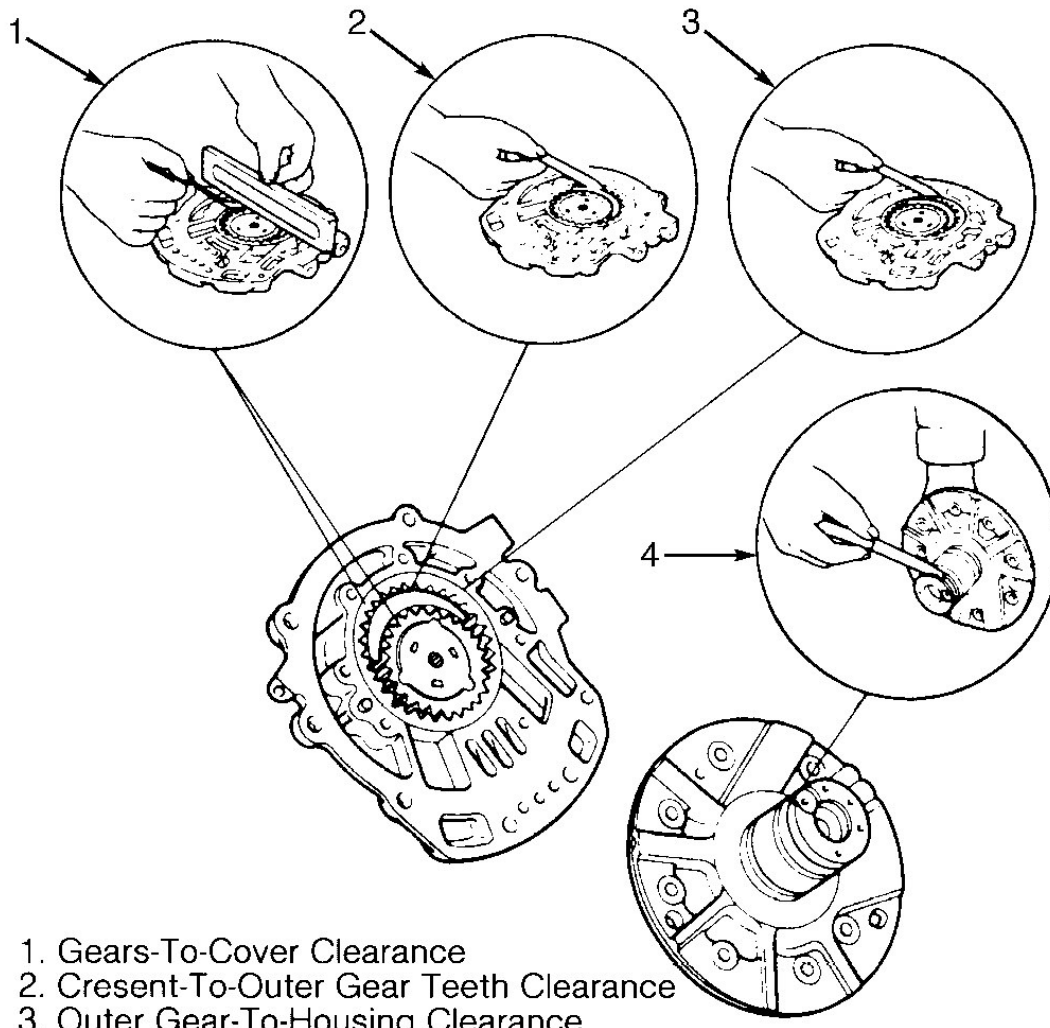
Apply ATF on all parts. To assemble, reverse disassembly procedure. **DO NOT** tighten pump cover to oil pump housing. Oil pump reassembly is completed during transaxle reassembly.

### OIL PUMP SPECIFICATIONS

Application	Clearance In. (mm)
Drive & Driven Gear-To-Pump Cover	.001-.003 (.025-.08)
Driven Gear-To-Crescent	.006-.010 (.14-.25)
Driven Gear-To-Pump Housing	.002-.003 (.04-.08)
Seal Ring Side	.002-.016 (.04-.40)



**Fig. 19: Exploded View Of Oil Pump Assembly**  
Courtesy of FORD MOTOR CO.



1. Gears-To-Cover Clearance
2. Crescent-To-Outer Gear Teeth Clearance
3. Outer Gear-To-Housing Clearance
4. Sealing Ring Side Clearance

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**Fig. 20: Measuring Oil Pump Clearances**  
Courtesy of FORD MOTOR CO.

## ONE-WAY CLUTCH

### Disassembly, Inspection & Reassembly

1. Record direction of rotation one-way clutch locks and turns. Remove snap ring and pull out planetary carrier from one-way clutch inner race. See **Fig. 8**. Check for worn or damaged parts. Bushing wear on one-way clutch must not exceed 5.120" (130.06 mm).
2. Check clearance between pinion gears and washers in planetary carrier. If clearance exceeds .031" (.80 mm), replace planetary carrier. Reverse disassembly procedure to reassemble. Install one-way clutch in

inner race and ensure that it will turn in one direction (clockwise) only.

