

2001-03 AUTOMATIC TRANSMISSIONS

Aisin Warner AW 03-72LE & AW 03-73LE Overhaul

APPLICATION

WARNING: Vehicle is equipped with a Supplemental Restraint System (SRS). When servicing vehicle, use care to avoid accidental air bag deployment. SRS-related components are located in steering column, center console, instrument panel and lower panel on instrument panel. **DO NOT** use electrical test equipment on these circuits. It may be necessary to deactivate SRS before servicing components. See appropriate **AIR BAG DEACTIVATION PROCEDURES** article in **GENERAL INFORMATION**.

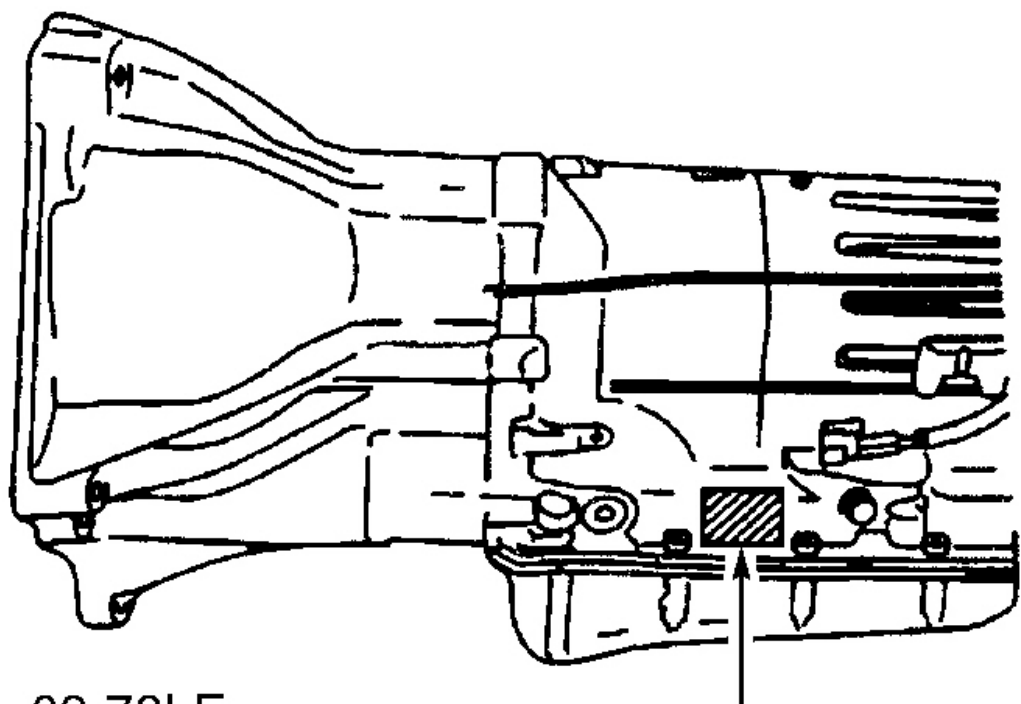
CAUTION: Flush oil cooler and oil cooler lines prior to transmission installation. Oil cooling system contamination may cause premature transmission failure. For additional information, see **LUBRICATION** in appropriate **SERVICING - A/T** article.

AUTOMATIC TRANSMISSION APPLICATIONS

Application	Transmission Model (RPO Code)
Chevrolet Tracker	AW 03-72LE (M41)
Kia Sportage	AW03-72LE
Suzuki Grand Vitara & Vitara	
2WD	AW03-72LE
4WD	AW03-73LE

IDENTIFICATION

Transmission is identified by transmission identification number. Transmission identification number is on a label or tag and may be located on left side of transmission near oil pan. See **Fig. 1**. Transmission identification number contains transmission type, production year, production month and serial number.



Identification Number

03-72LE

4-Speed

96 A 900001

Sequential Number

Assembly Month

Model Year

G96I30435

Fig. 1: Locating Transmission Identification Number
Courtesy of SUZUKI OF AMERICA CORP.

GEAR RATIOS

TRANSMISSION GEAR RATIOS

Gear Range	Gear Ratio

2001 Kia Sportage Limited

2001-03 AUTOMATIC TRANSMISSIONS Aisin Warner AW 03-72LE & AW 03-73LE Overhaul

All Models

1st	2.826:1
2nd	1.493:1
3rd	1.000:1
4th (OD)	
Grand Vitara & Vitara	⁽¹⁾ 0.689:1
Sportage & Tracker	0.730:1
Reverse	2.703:1

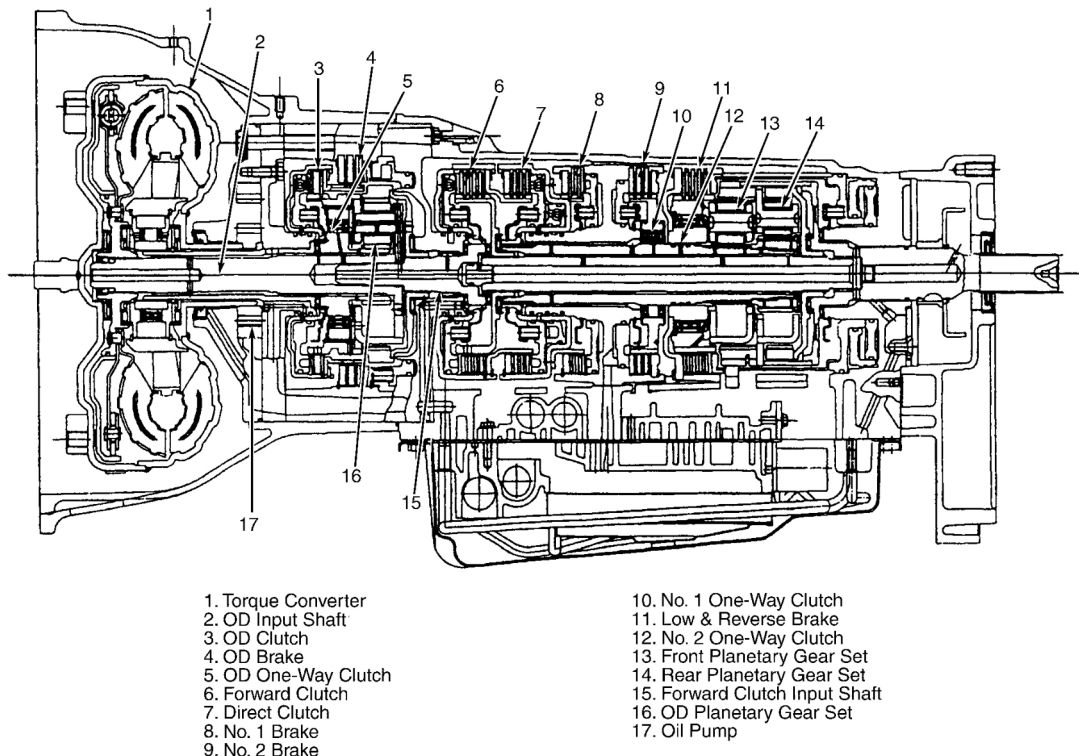
(1) On 2001 1.6L Vitara, 4th gear ratio is 0.730:1.

DESCRIPTION & OPERATION

This automatic is a full automatic type with 3 speeds plus overdrive. The torque converter is a 3 element, one step and 2 phase type and is equipped with an electronically controlled lock up mechanism. The internal drive components consist of 3 sets of planetary gear units. 3 disc type clutches, 4 disc type brakes and 3 one-way clutches. See **Fig. 2**.

The AW03-72LE and AW03-73LE 4-speed OD transmissions are electronically controlled. Transmission shifting and torque converter clutch lock-up are controlled by either a Powertrain Control Module (PCM) or a Transmission Control Module (TCM) depending on model, 2 shift solenoids and a lock-up solenoid. For electronic diagnosis, see appropriate ELECTRONIC CONTROLS article.

The control module receives information from various input devices and uses this information to control torque converter lock-up solenoid and shift solenoids No. 1 and 2 on transmission valve body. Solenoids are responsible for transmission shifting and torque converter clutch lock-up. A mode switch is mounted on console and is used to change shift program from ECONOMY to POWER.



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Fig. 2: Identifying Transmission Components
 Courtesy of SUZUKI OF AMERICA CORP.

LUBRICATION

For additional information, see appropriate AUTOMATIC TRANSMISSION SERVICING article.

RECOMMENDED FLUID

All models use Dexron III.

FLUID CAPACITIES

The following transmission refill capacities are approximate. Correct fluid level should always be determined by marks on dipstick, rather than amount of fluid added. DO NOT overfill. See **TRANSMISSION FLUID CAPACITIES** table.

TRANSMISSION FLUID CAPACITIES

Application	Refill - Qts. (L)	Dry-Fill - Qts. (L)
Grand Vitara		
2WD	2.96 (2.8)	7.82 (7.4)
4WD	2.64 (2.5)	7.50 (7.1)

2001 Kia Sportage Limited

2001-03 AUTOMATIC TRANSMISSIONS Aisin Warner AW 03-72LE & AW 03-73LE Overhaul

Sportage	2.64 (2.5)	7.08 (6.7)
Tracker	2.64 (2.5)	7.29 (6.9)
Vitara		
2WD	2.96 (2.8)	7.50 (7.1)
4WD	2.64 (2.5)	7.19 (6.8)

TROUBLE SHOOTING

NOTE: Transmission malfunctions may be caused by poor engine performance, improper adjustments, fluid condition or failure of hydraulic, mechanical or electronic components. Ensure all concerns have been properly checked prior to transmission overhaul. See appropriate DIAGNOSIS article.

COMPONENT TESTS

TORQUE CONVERTER

1. Replace torque converter if any of the following conditions exist:
 - Oil pump damage.
 - Metal particles found in oil cooler and cooler pipes.
 - Leaks in hub weld area.
 - Pilot cup damage or poor fit in crankshaft.
 - Hub damage or scoring.
 - Internal stator damage.
 - Engine coolant contamination.
2. DO NOT replace torque converter if any of the following conditions exist:
 - The fluid has an odor, is discolored and there is NO evidence of metal particles.
 - No indication of internal torque converter or oil pump damage.
 - A small amount of wear (sometimes referred to as fretting wear) appears on hub where oil pump drive gear is located.

TRANSMISSION DISASSEMBLY

TRANSMISSION

See the appropriate TRANSMISSION REMOVAL & INSTALLATION - A/T article.

TORQUE CONVERTER

Inspection

NOTE: Before you overhaul the transaxle, clean the exterior thoroughly in order to

protect its inner components against dust and dirt. Keep the transaxle in an upright position with the fluid pan on the bottom until all of the fluid has been drained from the transaxle. If you turn the transaxle on its side or over before the fluid stops draining, clutch material or other foreign matter may contaminant the fluid passages of the valve body and case. Failure to follow this precaution may result in unnecessary valve body overhaul.

1. Inspect the rings for cuts or restricted movement in the ring grooves.
2. If the rings are damaged, inspect the ring grooves for debris or burrs.
3. Inspect the thrust washer surfaces for damage. The thrust washer and the thrust bearing surfaces may appear to be polished. This is a normal condition.

Removal

NOTE: DO NOT use air powered tools in order to disassemble or assemble any vehicle component. Bolt torques are vital to diagnosis. You can detect bolt torques only when using hand tools. Improper bolt torques can contribute to vehicle repair problems.

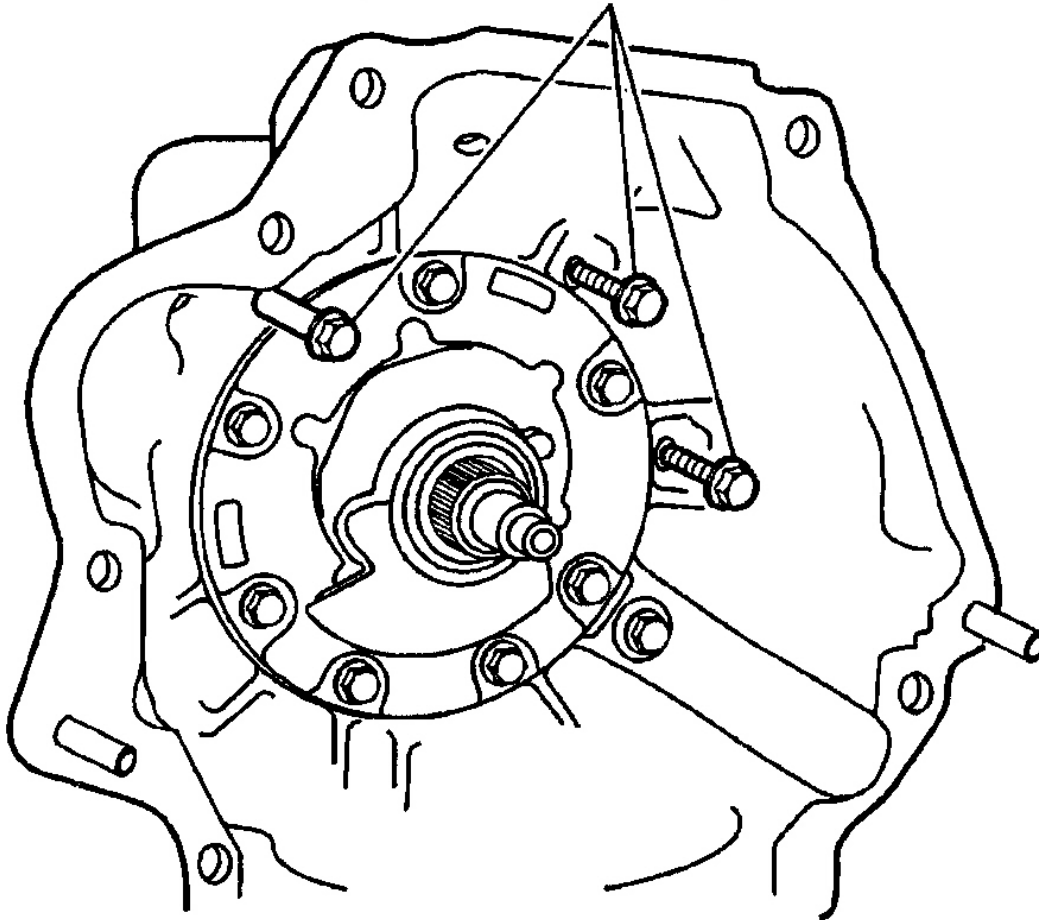
NOTE: For special tool part numbers, refer to special tools list. See SPECIAL TOOLS .

1. Remove the torque converter.
2. Remove the torque converter housing bolts. See Fig. 3 .
3. Install the Holding Fixture, onto the transmission case. See Fig. 4 .

WARNING: To reduce the possibility of personal injury or transmission damage, make sure when following the next step that all bolts for the Holding Fixture are installed and tightened to specifications. See TORQUE SPECIFICATIONS .

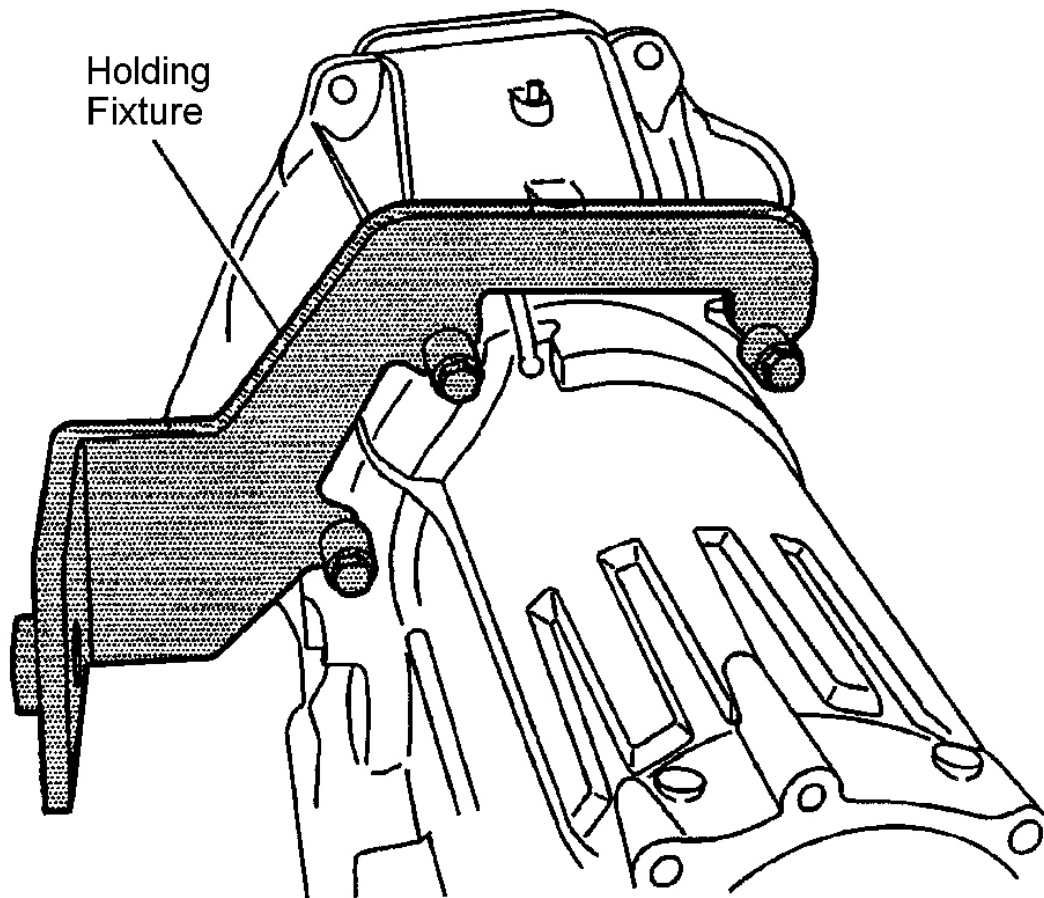
4. Install the transmission with the Holding Fixture into the Holding Fixture Base. Remove the fluid level indicator with the fluid filler tube.
5. Remove the vent hose clamp from the vent elbow at the top of the transmission case. Remove the vent hose. Drain the transmission fluid.

Torque Converter Housing Bolts



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Fig. 3: Identifying Torque Converter Housing Bolts
Courtesy of GENERAL MOTORS CORP.



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Fig. 4: Installing Holding Fixture

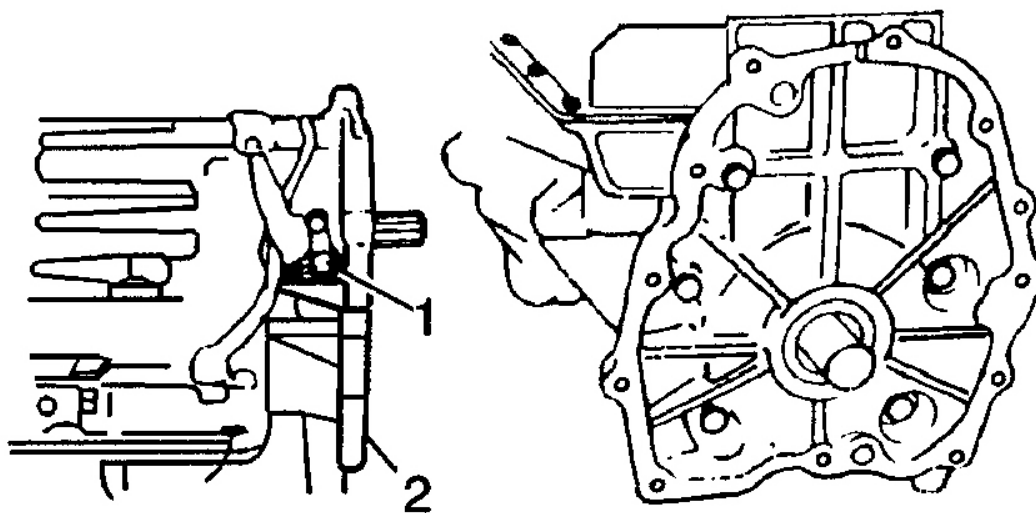
Courtesy of GENERAL MOTORS CORP.

REAR ADAPTER CASE, VEHICLE SPEED SENSOR**Removal**

1. Remove the following components from the rear adapter case:
 - The VSS bolt.
 - The VSS. See **Fig. 5**.
2. Remove the following rear adapter case components from the transmission case:
 - The bolts.
 - The case.
 - The gasket.
3. Remove the cooler lines and remove the fittings. See **Fig. 6**. Remove the following components from the

rear output shaft:

- The VSS snap ring. See **Fig. 7** or **Fig. 8**.
- Drive gear, if equipped.
- Steel ball and spacer, if equipped.
- The VSS rotor.
- The key-way.
- The rear cover plate and screws.

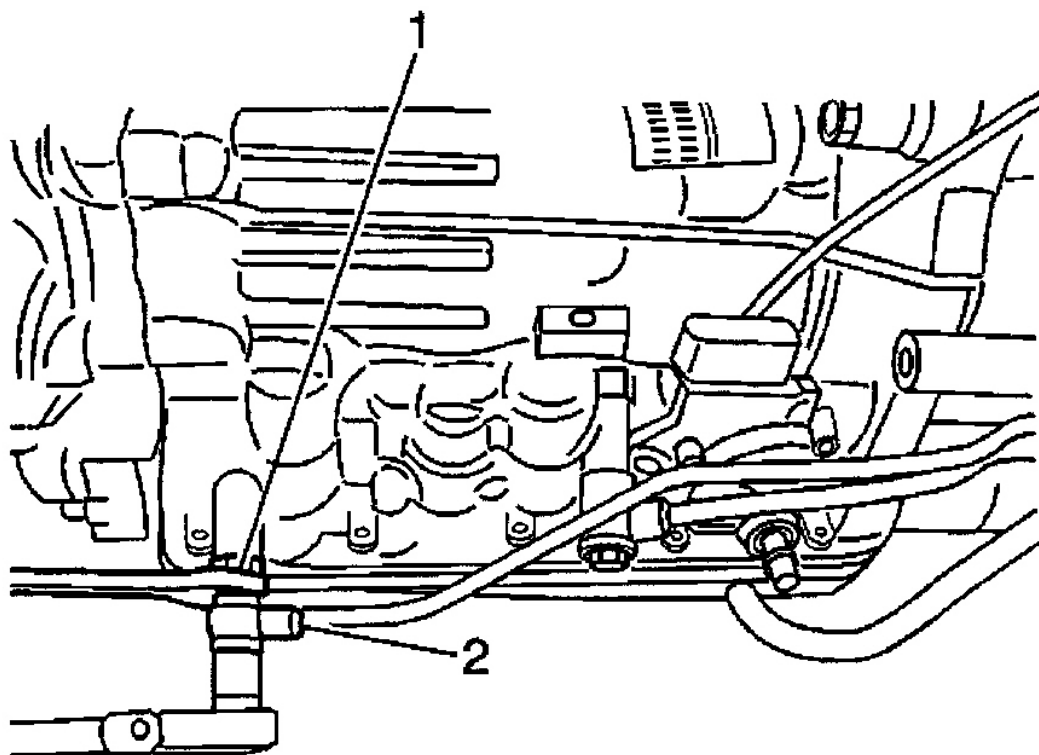


1. Vehicle Speed Sensor (VSS)

2. Rear Adapter Case

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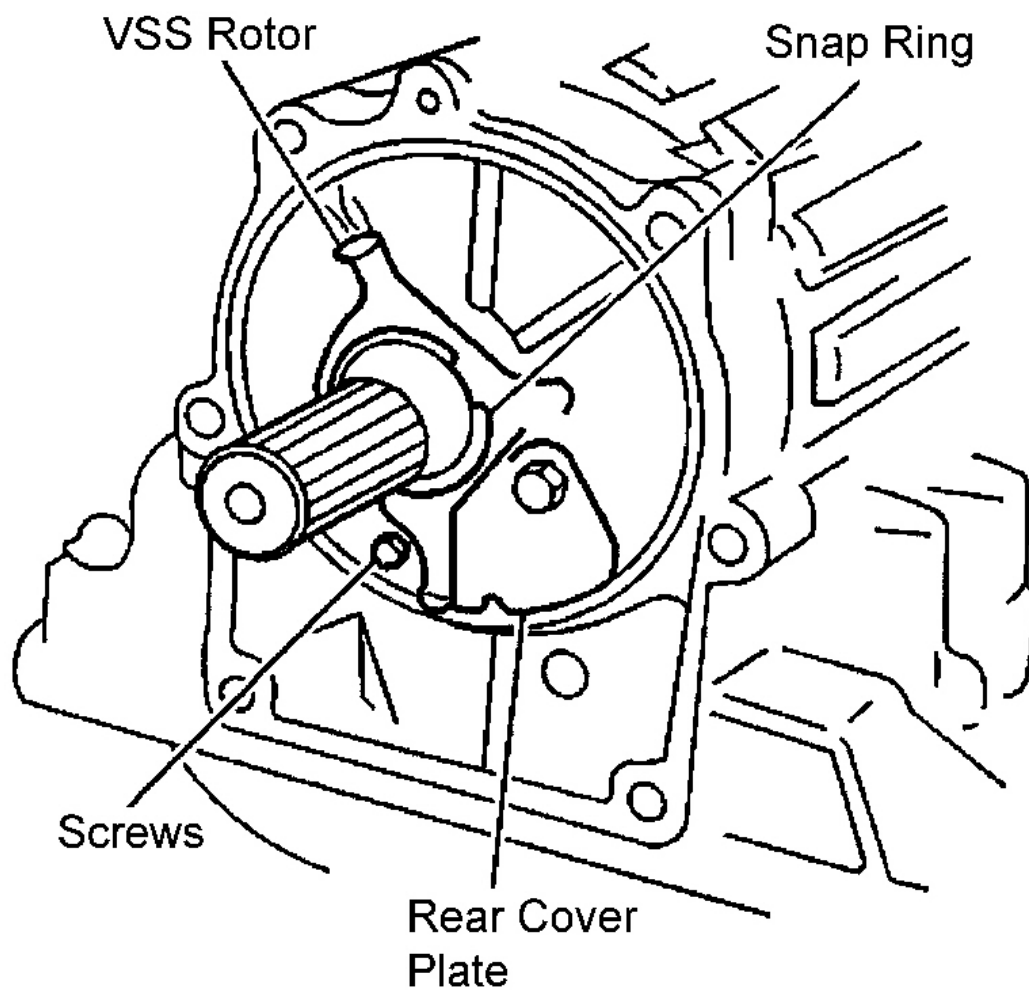
Fig. 5: Identifying Rear Adaptor Case/Vehicle Speed Sensor
Courtesy of GENERAL MOTORS CORP.



- 1. Cooler Lines
- 2. Fittings

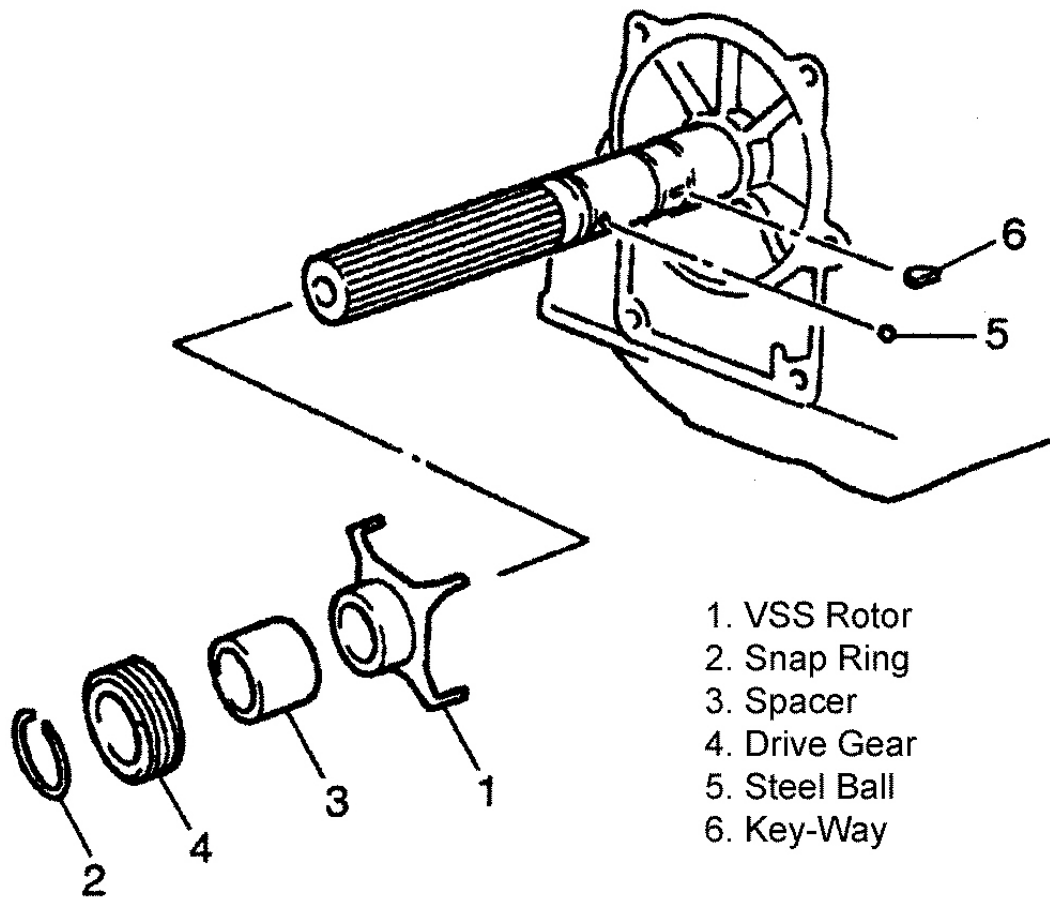
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Fig. 6: Identifying Transmission Cooler Lines
Courtesy of GENERAL MOTORS CORP.



