

1995 Chevrolet Cavalier Z24

1995 AUTOMATIC TRANSMISSIONS General Motors Corp. Hydra-Matic 4T40-E Overhaul

1995 AUTOMATIC TRANSMISSIONS

General Motors Corp. Hydra-Matic 4T40-E Overhaul

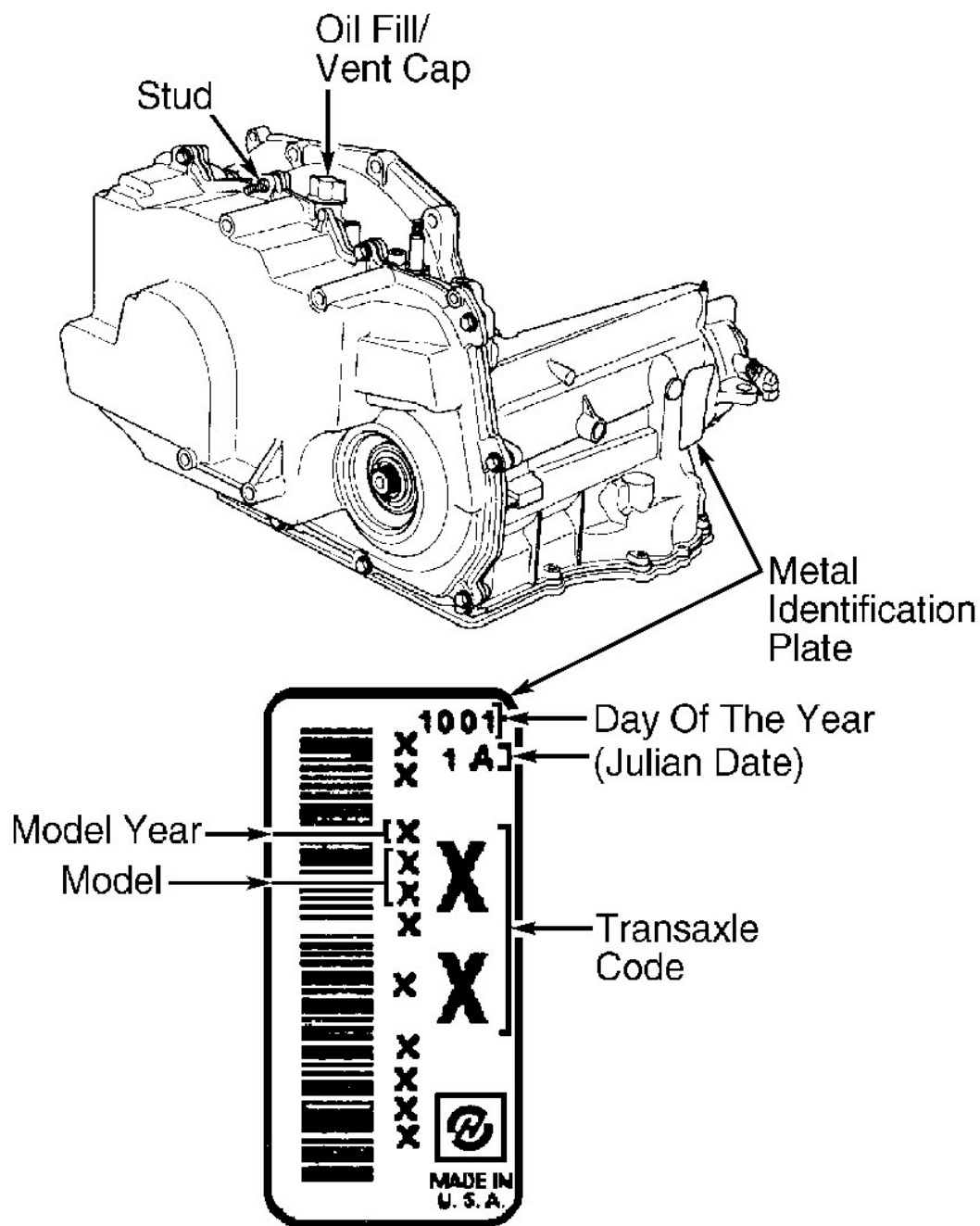
APPLICATION

TRANSMISSION APPLICATIONS

Application	Transaxle
Cavalier & Sunfire	4T40-E

IDENTIFICATION

Transaxle has a metal identification plate attached to rear face of transaxle case. See **Fig. 1** .



96A04003

Fig. 1: Locating Transaxle Identification Information
 Courtesy of GENERAL MOTORS CORP.

DESCRIPTION

NOTE: For testing/diagnostic procedures of electronic components, see **AUTO TRANS DIAGNOSIS - HYDRA-MATIC 4T40-E CONTROLS** article in the **AUTOMATIC TRANSMISSIONS** section.

Hydra-Matic 4T40-E transaxle is a fully automatic 4-speed transaxle consisting primarily of a 3-element hydraulic torque converter and converter clutch. Transaxle uses a variable capacity vane-type oil pump to supply all hydraulic pressure needed for operation.

Multiplied torque from torque converter is transferred to transaxle by a sprocket and drive link assembly. Other internal components consist of 5 multiple-disc clutches, 3 one-way clutches, 2 roller clutches, a sprag clutch, 2 bands and 2 planetary (carrier) gear sets. Differential and final drive assemblies are an integral part of transaxle. See **Fig. 2** .

The 4T40-E uses 2 electronic shift solenoids, controlled by Powertrain Control Module (PCM), to switch hydraulic pressure on or off. Torque Converter Clutch (TCC) solenoid is a Pulse Width Modulated (PWM) solenoid which controls TCC apply and release.

LUBRICATION

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

ADJUSTMENTS

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

ON-VEHICLE SERVICE

The following components can be serviced without removing transaxle from vehicle.

- Case Side Cover
- Converter-To-Flexplate Bolts
- Cooler Lines
- Drive Axles
- Low And Reverse Servo
- Intermediate/4th Servo
- Shift Control Cable
- Pressure Switch Assembly
- Pressure Control Solenoid
- TCC Control Solenoid
- Speed Sensor
- Transaxle Oil Pan
- Transaxle Filter
- Control Valve Assembly

- Wiring Harness
- 1-2 Or 3-4 Shift Solenoids
- Accumulator Assemblies

VALVE BODY

See **OIL PUMP & CONTROL VALVE ASSEMBLY** under TRANSAXLE DISASSEMBLY.

DRIVE AXLE SHAFTS

See appropriate **AXLE SHAFTS - FRONT** article in the AXLE SHAFTS & TRANSFER CASES section.

OIL COOLER FLUSHING

1. If available, fill Line Flusher (J-35944) with solution, and install line flusher to transaxle end of cooler line that feeds bottom fitting of transaxle cooler. Connect discharge hose to top cooler line and attach drain hose to oil drain container. Follow manufacturer's instructions to flush oil cooler and cooler lines.
2. If line flusher is not available, flush cooler and cooler lines with a mixture of clean solvent and water. Flush cooler in both directions until all old fluid and debris are removed. If necessary, replace plugged or damaged cooler and/or lines.

TROUBLE SHOOTING

NOTE: For testing/diagnostic procedures of electronic components, see **AUTO TRANS DIAGNOSIS - HYDRA-MATIC 4T40-E CONTROLS** article in the AUTOMATIC TRANSMISSIONS section.

NOTE: For clutch and band applications, see **CLUTCH & BAND APPLICATION** under TROUBLE SHOOTING.

QUICK CHECK

1. Check level and condition of transaxle fluid. Check PCM memory for stored trouble codes. See **AUTO TRANS DIAGNOSIS - HYDRA-MATIC 4T40-E CONTROLS** article in the AUTOMATIC TRANSMISSIONS section. If no trouble codes are present, go to next step. If codes are present, diagnose and repair all PCM-related trouble codes. Clear PCM trouble code memory.
2. Perform road test. See **ROAD TEST** under TESTING. During road test, record shift points. If shift point timing or shifting is incorrect, go to **AUTO TRANS DIAGNOSIS - HYDRA-MATIC 4T40-E CONTROLS** article.
3. If shift(s) is too harsh or too soft, see **HYDRAULIC PRESSURE TEST** under TESTING. For specific complaints, see appropriate condition(s) listed under **SYMPTOM DIAGNOSIS**.

SYMPTOM DIAGNOSIS

Oil Out Of Vent Or Foaming

Transaxle overfilled. Oil contaminated with antifreeze or engine overheating. Drain back holes plugged. Case porosity, incorrect fluid level indicator, plugged vent or misalignment of oil pump-to-case gasket (if equipped).

High Or Low Line Pressure

Incorrect oil level. Stuck pressure regulator valve, torque signal regulator valve, boost valve or springs. Damaged pressure control solenoid, throttle position sensor, oil pump or oil pump drive shaft. Pressure relief valve spring damaged or ball missing. Leaking cooler lines, oil filter seal or pressure control solenoid "O" ring.

Inaccurate/Inconsistent Shift Points

Electrical malfunction in throttle position, input speed or vehicle speed sensor circuit. Damaged or disconnected sensor.

Harsh Shifts

High line pressure. Missing check balls, binding accumulator springs or piston, accumulator valve stuck. Plugged clutch housing retainer and ball assemblies.

No Reverse Or Slips In Reverse

Reverse clutch does not apply or is slipping. Reverse clutch piston and seal assembly binding cracked or leaking. Clutch friction plates worn or splines broken. Reverse clutch snap ring out of position. Clutch housing cracked, feed holes plugged or tangs broken. Housing retainer and ball assembly missing or out of position. Clutch springs binding. Seal rings leaking. Channel plate and gasket misaligned, damaged or fluid restriction. Fluid leak across channels.

Low and reverse band and servo does not apply or is slipping. Servo piston broken or binding, servo piston seals leaking, servo pin and springs binding. Servo cover broken, loose or leaking. Low and reverse band broken, worn or out of position. Anchor pin broken. Oil feed tubes broken, bent, plugged or leaking. Transaxle case porosity, fluid leak or restriction. Shift linkage, manual valve and linkage disconnected or misaligned. No. 1 check ball missing. Low fluid level or pressure.

No First Gear Or Slips In First Gear

Forward clutch does not apply or is slipping. Clutch piston and seal assembly cracked, leaking or binding. Inner seal orifice plugged. Clutch friction plates worn or splines broken. Snap ring out of position. Clutch housing cracked or feed holes plugged. Housing retainer and ball assembly missing or out of position. Springs binding. Input sprag or low roller clutch damaged or not holding.

Fluid leak or restriction. Oil feed tubes broken, bent, plugged or leaking. Forward clutch support seal rings leaking, damaged or feed holes plugged. Channel plate and gasket misaligned, fluid leak across channels or restriction. Pressure switch assembly "O" ring leaking. 1-2 shift solenoid failed off or leaking. 1-2 shift valve stuck in upshift position. 2-3 shift solenoid failed on or exhaust is plugged. Manual valve or shift linkage is misaligned. Torque converter stator roller clutch does not hold. Low line pressure.

No Second Gear Or Slips In Second Gear

2nd clutch does not apply or is slipping. Clutch piston and seal assembly cracked, leaking or binding. Clutch friction plates worn or splines broken. Snap ring out of position. Driven sprocket support damaged or leaking. Springs binding.

Fluid leak or restriction in 2nd clutch. Misaligned, loose or restricted valve body, gaskets and spacer plate, channel plate and gasket, and driven sprocket support. 2nd roller clutch damaged or does not hold. 1-2 shift solenoid stuck on or plugged. 1-2 accumulator piston leaking. 1-2 accumulator valve stuck. 2-3 shift valve stuck in upshift position. Pressure switch assembly malfunction. Low line pressure.

2nd Gear Only

1-2 shift valve stuck in downshift position.

No Third Gear Or Slips In Third Gear

Direct clutch does not apply or is slipping. Clutch piston and seal assembly cracked, leaking or binding. Clutch friction plates worn or splines broken. Snap ring out of position. Direct clutch and coast housing and input shaft damaged, cracked or feed holes plugged. Housing retainer and ball assembly missing or out of position. Springs binding.

Direct clutch fluid leak or restriction. Misaligned, loose or restricted valve body, gaskets and spacer plate, channel plate and gasket, and driven sprocket support. Driven sprocket support seals leaking or input shaft seals leaking. Damaged or misaligned sleeve. 2-3 shift solenoid stuck off or leaking. 2-3 accumulator piston leaking. 2-3 accumulator valve stuck. 3-4 shift valve stuck in upshift position. Pressure switch assembly malfunction. Low line pressure.

No Fourth Gear Or Slips In Fourth Gear

Intermediate/4th band and servo does not apply or is slipping. Servo piston broken or binding, servo piston seals leaking, servo pin and springs binding. Servo cover broken, loose or leaking. Intermediate/4th band broken, worn or out of position. Transaxle case cracked at band seat.

Misaligned, loose or restricted valve body, gaskets and spacer plate, channel plate and gasket. 1-2 shift solenoid stuck off or leaking. Manual valve misaligned. 3-4 accumulator piston leaking. 3-4 accumulator valve stuck. 3-4 shift valve stuck in downshift position. Pressure switch assembly malfunction. Low line pressure. Direct clutch malfunction.

Loss Of Drive

Damaged torque converter or axle shafts. Oil pump seized or broken gears. Oil filter plugged or seal missing. Low fluid level. Shift linkage disconnected. Drive or driven sprockets and drive chain broken. Planetary (carrier) gear or final drive malfunction. Channel plate and gasket, valve body, gaskets and spacer plate damaged, leaking or misaligned. Damaged forward sprag clutch, forward clutch or low roller clutch does not hold. Fluid leaks.

Loss Of Power

Low fluid level. Failed shift solenoids. TCC stuck on or dragging. Damaged torque converter.

Engine Stall

TCC stuck on or dragging. TCC solenoid stuck on or solenoid exhaust plugged. TCC regulated apply valve stuck in apply position.

No Engine Braking In All Manual Ranges

Coast clutch does not apply or is slipping. Clutch piston and seal assembly leaking, cracked or binding. Clutch friction plates worn or splines broken. Clutch springs binding. Direct and coast clutch housing and input shaft damaged, cracked or fluid feed holes restricted. Housing retainer and ball assembly loose or missing.

Coast clutch fluid leak or restriction. Misaligned, loose or restricted valve body, gaskets and spacer plate, channel plate and gasket, and driven sprocket support. Driven sprocket support seals leaking or input shaft seals leaking. Damaged or misaligned sleeve. 3-4 shift valve stuck in 4th gear position. Manual valve and linkage misaligned.

No Engine Braking In Manual Second

Coast clutch does not apply or is slipping. Intermediate/4th band slipping or does not apply. Pressure switch assembly leaking or inoperative. Incorrect vehicle speed sensor reading.

No Engine Braking In Manual First

Coast clutch does not apply or is slipping. Low and reverse band does not apply or is slipping. Pressure switch assembly leaking or inoperative. No. 1 check ball missing.

Drives In Neutral

Forward clutch not releasing. Reverse clutch and low and reverse servo **DO NOT** release. Manual valve and linkage misaligned.

Vibration

Torque converter out of balance or internal failure. Transaxle and engine misaligned. Output shaft, stub shaft or input shaft out of balance or worn or damaged bushings.

No TCC Or TCC Slipping

TCC solenoid stuck off, "O" ring leaking, no voltage to solenoid or poor connection. No signal to solenoid from PCM. Brake switch not functioning. Stuck pressure regulator valve. Torque converter internal failure. TCC fluid circuit leaks or plugged release exhaust orifice. TCC regulated apply valve and TCC control valve stuck in TCC release position. Stuck TCC feed limit valve. Low fluid level or pressure. Plugged cooler lines.

No TCC Release

TCC solenoid internal failure, fluid exhaust plugged or external ground. Torque converter internal failure. TCC regulated apply valve and TCC control valve stuck in TCC apply position.

TCC Apply With Cold Engine

Engine coolant temperature sensor malfunction. TCC circuit malfunction.

Transaxle Locked In Reverse

Damaged parking pawl binding on final drive internal gear.

Vehicle Moves In Park

Manual linkage damaged or disconnected. Broken parking pawl spring, parking pawl or park lock gear in final drive internal gear assembly. Parking actuator damaged.

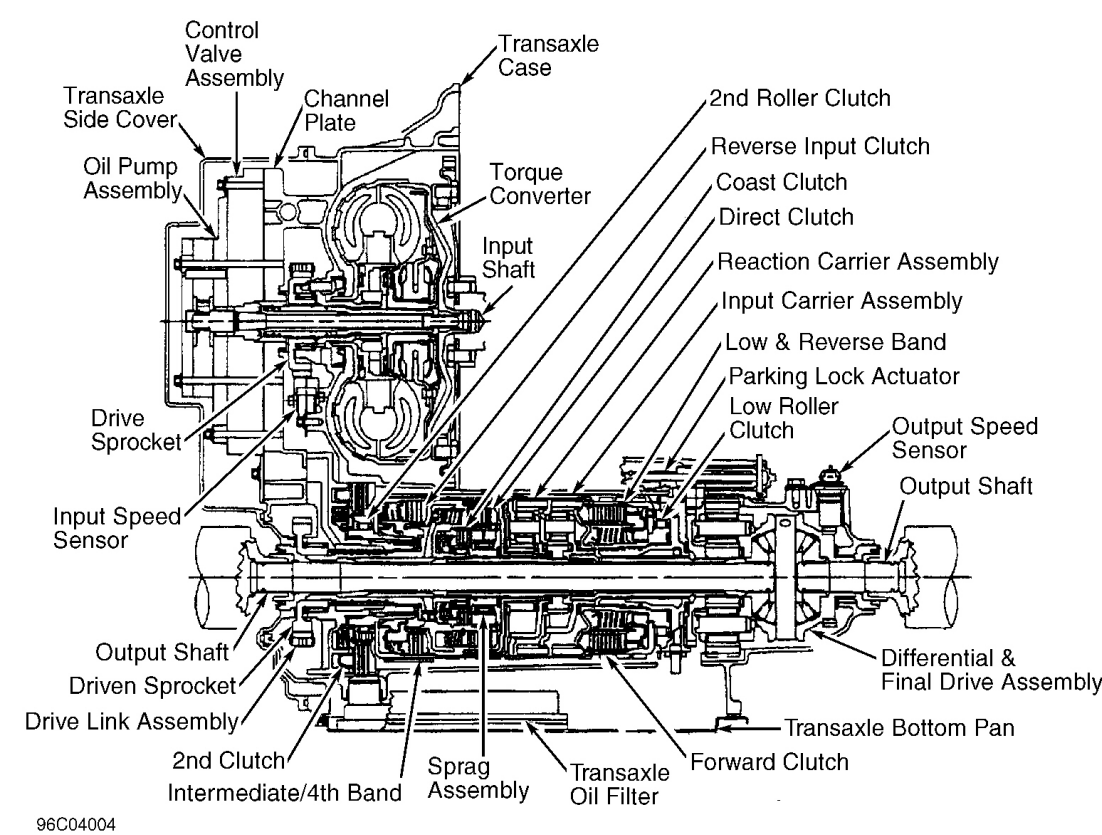


Fig. 2: Identifying Hydra-Matic 4T40-E Transaxle Component Locations
Courtesy of GENERAL MOTORS CORP.

CLUTCH & BAND APPLICATION TABLE

CLUTCH & BAND APPLICATION

Gear	Solenoid Position	Elements In Use
"D" (Drive)		

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1st Gear	"A" ON/"B" OFF	Forward Clutch, ⁽¹⁾ Input Sprag & ⁽¹⁾ Low Roller Clutch
2nd Gear	"A" OFF/"B" OFF	Forward Clutch, ⁽¹⁾ Input Sprag, ⁽³⁾ Low Roller Clutch, 2nd Clutch & ⁽¹⁾ 2nd Roller Clutch
3rd Gear	"A" OFF/"B" ON	Direct Clutch, Forward Clutch, ⁽¹⁾ Input Sprag, ⁽³⁾ Low Lower Clutch, ⁽²⁾ 2nd Clutch & ⁽³⁾ 2nd Roller Clutch
Overdrive	"A" ON/"B" ON	Direct Clutch, ⁽²⁾ Forward Clutch, ⁽³⁾ Input Sprag, Intermediate/4th Band, ⁽³⁾ Low Roller Clutch & ⁽²⁾ 2nd Clutch
"3" - Manual Third		
1st Gear	"A" ON/"B" OFF	Coast Clutch, Forward Clutch, ⁽¹⁾ Input Sprag & ⁽¹⁾ Low Roller Clutch
2nd Gear	"A" OFF/"B" OFF	Coast Clutch, Forward Clutch, ⁽¹⁾ Input Sprag, ⁽³⁾ Low Roller Clutch, 2nd Clutch & ⁽¹⁾ 2nd Roller Clutch
3rd Gear	"A" OFF/"B" ON	Coast Clutch, Direct Clutch, Forward Clutch, ⁽¹⁾ Input Sprag, ⁽³⁾ Low Roller Clutch, ⁽²⁾ 2nd Clutch & ⁽³⁾ 2nd Roller Clutch
"2" Manual Second		
1st Gear	"A" ON/"B" OFF	Coast Clutch, Forward Clutch, ⁽¹⁾ Input Sprag & ⁽¹⁾ Low Roller Clutch
2nd Gear	"A" OFF/"B" OFF	Coast Clutch, Forward Clutch, ⁽¹⁾ Input Sprag, Intermediate/4th Band, ⁽³⁾ Low Roller Clutch, 2nd Clutch & ⁽¹⁾ 2nd Roller

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		Clutch
Third Gear ⁽⁴⁾	"A" OFF/"B" ON	Coast Clutch, Direct Clutch, Forward Clutch, ⁽¹⁾ Input Sprag, ⁽³⁾ Low Roller Clutch, ⁽²⁾ 2nd Clutch & ⁽³⁾ 2nd Roller Clutch
"1" Manual Low		
First Gear	"A" ON/"B" OFF	Coast Clutch, Forward Clutch, ⁽¹⁾ Input Sprag, Low & Reverse Band & ⁽¹⁾ Low Roller Clutch
Second Gear ⁽⁵⁾	"A" OFF/"B" OFF	Coast Clutch, Forward Clutch, ⁽¹⁾ Input Sprag, Intermediate/4th Band, ⁽³⁾ Low Roller Clutch, 2nd Clutch & ⁽¹⁾ 2nd Roller Clutch
"R" (Reverse)	"A" ON/"B" OFF	Low & Reverse Band & Reverse Clutch
"N" (Neutral)	"A" ON/"B" OFF	Low & Reverse Band
"P" (Park)	"A" ON/"B" OFF	Low & Reverse Band
(1) Holding. (2) Applied, but not effective. (3) Overrunning. (4) Third gear is only available above about 62 MPH. (5) Second gear is only available above about 37 MPH.		

ELECTRONIC SELF-DIAGNOSTICS & ELECTRONIC TESTING

NOTE: See AUTO TRANS DIAGNOSIS - HYDRA-MATIC 4T40-E CONTROLS article in the AUTOMATIC TRANSMISSIONS section.

TESTING

ROAD TEST

NOTE: Shift speed charts reference throttle position angle instead of minimum or wide open throttle position. This measurement is more accurate. A scan tool should be used to monitor throttle position angle. For transaxle model code, refer to metal identification plate attached to transaxle.

Gear Selector Position "D" (Overdrive)

1. With gear selector in "D" (overdrive) position, choose throttle position angle of 10 or 25 percent. See **Fig. 3** . Set scan tool to monitor throttle position angle and vehicle speed. Accelerate vehicle to chosen throttle position angle and hold throttle steady.
2. Note shift speed engagement points in 2nd gear, 3rd gear and overdrive gear. Use chart as a reference for proper shift speeds. See **Fig. 3** . Also note Torque Converter Clutch (TCC) engagement point while in Overdrive. Repeat procedure using different throttle position angle.

NOTE: **Shift speeds may vary due to slight hydraulic delays responding to electronic controls. A change from original equipment tire size also affects shift speeds. Ensure TCC engages in overdrive. TCC should not apply unless transaxle has reached a minimum operating temperature of 46°F (8°C) and engine coolant temperature is 122°F (50°C).**

3. At vehicle speeds of 40-50 MPH in overdrive, quickly increase throttle position angle to more than 50 percent. Verify TCC releases, transaxle immediately downshifts to 3rd gear, 1-2 shift solenoid turns off and 2-3 shift solenoid remains on.
4. At vehicle speeds of 40-50 MPH in overdrive, quickly depress accelerator to wide open position (full throttle detent downshift). Verify TCC releases, transaxle immediately downshifts to 2nd gear and both solenoids are off.
5. At vehicle speeds of 40-55 MPH in overdrive, release accelerator pedal while moving gear selector to "3" (third gear) position. Verify TCC releases, transaxle immediately downshifts into 3rd gear, and engine braking slows vehicle.
6. Move gear selector to "D" (overdrive) position, and accelerate to 40-45 MPH. Release accelerator pedal while moving gear selector to "2" (2nd gear) position. Verify TCC releases, transaxle immediately downshifts to 2nd gear, and engine braking slows vehicle.
7. Move gear selector to "D" (overdrive) position, and accelerate to 40 MPH. Release accelerator pedal while moving gear selector to "1" (1st gear) position. Verify TCC releases, transaxle immediately downshifts to 2nd gear and engine braking slows vehicle. At speeds below 37 MPH, transaxle immediately downshifts to 1st gear.

NOTE: **A manual 1st-3rd gear ratio will occur at high speeds as an upshift safety feature. DO NOT attempt to perform this shift.**

8. With gear selector in the "D" (overdrive) position, accelerate vehicle to overdrive gear with TCC applied. Release accelerator pedal, and lightly apply brakes. Verify TCC releases and downshifts occur at speeds shown in shift speed chart. See **Fig. 3** .