## REAR CLUTCH

### Disassembly

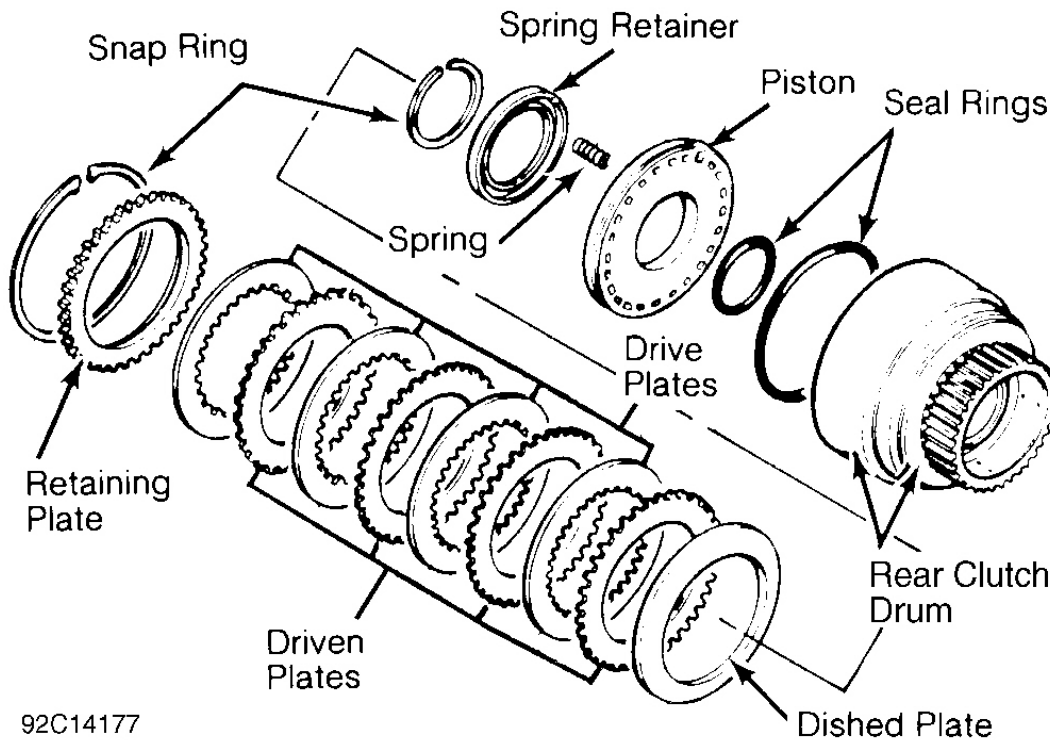
1. Remove large snap ring. Lift out retaining plate, clutch plates, and dished plate. See **Fig. 21** . Using appropriate compressor, compress rear clutch spring retainer to remove small snap ring, spring retainer, and clutch return springs.
2. Place front clutch on oil pump and rear clutch hub on top of front clutch. Apply air pressure to rear clutch oil passage to remove piston. See **Fig. 16** . Remove and discard piston seal rings.

### Inspection

Inspect for wear or damage. Ensure return spring free length is 1.031-1.071" (26.20-27.20 mm).

### Reassembly

1. Install seal rings on piston and install in clutch drum by applying even pressure on perimeter of piston and rotate piston slowly. Install return springs and spring retainer. Press spring retainer. Install snap ring. Note direction of dished plate and install. Install driven and drive plates, retainer plate and snap ring. See **Fig. 21** .
2. Ensure clearance between snap ring and retainer plate is .031-.039" (.80-1.00 mm). If clearance is not within specification, select correct retaining plate. Retaining plates are available in thicknesses .189" (4.80 mm) to .244" (6.20 mm) in .20 mm increments.
3. Check rear clutch operation by placing forward clutch on oil pump and then rear clutch. Apply compressed air (70 psi maximum) to rear clutch oil passage and check operation. See **Fig. 16** .



**Fig. 21: Exploded View Of Rear Clutch**  
Courtesy of FORD MOTOR CO.

## REAR CLUTCH HUB

### Disassembly, Inspection & Reassembly

Remove snap ring and separate hub from internal gear. Check for worn or damaged snap ring or gear and replace as needed. Reverse disassembly procedure to reassemble hub.

## VALVE BODY

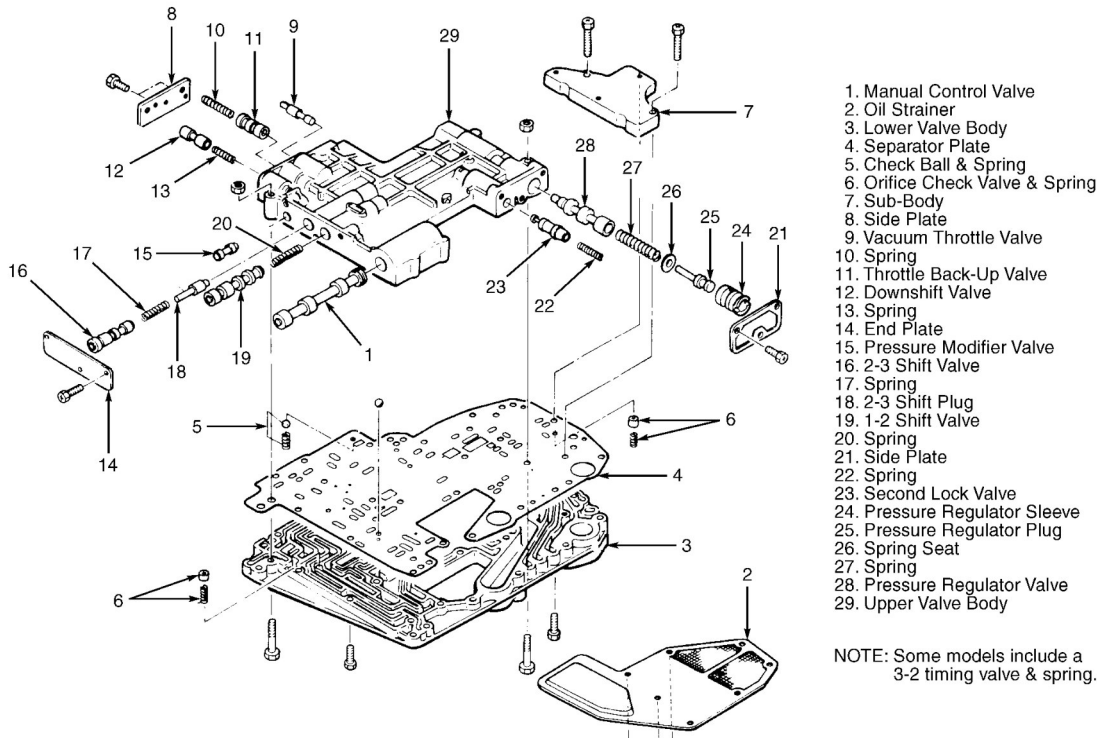
**NOTE:** Remove and clean one valve at a time to avoid incorrect installation. If any valves, valve springs, or valve bodies are damaged, the entire valve body assembly must be replaced.