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Fig. 7: Identifying Rear Output Shaft Components (GM & Kia)
Courtesy of GENERAL MOTORS CORP.



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Fig. 8: Identifying Rear Output Shaft Components (Suzuki)
 Courtesy of SUZUKI OF AMERICA CORP.

TRANSMISSION RANGE SWITCH

Removal

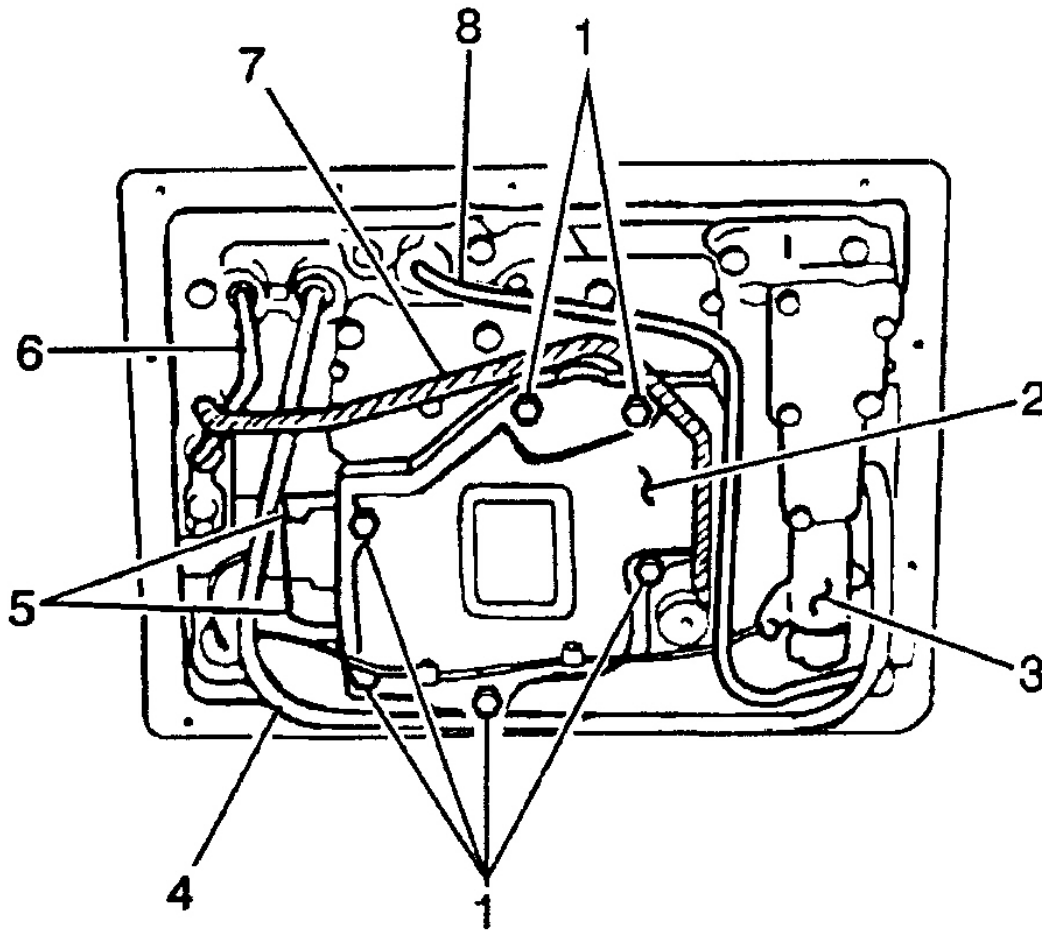
1. Remove the following manual lever components from the manual shaft:
 - The nut.
 - The washer.
 - The lever.
2. Unstake the lock plate behind the manual shaft nut. Remove the following components from the transmission range switch:
 - The manual shaft nut.
 - The lock plate.

3. Remove the transmission range switch retaining bolt. Remove the transmission range switch from the manual shaft. Remove the shift cable and the shift bracket.

FLUID PAN, FILTER SCREEN & FLUID PIPES

Removal

1. Rotate the transmission to the fluid pan side. Remove the following fluid pan components:
 - The 14 bolts.
 - The fluid pan.
 - The gasket.
2. Remove the 4 fluid pipes in the following order:
 - A. The reverse brake. See **Fig. 9** .
 - B. The forward clutch.
 - C. The brake applying.
 - D. The lube applying.
3. Unclip the TCC solenoid and shift solenoid wiring harness from the fluid filter screen. Remove the 6 fluid filter screen bolts from the valve body. Inspect the fluid filter screen mesh for the following particulate matter:
 - Clutch material.
 - Steel particles.



- | | |
|------------------------------|------------------------------|
| 1. Fluid Filter Screen Bolts | 5. Shift Solenoid |
| 2. Fluid Filter Screen | 6. Lube Applying Fluid Pipe |
| 3. TCC Solenoid | 7. Reverse Brake Fluid Pipe |
| 4. Forward Clutch Fluid Pipe | 8. Brake Applying Fluid Pipe |

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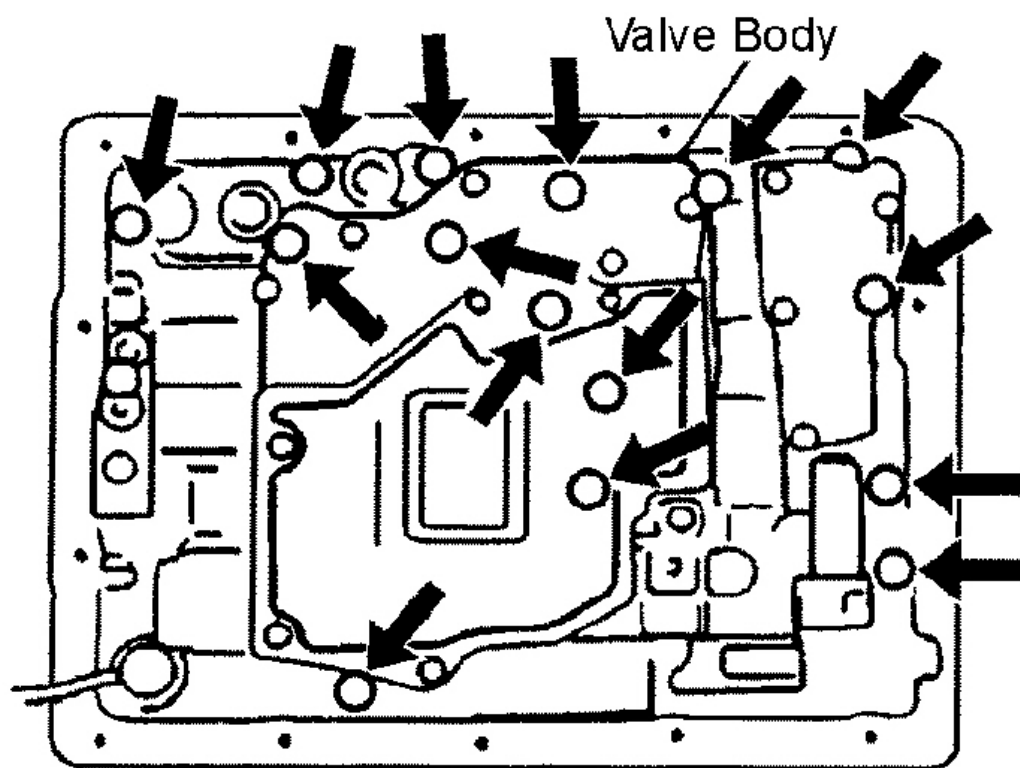
Fig. 9: Identifying Filter Screen Components, Fluid Pipes & TCC Solenoid
 Courtesy of GENERAL MOTORS CORP.

VALVE BODY, ACCUMULATORS , SOLENOID WIRING HARNESS

Removal

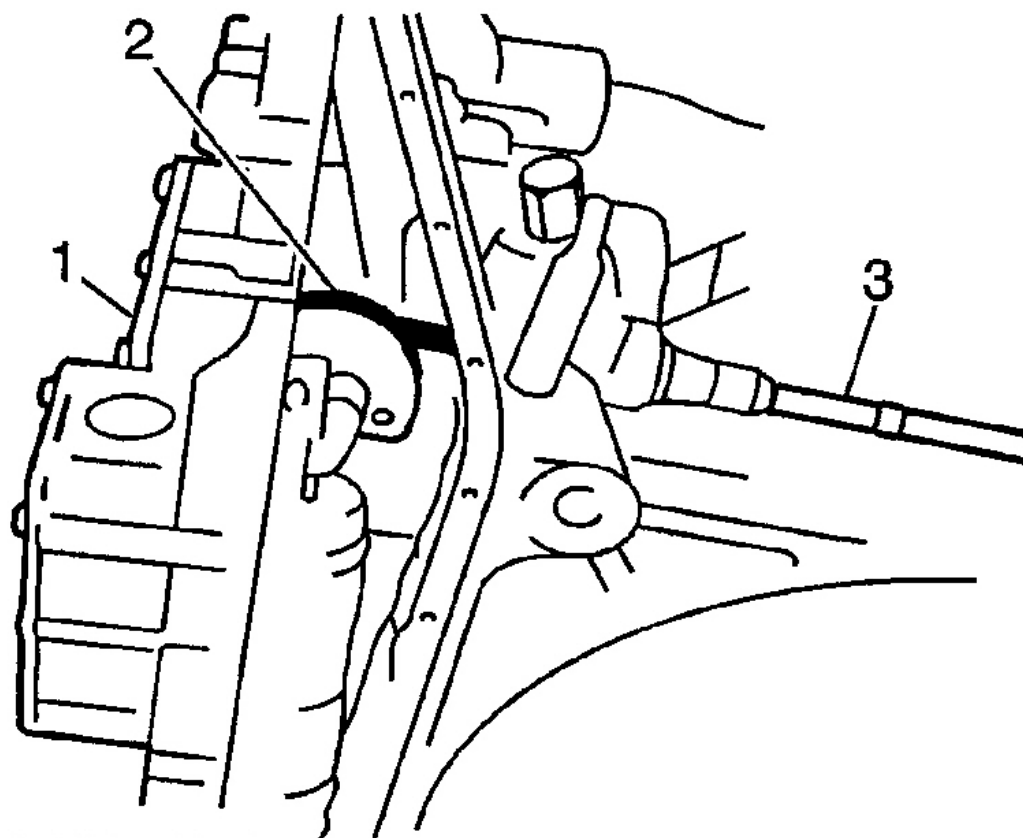
1. Disconnect the electrical connectors at the following components:
 - The torque converter clutch (TCC) solenoid. See **Fig. 9** .

- The shift solenoid.
2. Remove the 15 valve body bolts. See **Fig. 10** . Perform the following steps in order to remove the valve body from the transmission case:
 - Slowly lift the valve body.
 - Disconnect the TV cable from the TV cable cam. See **Fig. 11** .
 - Remove the valve body from the transmission case.
 3. Remove the solenoid wiring harness retaining bolt from the transmission case. Remove the solenoid wiring harness.
 4. Perform the following steps in order to remove the second brake, direct clutch, and forward clutch accumulators:
 - Cover the accumulators with a clean cloth.
 - Slowly apply low compressed air to the fluid passages until the accumulators are forced out of the case bores. See **Fig. 12** .
 5. Inspect the following accumulator components for damage:
 - The pistons. See **Fig. 12** .
 - The springs.
 - The piston seals.
 - The case bores.
 6. Remove the TV cable from the transmission case using a 10 mm nut driver.



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Fig. 10: Identifying Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.

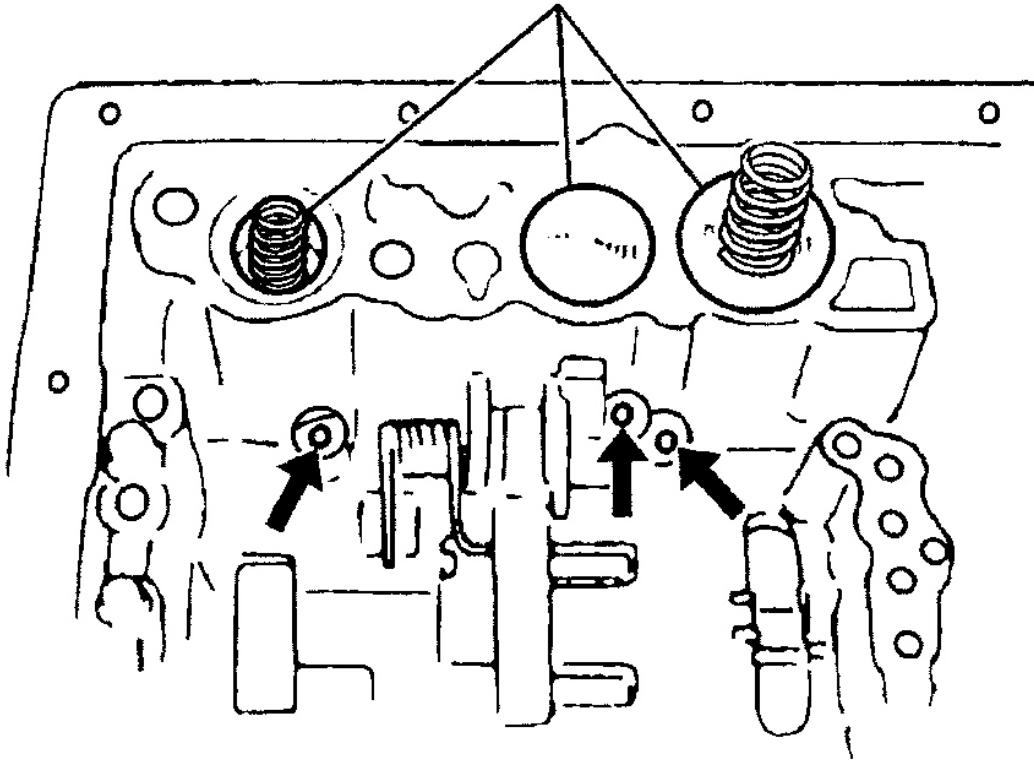


- 1. Valve Body
- 2. TV Cable Cam
- 3. Throttle Valve (TV) Cable

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Fig. 11: Identifying TV Cable
Courtesy of GENERAL MOTORS CORP.

Accumulator Pistons & Springs



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Fig. 12: Identifying Accumulator Components
 Courtesy of GENERAL MOTORS CORP.

PARKING PAWL & MANUAL SHIFT LINKAGE

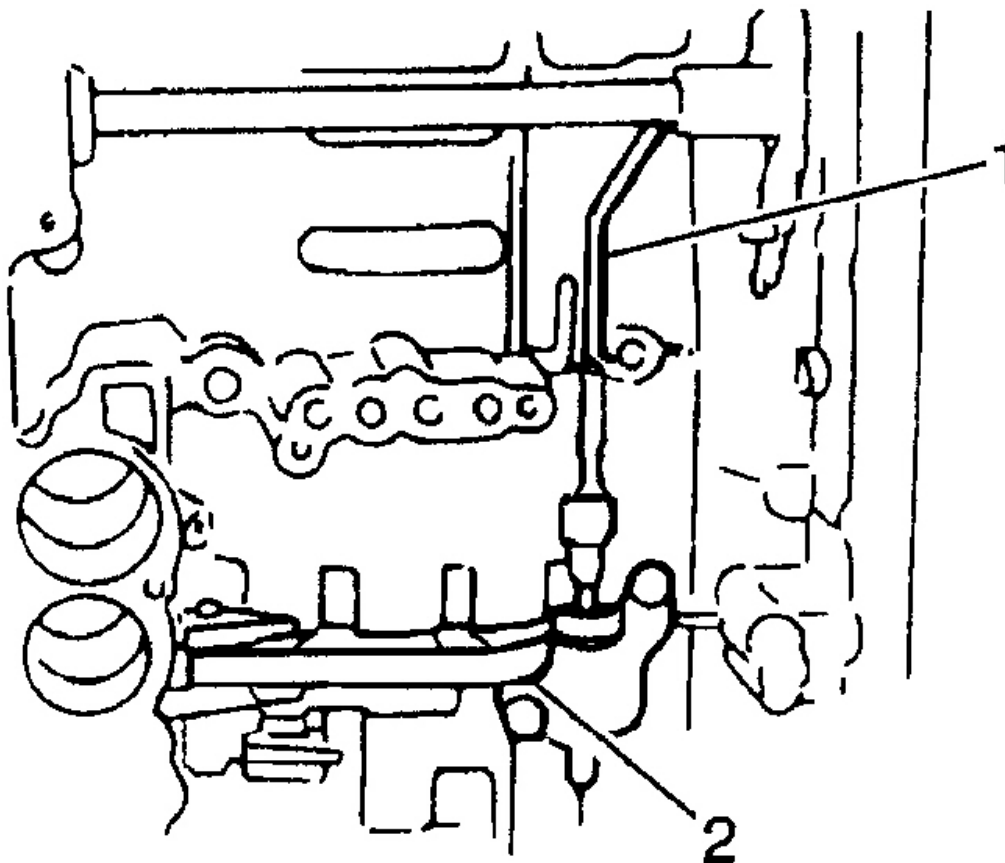
Removal

1. Remove the parking pawl plate bolts. Remove the parking pawl plate. Remove the following components from the transmission case:
 - The parking pawl torsion spring.
 - The pivot pin.
 - The parking pawl. See **Fig. 13**.

Remove the parking pawl rod from the manual shift shaft.

2. Remove the manual lever hub protection sleeve from the manual detent lever hub using a hammer and chisel. See **Fig. 14**.
3. Remove the manual detent lever hub roll pin using a standard drift punch and hammer. See **Fig. 15**.
 Remove the following components from the transmission case:

- The manual shaft.
 - The manual detent lever.
4. Remove the manual shaft oil seals from both sides of the transmission case using a Flathead screwdriver.

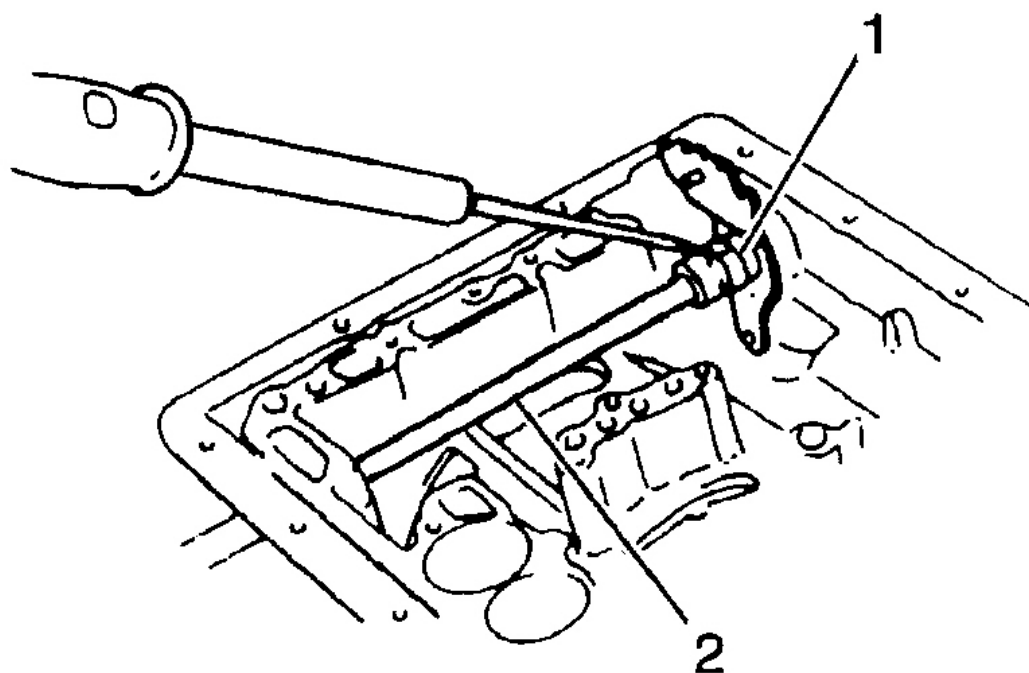


1. Parking Pawl Rod

2. Parking Pawl

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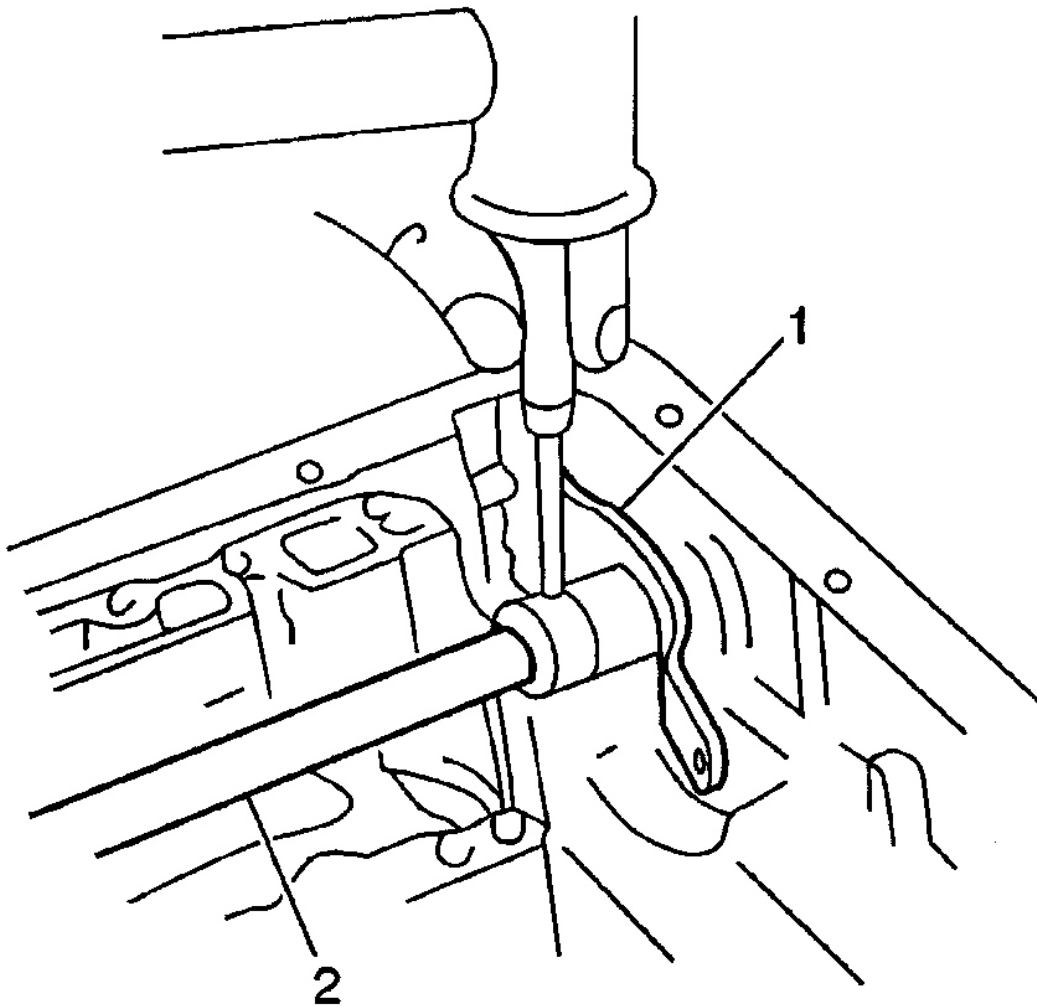
Fig. 13: Identifying Parking Pawl Components
Courtesy of GENERAL MOTORS CORP.



1. Manual Lever Hub Protection Sleeve
2. Manual Detent Lever Hub

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Fig. 14: Removing Manual Lever Hub Protection Sleeve
Courtesy of GENERAL MOTORS CORP.



1. Manual Detent Lever
2. Manual Shaft

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Fig. 15: Removing Manual Shaft & Detent Lever
Courtesy of GENERAL MOTORS CORP.

OIL PUMP & TORQUE CONVERTER HOUSING

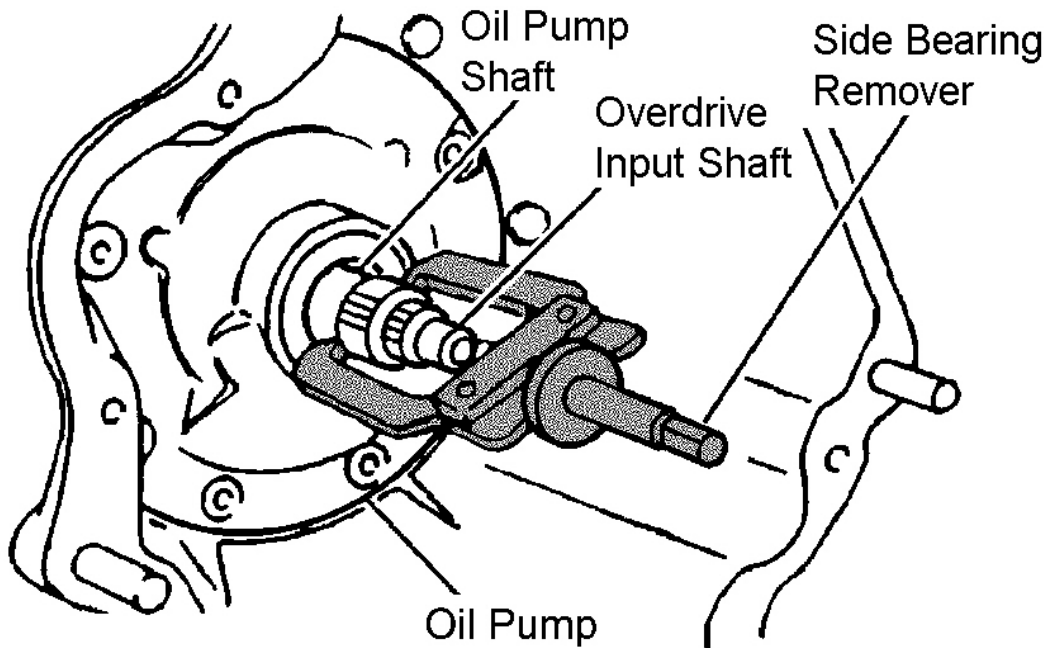
Removal

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

1. Rotate the transmission to the upright position. Remove the oil pump bolts. Use the Side Bearing

Remover, if necessary, to remove the oil pump. See **Fig. 16** .

2. Remove the bearing and the race from the rear of the oil pump. Remove the 2 remaining torque converter housing bolts. While holding the overdrive input shaft, remove the torque converter housing and "O" Ring from the transmission case.



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Fig. 16: Removing Oil Pump

Courtesy of GENERAL MOTORS CORP.

OVERDRIVE CLUTCH DRUM & OVERDRIVE CASE

Removal

1. Measure the dimensions of the following surfaces and record measurements for reassembly:
 - The overdrive clutch drum. See **Fig. 17** .
 - The overdrive case.
2. Remove the overdrive clutch drum from the transmission case. Remove the overdrive case.

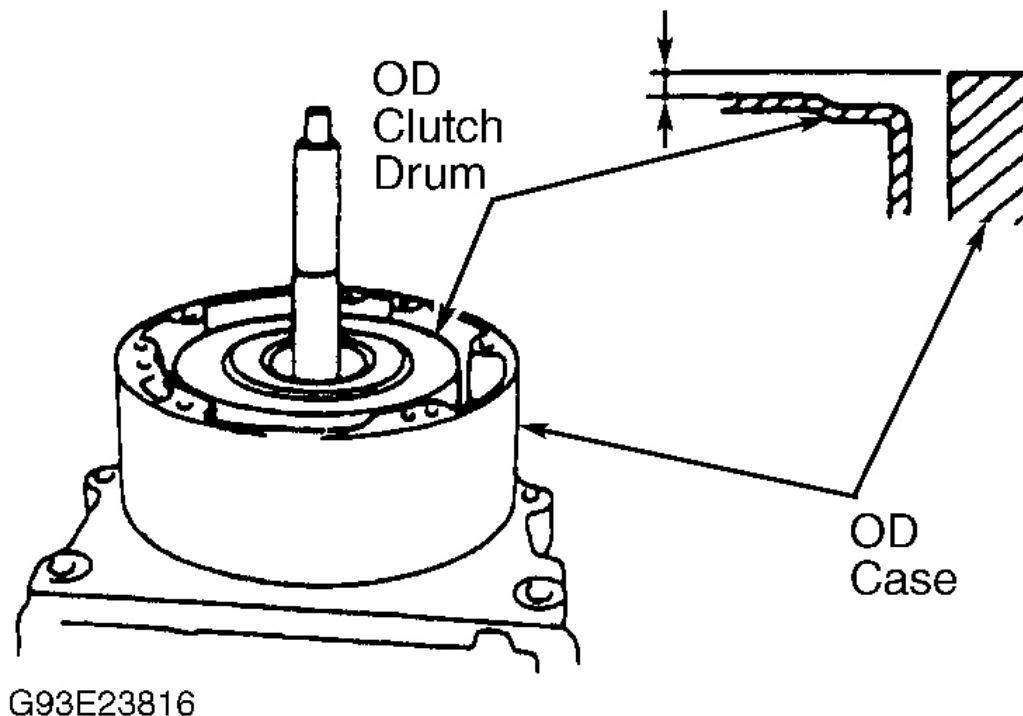


Fig. 17: Measuring OD Direct Clutch Drum-To-OD Case Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

FORWARD & DIRECT CLUTCH ASSEMBLY

Removal

1. Rotate the transmission to the upright position. Measure the height of the forward clutch against the transmission case in order to ease in assembly. See **Fig. 18**.
2. Note the direction of the bearing and the bearing race for assembly. Remove the forward clutch from the transmission case. Remove the direct clutch from the transmission case. See **Fig. 19**.

