2000-01 AUTOMATIC TRANSMISSIONS

Hydra-Matic 4L30-E Overhaul

APPLICATION

AUTOMATIC TRANSMISSION APPLICATIONS

Application	Transmission Model (RPO Code)
BMW	
Z3 (2.5L & 2.8L)	4L30-E
528i (2.8L)	4L30-E
Cadillac Catera (3.0L)	4L30-E (ML4)
Honda Passport (3.2L)	4L30-E
Isuzu	
Amigo (3.2L)	4L30-E
Rodeo (3.2L)	4L30-E
Trooper (3.5L)	4L30-E
VehiCROSS (3.5L)	4L30-E

IDENTIFICATION

Identification plate is located on side of transmission case. See **Fig. 1**. Identification plate information may be required when ordering replacement components.

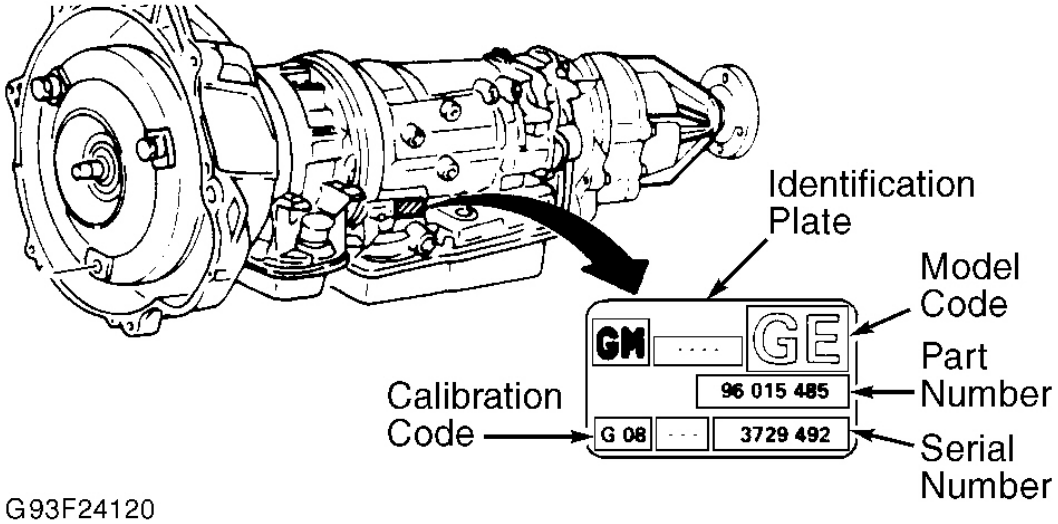


Fig. 1: Locating Transmission Identification Plate

Courtesy of ISUZU MOTOR CO.

GEAR RATIOS

TRANSMISSION GEAR RATIOS

Gear Range	Gear Ratio
1st	2.86:1
2nd	1.62:1
3rd	1.00:1
4th	0.72:1
Reverse	2.00:1

DESCRIPTION & OPERATION

INTRODUCTION

The 4L30-E automatic transmission is electronically controlled, providing 4 forward speeds and Reverse. Transmission uses a gear-type oil pump to supply all hydraulic pressure needed for operation. Transmission consists of a torque converter, 4 clutch assemblies, planetary gears and brake band. See **Fig. 2**.

Transmission shifting and torque converter lock-up are controlled by Powertrain Control Module (PCM) or Transmission Control Module (TCM), depending on model application. The control module receives information from various input devices and uses this information to control shift solenoids, band apply solenoid and Torque Converter Clutch (TCC) solenoid. Control module uses input signals to control force motor solenoid (also referred to as pressure control solenoid) operation, which activates pressure regulator valve for controlling line pressure.

A torque management control system is used to reduce engagement shock caused by a change in vehicle speed during shifting. Control module contains a self-diagnostic system which stores a Diagnostic Trouble Code (DTC) if a specified failure or problem is present in transmission electronic control system. If a DTC has set, transmission light (CHECK TRANS) or Sport Mode Light (STL) on instrument cluster will illuminate. DTC may be retrieved to determine transmission problem area. For additional information on self-diagnostic system, see HYDRA-MATIC 4L30-E ELECTRONIC CONTROLS article.

Transmission is capable of 3 different shift modes. These modes are ECONOMY/NORMAL mode, SPORT/POWER mode and WINTER mode. ECONOMY/NORMAL and SPORT/POWER mode may be selected by pressing SPORT/POWER mode switch. SPORT/POWER mode indicator light will illuminate. WINTER mode may be selected by pressing button mounted on center console, near gearshift lever. Shift modes are used to change transmission shift points for various vehicle operating conditions. See **OPERATING MODES**.

Transmission is equipped with shift lock system. Shift lock system prevents gearshift lever from being moved from Park unless brake pedal is depressed, ignition is on and release button on gearshift lever is depressed.

OPERATING MODES

Economy/Normal

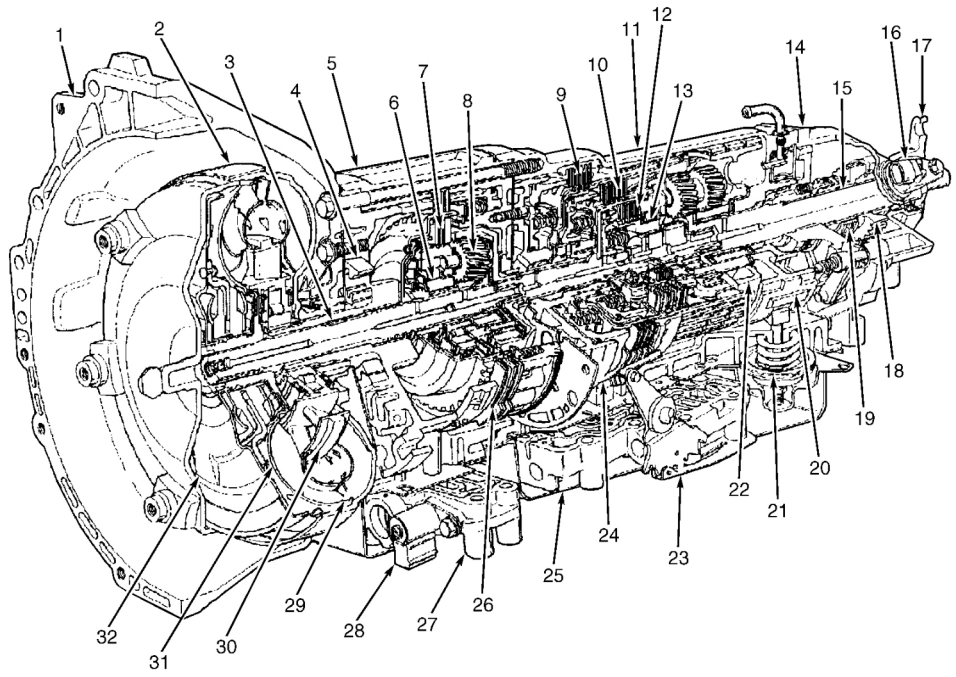
ECONOMY/NORMAL mode provides for better fuel economy by having control module initiate earlier part throttle upshifts. Line pressure is lower in order to provide smoother upshifts and downshifts.

Sport/Power

Depressing SPORT/POWER mode switch changes transmission operating mode between ECONOMY/NORMAL and SPORT/POWER modes. In SPORT/POWER mode, control module delays part throttle upshifts for greater acceleration. Control module also signals pressure control solenoid to increase line pressure for additional torque requirements in SPORT/POWER mode. Increased line pressure creates firmer shifts and more holding force for clutches and band.

Winter

In WINTER mode, control module changes shift solenoid states in order to start transmission in 3rd gear. By starting off in 3rd gear, less torque is created, thereby reducing tire slippage on ice and snow. When WINTER mode is selected, control module overrides all other modes. Control module only enters WINTER mode when gearshift lever is in "D" (Overdrive), vehicle speed is less than 6 MPH, transmission fluid temperature is less than 266°F (130°C), wide open throttle switch is off and throttle opening is less than 7 percent. WINTER mode is canceled if WINTER mode button is depressed, gearshift lever is moved to Park or a lower drive range, ignition is turned off, transmission fluid temperature is greater than 266°F (130°C), or wide open throttle switch is activated. When WINTER mode is canceled due to one of these conditions, control module returns vehicle to economy/normal mode, regardless of operating mode before selecting WINTER mode.



1. Torque Converter Housing
2. Torque Converter
3. Turbine Shaft
4. Oil Pump Assembly
5. Adapter Case
6. Overdrive Roller Clutch
7. Overrun Clutch Plates
8. Overdrive Carrier Assembly
9. Reverse Clutch Plates
10. 2nd Clutch Plates
11. Transmission Case
12. 3rd Clutch Plates
13. Sprag Assembly
14. Extension Housing
15. Output Shaft
16. Speed Sensor
17. Drive Flange
18. Speed Sensor Drive Gear
19. Parking Lock Gear
20. Brake Band
21. Servo Piston
22. Planetary Carrier Assembly
23. Selector Lever
24. Center Support
25. Main Valve Body
26. 4th Clutch Plates
27. Adapter Case Valve Body
28. Solenoid
29. Converter Pump Assembly
30. Stator
31. Turbine Assembly
32. Pressure Plate

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Fig. 2: Identifying Transmission Component Locations
Courtesy of GENERAL MOTORS CORP.

LUBRICATION

RECOMMENDED FLUID

Manufacturer recommends Dexron-III ATF for use in this transmission. Fill to appropriate level. See **FLUID CAPACITIES**.

FLUID CAPACITIES

TRANSMISSION FLUID CAPACITIES

Application	Refill - Qts. (L)	Dry Fill - Qts. (L)
Catera	(1)	7.0 (6.6)
All Others	(2)	9.1 (8.6)

(1) Transmission is not equipped with a dipstick. Fill to bottom of fill hole. For refill procedures, see DRAINING & REFILLING in appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING.

(2) Transmission is not equipped with a dipstick. Fill until fluid runs from overfill hole. For refill procedures, see DRAINING & REFILLING in appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING.

ON-VEHICLE SERVICE

The following components may be serviced without transmission removal:

- Servo Assembly
- Extension Housing
- Shift Linkage
- Solenoids
- Speedometer Driven Gear & Seal
- Speed Sensor
- Main Case Oil Pan & Filter
- Adapter Case Oil Pan & Filter
- Main Valve Body
- Adapter Case Valve Body
- Transmission Range Switch & Wiring Harness
- Accumulator Assemblies

BRAKE BAND ADJUSTMENT

1. Drain fluid. Remove bolts, main case oil pan and gasket. See **Fig. 7**. Remove bolts, servo cover and gasket. Loosen lock nut on servo adjusting screw.
2. Using INCH-lb. torque wrench, tighten servo adjusting screw to 40 INCH lbs. (4.5 N.m). Back off servo adjusting screw 5 turns. Hold sleeve on servo piston. Tighten lock nut to 14 ft. lbs. (19 N.m). Ensure servo adjusting screw does not rotate while tightening lock nut.
3. Using NEW gasket, install servo cover. Install and tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Using NEW gasket, install main case oil pan. Install and tighten bolts to specification. Fill transmission with appropriate fluid to proper level. See **LUBRICATION**.

OIL COOLER FLUSHING

1. If available, fill line flusher with solution and install Oil Cooler and Line Flusher (J-35944) to top transmission cooler line on transmission. Follow equipment manufacturer's instructions to flush oil cooler and cooler lines.
2. If flusher tool 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 is removed. If necessary, replace plugged or damaged cooler and/or lines.

TROUBLE SHOOTING

NOTE: For diagnosis of transmission electronic control system, see HYDRA-MATIC 4L30-E ELECTRONIC CONTROLS article. For illustration of hydraulic circuit operation, see appropriate HYDRA-MATIC 4L30-E article in OIL CIRCUIT DIAGRAMS.

PRELIMINARY INSPECTION

1. Before performing transmission trouble shooting, check fluid level, fluid condition and shift linkage adjustment. Check for stored DTCs. If any DTCs are present, diagnose and repair all computer-related DTCs. See HYDRA-MATIC 4L30-E ELECTRONIC CONTROLS article. If no DTCs are present, go to next step.
2. Perform a road test, stall speed test and hydraulic pressure test to identify problem. See **PERFORMANCE TESTS**. For specific complaints, see appropriate condition(s) listed under **SYMPTOM DIAGNOSIS**.

SYMPTOM DIAGNOSIS

Engine Will Not Start

Gearshift lever position switch or shift linkage out of adjustment, or oil pump or torque converter is blocked.

Gearshift Lever Will Not Engage In "P" Position

Gearshift lever position switch or shift linkage out of adjustment, or shift gate at gearshift lever "P" position is damaged.

Rattling Noises In Transmission Or Rear Wheels Locked

Worn parking lock return spring.

Delayed Shifting From "N" To "D"

Transmission fluid too low, fluid pressure too low, or jammed brake band valve.

Slips Or Shudders In 1st Gear

Fluid pressure too low, defective torque converter, loss of fluid in circuit between accumulator and brake band, incorrect brake band adjustment, defective freewheel (planetary set or 4th gear unit), or fluid loss in converter clutch fluid circuit.

No Reverse Gear

Gearshift lever position switch or shift linkage out of adjustment, or clutch for reverse gear is defective (only noticeable on transmission removal and disassembly).

Vehicle Drives With Gearshift Lever In "N" Position

Gearshift lever position switch or shift linkage out of adjustment, or brake band adjustment is too tight.

Course Shifting From "N" To "D"

Brake band valve is blocked or defective, cable connection to pressure regulator is defective, or pressure regulator is defective.

Poor Acceleration

Poor engine performance, winter program is selected, default mode is active, or torque converter is defective.

No 1-2 Upshift

Gearshift lever position switch or shift linkage out of adjustment, blocked solenoid valve for 1-2/3-4 shift or on-off valve in valve body assembly, or loss of fluid in clutch C2 or in fluid circuit (only noticeable on transmission removal and disassembly).

Difficulty In Shifting Between 1st & 2nd Gear

Incorrect fluid pressure in clutch C2, accumulator valve for 1-2 shift valve blocked or leaking, loss of fluid in clutch C2 or in the fluid circuit (only noticeable on transmission removal and disassembly), or incorrect main pressure.

No 2-3 Upshift

Gearshift lever position switch or shift linkage out of adjustment, or solenoid valve for 2-3 shift or on-off valve in valve body assembly is defective.

Difficulty In Shifting Between 2nd & 3rd Gear

Incorrect brake band adjustment, loss of fluid in return line between accumulator and brake band, loss of fluid in clutch C3 or in fluid circuit, defective or blocked brake band valve, or incorrect fluid pressure.

No 3-4 Upshift

Gearshift lever position switch or shift linkage out of adjustment, solenoid valve for 1-2/3-4 shift or the on-off valve in valve body assembly is defective, or loss of hydraulic fluid in clutch C4 or in the fluid circuit.

Difficulty In Shifting Between 3rd & 4th Gear

Loss of fluid in clutch C4 or in the fluid circuit, incorrect fluid pressure, or bridging clutch for 4th gear (4th gear lockup clutch) will not release.

No Engagement Of Torque Converter Clutch

Converter clutch solenoid valve defective, interruption in signal circuit, or fluid loss in converter clutch fluid circuit.

Rattling In Torque Converter Clutch

Defective torque converter clutch, or fluid pressure is inadequate.

Cannot Release Torque Converter Clutch

Converter clutch solenoid valve is defective, or return line is blocked.

Vibration In 2nd Gear

Converter clutch solenoid valve is jammed in active position so that converter clutch is engaged.

No Sport Program Or No Winter Program

Tip switch is defective, or there is an electrical circuit interruption.

No Kickdown Program

Wide open throttle switch is defective, or there is an electrical circuit interruption.

No Downshift Possible

1-2/3-4 or 2-3 shift solenoid valves are defective or the on-off valve in the valve body assembly is blocked.

No Engine Braking

Bridging clutch for 4th gear (4th gear lockup clutch) is defective or there is a loss of fluid in the fluid circuit.

Fluid Overheating & Leaking From Vent

Fluid level too high, torque converter clutch not functioning, or there is an extreme load in default mode or in winter mode.

CLUTCH & BAND APPLICATIONS

CLUTCH & BAND APPLICATIONS

Selector Position	Solenoid State 1-2/3-4 & 2/3	Elements In Use
"P" (Park)	Off/On	(1) Overrun Clutch
"R" (Reverse)	Off/On	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (1) Reverse Clutch & (2) Sprag Assembly
"N" (Neutral)	Off/On	(1) Overrun Clutch
"D" (Overdrive)		
1st Gear	Off/On	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (2) Sprag Assembly & (1) Brake Band
2nd Gear	On/On	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (1) 2nd

		Clutch, (3) Sprag Assembly & (1) Brake Band
3rd Gear	On/Off	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (1) 3rd Clutch, (1) 2nd Clutch & (4) Sprag Assembly
4th Gear	Off/Off	(3) Overrun Roller Clutch, (1) 2nd Clutch, (1) 3rd Clutch, (1) 4th Clutch & (4) Sprag Assembly
"3" (Manual 3rd)		
1st Gear	Off/On	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (2) Sprag Assembly & (1) Brake Band
2nd Gear	On/On	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (1) 2nd Clutch, (3) Sprag Assembly & (1) Brake Band
3rd Gear	On/Off	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (1) 3rd Clutch, (1) 2nd Clutch & (4) Sprag Assembly
"2" (Manual 2nd)		
1st Gear	Off/On	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (1) 3rd Clutch, (2) Sprag Assembly & (1) Brake Band
2nd Gear	On/On	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (1) 2nd Clutch, (3) Sprag Assembly & (1) Brake Band
"1" (Manual 1st)		
1st Gear	Off/On	(2) Overdrive Roller Clutch, (1) Overrun Clutch, (1) 3rd Clutch, (2) Sprag Assembly & (1) Brake Band

(1) Applied.

(2) Holding.

(3) Overrunning.

(4) Applied or holding with no load (not transmitting torque).

PERFORMANCE TESTS

NOTE: Shift speed tables reference throttle angle percent and output shaft speed. Both conditions are monitored using scan tool. Shift speed tables apply when transmission is in "D" (Overdrive) position while vehicle is driven in 4 forward gears. Ensure vehicle speed listed in road test procedures corresponds with output shaft speed indicated in shift speed tables. Upshifts and downshifts should occur at specified output shaft speed noted in shift speed tables. Warm up information in shift speed tables applies to open loop operation. Before road testing vehicle, engine and transmission must be at operating temperature. Torque converter clutch will not engage if engine coolant has not reached operating temperature.

ROAD TEST (CATERA)

If transmission shift speeds are not as specified during road test, check for DTCs. See HYDRA-MATIC 4L30-E ELECTRONIC CONTROLS article. If slippage occurs, determine which components are applied in each gear to aid in diagnosis. See **CLUTCH & BAND APPLICATIONS** under TROUBLE SHOOTING. Perform hydraulic pressure test to check transmission internal components. See **HYDRAULIC PRESSURE TESTS**.

NOTE: Perform the following tests in the sequence given. Ensure engine is operating properly, and transmission fluid level and tire pressure are correct.

Electrical Function Check

1. Connect scan tool. Ensure gearshift lever is in Park and parking brake is set. Start engine. Using scan tool, ensure the following data can be displayed and is functioning properly:
   - Engine Speed
   - Transmission Output Speed
   - Vehicle Speed
   - Transmission Range
   - Commanded Gear (Current Gear)
   - PC Solenoid Actual Current
   - Brake Switch
   - Engine Coolant Temperature
   - Transmission Fluid Temperature
   - Throttle Angle
   - Ignition Voltage (Battery Voltage)
   - 1-2 Shift Solenoid

- 2-3 Shift Solenoid
- TCC Solenoid
- TCC Slip Speed
- Band Apply Solenoid Duty Cycle
- Power Relay Status
- Shift Pattern (Econo/Sport)
- Default Mode

If all data is displayed and appears accurate, go to next step. If any data is in question, diagnose and repair as necessary. See HYDRA-MATIC 4L30-E ELECTRONIC CONTROLS article or SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

2. Using scan tool, monitor brake switch signal while depressing and releasing brake pedal. Ensure scan tool displays CLOSED with brake pedal released and OPEN with brake pedal depressed.

NOTE: Harsh engagement may be caused by high idle speed, commanded low PC solenoid current or default condition caused by DTCs. Soft or delayed engagements may be caused by low idle speed, low fluid level, commanded high PC solenoid current or cold fluid.

3. Apply brake pedal and set parking brake. Move gearshift lever from Park to Reverse, Reverse to Neutral, and then from Neutral to Drive. Pause 2-3 seconds in each range. Ensure engagements are immediate and not harsh.
4. Using scan tool, monitor transmission range. Move gearshift lever through all ranges. Pause in each range for 2-3 seconds and return gearshift lever to Park. Ensure all gearshift lever positions match scan tool display.
5. Using scan tool, monitor throttle angle while increasing and decreasing engine speed with accelerator pedal. Ensure actual engine speed matches engine speed displayed on scan tool.
6. Record test results in question for reference and continue with road test.

Upshift Control & Torque Converter Clutch Apply

NOTE: To include normal driving ranges in the following test, check shift speeds at 10, 25 and 50 percent throttle angles.

1. Using scan tool, monitor the following parameters:
   - Throttle Angle
   - Vehicle Speed
   - Engine Speed
   - Output Shaft Speed
   - Commanded Gear
   - Slip Speed
   - Solenoid States

Place gearshift lever in Overdrive. Accelerate vehicle to chosen throttle angle (10, 25 or 50 percent) and hold steady. As transmission upshifts, note vehicle speed as shift occurs for each gear change. Compare shift speeds with specification. See **Fig. 3** and **Fig. 4** . Check for harsh, soft or delayed shifts. Note any noise or vibration. Repeat procedure for each throttle angle.

NOTE: The TCC will not engage until engine is in closed loop operation and vehicle is on a level surface in a near-cruise condition (not accelerating or coasting).