### Disassembly

1. Remove manual control valve. Remove oil strainer retaining bolts and oil strainer. Remove upper-to-lower valve body retaining bolts. Separate valve bodies, separator plate and sub-body. **DO NOT** lose check balls and springs or orifice valve and spring. See **Fig. 22**.
2. Remove, clean and install each valve individually as needed. See **Fig. 22**. Lubricate moving parts with

ATF. Ensure all valves move (snap) freely. If valve sticks in its bore and cannot be freed, valve body must be replaced. **DO NOT** attempt to hone valve bores or polish valves.

- Inspect the valve springs for signs of damage or deformation. Measure valve spring free length and diameter. Refer to the **VALVE BODY SPRING DIMENSIONS** table. Reassemble components in reverse order of disassembly.



92H14180

**Fig. 22: Exploded View Of Valve Body Assembly**  
Courtesy of FORD MOTOR CO.

### VALVE BODY SPRING DIMENSIONS

Application	Free Length In. (mm)
Throttle Back-Up	1.417 (36.00)
Downshift	.862 (21.90)
2-3 Shift	
Isuzu I-Mark	1.614 (41.00)
Chevrolet/Geo Spectrum	1.614 (41.00)
Geo Storm	1.429 (36.30)
Isuzu Stylus	1.429 (36.30)
1-2 Shift	1.260 (32.00)
Second Lock	1.319 (33.50)
Pressure Regulator	1.693 (43.00)
Throttle Relief	.441 (11.20)

## 1991 Isuzu Stylus S

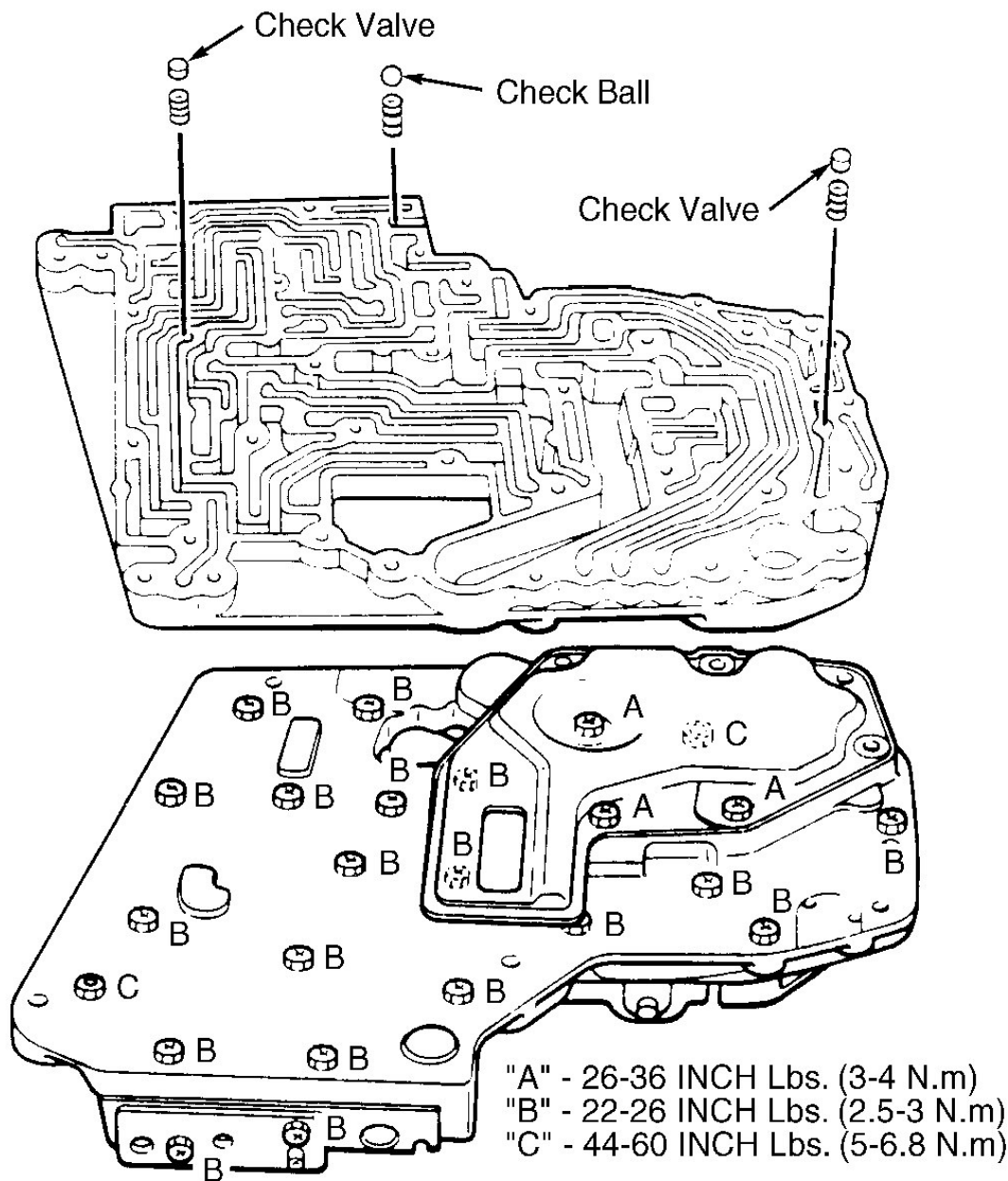
1986-93 AUTOMATIC TRANSMISSIONS General Motors Corp./Isuzu - KF100, KF400 & RMC