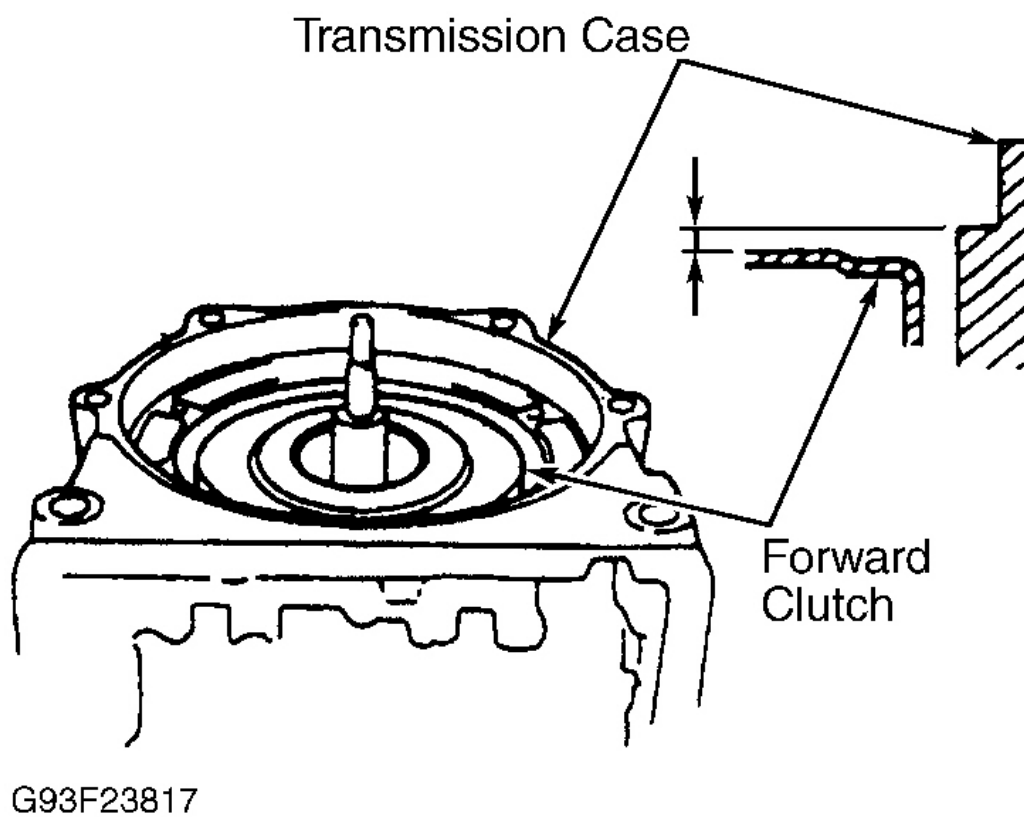
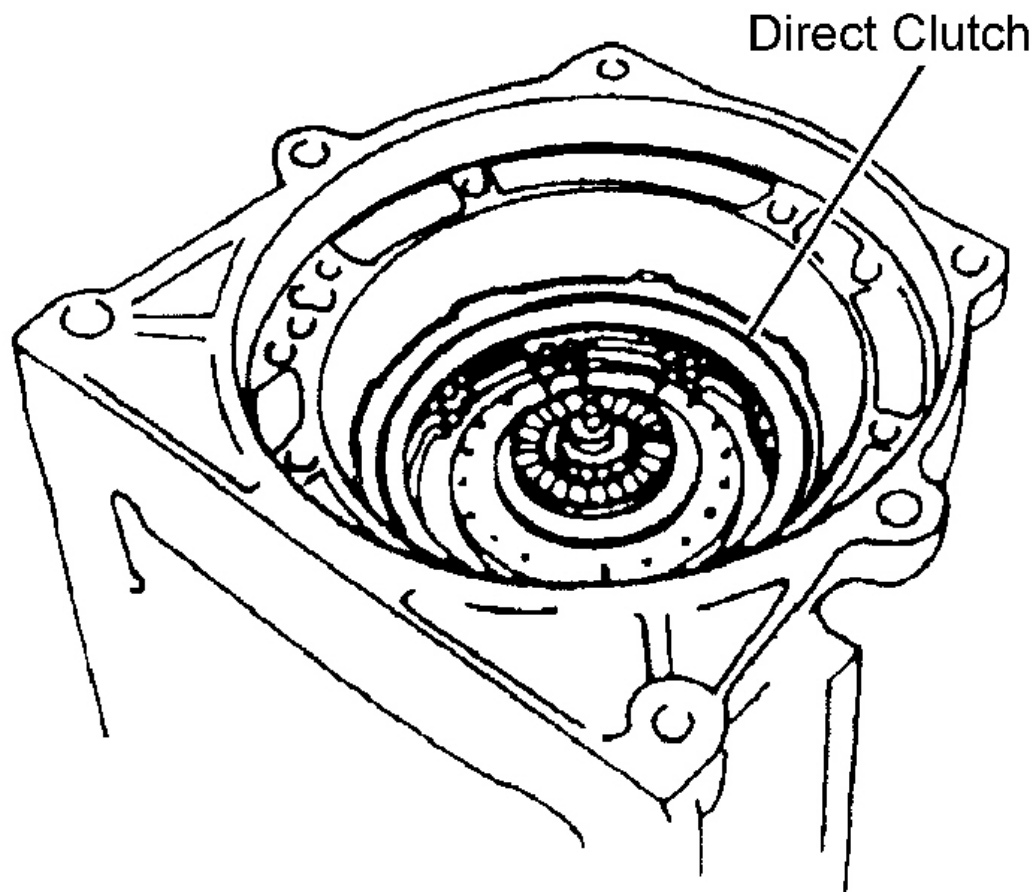


Fig. 18: Measuring Forward Clutch Drum-To-Transmission Case Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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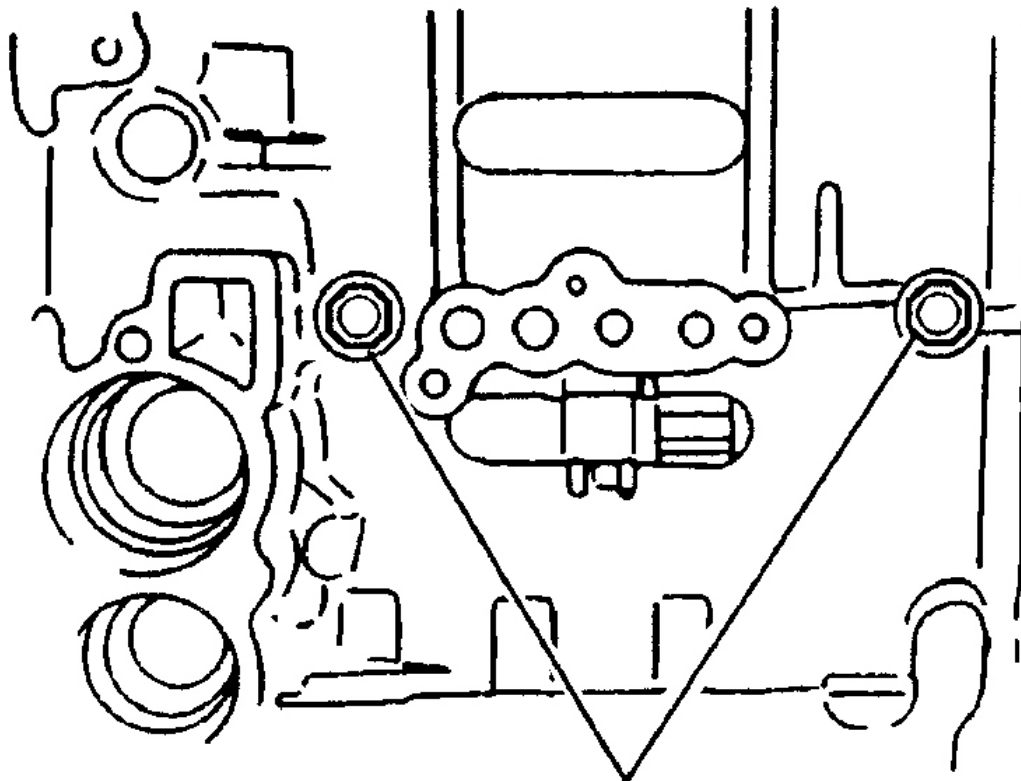
Fig. 19: Identifying Direct Clutch

Courtesy of GENERAL MOTORS CORP.

CENTER SUPPORT & PLANETARY SUN GEAR

Removal

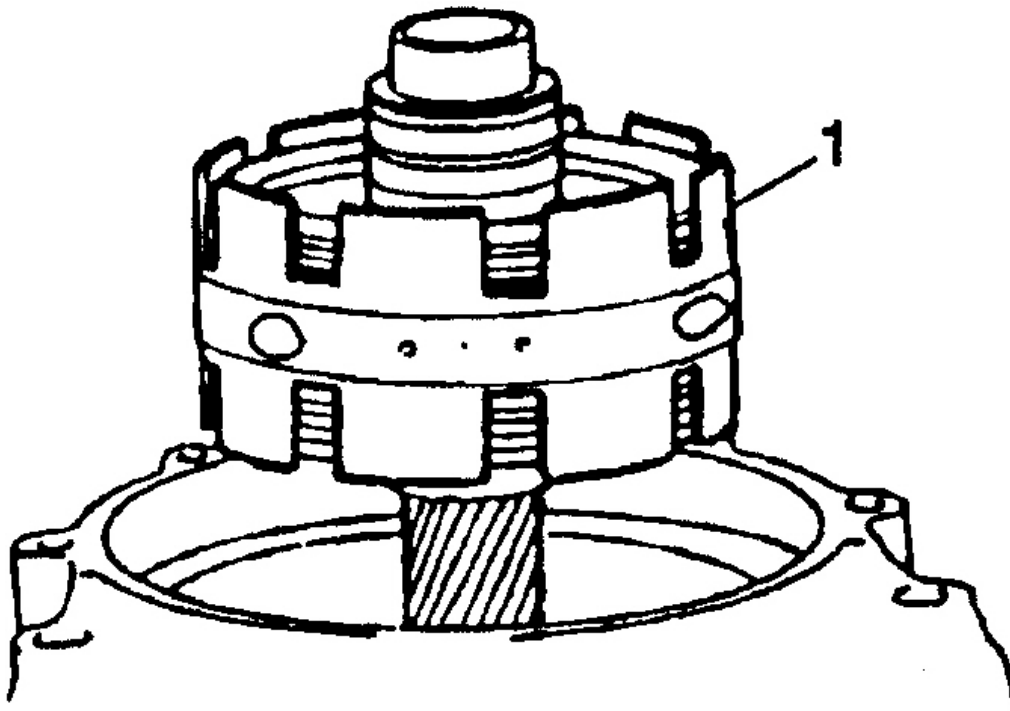
1. Rotate the transmission to the upright position. Remove the center support bolts. See **Fig. 20** .
2. Remove the following components as a unit from the transmission case:
 - The center support. See **Fig. 21** .
 - The planetary sun gear.



Center Support Bolts

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Fig. 20: Identifying Center Support Bolts
Courtesy of GENERAL MOTORS CORP.



1. Center Support

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Fig. 21: Identifying Center Support
Courtesy of GENERAL MOTORS CORP.

REVERSE BRAKE PISTON

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

Removal

1. Remove brake apply cover bolts. See **Fig. 22** . Remove brake apply cover. Remove the gasket.
2. Compress the reverse brake piston using a Clutch Spring Compressors. Remove the snap ring. Remove the return springs. See **Fig. 23** . Remove the retainer.
3. Cover the reverse brake piston with a clean cloth. Slowly apply low pressure compressed air to the fluid passage "B" while holding the fluid passage "A" closed until the pistons are released from the case. See **Fig. 24** .
4. Remove the following loose components from case. See **Fig. 25** .
 - Outer Reverse Brake Piston

- Reaction Sleeve
- Inner Reverse Brake Piston

5. Remove the piston "O" rings.

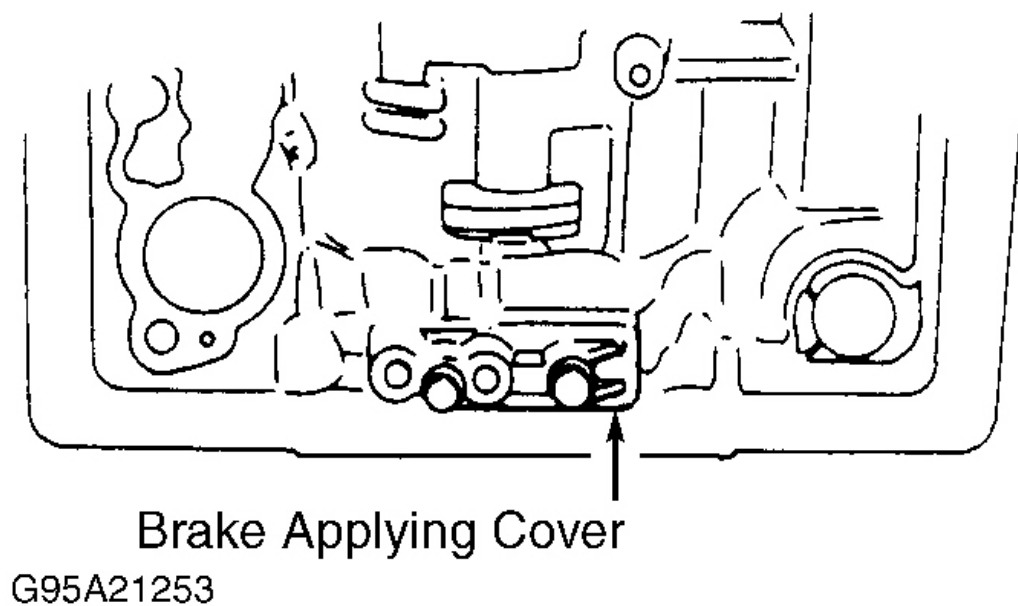
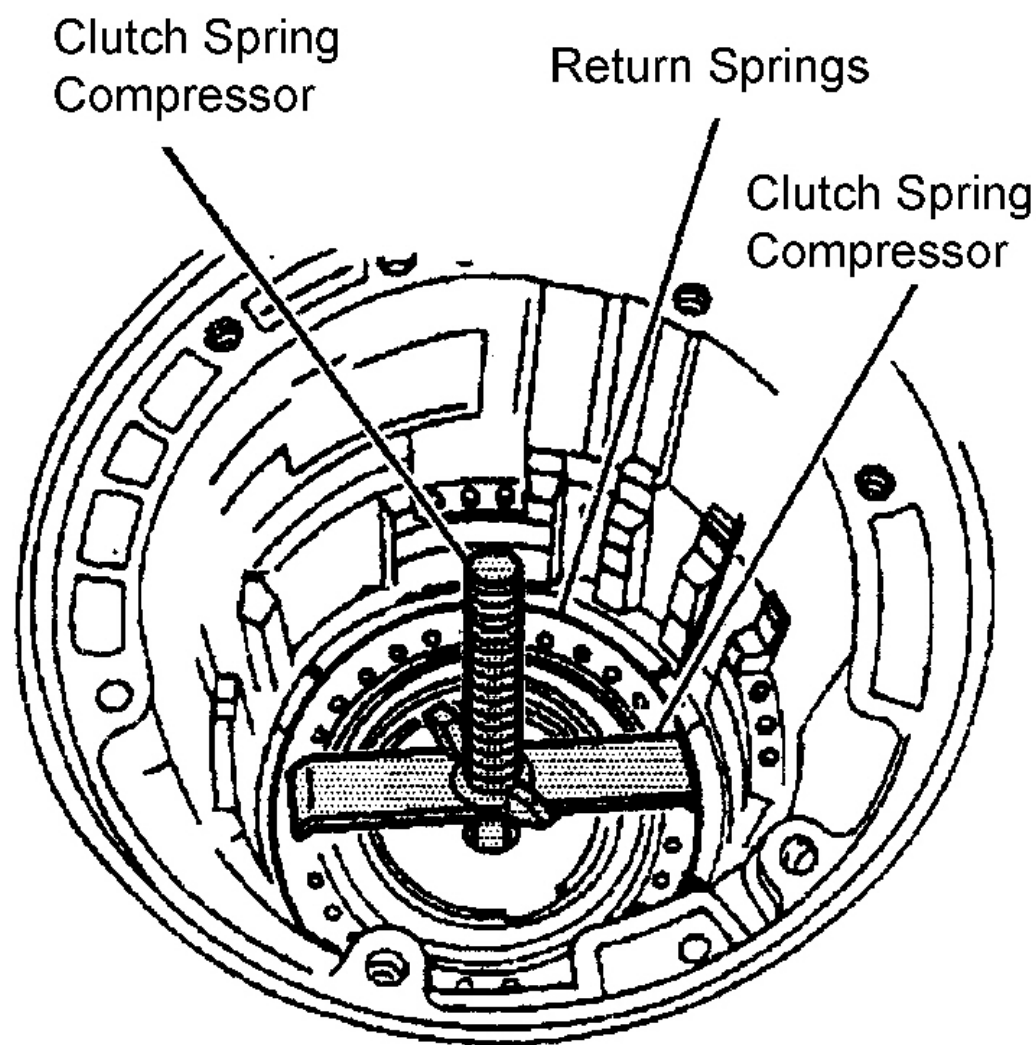
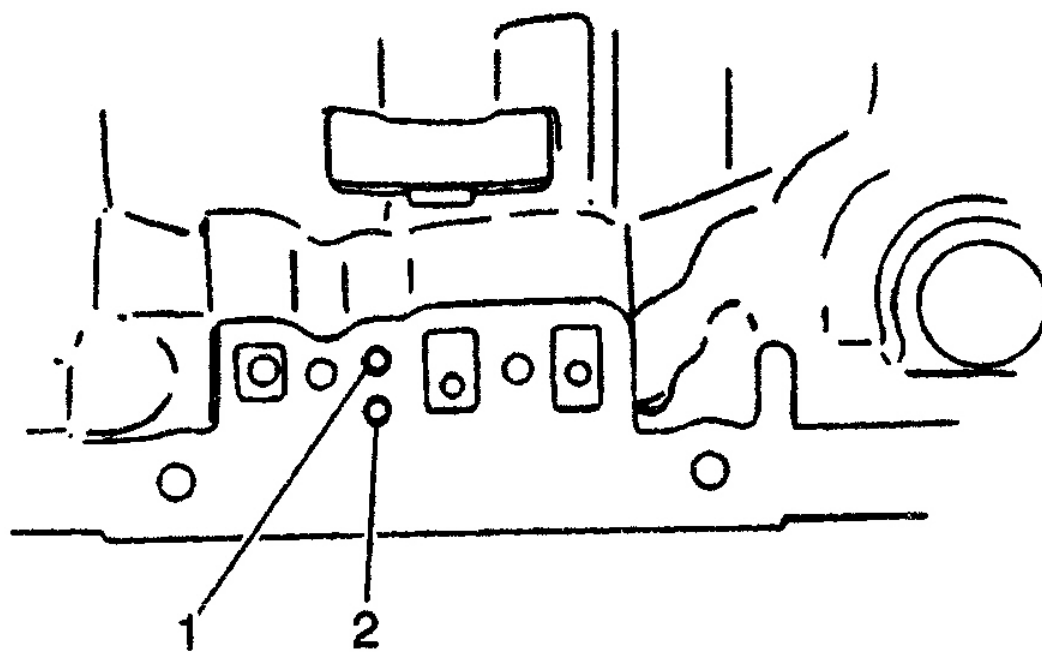


Fig. 22: Locating Brake Applying Cover
Courtesy of SUZUKI OF AMERICA CORP.



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Fig. 23: Removing Reverse Brake Piston Return Springs
Courtesy of GENERAL MOTORS CORP.

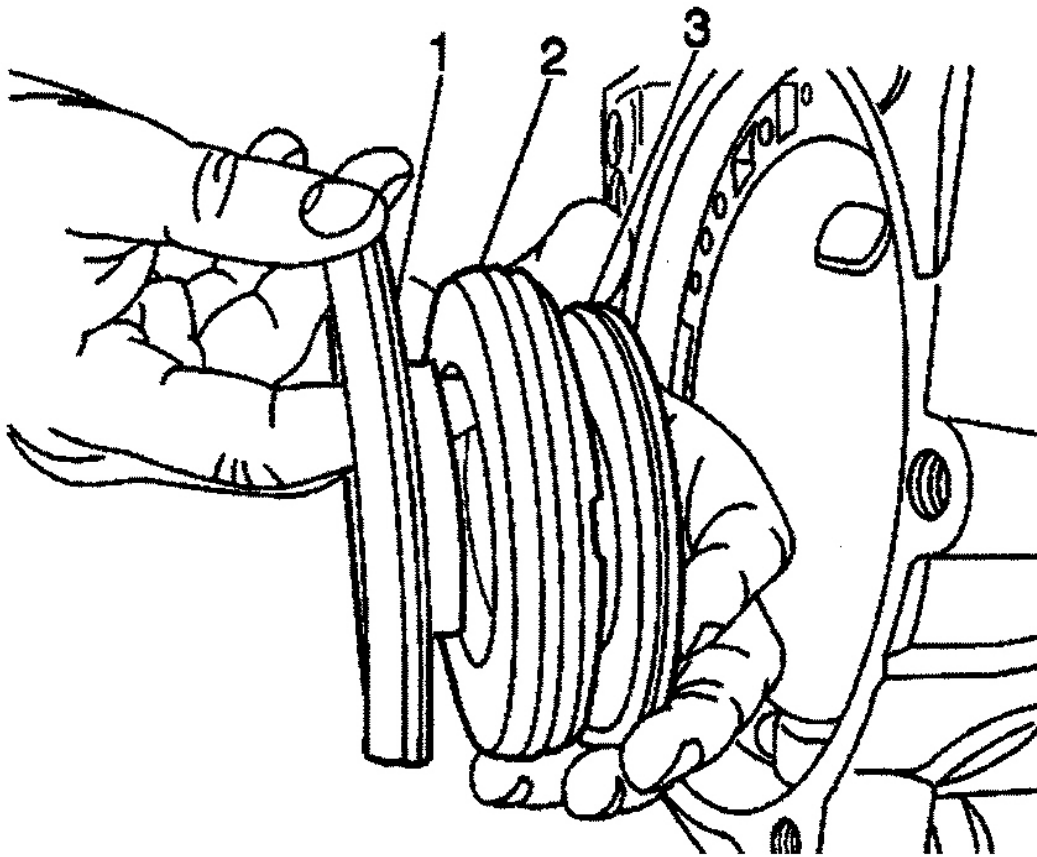


1. Fluid Passage "A"

2. Fluid Passage "B"

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Fig. 24: Applying Air Pressure To Remove Reverse Brake
Courtesy of GENERAL MOTORS CORP.



1. Outer Reverse Brake Piston
2. Reaction Sleeve
3. Inner Reverse Brake Piston

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Fig. 25: Remove Loose Reverse Brake Piston Components
 Courtesy of GENERAL MOTORS CORP.

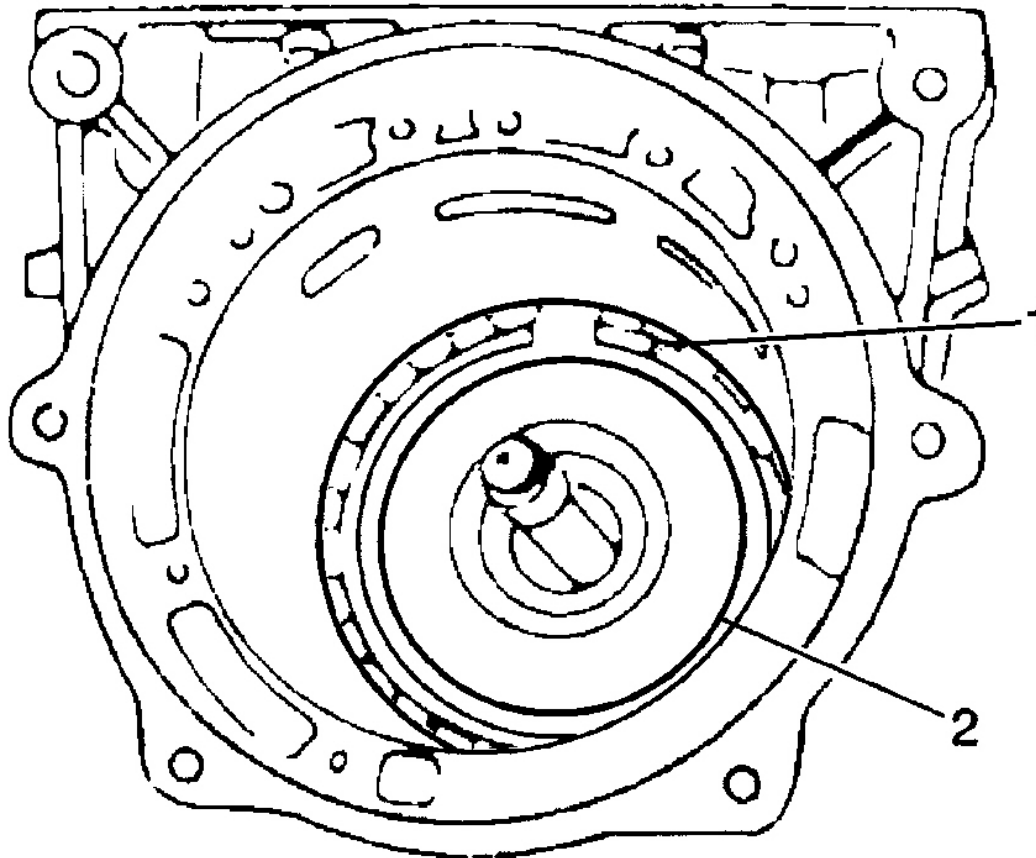
PLANETARY GEARS & OUTPUT SHAFT

Removal

1. Carefully remove the planetary gear snap ring using a Flathead screwdriver. See **Fig. 26** . Remove the following components together:
 - The planetary gear.
 - The output shaft.
2. Remove the leaf spring. See **Fig. 27** . Remove the brake applying tube. Remove the output shaft thrust

bearing and race.

NOTE: Confirm that bearing and race were installed "cup" side down.



- 1. Planetary Gear Snap Ring
- 2. Planetary Gear

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Fig. 26: Identifying Planetary Gear & Snap Ring
Courtesy of GENERAL MOTORS CORP.

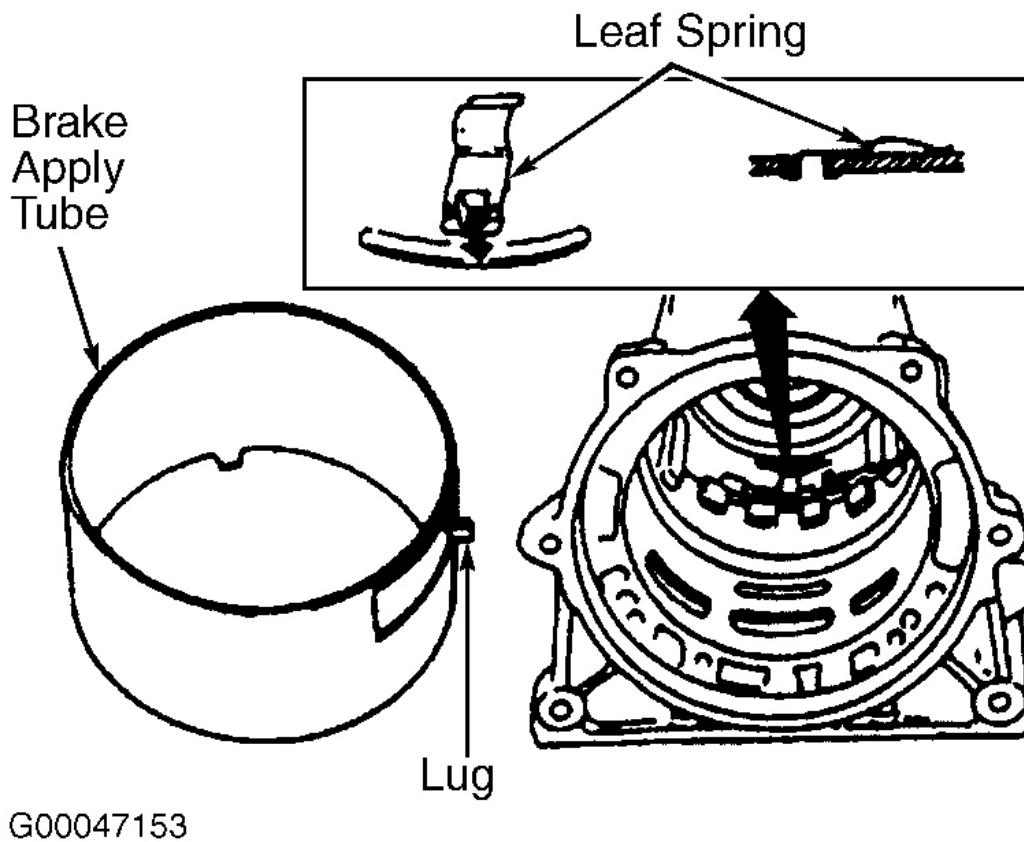


Fig. 27: Identifying Brake Apply Tube & Leaf Spring
Courtesy of SUZUKI OF AMERICA CORP.

COMPONENT DISASSEMBLY & REASSEMBLY

CASE ASSEMBLY

WARNING: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

Cleaning & Inspection Procedure

NOTE: Adhere to the following general precautions when inspecting the transmission case and the case components:

- Work in a clean area and with clean tools.