2. Check for TCC apply in 3rd and 4th gear. Note TCC apply point. Typical TCC apply speed in 4th gear is 45-55 MPH. A noticeable drop in engine RPM should be observed, and slip speed should decrease to less than 100 RPM. Ensure TCC apply speed is within specification and TCC disengages with light application of brake pedal. If TCC apply is not detected, check for DTCs. See HYDRA-MATIC 4L30-E ELECTRONIC CONTROLS article. Check TCC operation. See **TORQUE CONVERTER DIAGNOSIS**.

		1–2 Shift					2–3 Shift					3–4 Shift				
Throttle %		10	25	50	100	WOT	10	25	50	100	WOT	10	25	50	100	WOT
Output Shaft Speed (RPM)	ECON	448	608	1056	1632	1856	768	1001	1760	3072	3584	1280	1600	3648	5408	6176
	SPORT	544	704	1376	1856	1856	832	1312	2560	3584	3584	1344	2128	5888	6176	6176
	WARM UP	960	1136	1440	1856	1856	1504	1824	2784	3616	3616	3008	3168	4256	6176	6176

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Fig. 3: Identifying 4L30-E Upshift Speed Specifications Using Output Shaft Speed
Courtesy of GENERAL MOTORS CORP.

		2–1 Shift					3–2 Shift					4–3 Shift				
Throttle %		10	25	50	100	WOT	10	25	50	100	WOT	10	25	50	100	WOT
Output Shaft Speed (RPM)	ECON	320	320	320	800	1536	672	768	1216	2752	3456	928	1088	1920	4768	5984
	SPORT	256	352	640	1568	1568	512	656	1728	3456	3456	1024	1200	3232	5984	5984
	WARM UP	800	800	800	1568	1568	960	1120	1952	3456	3456	2496	2496	3232	5984	5984

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Fig. 4: Identifying 4L30-E Downshift Speed Specifications Using Output Shaft Speed
Courtesy of GENERAL MOTORS CORP.

Part Throttle Detent Downshift

Place gearshift lever in Drive. Accelerate vehicle to 40-55 MPH in 4th gear. Quickly increase throttle angle greater than 50 percent. Ensure TCC releases, and transmission immediately downshifts to 3rd gear.

Full Throttle Detent Downshift

Place gearshift lever in Drive. Accelerate vehicle to 40-55 MPH in 4th gear. Quickly increase throttle angle to 100 percent. Ensure TCC releases, and transmission immediately downshifts to 2nd gear.

Manual Downshifts

1. Place gearshift lever in Overdrive. Accelerate vehicle to 40-55 MPH in 4th gear. Release throttle while moving gearshift lever to 3rd gear. Ensure TCC releases, transmission immediately downshifts to 3rd gear, and engine slows vehicle (engine braking).
2. Place gearshift lever in Overdrive. Accelerate vehicle to 40-45 MPH. Release throttle while moving gearshift lever to 2nd gear. Ensure TCC releases, transmission immediately downshifts to 2nd gear, and engine slows vehicle (engine braking).
3. Place gearshift lever in Overdrive. Accelerate vehicle to 30 MPH. Release throttle while moving gearshift lever to 1st gear. Ensure TCC releases, transmission immediately downshifts to 1st gear, and engine slows vehicle (engine braking).

Coasting Downshifts

Place gearshift lever in Overdrive. Accelerate vehicle to 4th gear and ensure TCC is applied. Release throttle and lightly apply brake pedal. Ensure TCC releases, and downshifts occur at specified vehicle speeds. See **Fig. 3** and **Fig. 4** .

Manual Gear Range Selection

NOTE: Shift solenoids control upshifts in manual gear ranges. Perform the following tests with 15 percent throttle angle.

1. With vehicle stopped, place gearshift lever in Reverse. Slowly accelerate vehicle. Ensure there is no noticeable slip, noise or vibration.
2. With vehicle stopped, place gearshift lever in manual 1st gear. Accelerate vehicle to 20 MPH. Ensure no upshifts occur, TCC does not apply and there is no noticeable slip, noise or vibration.
3. With vehicle stopped, place gearshift lever in manual 2nd gear. Accelerate vehicle to 35 MPH. Ensure 1-2 upshift occurs, and there is no noticeable slip, noise or vibration.
4. With vehicle stopped, place gearshift lever in manual 3rd gear. Accelerate vehicle to 40 MPH. Ensure 1-2 and 2-3 upshifts occur, and there is no noticeable slip, noise or vibration.

ROAD TEST (EXCEPT CATERA)

NOTE: If road test is performed with engine coolant temperature less than 158°F (70°C), shift speeds will be delayed during light throttle application and occur at a slightly higher speed.

NOTE: Engine coolant temperature must be greater than 158°F (70°C) for TCC operation. TCC is always applied in 2nd, 3rd and 4th gear when transmission fluid temperature is greater than 275°F (135°C).

1. If a stored DTC is present, clear DTCs from control module memory. See HYDRA-MATIC 4L30-E ELECTRONIC CONTROLS article.
2. Start and warm engine to normal operating temperature. Road test vehicle and check for abnormal noise,

clutch slippage and shift firmness. Specified clutch and brake are applied in designated gear. See **CLUTCH & BAND APPLICATIONS** under TROUBLE SHOOTING.

3. Ensure upshift and downshift speeds are correct in relation to throttle opening and position of POWER or WINTER mode switches mounted on center console, near gearshift lever. See appropriate UPSHIFT SPECIFICATIONS and DOWNSHIFT SPECIFICATIONS tables.
4. Ensure Torque Converter Clutch (TCC) operation is correct to gear application in relation to throttle opening with gearshift lever in "D" position. See appropriate TCC SPECIFICATIONS table.
5. During road test, if CHECK TRANS light on instrument cluster begins to flash, a DTC is stored in control module memory. Check stored DTCs and repair as necessary. See HYDRA-MATIC 4L30-E ELECTRONIC CONTROLS article.
6. During road test, if a problem is present, but CHECK TRANS light on instrument cluster did not flash, turn engine off. Disconnect control module harness connectors at transmission.
7. Repeat road test, while manually shifting transmission. With gearshift lever in "L" position, transmission should remain in 1st gear. With gearshift lever in "2" position, transmission should remain in 3rd gear. With gearshift lever in "3" or "D" position, transmission should remain in 4th gear. Turn engine off. Reconnect control module harness connectors.
8. If problem is still present, attempt diagnosis by symptom. See **SYMPTOM DIAGNOSIS** under TROUBLE SHOOTING. If problem is not present with harness connectors disconnected at control module, check wiring connections and control module ground circuits.

UPSHIFT SPECIFICATIONS (AMIGO, PASSPORT & RODEO)

Gearshift Lever Position	1st-2nd MPH	2nd-3rd MPH	3rd-4th MPH
Normal Mode			
"D"			
Full Throttle	34-37	69-73	105-109
Half Throttle	21-25	40-44	73-76
"3"			
Full Throttle	34-37	69-73	N/A
Half Throttle	21-25	40-44	N/A
"2"			
Full Throttle	34-37	N/A	N/A
Half Throttle	21-25	N/A	N/A
Power Mode			
"D"			
Full Throttle	34-37	69-73	105-109
Half Throttle	26-30	49-52	83-86
"3"			
Full Throttle	34-37	69-73	N/A
Half Throttle	26-30	49-52	N/A
"2"			
Full Throttle	34-37	N/A	N/A
Half Throttle	26-30	N/A	N/A

UPSHIFT SPECIFICATIONS (BMW)

Gearshift Lever Position	1st-2nd MPH	2nd-3rd MPH	3rd-4th MPH
Normal Mode			
"D"			
Full Throttle	34-37	69-73	105-109
Half Throttle	21-25	40-44	73-76
"3"			
Full Throttle	34-37	69-73	N/A
Half Throttle	21-25	40-44	N/A
"2"			
Full Throttle	34-37	N/A	N/A
Half Throttle	21-25	N/A	N/A
Power Mode			
"D"			
Full Throttle	34-37	69-73	105-109
Half Throttle	26-30	49-52	83-86
"3"			
Full Throttle	34-37	69-73	N/A
Half Throttle	26-30	49-52	N/A
"2"			
Full Throttle	34-37	N/A	N/A
Half Throttle	26-30	N/A	N/A

UPSHIFT SPECIFICATIONS (TROOPER)

Gearshift Lever Position	1st-2nd MPH	2nd-3rd MPH	3rd-4th MPH
Normal Mode			
"D"			
Full Throttle	33-37	68-72	103-107
Half Throttle	20-24	35-39	61-65
"3"			
Full Throttle	33-37	68-72	N/A
Half Throttle	20-24	35-39	N/A
"2"			
Full Throttle	33-37	N/A	N/A
Half Throttle	20-24	N/A	N/A
Power Mode			
"D"			
Full Throttle	33-37	68-72	108-112
Half Throttle	25-29	52-56	84-88
"3"			
Full Throttle	33-37	68-72	N/A

Half Throttle	25-29	52-56	N/A
"2"			
Full Throttle	33-37	N/A	N/A
Half Throttle	25-29	N/A	N/A

UPSHIFT SPECIFICATIONS (VEHICROSS)

Gearshift Lever Position	1st-2nd MPH	2nd-3rd MPH	3rd-4th MPH
Normal Mode			
"D"			
Full Throttle	26-30	54-58	87-91
Half Throttle	18-22	36-40	70-74
"3"			
Full Throttle	33-36	66-69	N/A
Half Throttle	20-24	36-40	N/A
"2"			
Full Throttle	33-36	N/A	N/A
Half Throttle	20-24	N/A	N/A
Power Mode			
"D"			
Full Throttle	29-33	56-59	88-91
Half Throttle	23-27	45-49	78-82
"3"			
Full Throttle	33-36	66-69	N/A
Half Throttle	23-27	46-50	N/A
"2"			
Full Throttle	33-36	N/A	N/A
Half Throttle	23-27	N/A	N/A

DOWNSHIFT SPECIFICATIONS (AMIGO, PASSPORT & RODEO)

Gearshift Lever Position	4th-3rd MPH	3rd-2nd MPH	2nd-1st MPH
Normal Mode			
"D"			
Full Throttle	99-103	55-59	29-32
Half Throttle	46-50	22-26	9-13
Closed Throttle	17-21	13-17	9-12
"3"			
Full Throttle	N/A	55-59	29-32
Half Throttle	N/A	22-26	9-13
Closed Throttle	N/A	13-17	9-12
"2"			
Full Throttle	N/A	60-63	29-32

Half Throttle	N/A	60-63	9-13
Closed Throttle	N/A	60-63	9-12
"L"	N/A	N/A	31-35
Power Mode			
"D"			
Full Throttle	99-103	55-59	29-32
Half Throttle	67-71	37-40	9-13
Closed Throttle	30-33	15-19	9-12
"3"			
Full Throttle	N/A	55-59	29-32
Half Throttle	N/A	37-40	14-18
Closed Throttle	N/A	15-19	9-12
"2"			
Full Throttle	N/A	60-63	29-32
Half Throttle	N/A	60-63	14-18
Closed Throttle	N/A	60-63	9-12
"L"	N/A	N/A	31-35

DOWNSHIFT SPECIFICATIONS (BMW)

Gearshift Lever Position	4th-3rd MPH	3rd-2nd MPH	2nd-1st MPH
Normal Mode			
"D"			
Full Throttle	99-103	55-59	29-32
Half Throttle	46-50	22-26	9-13
Closed Throttle	17-21	13-17	9-12
"3"			
Full Throttle	N/A	55-59	29-32
Half Throttle	N/A	22-26	9-13
Closed Throttle	N/A	13-17	9-12
"2"			
Full Throttle	N/A	60-63	29-32
Half Throttle	N/A	60-63	9-13
Closed Throttle	N/A	60-63	9-12
"L"	N/A	N/A	31-35
Power Mode			
"D"			
Full Throttle	99-103	55-59	29-32
Half Throttle	67-71	37-40	9-13
Closed Throttle	30-33	15-19	9-12
"3"			
Full Throttle	N/A	55-59	29-32

Half Throttle	N/A	37-40	14-18
Closed Throttle	N/A	15-19	9-12
"2"			
Full Throttle	N/A	60-63	29-32
Half Throttle	N/A	60-63	14-18
Closed Throttle	N/A	60-63	9-12
"L"	N/A	N/A	31-35

DOWNSHIFT SPECIFICATIONS (TROOPER)

Shift Lever Position	4th-3rd MPH	3rd-2nd MPH	2nd-1st MPH
Normal Mode			
"D"			
Full Throttle	96-100	54-58	28-32
Half Throttle	40-43	20-24	9-12
Closed Throttle	17-21	12-16	8-12
"3"			
Full Throttle	N/A	54-58	28-32
Half Throttle	N/A	20-24	9-12
Closed Throttle	N/A	12-16	8-12
"2"			
Full Throttle	N/A	57-61	28-32
Half Throttle	N/A	57-61	9-12
Closed Throttle	N/A	57-61	8-12
"L"	N/A	N/A	30-34
Power Mode			
"D"			
Full Throttle	101-105	65-68	28-32
Half Throttle	67-71	35-39	14-17
Closed Throttle	29-32	14-18	8-12
"3"			
Full Throttle	N/A	65-68	28-32
Half Throttle	N/A	35-39	14-17
Closed Throttle	N/A	14-18	8-12
"2"			
Full Throttle	N/A	57-61	28-32
Half Throttle	N/A	57-61	14-17
Closed Throttle	N/A	57-61	8-12
"L"	N/A	N/A	30-34

DOWNSHIFT SPECIFICATIONS (VEHICROSS)

Shift Lever Position	4th-3rd MPH	3rd-2nd MPH	2nd-1st MPH

Normal Mode			
"D"			
Full Throttle	74-78	47-51	11-14
Half Throttle	40-44	20-24	14-18
Closed Throttle	17-21	12-16	8-12
"3"			
Full Throttle	N/A	58-61	26-30
Half Throttle	N/A	21-25	9-13
Closed Throttle	N/A	9-13	8-12
"2"			
Full Throttle	N/A	63-66	27-31
Half Throttle	N/A	59-63	9-13
Closed Throttle	N/A	51-55	8-12
"L"	N/A	N/A	31-35
Power Mode			
"D"			
Full Throttle	79-82	49-52	21-24
Half Throttle	58-62	31-35	13-17
Closed Throttle	28-32	14-18	8-12
"3"			
Full Throttle	N/A	60-63	27-30
Half Throttle	N/A	34-38	13-17
Closed Throttle	N/A	15-19	8-12
"2"			
Full Throttle	N/A	63-66	27-30
Half Throttle	N/A	59-63	13-17
Closed Throttle	N/A	51-55	8-12
"L"	N/A	N/A	33-36

TCC SPECIFICATIONS (AMIGO, PASSPORT & RODEO) (1)

Shift Mode & Gear Range	**MPH**
TCC ON	
Normal	
2nd	47-50
3rd	42-46
4th	47-51
Power	
2nd	47-50
3rd	50-53
4th	50-53
TCC OFF	

Normal	
2nd	43-47
3rd	29-33
4th	45-48
Power	
2nd	43-47
3rd	44-48
4th	47-50
(1) Specification is taken with throttle opening at 6 percent, and gearshift lever in "D" position.	

TCC SPECIFICATIONS (BMW) (1)

Shift Mode & Gear Range	MPH
TCC ON	
Normal	
2nd	47-50
3rd	42-46
4th	47-51
Power	
2nd	47-50
3rd	50-53
4th	50-53
TCC OFF	
Normal	
2nd	43-47
3rd	29-33
4th	45-48
Power	
2nd	43-47
3rd	44-48
4th	47-50
(1) Specification is taken with throttle opening at 6 percent, and gearshift lever in "D" position.	

TCC SPECIFICATIONS (TROOPER) (1)

Shift Mode & Gear Range	MPH
TCC ON	
Normal	
2nd	35-39
3rd	26-30
4th	27-31
Power	

2nd	35-39
3rd	42-45
4th	35-39
TCC OFF	
Normal	
2nd	32-36
3rd	20-24
4th	25-29
Power	
2nd	32-36
3rd	20-24
4th	30-34
(1) Specification is taken with throttle opening at 6 percent, and gearshift lever in "D" position.	

TCC SPECIFICATIONS (VEHICROSS) (1)

Shift Mode & Gear Range	MPH
TCC ON	
Normal	
2nd	45-48
3rd	33-37
4th	48-52
Power	
2nd	45-48
3rd	48-52
4th	48-52
TCC OFF	
Normal	
2nd	42-45
3rd	28-32
4th	45-49
Power	
2nd	42-45
3rd	42-46
4th	45-48
(1) Specification is taken with throttle opening at 9 percent, and gearshift lever in "D" position.	

TORQUE CONVERTER DIAGNOSIS

NOTE: Torque converter is a sealed unit and can not be disassembled.

Stator Check

1. Torque converter stator roller clutch may fail and can either remain locked up at all times or freewheel in both directions. If stator is freewheeling at all times, vehicle tends to have poor acceleration from a standstill. Vehicle may operate normally at speeds greater than 30-35 MPH.
2. If poor acceleration is noted, ensure exhaust system is not blocked, engine timing is correct and transmission is in 1st gear when starting from a standstill. If stator is locked up at all times, performance from a standstill will appear normal. Engine RPM and acceleration is limited at high speeds. Engine may overheat from this condition. A visual inspection of torque converter may reveal converter is Blue in color indicating an overheat condition.

Noise Test

1. Torque converter whine is usually noticed when vehicle is stopped and transmission 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. Ensure whine originates from torque converter.
2. Start engine, and allow it to reach normal operating temperature. Apply parking and service brakes. Place transmission in Drive. Depress accelerator pedal to increase engine speed to about 1200 RPM for less than 6 seconds. DO NOT depress accelerator for more than 6 seconds or transmission 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.

Stall Speed Test

CAUTION: Do not perform stall speed test for more than 5 seconds or transmission damage may occur. Transmission must be cooled between tests by placing gearshift lever in "N" position and operating engine at idle for at least one minute.

1. Apply parking brake. Block all wheels. Connect tachometer and start engine. Warm engine to normal operating temperature. Ensure transmission fluid level is correct.
2. Fully depress brake pedal. Place gearshift lever in "D" position. Fully depress accelerator for no more than 5 seconds and note highest engine speed. This is torque converter stall speed.
3. Place gearshift lever in "N" position. Operate engine at idle for at least one minute to cool transmission. Repeat test procedure with gearshift lever in "3", "2", "1" and "R" positions.
4. Ensure stall speed is within specification. See **TORQUE CONVERTER STALL SPEED** table. If stall speed is not within specification, an internal torque converter or transmission failure is present. Check for faulty oil pump, pressure control solenoid (also referred to as force motor solenoid), oil filter, pressure regulator oil screen, pressure limiting valve, throttle valve switch or wiring harness between components.

TORQUE CONVERTER STALL SPEED (1)

Application	RPM
Amigo, Catera & Rodeo	2050-2350
Passport, Trooper & VehiCROSS	1950-2250

(1) Information for BMW is not available from manufacturer.

HYDRAULIC PRESSURE TESTS

NOTE: Control module controls pressure control solenoid (also referred to as force motor solenoid) in order to control pressure regulator valve. During line pressure test, compare scan tool value for pressure control solenoid current draw and transmission fluid pressure at oil pressure gauge to ensure line pressure specifications are correct. Values on scan tool may deviate slightly.

Pressure Test Preparation

Warm engine to normal operating temperature. Ensure transmission fluid level is correct. Turn engine off. Apply parking brake. Connect scan tool to Data Link Connector (DLC).

Line Pressure Test

1. Raise and support vehicle. With engine off, remove oil pressure tap plug from line pressure tap located near torque converter housing on driver's side of transmission case, just above adapter case oil pan. See **Fig. 5**.
2. Install oil pressure gauge and adapter on line pressure tap. Start engine and allow it to idle. Line pressure is checked in each transmission shift mode with engine idling and at stall speed with gearshift lever in specified position. Shift mode may be selected by depressing sport/power mode switch mounted on gearshift lever, or by depressing winter mode switch located to right of gearshift lever. When neither sport/power or winter mode are selected, transmission will remain in economy/normal mode.
3. With engine idling, place gearshift lever in specified position and note line pressure reading. Line pressure should be within specification. See appropriate LINE PRESSURE SPECIFICATIONS table.

CAUTION: Stall speed should be greater than 1500 RPM. Normal stall speed RPM is 2200-2450 RPM, depending on model application. See TORQUE CONVERTER STALL SPEED table. Do not perform line pressure test for more than 5 seconds at stall speed or transmission damage may occur. Transmission must be cooled between pressure tests by placing gearshift lever in "N" position and operating engine at idle for at least one minute. Use scan tool to monitor transmission fluid temperature. Under normal conditions, transmission fluid temperature is 158-248°F (70-120°C).

4. To check line pressure at stall speed, fully depress brake pedal. Place gearshift lever in "D" position and in proper shift mode. Fully depress accelerator pedal no more than 5 seconds and note line pressure reading.
5. Place gearshift lever in "N" position. Operate engine at idle for at least one minute to cool transmission. Repeat line pressure test procedure at stall speed with gearshift lever in "3", "2", "1" and "R" positions in proper shift mode.
6. Line pressure should be within specification. See appropriate LINE PRESSURE SPECIFICATIONS

table. If line pressure is not within specification, check items of probable cause. See **LINE PRESSURE TROUBLE SHOOTING** table. Repair as necessary.

7. Turn engine off. Remove oil pressure gauge and adapter. Install oil pressure tap plug and tighten to 106 INCH lbs. (12 N.m).