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UPSHIFT SPEED CHART

MODEL	1-2 SHIFT (+/- 3 MPH)				2-3 SHIFT (+/- 4 MPH)				3-4 SHIFT (+/- 5 MPH)		
	10% TPS	25% TPS	50% TPS	100% TPS	10% TPS	25% TPS	50% TPS	100% TPS	10% TPS	25% TPS	50% TPS
WKR	8.0	12.5	19	38	16	24.5	38.5	68	29	36.0	57.0
WBR	10.0	15	21	38.5	20	27	40	69	31	41	57

DOWNSHIFT SPEED CHART

MODEL	DOWNSHIFTS (+/- 4 MPH)			TCC APPLY 4TH GEAR		TCC RELEASE 4TH GEAR	
	4-3 COAST	3-2 COAST	2-1 COAST	10% TPS	25% TPS	10% TPS	25% TPS
WKR	26	11.5	6	43	64	39	43
WBR	27	14.0	7	39	54	37	42

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Fig. 3: Hydra-Matic 4T40-E Shift Speed Charts
Courtesy of GENERAL MOTORS CORP.

NOTE: Upshifts in manual gear ranges are controlled by shift solenoids. Perform following steps by accelerating vehicle at throttle position angle of 10 percent.

Gear Selector Position "3" (3rd Gear)

With vehicle stopped, move gear selector to "3" (3rd gear) position and steadily increase throttle pressure to accelerate vehicle. Note speeds at which vehicle shifts into 2nd and 3rd gears. See **Fig. 3**.

Gear Selector Position "2" (2nd Gear)

With vehicle stopped, move gear selector to "2" (2nd gear) position. Accelerate vehicle and note speed at which vehicle shifts from 1st gear to 2nd gear. Accelerate vehicle to 35 MPH. Verify transaxle does not shift into 3rd gear, and TCC does not apply.

Gear Selector Position "1" (1st Gear)

With vehicle stopped, move gear selector to "1" (1st gear) position. Accelerate vehicle to 20 MPH. Verify transaxle does not upshift, and TCC does not apply.

Gear Selector Position "R" (Reverse)

With vehicle stopped, move gear selector to "R" (Reverse) position. Verify 1-2 shift solenoid is on, and 2-3 shift solenoid is off.

HYDRAULIC PRESSURE TEST

CAUTION: Parking and service brakes must be applied throughout hydraulic pressure test. Total time for testing with vehicle in any driving gear should not exceed 2 minutes. Transaxle damage may occur.

1. Before performing hydraulic pressure test, check fluid level and condition. Check manual control

linkages for correct adjustment, and ensure engine is properly tuned.

2. Connect scan tool to Data Link Connector (DLC). Apply parking brake and start engine. Check for stored trouble codes. If trouble codes are present, diagnose as necessary. See 4T40-E ELECTRONIC CONTROLS article in the AUTOMATIC TRANSMISSIONS section. Turn engine off. Connect oil pressure gauge to line pressure test port. See **Fig. 4**.
3. Start engine and warm to normal operating temperature. With vehicle in Reverse, line pressure should be 58-186 psi (400-1282 kPa). With vehicle in Park, Neutral or Drive, line pressure should be 50-160 psi (345-1103 kPa).
4. Shift transaxle into Park. Access Pressure Control Solenoid (PCS) test on scan tool. Increase DESIRED PCS in 0.1 amp increments and read corresponding line pressure on oil pressure gauge. Allow pressure to stabilize for 5 seconds after each current change. Compare readings to those in **LINE PRESSURE SPECIFICATIONS**. If pressure readings are not as specified, and no trouble codes are present, internal malfunction exists. See **TROUBLE SHOOTING**.

NOTE: Scan tool is only able to control pressure control solenoid in Park and Neutral with vehicle stopped. This protects clutches from extremely high or low pressures in Reverse and Drive.

LINE PRESSURE SPECIFICATIONS

PCS Current (Amp)	Line Pressure psi (kPa)
0.00	152-160 (1048-1103)
0.10	149-151 (1027-1041)
0.30	141-143 (972-986)
0.50	124-127 (855-876)
0.60	111-115 (765-793)
0.70	97-101 (669-696)
0.80	81-84 (558-579)
0.90	64-67 (441-462)
0.95	56-58 (386-400)
1.00	50-51 (345-352)
1.05	50 (345)
1.10	50 (345)

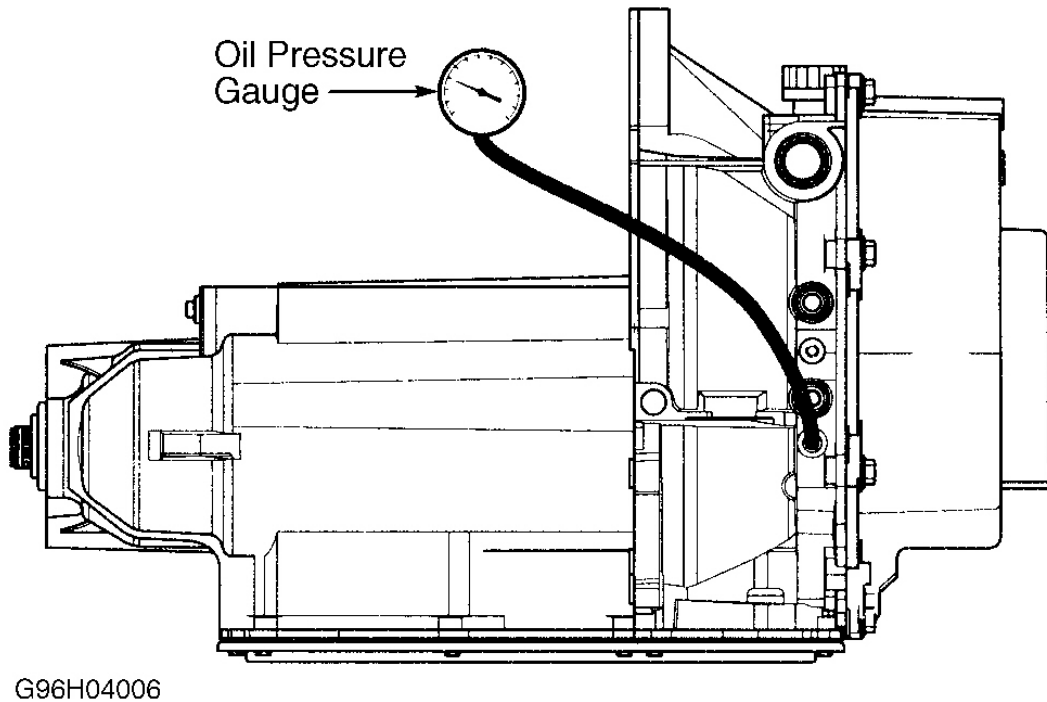


Fig. 4: Installing Oil Pressure Gauge
Courtesy of GENERAL MOTORS CORP.

REMOVAL & INSTALLATION

See appropriate **TRANSMISSION REMOVAL & INSTALLATION - A/T** article in the TRANSMISSION SERVICING section.

TORQUE CONVERTER INSPECTION

Torque converter must be replaced for any of the following reasons.

- Damage To Pump Assembly
- Metal Particles Present In Oil
- Leaks In Hub Weld Area
- Hub Scored Or Damaged
- Stator Failure
- Torque Converter Imbalance
- Engine Coolant Contamination
- Excessive End Play

TORQUE CONVERTER STALL TEST

1. Torque converter whine is usually noticed when vehicle is stopped and transaxle is in Reverse or Drive. Whine will increase when engine RPM is increased and will stop when vehicle is moving or when torque converter clutch is applied. Stall test is to ensure whine is coming from torque converter.
2. Start engine, and allow it to reach normal operating temperature. Apply parking and service brakes. Put transaxle in Drive. Depress accelerator to about 1200 RPM for less than 6 seconds. **DO NOT** depress accelerator for more than 6 seconds or transaxle damage may occur. Torque converter noise will increase under this load.

NOTE: **Torque converter whine should not be confused with pump whine, which is usually noticeable in Park, Neutral and all other gear ranges. Pump whine will vary with pressure ranges.**

TORQUE CONVERTER STATOR CHECK

1. Torque converter stator roller clutch may either remain locked up at all times or free-wheel in both directions. If stator is free-wheeling at all times, vehicle tends to have poor acceleration from a stop. Vehicle may act normal at speeds above 30-35 MPH.
2. If poor acceleration is noted, ensure exhaust system is not blocked, engine timing is correct and transaxle is in 1st gear when starting from a stop. If stator is locked up at all times, performance from a stop appears normal. Engine RPM and acceleration is limited at high speeds. Engine may overheat from this condition.
3. A visual inspection of torque converter may reveal converter is Blue from overheating. If torque converter has been removed from vehicle, stator roller clutch can be checked by inserting a finger into splined inner race of roller clutch and trying to turn race in both directions. Inner race should turn freely clockwise but should not turn or should be difficult to turn counterclockwise.

TORQUE CONVERTER CLUTCH (TCC) CONTROL COMPONENTS

The following component signals are used in TCC operation.

Brake Switch

Power from ignition switch passes through brake switch to TCC solenoid. When brake pedal is depressed with TCC applied, power to TCC solenoid is interrupted, releasing converter clutch and preventing engine from stalling.

Coolant Temperature Sensor

This sensor provides PCM with engine coolant temperature information. PCM will not allow TCC operation until signal from this sensor indicates coolant temperature more than 130-150°F (55-65° C).

Powertrain Control Module (PCM)

To determine application of torque converter clutch, PCM receives and processes information from various input devices. These devices may include vehicle speed sensor, coolant temperature sensor, throttle position

sensor and brake switch. PCM controls application of torque converter clutch by providing a ground circuit for TCC solenoid circuit.

TCC Solenoid

Solenoid is energized by PCM to redirect transaxle fluid to converter clutch apply valve in control valve assembly. TCC solenoid controls apply and release of TCC.

Throttle Position Sensor (TPS)

Provides PCM with throttle position information. TCC operation is prevented when throttle position signal is less than a specified value.

Vehicle Speed Sensor (VSS)

This sensor sends vehicle speed information to PCM. Vehicle speed must be more than a certain value before TCC can be applied. A Permanent Magnet (PM) generator type sensor is mounted on transaxle.

NOTE: Diagnostic codes for coolant temperature sensor and throttle position sensor may be present while performing TCC electrical diagnosis. See **SELF-DIAGNOSTICS - 2.4L** article in the **ENGINE PERFORMANCE** section for complete diagnostic information for these codes.

TCC TESTING

NOTE: For TCC component testing, see procedures in **AUTO TRANS DIAGNOSIS - HYDRA-MATIC 4T40-E CONTROLS** article.

TRANSAXLE DISASSEMBLY

REAR SECTION

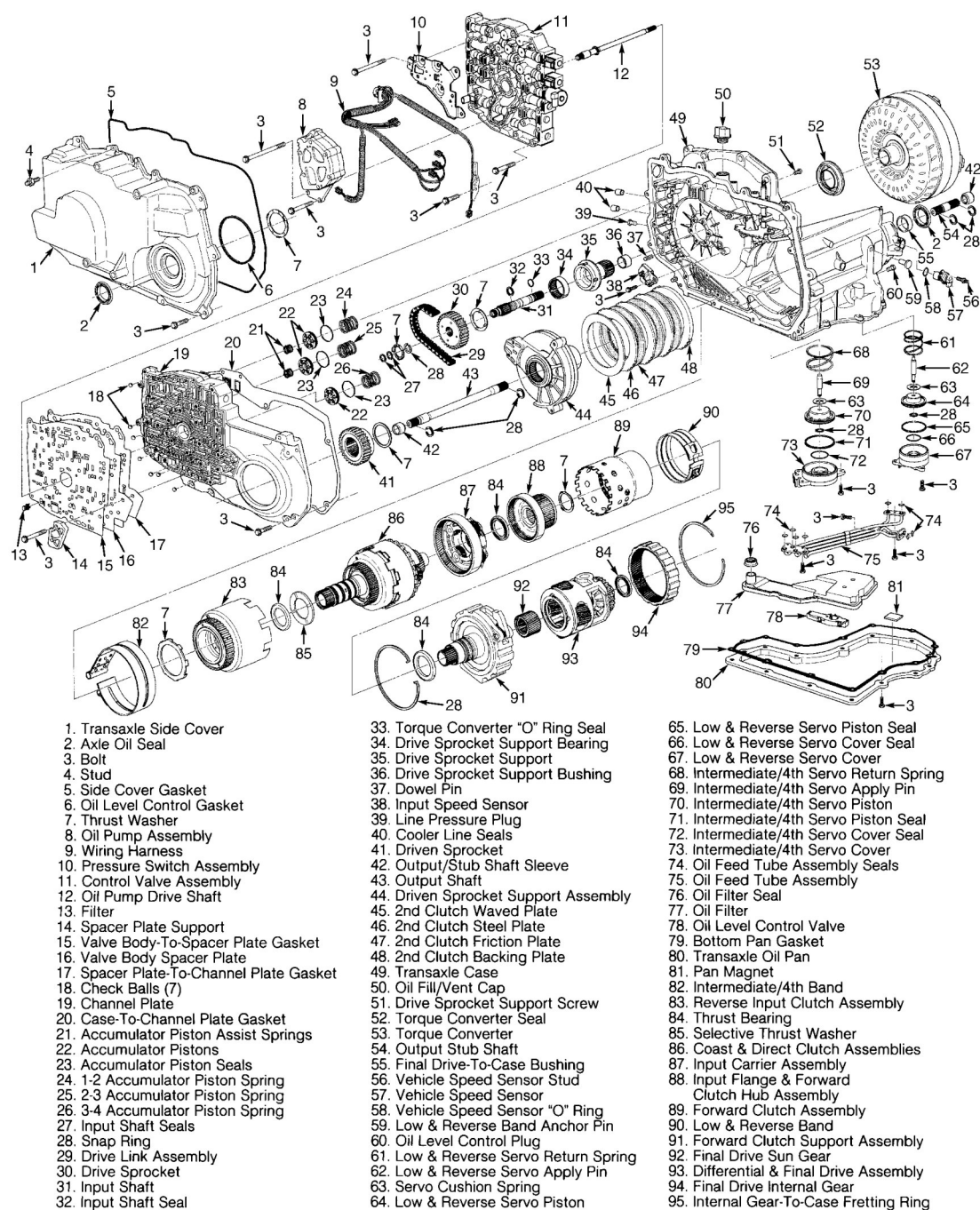
1. Thoroughly clean transaxle exterior. Drain fluid, and remove torque converter. Remove input shaft "O" ring from input shaft. Place transaxle in holding fixture. Remove and discard snap ring from end of axle stub shaft. Attach slide hammer to shaft removal tool.
2. Install shaft removal tool into snap ring groove on stub shaft. Secure removal tool to stub shaft. Pull on stub shaft and rotate until stub shaft snap ring at differential seats in taper on differential side gear. Pull stub shaft out using slide hammer.

LOWER SECTION

1. Rotate transaxle so case side cover is facing upward to drain most transaxle fluid through stub shaft end of transaxle. Rotate transaxle with oil pan facing up. Remove speed sensor stud, speed sensor and "O" ring. Remove bottom oil pan and gasket. Remove oil filter and filter seal from transaxle case. See **Fig. 5**.
2. Remove oil level control valve. Remove 4 oil feed tube bolts and oil feed tube assembly. Feed tube seal rings are glued in place and should remain with feed tube assembly. Seal rings are reusable.

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Fig. 5: Exploded View Of Transaxle Components
Courtesy of GENERAL MOTORS CORP.

SERVO ASSEMBLIES

Remove 3 bolts from intermediate/4th servo, and low and reverse covers. Remove servo cover, servo piston and servo return spring. See **Fig. 5**.

CASE SIDE COVER

Rotate transaxle so case side cover is facing up. Remove 10 side cover bolts and one stud. Remove transaxle side cover. Remove 2 side cover gaskets and side cover-to-driven sprocket support thrust washer. Components may be removed with side cover. See **Fig. 5** .

OIL PUMP & CONTROL VALVE ASSEMBLY

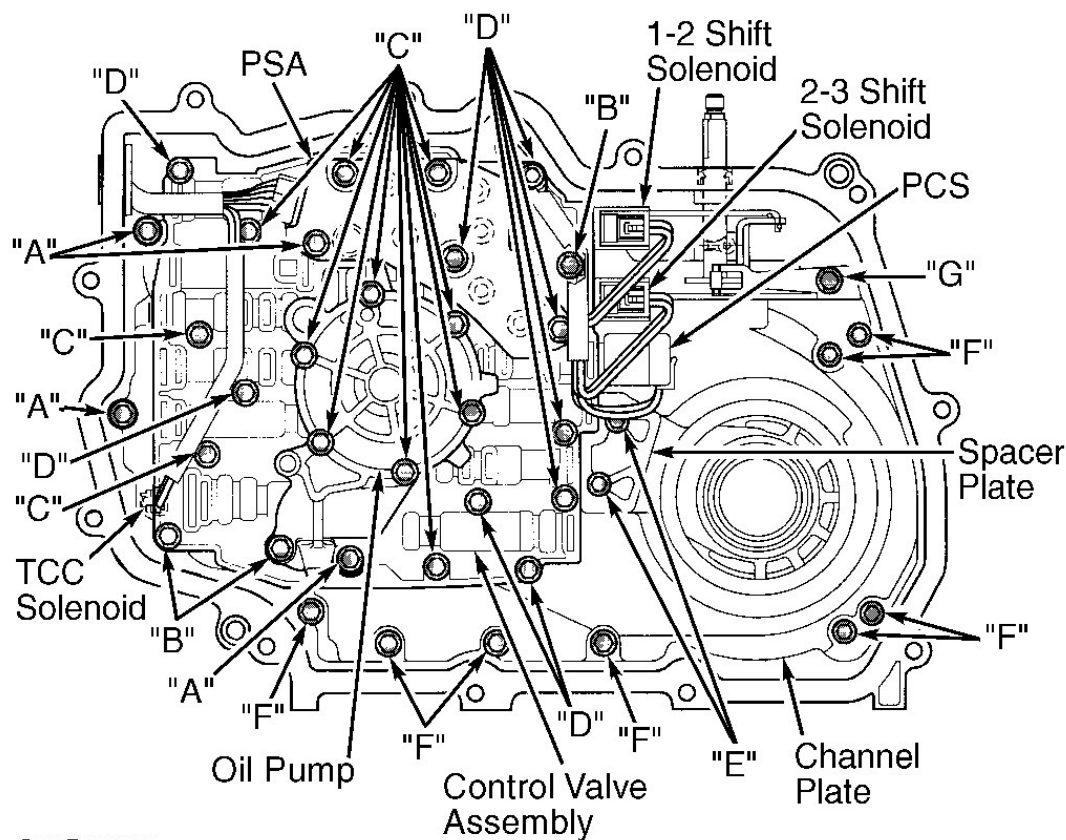
NOTE: For oil pump, control valve assembly and channel plate bolt identification and length, see **BOLT IDENTIFICATION** .

1. Remove 8 bolts from oil pump. See **Fig. 6** . Remove oil pump assembly and oil pump shaft. Disconnect wiring harness connectors from Pressure Switch Assembly (PSA), Pressure Control Solenoid (PCS), TCC solenoid and shift solenoids.
2. Remove 6 bolts from pressure switch assembly. Remove pressure switch assembly from control valve assembly. Pressure switch "O" rings are reusable and should remain with pressure switch assembly. Remove remaining 12 control valve assembly bolts. Remove control valve assembly and valve body-to-spacer plate gasket. Discard gasket. See **Fig. 5** .
3. Remove 2 spacer plate support bolts and spacer plate support. Remove spacer plate with spacer plate filter attached. Remove and discard spacer plate-to-channel plate gasket. Remove 7 check balls in channel plate. See **Fig. 7** . **DO NOT** use a magnet to remove check balls. Magnet may cause check balls to become magnetized and attract metallic particles.

BOLT IDENTIFICATION ⁽¹⁾

Bolt ID (Letter)	Length Inches (mm)
A	2.48 (63.00)
B	4.05 (103.00)
C	3.50 (90.00)
D	2.00 (51.00)
E	2.68 (68.00)
F	1.10 (28.00)
G	0.75 (19.00)

(1) For bolt locations, See **Fig. 6** .



G96B04008

Fig. 6: Removing Oil Pump, Control Valve Assembly & Channel Plate Bolts
Courtesy of GENERAL MOTORS CORP.

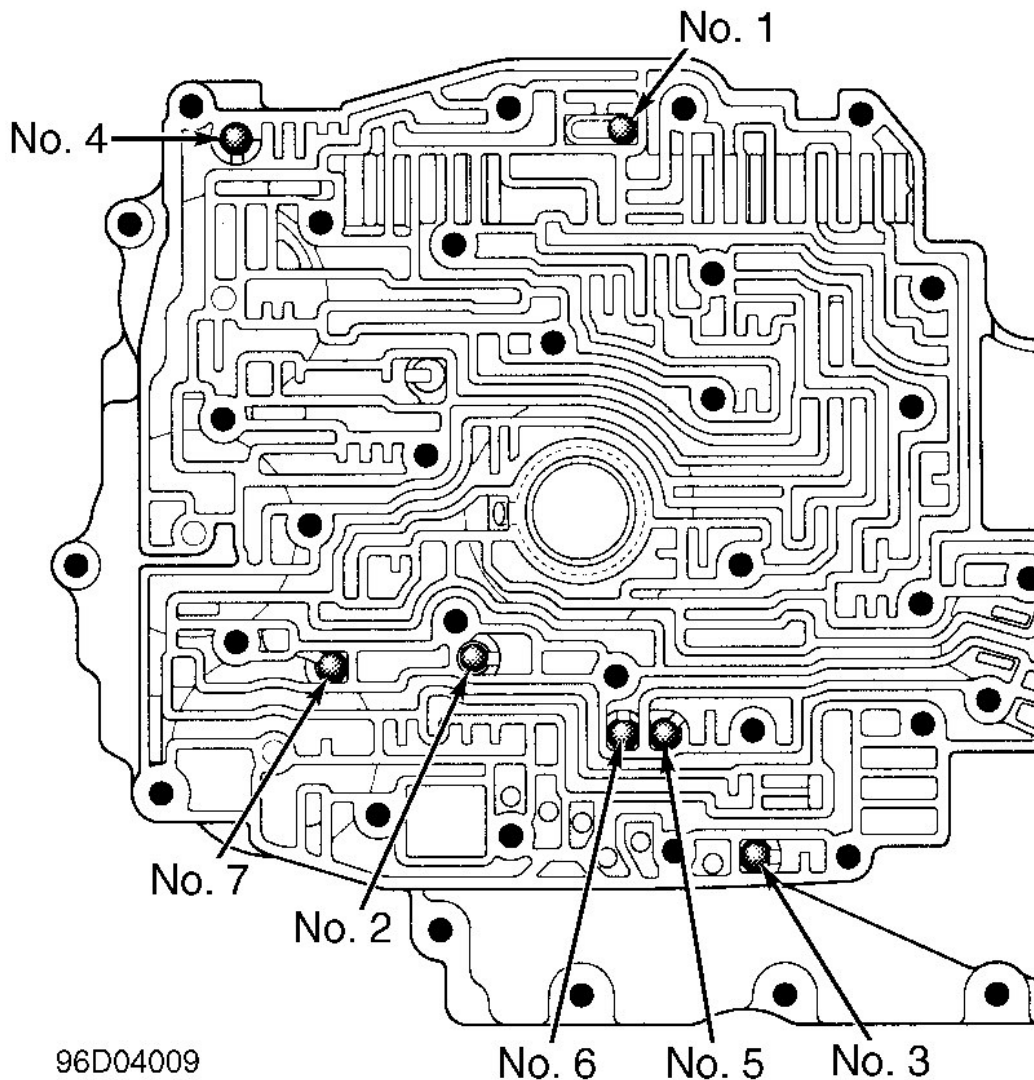


Fig. 7: Locating Check Balls
Courtesy of GENERAL MOTORS CORP.

CHANNEL PLATE, GASKET & ACCUMULATORS

Disconnect manual valve clip and link from manual valve. See **Fig. 8**. Remove 10 channel plate bolts. See **Fig. 6**. Remove channel plate assembly with drive sprocket-to-channel plate thrust washer, accumulator pistons and pins, manual valve and detent lever spring and bolt. Remove and discard channel plate-to-case gasket. Remove 3 accumulator springs from case. See **Fig. 9**.

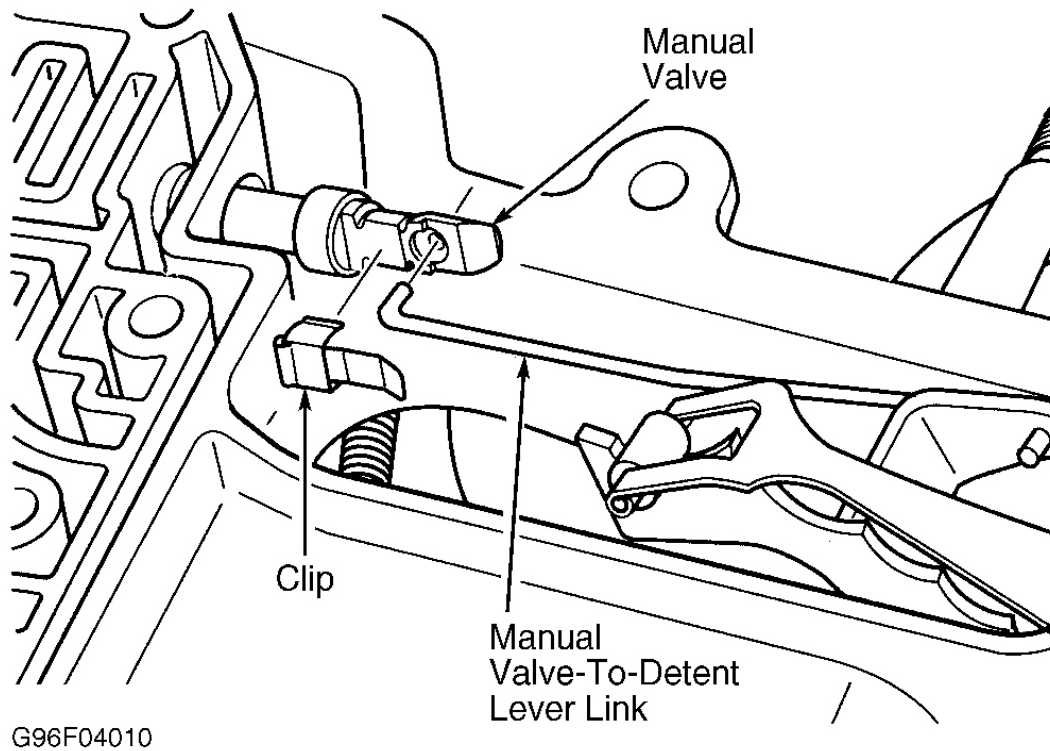


Fig. 8: Removing Manual Valve Clip, Link & Manual Valve
Courtesy of GENERAL MOTORS CORP.