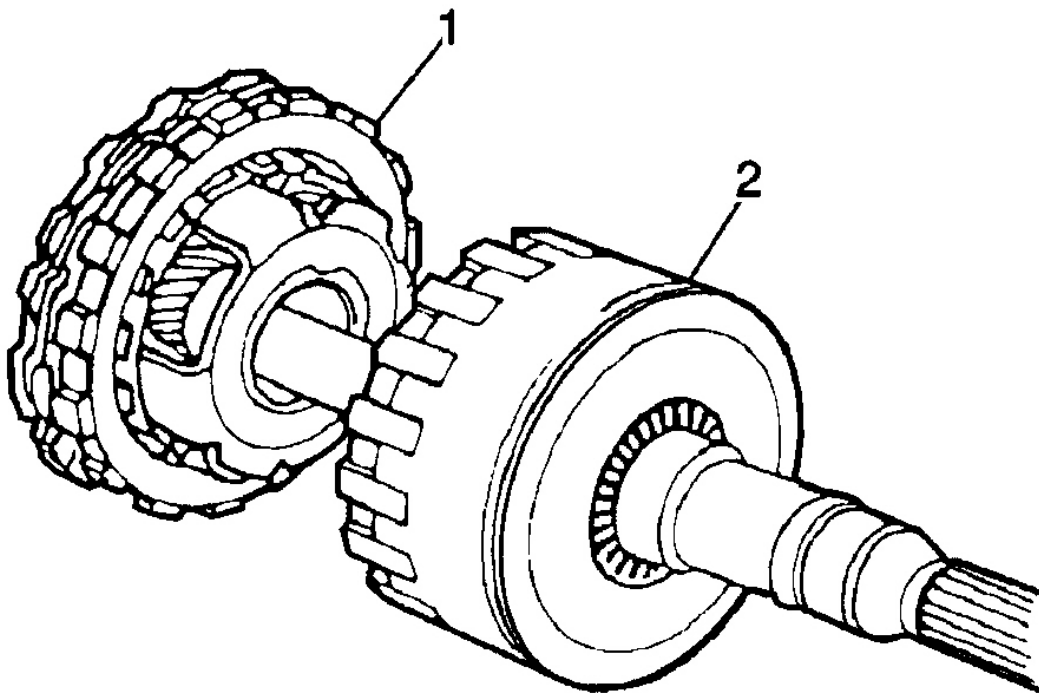
- **DO NOT use wipe cloths or rags.**
 - **DO NOT use solvents on the following components:**
 - a. **Rubber seals.**
 - b. **Plastic or Teflon(R) thrust washers or spacers.**
 - **Blow out all fluid passages using compressed air.**
 - **Clean out all small passages using a fine wire**
 - **Carefully handle all small parts.**
 - **Clean all parts and allow to air dry before assembly.**
1. Clean the case components using a solvent. Allow the components to air dry. Inspect the case for porosity.
 2. Inspect the case to valve body surfaces for damage. Inspect the vent for damage. Inspect all fluid passages using compressed air.
 3. Inspect the case bores for the following conditions:
 - General damage.
 - Porosity.
 - Burrs.
 - Sharp edges (Remove using a fine emery cloth).
 4. Inspect the bolt holes for thread damage. Inspect the case interior for the following conditions:
 - Damaged ring grooves.
 - Casting flash.
 - Worn or damaged clutch plate lugs.
 5. Inspect the case exterior for scarred or damaged gasket mating surfaces.

PLANETARY GEARS & OUTPUT SHAFT

Disassembly

1. Remove the front planetary gear assembly from the output shaft assembly. See **Fig. 28** .
2. Remove the following components from the front planetary gear:
 - The rear planetary thrust washer. See **Fig. 29** .
 - Retainer plate.
 - Clutch discs.
 - Clutch plates.
3. Remove the reverse brake reaction plate from the front planetary gear. See **Fig. 30** .
4. Remove the following components from the front planetary gear. See **Fig. 31** .
 - Snap Ring
 - One-Way Clutch
 - One-Way Clutch Thrust Washer

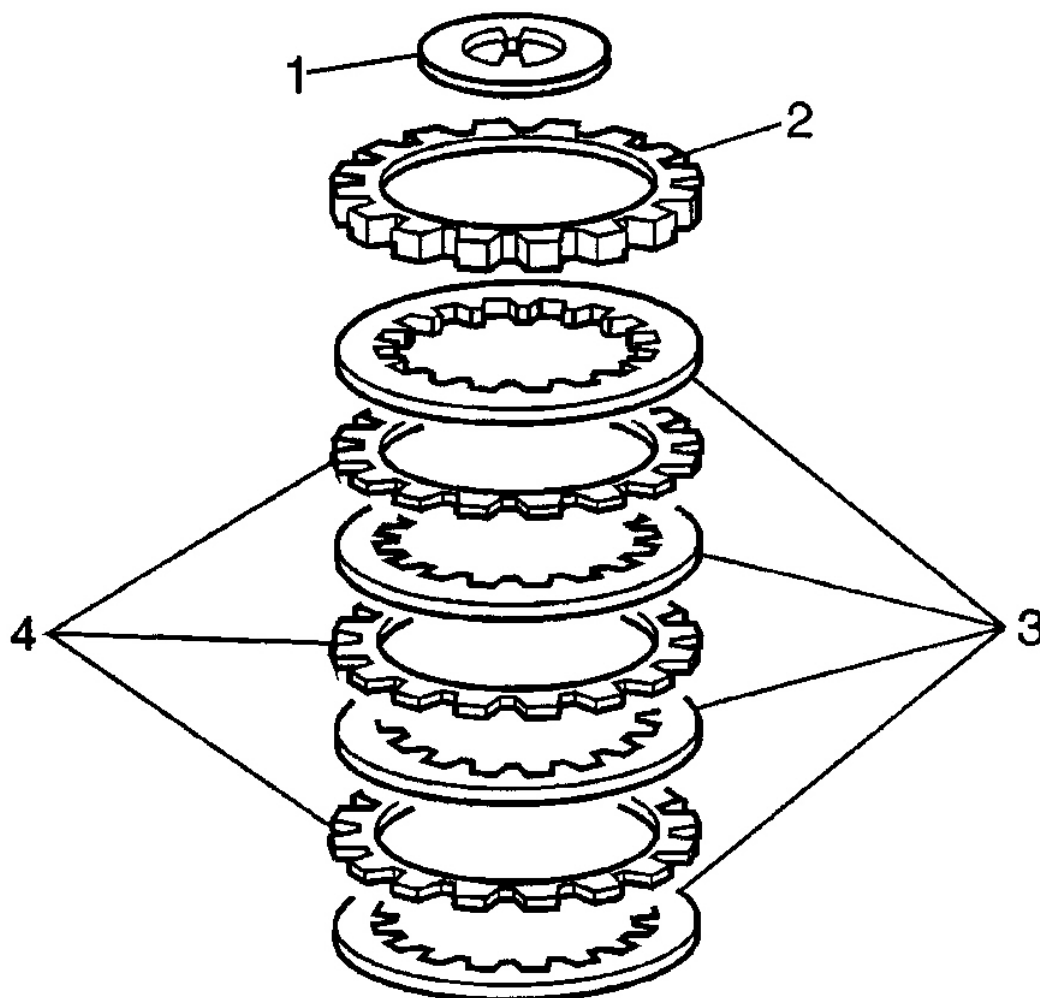
5. Compress the front planetary gear snap ring while removing the following components. See **Fig. 32** .
 - Front Planetary Ring Gear
 - Thrust Bearing
 - Rear Planetary Race
6. Remove the following components from the rear planetary gear:
 - The rear planetary thrust washer. See **Fig. 33** .
 - The rear planetary gear.
 - The rear planetary sun gear.
7. Using a screwdriver, remove the inner shaft spiral snap ring. See **Fig. 34** . Separate the inner shaft from the rear planetary ring gear. Remove the thrust bearing assembly from the rear planetary ring gear.



1. Front Planetary Gear Assembly
2. Output Shaft Assembly

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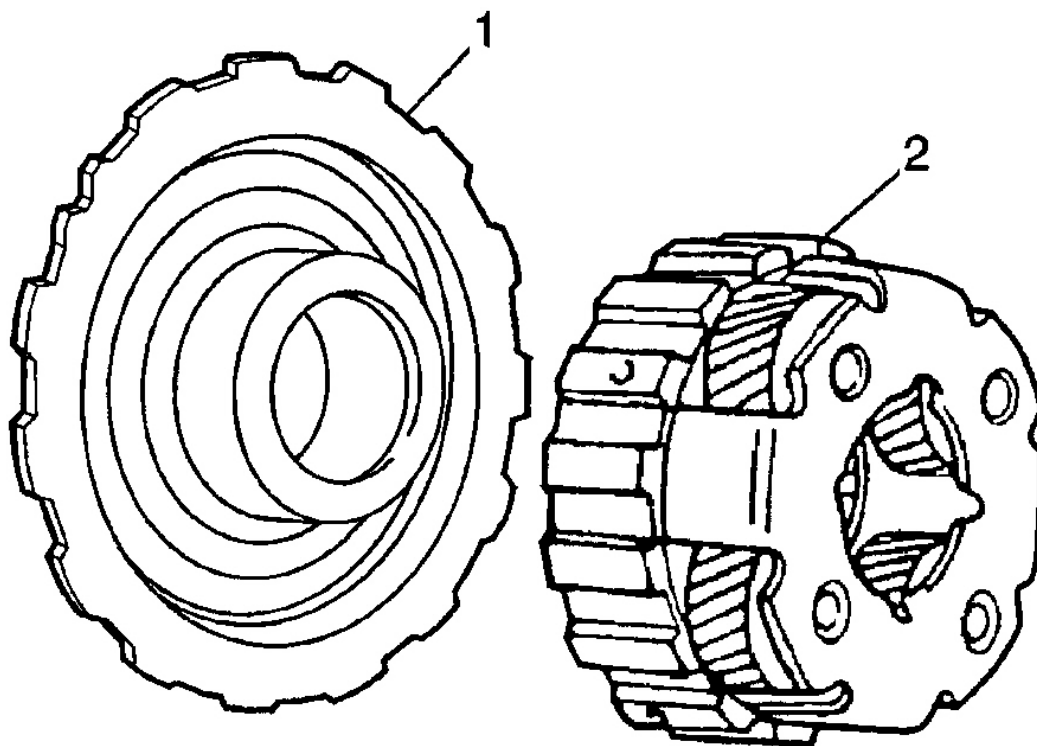
Fig. 28: Removing Front Planetary Gear
Courtesy of GENERAL MOTORS CORP.



- 1. Rear Planetary Thrust Washer
- 2. Retainer Plate
- 3. Clutch Discs
- 4. Clutch Plates

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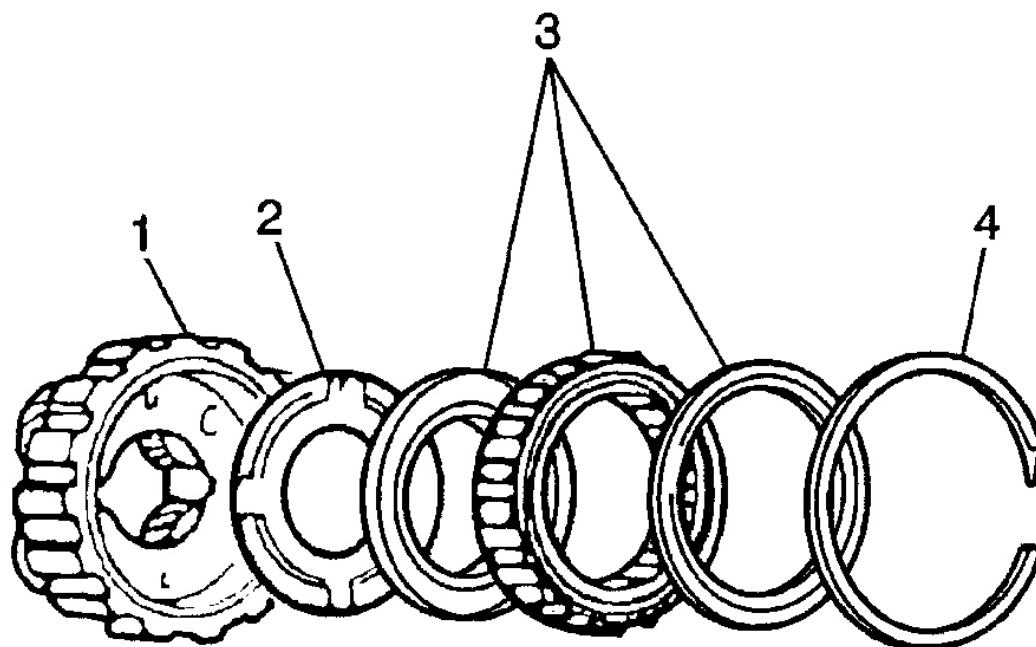
Fig. 29: Removing Front Planetary Gear Components (1 Of 2)
Courtesy of GENERAL MOTORS CORP.



- 1. Reverse Brake Reaction Plate
- 2. Front Planetary Gear

G00286800

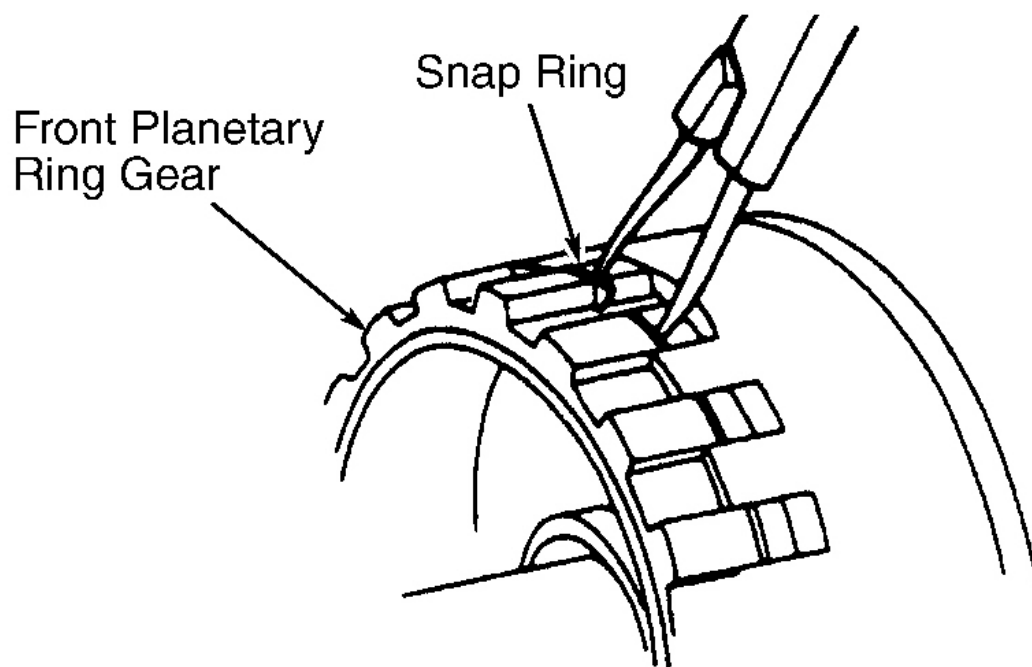
Fig. 30: Removing Reverse Brake Reaction Plate
Courtesy of GENERAL MOTORS CORP.



1. Front Planetary Gear
2. One-Way Clutch Thrust Washer
3. One-Way Clutch
4. Snap Ring

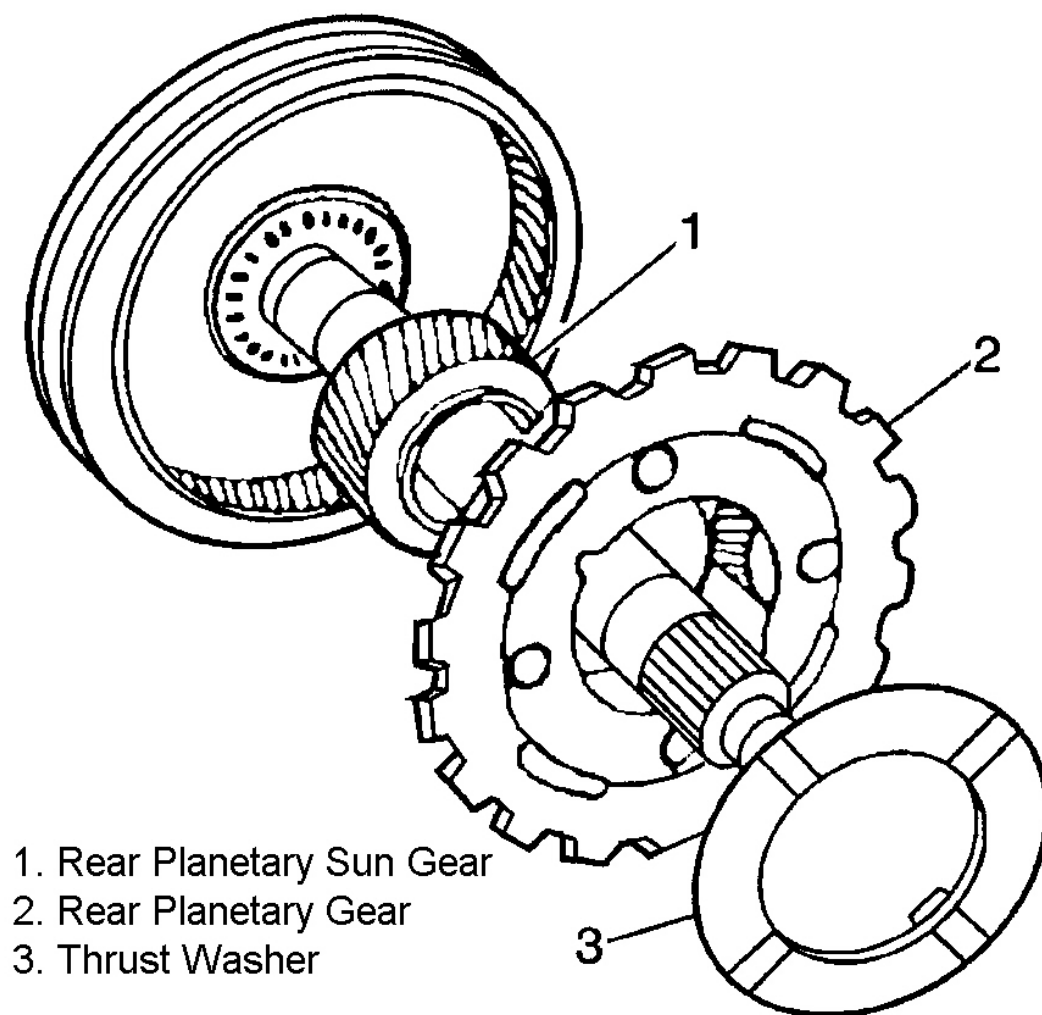
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Fig. 31: Removing Front Planetary Gear Components (2 Of 2)
Courtesy of GENERAL MOTORS CORP.



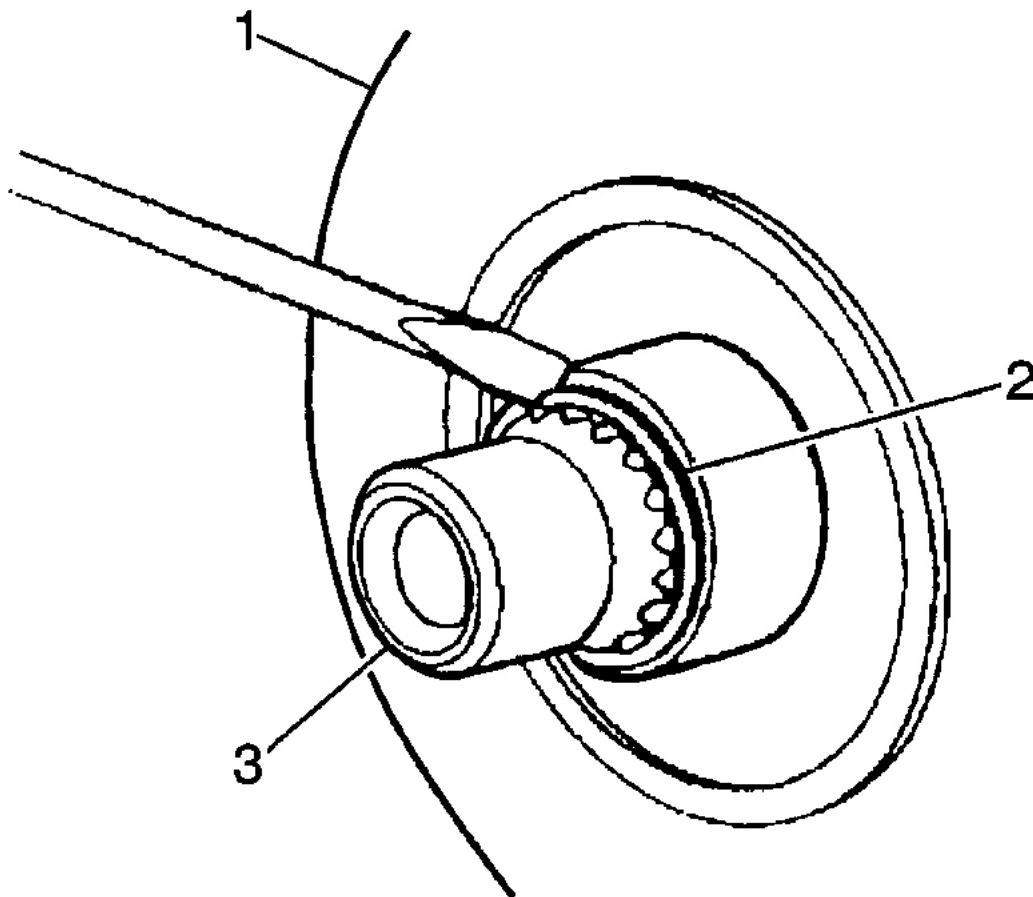
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Fig. 32: Removing & Installing Planetary Ring Gear Snap Ring
Courtesy of SUZUKI OF AMERICA CORP.



G00286802

Fig. 33: Removing Rear Planetary Gear Components
Courtesy of GENERAL MOTORS CORP.



1. Rear Planetary Ring Gear
2. Inner Shaft Spiral Snap Ring
3. Inner Shaft

G00286803

Fig. 34: Removing Inner Shaft Spiral Snap Ring
 Courtesy of GENERAL MOTORS CORP.

Inspection

1. Inspect the following components, as indicated, and replace as required:
 - All contact surfaces between the input shaft and the clutch cylinder for excessive wear or damage.
 - Intermediate shaft for wear and damage, or clogging of the oil holes.
 - Output shaft cylinder teeth (cut-outs) for excessive wear or damage.
 - Piston sliding surface for excessive wear.

- Thrust bearing/washer seating surfaces for excessive wear, bending or binding.
- Teflon seal ring surface for excessive wear or damage.
- Clutch discs and plates for excessive wear and binding of surfaces, and excessive wear to the engagement tabs (teeth).
- Planetary gear sets for wear and damage.
- Reaction plate for wear and damage.

Reassembly

NOTE: Clutch discs should be soaked in ATF for 15 minutes prior to installation. Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.

NOTE: For special tool part numbers, refer to special tools list. See SPECIAL TOOLS .

1. Install the thrust bearing assembly to the rear planetary ring gear. Install the inner shaft to the rear planetary ring gear.
2. Install the inner shaft snap ring. Install the following rear planetary ring gear components:
 - The rear planetary sun gear with wide machined surface downward. See Fig. 35 .
 - The rear planetary gear.
 - The rear planetary thrust washer and sleeve oil seal ring.
3. Install the rear planetary thrust bearing and race. Compress the snap ring while installing the front planetary ring gear.
4. Install the following one-way clutch components to the front planetary gear:
 - The one-way clutch rear thrust washer.
 - The one-way clutch.
 - The snap ring.

Install the reverse brake reaction plate to the front planetary gear. See Fig. 36 .

5. Inspect the front planetary gear operation:
 - A. Hold the reverse brake reaction plate stationary. See Fig. 37 .
 - B. Inspect that the gear locks when turned in the clockwise direction.
 - C. Inspect that the gear turns freely in the counter clockwise direction.
 - D. If the gear does not operate properly, disassemble and inspect.
6. Install the front planetary gear with the beveled side down. Install the rear planetary thrust washer to the front planetary gear. Install the front planetary gear to the output shaft.

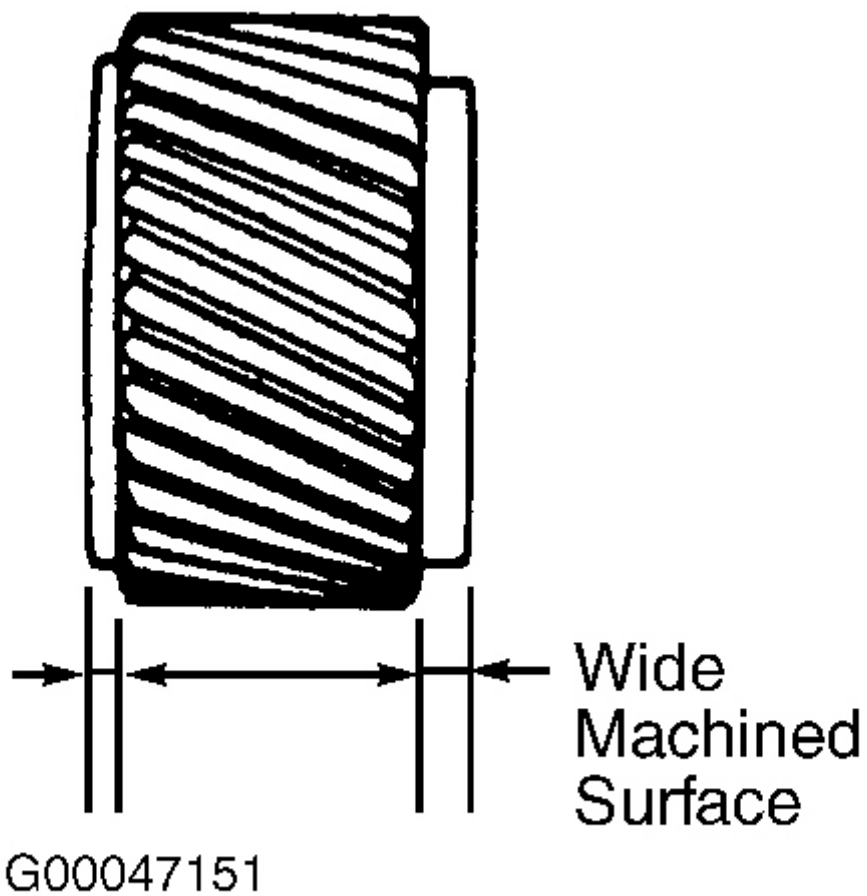
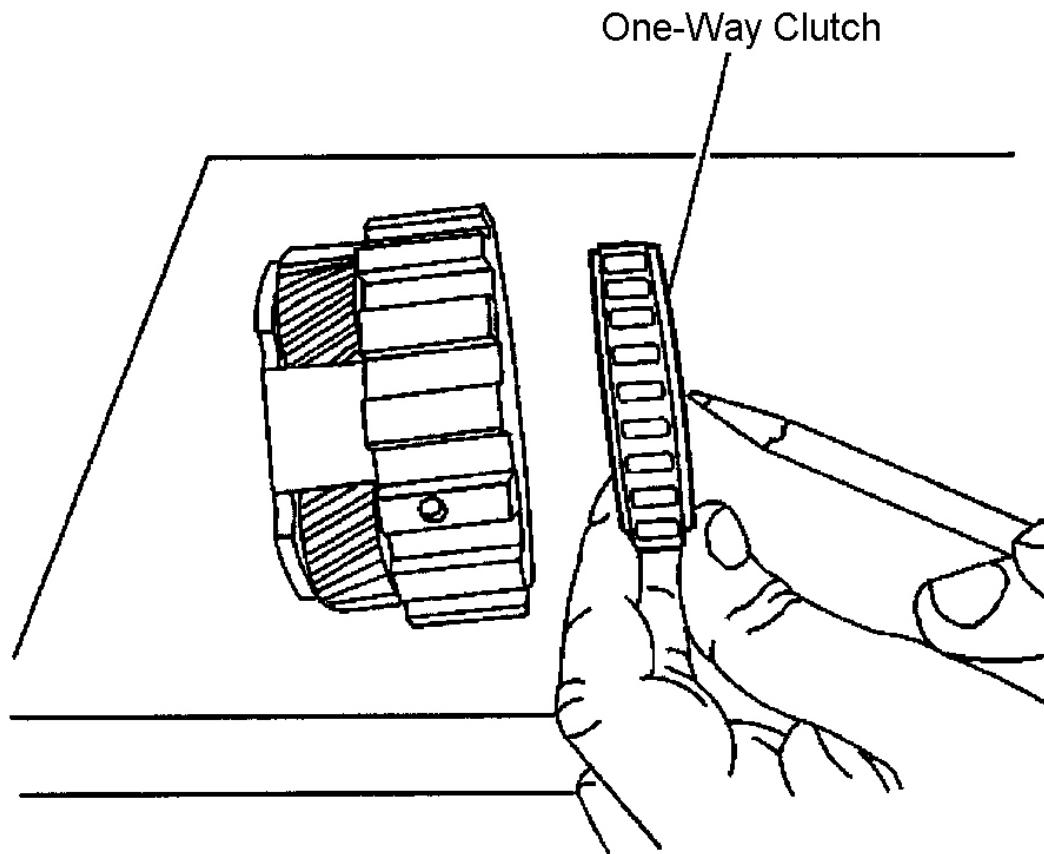
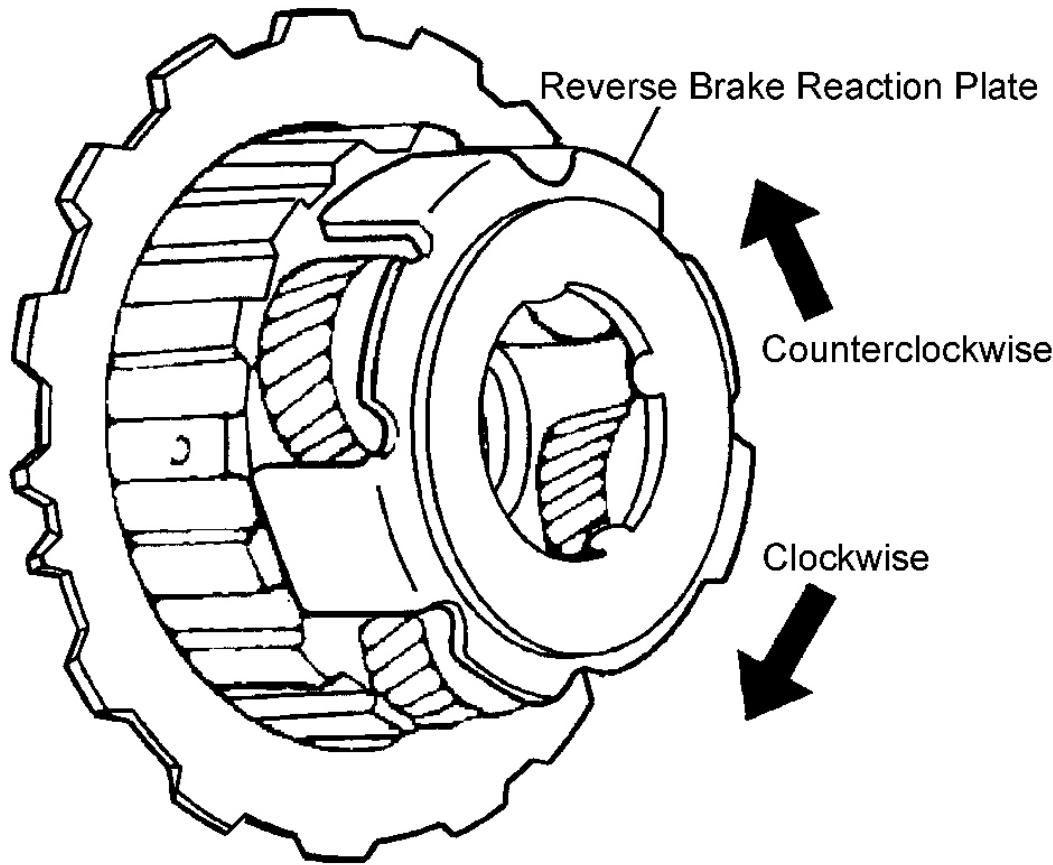


Fig. 35: Identifying Wide Machined Surface Of Rear Planetary Sun Gear
Courtesy of SUZUKI OF AMERICA CORP.