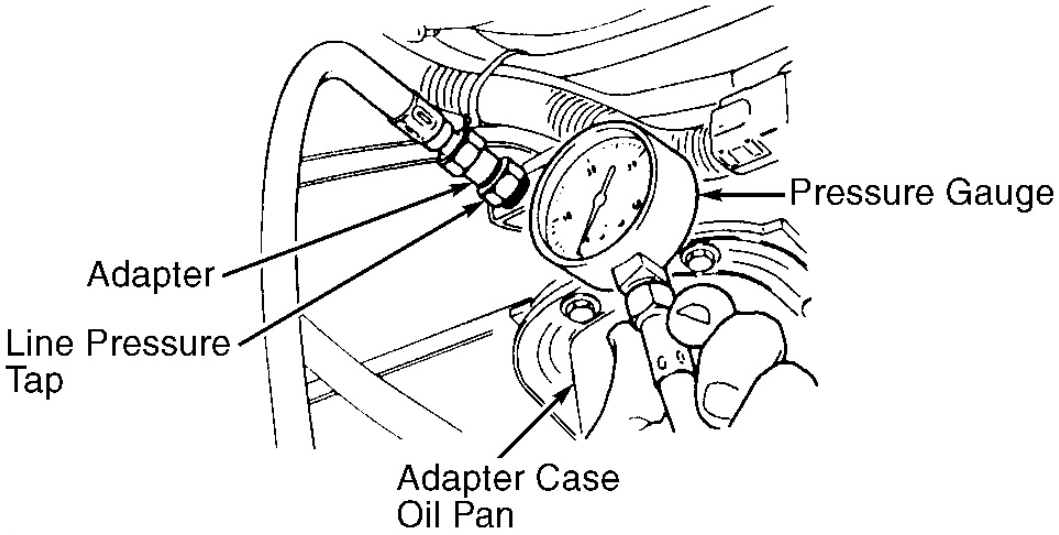


Fig. 5: Checking Line Pressure
Courtesy of ISUZU MOTOR CO.

LINE PRESSURE SPECIFICATIONS (AMIGO, PASSPORT, RODEO & TROOPER)

Shift Mode	Gear Position	Line Pressure - PSI (kPa)	Force Motor Current
Engine Idling			
Normal/Power	"D", "3", "2" & "L"	86-106 (593-731)	680-720 mA
Winter	"D"	44-57 (303-393)	1020-1060 mA
Normal/Power/Winter	Reverse	67-91 (462-627)	880-920 mA
At Stall Speed			
Normal/Power	"D", "3", "2" & "L"	181-200 (1248-1379)	70-110 mA
Winter	"D"	181-200 (1248-1379)	70-110 mA
Normal/Power	Reverse	203-229 (1400-1579)	340-380 mA

LINE PRESSURE SPECIFICATIONS (BMW)

Gear Position	Engine RPM	Line Pressure - PSI (kPa)
Park & Neutral	1500	139-152 (958-1048)
Reverse	1500	187-202 (1289-1393)

LINE PRESSURE SPECIFICATIONS (CATERA)

Shift Mode	Gear Position	Line Pressure PSI (kPa)
Engine Idling		
Economy & Sport (1)	"D","3","2" & "1"	145-160 (1000-1100)
Winter (2)	"D"	44-51 (300-350)
Economy & Sport (2)	"R"	58-73 (400-500)
At Stall Speed (3)		
Economy & Sport	"D", "3", "2" & "1"	145-160 (1000-1100)
Winter	"D"	145-160 (1000-1100)
Economy & Sport	"R"	210-225 (1450-1550)

(1) Pressure control solenoid current reading on scan tool should be 165 milliamps.

(2) Pressure control solenoid current reading on scan tool should be 970 milliamps.

(3) Pressure control solenoid current reading on scan tool should be 165 milliamps in all modes and gears.

LINE PRESSURE SPECIFICATIONS (VEHICROSS)

Shift Mode	Gear Position	Line Pressure - PSI (kPa)	Force Motor Current
Engine Idling			
Normal/Power	"D", "3", "2" & "L"	45-53 (312-363)	Variable
Winter	"D"	45-53 (312-363)	0.9-1.0 Amps
Normal/Power	Reverse	61-71 (419-486)	0.9-1.0 Amps
At Stall Speed			
Normal/Power	"D", "3", "2" & "L"	179-191 (1236-1320)	0.1-0.2 Amps
Winter	"D"	179-191 (1236-1320)	0.1-0.2 Amps
Normal/Power	Reverse	237-253 (1634-1743)	0.1-0.2 Amps

LINE PRESSURE TROUBLE SHOOTING

Application	Probable Cause
High Line Pressure	Defective TP Sensor, Force Motor Solenoid Plunger Stuck, Defective Force Motor Solenoid Or Wiring Circuit, Stuck Feed Limit Valve In Adapter Case Valve Body, Loose Torque Converter Housing Bolts, Stuck Pressure Regulator Valve Or Boost Valve In Oil Pump, Missing Check Balls In Valve Bodies, Defective Seals Or Gaskets
Low Line Pressure	Low Fluid Level, Defective TP Sensor, Restricted Or Damaged Oil Filter, Force Motor Solenoid Plunger Stuck, Stuck Feed Limit Valve In Adapter Case Valve Body, Loose Torque Converter Housing Bolts, Stuck Pressure Regulator Valve Or Boost Valve In Oil Pump, Restricted Pressure Regulator Valve Oil Passages, Defective Oil Pump, Missing Check Balls In Valve Bodies, Defective Seals Or Gaskets

COMPONENT TESTS

TORQUE CONVERTER

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 attempting to rotate race in both directions. Inner race should rotate freely clockwise, but should not rotate or should be difficult to rotate counterclockwise.

REMOVAL & INSTALLATION

TRANSMISSION

NOTE: See appropriate AUTOMATIC TRANSMISSION REMOVAL article in TRANSMISSION SERVICING.

VALVE BODIES

Removal & Installation

Remove bolts, adapter case oil pan and gasket. Disconnect electrical connectors at components on adapter case valve body. See **Fig. 8**. Note location of adapter case valve body bolts for reassembly reference. Remove bolts, adapter case valve body, transfer plate, transfer plate gasket and valve body gasket. Remove check ball from adapter case. See **Fig. 9**. Remove wiring harness for solenoids on adapter case valve body. Remove bolts, main case oil pan, magnet and gasket. Remove bolts and oil filter. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**.

TRANSMISSION DISASSEMBLY

VALVE BODIES & INTERNAL COMPONENTS

1. Remove torque converter. Remove "O" ring from end of turbine shaft. Using spring compressor,

compress 3-4 accumulator cover. Remove snap ring from adapter case. Remove spring compressor. Using slide hammer screwed into center of cover, pull cover from adapter case. Remove spring and 3-4 accumulator piston. See **Fig. 7**. Remove all seal rings.

2. Remove screws, cover, transmission range switch and wiring harness. See **Fig. 7**. Remove bolts, adapter case oil pan and gasket.
3. Disconnect electrical connectors at components on adapter case valve body. See **Fig. 8**. Note location of adapter case valve body bolts for reassembly reference. Remove bolts, adapter case valve body, transfer plate, transfer plate gasket and valve body gasket. Remove check ball from adapter case. See **Fig. 9**.
4. Remove wiring harness for solenoids on adapter case valve body. See **Fig. 8**. Remove bolts, main case oil pan, magnet and gasket. Remove bolts and oil filter.
5. Remove bolts and manual detent. Disconnect wiring harness at solenoids on main case valve body and case electrical connector. Remove wiring harness. See **Fig. 8**.
6. Remove bolts, servo cover and gasket. Position transmission case with main case valve body facing upward. Note location of main case valve body bolts for reassembly reference. Note position of manual valve link, as long end fits into manual valve and short end fits into range selector.
7. Remove bolts, main valve body with manual valve link, transfer plate gasket, main case gasket and transfer plate. Note location of 2 check balls in transmission case. See **Fig. 10**. Remove check balls from transmission case.
8. Using spring compressor, compress servo piston and return spring. Remove servo piston retaining ring. Slowly release spring compressor. Remove spring compressor, servo piston, apply rod and return spring. See **Fig. 7**.
9. Remove bolt and speed sensor with "O" ring from extension housing. Remove drive shaft flange nut, drive shaft flange and "O" ring from rear of transmission. Remove bolts, extension housing and gasket from transmission case.
10. Remove retaining ring, speed sensor drive gear and parking lock gear with seal ring from output shaft. Position transmission case in vertical position with torque converter housing facing upward.
11. If removing oil pump assembly from torque converter housing, loosen but DO NOT remove 5 inner bolts on torque converter housing. These are oil pump assembly-to-torque converter housing bolts.
12. Remove 7 torque converter housing-to-adapter case outer bolts. Remove torque converter housing, "O" ring seal, oil pump, gasket and selective thrust washer.
13. Remove 4th clutch retainer from the turbine shaft. See **Fig. 11**. Pull upward on turbine shaft and lift overrun clutch assembly and 4th clutch plates and clutch discs from transmission case. Remove thrust bearing, overdrive internal gear and thrust washer.
14. Remove adapter case and center support assembly with 4th clutch piston. See **Fig. 7** and **Fig. 11** . Remove seal ring, selective thrust washer and "O" rings from transmission case.
15. While holding intermediate shaft, twist and pull out 2nd and 3rd clutch assemblies with reverse clutch plates and clutch discs from transmission case while holding onto output shaft. See **Fig. 12**. Separate 2nd and 3rd clutch assemblies. Remove thrust washer, reverse clutch plates and pressure plate.
16. Remove bearing, washer, planetary carrier and thrust bearing assembly from transmission case. See **Fig. 12**. Remove reaction sun gear, needle bearing, drum, brake band and thrust bearing assembly.
17. For reassembly reference, measure height of spring pin in relation to transmission case. Spring pin retains selector shaft in transmission case. See **Fig. 13**.
18. Insert wire into center of spring pin to prevent spring pin from collapsing during removal. Protect

machined surface of transmission case. Using diagonal pliers, remove spring pin.

19. Remove selector shaft nut from end of selector shaft. Remove parking lock and range selector lever with actuator rod from selector shaft. Remove selector shaft. See **Fig. 13**. Remove main case breather and seal. See **Fig. 7**.

COMPONENT DISASSEMBLY & REASSEMBLY

TRANSMISSION CASE

Cleaning & Inspection

Clean transmission case and dry with compressed air. Inspect case assembly for damage, cracks and damaged bolt hole threads. Inspect valve body surface for flatness and land damage. Check case oil passages for restrictions and blockage. Blow compressed air through all case passages. See **Fig. 6**. Inspect case internal clutch plate lugs for damage and wear. Inspect servo and accumulator bores for damage. Inspect all snap ring grooves for damage.

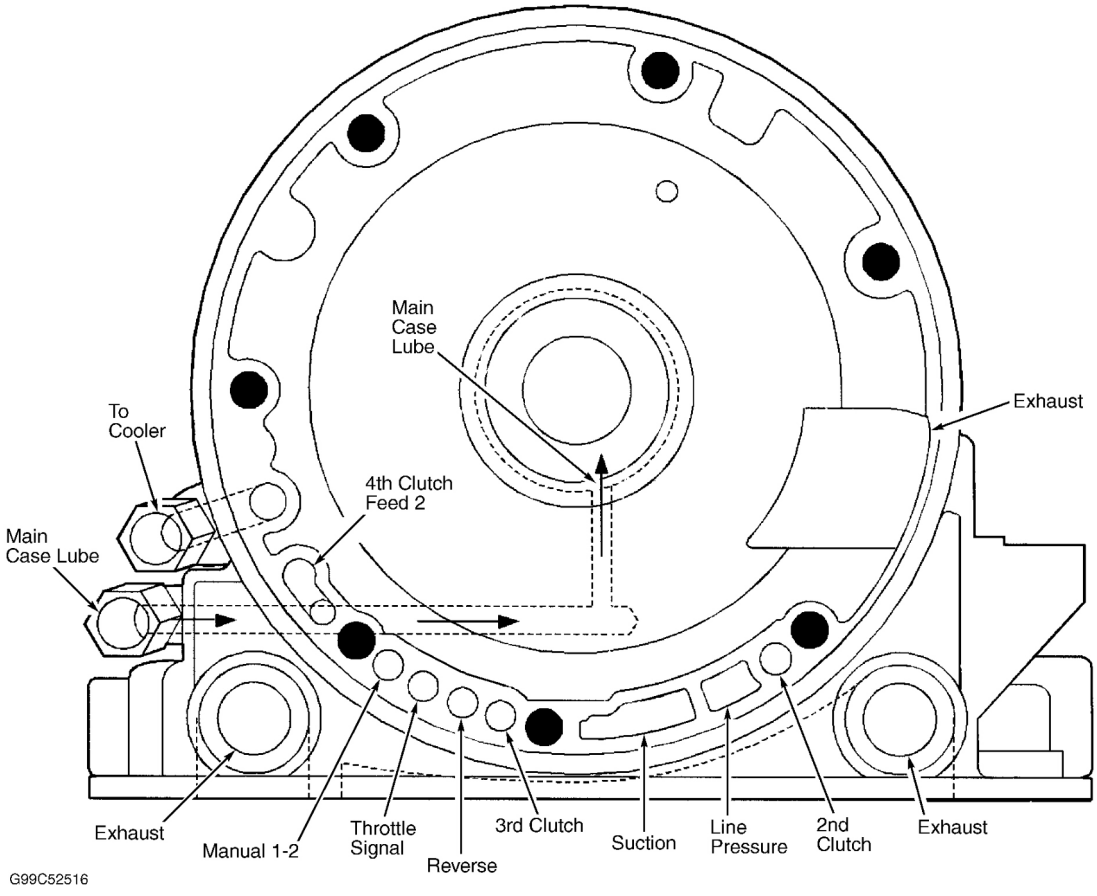


Fig. 6: Identifying Transmission Case Fluid Passages
Courtesy of GENERAL MOTORS CORP.

PLANETARY CARRIER

Cleaning & Inspection

1. Clean components with solvent and dry with compressed air. Inspect all gears and shafts for chipped gears, excessive wear and damage. Replace components as necessary.
2. Using feeler gauge, measure planetary carrier pinion gear clearance. See **Fig. 14**. Planetary carrier pinion gear clearance should be .005-.035" (.13-.89 mm). Replace planetary carrier if pinion end clearance is not within specification.

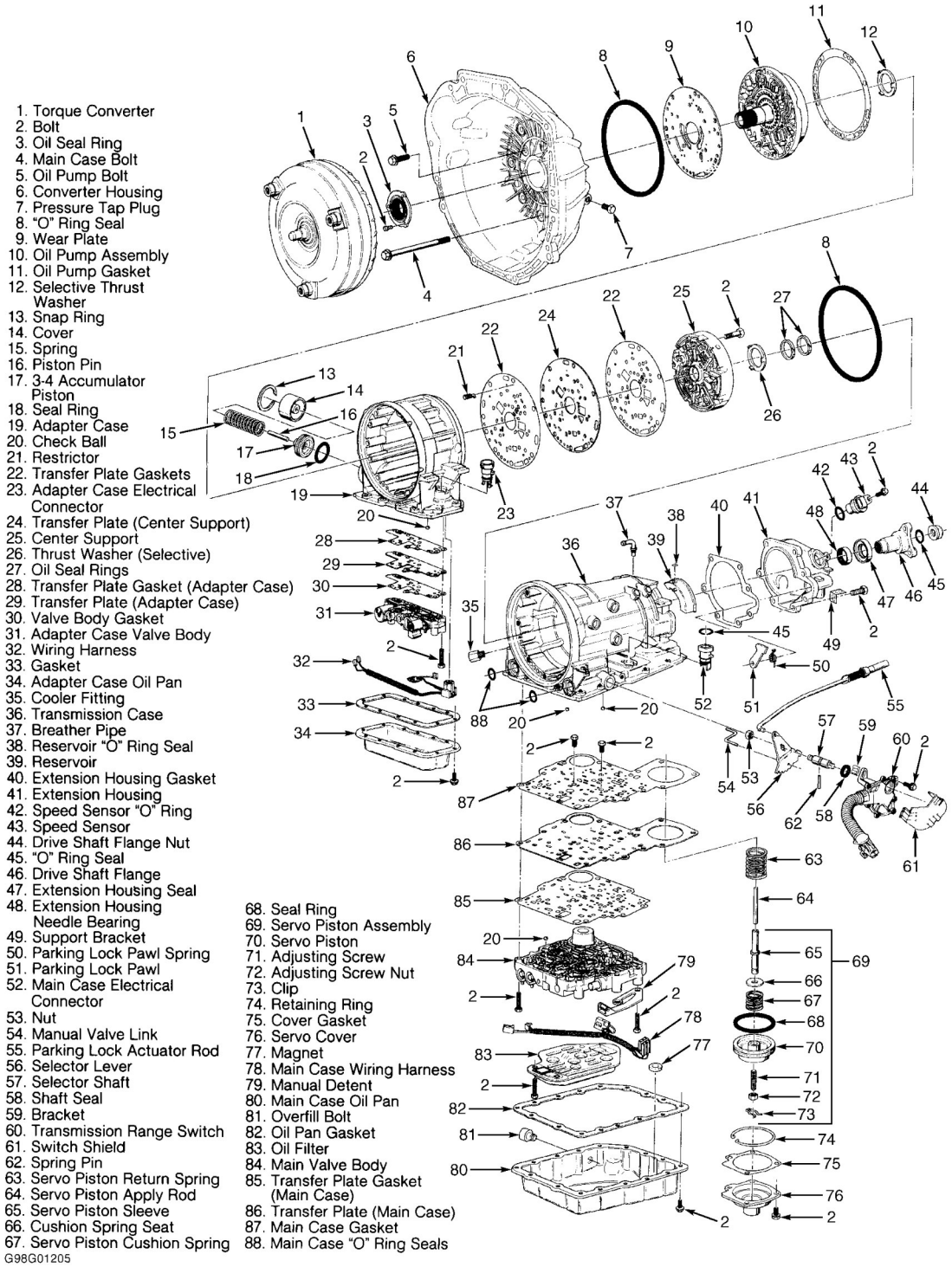


Fig. 7: Exploded View Of Transmission Case Components
Courtesy of GENERAL MOTORS CORP.

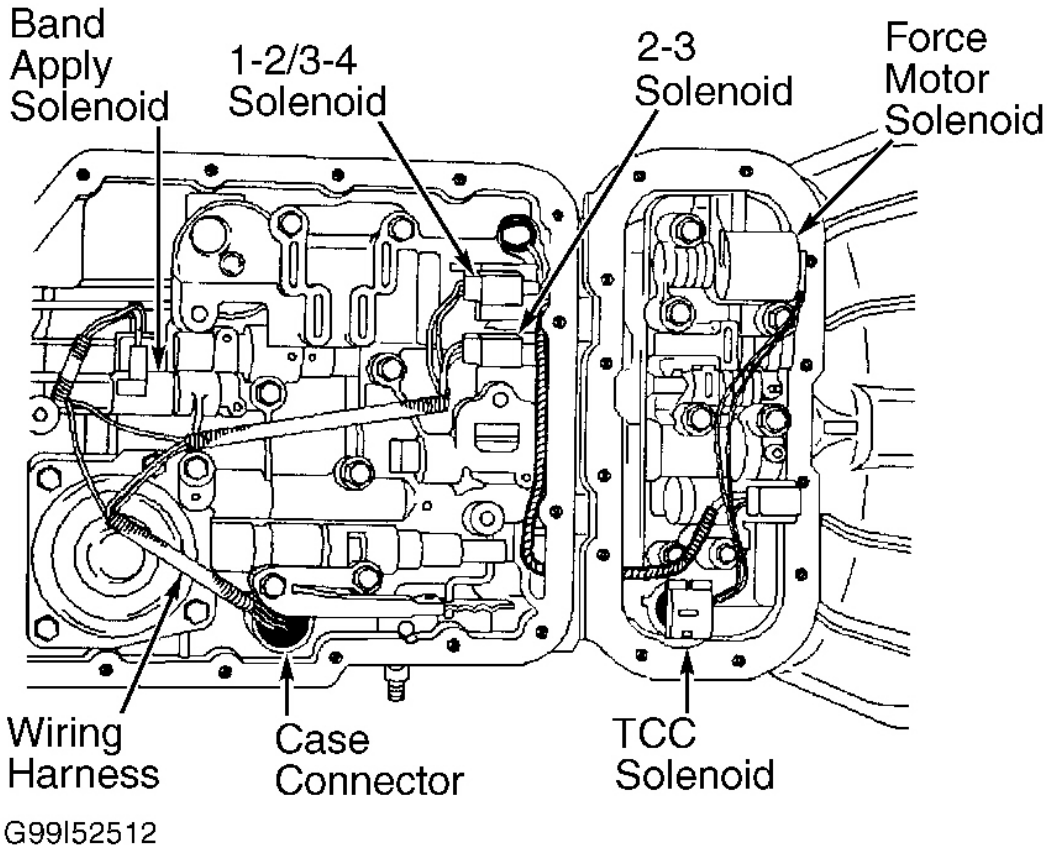


Fig. 8: Identifying 4L30-E Electrical Component Locations & Wiring Harness Routing
Courtesy of ISUZU MOTOR CO.

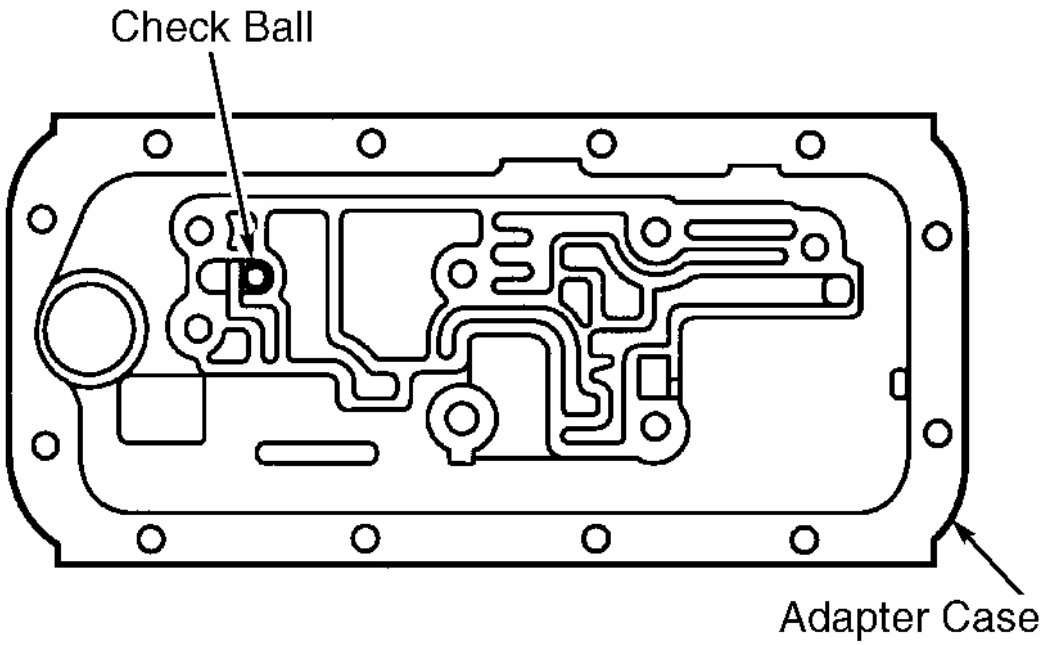


Fig. 9: Identifying Check Ball Location In Adapter Case
Courtesy of GENERAL MOTORS CORP.