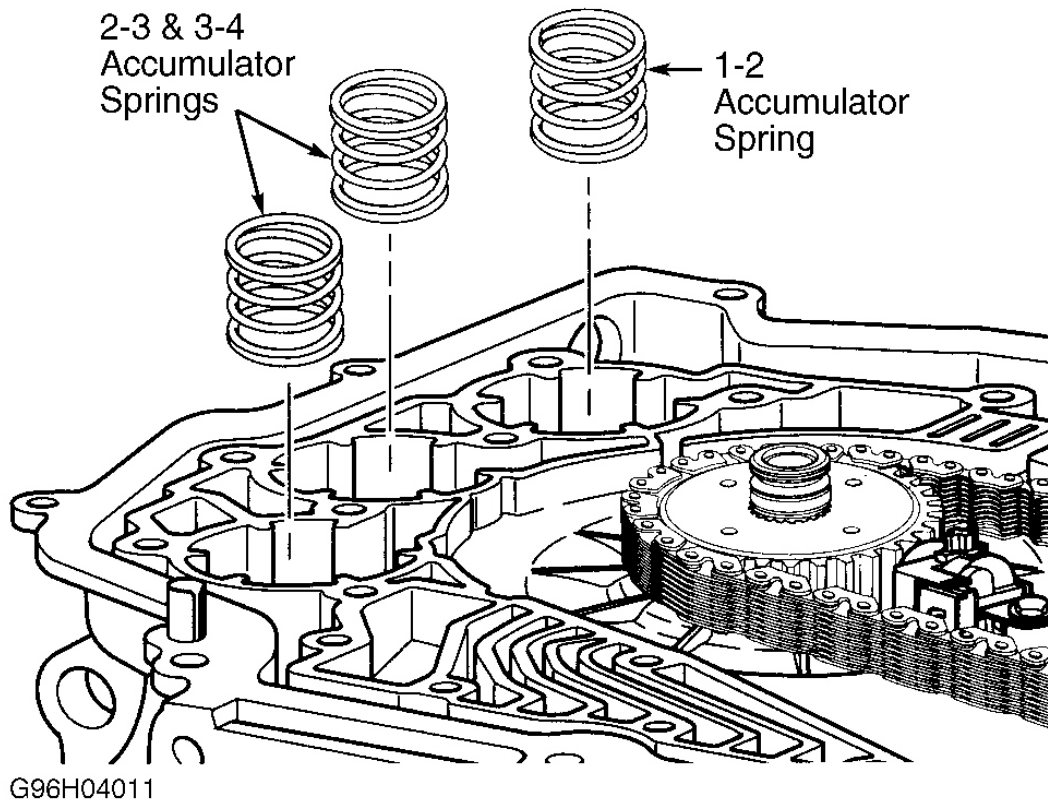


Fig. 9: Identifying Accumulator Springs
Courtesy of GENERAL MOTORS CORP.

OUTPUT SHAFT SLEEVE

NOTE: Output shaft cannot be removed without complete disassembly of transaxle. Attempting to remove output shaft at this time in same manner as stub shaft will result in damage to other transaxle components.

Using sleeve puller, remove and discard output shaft sleeve. Sleeve is not reusable after removal. Position puller leg's under sleeve. Tighten center bolt down to pull the sleeve off the shaft. See **Fig. 10**.

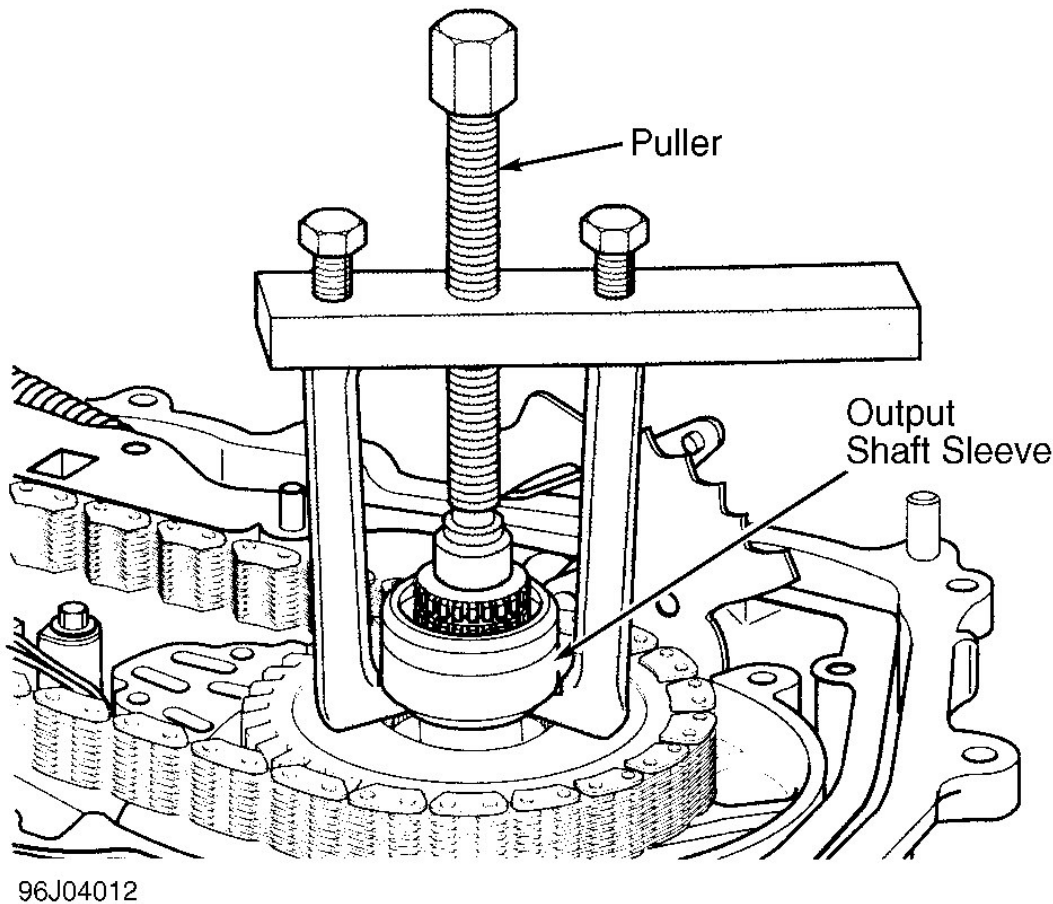
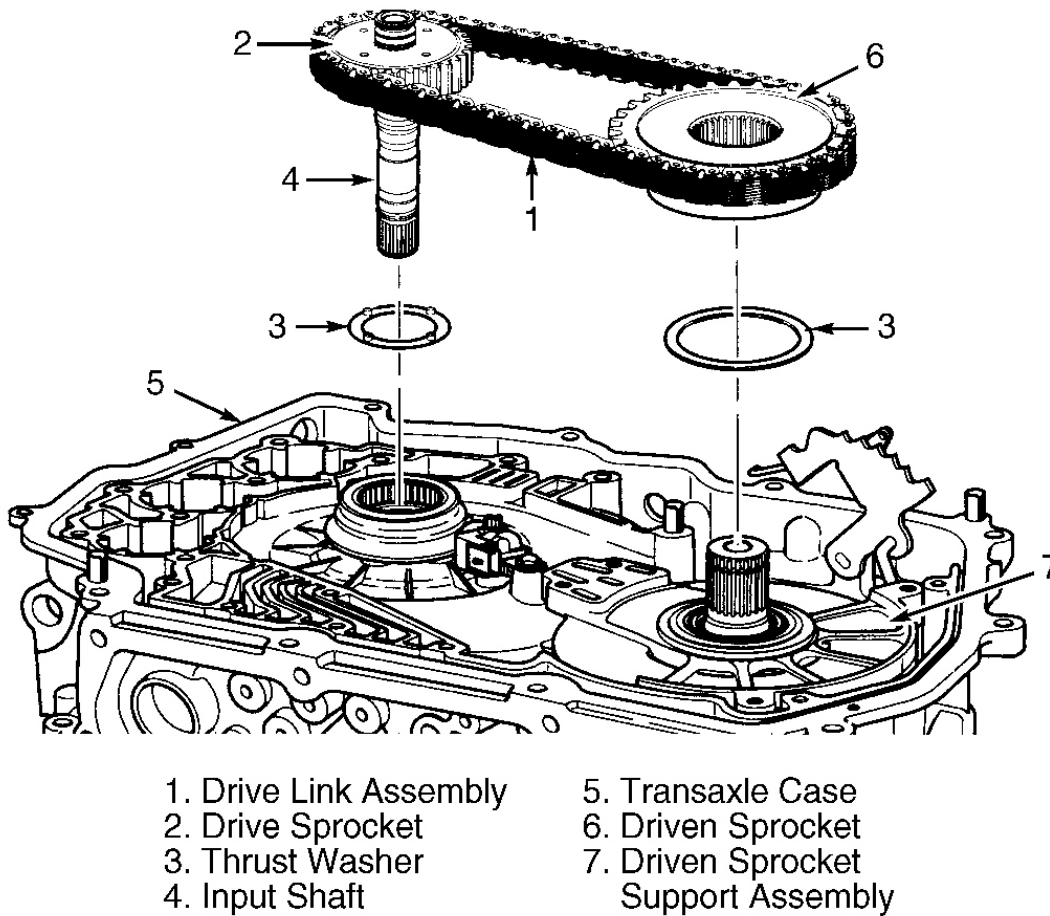


Fig. 10: Removing Output Shaft Sleeve
Courtesy of GENERAL MOTORS CORP.

DRIVE & DRIVEN SPROCKETS, & DRIVE LINK ASSEMBLY

Lift and remove drive sprocket, driven sprocket and drive link assembly as a complete unit. Note direction chain is facing when removed. Chain should be installed in same direction during assembly to prevent excessive noise. Remove drive sprocket-to-drive sprocket support thrust washer. Driven sprocket-to-support thrust washer should remain with driven sprocket support assembly. See **Fig. 11**.

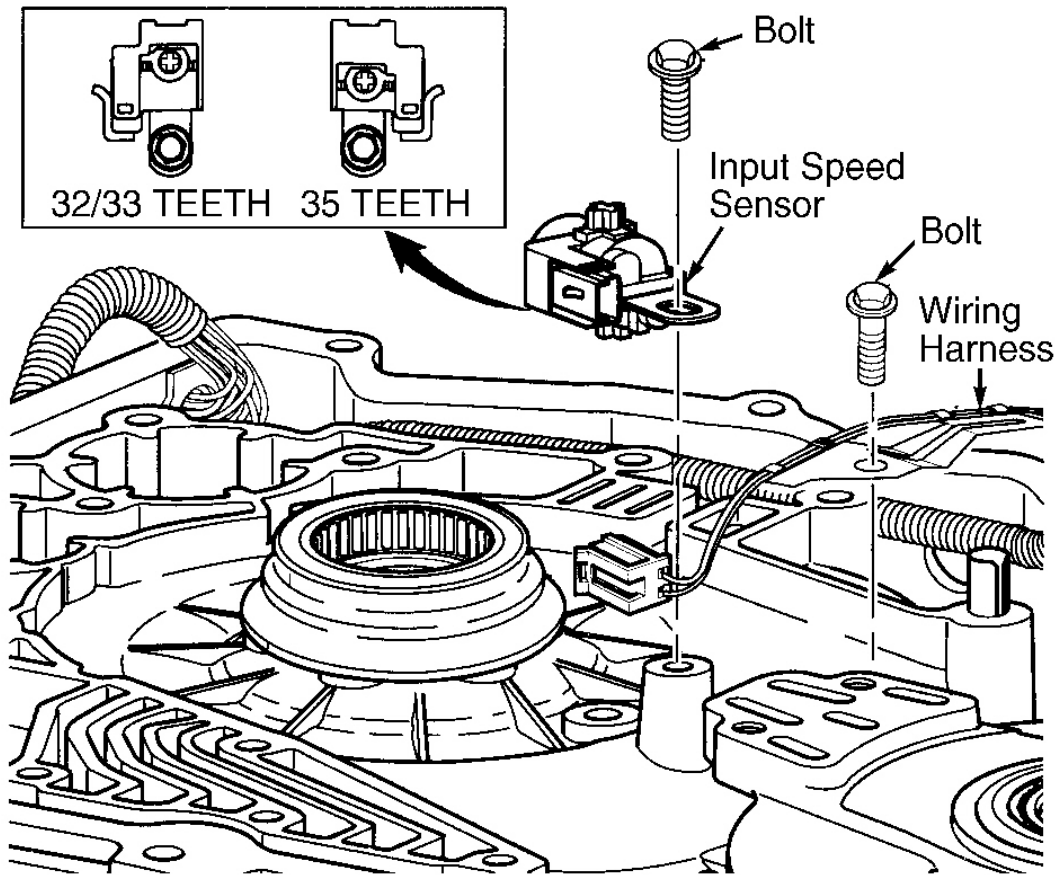


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Fig. 11: Removing Drive & Driven Sprockets & Drive Link Assembly
Courtesy of GENERAL MOTORS CORP.

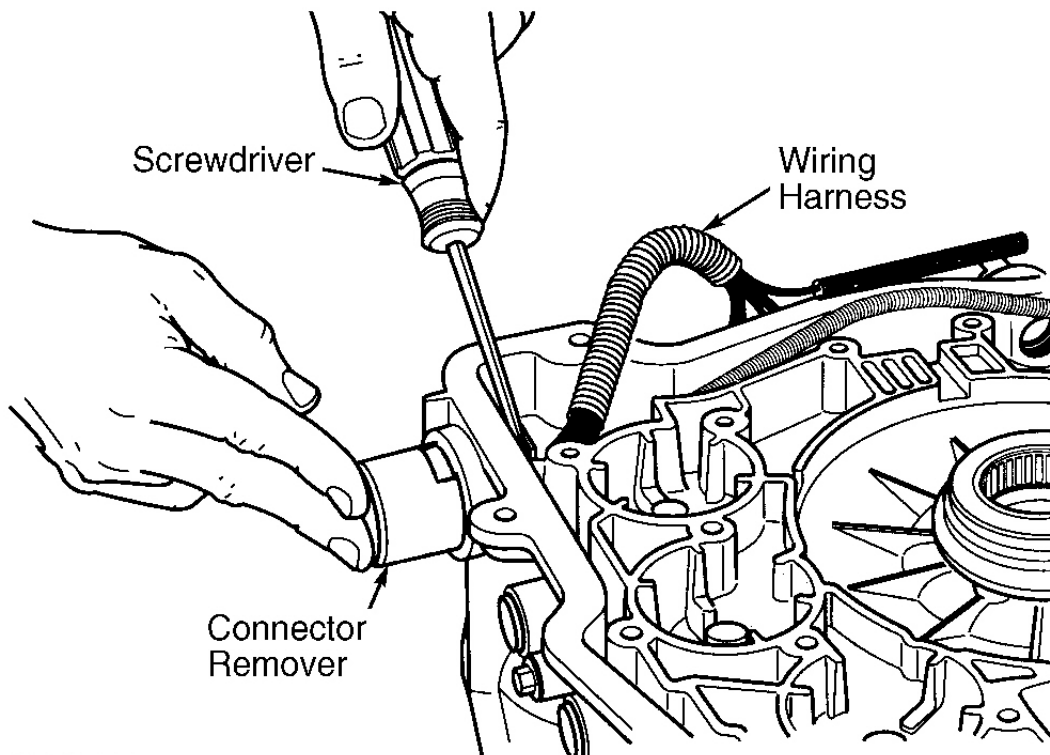
INPUT SPEED SENSOR & WIRING HARNESS

Disconnect wiring harness connector at input speed sensor. Remove input speed sensor bolt and sensor. Remove wire retainer clip bolt and retainer clip. See **Fig. 12** . Using Tool (J-41101), remove pass-thru connector. Push tool onto pass-thru connector from outside of transaxle case to compress pass-thru connector retaining tabs. With retaining tabs compressed, use a screwdriver to remove pass-thru connector through inside of transaxle case. Remove wiring harness. See **Fig. 13** .



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Fig. 12: Locating & Identifying Input Speed Sensor
Courtesy of GENERAL MOTORS CORP.



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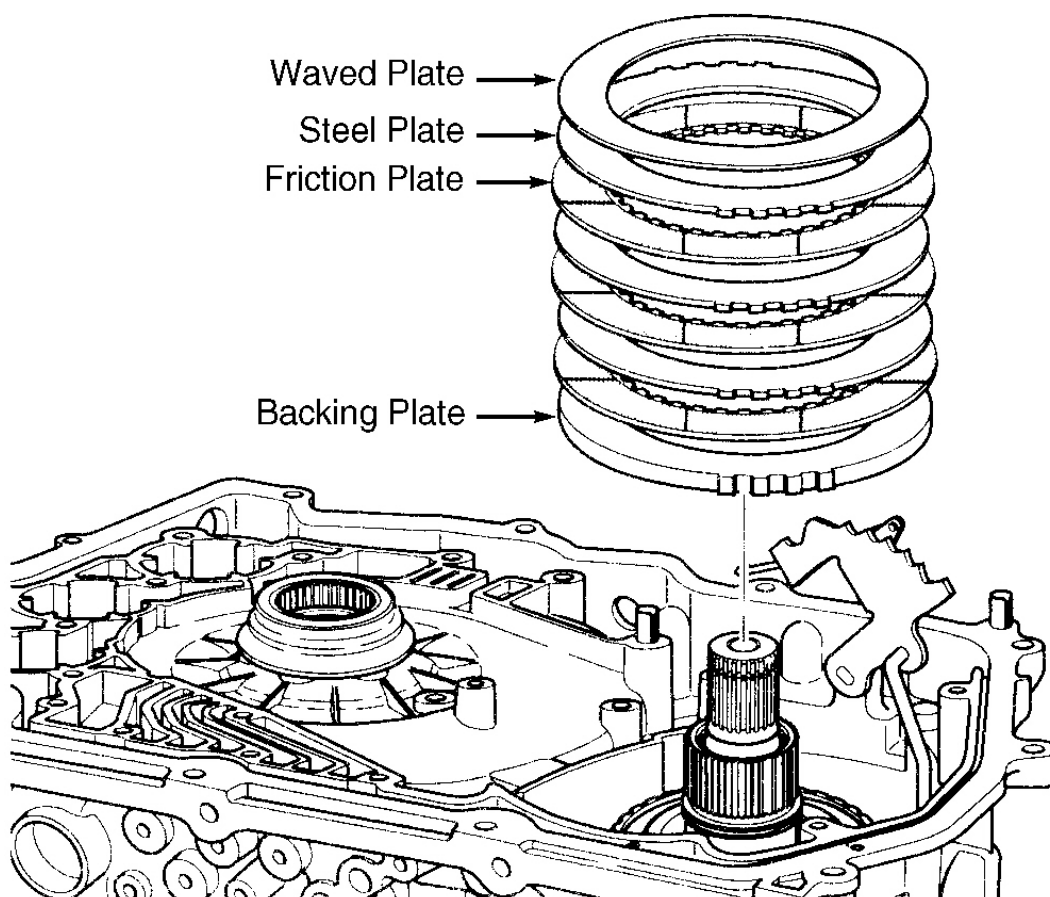
Fig. 13: Removing Pass-Thru Connector From Transaxle
 Courtesy of GENERAL MOTORS CORP.

TRANSAXLE CASE COMPONENTS

1. Remove driven sprocket-to-driven sprocket support thrust washer (if necessary). Remove driven sprocket support assembly. See **Fig. 11**. Remove 2nd clutch plates. Plates consist of one waved plate, 3 steel plates, 3 friction plates and one backing plate. See **Fig. 14**. Remove driven sprocket support-to-reverse input clutch housing thrust washer. Remove reverse input clutch housing and 2nd roller clutch assembly.
2. Remove intermediate/4th band. See **Fig. 5**. Remove coast and direct clutch and reaction carrier assembly. Keep bearing assembly and selective thrust washer located on top of assembly. Remove input carrier and reaction internal gear assembly. Bearing assembly is permanently located in input carrier. Remove input carrier-to-forward clutch hub thrust bearing. Thrust bearing may have remained with input carrier. See **Fig. 5**.
3. Remove input flange and forward clutch hub assembly. Remove forward clutch hub-to-race thrust washer. Thrust washer may be attached to forward clutch hub. Remove forward clutch assembly and low and reverse band. Using a screwdriver, remove forward clutch support snap ring from transaxle case.
4. Remove forward clutch support and low roller clutch assembly. Keep forward clutch housing-to-forward clutch support thrust bearing with forward clutch support assembly. Parking pawl may need to be depressed to allow forward clutch support to be removed.
5. Remove output shaft, final drive assembly and final drive sun gear as an assembly. Remove differential

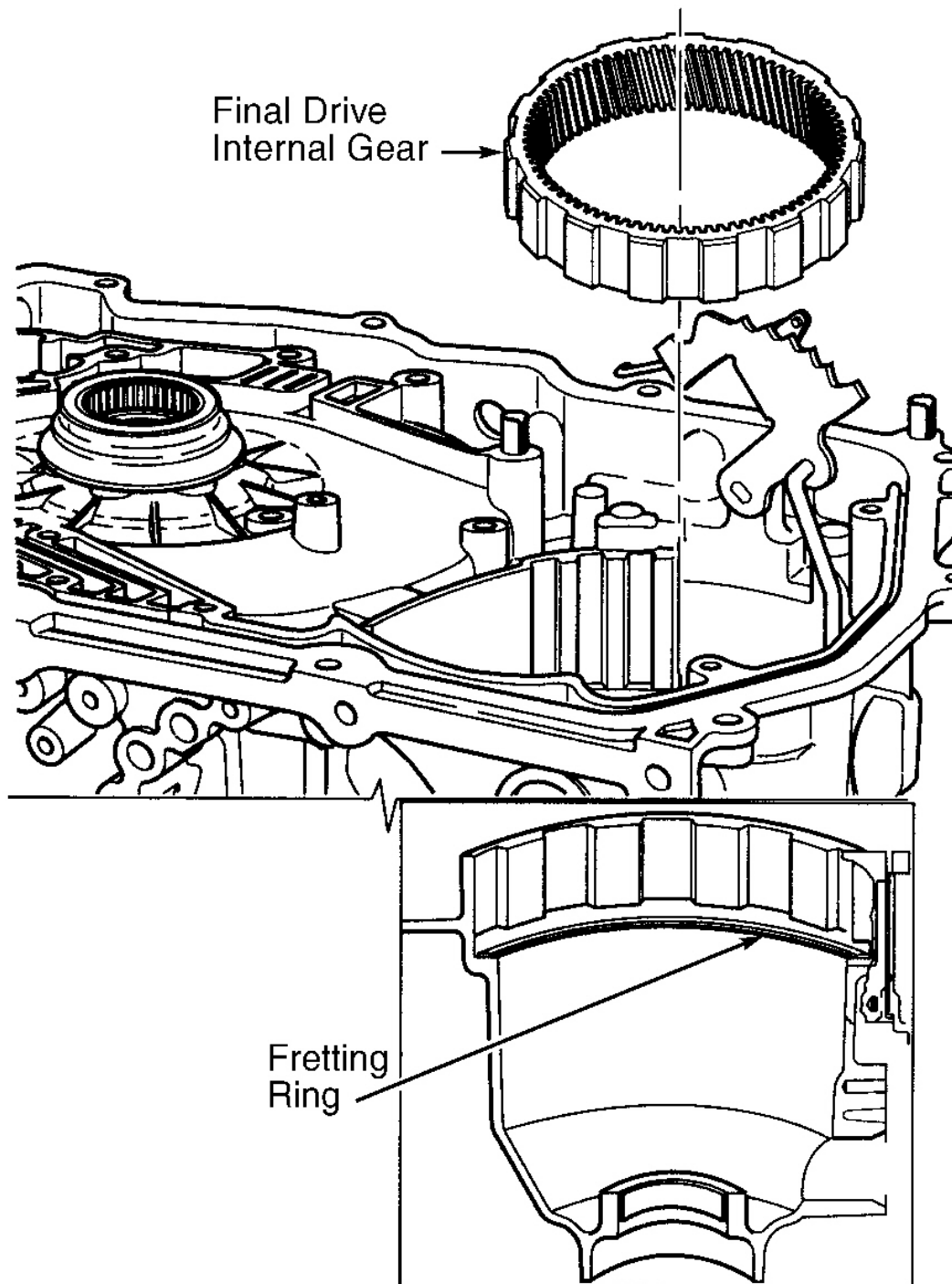
carrier-to-case thrust bearing. Thrust bearing may be removed with final drive assembly. Remove final drive internal gear.

NOTE: Fretting ring is located in case ring groove. See Fig. 15 . Fretting ring does not need to be removed unless it appears to be damaged.