G00286804

Fig. 36: Installing Reverse Brake Reaction Plate
Courtesy of GENERAL MOTORS CORP.



G00286805

Fig. 37: Checking Front Planetary Gear Operation
Courtesy of GENERAL MOTORS CORP.

CENTER SUPPORT ASSEMBLY RECONDITIONING

Disassembly & Measurements

NOTE: For special tool part numbers, refer to special tools list. See SPECIAL TOOLS .

1. Remove the planetary gear snap ring using the Parallel Jaws. See Fig. 38 . Remove the planetary gear from the center support. See Fig. 39 .
2. Measure the B1 brake piston stroke using Dial Indicator Set and Magnetic Base:
 - Place the Dial Indicator Set plunger on the B1 brake piston. See Fig. 40 .
 - Apply 57-114 psi (4.08-8.02 Kg/CM²) of air pressure into the extreme left overdrive case fluid passage.
 - Measure the B1 brake piston stroke. See CENTER SUPPORT SPECIFICATIONS table.

- If the B1 brake piston stroke is not within specifications, replace the brake flange or the disc.
- 3. Remove the 3 rear sealing rings from the center support. Remove the B1 brake clutch snap ring from the center support using a Flathead screwdriver. See **Fig. 41**.
- 4. Remove the following B1 brake components from the center support:
 - The flange. See **Fig. 42**.
 - The clutch discs.
 - The clutch plates.
- 5. Remove the B1 brake piston return spring snap ring from the B1 brake piston retainer using Clutch Spring Compressor, and a hydraulic press. See **Fig. 43**.
- 6. Remove the B1 brake piston return springs seat and 12 springs from the center support. See **Fig. 44**.

NOTE: When using compressed air to remove components, air pressure should not exceed 14 psi (0.98 Kg/CM²).

- 7. Apply low pressure compressed air to the extreme left fluid passage in order to remove the B1 brake piston. See **Fig. 45**. Remove the "O" Rings from the B1 brake piston.
- 8. Measure the B2 brake piston stroke using Dial Indicator Set and Magnetic Base:
 - Place the Dial Indicator Set plunger on the B2 brake piston.
 - Apply 58-114 psi (4.08-8.02 Kg/CM²) of air pressure into the second left overdrive case fluid passage. See **Fig. 46**.
 - Measure the B2 brake piston stroke. See **CENTER SUPPORT SPECIFICATIONS** table.
 - If the B2 brake piston stroke is not within specifications, replace the brake flange or the disc.
- 9. Remove the B2 brake snap ring from the center support. Remove the following B2 brake components from the center support:
 - The flange.
 - The clutch discs.
 - The clutch plates.
- 10. Remove the B2 brake piston return spring snap ring from the B2 brake piston retainer using the Clutch Spring Compressor and a hydraulic press. See **Fig. 43**. Remove the B2 brake piston return spring seat and springs from the center support.

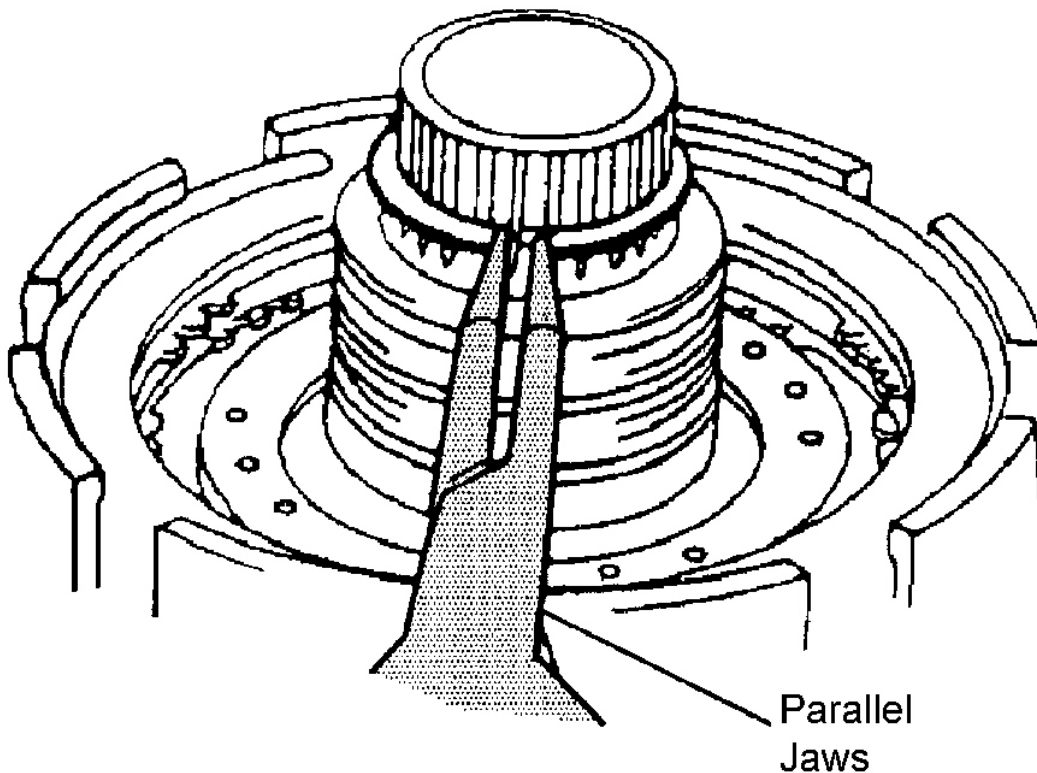
NOTE: When using compressed air to remove components, air pressure should not exceed 14 psi (0.98 Kg/CM²).

- 11. Apply low pressure compressed air to the second left fluid passage in order to remove the B2 brake piston. See **Fig. 47**. Remove the "O" Rings from the B2 brake piston.
- 12. Perform the following steps in order to inspect the planetary sun gear operation. See **Fig. 48**:
 - Hold the B2 brake hub assembly.
 - Inspect that the gear locks when turned in the clockwise direction.
 - Inspect that the gear turns freely in the counter clockwise direction.

13. Remove the B2 brake hub assembly from the planetary sun gear. See **Fig. 49** . Using a pin punch, loosen staked parts of one-way clutch rear side retainer, then remove retainer, as necessary. See **Fig. 50** . Remove the 2 planetary sun gear sealing rings.

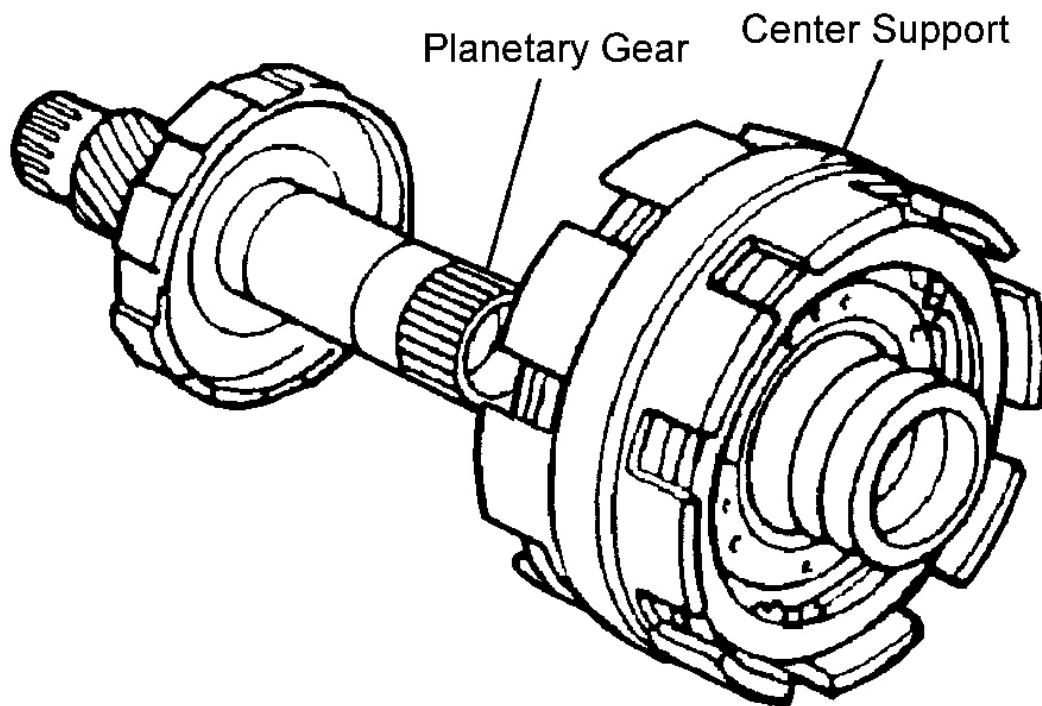
CENTER SUPPORT SPECIFICATIONS

Application	In. (mm)
B1 Brake Piston Stroke	
Sportage & Tracker	.025-.068 (0.63-1.73)
Grand Vitara & Vitara	.039-.047 (1.00-1.20)
B2 Brake Piston Stroke	.040-.088 (1.01-2.25)
Brake Piston Return Springs	.635 (16.12)



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Fig. 38: Removing Planetary Gear Snap Ring
Courtesy of GENERAL MOTORS CORP.



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Fig. 39: Removing Planetary Gear From Center Support
Courtesy of GENERAL MOTORS CORP.

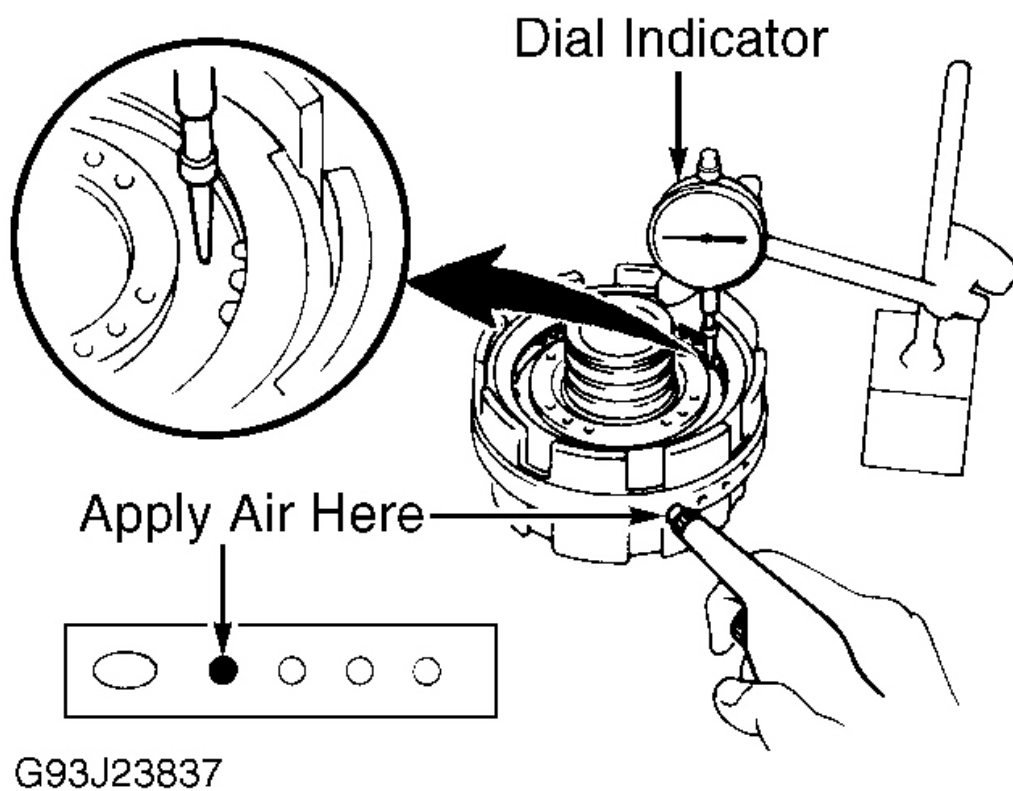
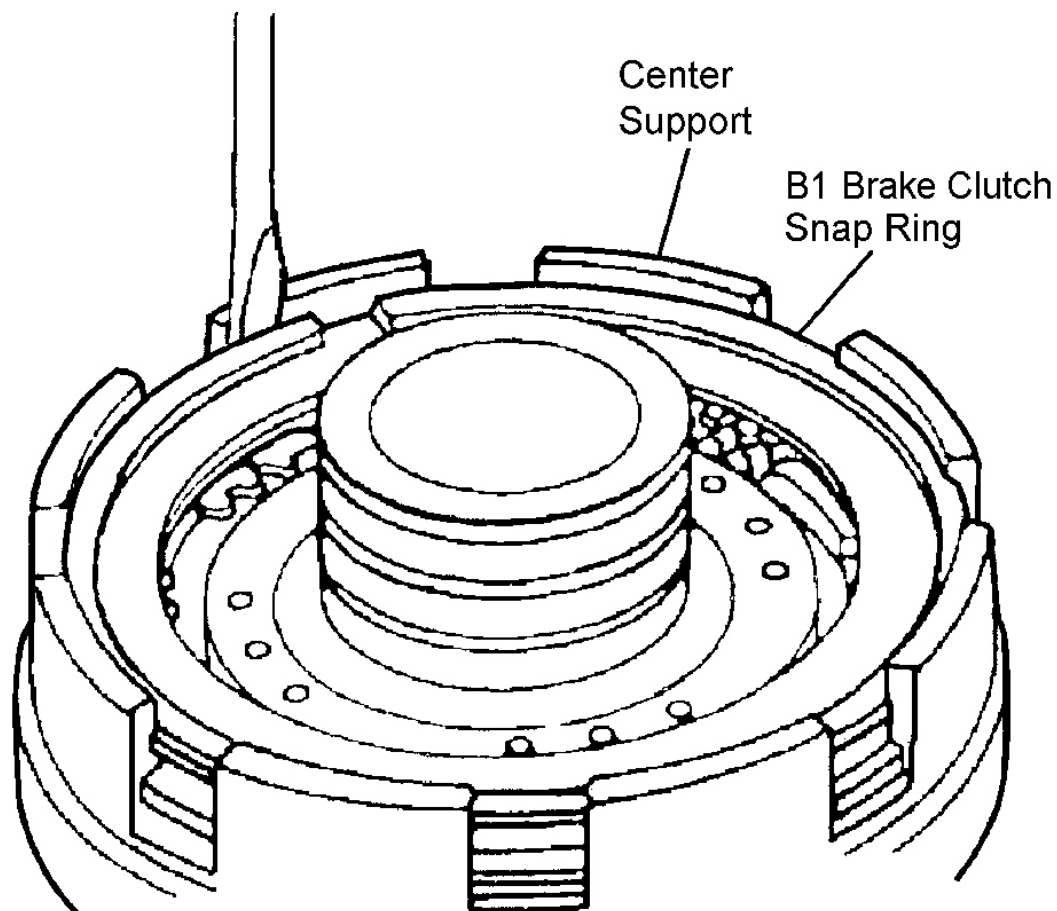
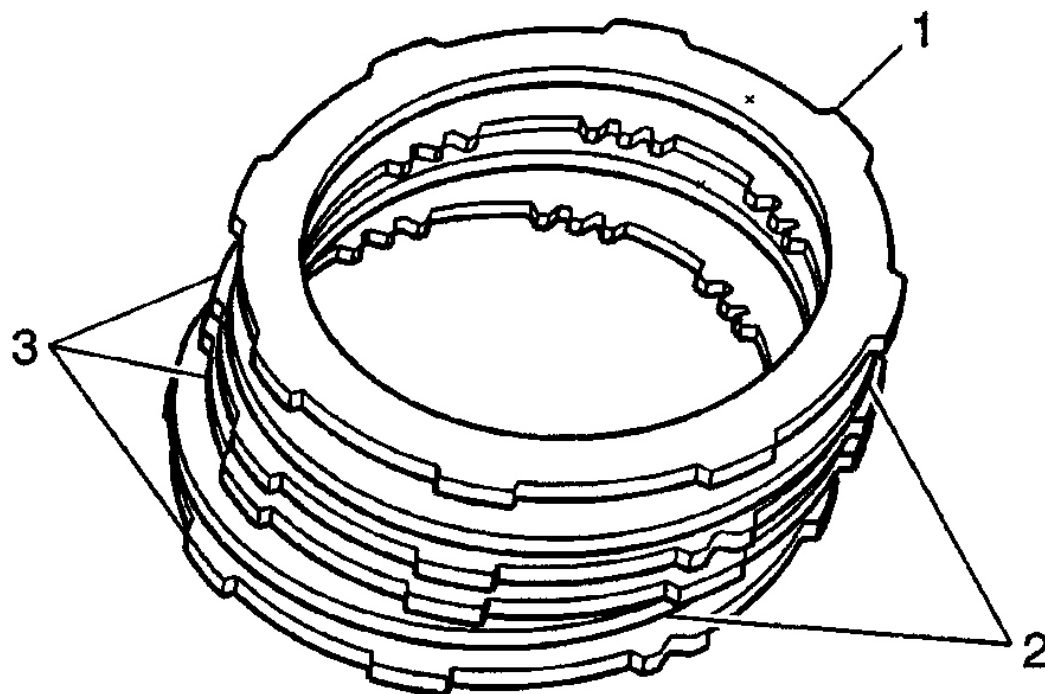


Fig. 40: Measuring No. 1 Brake Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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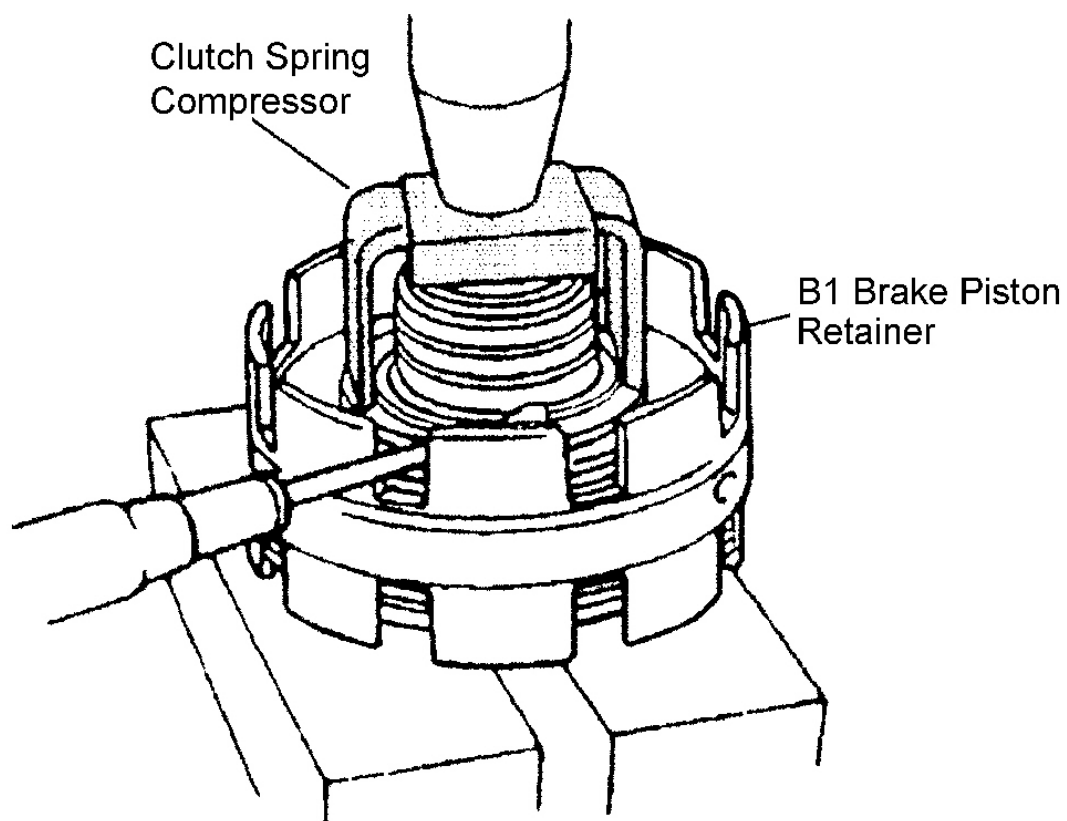
Fig. 41: Removing B1 Brake Clutch Snap Ring
Courtesy of GENERAL MOTORS CORP.



- 1. Flange
- 2. Clutch Discs
- 3. Clutch Plates

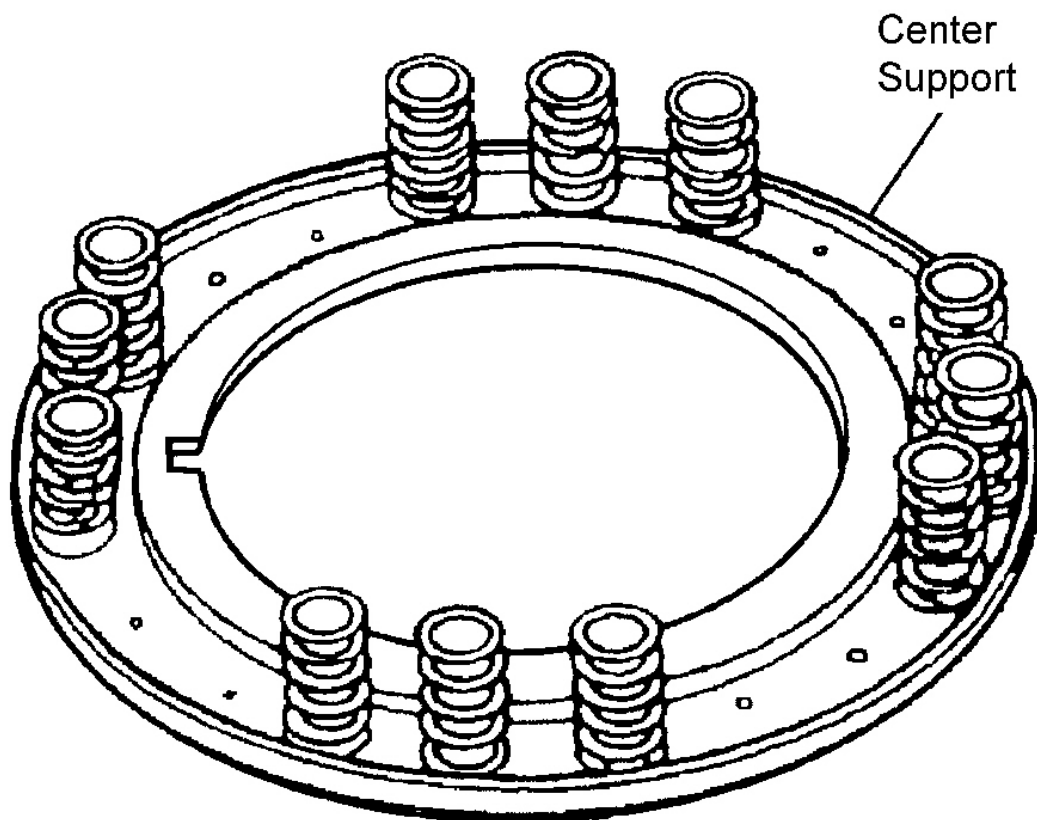
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Fig. 42: Removing B1 Brake Components
Courtesy of GENERAL MOTORS CORP.



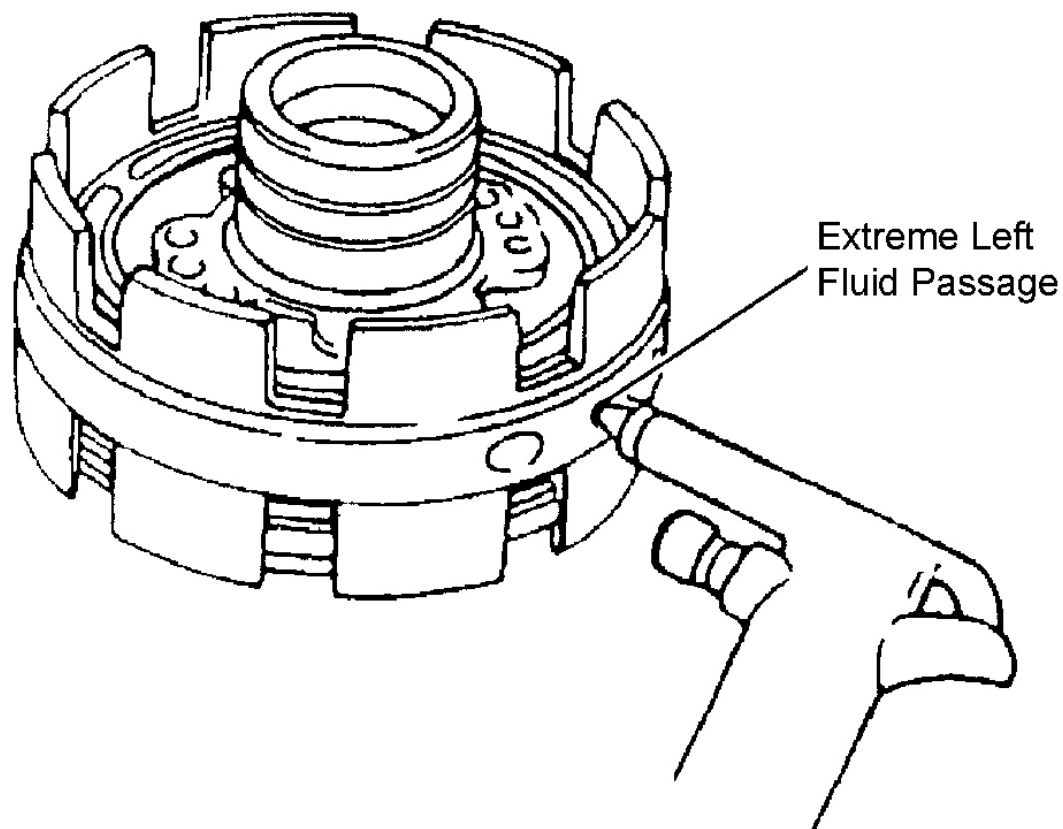
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Fig. 43: Removing Brake Piston Return Spring Snap Ring
Courtesy of GENERAL MOTORS CORP.