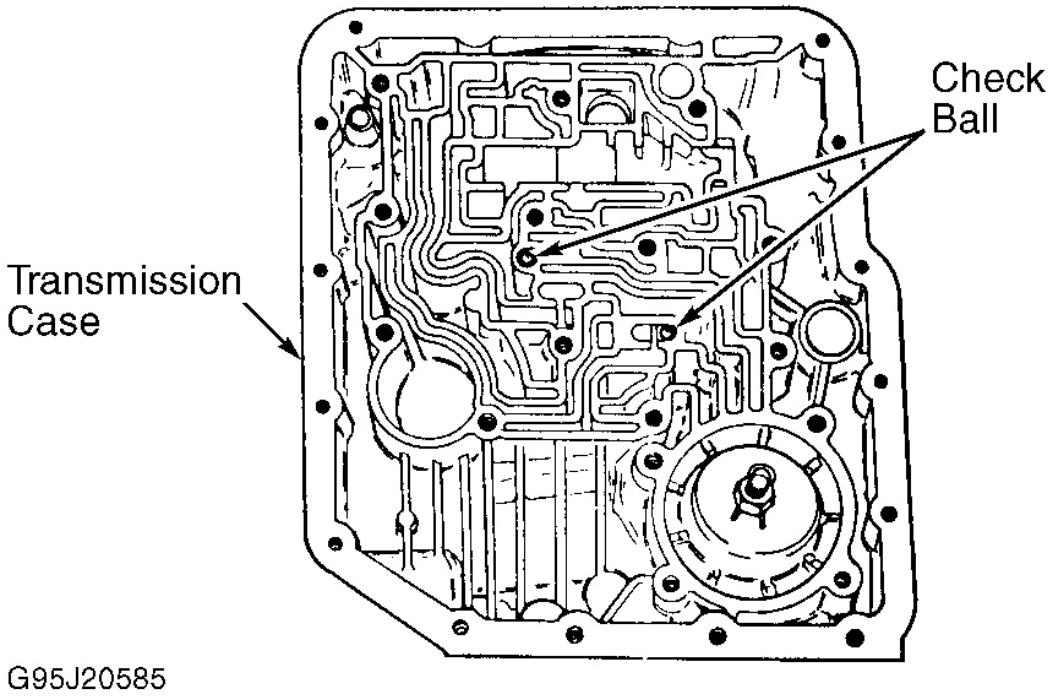
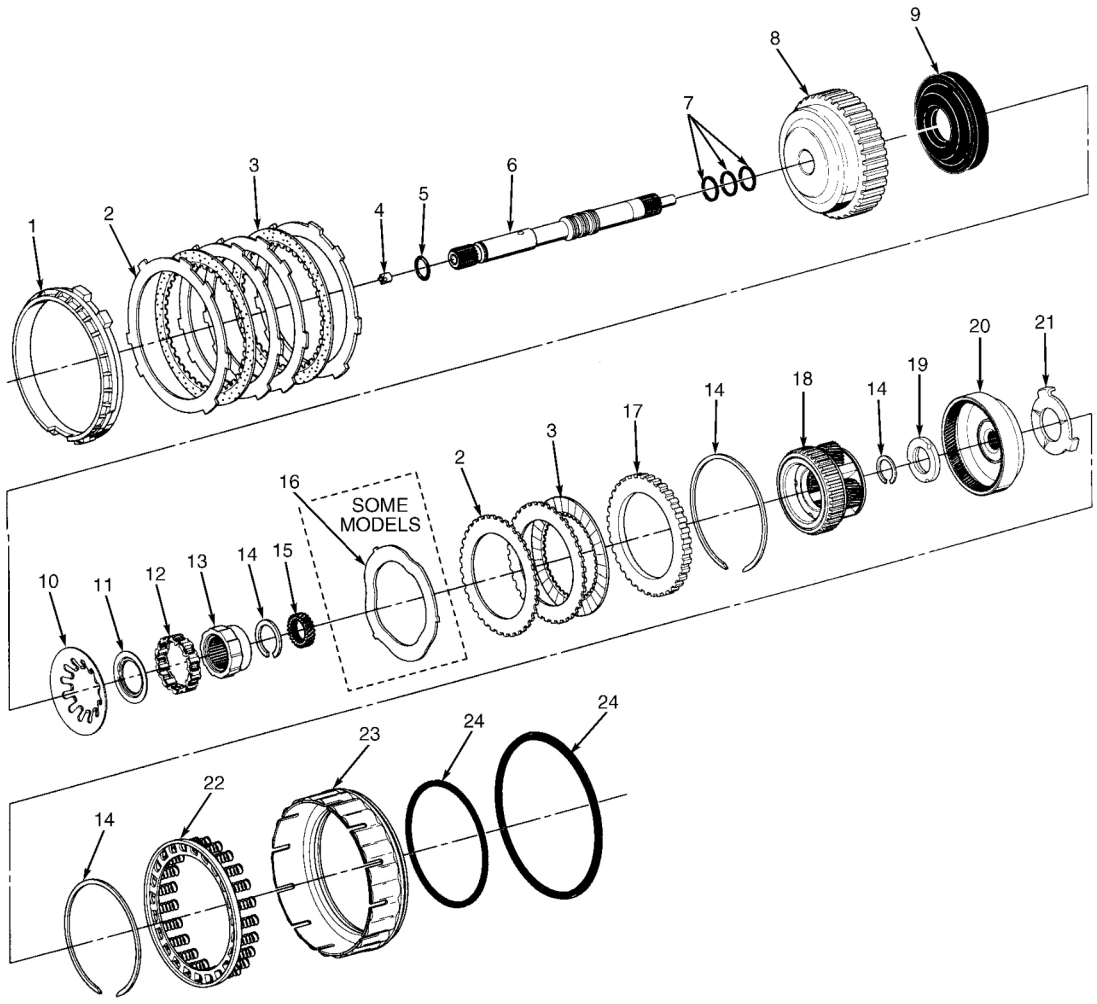
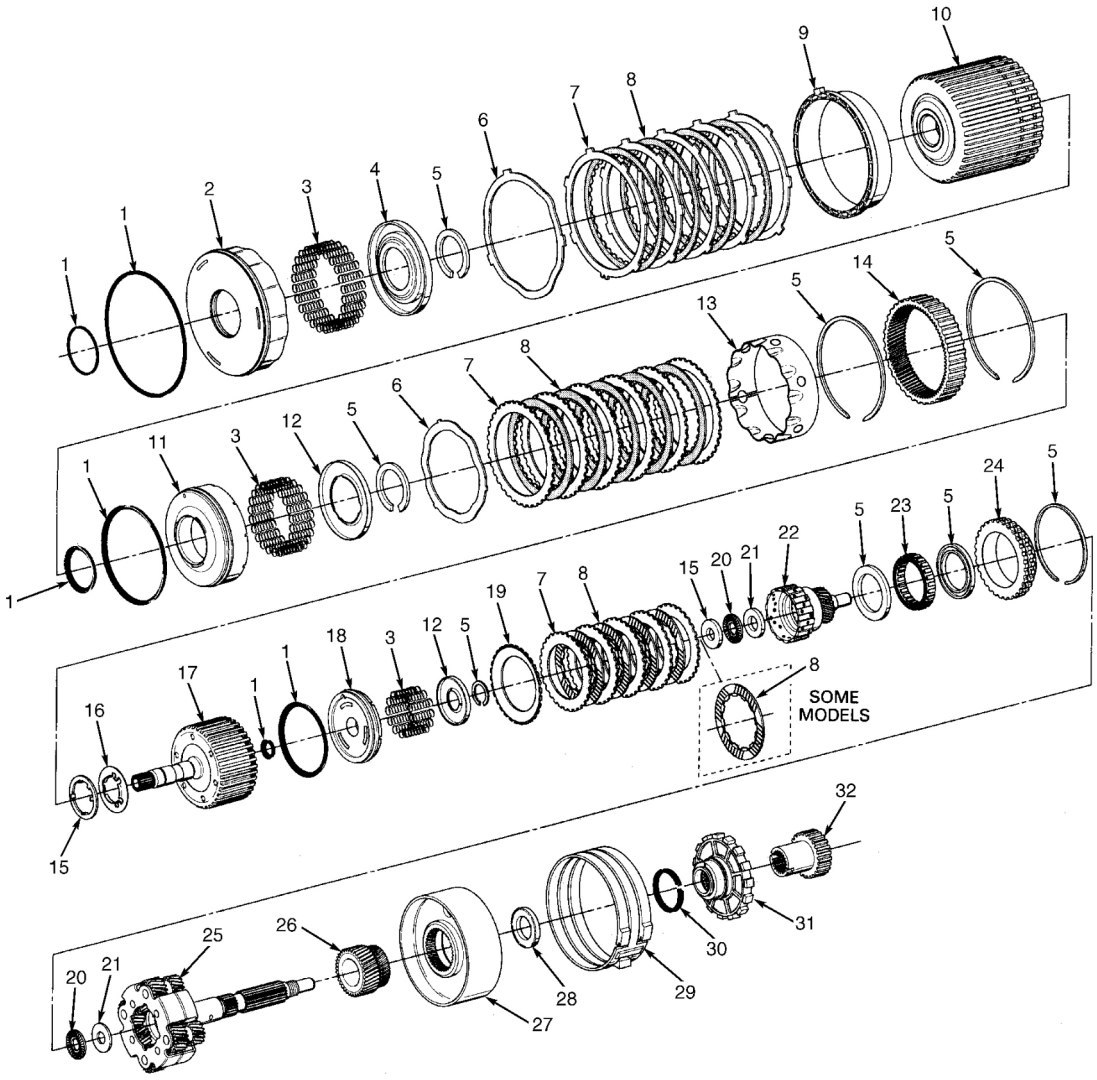


Fig. 10: Identifying Check Ball Locations In Transmission Case
Courtesy of ISUZU MOTOR CO.



1. 4th Clutch Retainer
2. Clutch Plate
3. Clutch Disc
4. Check Ball
5. "O" Ring Seal
6. Turbine Shaft
7. Oil Seal Rings
8. Overrun Clutch Drum
9. Overrun Clutch Piston
10. Release Spring
11. Release Spring Retainer
12. Overdrive Clutch Roller
13. Clutch Roller Cam
14. Snap Ring
15. Overdrive Sun Gear
16. Waved Plate (Some Models)
17. Backing Plate
18. Overdrive Carrier Assembly
19. Thrust Bearing
20. Overdrive Internal Gear
21. Thrust Washer
22. 4th Clutch Retainer & Spring Assembly
23. 4th Clutch Piston
24. Piston Seal

Fig. 11: Exploded View Of 4th Clutch, Overrun Clutch & Turbine Shaft
Courtesy of GENERAL MOTORS CORP.



1. Piston Seal
2. Reverse Clutch Piston
3. Return Spring Assembly
4. Spring Seat
5. Retaining Ring
6. Waved Plate
7. Clutch Plate
8. Clutch Disc
9. Selective Pressure Plate
10. 2nd Clutch Drum
11. 2nd Clutch Piston
12. Clutch Spring Seat
13. Spacer
14. Ring Gear
15. Thrust Washer
16. Clutch Hub Thrust Washer
17. 3rd Clutch Drum
18. 3rd Clutch Piston
19. Spring Cushion Plate
20. Shaft Bearing
21. Retaining Washer
22. Input Sun Gear
23. Sprag Assembly
24. Sprag Race
25. Planetary Carrier Assembly
26. Reaction Sun Gear
27. Reaction Sun Drum
28. Thrust Bearing
29. Brake Band
30. Parking Lock Gear Seal
31. Parking Lock Gear
32. Speed Sensor Drive Gear

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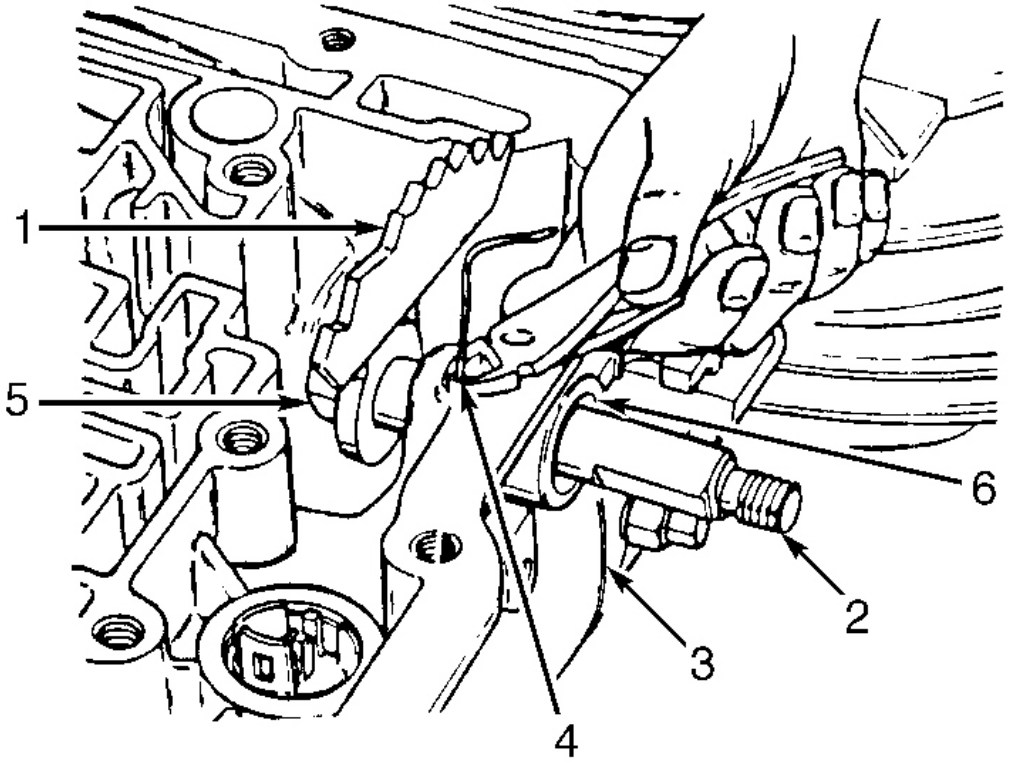
Fig. 12: Exploded View Of Reverse Clutch, 2nd Clutch, 3rd Clutch & Planetary Carrier Components
Courtesy of GENERAL MOTORS CORP.



1. Parking Lock & Range Selector Lever
2. Selector Shaft
3. Transmission Case
4. Spring Pin
5. Selector Shaft Nut
6. Shaft Seal

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Fig. 13: Identifying Spring Pin, Selector Shaft, Parking Lock & Range Selector Lever
Courtesy of ISUZU MOTOR CO.

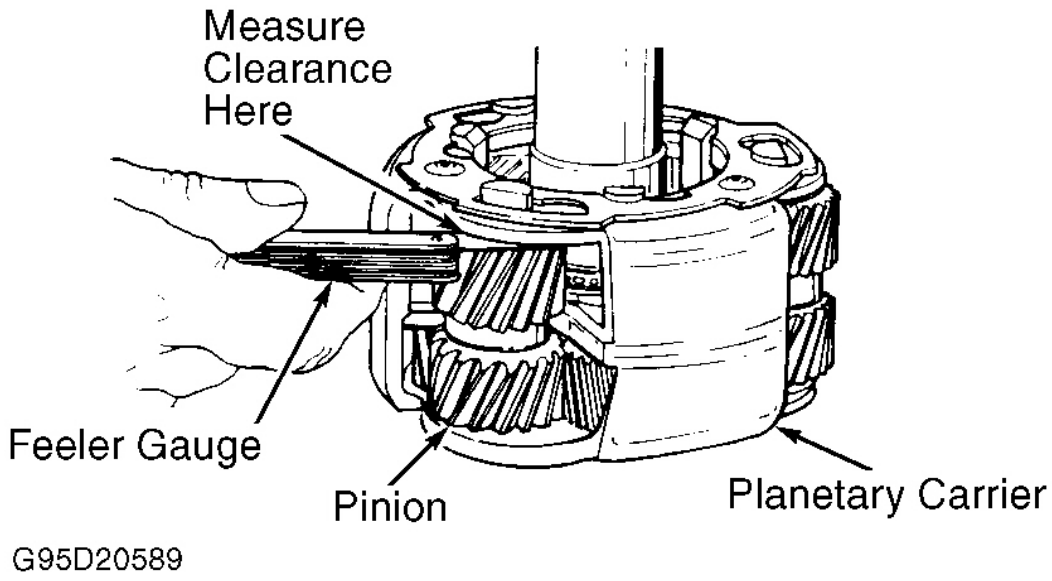


Fig. 14: Measuring Planetary Carrier Pinion Gear Clearance
Courtesy of ISUZU MOTOR CO.

TORQUE CONVERTER HOUSING & OIL PUMP ASSEMBLY

Disassembly

1. Remove oil pump assembly-to-torque converter housing bolts from center of torque converter housing. Remove torque converter housing, outer seal ring and wear plate from oil pump assembly. See **Fig. 15**.
2. Remove bolts and oil seal ring from center of torque converter housing. Using feeler gauge and straightedge, measure oil pump gear clearance. See **Fig. 16**. Clearance should be .0005-.0033" (.013-.084 mm). Replace components as necessary. If disassembling oil pump assembly, place reference marks on drive and driven gears for reassembly reference to ensure gears are installed in original direction.
3. Remove components from oil pump assembly. See **Fig. 15**. Use care when removing pins and snap rings, as they are under spring pressure.

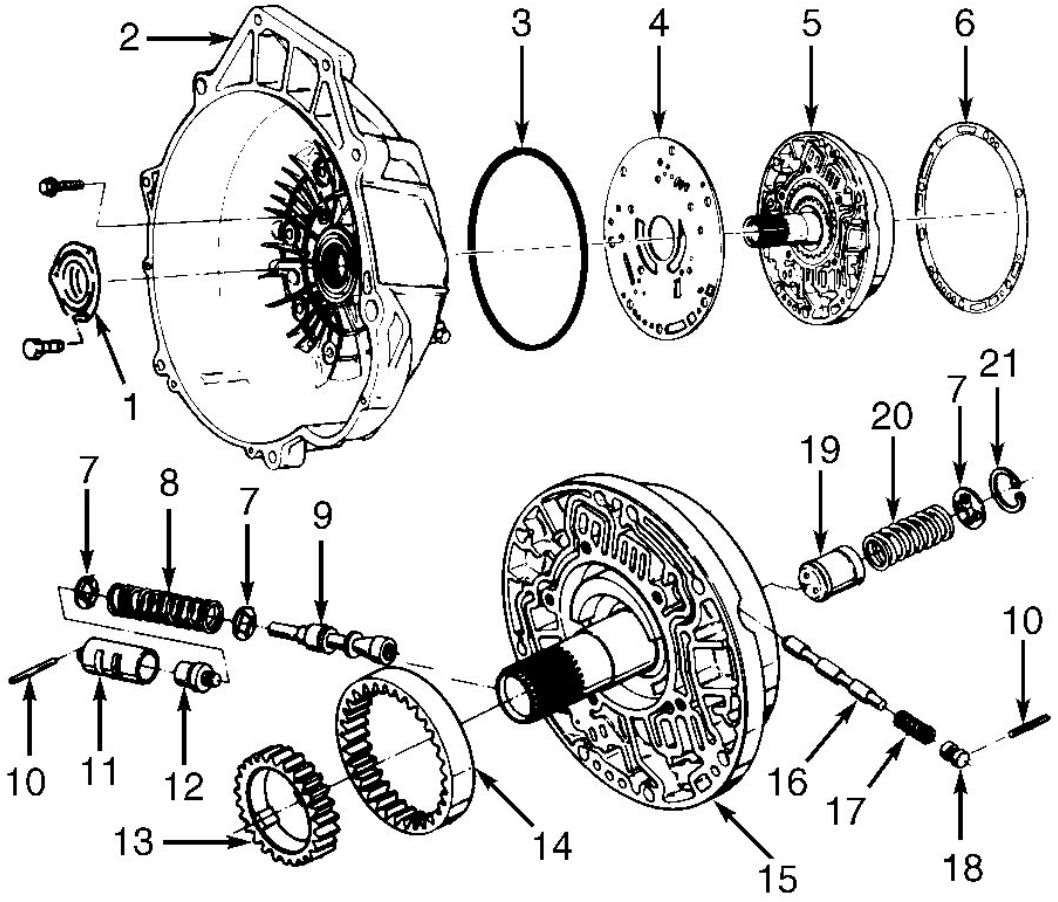
Cleaning & Inspection

Clean components with solvent and dry with compressed air. Inspect for damage and excessive wear. Replace components as necessary.

NOTE: Do not remove TCC control valve, pressure regulator valve or reverse boost valve unless line pressure test determines these components are malfunctioning.