Orifice Check	.846 (21.50)
Steel Ball (Spring)	1.516 (26.80)

### Reassembly

1. To reassemble, reverse disassembly procedure. Coat all parts with clean transmission fluid. **DO NOT** force valves into position. Ensure orifice check valve, check ball and springs are located correctly.
2. Place separator plate on lower valve body and hold with clamps. Install upper valve body and bolt into place. Tighten upper valve body to lower valve body. See **Fig. 23** .





92114181

**Fig. 23: Locating Valve Body Check Balls & Tightening Bolts**  
 Courtesy of GENERAL MOTORS CORP.

## TRANSAXLE CASE

### Inspection

Inspect case for cracks and stripped threads. Inspect gasket surfaces and mating surfaces for burrs. Check vent

for obstructions, and check all fluid passages for obstructions and leakage. Inspect case bushing for scores. Check all parking linkage parts for wear or damage.

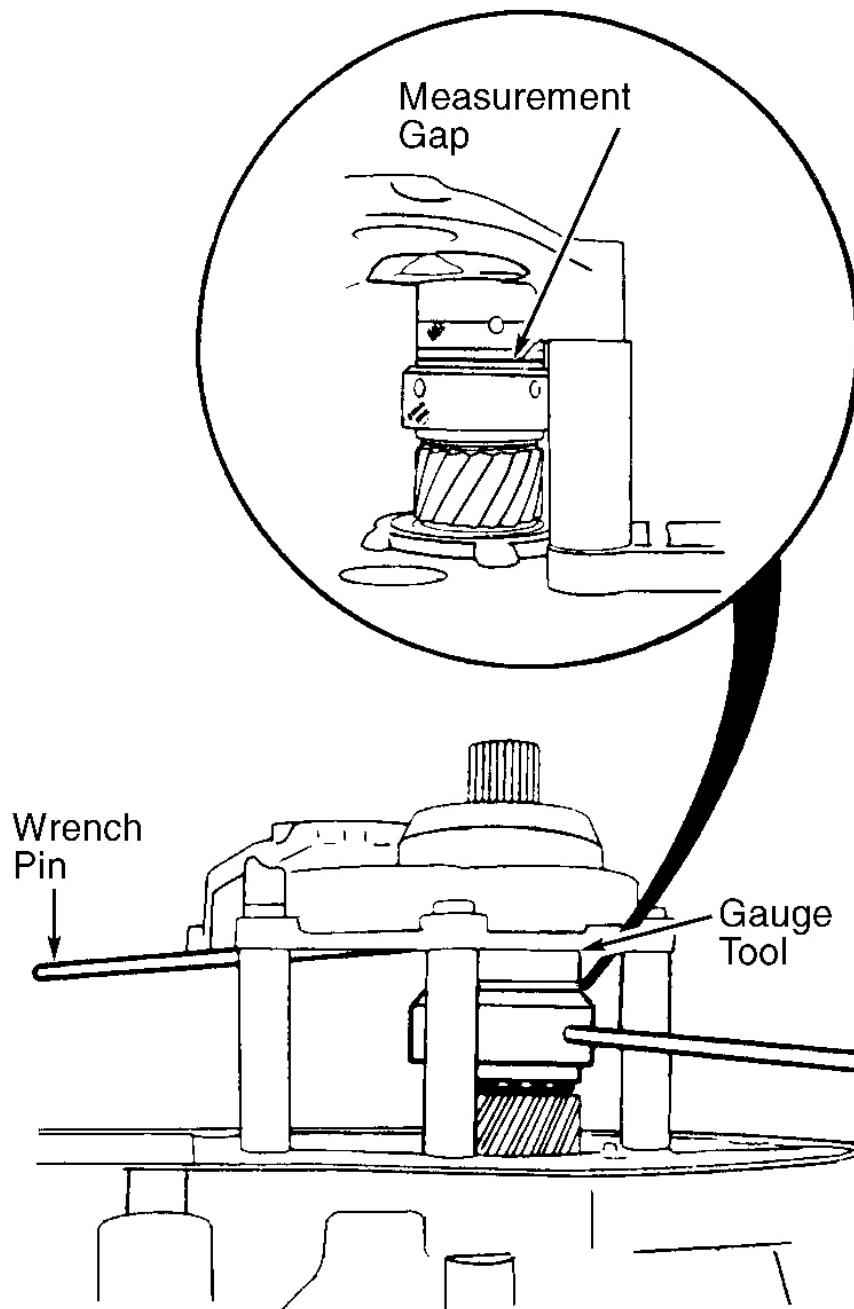
## TRANSAXLE REASSEMBLY

**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 them in place. Soak all friction discs in ATF for at least 15 minutes. Use all new gaskets and seals, and tighten bolts evenly.