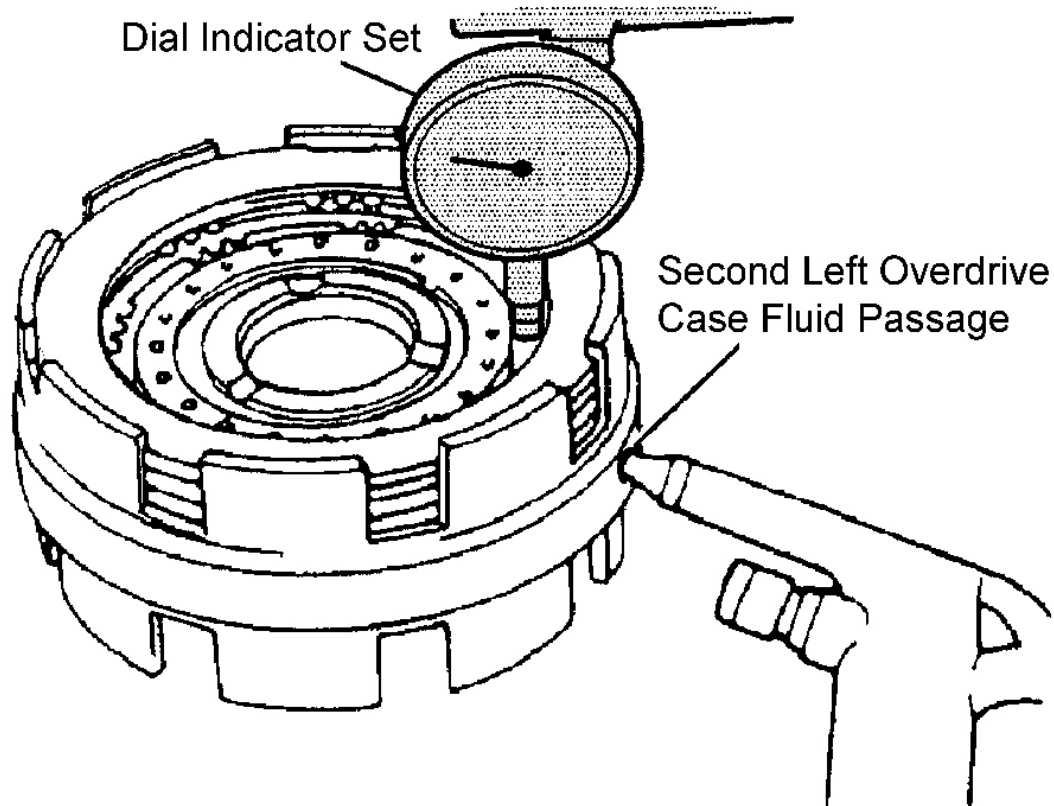
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Fig. 44: Identifying B1 Brake Piston Return Springs
Courtesy of GENERAL MOTORS CORP.



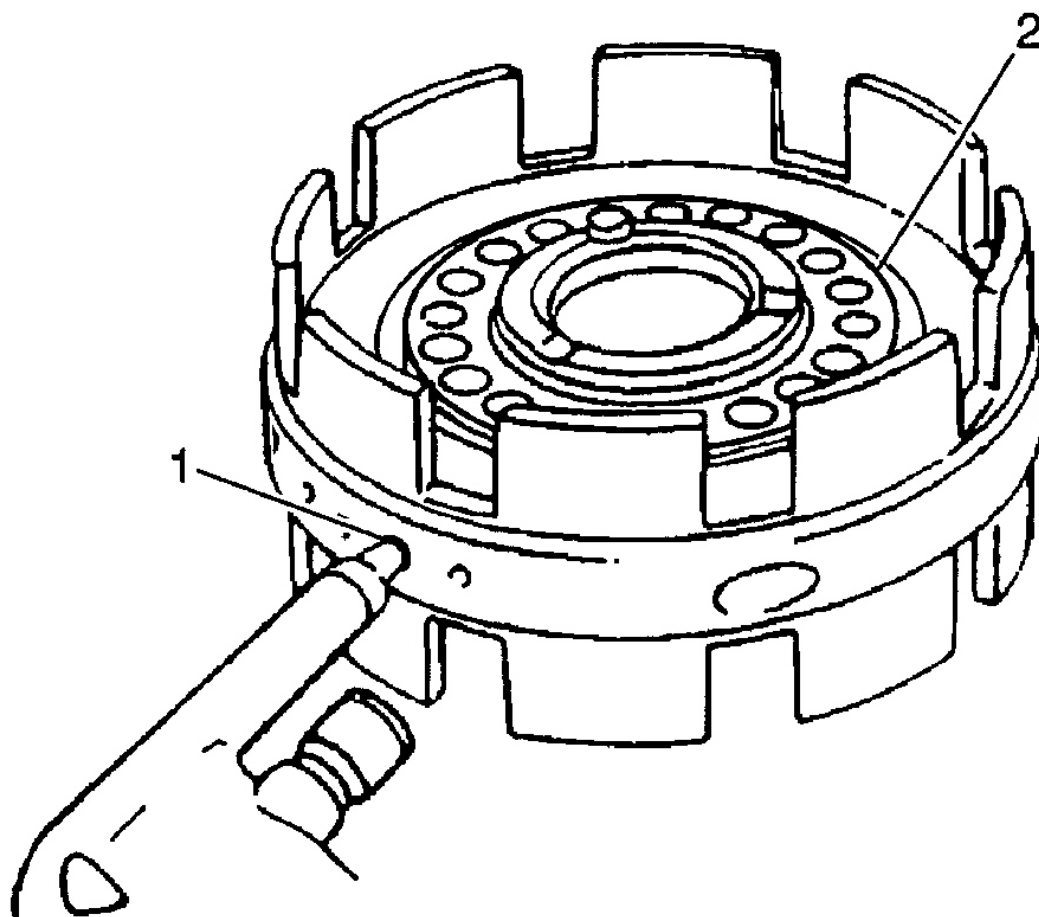
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Fig. 45: Applying Air Pressure To Remove B1 Brake Piston
Courtesy of GENERAL MOTORS CORP.



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Fig. 46: Measuring B2 Brake Piston Stroke
Courtesy of GENERAL MOTORS CORP.

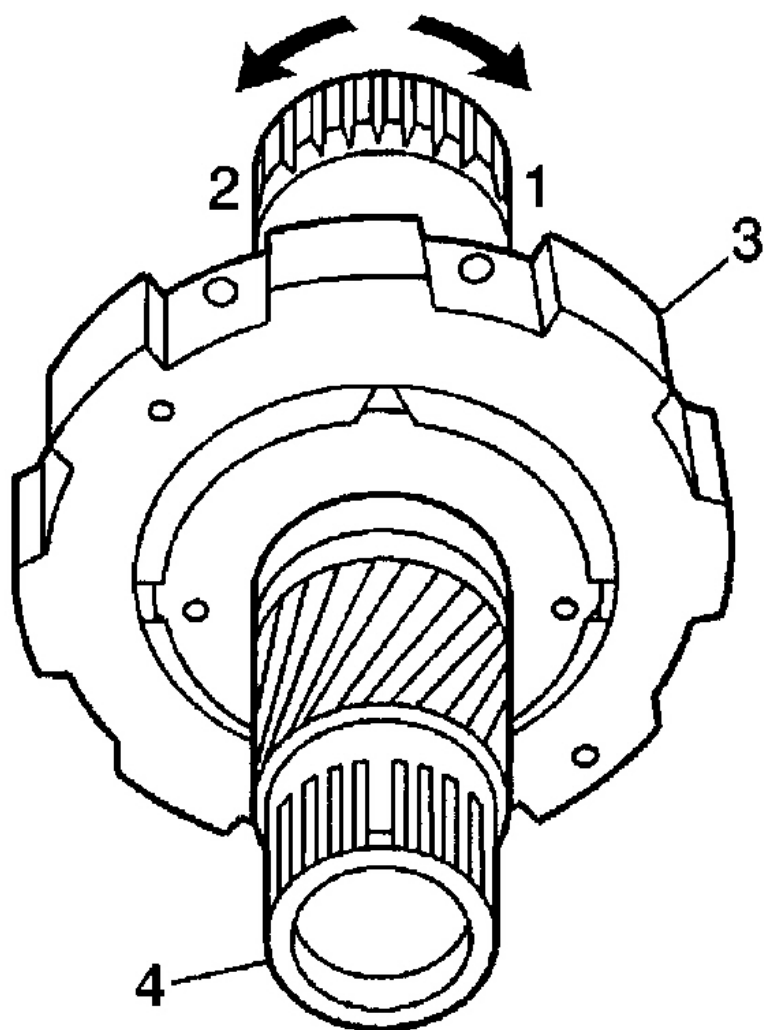


1. Second Left Fluid Passage

2. B2 Brake Piston

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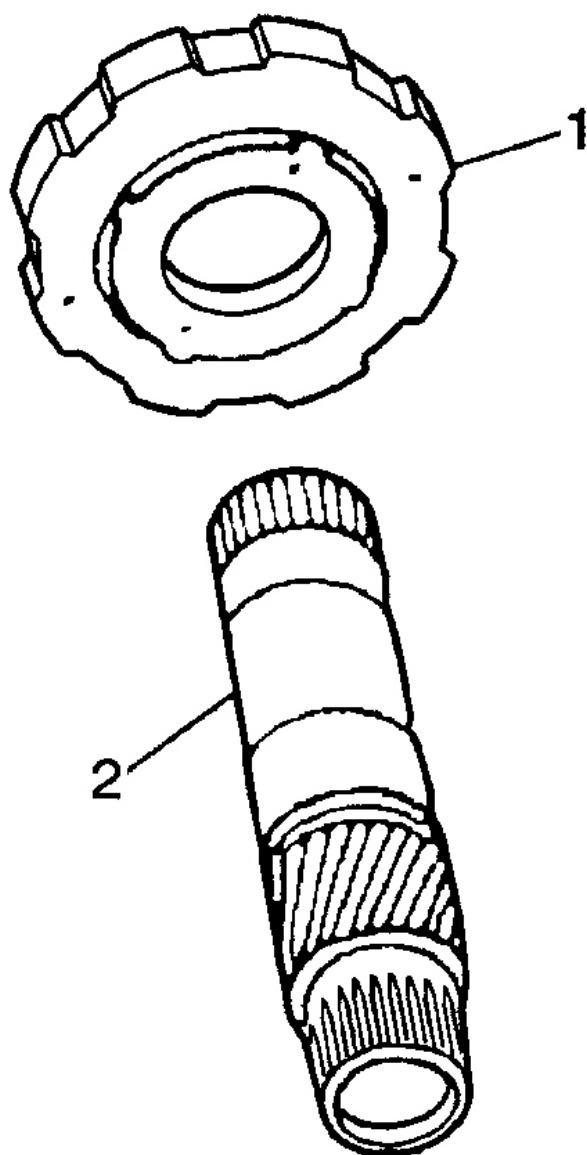
Fig. 47: Applying Air Pressure To Remove B2 Brake Piston
Courtesy of GENERAL MOTORS CORP.



- 1. Clockwise
- 2. Counterclockwise
- 3. B2 Brake Hub Assembly
- 4. Sun Gear

G00286815

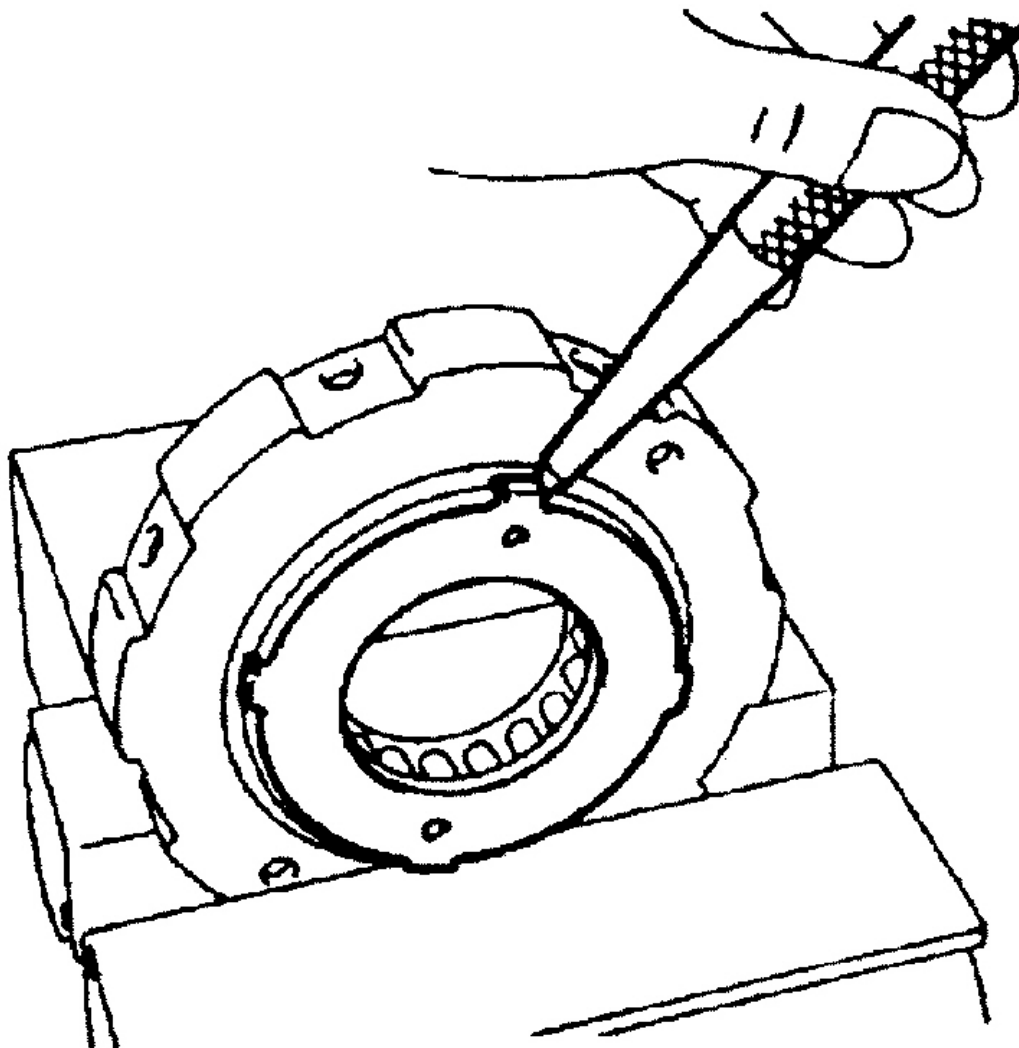
Fig. 48: Checking Planetary Sun Gear Operation
Courtesy of GENERAL MOTORS CORP.



- 1. B2 Brake Hub Assembly
- 2. Planetary Sun Gear

G00286816

Fig. 49: Removing Planetary Sun Gear From B2 Brake Hub Assembly
Courtesy of GENERAL MOTORS CORP.



G00294030

Fig. 50: Removing Rear Side Retainer
Courtesy of KIA MOTORS AMERICA, INC.

Reassembly

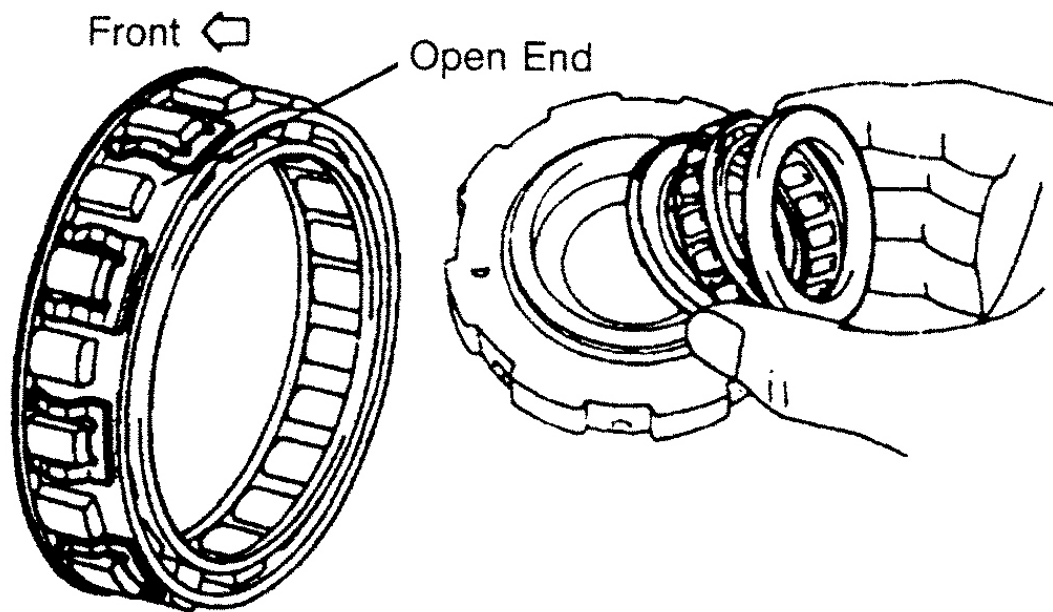
NOTE: Clutch discs should be soaked in ATF for 15 minutes prior to installation. Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

1. Carefully install 2 NEW planetary sun gear seal rings. Assemble one-way clutch into outer race with end of retainers facing rearward, if necessary. See **Fig. 51** . Install 2 retainers to outer race and stake retainer tabs. Install B2 brake hub assembly to the planetary sun gear.
2. Perform the following steps in order to inspect the planetary sun gear operation. See **Fig. 48** :
 - Hold the B2 brake hub assembly.
 - Inspect that the gear locks when turned in the clockwise direction.
 - Inspect that the gear turns freely in the counter clockwise direction.
3. Install 2 NEW "O" Rings to the B2 brake piston. Install the B2 brake piston to the center support.
4. Install the B2 brake piston return springs and seat to the B2 brake piston.

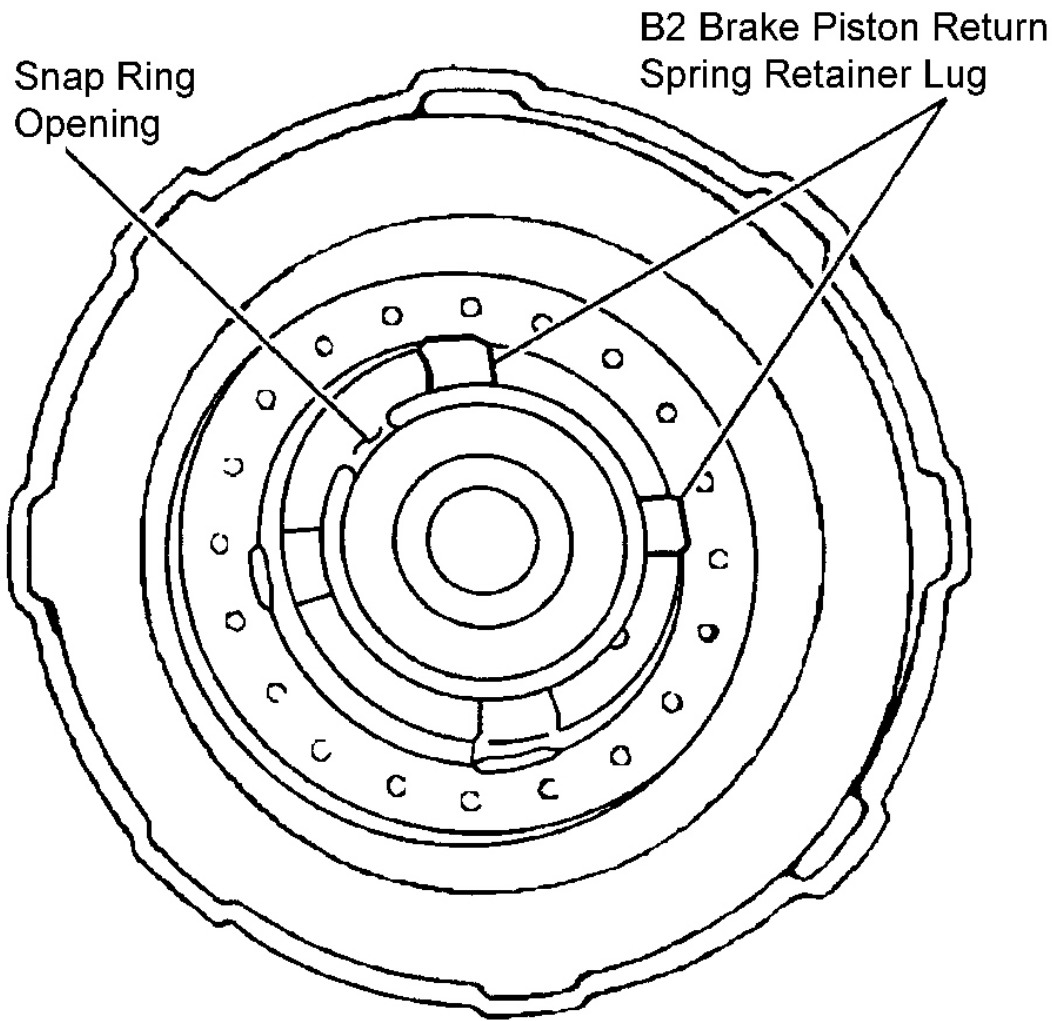
NOTE: **DO NOT align the snap ring opening with B2 brake piston return spring retainer lug during the next step. See Fig. 52 .**

5. Install the B2 brake piston return spring snap ring onto the B2 piston return spring retainer using Clutch Spring Compressor and a hydraulic press. Install 3 each of B2 brake plates and discs, starting with a plate and alternating.
6. Install the B2 brake flange with the chamfered side facing the disc. Install the B2 snap ring into the center support.
7. Measure the B2 brake piston stroke using Dial Indicator Set and Magnetic Base:
 - Place Dial Indicator Set plunger on the B2 brake piston.
 - Apply 58-114 psi (4.08-8.02 Kg/CM²) of air pressure into the second left overdrive case fluid passage. See **Fig. 46** .
 - Measure B2 brake piston stroke. See **CENTER SUPPORT SPECIFICATIONS** table.
 - If the B2 brake piston stroke is not within specifications, disassemble and inspect.
8. Install 2 NEW "O" Rings to the B1 brake piston. Install the B1 brake piston to the center support.
9. Install the B1 brake piston return springs and seat to the B1 brake piston. Install the B1 brake piston return spring snap ring onto the B1 brake piston return spring retainer using Clutch Spring Compressor and a hydraulic press.
10. Install 3 each of B1 brake plates and discs, starting with a plate and alternating. Install the B1 brake flange with the chamfered side facing the disc. Install the B1 snap ring into the center support.
11. Measure the B1 brake piston stroke using Dial Indicator Set and Magnetic Base. See **Fig. 46** :
 - Place the Dial Indicator Set plunger on the B1 brake piston.
 - Apply 58-114 psi (4.08-8.02 Kg/CM²) of air pressure into the extreme left overdrive case fluid passage.
 - Measure B1 brake piston stroke. See **CENTER SUPPORT SPECIFICATIONS** table.
 - If the B1 brake piston stroke is not within specifications, disassemble and inspect.
12. Install the 3 rear seal rings to the center support. Install the planetary gear to the center support. Install the planetary gear snap ring using Parallel Jaws.



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Fig. 51: Assembling One-Way Clutch
Courtesy of KIA MOTORS AMERICA, INC.



G00286817

Fig. 52: Identifying Snap Ring-To-B2 Brake Piston Return Spring Retainer Lug Orientation
Courtesy of GENERAL MOTORS CORP.

DIRECT CLUTCH

NOTE: Perform the following procedure before disassembling the direct clutch and again after assembly.

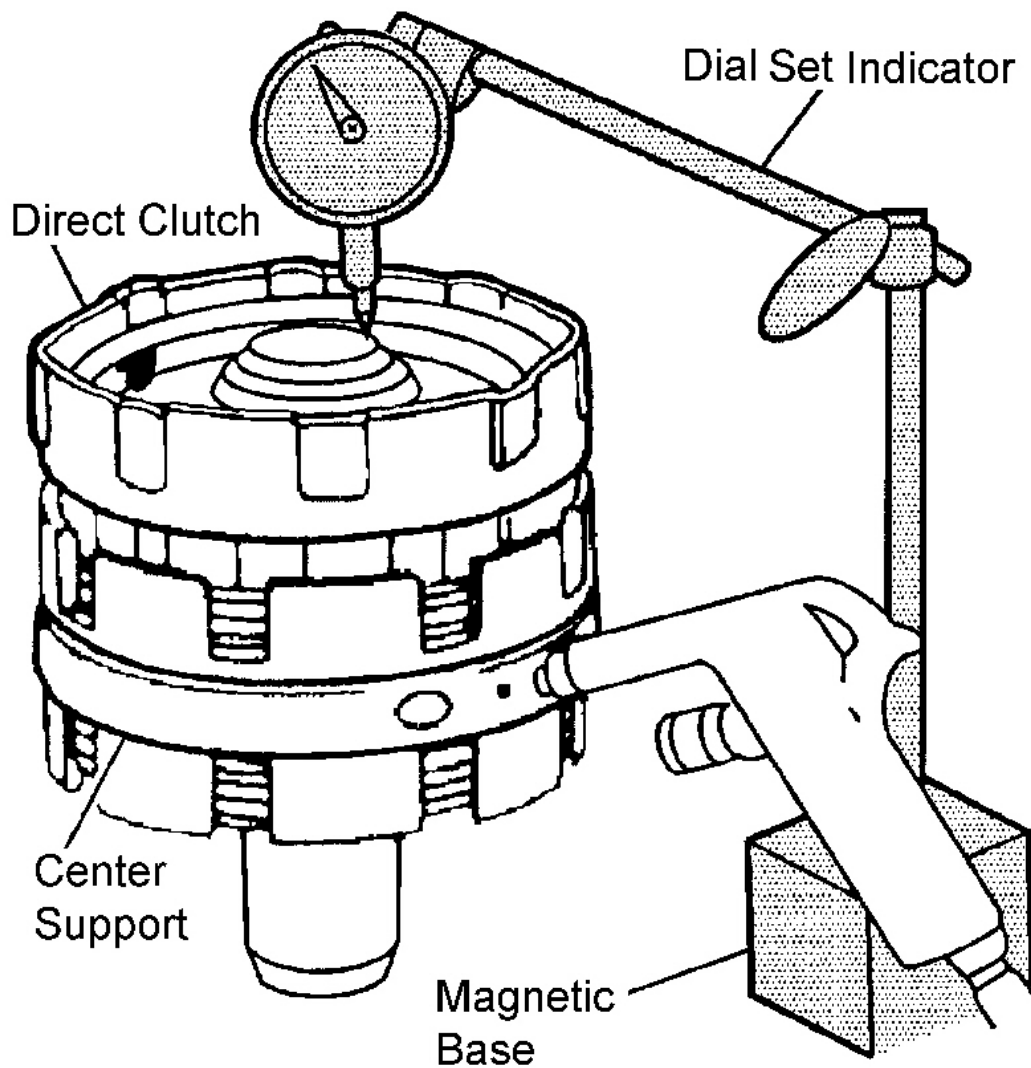
NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

Measurement Procedure

1. Install Dial Indicator Set and Magnetic Base. Temporarily install the direct clutch onto the center support. See **Fig. 53** . Place Dial Indicator Set plunger on the direct clutch piston.
2. Apply 58-114 psi (4.08-8.02 Kg/CM²) of compressed air into the second left fluid passage in the overdrive case. Measure the direct clutch piston stroke. See **DIRECT CLUTCH PISTON STROKE SPECIFICATIONS** table.
3. If the direct clutch piston stroke is not within specifications, install a flange of one of the following sizes in order to adjust the stroke:
 - 0.141" (3.60 mm)
 - 0.149" (3.80 mm)
 - 0.157" (4.00 mm)

DIRECT CLUTCH PISTON SPECIFICATIONS

Application	Stroke Clearance - In. (mm)	Return Spring Free Length - In. (mm)
Grand Vitara	.036-.078 (0.91-1.99)	.595 (15.13)
Sportage	.040-.089 (1.01-2.25)	.595 (15.13)
Tracker	.008-.069 (0.20-1.75)	.595 (15.13)
Vitara	.042-.084 (1.06-2.14)	.595 (15.13)



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Fig. 53: Measuring Direct Clutch Piston Stroke
Courtesy of GENERAL MOTORS CORP.

Disassembly

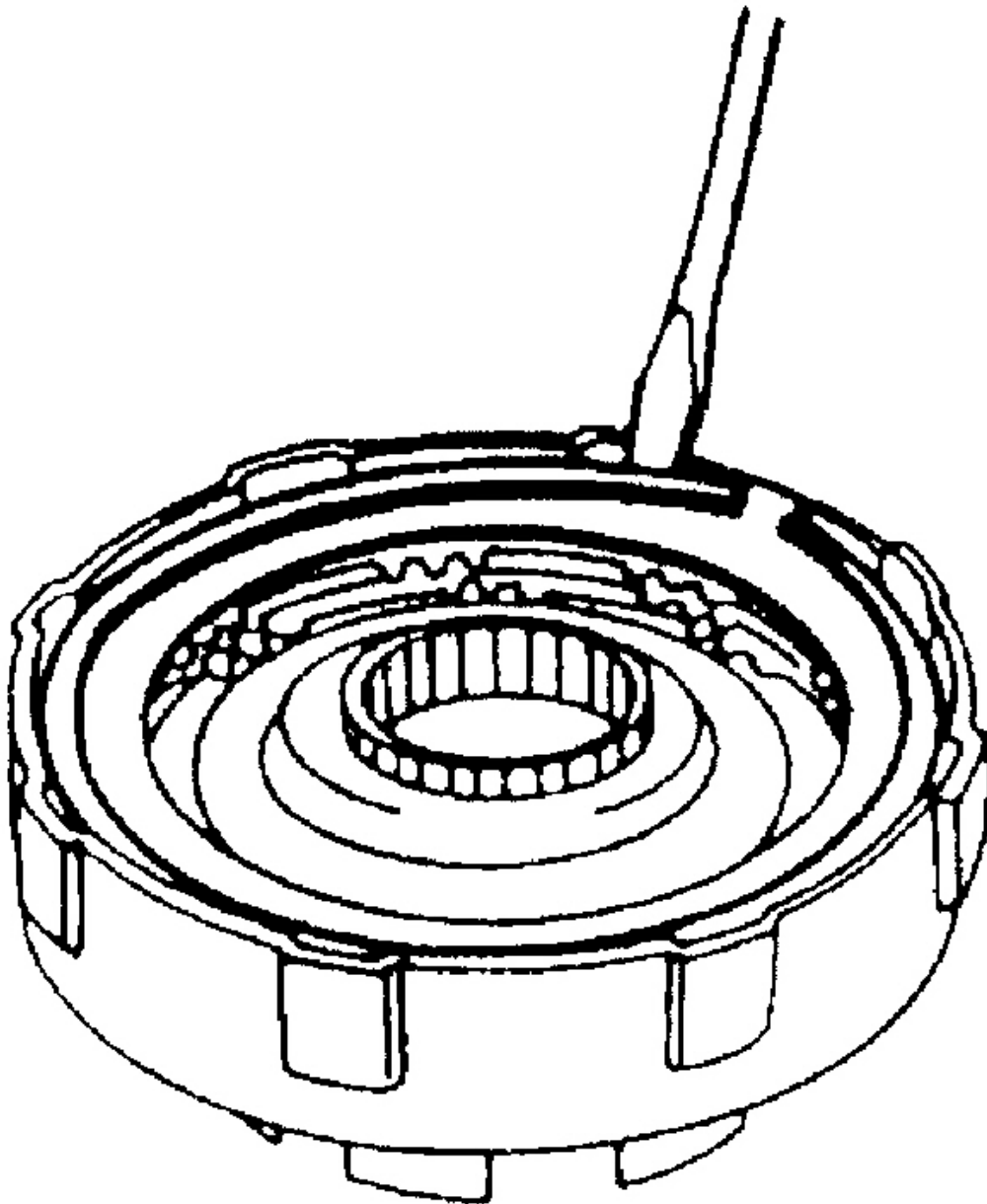
NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

1. Remove the direct clutch from the center support. Remove the direct clutch snap ring from the direct clutch drum. See **Fig. 54** .
2. Remove the following components from the direct clutch drum:

- The flange. See **Fig. 55** .
 - The discs.
 - The plates.
3. Remove the direct clutch piston return spring snap ring from the direct clutch piston retainer using Clutch Spring Compressor, and a press. See **Fig. 56** . Remove the direct clutch piston return springs from the direct clutch piston.