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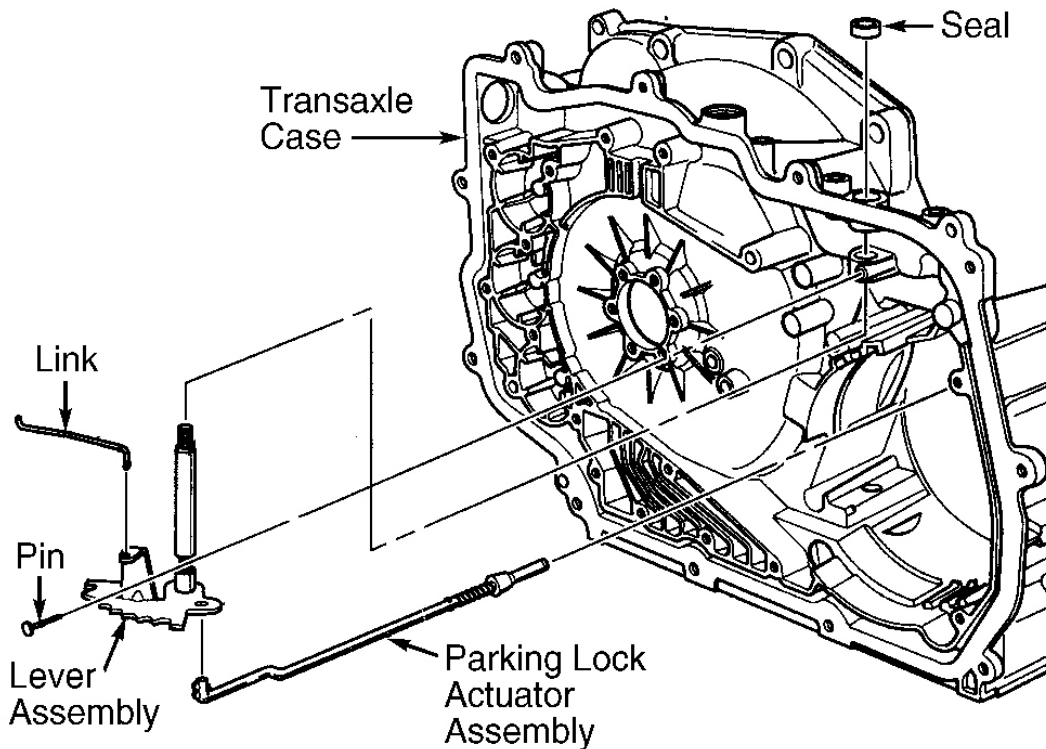
Fig. 14: Removing & Installing 2nd Clutch Plates
Courtesy of GENERAL MOTORS CORP.



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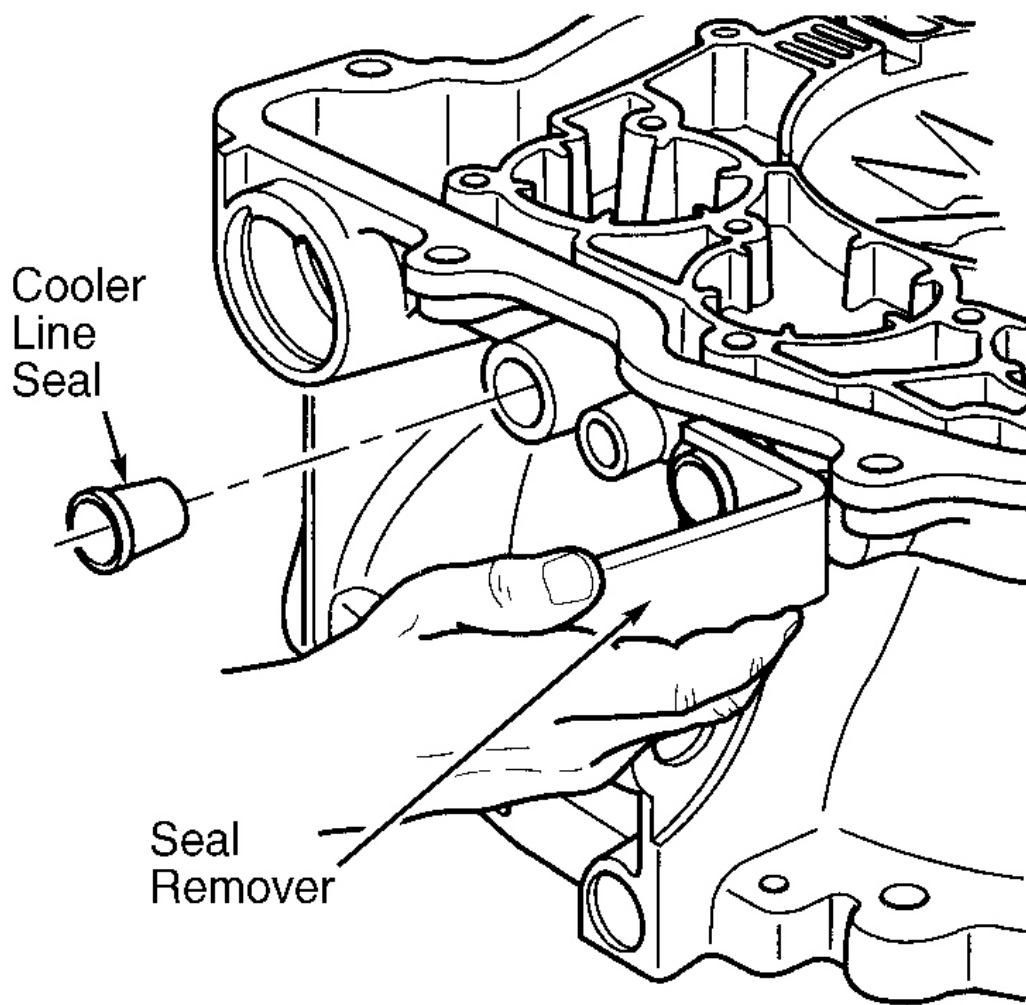
Fig. 15: Locating Fretting Ring
Courtesy of GENERAL MOTORS CORP.

6. Remove manual shaft-to-transaxle case pin. Remove manual shaft and detent lever assembly by pushing manual shaft into case. Parking lock actuator assembly will remain attached to detent lever until assembly is removed. Remove manual shaft seal from case. See **Fig. 16** . Be careful not to damage case bore during removal.
7. Remove transaxle cooler line seals. Using Seal Remover (J-41239-2) and hammer, wedge seal remover into seal on outside of transaxle case bore. Pry seals out of transaxle case. See **Fig. 17** .
8. Remove torque converter seal using Seal Remover (J-41103). Insert 3 puller feet under converter seal. Insert support body over stator shaft. Insert puller bridge over support body and connect puller feet into slots on puller bridge. Tighten forcing screw on puller until puller feet remove converter seal. Discard seal after removal. See **Fig. 18** .
9. Remove 6 bolts from drive sprocket support. Remove drive sprocket support from case. See **Fig. 5** . Using screwdriver, remove right side axle oil seal from transaxle case. **DO NOT** damage case bore.



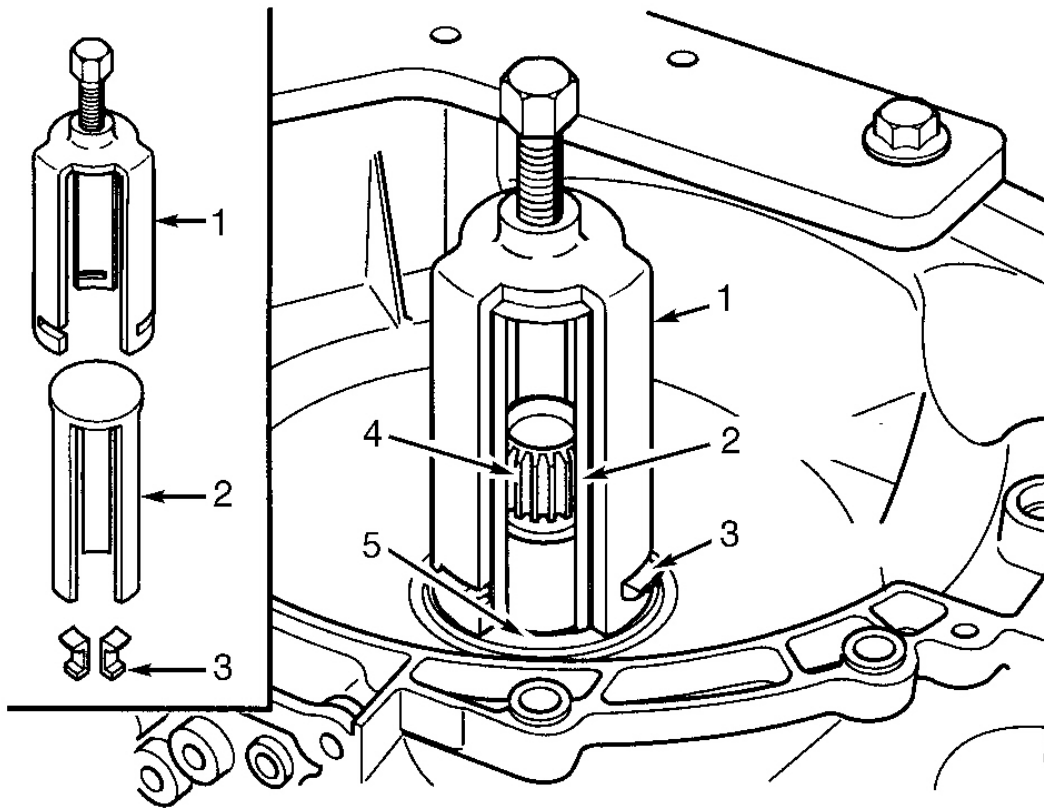
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Fig. 16: Removing Manual Shaft, Detent Lever & Parking Lock Actuator Assembly
Courtesy of GENERAL MOTORS CORP.



G96E04019

Fig. 17: Removing Cooler Line Seals
Courtesy of GENERAL MOTORS CORP.



- 1. Puller
- 2. Support
- 3. Feet

- 4. Drive Sprocket & Stator Shaft Support
- 5. Converter Seal

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Fig. 18: Removing Torque Converter Seal
Courtesy of GENERAL MOTORS CORP.

COMPONENT DISASSEMBLY, REASSEMBLY & TRANSAXLE REASSEMBLY

NOTE: Following procedures also include transaxle reassembly. Transaxle components are installed into transaxle as components are reassembled. For component seal, thrust bearing and thrust washer locations, see [Fig. 44](#) and [Fig. 45](#) .

TRANSAXLE CASE

Cleaning & Inspection

Prior to transaxle reassembly, clean transaxle case thoroughly with solvent and air dry. Inspect transaxle case for damage to band lugs, snap ring grooves and bushings. Check for interconnected or damaged oil passages and servo bores. Inspect case for stripped threads in bolt holes or casting porosity. Repair or replace case if necessary.

NOTE: DO NOT remove actuator guide unless replacement is necessary.

Actuator Guide (Disassembly & Reassembly)

1. Remove actuator guide roll pin from case. Remove actuator guide and seal from transaxle case by tapping guide into transaxle case. See **Fig. 19**.
2. Install NEW seal on actuator guide. Install actuator guide into transaxle case. Install actuator guide roll pin into transaxle case to secure actuator guide.

Drive Sprocket Support (Disassembly & Reassembly)

1. If removal of drive sprocket bearing from drive sprocket is necessary, use appropriate bearing puller and slide hammer. Remove support bearing and install NEW bearing.
2. Inspect drive sprocket support for damage to stator shaft splines, journals and bushings. Also inspect converter seal drain holes for blockage. If drive sprocket support replacement is necessary, remove attaching screws and remove support. Install drive sprocket support and tighten attaching screws to specification. See **TORQUE SPECIFICATIONS**. Install NEW torque converter seal using appropriate seal installer.

Transaxle Cooler Line Seals (Reassembly)

Seals were removed during transaxle disassembly procedure. For reassembly, place NEW seal in transaxle case bore. Position Seal Installer (J-41239-1) on transaxle case at cooler line bracket bolt hole. Press seal into case by tightening seal pressing bolt on tool until seal bottoms out in case bore.

Manual Shaft, Detent Lever & Actuator Rod (Reassembly)

Components were removed during transaxle disassembly. For component reassembly, install NEW manual shaft seal into transaxle case using 13 mm socket. Install manual shaft and detent lever assembly into transaxle case with manual valve to detent lever link and parking lock actuator assembly attached. See **Fig. 16**. Ensure parking lock actuator rod is positioned properly into actuator guide. Using Height Tool (J-41229), install manual shaft-to-case pin. See **Fig. 20**.

NOTE: Manual shaft pin must be installed to correct height to properly secure manual shaft. Tool provides correct installation height. If pin is installed too deep, pin will crack case boss.

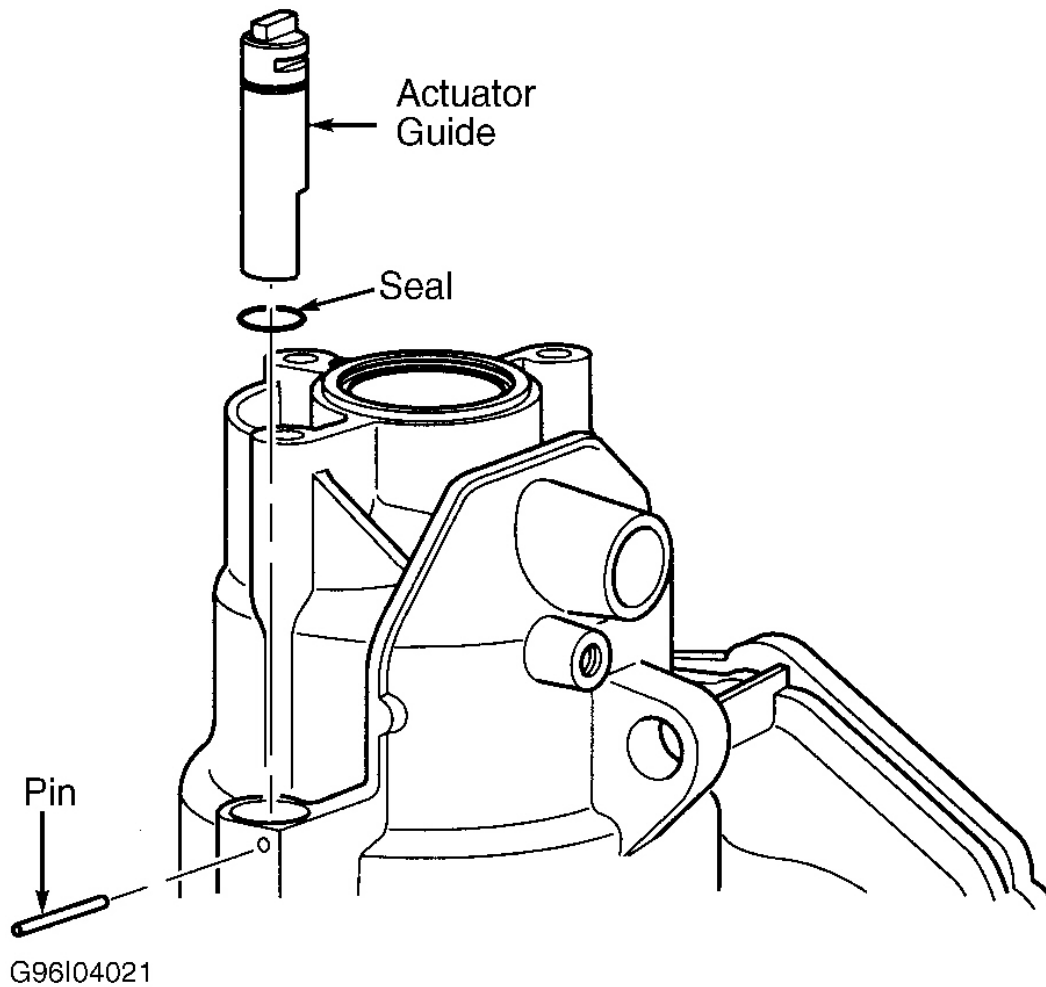
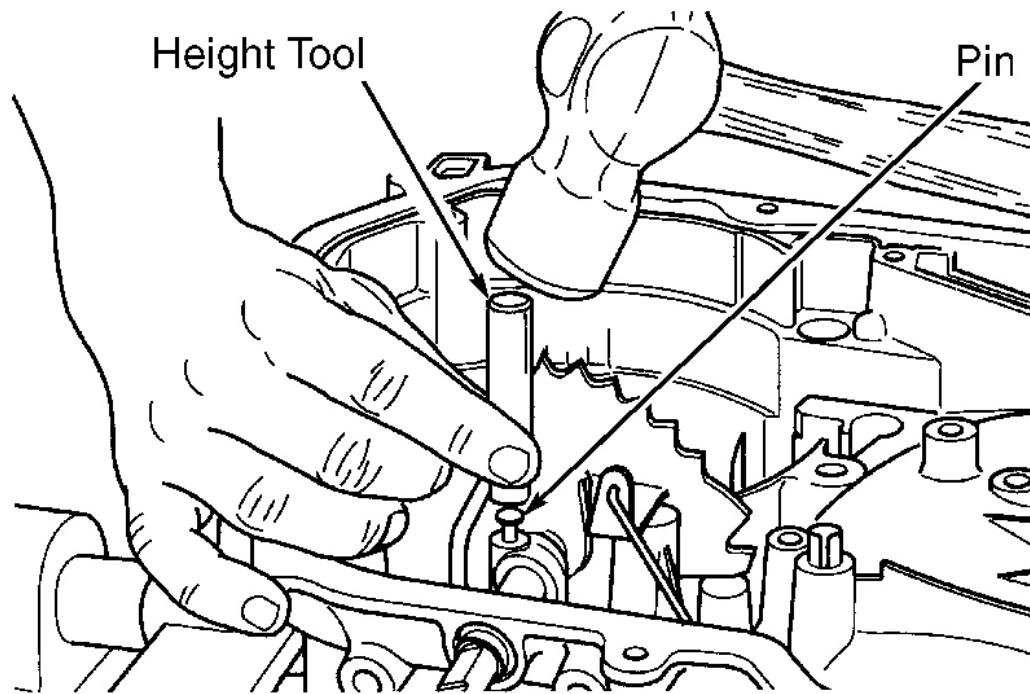


Fig. 19: Removing Actuator Guide
Courtesy of GENERAL MOTORS CORP.



G96A04022

Fig. 20: Installing Manual Shaft Pin
 Courtesy of GENERAL MOTORS CORP.

DIFFERENTIAL & FINAL DRIVE ASSEMBLY

Disassembly & Inspection

1. Place differential and final drive assembly in clean drain pan to prevent needle bearings from being lost if pinion gears are removed. Using a pin punch, remove differential pinion shaft retaining pin. Remove differential pinion shaft. Remove snap ring from end of output shaft and remove output shaft from differential carrier. Discard snap ring.
2. Remove final drive sun gear. Remove differential pinion gears and thrust washers. Remove differential side gears and thrust washers. See **Fig. 21** . Remove final drive carrier spiral retaining ring.

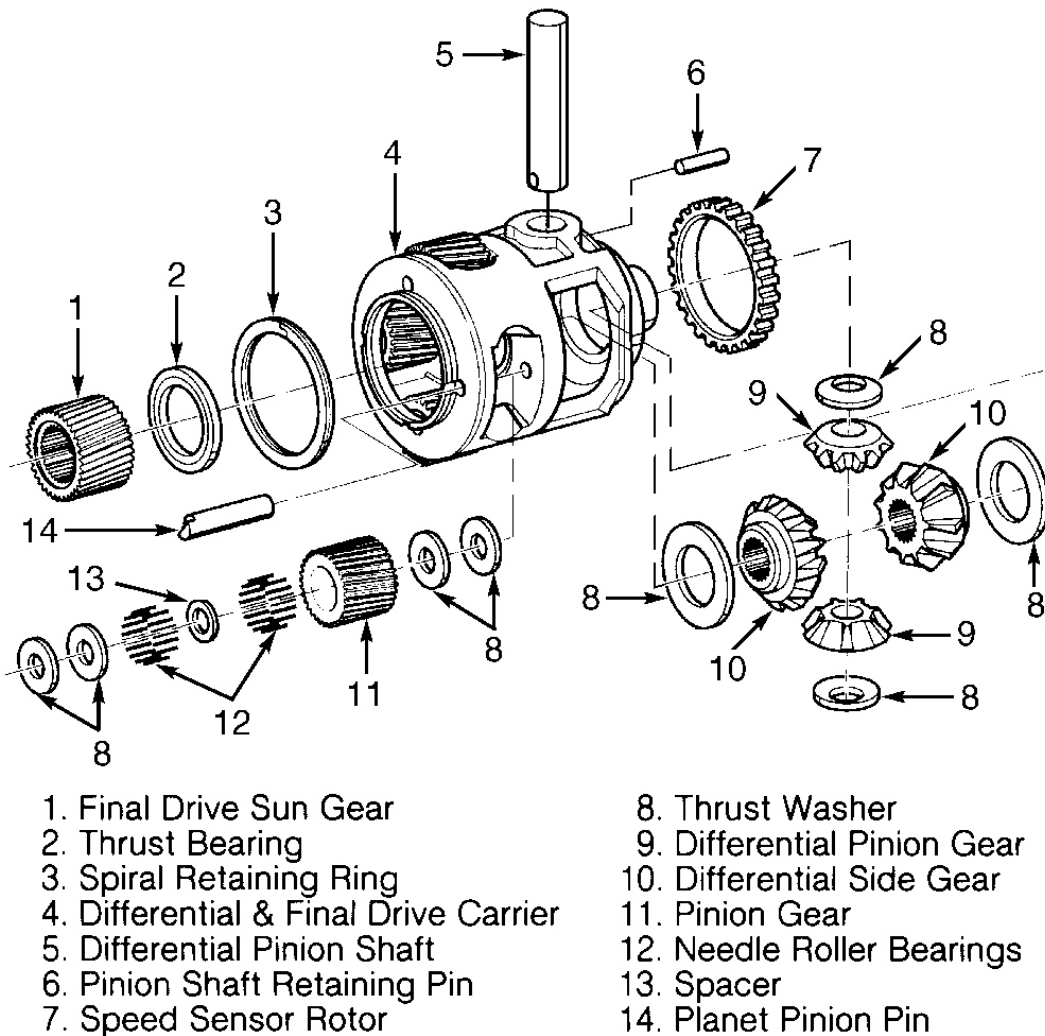
NOTE: **Note position of pinion gears when removing. Pinion gears should be installed in same direction as removed. Installing pinion gear upside down may cause noise due to change in set wear pattern.**

3. Remove 4 planet pinion pins, 4 pinion gears, pinion thrust washers, needle roller bearings and needle bearing spacers. Remove final drive sun gear-to-carrier thrust bearing. See **Fig. 21** .
4. Inspect needle bearings, thrust washers, pinion gears and planet pinion pins for excessive wear. Polishing

is normal condition for pinion pins and needle bearings. Inspect pinion shaft for spalling or wear. Inspect thrust washers for wear and cracks. Clean and dry final drive carrier and final drive components.

Reassembly

1. Install needle bearing spacer onto planet pinion gear. Spacer must be assembled between 2 rows of needle bearings. To aid in assembly of needle bearings, place spacer and pinion gear onto planet pinion pin. Install needle roller bearings one at a time into planet pinion. Place thrust washer on bottom of pinion to retain bottom row of needle bearings. Use petroleum jelly to keep bearings in place.
2. Install sun gear-to-final drive carrier thrust bearing onto final drive carrier. Use petroleum jelly to position thrust bearing. Assemble pinion gear thrust washers and planet pinion gears into final drive carrier. Pinion gears should be assembled in same direction as removed to prevent noise due to change in gear wear pattern.
3. Install planet pinion pins into final drive carrier to retain planet pinion gears. Install final drive carrier spiral retaining ring to retain planet pinion pins. Check final drive carrier pinion gears for excessive end play. Use a feeler gauge and measure end play clearance between carrier and pinion gear thrust washer. See **Fig. 27** . End play should be .009-.025" (.24-.63 mm). Replace components as necessary.
4. Install thrust washers onto differential side gears and install gears into final drive carrier. Using petroleum jelly, position thrust washers onto pinion gears. Install pinion gears and washers onto final drive carrier.
5. Rotate pinion gears into position and install pinion shaft through final drive carrier and pinion gears. Position of pinion shaft must allow retaining pin to be installed. Tap retaining pin into position using a plastic hammer.
6. Install fretting ring into small groove in transaxle case (if removed). Install final drive internal gear into transaxle case. Install final drive carrier-to-case thrust bearing onto final drive carrier. Retain bearing with petroleum jelly. Install final drive carrier assembly into transaxle case. Install final drive sun gear into final drive carrier. Sun gear must be installed with grooved side up (flat side down).



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Fig. 21: Exploded View Of Differential & Final Drive Assembly
 Courtesy of GENERAL MOTORS CORP.

FORWARD CLUTCH SUPPORT & LOW ROLLER CLUTCH ASSEMBLY

Disassembly

Remove roller clutch assembly from forward clutch support. Turn roller clutch assembly clockwise while gently lifting up. Remove thrust bearing from forward clutch support. See **Fig. 22**. Remove final drive sun gear shaft snap ring. Remove park lock gear. Remove forward clutch support-to-park lock gear thrust bearing. Remove forward clutch support from final drive sun gear shaft. Remove and discard 2 seal rings from forward clutch support.