**NOTE:** For identification and position of thrust bearings and washers, see Fig. 27 .

### Output Shaft Bearing Preload

1. Position output shaft into torque converter housing. Position output shaft outer bearing race in recessed end of Gauge Tool (T87C-770002DJ). Place gauge tool over output shaft. See Fig. 24 .
2. Ensure gauge tool is completely threaded together so that no gap is present. Position spacer collars and assemble output bearing and idler support to converter housing using supplied bolts and washers of tool set. See Fig. 24 . Tighten bolts to 14-19 ft. lbs. (26 N.m).



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**Fig. 24: Measuring Output Shaft Bearing Preload**  
Courtesy of FORD MOTOR CO.

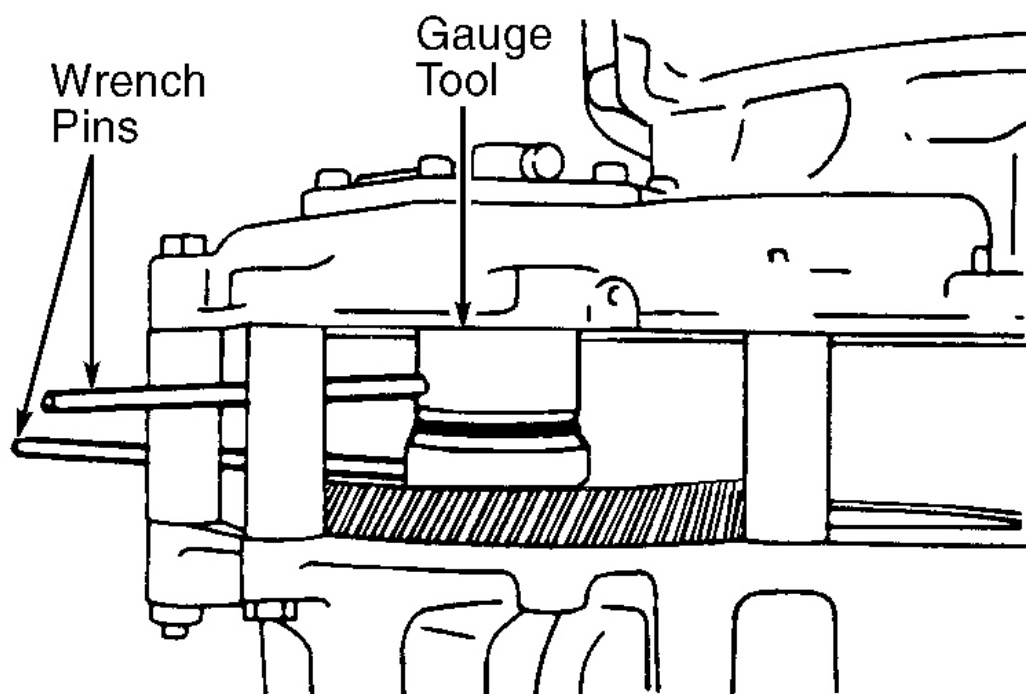
3. Unthread gauge tool until output shaft bearings are seated and no play exists. Install Torque Adapter (T87C77000-E) over splined end of output shaft. Using INCH lb. torque wrench, rotate output shaft while

unthreading gauge tool. Unthread gauge tool until 4.42-7.97 INCH lbs. (.5-.9 N.m) of turning torque is obtained.

4. Using feeler gauge, measure gap of gauge tool. Select correct thrust shim(s) that match measured gauge tool gap. Shims are available from in thicknesses of .004" (.10 mm) to .007" (.18 mm) in .02 mm increments. One shim is available in thickness of .019" (.50 mm).
5. Disassemble output bearing and idler support from converter housing. Remove gauge set and spacers. Install selected shim(s) in output bearing and idler support. **DO NOT** exceed 7 shims. Remove bearing race from gauge tool and install race in support. Reassemble converter housing and output bearing and idler support. Install bolts and tighten retaining bolts to specification. Refer to the **TORQUE SPECIFICATIONS** table.
6. Install Torque Adapter (T87C77000-E) over splined end of output shaft. Using INCH lb. torque wrench, rotate output shaft to confirm correct bearing preload. Turning torque should be .26-7.96 INCH lbs. (.03-.9 N.m). If turning torque is not within specification, repeat steps 1) through 6).
7. Once correct output shaft bearing preload is obtained, remove output bearing and idler gear support. Replace idler gear shaft seal on idler gear shaft. Install idler gear into converter housing. Install output gear and bearing support. Ensure alignment groove in idler gear shaft is aligned with support ridge of output bearing and idler support.
8. Install new idler gear shaft roll pin. Install output gear and bearing support bolts and tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

#### **Differential Bearing Preload Adjustment**

1. Install differential assembly into converter housing. Position differential side bearing race in recessed end of Gauge Tool (T87C-770002DJ). Place gauge tool on differential. See **Fig. 25** .
2. Ensure gauge tool is completely threaded together so that no gap is present. Position spacer collars and assemble case halves using supplied bolts and washers of tool set. See **Fig. 25** . Tighten bolts to 22-34 ft. lbs. (292D46 N.m).