Reassembly

1. Lubricate all components with Dexron-III ATF. To reassemble oil pump assembly, reverse disassembly procedure. Ensure spring seat is installed on pressure regulator valve with flat side of spring seat against shoulder on pressure regulator valve. Ensure spring seat is installed on throttle signal accumulator piston spring with flat side of spring seat away from spring. Ensure drive and driven gears are installed in original direction.
2. To reassemble torque converter housing, install NEW oil seal ring on torque converter housing. Install and tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Install wear plate on oil pump assembly. Install NEW gasket and NEW outer seal ring. Install torque converter housing on oil pump assembly.
3. Install Guide Pins (J-38588) in torque converter housing and oil pump assembly. See **Fig. 17**. Loosely install oil pump assembly-to-torque converter housing bolts.
4. Using Oil Pump Centering Adapter (J-38557), center oil pump assembly on torque converter housing. Tighten oil pump assembly-to-torque converter housing bolts to specification in a crisscross pattern. Remove oil pump centering adapter and guide pins.



1. Oil Seal Ring
2. Torque Converter Housing
3. Outer Seal Ring
4. Wear Plate
5. Oil Pump Assembly
6. Gasket
7. Spring Seat
8. Pressure Regulator Valve Spring
9. Pressure Regulator Valve
10. Pin
11. Sleeve
12. Boost Valve
13. Drive Gear
14. Driven Gear
15. Oil Pump Assembly
16. Torque Converter Clutch (TCC) Control Valve
17. Torque Converter Clutch (TCC) Control Valve Spring
18. Plug
19. Throttle Signal Accumulator Piston
20. Throttle Signal Accumulator Piston Spring
21. Snap Ring

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Fig. 15: Exploded View Of Torque Converter Housing & Oil Pump Assembly
Courtesy of ISUZU MOTOR CO.

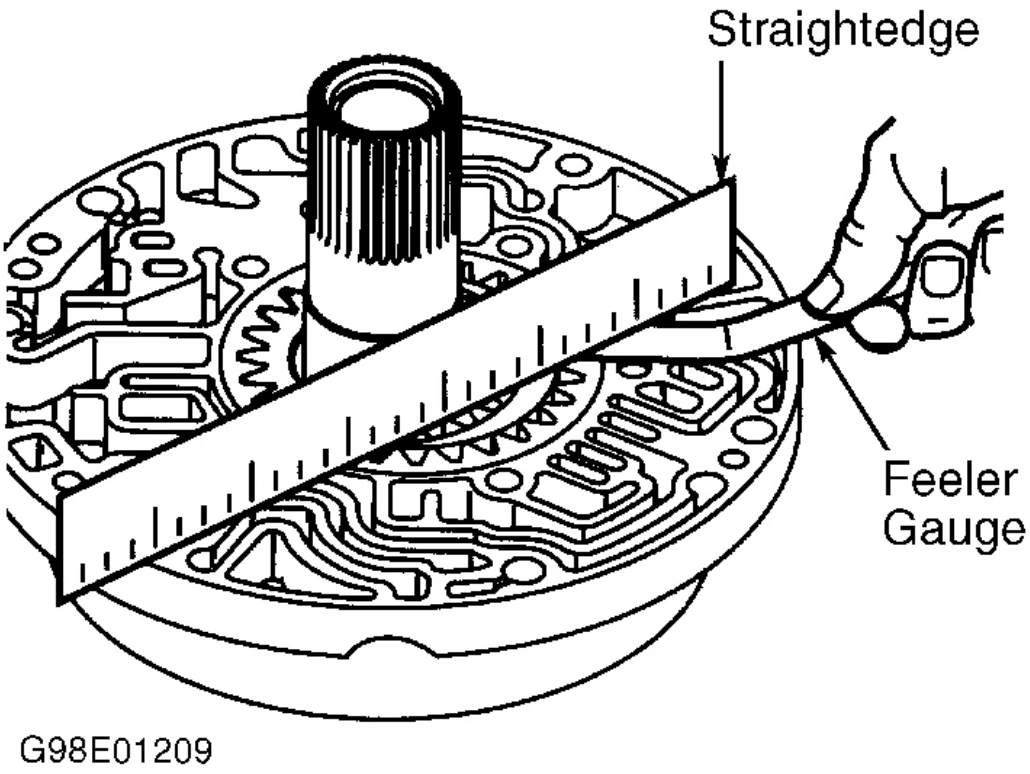


Fig. 16: Checking Oil Pump Gear Clearance
Courtesy of GENERAL MOTORS CORP.

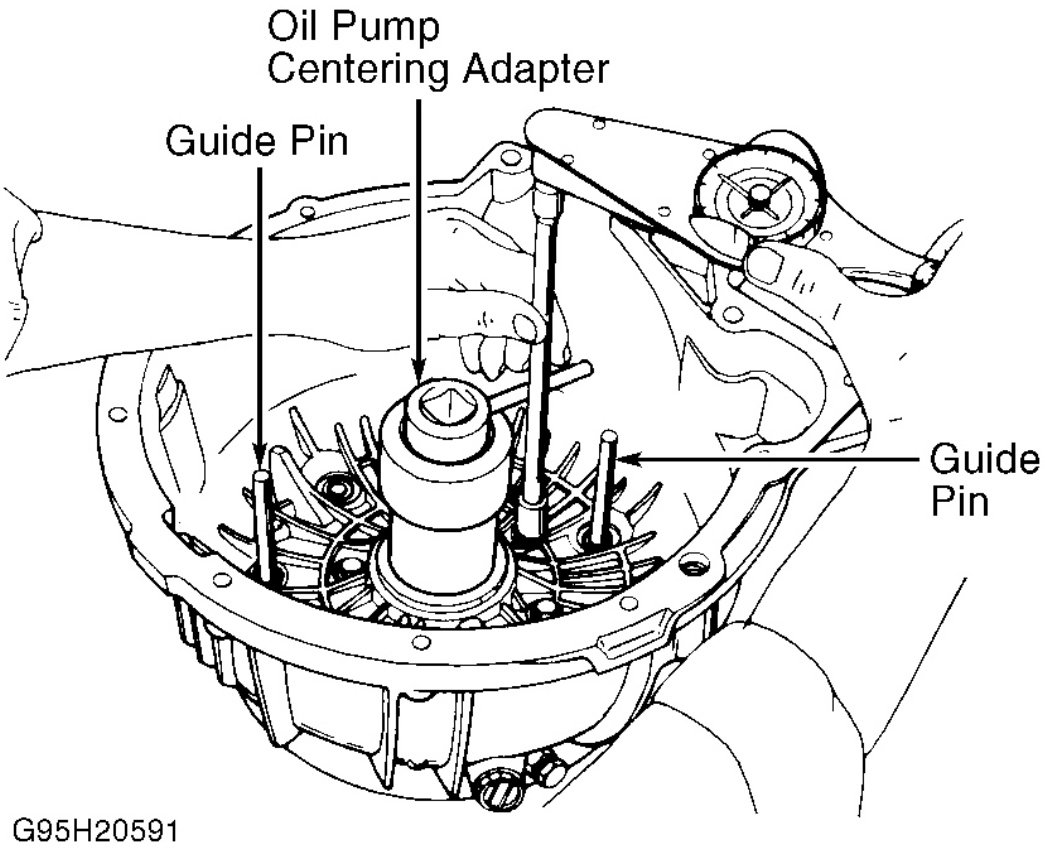


Fig. 17: Installing Torque Converter Housing On Oil Pump Assembly
Courtesy of ISUZU MOTOR CO.

MAIN VALVE BODY

CAUTION: When disassembling main valve body, place components in order and mark spring locations for reassembly reference. Do not use force to remove components from main valve body. Remove solenoids by pulling on metal tip. Do not pull on electrical connector housing on solenoid.

Disassembly

Remove transfer plate-to-main valve body bolts. Remove transfer plate gasket/transfer plate from main valve body. See **Fig. 7**. Note location of check ball in main valve body. See **Fig. 18**. Remove components from main valve body. Use care when removing pins and plugs, as components are under spring tension.

Cleaning & Inspection

Clean components with solvent and dry with compressed air. Inspect components for damage or signs of wear.

Replace components as necessary. Ensure valves slide freely in bores on main valve body.

NOTE: The use of a honing stone, fine sandpaper or crocus cloth is not recommended for servicing stuck valves. If it is necessary to clean valves, use micro fine lapping compound 900 grit or finer. Valve lands have sharply machined corners that are designed to clean bores.

Reassembly

1. Lubricate all components with Dexron-III ATF. To reassemble, reverse disassembly procedure using NEW transfer plate gaskets. Ensure components are installed in correct location. See **Fig. 18**.
2. Use guide pins in main valve body when installing transfer plate gaskets and transfer plate on main valve body. Install and tighten transfer plate-to-main valve body bolts to specification. See **TORQUE SPECIFICATIONS**.

NOTE: A delayed forward engagement condition may be caused by a clogged band apply solenoid. Solenoid screen assembly may break apart, clogging solenoid. If screen assembly is broken, replace both screen assembly and solenoid.

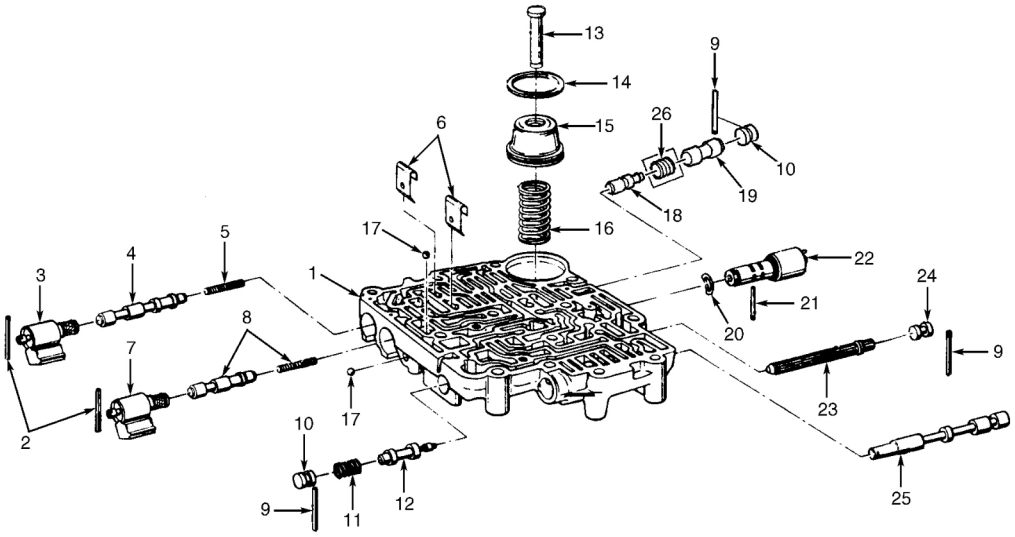


Fig. 18: Exploded View Of Main Valve Body
Courtesy of ISUZU MOTOR CO.

ADAPTER CASE VALVE BODY

CAUTION: When disassembling adapter case valve body, place components in order

and mark spring locations for reassembly reference. Do not use force to remove components from adapter case valve body.

Disassembly

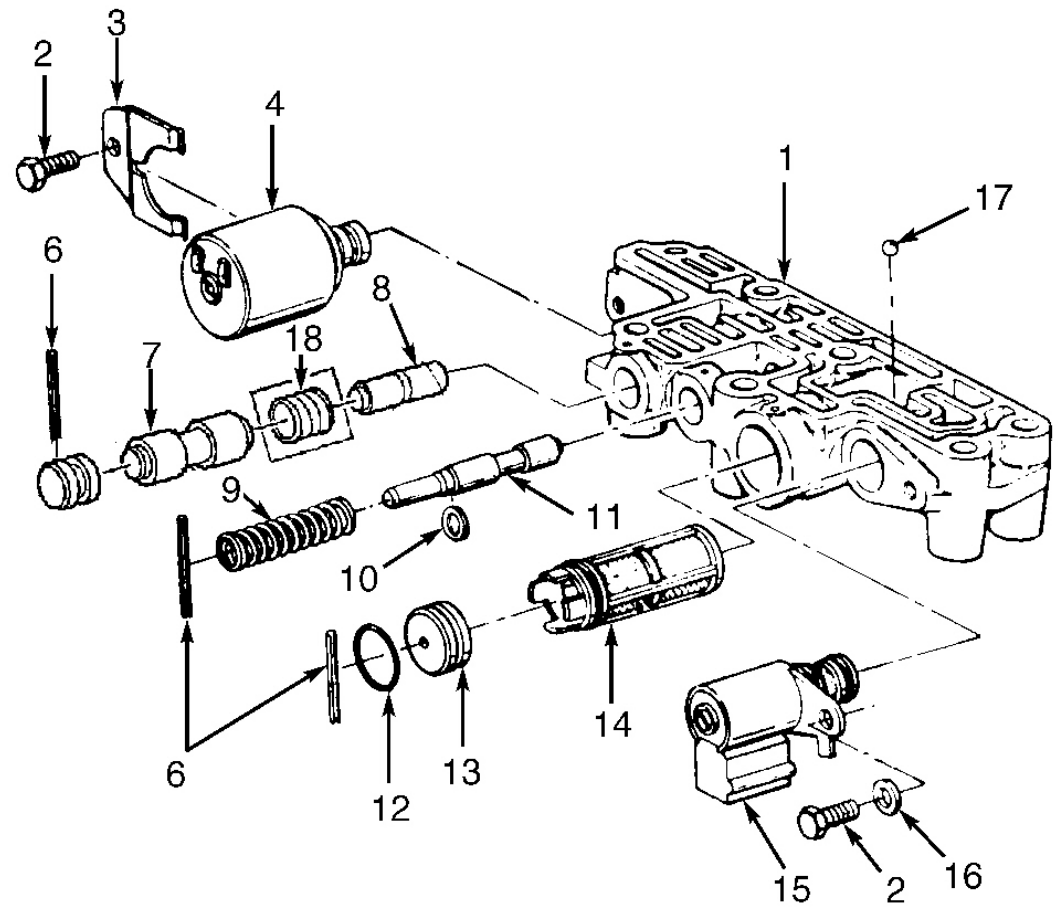
Remove components from adapter case valve body. See **Fig. 19**. Use care when removing spring pins and plugs, as components may be under spring tension. When removing plug for screen assembly, it may be necessary to screw a 5-mm bolt in center of plug to aid in plug removal.

Cleaning & Inspection

Clean components with solvent and dry with compressed air. Inspect components for damage or signs of wear. Replace components as necessary. Ensure valves slide freely in bores on adapter case valve body.

Reassembly

Lubricate all components with Dexron-III ATF. To reassemble, reverse disassembly procedure using NEW "O" rings. Ensure force motor solenoid (also referred to as pressure control solenoid) is positioned with electrical connections on solenoid facing toward mounting surface on adapter case valve body. Tighten force motor solenoid and torque converter clutch solenoid retaining bolts to specification. See **TORQUE SPECIFICATIONS**.



1. Adapter Case Valve Body
2. Bolt
3. Retainer
4. Force Motor Solenoid
5. Plug
6. Spring Pin
7. 3-4 Accumulator Valve
8. 3-4 Accumulator Control Valve
9. Feed Limit Valve Spring
10. Retaining Ring
11. Feed Limit Valve
12. "O" Ring
13. Plug
14. Screen Assembly
15. Torque Converter Clutch (TCC) Solenoid
16. Washer
17. Check Ball
18. 3-4 Accumulator Valve Spring (Optional)

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Fig. 19: Exploded View Of Adapter Case Valve Body
Courtesy of ISUZU MOTOR CO.

3RD CLUTCH & SPRAG ASSEMBLY

Disassembly

1. Place 3rd clutch drum and intermediate shaft upright, using overdrive internal gear as a support. See **Fig. 20**. Locate end of retaining ring at opening on side of 3rd clutch drum. Using screwdriver, compress one end of retaining ring and install one Retaining Ring Compressor (J-38450-A) near end of retaining ring to hold retaining ring clear of groove in 3rd clutch drum. See **Fig. 20**.
2. Compress other end of retaining ring and install retaining ring compressor near end of retaining ring. Repeat procedure by installing 4 remaining retaining ring compressors at equal intervals between retaining ring and 3rd clutch drum. Ensure retaining ring is fully disengaged from 3rd clutch drum.
3. Pull upward on input sun gear assembly until retaining ring clears groove in 3rd clutch drum. Remove retaining ring compressors. Remove input sun gear assembly from 3rd clutch drum.
4. Remove retaining washer, thrust bearing and thrust washer from 3rd clutch drum. Remove clutch plates, clutch discs and spring cushion plate from 3rd clutch drum. Note number and direction of clutch plates, clutch discs and spring cushion plate installation for reassembly reference. See **Fig. 12**.
5. To remove clutch piston from 3rd clutch drum, using spring compressor, compress return springs and return spring seat. DO NOT over-compress return springs and return spring seat.
6. Remove retaining ring from center of 3rd clutch drum. Release spring compressor. DO NOT allow return spring seat to bind in groove for retaining ring.
7. Remove spring compressor, return spring seat and return springs. Remove clutch piston from 3rd clutch drum. Remove seal rings from clutch piston.
8. To remove sprag assembly from input sun gear, remove sprag assembly outer race. See **Fig. 12**. Note direction of sprag assembly installation on input sun gear for reassembly reference. Remove sprag assembly from input sun gear.

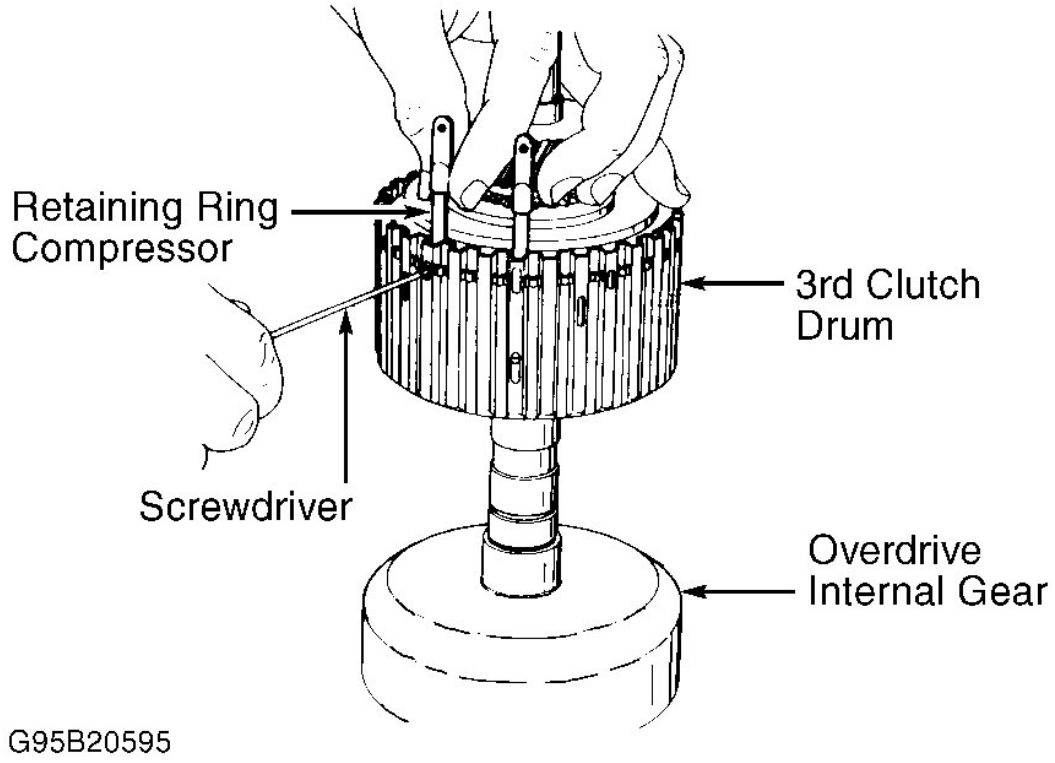


Fig. 20: Removing & Installing Input Sun Gear Assembly
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean metal components with solvent and dry with compressed air. Inspect components for damage or signs of wear. Replace components as necessary. Ensure check ball is located in clutch piston. Shake clutch piston to ensure check ball moves freely in clutch piston.

Reassembly

CAUTION: Sprag assembly must be installed on input sun gear so flared shoulder on sprag assembly is facing upward.

1. Lubricate all components with Dexron-III ATF. Place input sun gear on flat surface with sun gear facing upward.
2. Install sprag assembly outer race on sprag assembly. Install sprag assembly with outer race on input sun gear with flared shoulder on sprag assembly facing upward. See **Fig. 21**. Push downward on sprag assembly while rotating input sun gear counterclockwise until sprag assembly seats on input sun gear.
3. To check sprag assembly operation, hold input sun gear. Rotate sprag assembly outer race. Sprag

assembly outer race should rotate freely counterclockwise and lock when rotated clockwise. See **Fig. 22**. If sprag assembly operation is not as specified, sprag assembly is incorrectly installed on input sun gear.