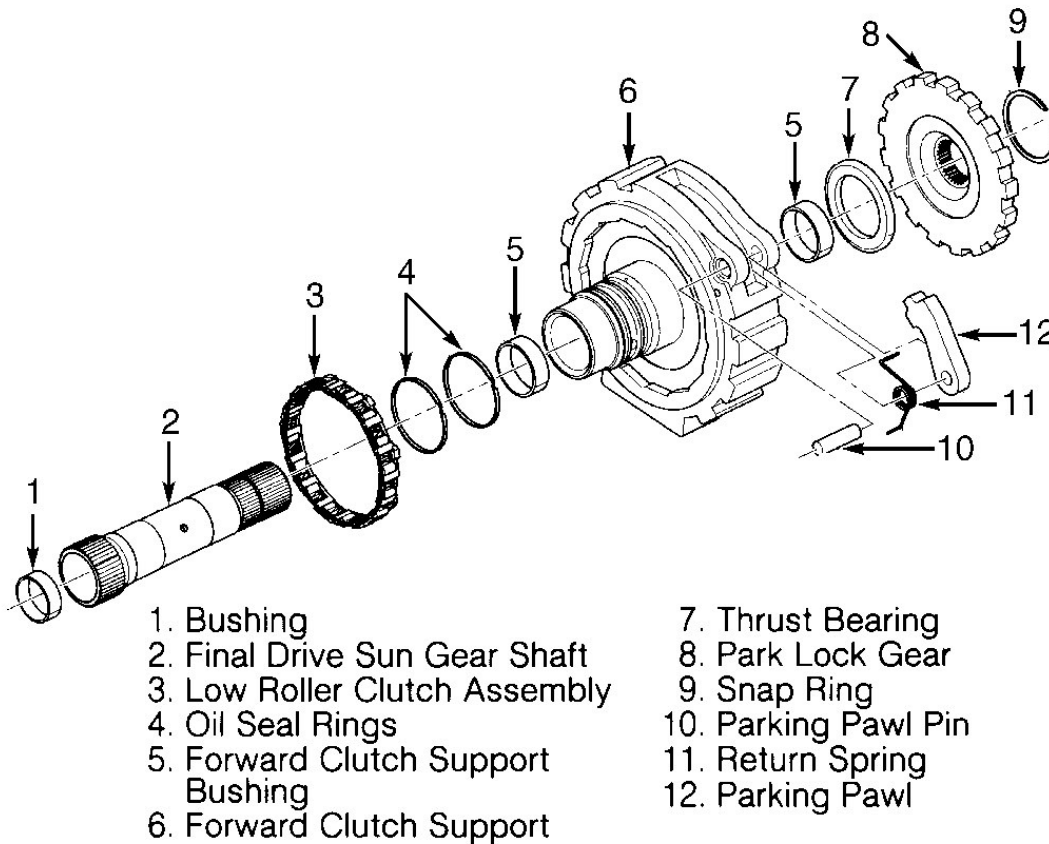
NOTE: **Parking pawl pin has a pressed fit into forward clutch support. Pin is not serviceable and should not be removed.**

Inspection

Inspect all components for excessive wear or damage. Inspect snap ring for over extension and seal grooves for damage. Check for signs of excessive bearing or bushing wear. Check splines and park lock gear teeth for cracks or excessive wear. Ensure fluid feed holes are not plugged.

Reassembly

1. Install 2 NEW seal rings on forward clutch support. Install forward clutch support onto final drive sun gear shaft. Install thrust bearing onto forward clutch support.
2. Install park lock gear onto final drive sun gear shaft with raised inner boss facing up so that parking pawl properly engages teeth on park lock gear. Install snap ring to final drive sun gear shaft to retain park lock gear. See **Fig. 22** . Ensure clearance between park lock gear and snap ring is .12" (3 mm).
3. Install low roller clutch assembly onto forward clutch support. Larger tabs on cage must face down into forward clutch support. Rotate cage slightly counterclockwise to lock tabs into grooves in forward clutch support. Install thrust bearing onto forward clutch support.
4. Install forward clutch support and low roller clutch assembly into transaxle case. Compress parking pawl return spring and line up parking pawl with park lock gear. Install forward clutch support snap ring into transaxle case with chamfer side up. Snap ring opening must be toward bottom of transaxle case facing bottom pan. Use a screwdriver to set snap ring into place.



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Fig. 22: Exploded View Of Forward Clutch Support & Low Roller Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

FORWARD CLUTCH ASSEMBLY

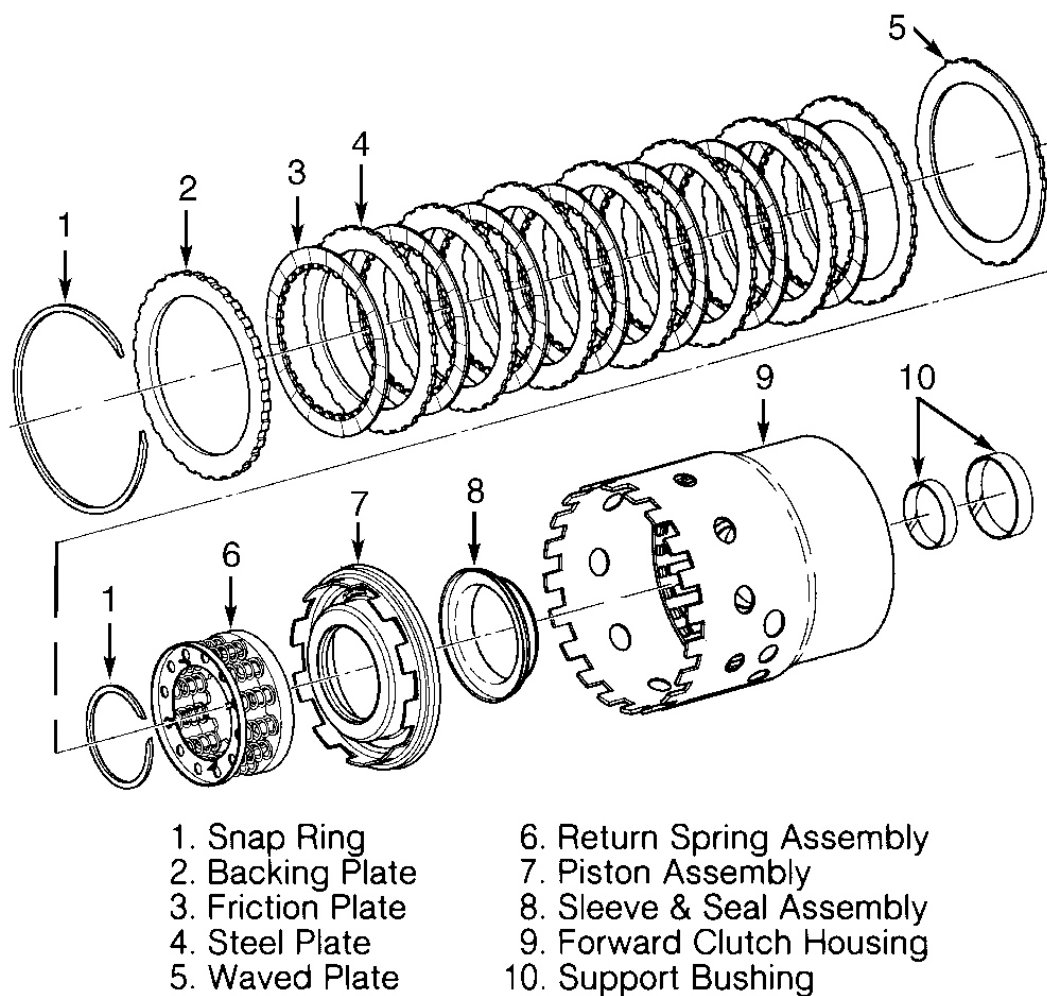
1. Remove snap ring from clutch housing assembly. Remove backing plate, 7 friction plates, 7 steel plates and one waved plate. See **Fig. 23** . Using Spring Compressor (J-23327), compress forward clutch return spring assembly. Remove snap ring and spring compressor.
2. Remove forward clutch return spring assembly. Remove forward clutch piston assembly. Inspect forward clutch inner seal assembly for damage. If seal is damaged, place Disc (J-41097) on inner hub of clutch housing. Use puller to remove inner seal.

Inspection

Clean all parts and dry with compressed air. Inspect all components for excessive wear or damage. Ensure fluid feed holes and retainer and ball assembly are not plugged. Inspect piston for damage. Inspect for cut seal. Repair or replace components as necessary.

Reassembly

1. Install NEW inner seal if old seal was removed or damaged. Using arbor press and seal installer, press inner seal onto forward clutch housing inner hub. Install forward clutch piston assembly into forward clutch housing. Lubricate seals with transaxle fluid prior to installation.
2. Install forward clutch return spring assembly into forward clutch housing with snap ring tabs facing up. Compress return spring assembly and install snap ring. Remove spring compressor. Install forward clutch waved plate. Install remaining clutch plates starting with steel plate and alternating between steel and friction plates.
3. Install forward clutch backing plate. Install snap ring to retain clutch plates. Using compressed air, air check forward clutch to verify proper operation of seals and clutch assembly. Apply compressed air at specified location. See **Fig. 24** . If clutch assembly does not operate properly, check component installation.
4. Install low and reverse band into transaxle case. Align band servo pin apply surface toward bottom pan and hook band into band anchor pin in transaxle case. Install forward clutch assembly into transaxle case. Rotate forward clutch assembly counterclockwise during assembly to seat clutch assembly into low roller clutch. When assembly is seated properly, forward clutch assembly should not turn clockwise.
5. Verify proper installation of low and reverse band by inserting screwdriver through reverse servo pin hole. Screwdriver should compress band around forward clutch housing.



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Fig. 23: Exploded View Of Forward Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

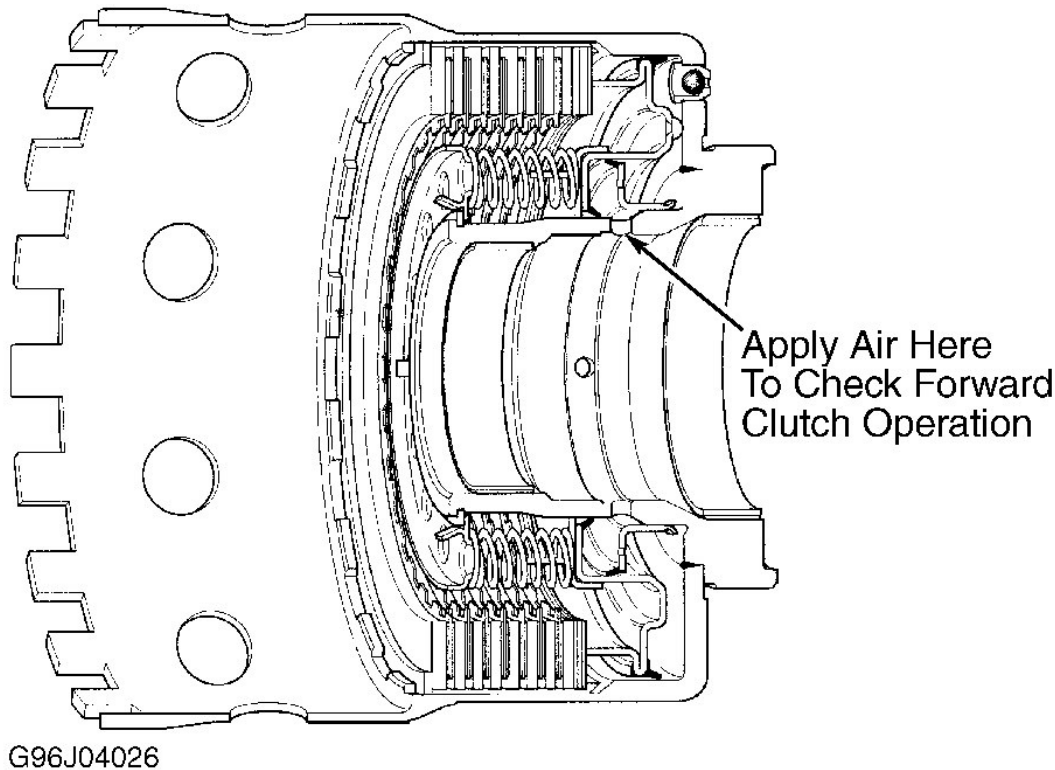


Fig. 24: Checking Forward Clutch Assembly Operation
Courtesy of GENERAL MOTORS CORP.

INPUT INTERNAL GEAR & FORWARD CLUTCH HUB ASSEMBLY

Disassembly

Remove thrust washer from forward clutch hub (if necessary). Remove input internal gear-to-forward clutch hub assembly snap ring. Remove forward clutch hub from input internal gear. See **Fig. 25** .

Inspection

Inspect input internal gear and forward clutch hub splines, bushing and thrust washer for excessive wear or damage. Clean all parts and dry with compressed air.

Reassembly

Install forward clutch hub onto input internal gear and retain hub with snap ring. Coat thrust washer with petroleum jelly. Install thrust washer onto forward clutch hub with thrust washer tabs toward forward clutch hub. Install forward clutch hub and input internal gear assembly into transaxle case. See **Fig. 5** . Rotate assembly while installing to align forward clutch hub spline with forward clutch plates.

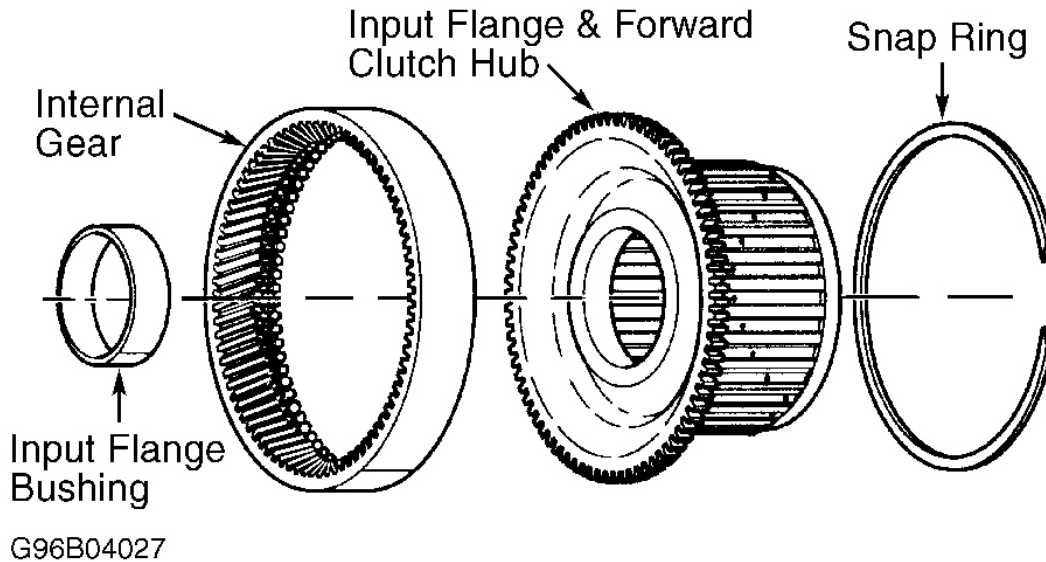


Fig. 25: Exploded View Of Input Internal Gear & Forward Clutch Hub Assembly
 Courtesy of GENERAL MOTORS CORP.

REACTION INTERNAL GEAR & INPUT CARRIER ASSEMBLY

Disassembly

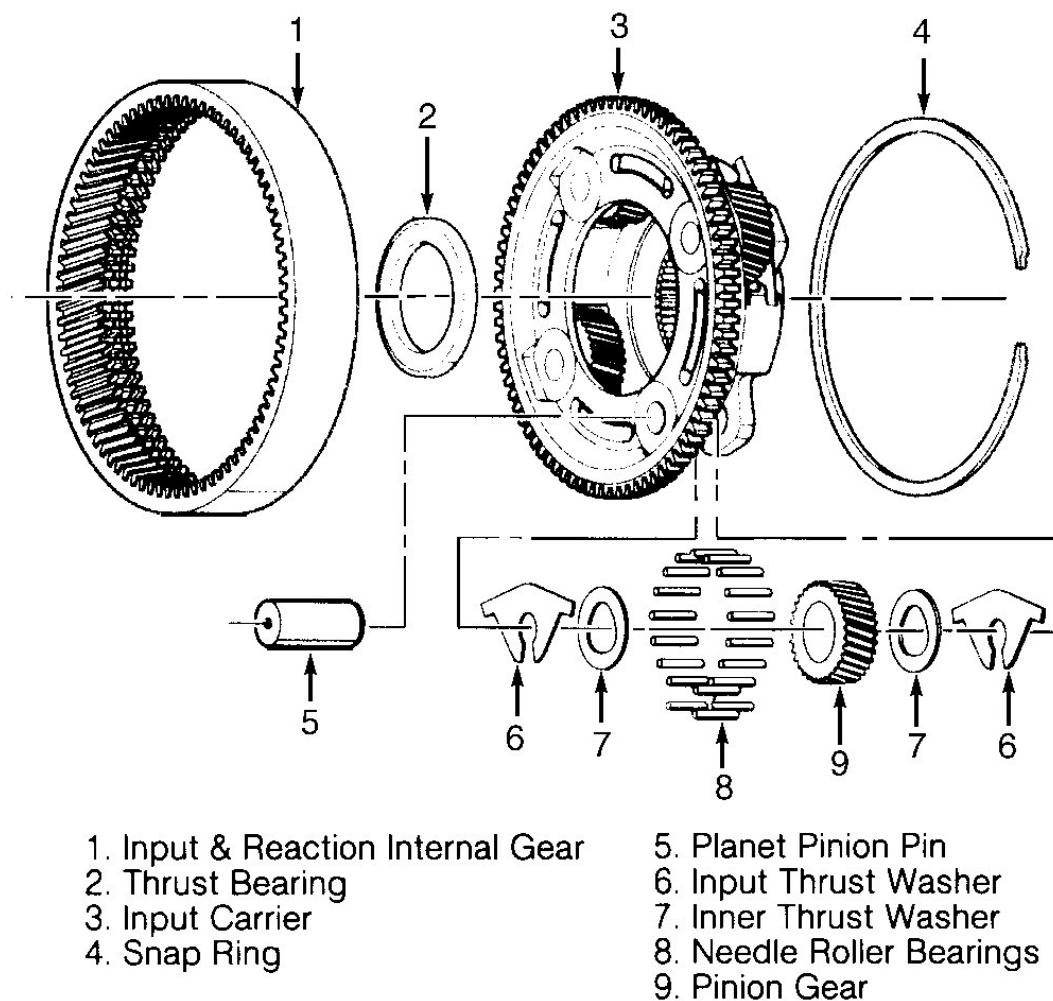
Remove thrust bearing from reaction carrier (if necessary). Remove reaction internal gear-to-input carrier assembly snap ring. Remove input carrier assembly from reaction internal gear. See [Fig. 26](#).

Inspection

1. Check input carrier assembly pinion gears for excessive end play. Using a feeler gauge, measure end play clearance between carrier and pinion gear thrust washer. See [Fig. 27](#). End play should be .009-.027" (.24-.69 mm). Replace carrier if pinion gear clearance is not within specification. Pinion gears are permanently assembled to carrier and are not serviceable.
2. Inspect reaction internal gear and input carrier assembly for excessive wear or damage. Inspect condition of pinion gears, washers and bearings. Clean all parts and dry with compressed air.

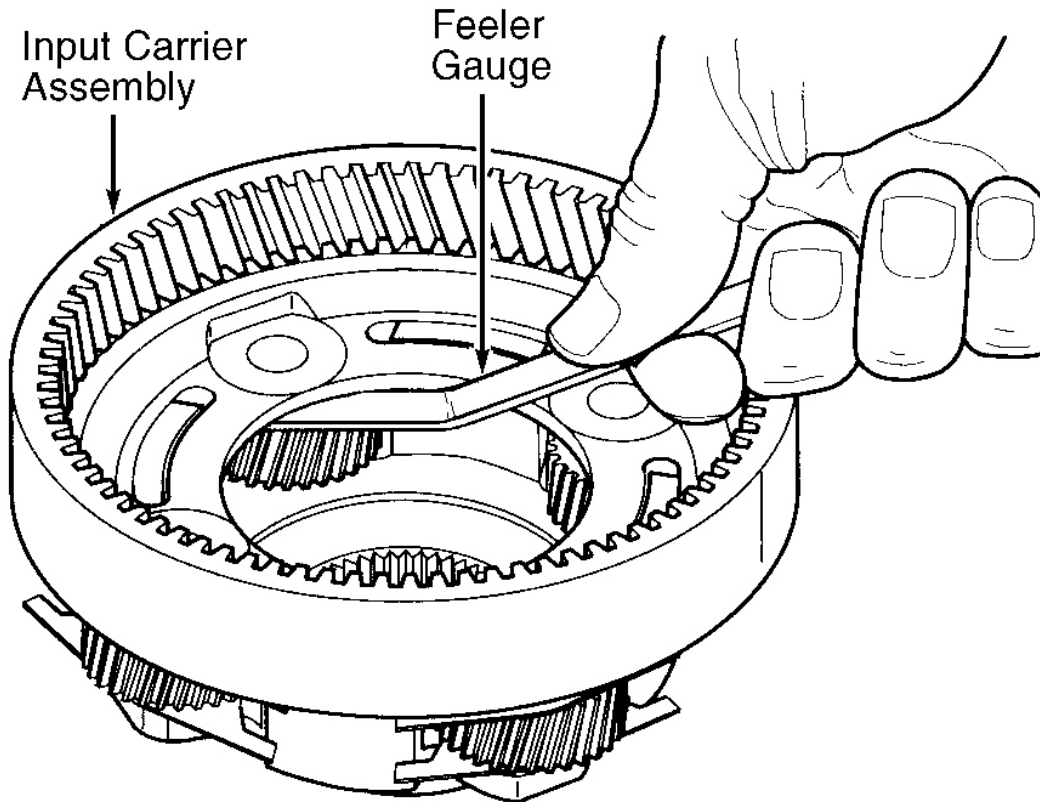
Reassembly

Install input carrier assembly to reaction internal gear and retain with snap ring. Coat thrust bearing with petroleum jelly. Install thrust bearing onto input carrier assembly. Second thrust bearing is permanently retained in input carrier assembly. Install reaction internal gear and input carrier assembly into transaxle case. See [Fig. 5](#). Rotate assembly while installing to mesh input carrier pinion gears to input internal gear.



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Fig. 26: Exploded View Of Reaction Internal Gear & Input Carrier Assembly
 Courtesy of GENERAL MOTORS CORP.



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Fig. 27: Measuring Pinion End Play (Input Carrier Assembly Shown; Others Are Similar)
 Courtesy of GENERAL MOTORS CORP.

COAST & DIRECT CLUTCH, & REACTION CARRIER ASSEMBLY

Disassembly

1. Remove selective thrust bearing and thrust washer from input shaft. Remove input sun gear-to-input sun gear shaft snap ring. Remove input sun gear from input sun gear shaft. Remove thrust bearing from reaction carrier assembly. See **Fig. 28**.
2. Remove reaction carrier assembly. Thrust bearing is permanently installed in reaction carrier assembly under pinion gears. Remove reaction sun gear and shell assembly. Remove thrust bearing from reaction carrier shaft and shell assembly. Remove reaction carrier shaft and shell assembly. Remove thrust bearing from top of sprag race assembly.
3. Remove coast and direct clutch snap ring. Remove direct clutch plates from clutch input housing. Note number and sequence of plates during removal for reassembly reference. Number of clutch plates may vary depending on vehicle model. Direct clutch consists of a backing plate, steel plates and friction plates.
4. Remove input sun gear shaft and sprag as an assembly by lifting up on input sun gear shaft. Remove inner race-to-input housing thrust bearing from input housing, if necessary. Bearing may remain with input sun

gear shaft and sprag when assembly is removed. Remove coast clutch plates from input housing. Coast clutch consists of 4 steel plates and 4 friction plates. See **Fig. 28** .

5. Using Spring Compressor (J-41232), compress direct clutch spring and retainer assembly. Remove retainer ring and spring compressor. Remove direct clutch spring and retainer assembly. Remove direct clutch piston assembly.
6. Using Spring Compressor (J-41236), compress coast clutch release spring assembly. Remove snap ring and spring compressor. Remove coast clutch release spring retainer and release spring. Remove coast clutch piston assembly. Remove and discard 4 Teflon oil seal rings from input shaft assembly.
7. Remove input sprag assembly from input sun gear shaft. Remove snap ring from sprag assembly. Remove sprag clutch assembly from sprag outer race. Remove 2 end bearings from sprag clutch assembly. See **Fig. 28** .

Inspection

1. Check clutch spring assemblies for distortion or missing springs. Check oil passages for blockage. Check bushings and bearings for excessive wear. Inspect seal grooves on input shaft for nicks or damage.
2. Inspect piston assemblies for cut seals or damage. If pistons or seals are damaged, assembly must be replaced. Check coast and direct clutch retainer and ball assemblies for leaks or damage. Check splines, housings and clutch plates for cracks, excessive wear or damage. Clean all parts and dry with compressed air. Replace components as necessary.
3. Measure reaction carrier pinion gears for excessive end play. Using a feeler gauge, measure end play clearance between carrier and pinion gear thrust washer. See **Fig. 27** . End play should be .009-.027" (.24-.69 mm). Replace carrier if pinion gear clearance is not within specification. Pinion gears are permanently assembled to carrier and are not serviceable.