94B38241

**Fig. 25: Measuring Differential Bearing Preload**  
 Courtesy of FORD MOTOR CO.

3. Unthread gauge tool until differential bearings are seated. Install Differential Rotator into differential assembly. Using INCH lb. torque wrench, rotate differential assembly while unthreading gauge tool. Unthread gauge tool until 4.3 INCH lbs. (.5 N.m) of turning torque is obtained.
4. Using feeler gauge, measure gap of gauge tool. Select correct thrust shim(s) by adding .006" (.15 mm) to measured gauge tool gap. Shims are available from in thicknesses of .043" (1.08 mm) to .079" (2.00 mm) in .040 mm increments.
5. Disassemble case halves. Remove gauge set and spacers. Install selected shim(s) in transaxle case. **DO NOT** exceed 3 shims. Remove bearing race from gauge tool and install race in transaxle case. Reassemble transaxle case halves. Install bolts and tighten bolts to specification. See **TORQUE SPECIFICATIONS**.
6. Install Differential Rotator (T88C-77000-L) into differential assembly. Using INCH lb. torque wrench, rotate differential assembly to confirm correct bearing preload. Turning torque should be 18-25 INCH lbs. (21.-2.8 N.m). If turning torque is not within specification, repeat steps 1) through 6).

#### Final Reassembly

1. Install low-reverse brake piston by applying even pressure on perimeter of piston while rotating slowly. Install 20 return springs and low-reverse brake hub. Using appropriate compressor, compress return

spring and install snap ring. See **Fig. 9**.

2. Install dished plate with small end of dish facing away from piston. Install clutch discs, retainer ring and one-way clutch. Install one-way clutch machined surface toward retainer ring. Install snap ring.

**NOTE:**        **Low/reverse snap ring may not have been installed during production.  
Snap ring is required during overhaul reassembly.**

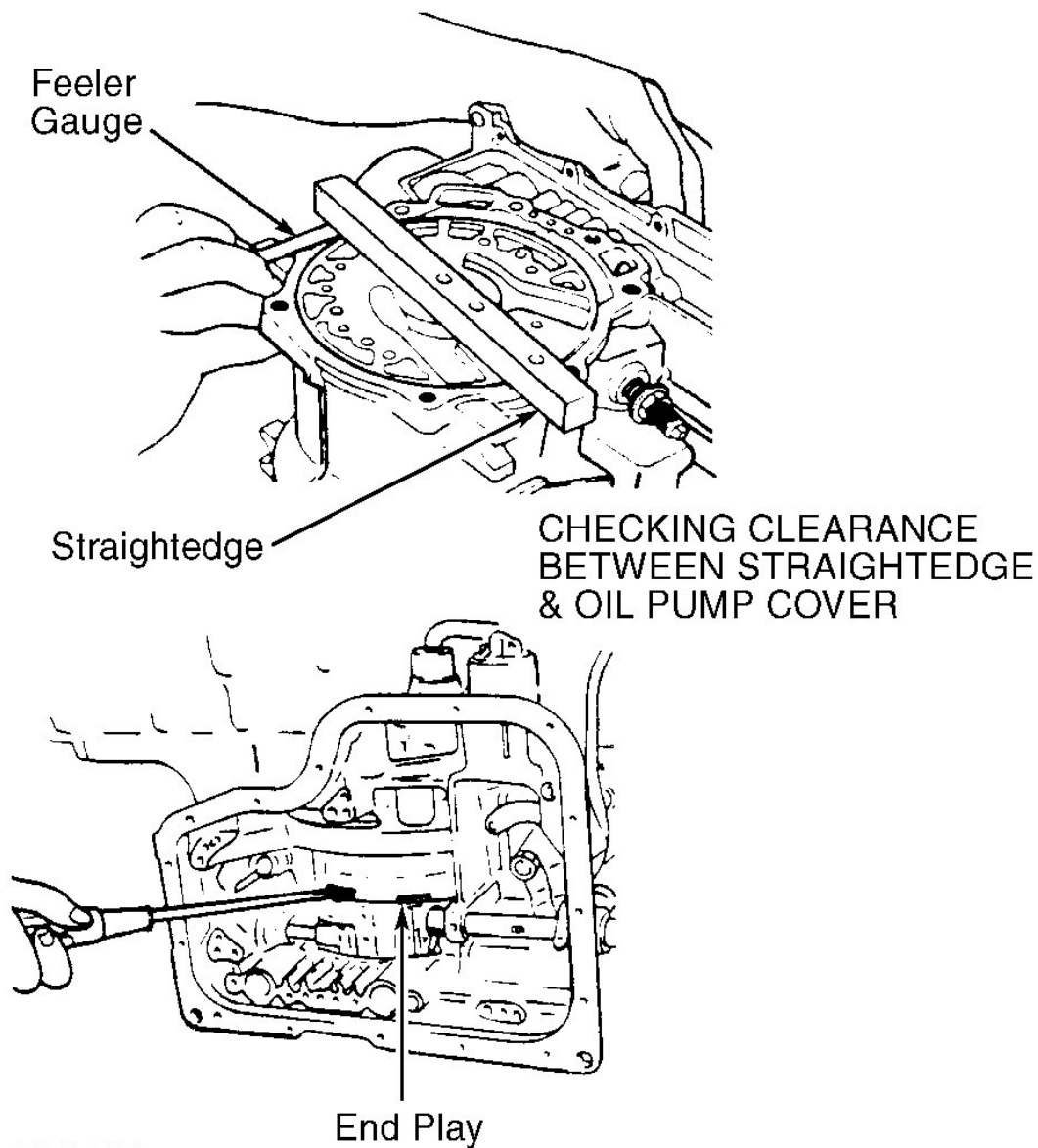
3. Using a feeler gauge, ensure clearance between one-way clutch and retainer plate is .031-.041" (.80-1.05 mm). If clearance is not within specification, select correct retainer plate to obtain correct clearance. Retainer plates are available in thicknesses of .063" (1.60 mm) to .102" (2.60 mm) in .20 mm increments. Apply air pressure to low-reverse oil passage and check for proper clutch operation. See **Fig. 10**.
4. Place converter housing on bench with output shaft facing upward. Install needle bearing over output shaft. Install drum hub assembly onto output shaft spline. Install needle bearing with thrust washer in recess of drum hub. Install rear planetary carrier onto one-way clutch race. Install snap ring. Install rear planetary assembly into drum hub. Install oil tubes into transaxle case.
5. Install governor into transaxle case. Ensure alignment mark on governor sleeve is aligned with mark on transaxle case. Install governor cover. Tighten bolts to specification. Refer to the **TORQUE SPECIFICATIONS** table. Apply appropriate gasket sealant to converter housing and install transaxle case. Once case halves are secured in place, ensure all parts previously installed rotate without resistance.
6. Lubricate servo piston with ATF. Assemble servo retainer, piston, piston large seal and spring. Insert assembly into transaxle. Using "C" clamp and socket, compress assembly and install snap ring.
7. Install thrust bearing and thrust washer. Install sun gear shell with sun gear spacer and sun gear. See **Fig. 8**. Install front planetary carrier with thrust washer onto sun gear. Install thrust washer and thrust bearing onto front of front planetary carrier.
8. Install seal sleeve to center of front planetary carrier. Install front ring gear. Install front ring gear needle bearing with rollers facing upward. Install thrust washer. Match tangs on thrust washer with mating holes in rear clutch assembly.
9. Install rear clutch assembly. Install needle bearing. Companion thrust washer is fitted to oil pump support later in reassembly procedure. Install front clutch assembly. Install band, band strut and band adjusting stop. Tighten band adjusting stop until band is secured in place.