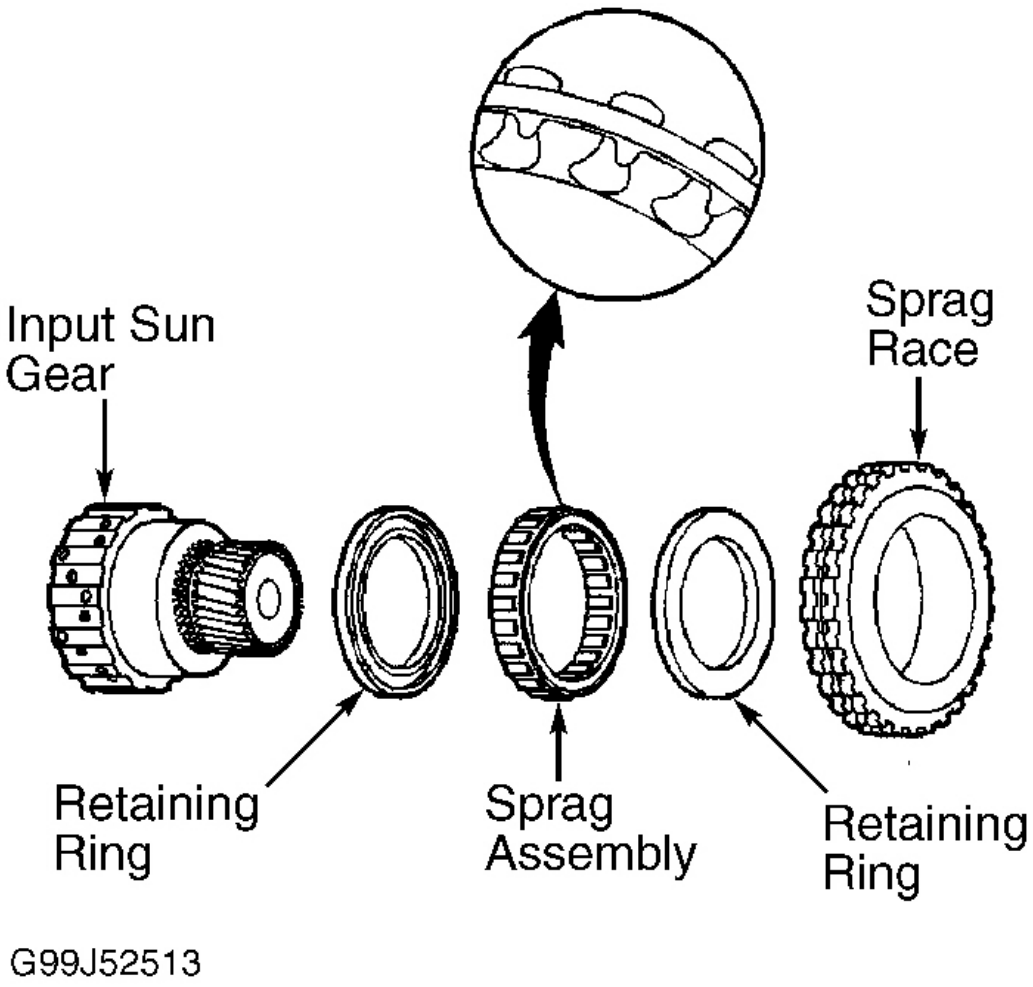


Fig. 21: Installing Sprag Assembly
Courtesy of GENERAL MOTORS CORP.

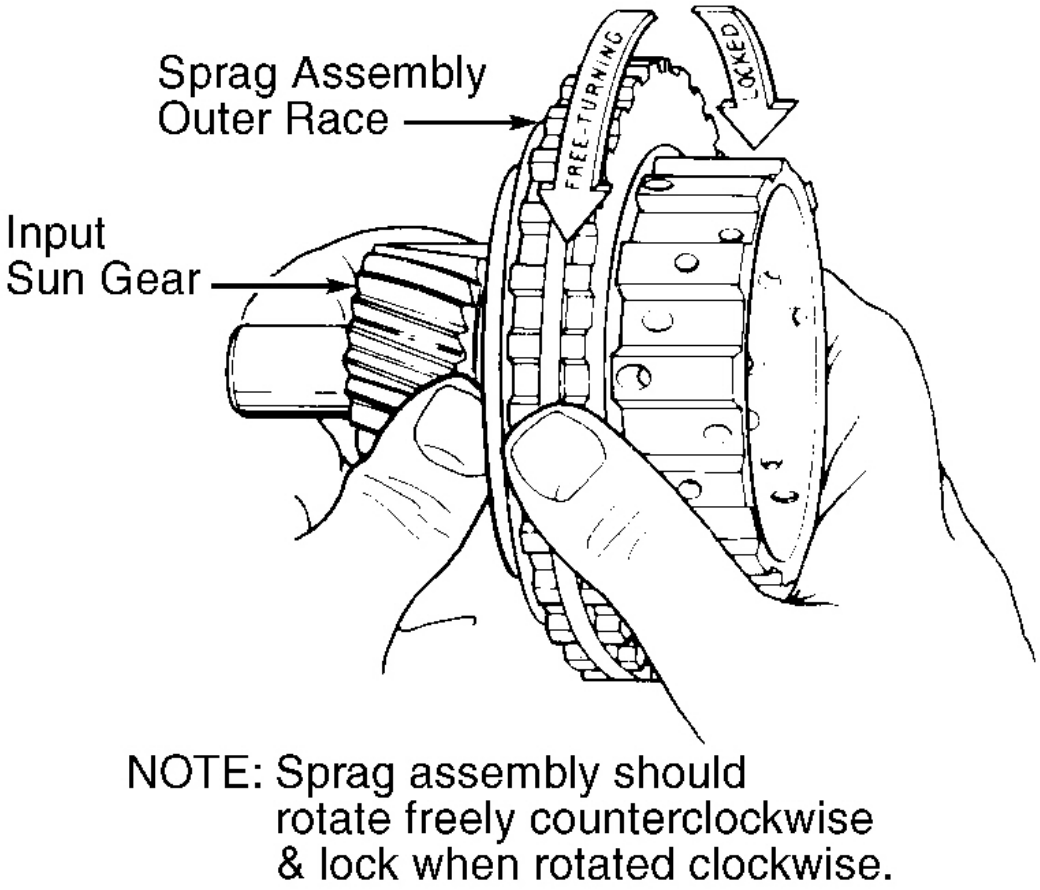


Fig. 22: Checking Sprag Assembly Operation
Courtesy of ISUZU MOTOR CO.

4. Install NEW seal rings on clutch piston so lip on seal ring faces toward shaft end of 3rd clutch drum (toward front of transmission). Lubricate seal rings with Dexron-III ATF.
5. Install clutch piston in 3rd clutch drum. Use care not to damage seal rings. Install return springs and return spring seat.
6. Using spring compressor, compress return springs and return spring seat. Ensure return spring seat does not bind in groove for retaining ring or over-compress return springs and return spring seat.
7. Install retaining ring at center of 3rd clutch drum. Remove spring compressor. Place 3rd clutch drum and intermediate shaft upright, using overdrive internal gear as a support.

CAUTION: Spring cushion plate must be installed in 3rd clutch drum so beveled side of spring cushion plate is toward 3rd clutch drum. See Fig. 12.

8. Install spring cushion plate in 3rd clutch drum. Install clutch plates and clutch discs in 3rd clutch drum, starting with clutch plate and alternating with clutch disc.
9. Install thrust washer, thrust bearing and retaining washer on 3rd clutch drum. Install input sun gear assembly on 3rd clutch assembly. Ensure splines on sprag assembly fully engages with tangs on clutch discs. Rotate input sun gear assembly back and forth to ensure sprag assembly outer race engages with 3rd clutch drum.
10. Install retaining ring compressors at each side of retaining ring. Using screwdriver, compress retaining ring while pushing downward on sprag assembly outer race until retaining ring aligns with groove on 3rd clutch drum. Remove retaining ring compressors. Ensure retaining ring fully engages in groove in 3rd clutch drum.

2ND CLUTCH

Disassembly

1. Remove retaining ring, ring gear, retaining ring and spacer from 2nd clutch drum. See **Fig. 12**. Remove clutch plates, clutch discs and waved plate from 2nd clutch drum. Note number and direction of clutch plates, clutch discs and waved plate installation for reassembly reference.
2. To remove clutch piston from 2nd clutch drum, using spring compressor, compress return springs and return spring seat. Remove retaining ring from center of 2nd clutch drum.
3. Release spring compressor. DO NOT allow return spring seat to bind in groove for retaining ring. Remove spring compressor, return spring seat and return springs. Remove clutch piston from 2nd clutch drum. Remove seal rings from clutch piston.

Cleaning & Inspection

Clean metal components with solvent and dry with compressed air. Inspect components for damage or signs of wear. Replace components as necessary. Ensure check ball is located in clutch piston. Shake clutch piston to ensure check ball moves freely in clutch piston.

Reassembly

1. Lubricate all components with Dexron-III ATF. Install NEW seal rings on clutch piston so lip on seal ring faces toward inside of 2nd clutch drum (toward front of transmission). Install clutch piston in 2nd clutch drum. Use care not to damage seal rings. Install return springs and return spring seat.
2. Using spring compressor, compress return springs and return spring seat. Ensure return spring seat does not bind in groove for retaining ring.
3. Install retaining ring at center of 2nd clutch drum. Remove spring compressor. Install waved plate in 2nd clutch drum. Ensure waved plate is installed in original direction.
4. Install clutch plates and clutch discs in 2nd clutch drum, starting with clutch plate, alternating with clutch disc. Install spacer with waved end facing clutch plates. See **Fig. 12**. Install retaining ring, ring gear and remaining retaining ring. Ensure ring gear is installed with grooved edge facing up.

3-4 ACCUMULATOR

Disassembly

1. The 3-4 accumulator is located in adapter case. See **Fig. 23**. Using spring compressor, depress cover. Remove snap ring from adapter case. Remove spring compressor.
2. Using slide hammer screwed into center of cover, pull cover from adapter case. Remove spring and 3-4 accumulator piston. Remove all seal rings.

Cleaning & Inspection

Clean metal components with solvent and dry with compressed air. Inspect components for damage or signs of wear. Replace components as necessary.

Reassembly

To reassemble, reverse disassembly procedure using NEW seal rings. Lubricate seal rings with Dexron-III ATF.

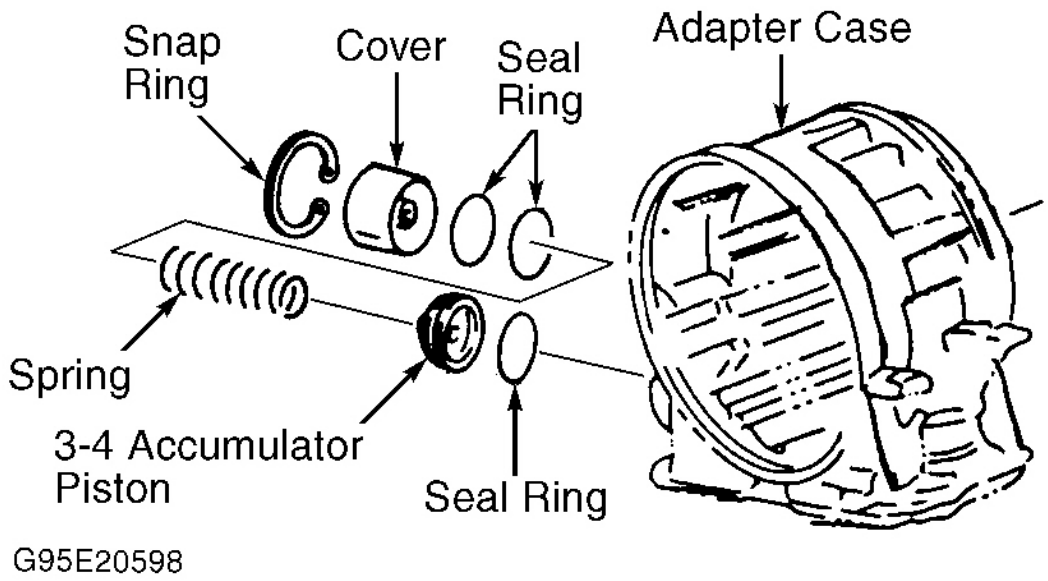


Fig. 23: Exploded View Of 3-4 Accumulator Piston
Courtesy of ISUZU MOTOR CO.

REVERSE CLUTCH PISTON & CENTER SUPPORT

Disassembly

1. Using Spring Compressor (J-23327), compress return springs and return spring seat on center support. See **Fig. 24**. DO NOT over compress return springs and return spring seat or damage to return spring seat may result.
2. Remove retaining ring. Remove spring compressor, return spring seat and return springs. Remove the reverse clutch piston. See **Fig. 12**. Remove bolts, center support, gasket, transfer plate and gasket from

adapter case. See **Fig. 7**. Remove restrictor from adapter case. See **Fig. 25**.

3. Remove retainer plate from side of center support. See **Fig. 26**. Remove plug, overrun and reverse lock-out valve springs and overrun and reverse lock-out valves from center support (if equipped).

Cleaning & Inspection

Clean components with solvent and dry with compressed air. Inspect components for damage or signs of wear. Replace components as necessary.

Reassembly

1. Lubricate all metal components with Dexron-III ATF. Install overrun and reverse lock-out valves (if equipped) in center support so the small diameter end is toward overrun and reverse lock-out valve spring area in center support. See **Fig. 26**. Install overrun and reverse lock-out valve springs.
2. Install plug and retainer plate on center support. Install restrictor in rear of adapter case. See **Fig. 25**. Using NEW gaskets, install transfer plate and center support on adapter case. Install and tighten center support bolts to specification. See **TORQUE SPECIFICATIONS**.
3. Install reverse clutch piston on center support. Install return springs and return spring seat. Using spring compressor, compress return springs and return spring seat. Install retaining ring. Remove spring compressor.

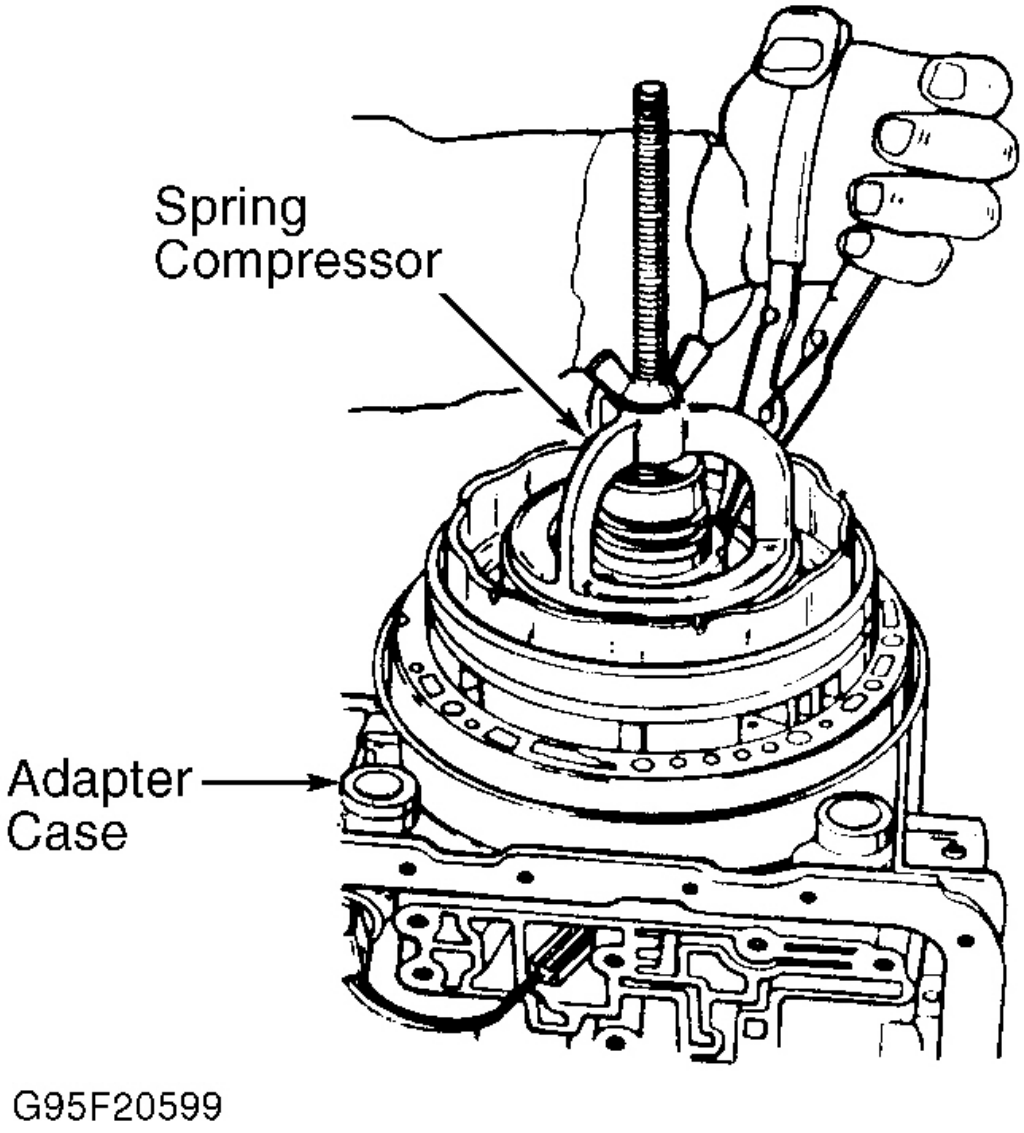


Fig. 24: Compressing Return Springs On Reverse Clutch
Courtesy of ISUZU MOTOR CO.

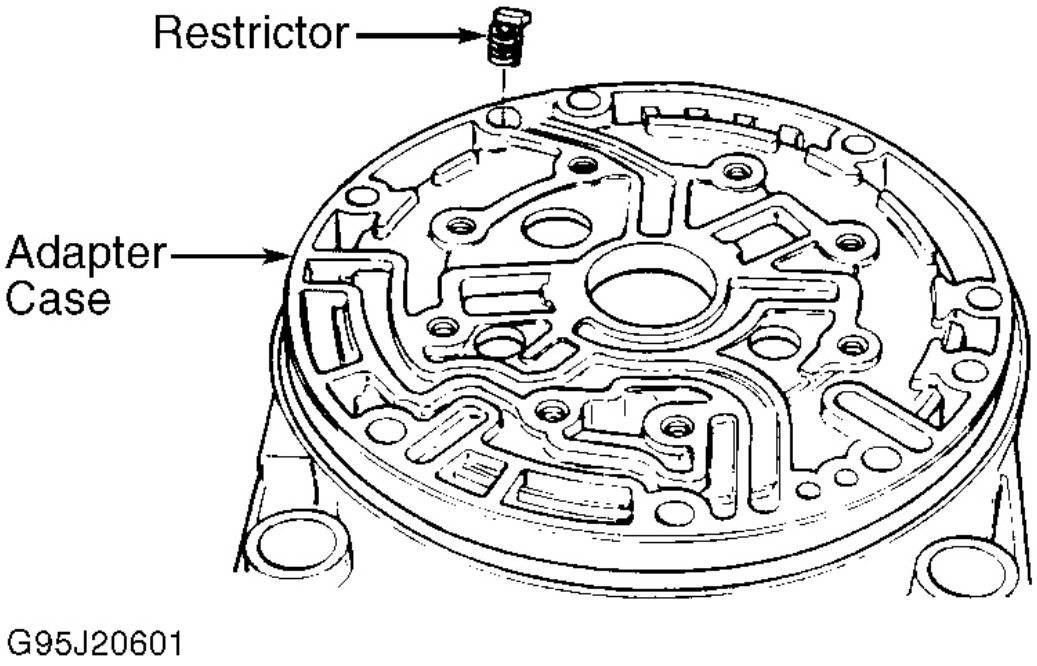
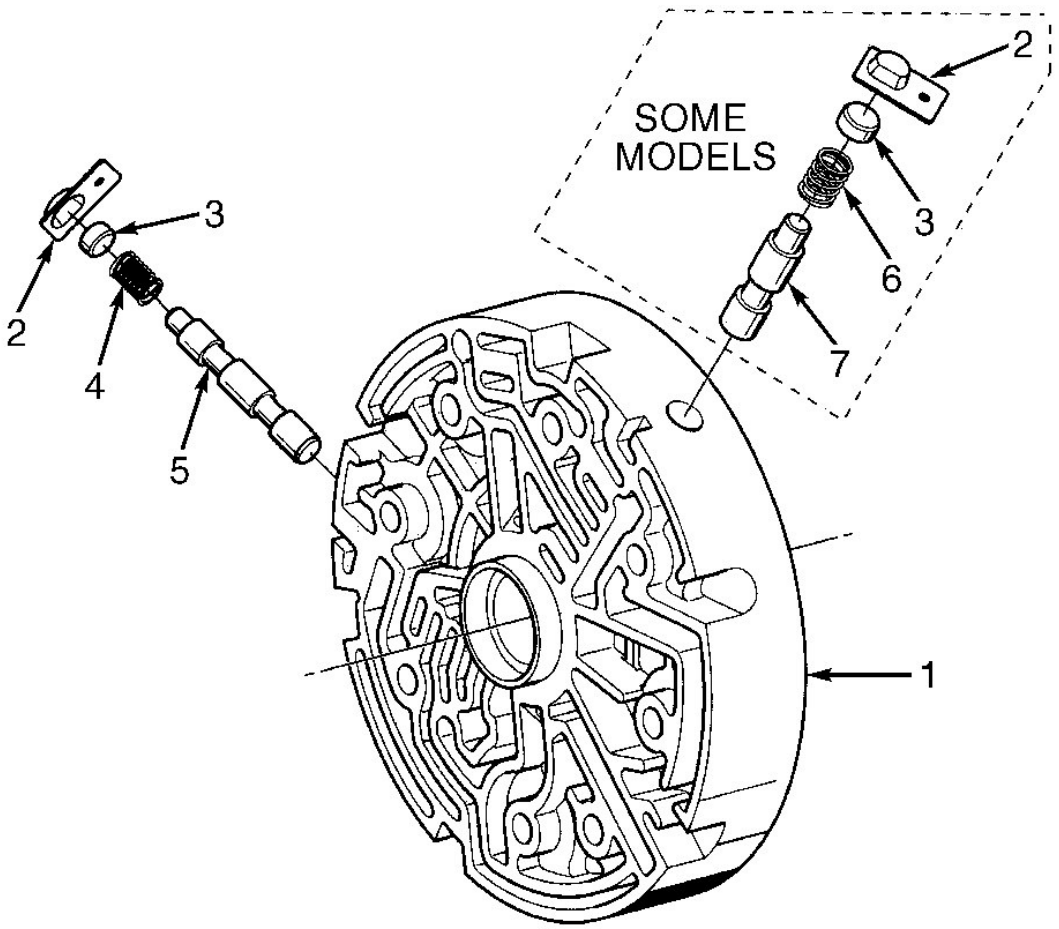


Fig. 25: Removing & Installing Restrictor In Adapter Case
Courtesy of ISUZU MOTOR CO.



1. Center Support
2. Retainer Plate
3. Plug
4. Overrun Lock-Out Spring
5. Overrun Lock-Out Valve
6. Reverse Lock-Out Spring
7. Reverse Lock-Out Valve

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Fig. 26: Exploded View Of Center Support Components
Courtesy of GENERAL MOTORS CORP.