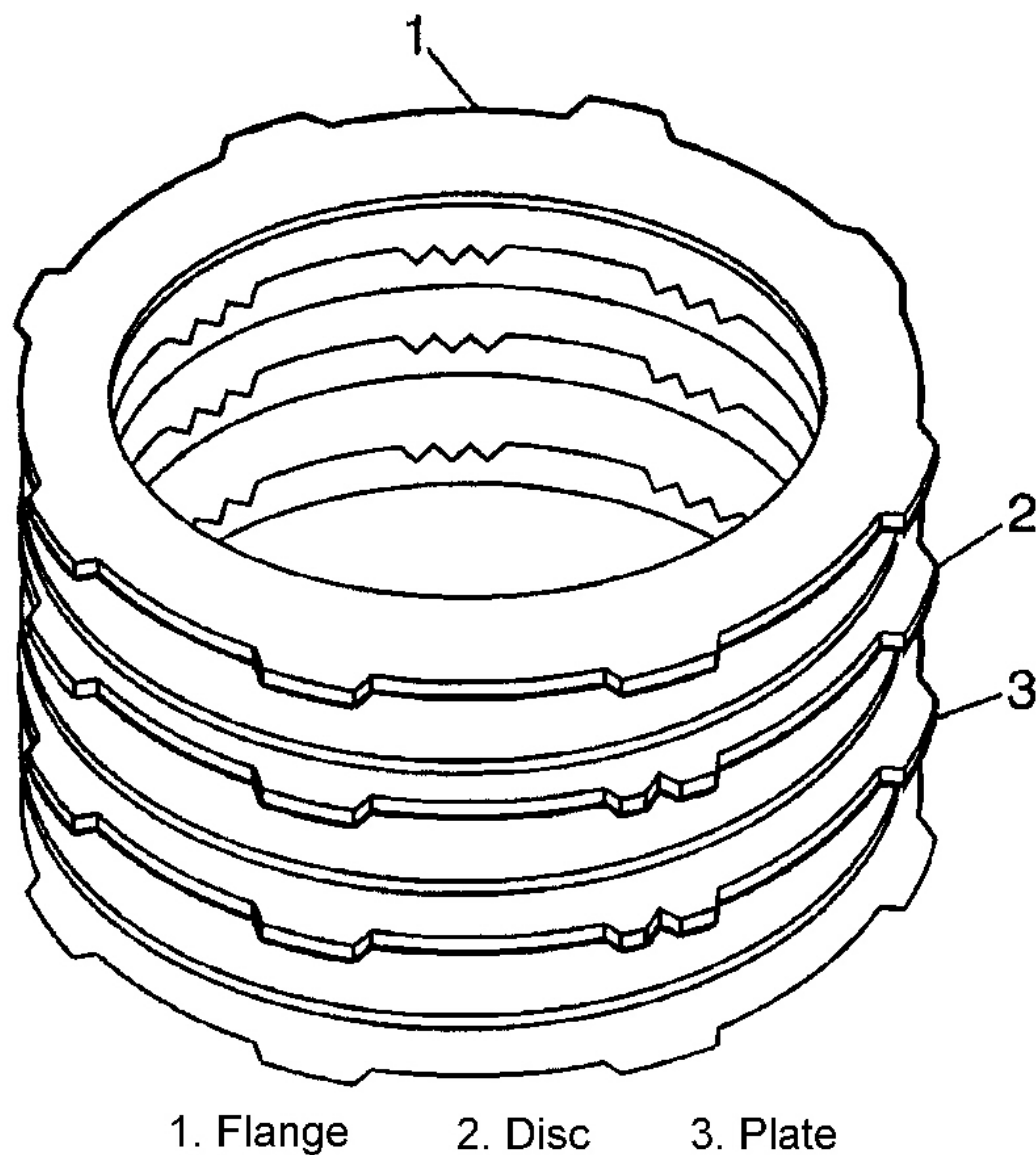
NOTE: **When using compressed air to remove components, air pressure should not exceed 14 psi (0.98 Kg/CM²).**

4. Remove the direct clutch piston from the direct clutch drum:
- Temporarily install the drum onto the center support. See **Fig. 57** .
 - Apply low pressure compressed air into the second left fluid passage.
5. Apply low pressure compressed air into the extreme right fluid passage in order to remove the direct clutch inner pistons. Remove the inner and outer direct clutch piston "O" Ring seals. Measure the direct clutch piston return springs. See **DIRECT CLUTCH PISTON SPECIFICATIONS** table. Replace as necessary.
6. Clean all direct clutch components. Allow the components to air dry. Inspect the direct clutch disc for excessive wear or damage. Replace as necessary. Inspect the direct clutch pistons for cracks or porosity. Replace as necessary.
7. Shake the piston in order to inspect the free movement of the check ball. Apply low pressure compressed air to the check ball opening in order to inspect for leaks. See **Fig. 58** .



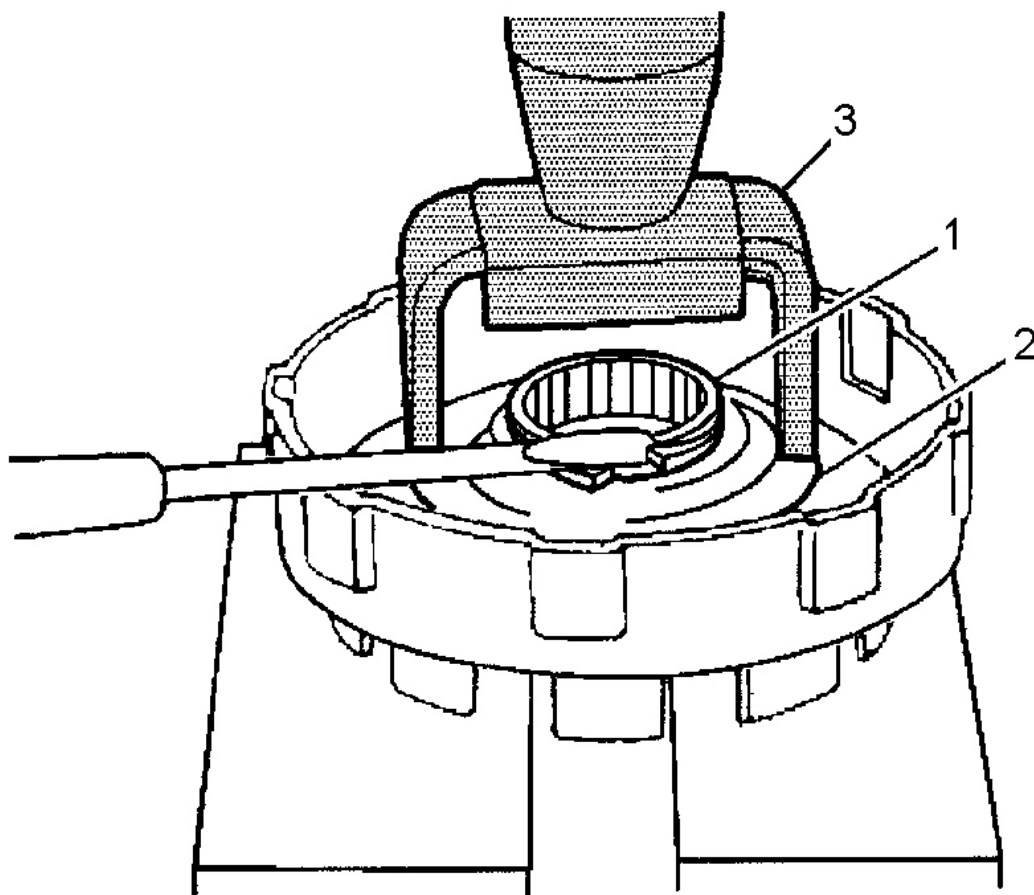
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Fig. 54: Removing Direct Clutch Snap Ring
Courtesy of GENERAL MOTORS CORP.



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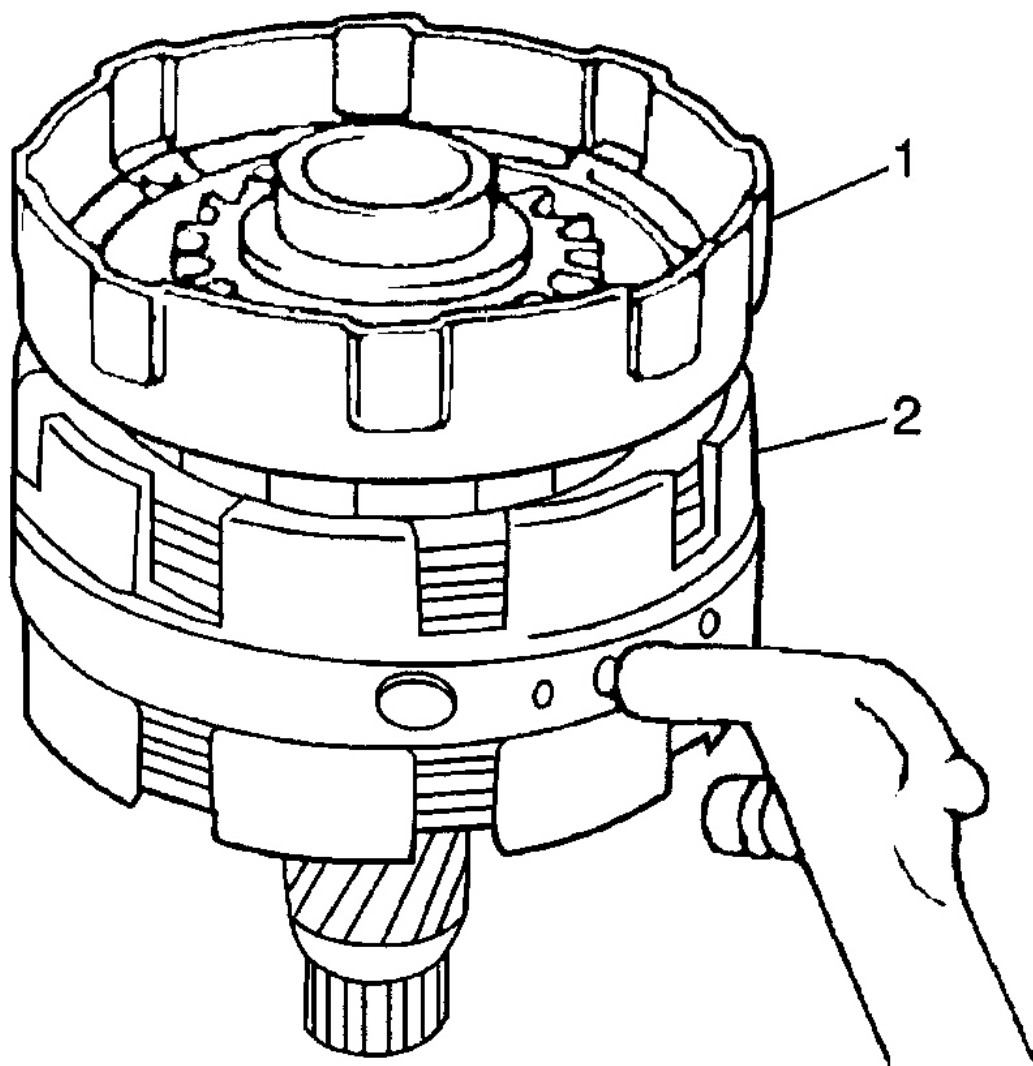
Fig. 55: Identifying Direct Clutch Drum Components
Courtesy of GENERAL MOTORS CORP.



1. Direct Clutch Piston Return Spring Snap Ring
2. Return Spring
3. Clutch Spring Compressor

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Fig. 56: Removing Direct Clutch Piston Return Spring Snap Ring
Courtesy of GENERAL MOTORS CORP.

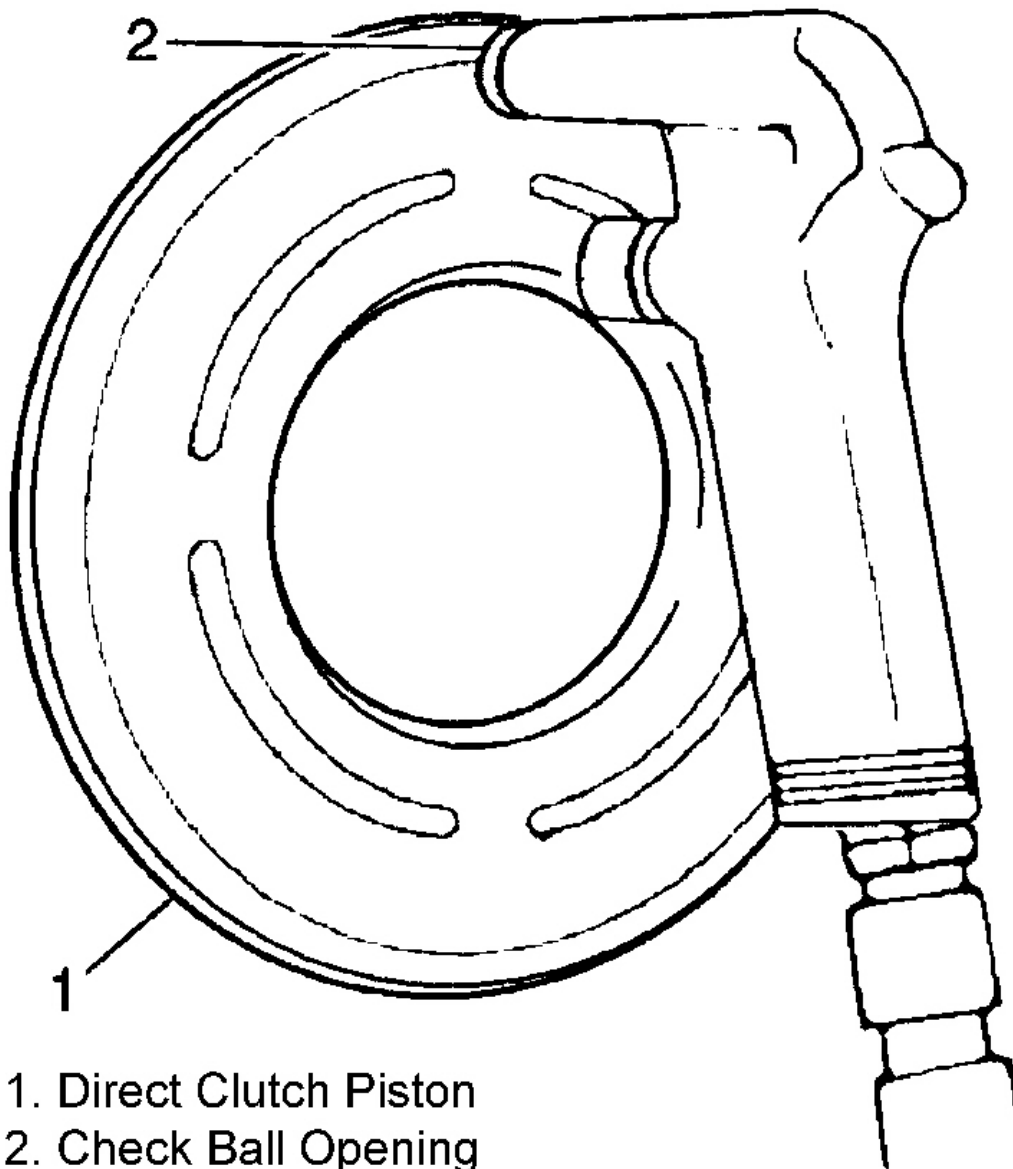


1. Direct Clutch Drum

2. Center Support

G00286822

Fig. 57: Applying Air Pressure To Remove Direct Clutch Inner Pistons
Courtesy of GENERAL MOTORS CORP.



- 1. Direct Clutch Piston
- 2. Check Ball Opening

G00286823

Fig. 58: Applying Air Pressure To Check Ball Opening To Test For Leaks
Courtesy of GENERAL MOTORS CORP.

Reassembly

NOTE: Clutch discs should be soaked in ATF for 15 minutes prior to installation.
Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R)

Transmission Assembly Lubricant or petroleum jelly.

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

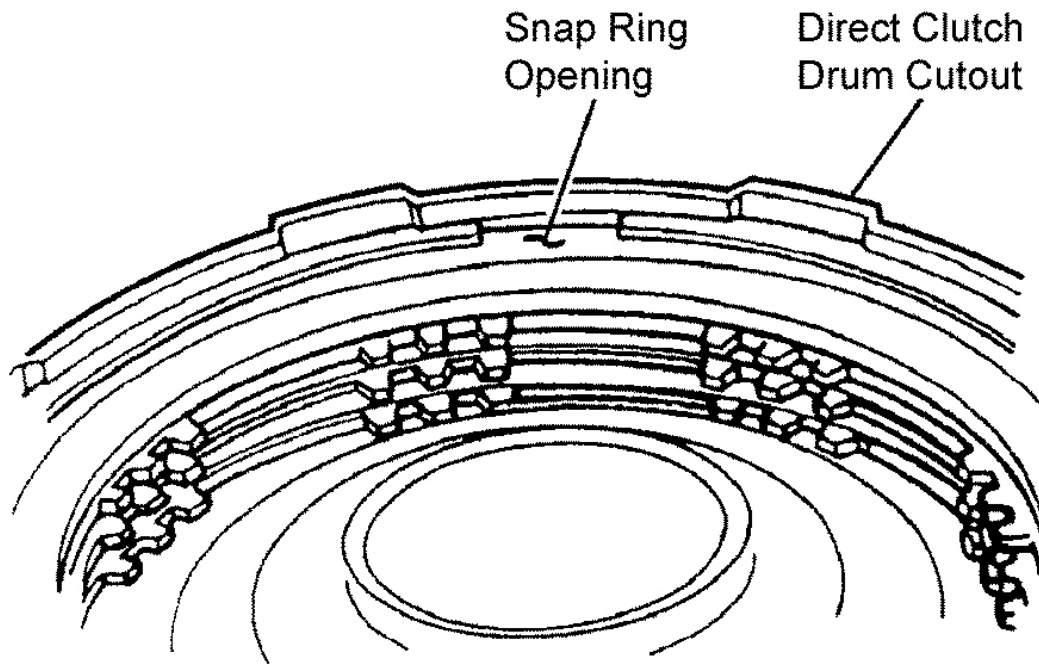
1. Install NEW "O" Rings to the direct clutch inner and outer pistons. Install the direct clutch inner piston. Install the direct clutch outer piston.

NOTE: When installing the return springs, **DO NOT** allow the springs to tilt or fall out of place.

2. Install the direct clutch piston return springs and seat into the direct clutch piston.

NOTE: **DO NOT** align the snap ring opening with the cutout in the direct clutch drum during the next step. See **Fig. 59** .

3. Install the direct clutch piston return spring snap ring onto the spring retainer using Clutch Spring Compressor, and a press. Install the direct clutch plates and discs in the following order:
 - A. The plate.
 - B. The disc.
 - C. The plate.
 - D. The disc.
 - E. The plate.
 - F. The disc.
 - G. The flange.
4. Install the direct clutch flange with the flat side facing down and the stepped portion facing upwards. Install the direct clutch snap ring into the direct clutch drum.
5. Install the following components in the order listed:
 - The race.
 - The thrust bearing and race.
6. Perform measurement of direct clutch piston stroke. See **MEASUREMENT PROCEDURE** .



G00286824

Fig. 59: Identifying Direct Clutch Drum Cutout-To-Snap Ring Orientation
Courtesy of GENERAL MOTORS CORP.

FORWARD CLUTCH

NOTE: For special tool part numbers, refer to special tools list. See SPECIAL TOOLS .

Disassembly & Inspection

1. Remove the following components from the input shaft assembly:
 - The snap ring. See **Fig. 61** .
 - The direct clutch input hub.
 - The forward clutch hub.
2. Remove the following components from the input shaft:
 - The thrust bearing No. 2 race. See **Fig. 62** .
 - The thrust rear bearing race.
 - The forward clutch thrust bearing.
3. Temporarily install the direct clutch input hub and the snap ring into the forward clutch. See **Fig. 63** . Temporarily install the forward clutch into the overdrive case. See **Fig. 64** .
4. Measure the forward clutch piston stroke using Dial Indicator Set and Magnetic Base:

- A. Place the dial indicator plunger on the forward clutch piston.
 - B. Apply 58-114 psi (4.08-8.02 Kg/CM²) of compressed air into the fluid passage at the right of the cut in the overdrive case.
 - C. Measure forward clutch piston stroke. See **FORWARD CLUTCH PISTON SPECIFICATIONS** table.
 - D. If the forward clutch piston stroke is not within specifications, install a 0.071 or 0.079" (1.80 mm or 2.00 mm) clutch disc in order to adjust.
5. Remove the forward clutch from the overdrive case. Remove the direct clutch input hub and snap ring from the forward clutch hub.
 6. Remove the following forward clutch hub components:
 - The snap ring.
 - The clutch plates.
 - The discs.

WARNING: When applying pressure, use care, as excessive pressure will cause a section of piston return springs to deform.

7. Compress the forward clutch piston return springs using the Clutch Spring Compressor, and a press while removing the snap ring. See **Fig. 65**. Remove 18 forward clutch piston return springs. Inspect for damage, cracks, excessive outside wear or deterioration.
8. Install the forward clutch to the overdrive case. See **Fig. 66**. Apply low compressed air pressure to the fluid passage at the right of the overdrive case in order to remove the forward clutch piston. Remove the forward clutch piston "O" Rings.
9. Measure the free length of the forward clutch piston return springs. See **FORWARD CLUTCH PISTON SPECIFICATIONS** table. Replace if not within specifications.
10. Clean all forward clutch components. Allow the components to air dry. Inspect the forward clutch disc for excessive wear or damage. Replace as necessary.
11. Inspect the forward clutch piston for cracks or porosity. Replace as needed. Shake the piston in order to inspect the forward clutch piston check ball free movement. Apply low compressed air pressure to the check ball opening in order to inspect for leaks. Repair or replace as necessary.

FORWARD CLUTCH PISTON SPECIFICATIONS

Application	Stroke Clearance - In. (mm)	Return Spring Free Length - In. (mm)
Forward Clutch Piston	.056-.088 (1.40-2.24)	.595 (15.13)

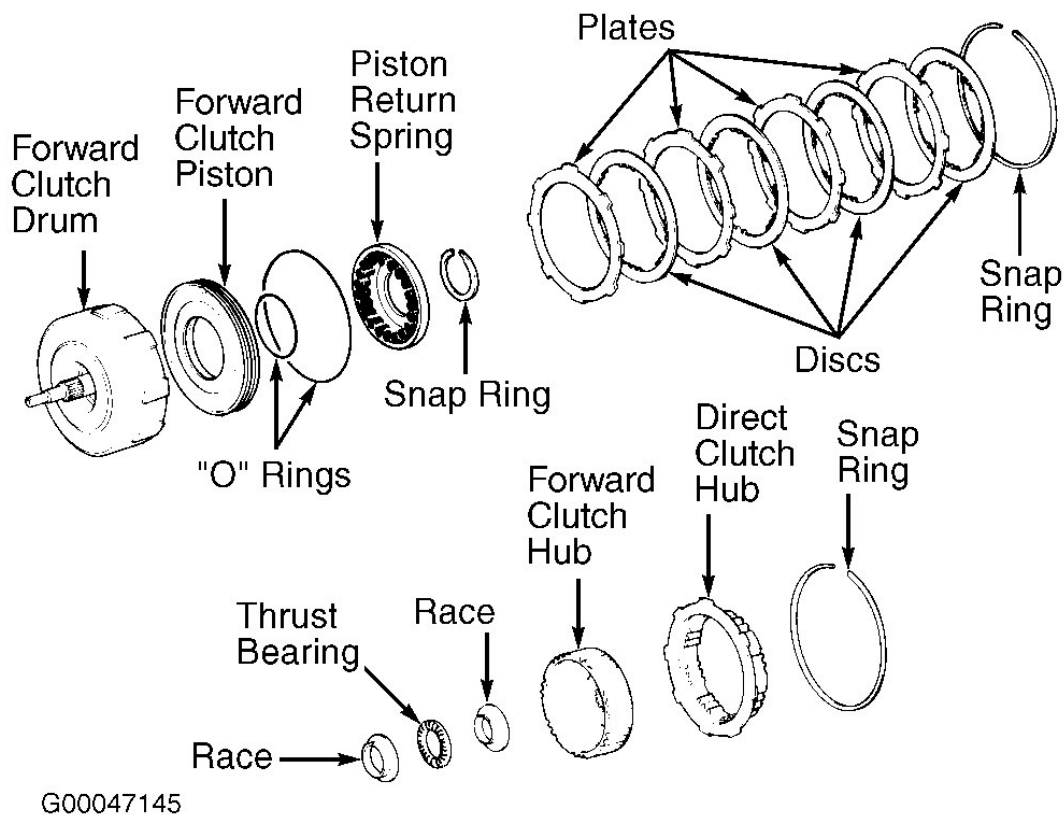
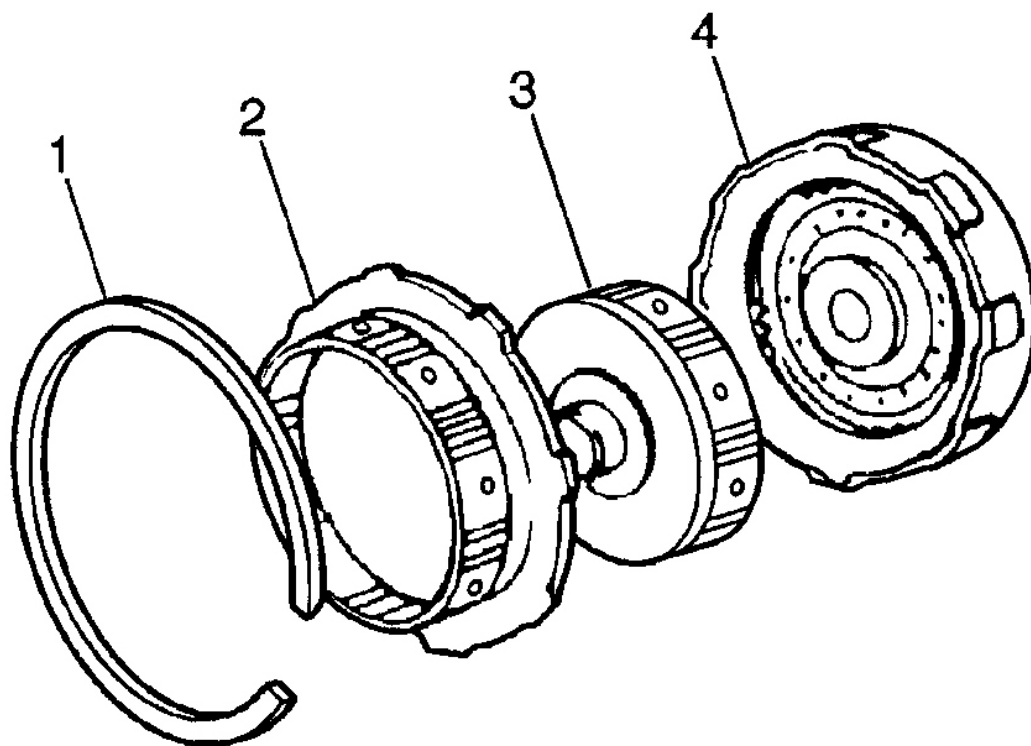


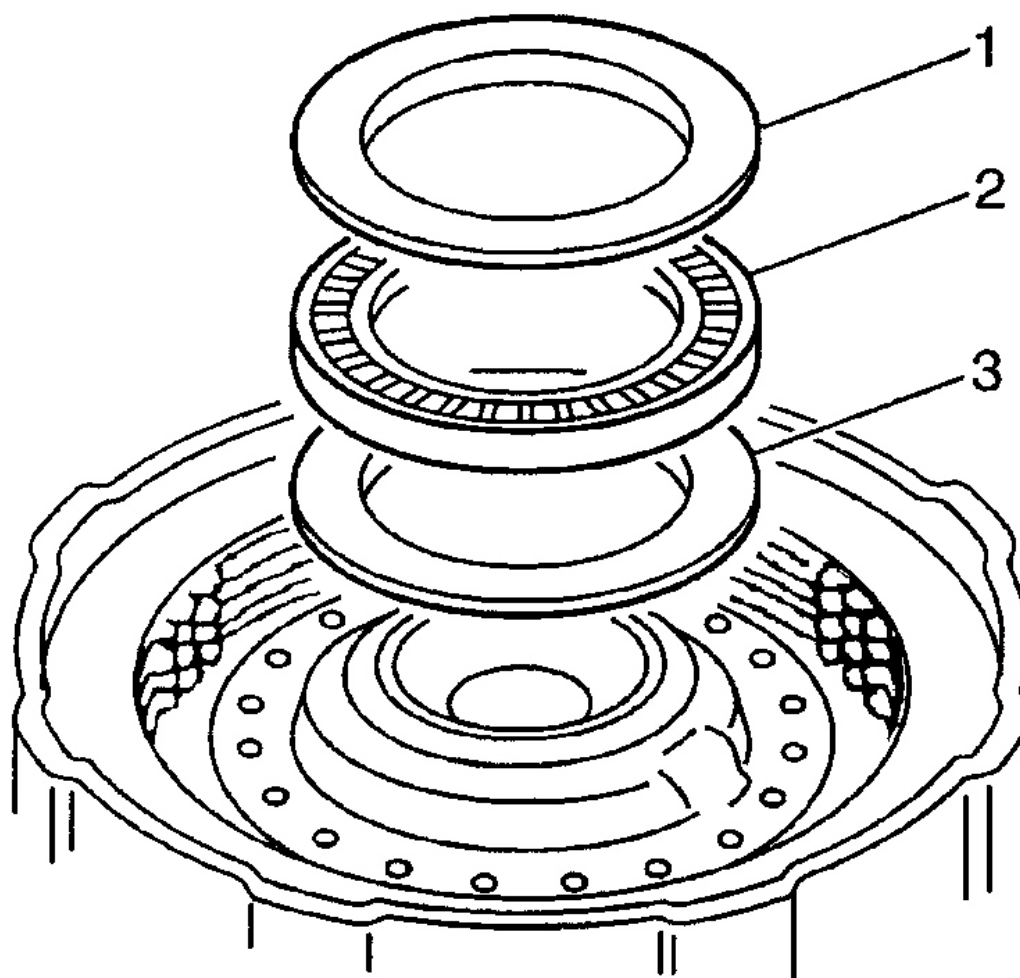
Fig. 60: Exploded View Of Forward Clutch Components
 Courtesy of SUZUKI OF AMERICA CORP.