#### Total End Play Adjustment

1. Remove oil pump cover from oil pump housing. Set oil pump housing aside. Coat pump support thrust washer with petroleum jelly and install on end of pump support. Ensure washer tangs mate with holes in pump support.
2. Install pump cover in front clutch drum. **DO NOT** have front drum adjusting thrust shim installed. Place a straightedge across transaxle case over pump cover. Measure clearance between straightedge and pump cover, or between straightedge and transaxle case. See **Fig. 26**.
3. If pump cover is below edge of transaxle case, clearance between straightedge and pump cover should not exceed .004" (.10 mm). If pump cover is above edge of transaxle case, clearance between straightedge and transaxle case should not exceed .006" (.15 mm).
4. If pump cover and/or transaxle case clearance is correct, total clutch assembly end play will be correct. Total clutch assembly end play should be .010-.020" (.25-.50 mm). If pump cover and/or transaxle case clearance is incorrect, remove pump cover and replace pump support thrust washer. Thrust washers are

available in thicknesses from .047" (1.20 mm) to .087" (2.20 mm) in .20 mm increments.

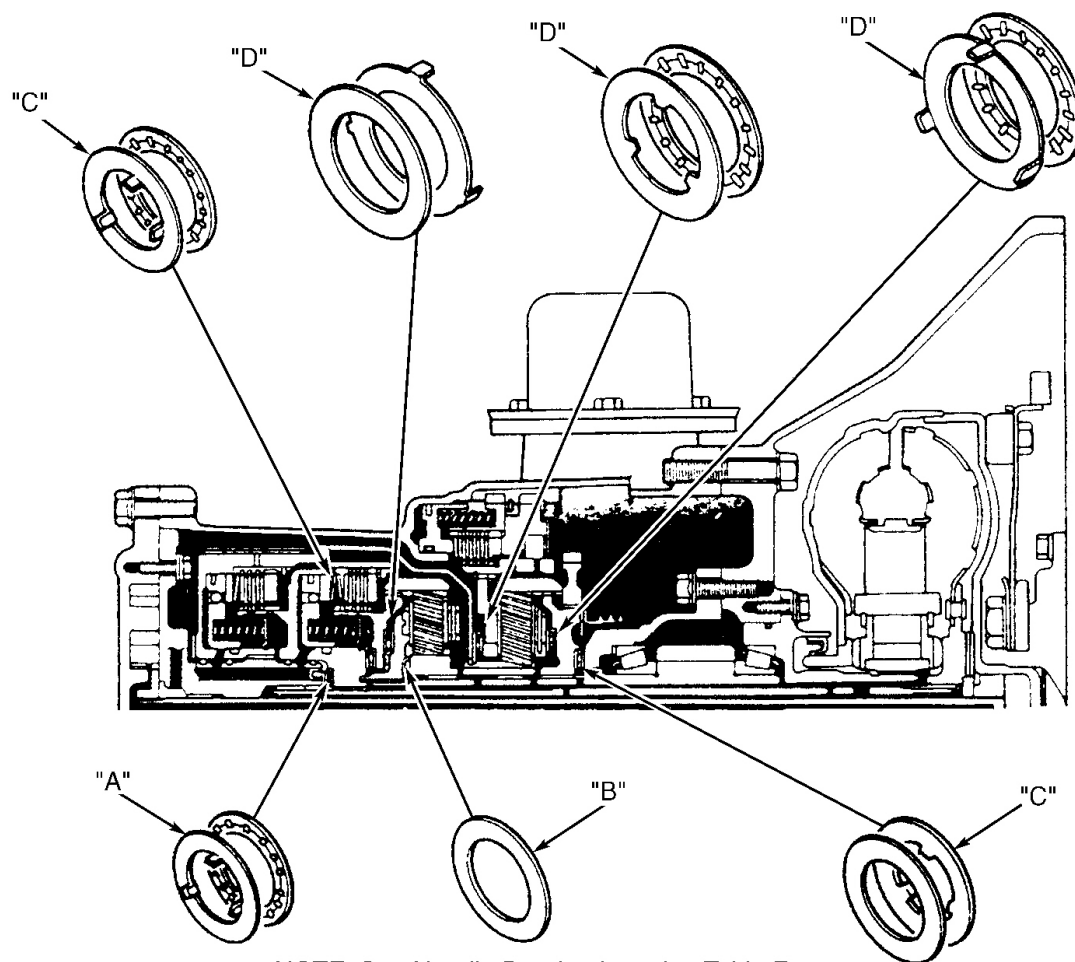
5. Reassemble oil pump by aligning marks on oil pump gears. Place pump cover on pump housing. Install and tighten bolts to specification. See **TORQUE SPECIFICATIONS** . Install oil pump shaft in oil pump and check operation by turning shaft by hand. Gears should move freely without binding.
6. Install front clutch thrust washer over pump support. Install oil pump to transaxle. Install oil pump bolts. Apply sealant on 2 lower bolts and tighten bolts to specification. Refer to the **TORQUE SPECIFICATIONS** table.
7. Position transaxle with oil pump facing down. Turn sun shell 2 revolutions. Insert screwdriver between tabs of front clutch and sun shell deep slots. Using a feeler gauge, measure in the shallow slots. See **Fig. 26** .
8. End play should be .020-.031" (.50-.80 mm). If end play is not within specification, remove oil pump and install correct thrust washer. Thrust washers are available in thicknesses of .051" (1.30 mm) to .106" (2.70 mm) in .20 mm increments.
9. Tighten band adjusting stop bolt to 106-133 INCH lbs. (12-15 N.m). Loosen bolt 3 turns and then tighten lock nut to 41-59 ft. lbs. (56-80 N.m). Install valve body steel check ball and spring in case. Install valve body and oil pan. Install turbine and oil pump shafts. Install speedometer driven gear, oil dipstick and tube.