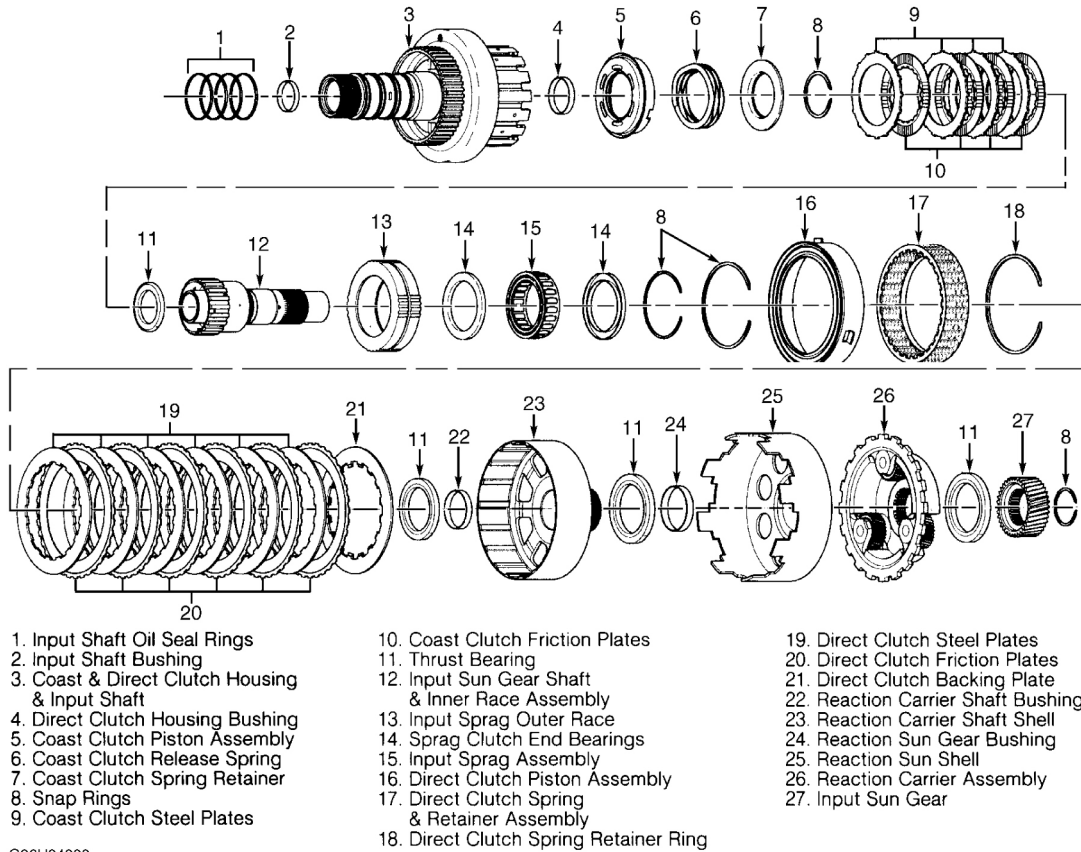


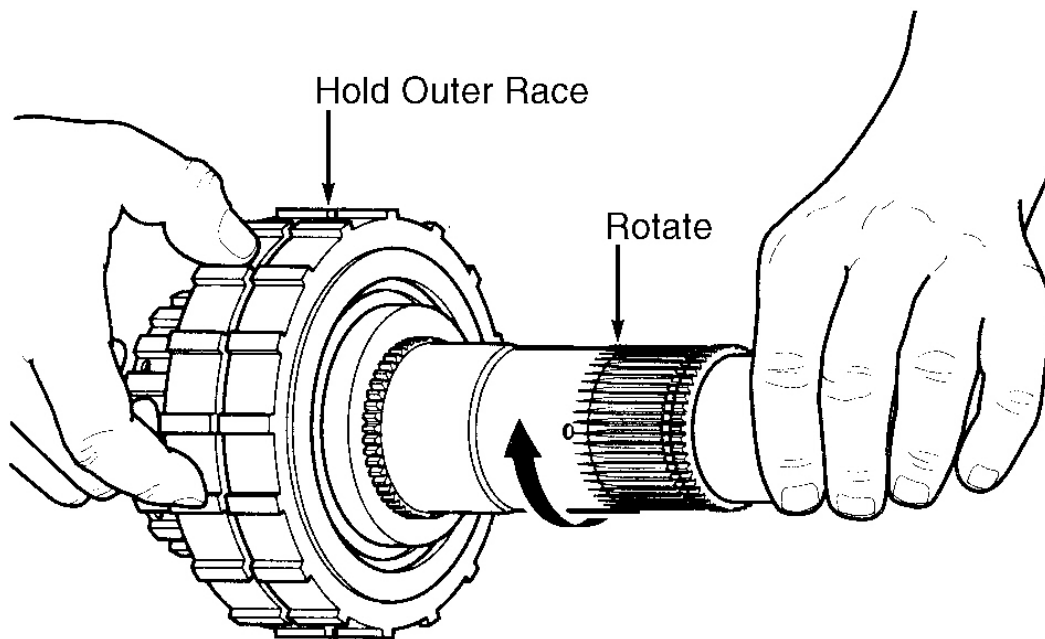
Fig. 28: Exploded View Of Coast & Direct Clutch Assemblies
Courtesy of GENERAL MOTORS CORP.

Reassembly

1. Install coast clutch piston assembly into input housing. Lubricate piston seal with transaxle fluid prior to installation. Install coast clutch release spring and spring retainer into input housing. See **Fig. 28**. Spring retainer must be assembled with inner lip facing up.
2. Compress release spring assembly and install snap ring onto input housing. Remove spring compressor. Install direct clutch piston assembly into input housing. Lubricate piston seal with transaxle fluid prior to installation. Install direct clutch spring and retainer assembly into input housing with snap ring tabs facing up. Compress spring and retainer assembly and install snap ring into input housing. Remove spring compressor.
3. Install coast clutch plates into input housing. Start with steel plate and alternate between 4 steel and 4 NEW friction plates. Steel plates must be assembled with splines in input housing grooves that are machined to piston.
4. Place sprag outer race on bench with flat side down and end with snap ring groove up. Place one end bearing into outer race. Install sprag clutch into sprag outer race with grooved edge up and flat side down. Rotate sprag slowly during assembly. Install other end bearing on top of sprag clutch.
5. Install snap ring into sprag outer race to retain sprag assembly and end bearings. Install sprag clutch and

outer race assembly onto input sun gear shaft. Snap ring side of assembly faces up when installing sprag clutch onto input sun gear shaft. Flat side of sprag outer race functions as backing plate for coast clutch. Rotate input sun gear shaft clockwise during assembly to help seat sprags.

6. Ensure correct operation of sprag clutch by holding sprag clutch outer race and rotating input sun gear shaft. Input sun gear shaft should only rotate in counterclockwise direction. See **Fig. 29**.
7. Coat thrust bearing with petroleum jelly. Install thrust bearing on back side of input sun gear shaft. Install input sun gear shaft and sprag clutch assembly into input housing. Splines on input sun gear shaft engage with coast clutch friction plates.
8. Install direct clutch plates into input housing. Start with steel plate and alternate between steel plate and NEW friction plates. Ensure same number of steel and friction plates removed are reinstalled. Install direct clutch backing plate onto input housing with flat side down.
9. Install snap ring to retain input sun gear shaft, sprag clutch assembly and direct clutch plates. Coat thrust bearing with petroleum jelly. Install thrust bearing on top of sprag clutch assembly. Install reaction carrier shaft and shell assembly onto input housing. Splines on inside of shell engage direct clutch friction plates.



INPUT SUN GEAR SHAFT MUST
FREE WHEEL IN DIRECTION OF ARROW
& HOLD IN OPPOSITE DIRECTION

G96J04031

Fig. 29: Checking Sprag Clutch Operation
Courtesy of GENERAL MOTORS CORP.

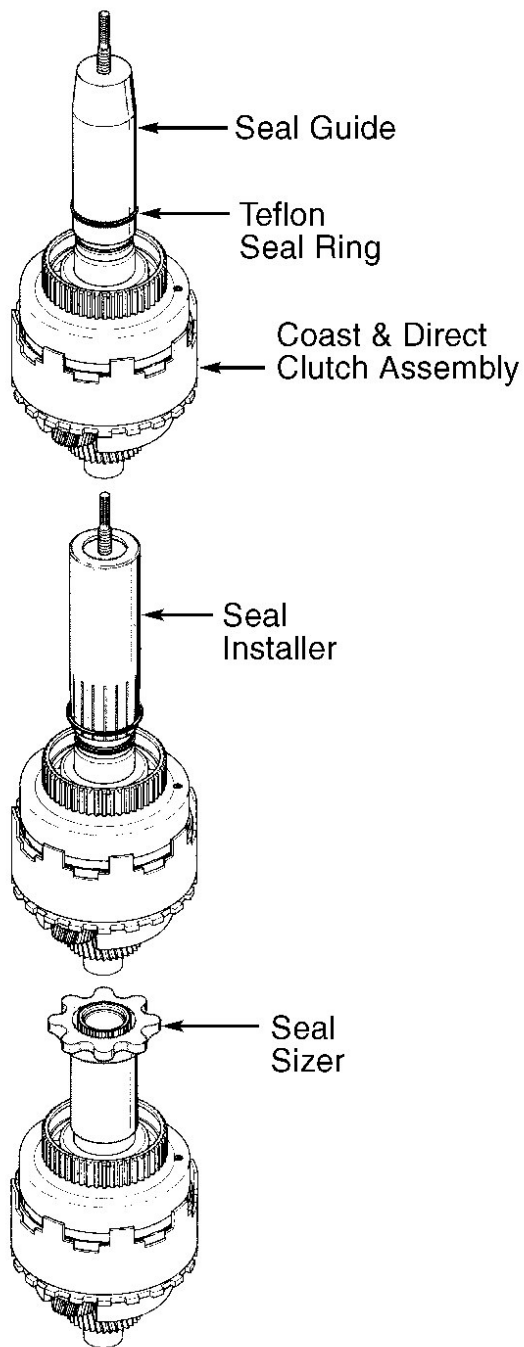
10. Install thrust bearing onto top of reaction carrier shaft and shell assembly. Install reaction carrier sun gear and shell assembly onto reaction shaft shell. Install reaction carrier assembly onto reaction sun gear.

Rotate reaction carrier assembly to mesh sun gear with pinion gears.

11. Install reaction carrier assembly-to-input sun gear thrust bearing onto reaction carrier assembly. Install input sun gear onto input sun gear shaft. Install input sun gear snap ring onto input sun gear shaft.
12. Using Seal Installer (J-41234), install 4 NEW Teflon seals onto input shaft. Install seal closest to housing first. Coat seal installer with transaxle fluid. Slide seal installer over input shaft and position at seal groove. Guide NEW seal onto seal installer and slide seal into groove. See **Fig. 30**.
13. After all seals are installed, use Seal Sizer Tool (J-41234-4) to size seals. Leave tool in place for at least 5 minutes. If possible, leave tool in place until assembly is ready to be installed in transaxle case.
14. Air check coast clutch and direct clutch to ensure proper operation of seals and clutch assemblies. Apply compressed air to specified location to check component operation. See **Fig. 31**. If clutch assemblies do not operate properly, check component installation.
15. Install coast clutch, direct clutch and reaction carrier assembly into transaxle case. Measure clutch assembly end play. Place gauge block across machined surface of transaxle case. See **Fig. 32**. Measure distance between top of coast and direct clutch housing and machined surface of transaxle case (Dimension "A"). Choose correct selective thrust washer. See **SELECTIVE THRUST WASHER IDENTIFICATION**.
16. Install selective thrust washer onto top of input housing. Tab on thrust washer must be located in recessed area for retainer and ball assembly. Install thrust bearing over input shaft and onto top of selective thrust washer.

SELECTIVE THRUST WASHER IDENTIFICATION

Dimension "A": In. (mm)	Washer Color	Washer Thickness In. (mm)
3.95-3.96 (100.40-100.70)	Brown	.059-.063 (1.50-1.60)
3.96-3.98 (100.70-100.99)	Gray	.070-.075 (1.80-1.90)
3.98-3.99 (100.99-101.29)	Natural	.082-.086 (2.09-2.19)
3.99-4.00 (101.29-101.59)	Black	.094-.098 (2.39-2.49)
4.00-4.01 (101.59-101.88)	Orange	.106-.109 (2.68-2.78)
4.01-4.02 (101.88-102.18)	Violet	.117-.121 (2.98-3.08)
4.02-4.03 (102.18-102.48)	Yellow	.129-.133 (3.28-3.38)
4.03-4.05 (102.48-102.77)	Red	.141-.145 (3.57-3.67)
4.05-4.06 (102.77-103.07)	Green	.152-.156 (3.87-3.97)



G96B04032

Fig. 30: Installing Input Shaft Teflon Seal Rings
Courtesy of GENERAL MOTORS CORP.

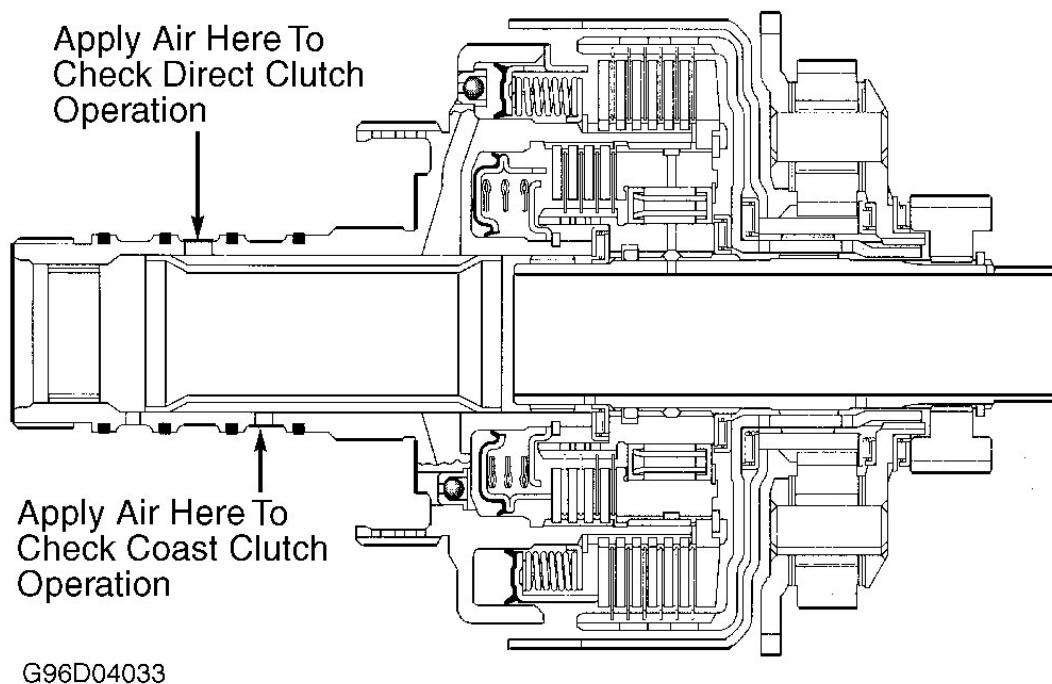


Fig. 31: Checking Coast & Direct Clutch Operation
Courtesy of GENERAL MOTORS CORP.

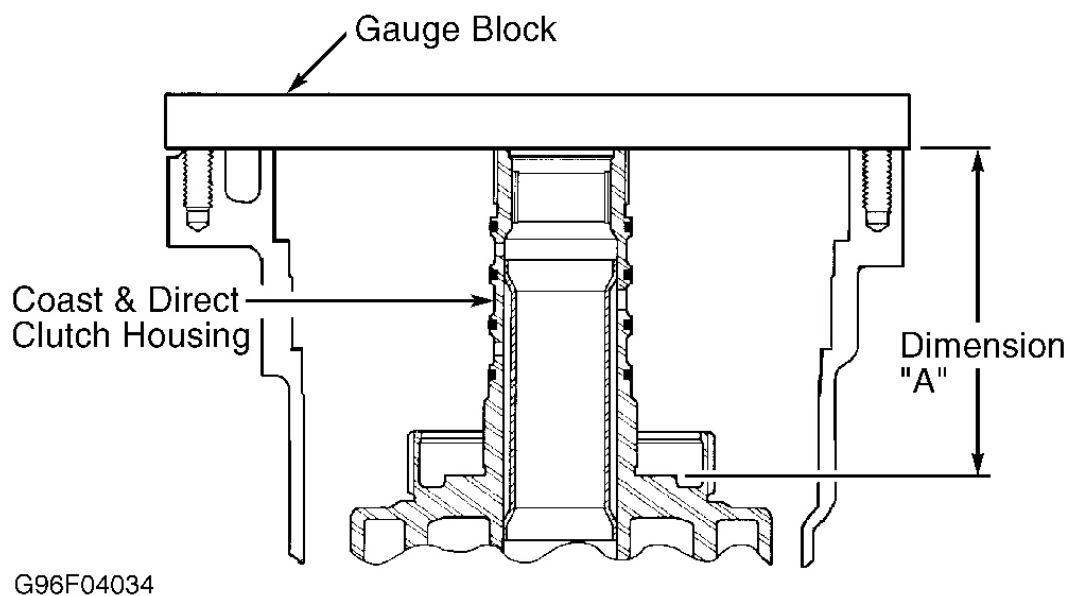


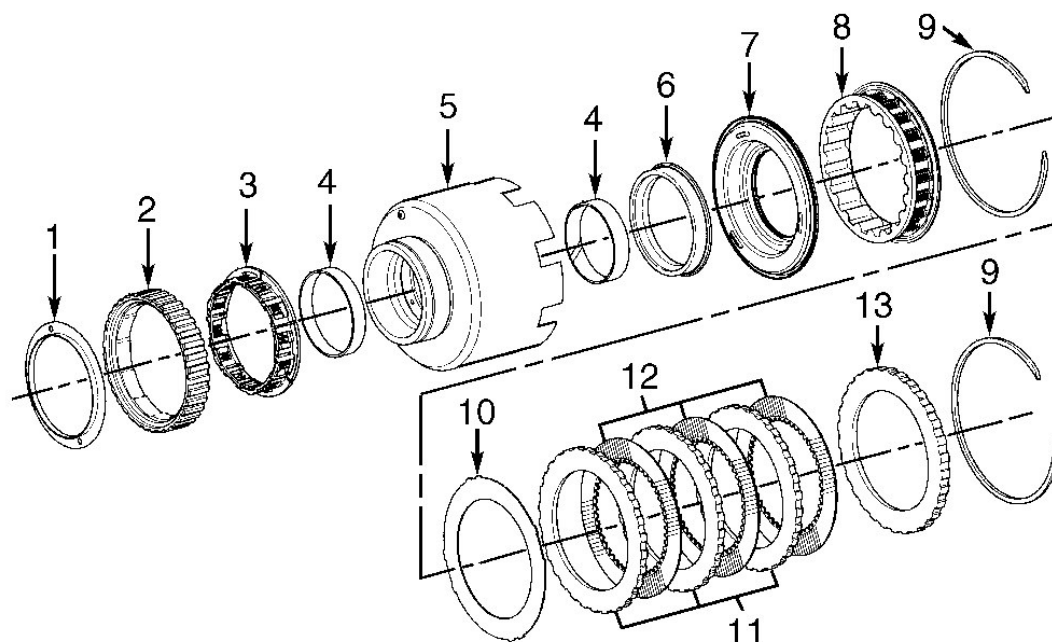
Fig. 32: Measuring Clutch Assembly End Play

Courtesy of GENERAL MOTORS CORP.

REVERSE INPUT CLUTCH & 2ND ROLLER CLUTCH ASSEMBLY

Disassembly

1. Remove reverse clutch snap ring. Remove reverse clutch selective backing plate, 3 steel plates, 3 friction plates and waved plate. Using Spring Compressor (J-41232), compress reverse clutch spring and retainer assembly. Remove snap ring and spring compressor. Remove reverse clutch spring and retainer assembly. Remove reverse clutch piston assembly.
2. Inspect reverse clutch inner seal for damage. **DO NOT** remove seal assembly if seal is not damaged. If seal is damaged, place Disc (J-41097) on inner hub of clutch housing. Use Puller (J-25031-A) to remove seal.
3. Remove 2nd roller clutch and roller clutch retainer by prying up on roller clutch assembly with 2 screwdrivers. **DO NOT** score roller clutch inner race with screwdrivers. The 2nd roller clutch retainer is pressed onto reverse clutch housing and is not reusable after being removed. Remove 2nd roller clutch assembly from inside of roller clutch cam. See **Fig. 33**.



- | | |
|--|--|
| 1. 2nd Roller Clutch Retainer | 8. Reverse Clutch Spring & Retainer Assembly |
| 2. 2nd Roller Clutch Cam | 9. Snap Ring |
| 3. 2nd Roller Clutch Assembly | 10. Reverse Clutch Waved Plate |
| 4. Reverse Clutch Bushing | 11. Reverse Clutch Steel Plates |
| 5. Reverse Clutch Housing | 12. Reverse Clutch Friction Plates |
| 6. Reverse Clutch Retainer & Seal Assembly | 13. Reverse Clutch Selective Backing Plate |
| 7. Reverse Clutch Piston Assembly | |

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Fig. 33: Exploded View Of Reverse Input Clutch & 2nd Roller Clutch Assembly
 Courtesy of GENERAL MOTORS CORP.

Inspection

Check reverse clutch housing for excessive band wear and damaged splines. Check retainer and ball assembly for clogging or damage. Ensure fluid feed holes are not plugged. Check bushings and roller clutch for excessive wear. Check spring assembly for dislocated or damaged springs. Clean all parts and dry with compressed air.

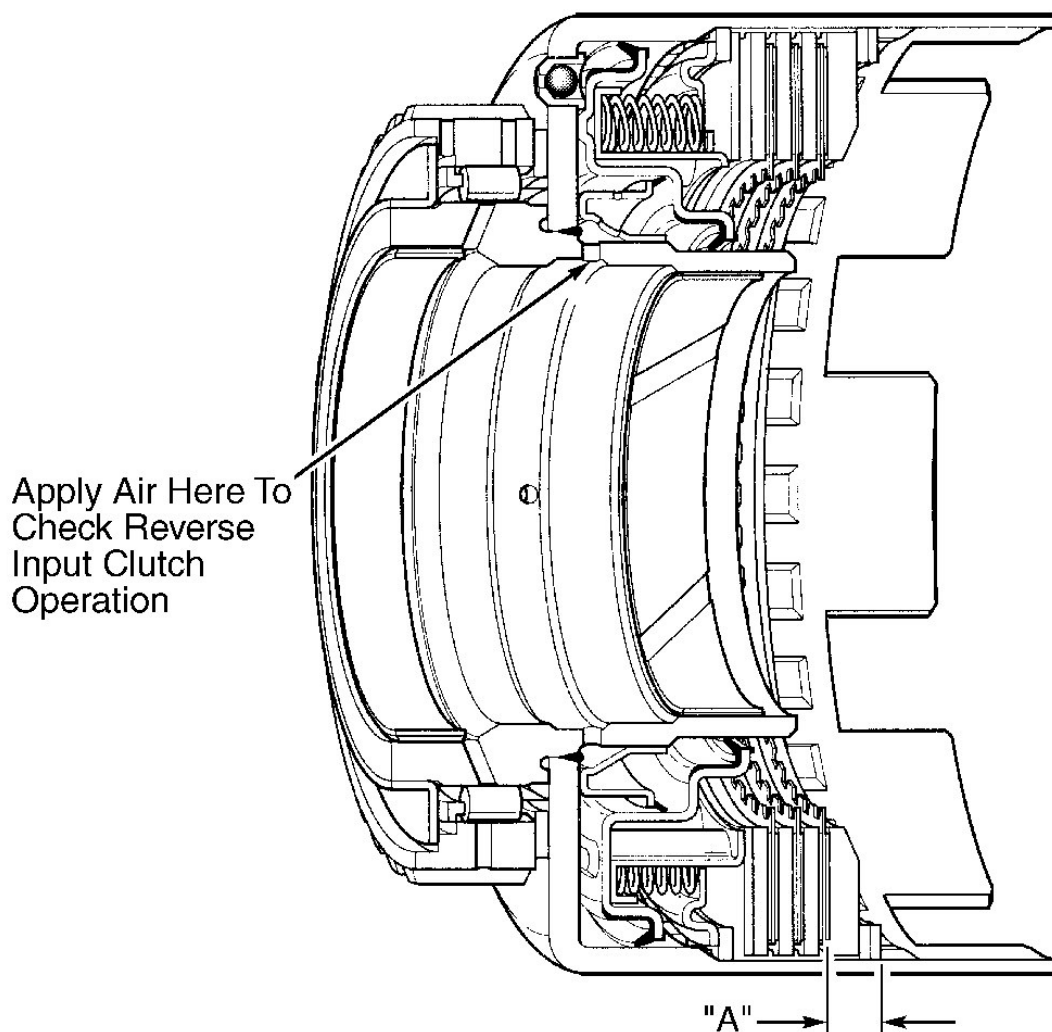
Reassembly

1. Install NEW reverse clutch inner seal assembly using arbor press and Seal Installer (J-41233) if seal was removed or damaged. Install reverse clutch piston assembly. Lubricate seal with transaxle fluid prior to installation. Install reverse clutch spring and retainer assembly with smaller outside diameter facing down.

2. Compress reverse clutch spring and retainer assembly and install snap ring. Install reverse clutch plates into clutch housing. Install waved plate, then alternate between steel plates and NEW friction plates.
3. Measure distance between top of snap ring groove and top friction plate (Dimension "A"). See **Fig. 34** . Select appropriate backing plate. See **BACKING PLATE IDENTIFICATION** . Backing plate identification letter is stamped on beveled side of backing plate. Install appropriate reverse clutch backing plate with beveled side facing up. Install snap ring in reverse clutch housing to retain reverse clutch plates.

BACKING PLATE IDENTIFICATION

Backing Plate ID Letter	Dimension "A"
A	.35-.37 (8.97-9.43)
B	.37-.39 (9.43-10.00)
C	.39-.41 (10.00-10.47)



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Fig. 34: Measuring Selective Backing Plate Dimension & Checking Reverse Input Clutch Operation
 Courtesy of GENERAL MOTORS CORP.