TURBINE SHAFT & OVERRUN CLUTCH ASSEMBLY

Disassembly

1. Position overrun clutch assembly upright, using overdrive internal gear as a support. Remove snap ring and overdrive carrier assembly. See **Fig. 11**.
2. Remove overdrive sun gear and turbine shaft. Remove snap ring, backing plate, clutch discs, clutch plates and waved plate (if equipped). Note number and direction of clutch discs and clutch plate installation for

reassembly reference.

3. Using spring compressor, compress release spring retainer and release spring. Remove snap ring from center of overrun clutch drum. Remove spring compressor.
4. Remove roller clutch cam, roller clutch, release spring retainer and release spring. Remove clutch piston from overrun clutch drum. Remove seals from clutch piston if seals are not molded onto clutch piston. Remove turbine shaft oil seal rings from turbine shaft.

Cleaning & Inspection

1. Clean metal components with solvent and dry with compressed air. Inspect components for damage or signs of wear. Replace components as necessary.
2. Using feeler gauge, measure overdrive carrier assembly pinion gear clearance. See **Fig. 27**. Overdrive carrier assembly pinion gear clearance should be .009-.025" (.23-.64 mm). Replace overdrive carrier assembly carrier if pinion gear clearance is not within specification.

Reassembly

1. Lubricate all metal components with Dexron-III ATF. Apply petroleum jelly on turbine shaft oil seal rings. Install turbine shaft oil seal rings on turbine shaft.
2. Install NEW seals on clutch piston if seals are not molded onto clutch piston. Install clutch piston in overrun clutch drum. Use care not to damage seal rings.

CAUTION: Release spring must be installed in proper direction in overrun clutch drum. See Fig. 11.

3. Install release spring in overrun clutch drum. Install release spring retainer, roller clutch and roller clutch cam in overrun clutch drum. Using spring compressor, compress release spring retainer and release spring. Install snap ring at center of overrun clutch drum. Remove spring compressor.
4. Install waved plate (if equipped). Install clutch plates and clutch discs in overrun clutch drum, starting with 2 clutch plates and alternating with clutch disc. See **Fig. 11**.

CAUTION: Sun gear must be installed with countersunk area on sun gear facing toward overrun clutch drum.

5. Install backing plate and snap ring. Install overrun clutch drum on turbine shaft. Install sun gear with countersunk area on sun gear facing toward overrun clutch drum.
6. Install overdrive carrier assembly. Rotate overdrive carrier assembly counterclockwise during installation until roller clutch fully engages overdrive carrier assembly. Rotate overdrive carrier assembly and listen for looseness in rollers on roller clutch. Install snap ring on end of turbine shaft.

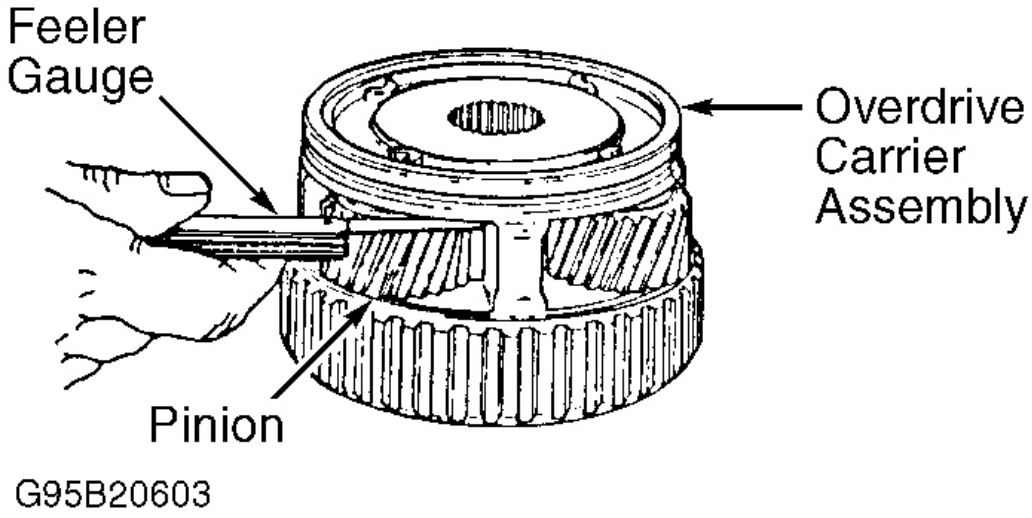


Fig. 27: Measuring Overdrive Carrier Assembly Pinion Gear Clearance
Courtesy of ISUZU MOTOR CO.

TRANSMISSION REASSEMBLY

NOTE: Lubricate all components with Dexron-III ATF before reassembly. Coat all thrust bearing assemblies with petroleum jelly before installing. For bearing, bushing, oil seal and thrust washer location reference during reassembly, see Fig. 33-Fig. 35 .

1. Install NEW shaft seal for selector shaft in transmission case. Install selector shaft. Install spring pin in transmission case. See **Fig. 13**. DO NOT install spring pin flush with surface on transmission case.
2. Install parking lock and range selector lever with actuator rod on selector shaft. Install and tighten selector shaft nut to specification. See **TORQUE SPECIFICATIONS**.
3. Install brake band in transmission case. Ensure servo pin area aligns with servo hole. Install thrust bearing assembly in rear of transmission case.
4. Install brake drum, reaction sun gear and needle bearing. See **Fig. 12**. Install thrust bearing assembly on output shaft on planetary carrier.
5. Prior to installation, pinions on planetary carrier must be properly aligned (if markings are present). Each pinion may be marked with 2 dots to indicate master tooth space and a single dot to indicate master tooth. Planetary carrier may be marked with double lines which should align with 2 dots on 2 opposite pinions. Single lines on planetary carrier should align with single dot on other 2 pinions. See **Fig. 28**.
6. Properly align all pinions on planetary carrier. Install 2nd and 3rd clutch assemblies on planetary carrier. If pinions are properly aligned, 2nd and 3rd clutch assembly should fit easily on planetary carrier.
7. Rotate 3rd clutch and ensure pinions with 2 dots are at teeth No. 1 and 46 on ring gear in 2nd clutch

assembly. See **Fig. 28**. Pinions with one dot should be between teeth No. 23 and 24 on ring gear in 2nd clutch assembly. If not as specified, realign as necessary.

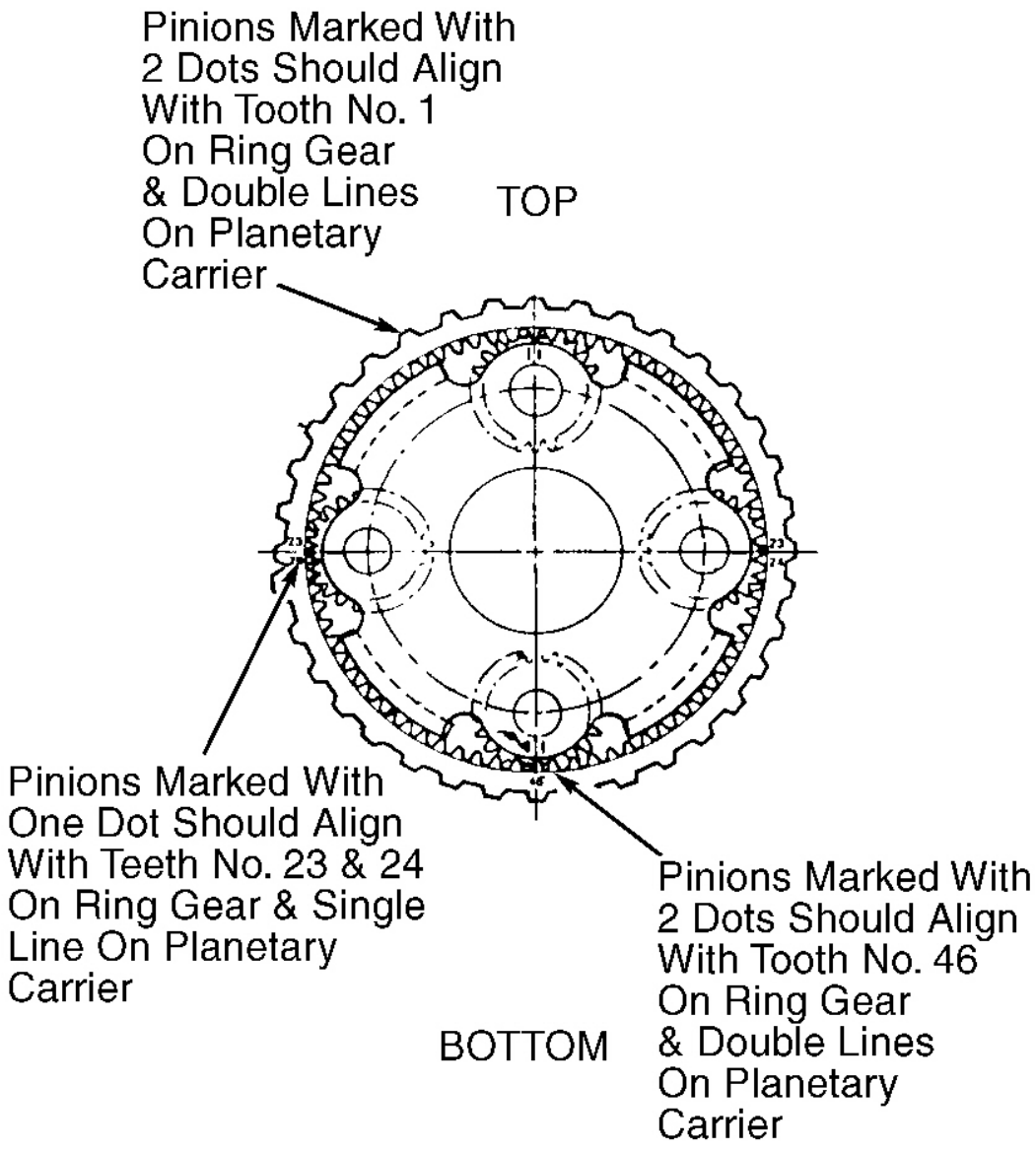


Fig. 28: Aligning Pinions On Planetary Carrier
Courtesy of ISUZU MOTOR CO.

8. Once correct pinion alignment is obtained, install planetary carrier in transmission case. Install washer and bearing on planetary carrier. See **Fig. 12**.
9. Install thrust washer on 2nd clutch. Ensure tangs on thrust washer engage with slots on 2nd clutch. Align

tangs on clutch plates in 2nd clutch. Install 3rd clutch assembly in 2nd clutch drum.

10. Install assembled 2nd and 3rd clutch assemblies in transmission case. Ensure planetary carrier is properly aligned. Rotate output shaft and clutch assemblies to ensure proper engagement.
11. Install pressure plate in transmission case with flat side up. Lug on pressure plate must engage narrow notch in case that faces oil pan mounting surface. See **Fig. 12**.
12. Install reverse clutch plates and clutch discs, starting with clutch plate and alternating with clutch disc. Install waved plate with lugs engaged with narrow notch in transmission case.
13. The 2nd clutch end play must now be checked. Install Selective Thrust Washer Gauge (J-23085-A) on transmission case, against intermediate shaft. Move inner shaft on selective thrust washer gauge downward against thrust surface on 2nd clutch hub. Perform STEP 1. See **Fig. 29**. Tighten thumb screw on selective thrust washer gauge.
14. Remove selective thrust washer gauge from transmission case. Install spacer ring on inner shaft of selective thrust washer gauge. Measure distance "G" from end of inner shaft to surface on spacer ring. Perform STEP 2. See Fig. 29.
15. Using dimension "G", determine color of selective thrust washer that fits on center support. See **SELECTIVE THRUST WASHER SPECIFICATIONS** table. This should provide a final 2nd clutch end play of .014-.031" (.36-.79 mm).

SELECTIVE THRUST WASHER SPECIFICATIONS

Dimension "G" - In. (mm)	Color
.060-.064 (1.53-1.63)	Yellow
.068-.072 (1.73-1.82)	Red
.075-.079 (1.91-2.01)	Black
.083-.087 (2.11-2.21)	White
.090-.094 (2.29-2.39)	Green
.098-.102 (2.49-2.59)	Blue

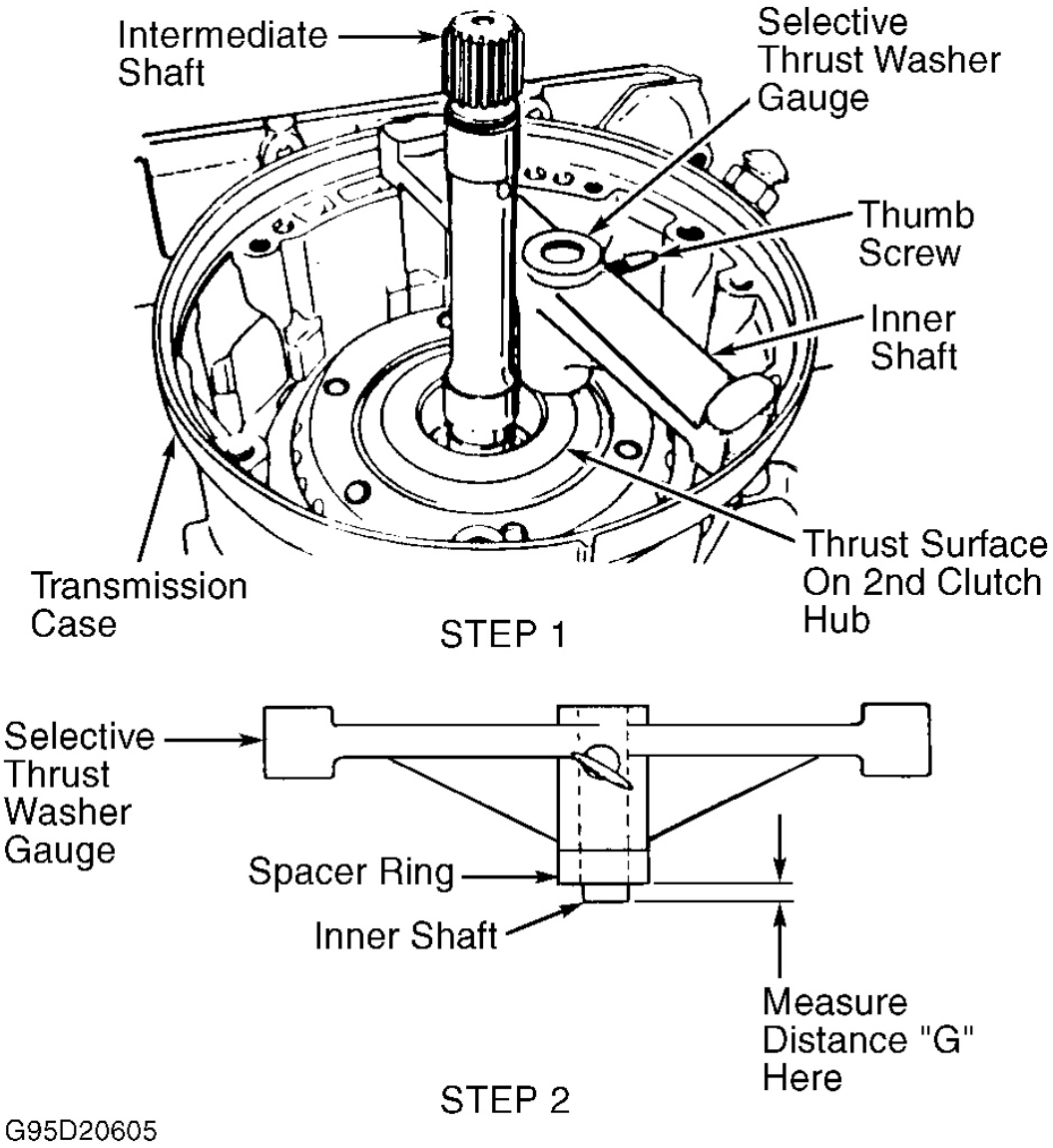
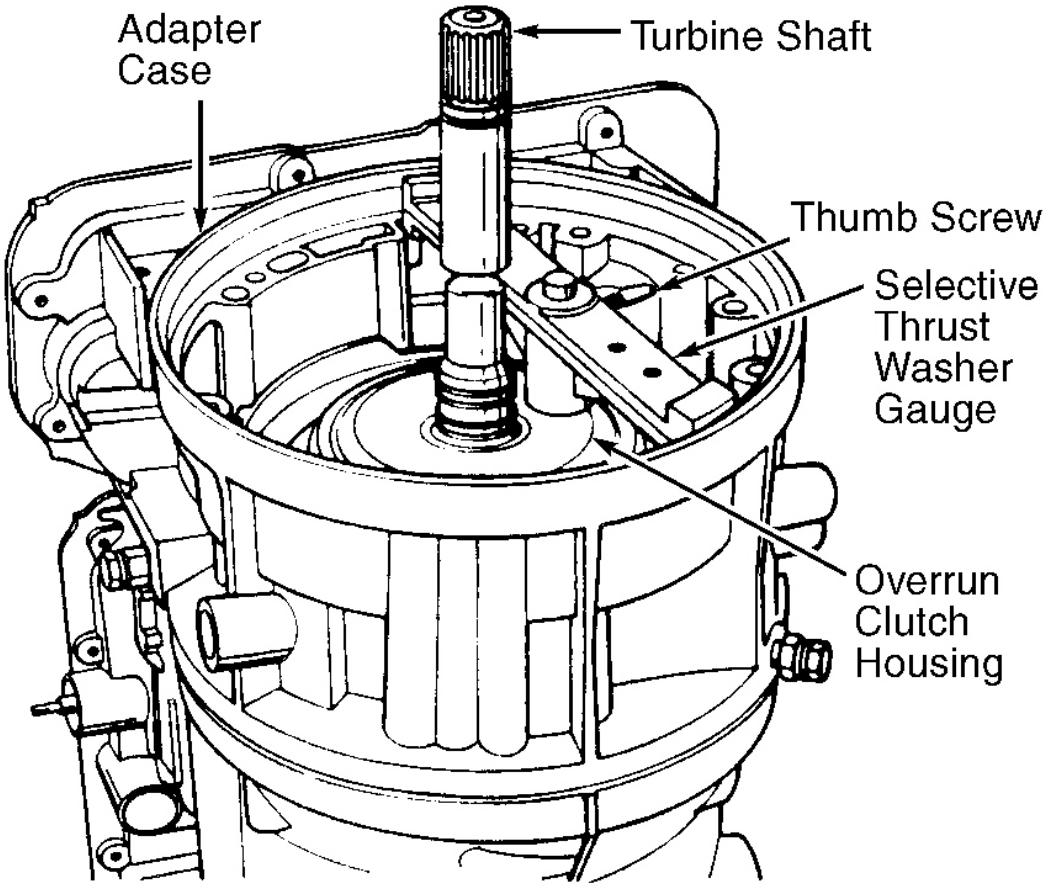


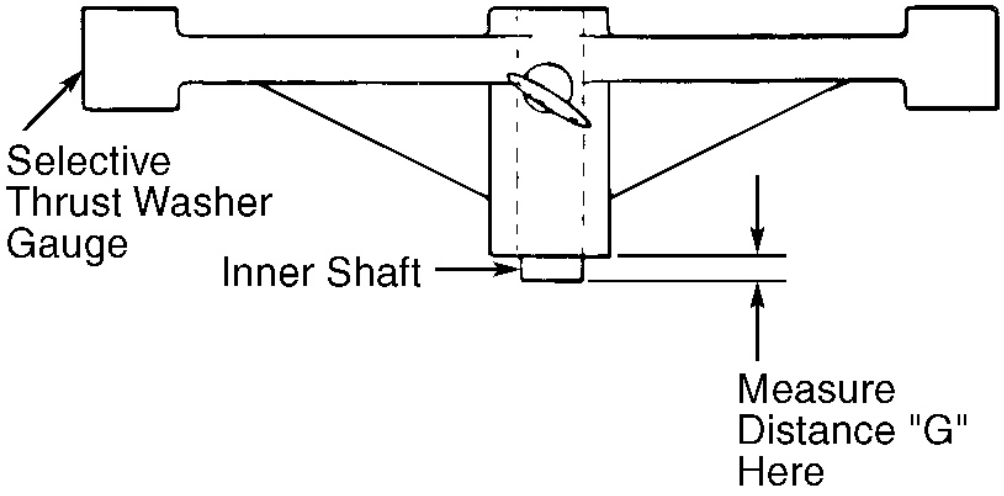
Fig. 29: Measuring 2nd Clutch End Play
Courtesy of ISUZU MOTOR CO.

16. Install NEW seals on 4th clutch piston. Lubricate seals with Dexron-III ATF. Install 4th clutch piston in adapter case. Use care not to damage seal rings.
17. Install 4th clutch retainer and spring assembly on 4th clutch piston. See **Fig. 12**. Using spring compressor, compress 4th clutch spring retainer and spring assembly. Install snap ring in adapter case. Remove spring compressor.
18. Apply petroleum jelly on selective thrust washer. Install selective thrust washer on center support. Install NEW "O" rings on front of transmission case and a NEW seal ring on the adapter case. See **Fig. 7**.

19. Install guide pins in front of transmission case for aligning adapter case at 4 and 11 o'clock positions. Install adapter case and center support assembly on transmission case.
20. Install thrust washer on adapter case. Ensure tangs on thrust washer engage with slots in adapter case. Apply petroleum jelly on thrust bearing and install at center of overdrive internal gear with Black side of thrust bearing facing upward. See **Fig. 11**.
21. Install overdrive internal gear with thrust bearing on turbine shaft and overrun clutch assembly. Install turbine shaft and overrun clutch assembly with overdrive internal gear in adapter case.
22. Install 4th clutch plates and clutch discs in following order: clutch plate, clutch disc, clutch plate, clutch plate, clutch disc and clutch plate. Clutch plates must be installed with short tang facing toward adapter case valve body surface.
23. Install 4th clutch retainer with notch area toward adapter case valve body surface. Overdrive clutch end play must now be checked.
24. Install Selective Thrust Washer Gauge (J-23085-A) on adapter case, against turbine shaft. Move inner shaft on selective thrust washer gauge downward against thrust surface on overrun clutch housing. Perform STEP 1. See **Fig. 30**. Tighten thumb screw on selective thrust washer gauge.
25. Remove selective thrust washer gauge from adapter case. Measure distance "G" from end of inner shaft to surface on selective thrust washer gauge. Perform STEP 2. See **Fig. 30**.
26. Using dimension "G", determine color of selective thrust washer that fits on rear of oil pump assembly. See **SELECTIVE THRUST WASHER SPECIFICATIONS** table. This should provide a final overdrive clutch end play of .004-.027" (.10-.69 mm).