10. Install the vacuum modulator valve in transaxle. Make sure correct length control rod is installed in the modulator. Refer to **VACUUM THROTTLE VALVE DIAPHRAGM (MODULATOR) R & I** under ON-VEHICLE SERVICE. Install kickdown solenoid and park/neutral switch. Install torque converter. With converter properly installed, distance between machined pad on torque converter and front edge of transaxle housing should be .50" (12.7 mm).



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**Fig. 26: Measuring Front Drum & Total End Play**  
Courtesy of FORD MOTOR CO.





NOTE: See Needle Bearing Location Table For  
Bearing & Thrust Washer Identification

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**Fig. 27: Identifying Needle Bearings & Thrust Washers**  
Courtesy of FORD MOTOR CO.

#### NEEDLE BEARING LOCATION

Application	Dimension In. (mm)
Needle Bearing	
"A"	1.650 (41.90)
"B"	1.846 (46.90)
"C"	2.083 (52.90)
"D"	2.752 (69.90)
Thrust Washer	
"A"	1.614 (41.00)
"C"	2.028 (51.50)
"D"	2.756 (70.00)

## TORQUE SPECIFICATIONS

### TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Axle Nut	116-174 (157-235)
Ball Joint Clamp Bolt	40-50 (54-68)
Idler Gear Lock Nut	94-130 (127-176)
Lug Nut	65-87 (88-118)
Oil Pump-To-Transaxle Case	11-16 (15-22)
Output Bearing/Idler Support Bolt	14-19 (19-26)
Output Shaft/Stator Support Bolt	8-10 (11-14)
Ring Gear	51-62 (69-83)
Torque Converter-To-Drive Plate	25-36 (34-49)
Transaxle Case-To-Converter Housing	22-34 (29-46)
	<b>INCH Lbs. (N.m)</b>
Governor Cover Bolts	71-97 (8-11)
Oil Pan Bolts	71-97 (8-11)
Oil Pump Cover	97-124 (11-14)
Upper-To-Lower Valve Body	(1)
Valve Body Bolts	89 (10)
(1) See <b>Fig. 19</b> .	

## TRANSAXLE SPECIFICATIONS

### TRANSAXLE SPECIFICATIONS

Application	In. (mm)
Differential Backlash	.004 (.01)
Front Clutch Drum Bushing Diameter	1.735 (44.08)
Front Clutch Pack Clearance	.063-.071 (1.6-1.8)
Front Drum End Play	.020-.031 (.5-.8)
Front Planetary Pinion Clearance	.031 (.8)
Low/Reverse Clutch Pack Clearance	.032-.041 (.8-1.05)
Oil Pump Gear Clearance	.010 (.25)
Oil Pump Sealing Ring Clearance	.016 (.40)
Outer Gear-To-Housing Clearance <sup>(1)</sup>	.10 (.25)
Output Gear End Play	.003 (.08)
Rear Clutch Pack Clearance	.031-.039 (.8-1.0)
Rear Planetary Pinion Clearance	.031 (.8)
(1) Oil pump outer gear.	