4. Air check reverse clutch assembly to ensure proper operation of seals and clutch assembly. Apply 40 psi of compressed air to specified location to check component operation. See **Fig. 34** . If clutch assembly does not operate properly, check component installation.
5. Install 2nd roller clutch assembly into roller clutch cam. Install 2nd roller clutch onto reverse clutch housing with flat side of roller clutch cam facing down toward housing. Rotate roller clutch during assembly to properly engage rollers.
6. Ensure roller clutch operates properly. While holding reverse clutch housing, roller clutch cam should only rotate clockwise. See **Fig. 35** . Install NEW 2nd roller clutch retainer onto 2nd roller clutch assembly. Using Installer (J-41235), press retainer and roller clutch assembly into place on reverse clutch housing and roller clutch inner race.

NOTE: Installer (J-41235) is designed to press roller clutch assembly to a specified depth. If 2nd roller clutch is installed too far down onto inner race, roller clutch may not operate properly.

7. Install reverse clutch and 2nd roller clutch assembly into transaxle case. See **Fig. 5**. Tangs on reverse clutch housing spline to tangs on reaction carrier sun gear and shell assembly. Rotate reverse clutch housing during installation to align clutch plates. Install reverse clutch thrust washer onto top of 2nd roller clutch with tabs facing down onto housing.

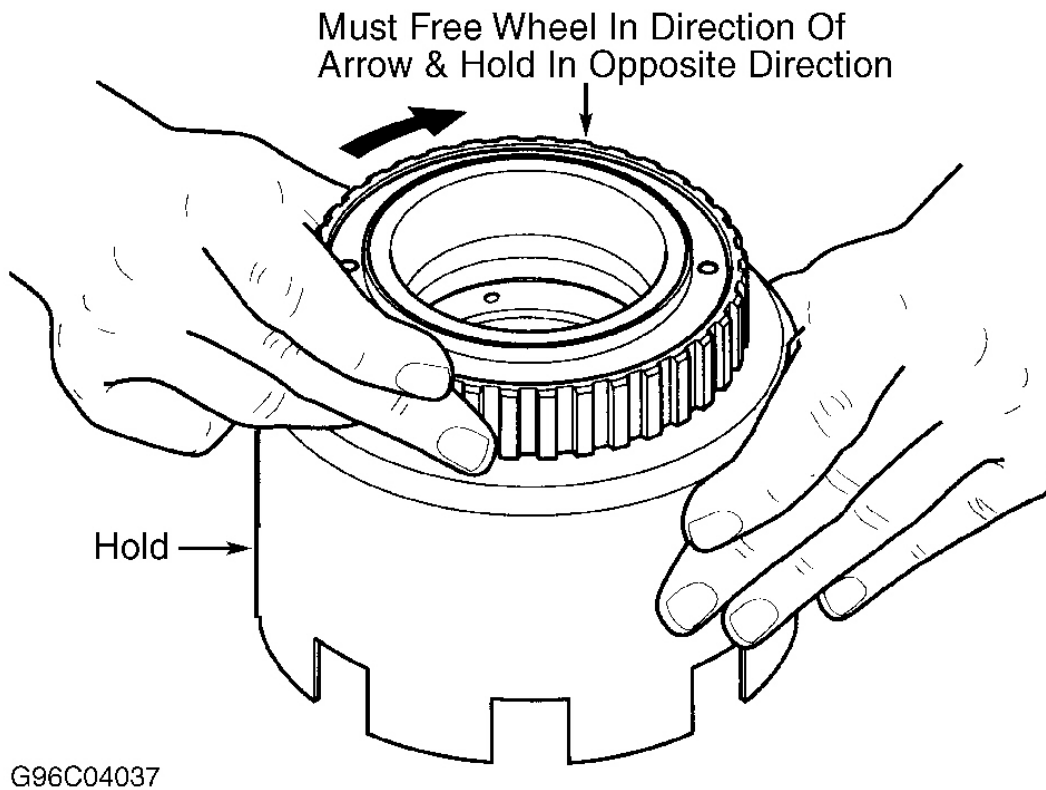


Fig. 35: Checking 2nd Roller Clutch Operation
Courtesy of GENERAL MOTORS CORP.

INTERMEDIATE/4TH BAND

Reassembly

Install NEW intermediate/4th band into transaxle case. See **Fig. 5**. Ensure band is positioned properly by inserting screwdriver through intermediate/4th servo bore. Screwdriver should press on servo pin rest and compress band around reverse clutch housing.

2ND CLUTCH PLATES

Inspection

Check clutch plates for excessive wear and replace as necessary. Clean parts and dry with compressed air.

Reassembly

Install 2nd clutch backing plate with flat side facing up. Install 2nd clutch plates into transaxle case. See **Fig. 14** . Install NEW friction plate and alternate between friction plates and steel plates. Install 2nd clutch waved plate.

DRIVE SPROCKET SUPPORT ASSEMBLY**Disassembly**

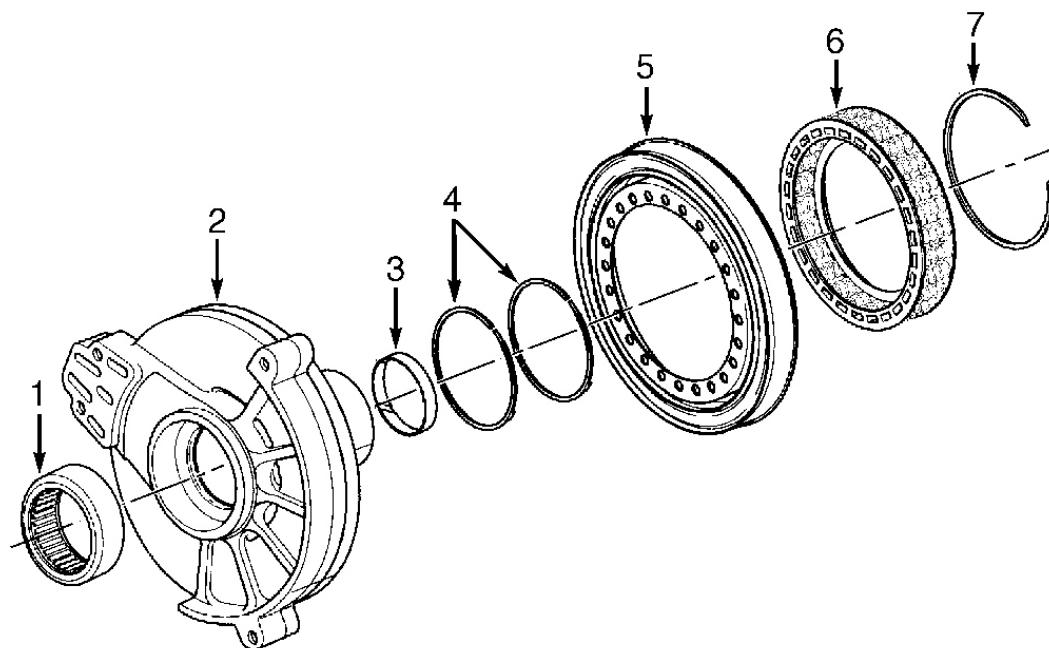
Remove and discard 2 seal rings. Using Spring Compressor (J-41232), compress 2nd clutch spring assembly and remove retaining ring. Remove spring compressor and 2nd clutch spring assembly. Remove 2nd clutch piston and seal assembly. See **Fig. 36** . Piston and seal assembly are reusable if not damaged.

Inspection

Check piston and seal assembly for damage. If seal is damaged, replace piston and seal assembly. Check bushing and bearing for excessive wear or damage. Check driven sprocket support for plugged feed holes, damaged seal grooves, stripped bolt holes or damaged machined surfaces. Check for dislocated or damaged springs. Clean all parts and dry with compressed air.

Reassembly

1. Install 2nd clutch piston and seal assembly into driven sprocket support. Lubricate seal with transaxle fluid prior to installation. Install 2nd clutch spring assembly into driven sprocket support.
2. Compress 2nd clutch spring assembly and install retaining ring. Install 2 NEW seal rings onto driven sprocket support. Air check 2nd clutch to ensure proper operation. Apply compressed air to 2nd clutch fluid circuit. See **Fig. 37** . If clutch assembly does not operate properly, check component installation.
3. Install driven sprocket support and 2nd clutch assembly into transaxle case. When installed properly, driven sprocket support will sit slightly below machined surface of transaxle case.



- | | |
|------------------------------------|-------------------------------|
| 1. Driven Sprocket Support Bearing | 5. 2nd Clutch Piston Assembly |
| 2. Driven Sprocket Support | 6. 2nd Clutch Spring Assembly |
| 3. Driven Sprocket Support Bushing | 7. Spring Retaining Ring |
| 4. Oil Seal Rings | |

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Fig. 36: Exploded View Of Drive Sprocket Support & 2nd Clutch
Courtesy of GENERAL MOTORS CORP.

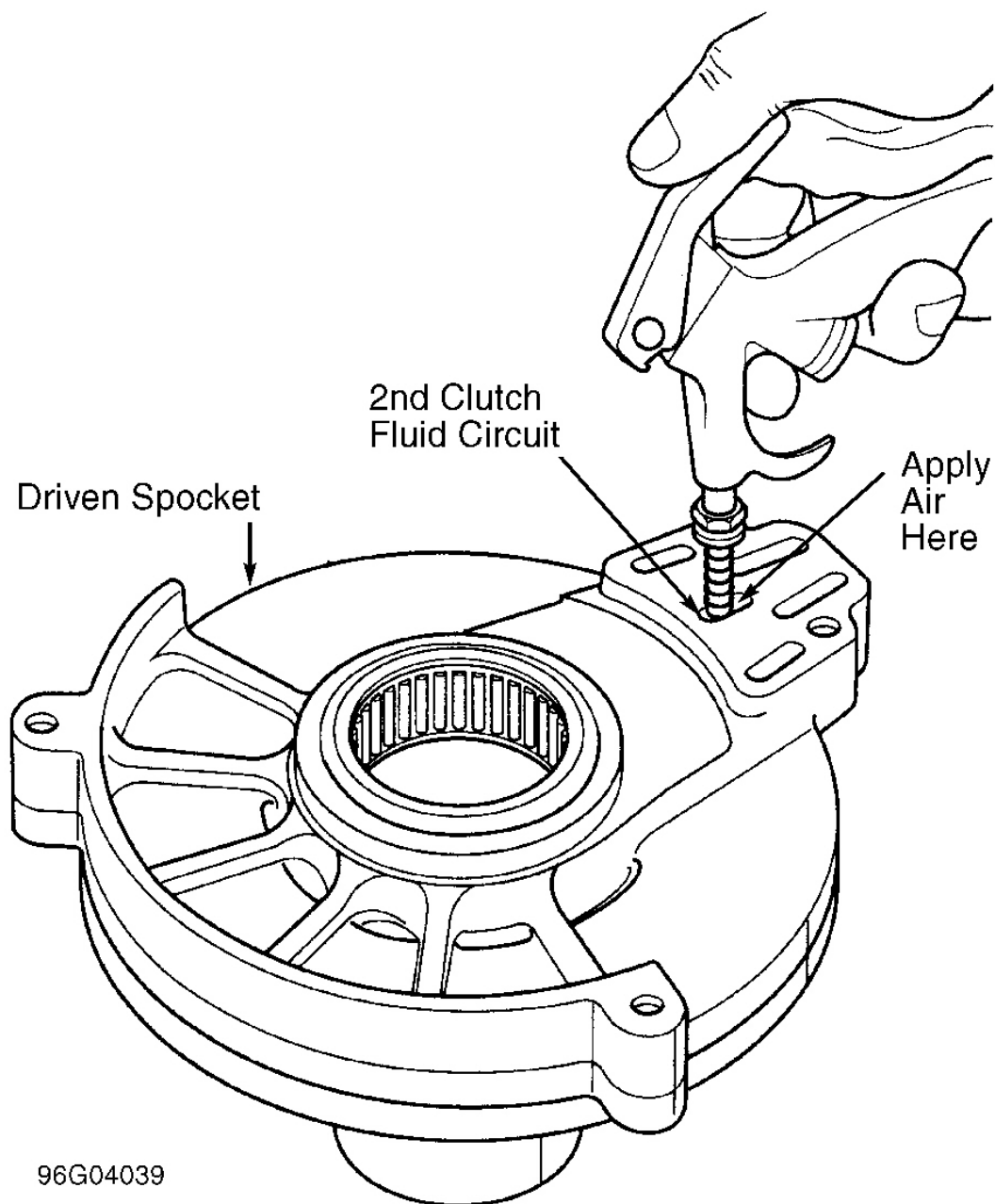


Fig. 37: Checking 2nd Clutch Operation
Courtesy of GENERAL MOTORS CORP.

INPUT SPEED SENSOR & WIRING HARNESS

Reassembly

1. Install input speed sensor into transaxle case. Tab on sensor housing fits into recess on transaxle case boss. Position of input speed sensor depends on number of teeth on drive sprocket. Number of teeth varies depending on model. See **Fig. 12** .
2. Drive sprockets with 32 or 33 teeth have speed sensor connector facing bottom pan. Drive sprockets with 35 teeth have speed sensor connector facing oil fill/vent cap. Install input speed sensor bolt and tighten to specification. See **TORQUE SPECIFICATIONS** .
3. Inspect wiring, "O" ring seal and pass-thru connector pins for damage. Install wire harness pass-thru connector into transaxle case bore from inside of transaxle case. Route input speed sensor wire harness in case channel. Install wire harness retainer and bolt. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** . Connect input speed sensor connector to speed sensor.

DRIVE & DRIVEN SPROCKETS & DRIVE LINK ASSEMBLY

Disassembly

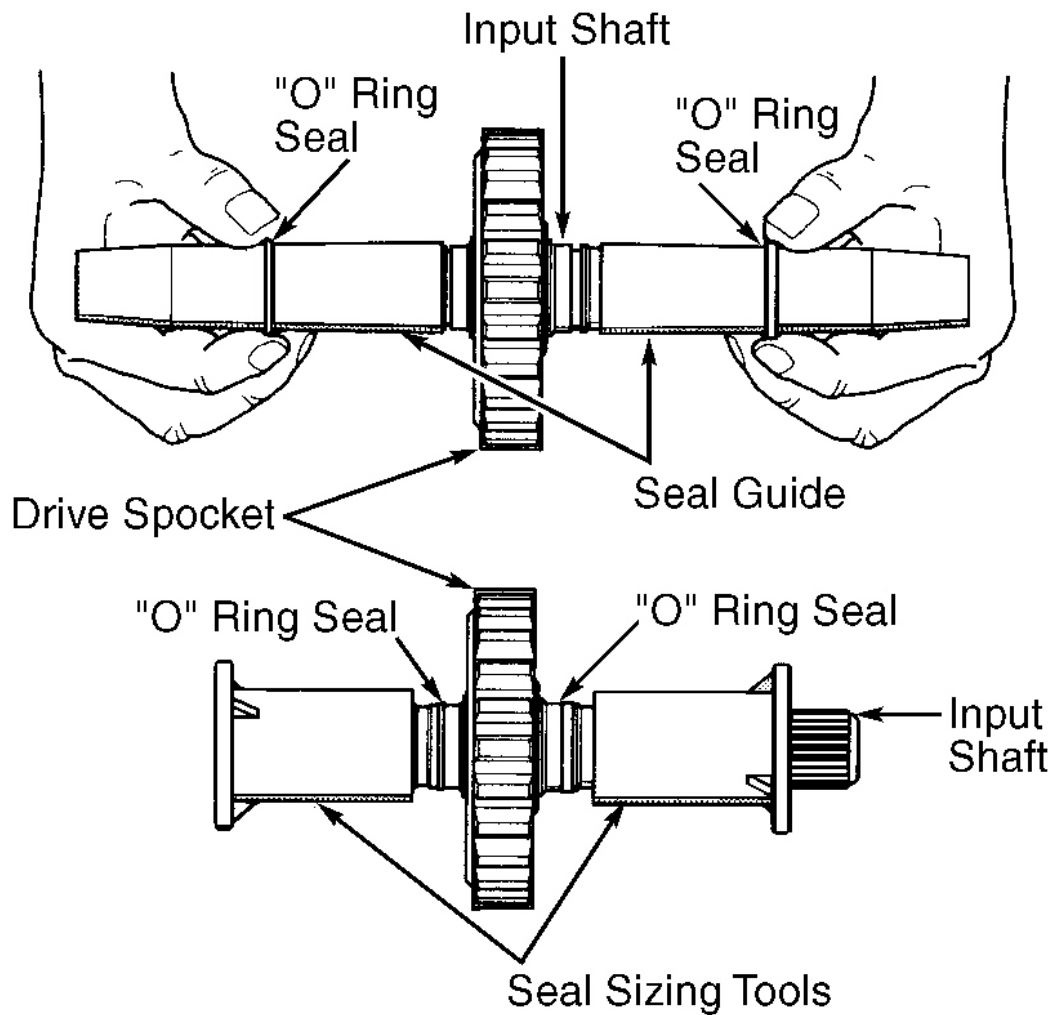
Remove input shaft-to-drive sprocket snap ring. Remove drive sprocket from input shaft. Remove 3 Teflon seals from input shaft. See **Fig. 5** . Seals are not reusable and should be discarded.

Inspection

Check drive sprocket, driven sprocket, drive link assembly, thrust washers and input shaft for excessive wear or damage. Check seal grooves for damage. Clean all parts and dry with compressed air.

Reassembly

1. Using Seal Installer Tools (J-29829) for channel plate seals and (J-29569) for drive sprocket support seal, install 3 NEW Teflon seals onto input shaft. Slide Seal Guides (J-29829-1 and J-29569-1) over input shaft and coat with transaxle fluid. See **Fig. 38** .
2. Guide seals over seal guides and into seal grooves on input shaft. Remove seal guides. Using Seal Sizing Tools (J-29829-2 and J-29569-2), size seals to input shaft. Allow seal sizer to remain in place for 5 minutes to properly size seals.
3. Install drive sprocket onto input shaft. Retain drive sprocket to input shaft using snap ring. Coat thrust washer with petroleum jelly. Install drive sprocket-to-drive sprocket support thrust washer to drive sprocket. Position tabs on thrust washer into holes on drive sprocket.
4. Install driven sprocket-to-driven sprocket support thrust washer onto driven sprocket support. Install drive link assembly to drive and driven sprockets. Position drive link assembly in same direction as removed. If drive link assembly is NEW, it can be installed in either direction. Install drive sprocket, driven sprocket and drive link assembly onto transaxle as a complete assembly. See **Fig. 11** .



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Fig. 38: Installing Input Shaft Teflon Seals
Courtesy of GENERAL MOTORS CORP.

CHANNEL PLATE ASSEMBLY

Disassembly

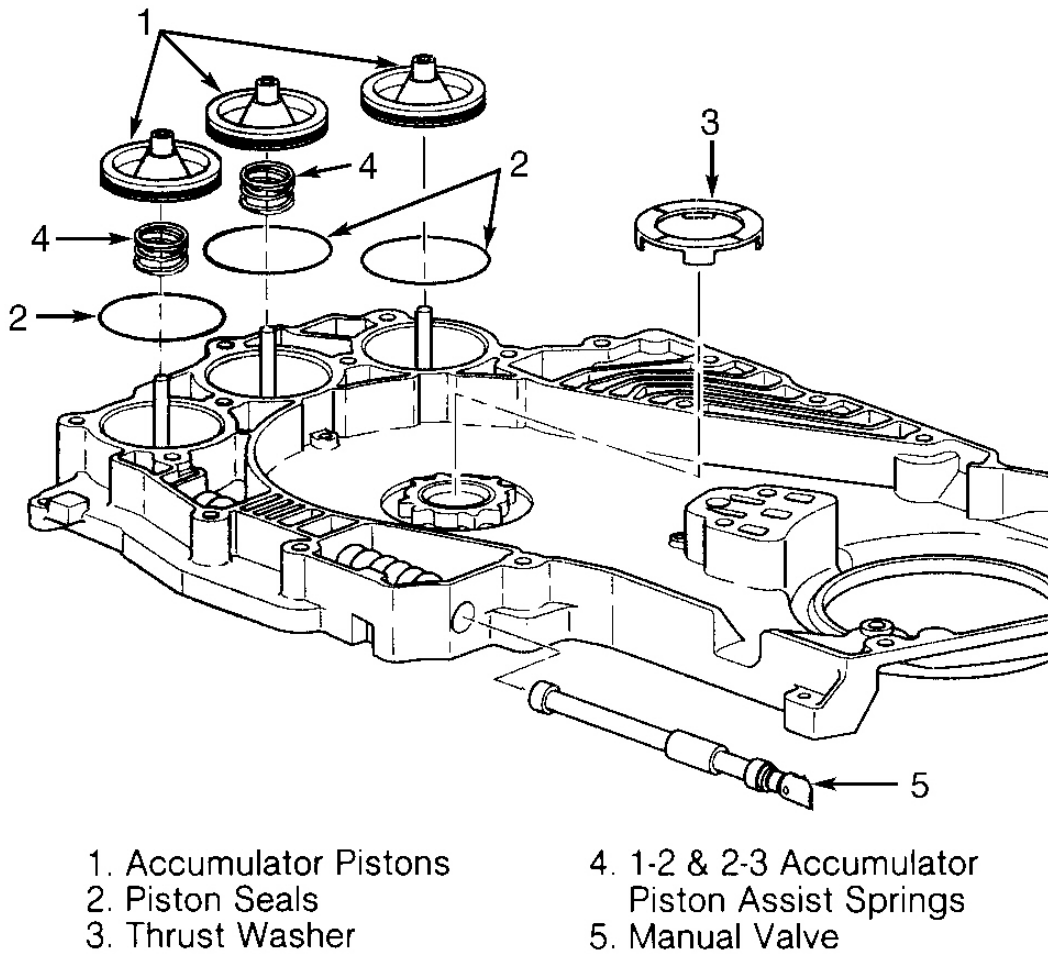
Remove 3 accumulator pistons from channel plate. Accumulator pins are pressed into channel plate and should not be removed. Remove 1-2 and 2-3 accumulator assist springs. Remove and discard seals from the accumulator pistons. Remove manual valve from channel plate. See [Fig. 39](#).

Inspection

Check channel plate for plugged passages or damage. Check accumulator assist springs, pistons and pins for damage. Check channel plate sleeve for input shaft wear. Check surfaces for nicks or scratches which could cause fluid leaks. Check manual valve for free movement. Clean all parts and dry with compressed air.

Reassembly

1. Install 3 NEW accumulator piston seals. Install 1-2 and 2-3 accumulator assist springs. Coat piston seals with petroleum jelly. Install accumulator pistons into channel plate over guide pins. Pistons are identical and can be assembled in any of 3 accumulator bores.
2. Install 3 accumulator springs into transaxle case accumulator bores. See **Fig. 9** . The 1-2 accumulator spring is slightly taller than other 2 springs and is installed in bore closest to electrical pass-thru connector.
3. Coat channel plate thrust washer with petroleum jelly. Install channel plate-to-drive sprocket thrust washer onto channel plate. Install NEW channel plate-to-transaxle case gasket. Install channel plate assembly onto transaxle case. Channel plate should fit tightly over guide pins located on transaxle case.
4. Install 8 channel plate-to-transaxle case bolts, and 2 channel plate-to-driven sprocket support bolts. Tighten 2 bolts located at 1 o'clock and 5 o'clock positions near axle shaft seal to 10.5 ft. lbs. (14 N.m). Tighten all other bolts to 106 INCH lbs. (12 N.m). See **Fig. 6** .
5. Install manual valve into channel plate. Connect manual valve link to both manual valve and detent lever. Install manual valve clip onto manual valve. See **Fig. 8** .



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Fig. 39: Removing & Installing Accumulator Pistons
Courtesy of GENERAL MOTORS CORP.

CHECK BALLS, SPACER PLATE & GASKETS

Inspection

Check spacer plate and spacer plate filter for damage or debris. Clean all parts and dry with compressed air.

Reassembly

Install 7 check balls into correct locations on channel plate. See **Fig. 7** . Install NEW spacer plate-to-channel plate gasket onto channel plate. Install spacer plate on top of gasket and channel plate. Install the spacer plate support and the 2 bolts onto spacer plate. See **Fig. 6** . Tighten retaining bolts to specification. Refer to the **TORQUE SPECIFICATIONS** .

CONTROL VALVE ASSEMBLY

NOTE: Each valve is held in control valve body by a retainer clip. Clip can be removed using screwdriver. Use care not to score valve body when removing clips and valves. Ensure each valve moves freely in valve body bore prior to disassembly.

Disassembly

Thoroughly clean valve body and dry with compressed air. Remove valve body components noting location of each component. Lay components on a clean surface in order removed. Remove the actuator oil filter and electrical solenoids noting component location. See **Fig. 40**.

Inspection

Check valve body passages for debris and machined surfaces for nicks or scratches. Check valves for nicks or scratches which may result in valves sticking or fluid leaks. Check springs, bushings, "O" rings and solenoids for damage. Clean all components and dry with compressed air. **NEVER** use shop towels to clean valve body components.

Reassembly

1. Reassemble control valve assembly in reverse order of disassembly. Lightly coat valves in transaxle fluid prior to installation. Install control valve assembly-to-spacer plate gasket onto spacer plate. Install control valve assembly onto transaxle case.
2. Check pressure switch assembly to ensure condition and location of "O" rings. Install pressure switch assembly onto control valve assembly. Install 18 control valve assembly bolts. See **Fig. 6**. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**.
3. Connect wiring harness to pressure switch assembly, pressure control solenoid (Red connector), 1-2 shift solenoid (Red and Light Green wires) 2-3 shift solenoid (Red and Yellow wires) and TCC solenoid. See **Fig. 6**.