STEP 1



STEP 2

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Fig. 30: Measuring Overdrive Clutch End Play
Courtesy of ISUZU MOTOR CO.

27. Install NEW outer seal ring on torque converter housing and NEW gasket on oil pump assembly. See **Fig. 15**. Apply petroleum jelly on selective thrust washer and install on rear of oil pump assembly. Ensure selective thrust washer is fully seated on oil pump assembly.
28. Install torque converter housing with oil pump assembly and gasket on adapter case. Install and tighten torque converter housing-to-adapter case bolts to specification. See **TORQUE SPECIFICATIONS**. Ensure oil pump gears rotate freely.
29. Install dial indicator, end play fixture and turbine shaft puller assembly onto turbine shaft. See **Fig. 31**. Pull turbine shaft upward until slight resistance is felt. Zero dial indicator.
30. Continue to pull turbine shaft upward and note turbine shaft end play. Turbine shaft end play should be .004-.031" (.10-.79 mm). Remove dial indicator, turbine shaft puller and end play fixture.
31. If turbine shaft end play is not within specification, different thickness selective thrust washer must be installed on rear of oil pump assembly. Repeat steps 24-26 for selective thrust washer selection procedure.

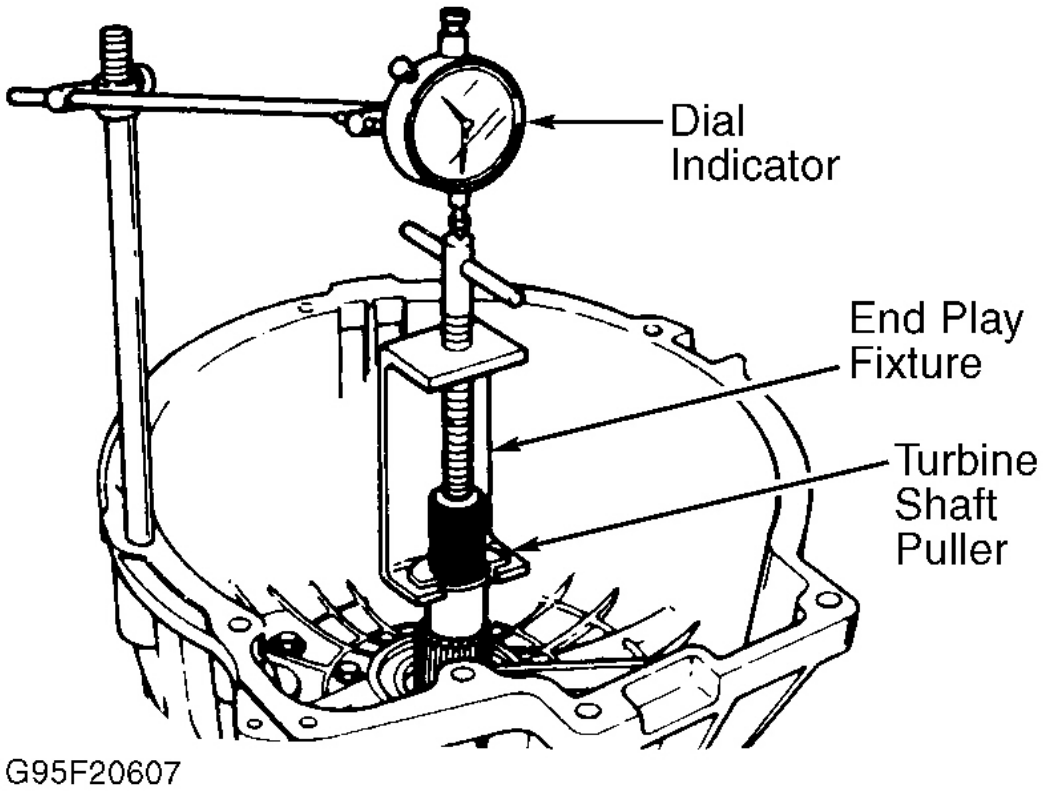


Fig. 31: Measuring Turbine Shaft End Play
Courtesy of ISUZU MOTOR CO.

32. Install NEW bearing in extension housing if replacement is necessary. Install NEW oil seal in extension housing. Install NEW seal ring on parking lock gear if seal ring is damaged. See **Fig. 12**.
33. Install parking lock gear, speed sensor drive gear and retaining ring on output shaft. See **Fig. 12**. Using NEW gasket, install extension housing. Ensure parking pawl shaft and actuator rod are aligned with extension housing. Install and tighten extension housing bolts to specification.
34. Using a NEW "O" ring, install speed sensor. Install and tighten bolt to specification. Position transmission with output shaft facing upward. Install dial indicator on extension housing with stem of dial indicator against output shaft. See **Fig. 32**. Zero dial indicator.
35. Manually push output shaft upward and note output shaft end play. Output shaft end play should be .014-.031" (.36-.79 mm). If output shaft end play is not within specification, different thickness selective thrust washer must be installed on center support. Repeat steps 13-15 for selective thrust washer selection procedure.
36. Install drive shaft flange and NEW "O" ring on output shaft. Install and tighten drive shaft flange nut to specification.
37. Ensure brake band is correctly positioned. Rotate output shaft if necessary. Install NEW seal ring on servo piston if necessary. Install apply rod in transmission case with rounded end of rod toward the brake band.
38. Install return spring and servo piston. Use care not to damage seal ring on servo piston. Using spring compressor, compress servo piston and return spring. Install servo piston retaining snap ring. Remove spring compressor.
39. To adjust brake band, loosen lock nut on servo adjusting screw. See **Fig. 7**. Using INCH-lb. torque wrench, tighten servo adjusting screw to 40 INCH lbs. (4.5 N.m).
40. Back off servo adjusting screw 5 turns. Hold sleeve on servo piston. Tighten lock nut to 14 ft. lbs. (19 N.m). Ensure servo adjusting screw does not rotate while tightening lock nut.
41. Install 2 check balls in transmission case. See **Fig. 10**. Install case electrical connector and wiring harness. See **Fig. 8**. Install guide pins for main valve body in transmission case.
42. Install assembled main valve body and manual valve link assembly. Manual valve link must be extended, as long end fits into manual valve and short end fits into range selector. Remove guide pins. Install and tighten main valve body bolts in a spiral pattern starting in center of valve body to specification. Install electrical connectors at solenoids on main valve body.
43. Using NEW gasket, install servo cover. Install and tighten bolts to specification. Install manual detent on main valve body. See **Fig. 7**. Install and tighten bolts to specification.
44. Install NEW oil filter. Install and tighten bolts to specification. Using NEW gasket, install main case oil pan. Install and tighten bolts to specification.
45. Install electrical connector in adapter case. Install adapter case check ball. See **Fig. 9**. Using NEW transfer plate gaskets, install adapter case valve body and transfer plate. Install and tighten bolts to specification. Install electrical connectors at solenoids on adapter case valve body. See **Fig. 8**.
46. Using NEW gasket, install adapter case oil pan. Install and tighten bolts to specification. Install and adjust transmission range switch. See appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. Install NEW "O" ring on end of turbine shaft. Install torque converter.

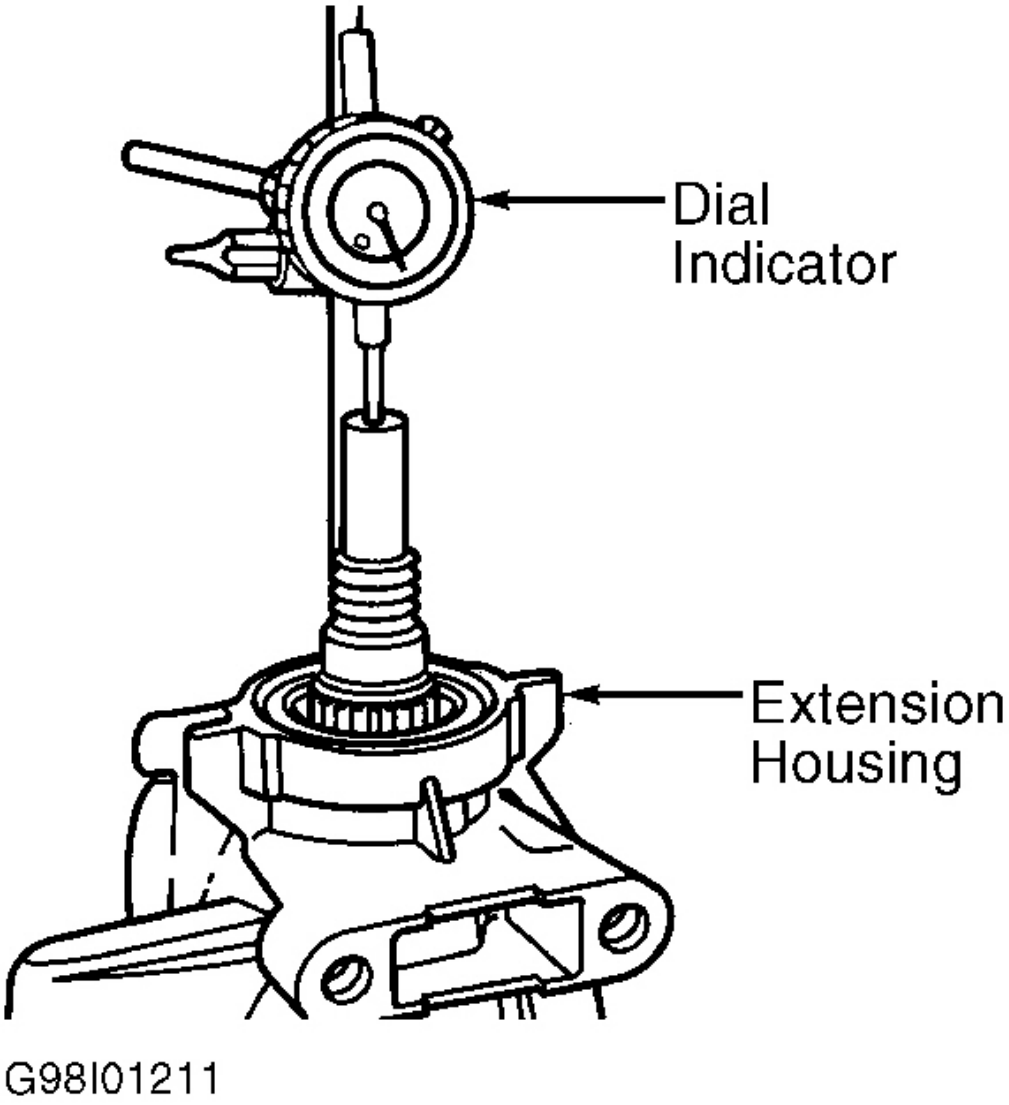
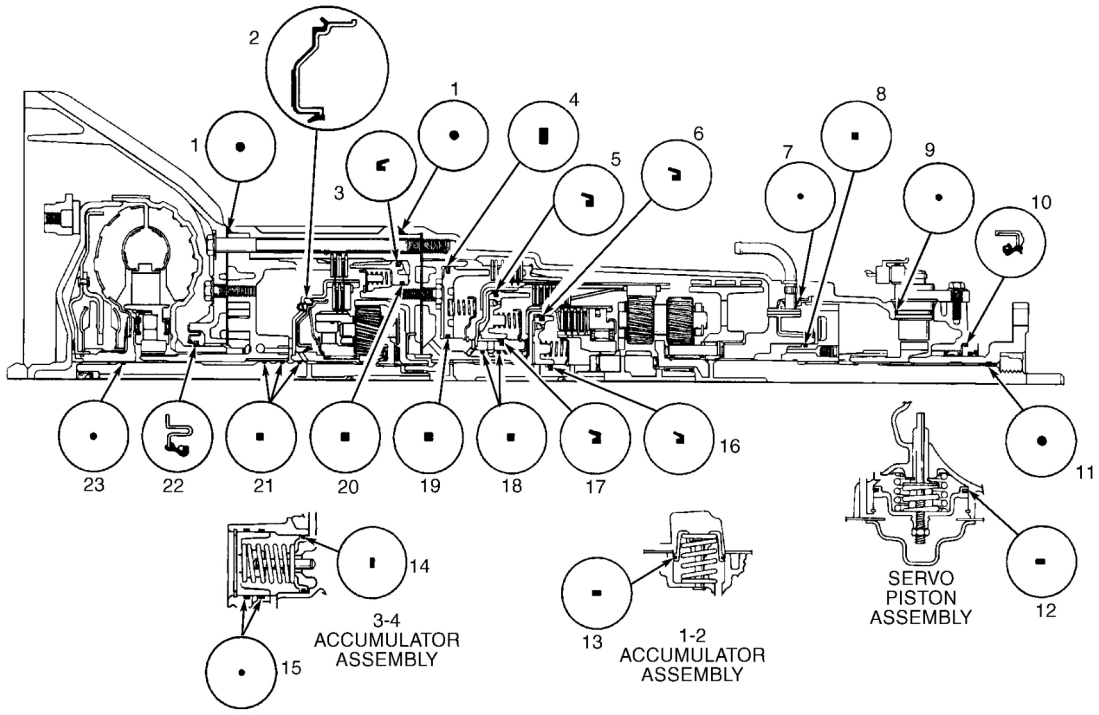


Fig. 32: Measuring Output Shaft End Play
Courtesy of GENERAL MOTORS CORP.



1. "O" Ring Seal
2. Overrun Clutch Piston Seal
3. 4th Clutch Piston Outer Seal
4. Reverse Clutch Piston Outer Seal
5. 2nd Clutch Piston Outer Seal
6. 3rd Clutch Piston Outer Seal
7. Breather Assembly "O" Ring Seal
8. Hub Seal Ring
9. Speed Sensor "O" Ring
10. Extension Housing Seal
11. Drive Flange "O" Ring Seal
12. Servo Piston Seal Ring
13. 1-2 Accumulator Piston Seal Ring
14. 3-4 Accumulator Piston Seal Ring
15. 3-4 Accumulator "O" Ring Seal
16. 3rd Clutch Piston Inner Seal
17. 2nd Clutch Piston Inner Seal
18. Oil Seal Ring
19. Reverse Clutch Piston Inner Seal
20. 4th Clutch Piston Inner Seal
21. Turbine Shaft Oil Seal Ring
22. Converter Housing Seal Ring
23. Turbine Shaft "O" Ring Seal

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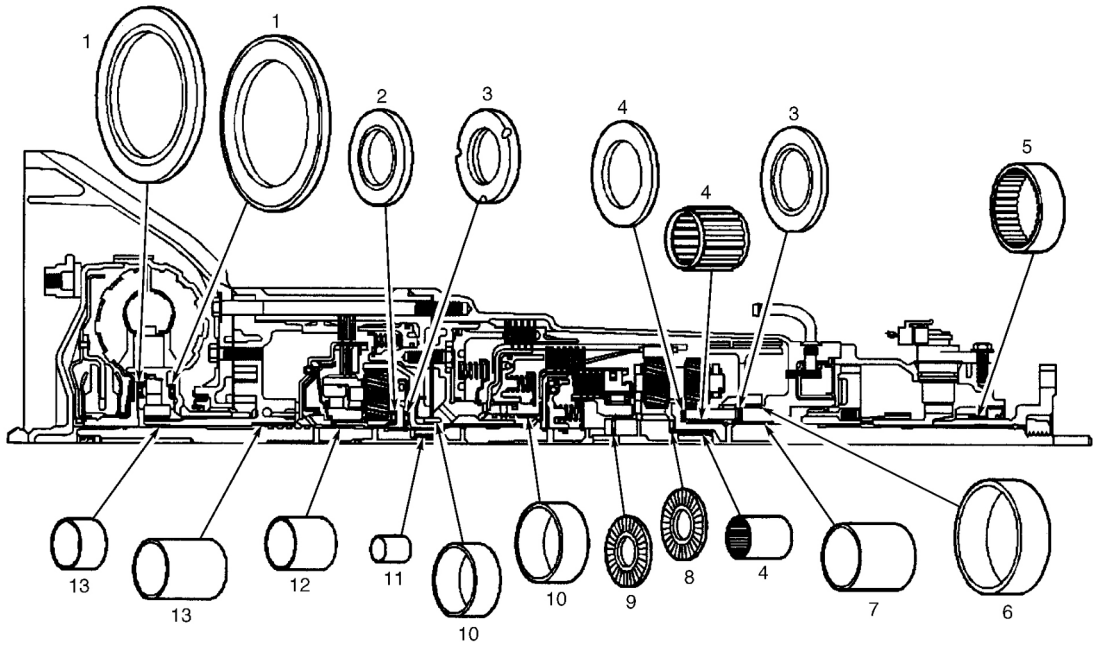
Fig. 33: Identifying Transmission Seal Locations
Courtesy of GENERAL MOTORS CORP.



1. Converter Clutch Bearings
2. Overdrive Carrier Bearing
3. Thrust Bearing
4. Planetary Carrier Assembly Bearings
5. Extension Housing Needle Bearing
6. Reaction Sun Drum Bushing
7. Main Case Bushing
8. Input Sun/Output Shaft Bearing
9. Input Shaft Bearing
10. Center Support Bushings
11. 3rd Clutch Drum Bushing
12. Overrun Clutch Housing Bushing
13. Oil Pump Assembly Bushings

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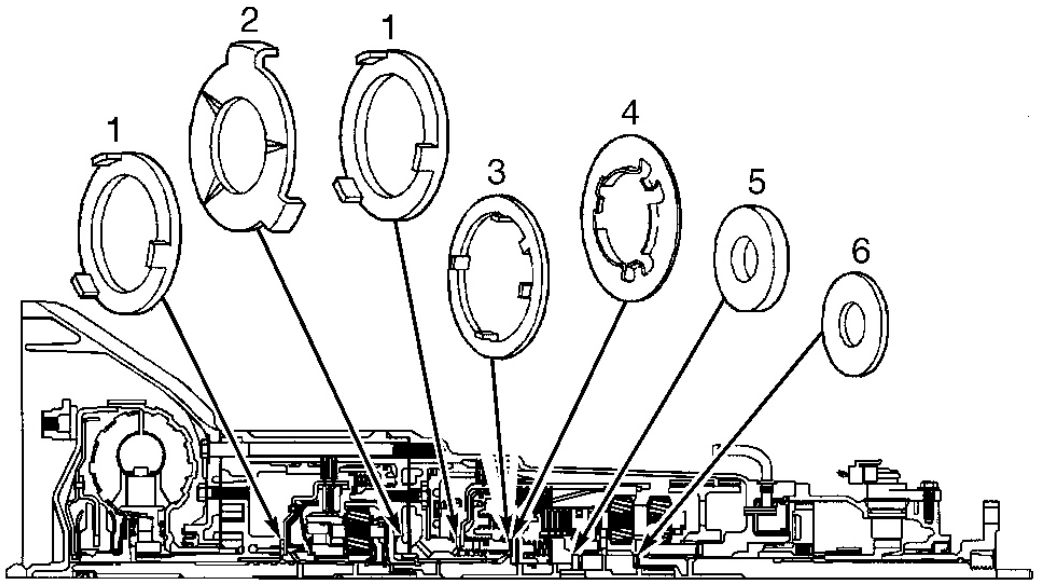
Fig. 34: Identifying Transmission Bearing & Bushing Locations
Courtesy of GENERAL MOTORS CORP.



1. Selective Thrust Washer
2. Internal Gear/Support Thrust Washer
3. 2nd-3rd Clutch Thrust Washer
4. Clutch Hub Retainer
5. Input Sun Gear Thrust Washer
6. Input Sun/Output Shaft Thrust Washer

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Fig. 35: Identifying Thrust Washer & Retainer Locations & Direction
Courtesy of GENERAL MOTORS CORP.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Adapter Case Valve Body Bolt	15 (20)
Center Support Bolt	18 (25)
Cooler Fitting	22 (30)
Drive Shaft Companion Flange Nut	77 (105)
Extension Housing Bolt	24 (32)
Flexplate-To-Torque Converter Bolt	22 (30)
Main Valve Body Bolt	15 (20)
Manual Detent Bolt	15 (20)
Oil Filter Bolt	15 (20)
Oil Pan Fill Plug	33 (45)
Oil Pump Assembly-To-Torque Converter Housing Bolt	15 (20)

Selector Shaft Nut	16 (22)
Servo Cover Bolt	18 (25)
Torque Converter Housing-To-Adapter Case Bolt	30 (40)
	INCH Lbs. (N.m)
Adapter Case Oil Pan Bolt	97 (11)
Force Motor Solenoid Bolt	89 (10)
Main Case Oil Pan Bolt	97 (11)
Pressure Tap Plug	106 (12)
Shift Linkage Rod Adjustment Bolt	71 (8)
Speed Sensor Bolt	80 (9)
Torque Converter Clutch Solenoid Bolt	115 (13)
Torque Converter Housing Oil Seal Ring Bolt	27 (3)
Transfer Plate-To-Main Valve Body Bolt	115 (13)
Transmission Range Switch Bolt	115 (13)

TRANSMISSION SPECIFICATIONS

TRANSMISSION SPECIFICATIONS

Application	**In. (mm)**
Oil Pump Clearance	.0005-.0033 (.013-.084)
Output Shaft End Play	.014-.031 (.36-.79)
Overdrive Carrier Assembly Pinion Gear Clearance	.009-.025 (.23-.64)
Overdrive Clutch End Play (1)	.004-.027 (.10-.69)
Planetary Carrier Pinion Gear Clearance	.005-.035 (.13-.89)
Turbine Shaft End Play	.004-.031 (.10-.79)
2nd Clutch End Play (1)	.014-.031 (.36-.79)
(1) For measuring procedure, see **TRANSMISSION REASSEMBLY**.	