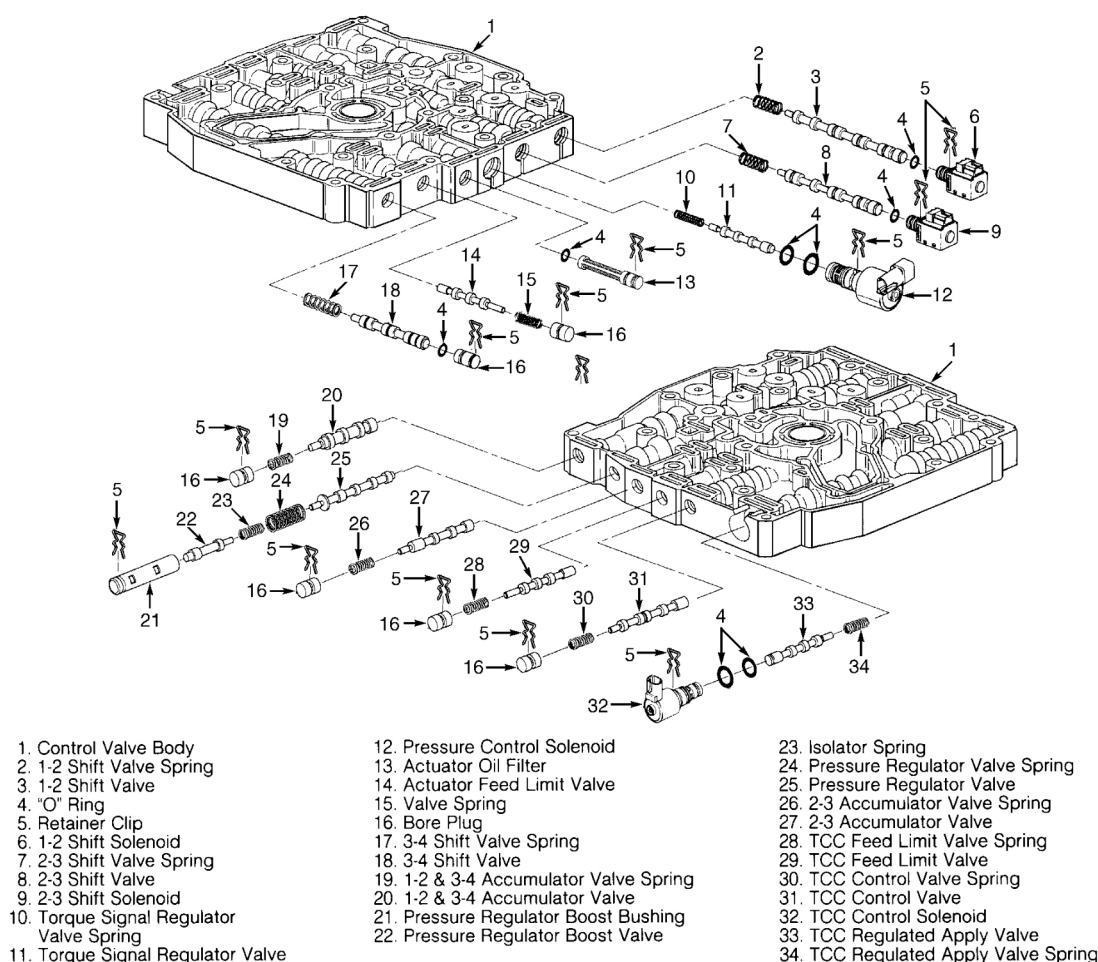


Fig. 40: Exploded View Of Control Valve Assembly
Courtesy of GENERAL MOTORS CORP.

OIL PUMP ASSEMBLY

Disassembly

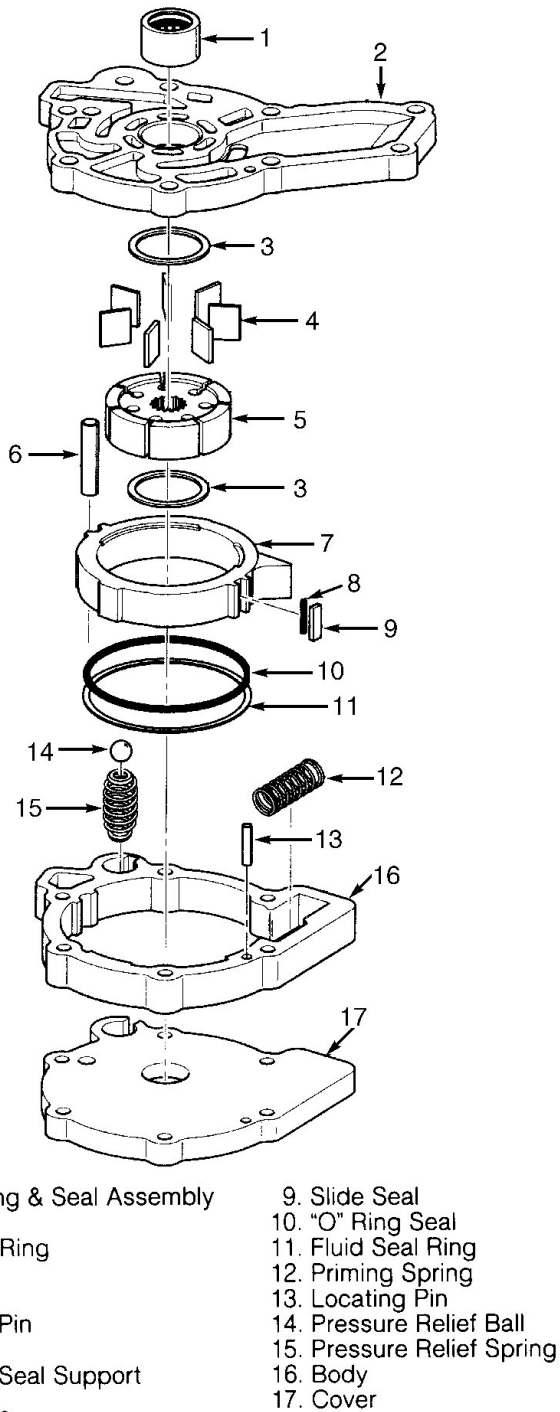
Oil pump is serviceable as a complete assembly only. Oil pump assembly should not be disassembled. Exploded view of oil pump assembly is provided for reference only. See **Fig. 41**.

Inspection

Check bearing on flange for excessive wear or damage. Check machined surfaces for scratches or nicks which may cause fluid leaks. Thoroughly flush oil pump assembly with clean transaxle fluid through pump inlet and outlet passages. While flushing pump, use oil pump drive shaft to rotate oil pump rotor. Allow excess fluid to drain from oil pump assembly.

Reassembly

Install oil pump shaft into control valve assembly. Install oil pump assembly onto oil pump shaft and control valve assembly. Rotate oil pump shaft during assembly to engage shaft splines to pump rotor splines. Install 8 oil pump bolts and tighten to specification. See **Fig. 6** . See **TORQUE SPECIFICATIONS** .



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Fig. 41: Exploded View Of Oil Pump Assembly

Courtesy of GENERAL MOTORS CORP.

TRANSAXLE SIDE COVER & GASKETS

Disassembly

Using hammer handle, remove side cover axle seal. **DO NOT** score or damage side cover bore.

Inspection

Check side cover for cracks or damage to seal grooves and mounting bosses. Check side cover gasket for damage. Gaskets are reusable if not damaged. During initial assembly, side cover gaskets are glued into place. Thoroughly clean side cover and gaskets prior to reassembly. Clean and dry gasket grooves and axle shaft bore.

Reassembly

Install side cover gaskets into grooves on side cover. Secure gaskets in place using petroleum jelly. Install side cover-to-driven sprocket thrust washer onto side cover. Secure thrust washer in place using petroleum jelly. Install side cover assembly onto transaxle case. See **Fig. 5** . Install 9 side cover bolts and one stud. Install stud at bolt hole to left of oil fill/vent cap. See **Fig. 1** . Tighten bolts and stud to specification. See **TORQUE SPECIFICATIONS** .

OUTPUT SHAFT & SLEEVE ASSEMBLY

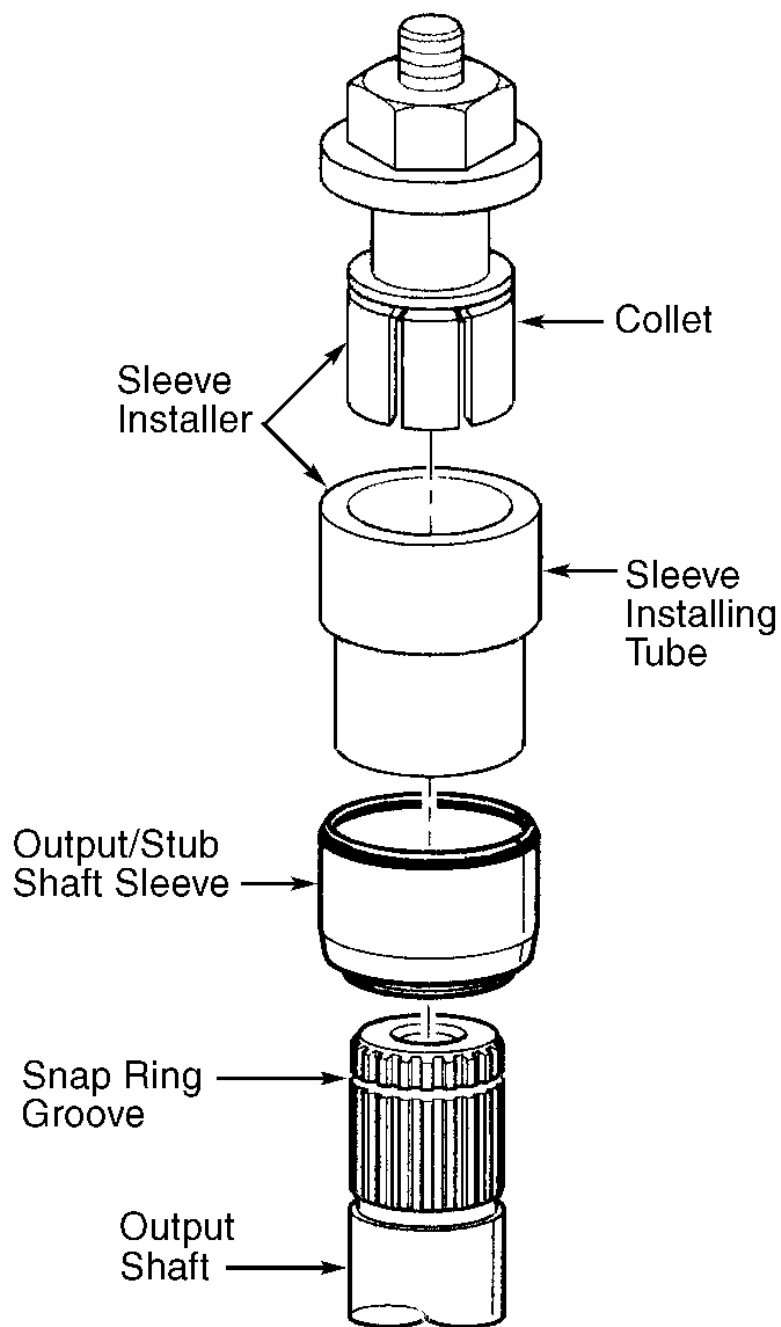
Inspection

Check output shaft for damage to splines, snap ring grooves and journals. Clean output shaft and dry with compressed air.

NOTE: **Sleeve Installer (J-41228) must be used to install sleeve onto output and stub shafts. Fluid leak may occur if installer is not used.**

Reassembly

1. Place sleeve over end of output shaft. Install collet into output shaft snap ring groove with collet attached to threaded collet shaft. See **Fig. 42** . Position sleeve installing tube over collet with small outside diameter of tube fitting securely into sleeve.
2. Install bearing and nut onto threaded collet shaft. Hold end of threaded collet shaft while tightening nut. This will move installing tube and press sleeve onto output shaft.
3. Install 2 NEW snap rings into output shaft snap ring grooves. **DO NOT** over extend snap rings during installation. Install output shaft and sleeve assembly into transaxle case. Use a mallet to install shaft through final drive differential gear.



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Fig. 42: Installing Output Shaft Sleeve
Courtesy of GENERAL MOTORS CORP.

LEFT & RIGHT AXLE SEALS

NOTE: Seal Installer (J-41102) must be used to install axle seals. Installer sets seal depth during installation.

Reassembly

Using Seal Installer (J-41102), install NEW axle seal into side cover (left seal) or transaxle case (right seal). See **Fig. 43** . Lubricate splines of output shaft to prevent damage to shaft during vehicle operation.

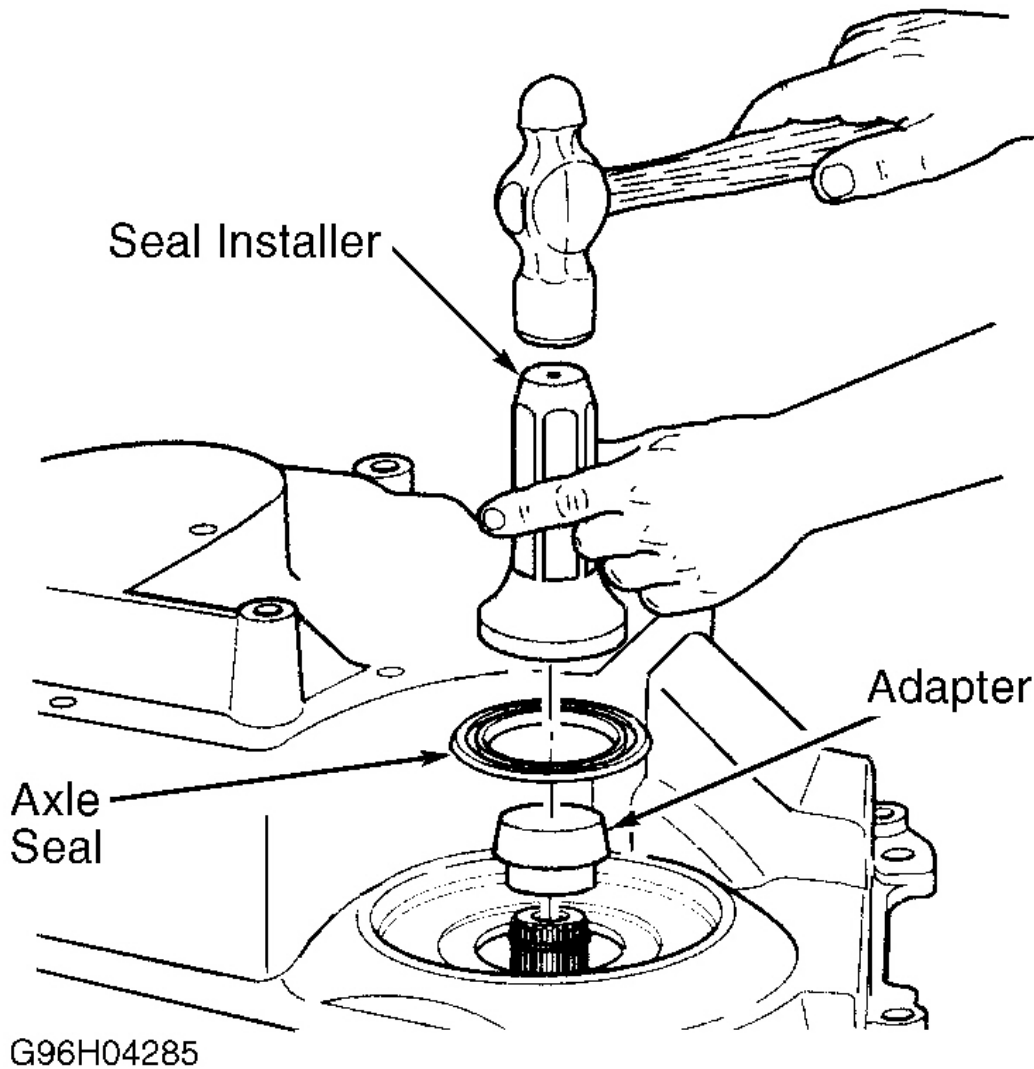


Fig. 43: Installing Left Axle Seal (Right Axle Seal Is Similar)
Courtesy of GENERAL MOTORS CORP.

STUB SHAFT & SLEEVE ASSEMBLY

Inspection

Check stub shaft for damage to splines, snap ring grooves and journals. Check sleeve for excessive wear, scratches or nicks which may cause a fluid leak or damage to seal. If sleeve appears damaged, replace using procedure for output shaft. For further details, see **OUTPUT SHAFT & SLEEVE ASSEMBLY** . Clean stub shaft and dry with compressed air.

Reassembly

Install 2 NEW snap rings on stub shaft. Snap rings are not reusable once shaft is removed. Install stub shaft into transaxle. Use a mallet to install shaft through final drive differential gear.

OUTPUT SPEED SENSOR**Inspection & Reassembly**

Check vehicle speed sensor for damage to sensor or electrical connector. Install NEW "O" ring on speed sensor. Install speed sensor into transaxle case. See **Fig. 5** . Install speed sensor stud and tighten to specification. See **TORQUE SPECIFICATIONS** .

INTERMEDIATE/4TH & LOW & REVERSE SERVOS**Disassembly**

Remove piston and pin assembly from servo cover. Remove snap ring from servo pin. Remove piston and servo cushion springs from servo pin. See **Fig. 5** . Remove and discard servo piston seals (outer seal from piston and inner seal from cover).

Inspection

Check all components for damage. Ensure fluid feed holes are not plugged. Check seal grooves for damage. Clean all parts and dry with compressed air.

Reassembly

1. Install servo cushion springs and servo piston onto servo pin. Retain spring and piston by installing snap ring onto servo pin. Install NEW seals onto servo piston and seal cover. Install servo piston assembly into servo cover. Lubricate piston seals with transaxle fluid prior to installation.
2. Install servo return spring onto transaxle case. Install servo cover and piston assembly over servo return spring. Install 3 servo cover bolts. Tighten bolts to specification. For details, see **TORQUE SPECIFICATIONS** .

OIL FEED TUBES**Inspection**

Check oil feed tubes for plugged passages, bent tubes or cracks. Check oil feed tube seals. Verify proper location of seals. Replace seals only if they are cut, swelled or damaged. Oil feed tube seals are glued into place

during initial assembly. If a seals need replacement, thoroughly clean any residual glue from oil feed tubes. Clean tubes and dry with compressed air.

Reassembly

Install oil feed tube assembly onto transaxle. See **Fig. 5** . Install bolts and tighten to specification. See **TORQUE SPECIFICATIONS** .

OIL FILTER ASSEMBLY & SEAL, & OIL LEVEL CONTROL VALVE**Reassembly**

Using socket (same size as seal), install NEW oil filter seal into transaxle case. Tap gently and evenly on seal to prevent damage to case bore and seal. Install NEW oil filter assembly into filter seal. See **Fig. 5** . It may be necessary to twist filter slightly during installation. Install oil level control valve into transaxle case. Push straight down on center of valve to prevent damage to case bore.

OIL PAN & GASKET**Inspection**

Check oil pan for cracks, dents or damage to gasket sealing surface. Check gasket for cuts or damage. Bottom pan gasket may be reused if it is not damaged. Clean pan and gasket and dry with compressed air.

Reassembly

Install pan gasket and bottom pan onto transaxle case. See **Fig. 5** . Install 12 oil pan bolts and tighten to specification. See **TORQUE SPECIFICATIONS** .

TORQUE CONVERTER ASSEMBLY**Reassembly**

Install NEW input shaft "O" ring on end of input shaft. Install torque converter onto transaxle. Install Torque Converter Holding Fixture (J-21366) to secure converter during transaxle installation.

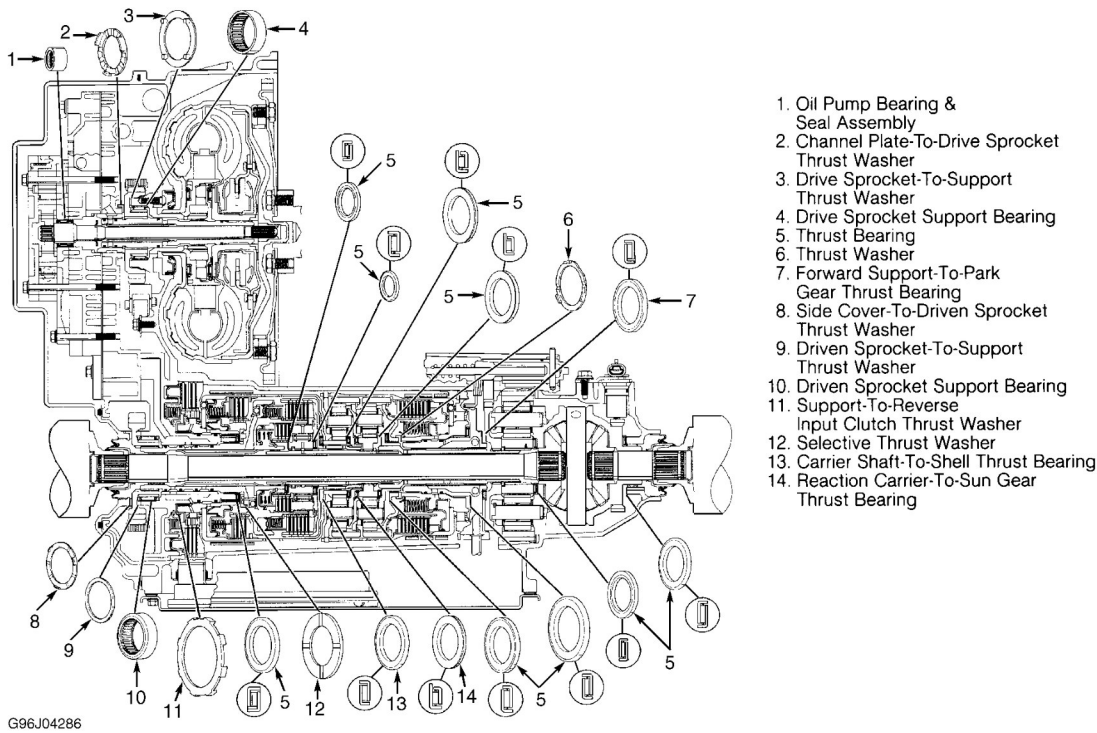


Fig. 44: Identifying 4T40-E Thrust Bearing & Thrust Washer Locations
 Courtesy of GENERAL MOTORS CORP.

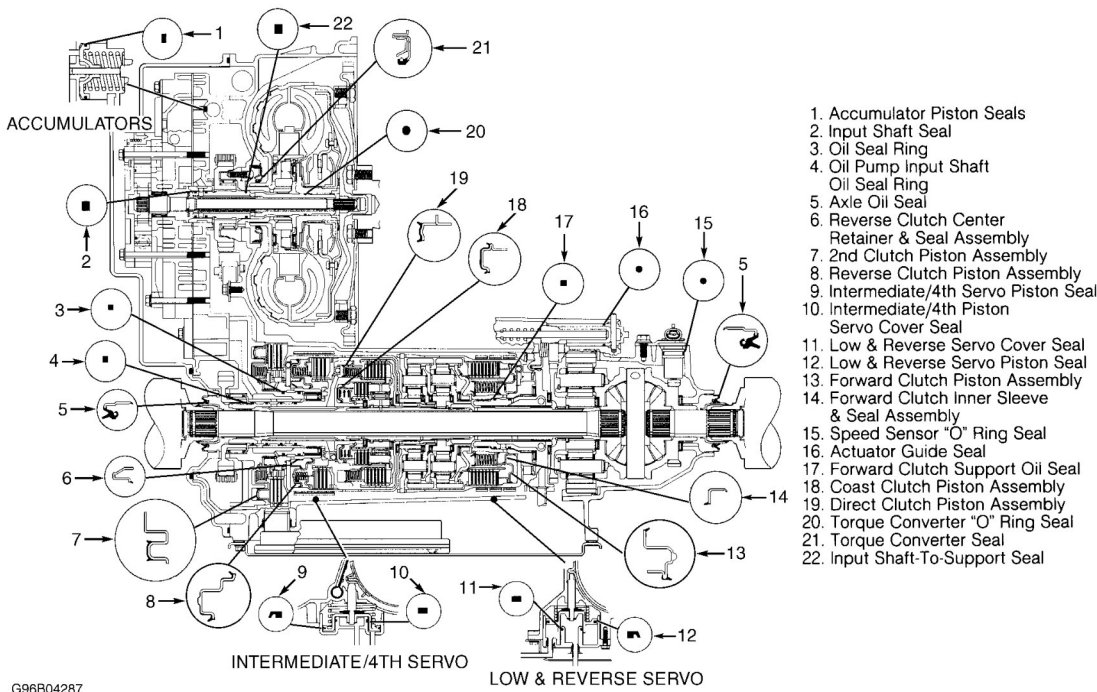


Fig. 45: Identifying 4T40-E Seal Locations & Installation Direction
 Courtesy of GENERAL MOTORS CORP.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Channel Plate Bolts (2) ⁽¹⁾	10.5 (14)
Side Cover Bolts & Stud	15 (20)
Spacer Plate Bolts	10.5 (14)
INCH Lbs. (N.m)	
All Other Channel Plate Bolts	106 (12)
Control Valve Assembly Bolts	106 (12)
Drive Sprocket Attaching Screws	106 (12)
Input Speed Sensor Bolt	106 (12)
Intermediate/4th Servo Cover Bolts	106 (12)
Low & Reverse Servo Cover Bolts	106 (12)
Oil Feed Tube Bolts	106 (12)
Oil Pan Bolts	89 (10)
Oil Pump Bolts	106 (12)
Output Speed Sensor Bolts	106 (12)
(1) Bolts are located at 1 o'clock and 5 o'clock position near axle shaft seal.	

WIRING DIAGRAMS

NOTE: See [AUTO TRANS DIAGNOSIS - HYDRA-MATIC 4T40-E CONTROLS](#) article.