- 1. Snap Ring
- 2. Forward Clutch Hub
- 3. Direct Clutch Hub
- 4. Input Shaft

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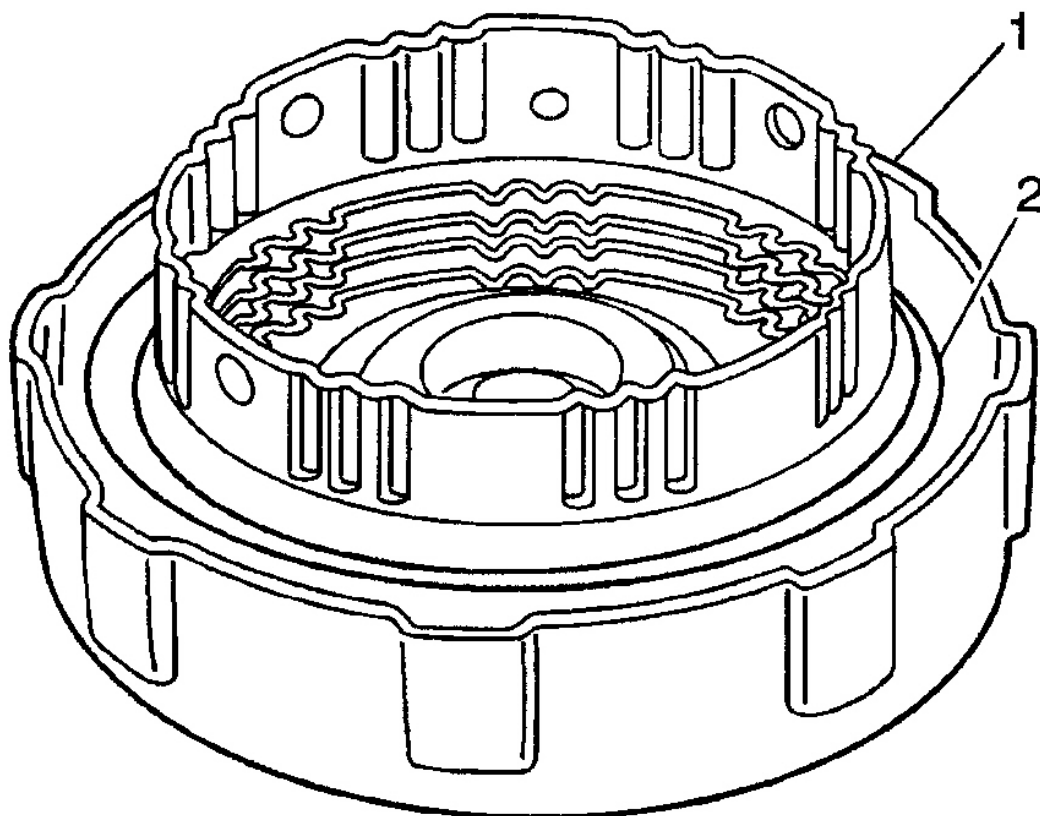
Fig. 61: Identifying Input Shaft Assembly Components
Courtesy of GENERAL MOTORS CORP.



1. Thrust Bearing No. 2 Race
2. Forward Clutch Thrust Bearing
3. Thrust Rear Bearing Race

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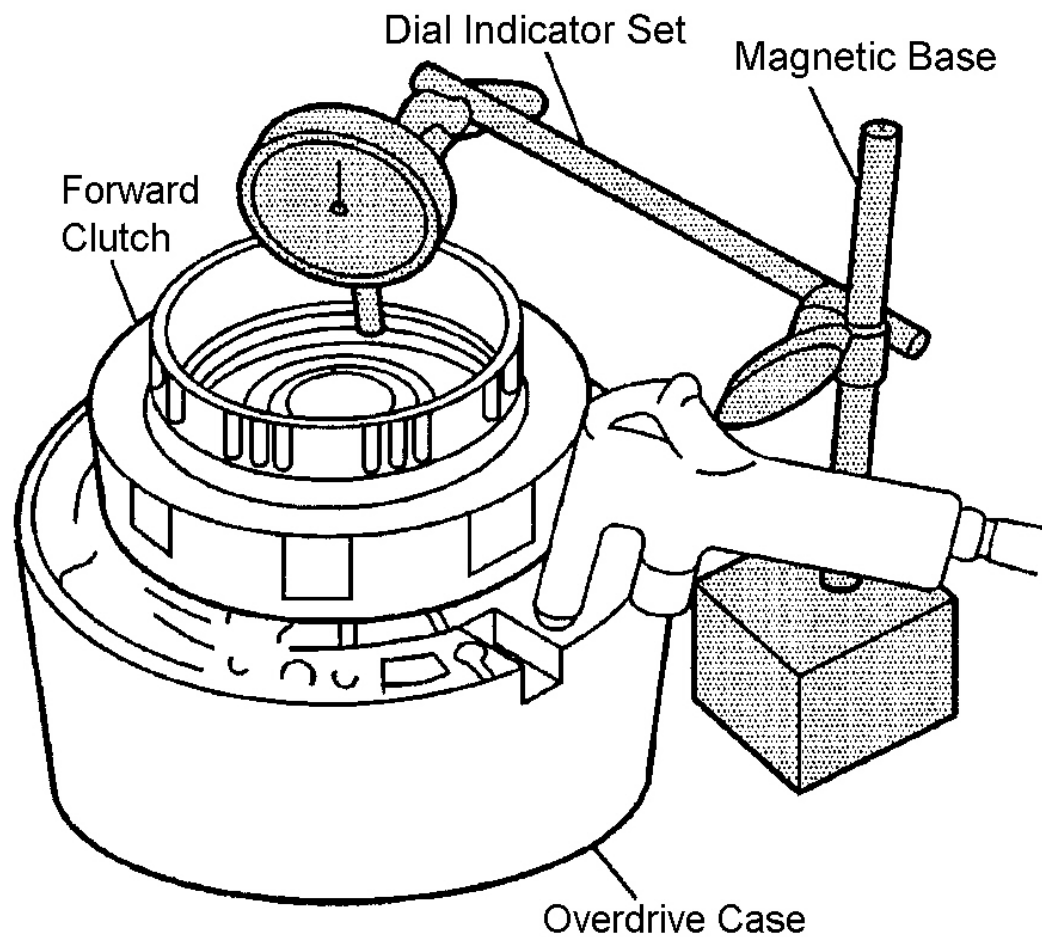
Fig. 62: Removing Input Shaft Components
Courtesy of GENERAL MOTORS CORP.



- 1. Direct Clutch Input Hub
- 2. Snap Ring

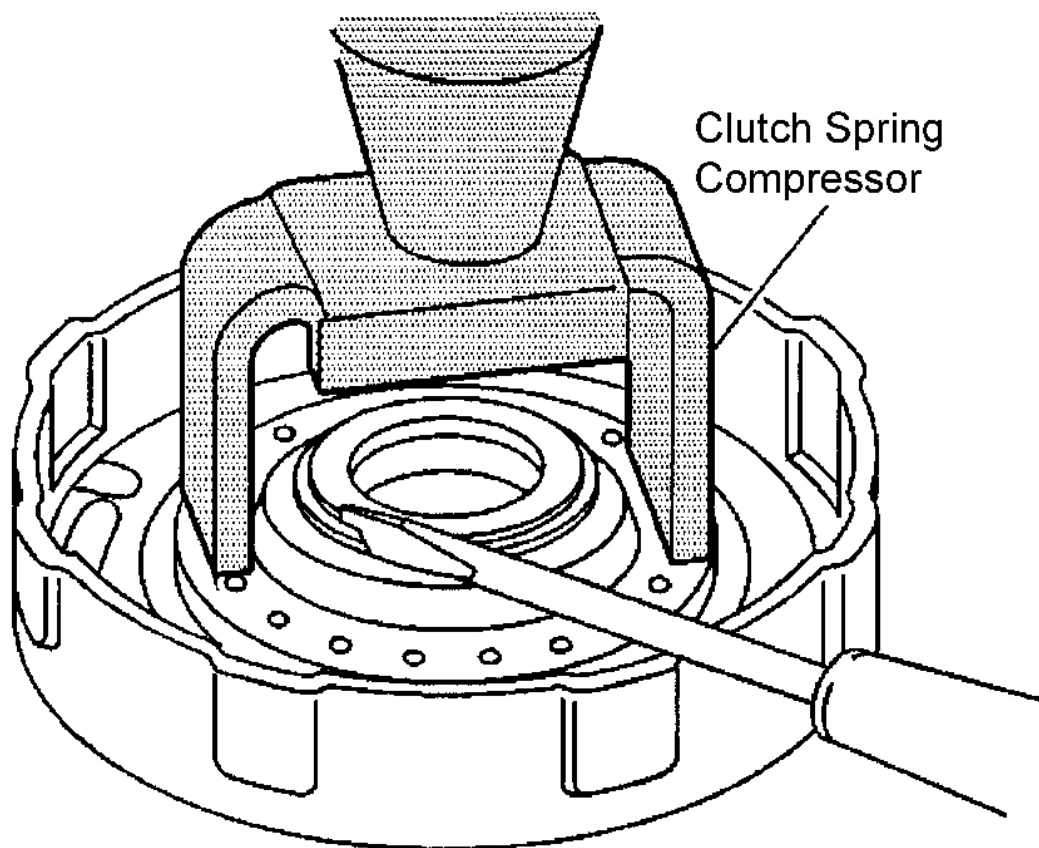
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Fig. 63: Temporarily Install Direct Clutch Input Hub & Snap Ring
Courtesy of GENERAL MOTORS CORP.



G00286827

Fig. 64: Measuring Forward Clutch Piston Stroke
Courtesy of GENERAL MOTORS CORP.



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Fig. 65: Removing Forward Clutch Piston Return Spring Snap Ring
Courtesy of GENERAL MOTORS CORP.

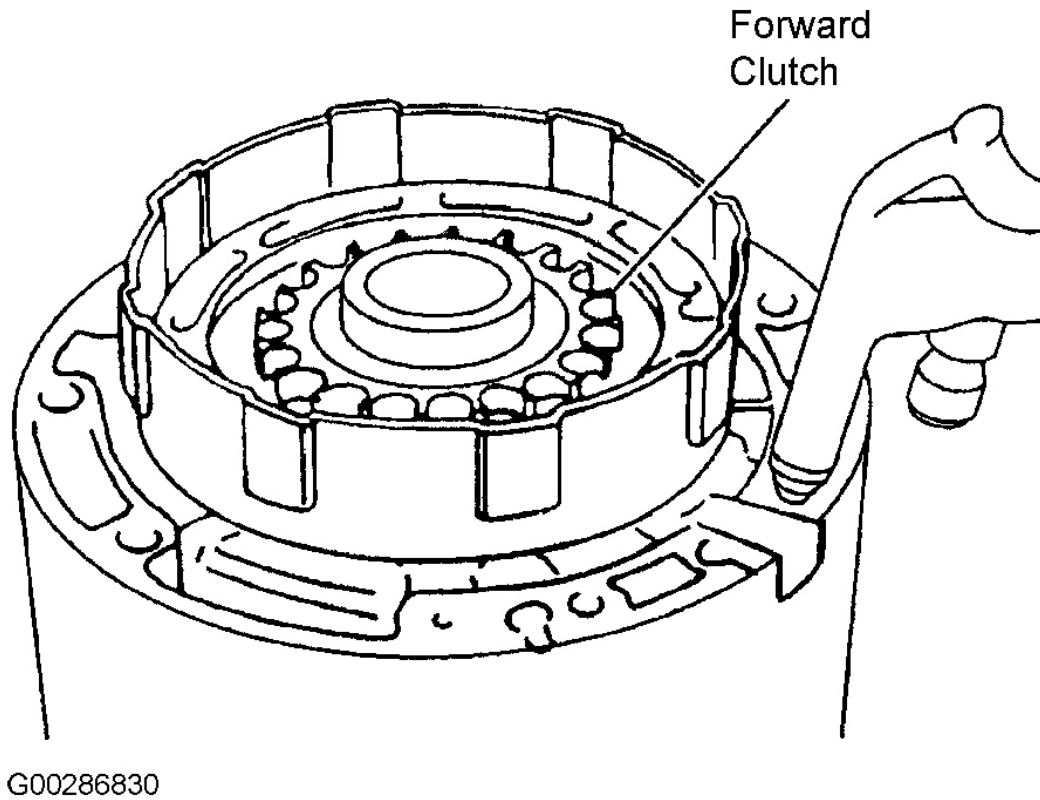


Fig. 66: Applying Air Pressure To Remove Forward Clutch
Courtesy of GENERAL MOTORS CORP.

Reassembly

NOTE: Clutch discs should be soaked in ATF for 15 minutes prior to installation. Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.

1. Install a NEW "O" Rings to the forward clutch piston. Carefully install forward clutch piston into forward clutch drum. Install the piston return springs. Install the spring retaining plate. Using a spring compressor and appropriate press, compress return spring and install snap ring. Ensure end gap of snap ring is not aligned with claw area of spring seat.
2. Install the forward clutch discs and plates (alternating discs and plates from thinnest one to thickest one) to piston side. Install the forward clutch snap ring. Ensure end gap of snap ring is not aligned with claw area of spring seat.
3. Install the following components, lubricating with Transjel(R) Transmission Assembly Lubricant:
 - The forward clutch thrust bearing.
 - The thrust rear bearing race.

- The thrust bearing No. 2 race.
- 4. Install the forward clutch hub. See **Fig. 61** . Install the direct clutch hub. Install the snap ring. Install bearing and bearing race.

OIL PUMP

Disassembly

NOTE: Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

1. Position oil pump on torque converter. Remove the oil pump seal from the oil pump body. Remove the oil pump thrust washer and bearing from the rear of the oil pump cover. Remove the oil pump seal rings.
2. Remove the 6 oil pump body bolts from the oil pump cover. Remove the oil pump body. Remove the input shaft oil seal from the oil pump body.

Cleaning & Inspection

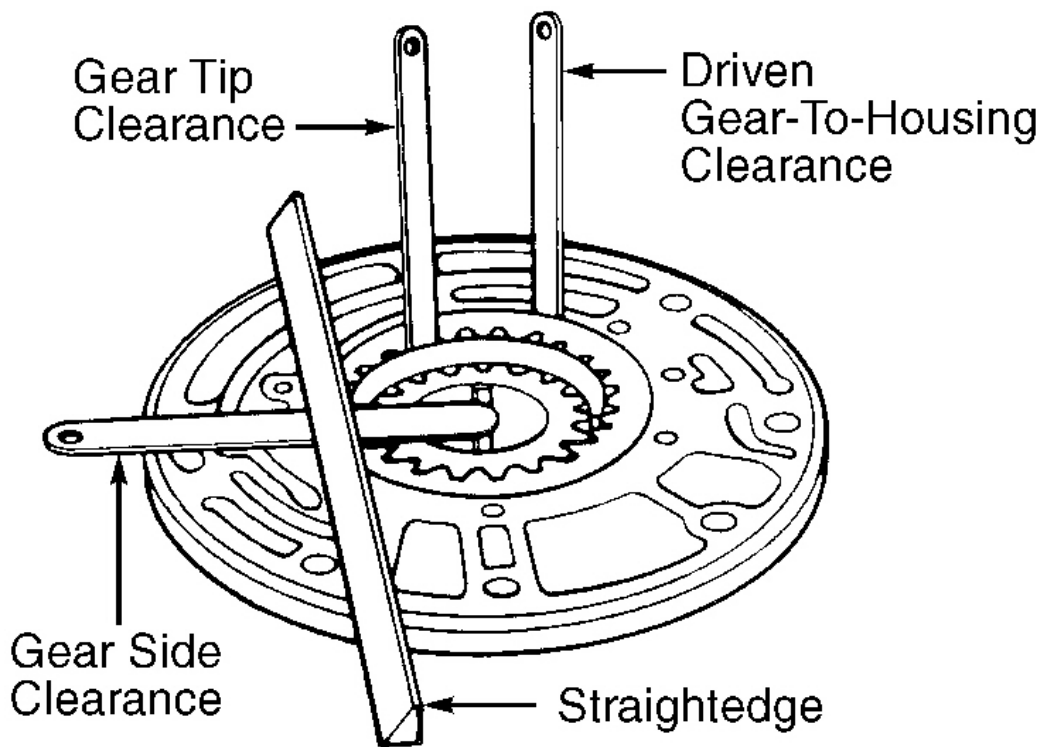
1. Clean all oil pump components. Allow the components to air dry.
2. Inspect the following oil pump components for excessive damage or wear. Replace as needed:
 - The drive gear.
 - The driven gear.
 - The cover.
3. Inspect the following oil pump components for distortion or warp. Replace as needed:
 - The body.
 - The stator oil pump cover.
4. Perform the following steps in order to measure the driven gear-to-housing clearance:
 - A. Using a feeler gage, measure the clearance between the oil pump body and driven gear. See **Fig. 67** . See **OIL PUMP SPECIFICATIONS** .
 - B. Push the oil pump driven gear to one side of the oil pump body while measuring the clearance on the opposite side.
 - C. Replace the oil pump if the clearance exceeds the maximum specified.
5. Perform the following steps with pump installed on torque converter, in order to measure the drive gear tip clearance:
 - A. Using a feeler gage, measure the clearance between the oil pump drive gear teeth and crescent. See **Fig. 67** . See **OIL PUMP SPECIFICATIONS** .
 - B. Replace the oil pump if the clearance exceeds the maximum specified.
6. Measure the oil pump drive gear and driven gear side clearance using a Flat Gage Bar, and a feeler gage:
 - A. Place the Flat Gage Bar across the oil pump body. See **Fig. 67** .
 - B. Measure the clearance between the drive gear and the driven gear and the oil pump body mating

surface.

C. Replace the oil pump body if the clearance exceeds the maximum specified.

OIL PUMP SPECIFICATIONS

Application	Standard - In. (mm)	Maximum - In. (mm)
Driven Gear-To-Housing Clearance	.0028-.0059 (.07-.15)	.0118 (.30)
Drive Gear Tip Clearance	.0043-.0055 (.11-.14)	.0118 (.30)
Gear Side Clearance	.0008-.0019 (.02-.05)	.0039 (.10)



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Fig. 67: Measuring Oil Pump Gear Clearances

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Reassembly

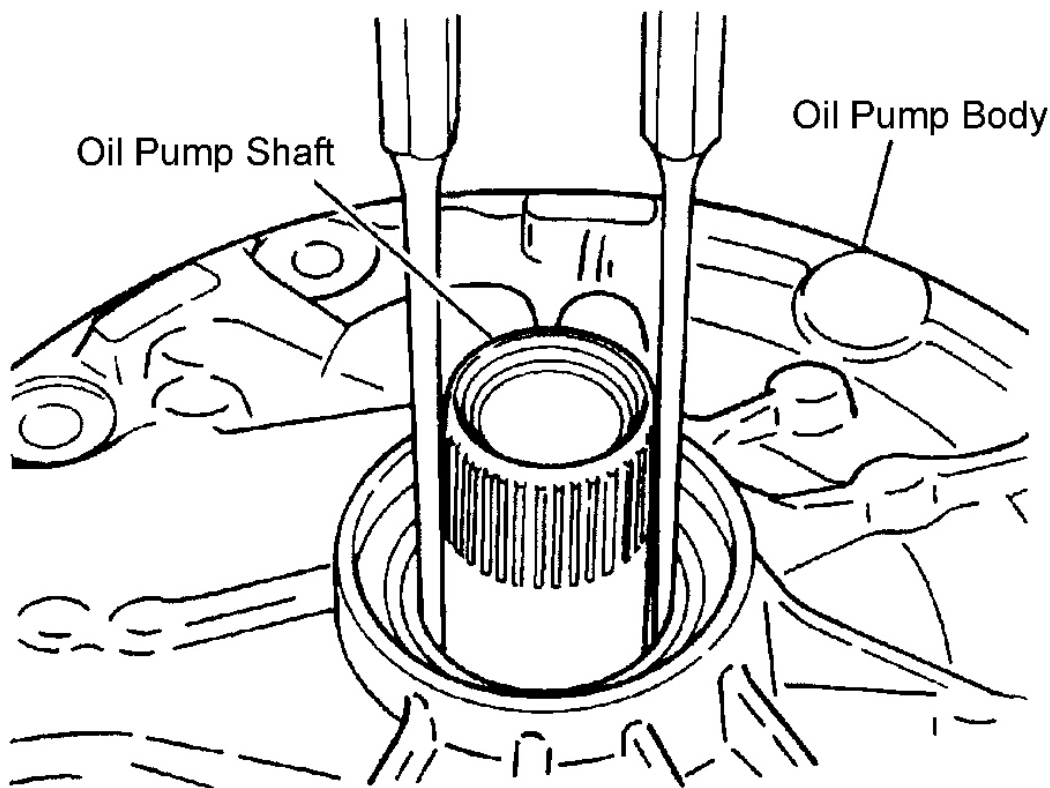
NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS**.

1. Install a NEW input shaft oil seal into the oil pump body using the Pump Seal Installer, and a hammer. Apply Transjel(R) Transmission Assembly Lubricant to the seal lip. Install the oil pump cover on the oil

pump body.

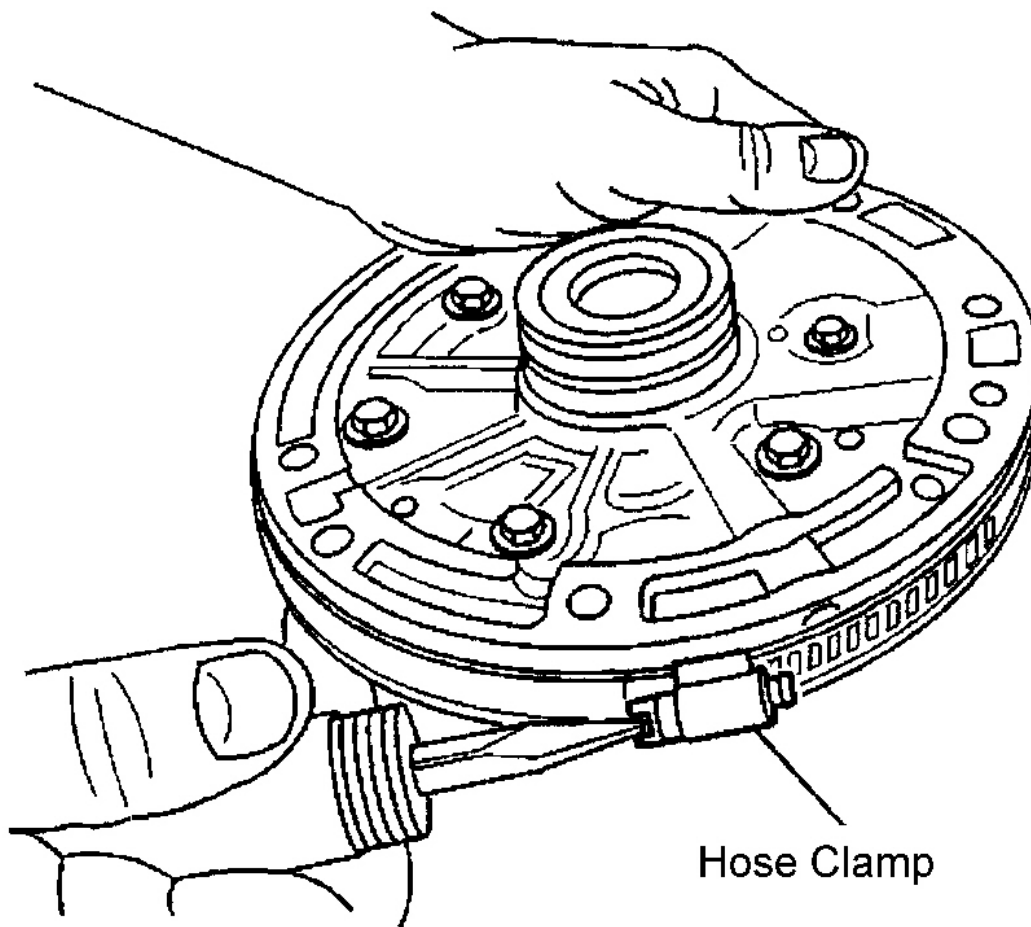
2. Install the cover bolts. Tighten oil pump cover bolts to specification. See **TORQUE SPECIFICATIONS**.
3. Apply Transjel to the oil pump thrust washer and bearing. Install the oil pump thrust washer and bearing onto the rear of the cover. Install 2 NEW seal rings onto the cover. Install a NEW oil pump seal onto the fluid pump body.
4. Inspect the drive gear as follows for smooth rotation:
 - A. Insert 2 small drift punches into the oil pump body while turning the drive gear. See **Fig. 68**.
 - B. If the rotation is not smooth, disassemble the pump.

Install a hose clamp in order to ensure correct alignment. See **Fig. 69**.



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Fig. 68: Inspecting Oil Pump Drive Gear For Smooth Operation
 Courtesy of GENERAL MOTORS CORP.



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Fig. 69: Installing Hose Clamp To Ensure Alignment
Courtesy of GENERAL MOTORS CORP.

OVERDRIVE - PLANETARY GEAR SIDE

Disassembly

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

1. Hold Overdrive (OD) direct clutch drum and turn input shaft. Input shaft should turn clockwise and lock when turned counterclockwise. See **Fig. 70** . Remove thrust bearing and race from OD planetary gear, then remove thrust washer and OD planetary gear from the OD clutch drum. See **Fig. 71** .
2. Perform the following steps in order to measure the OD clutch piston stroke:
 - A. Temporarily install the OD clutch drum to the oil pump.

- B. Place the Dial Indicator Set plunger on the OD clutch piston. See **Fig. 72** .
 - C. Apply 57-114 psi (4.08-8.02 Kg/CM²) of compressed air into the oil passage.
 - D. Measure OD clutch piston stroke. See **TRANSMISSION SPECIFICATIONS** .
 - E. Replace the following components as needed if the stroke is not within specifications:
 - The cushion clutch plate.
 - The clutch disc.
3. Remove one brake hub snap ring from the OD clutch drum. See **Fig. 73** . Remove the brake hub from the OD clutch drum.
 4. Remove the cushion plate snap ring. See **Fig. 74** . Remove the following components from the OD clutch drum:
 - The cushion plate.
 - The backing plate.
 - The clutch disc.
 5. Compress the OD clutch piston using Clutch Spring Compressor and hydraulic press, then remove snap ring. See **Fig. 75** .

NOTE: **When removing the components using compressed air, the air pressure should not exceed 14 psi (0.98 Kg/CM²).**

6. Temporarily install the OD clutch drum to the oil pump. See **Fig. 76** . Apply compressed air into the oil passage. Remove the OD clutch drum from the oil pump. Remove the inner and outer "O" Rings from the OD clutch piston.
7. Remove the OD planetary gear snap ring using a Flathead screwdriver. Remove the following components from the OD planetary gear. See **Fig. 77** :
 - The one-way clutch retainer.
 - The one-way clutch.
 - The one-way clutch outer race.
 - The thrust washer.
 - The thrust bearing.
8. Clean all OD clutch components. Allow the components to air dry. Inspect the OD clutch disc for excessive wear or damage. Replace as necessary.
9. Inspect the OD clutch piston porosity. Replace as necessary. Shake the clutch piston in order to make sure that the check ball moves freely. Apply low air pressure to the OD clutch piston check ball opening in order to inspect for leaks. See **Fig. 78** .
10. Inspect the one-way clutch flange. Replace as necessary. Inspect the planetary thrust washer. Replace as necessary.

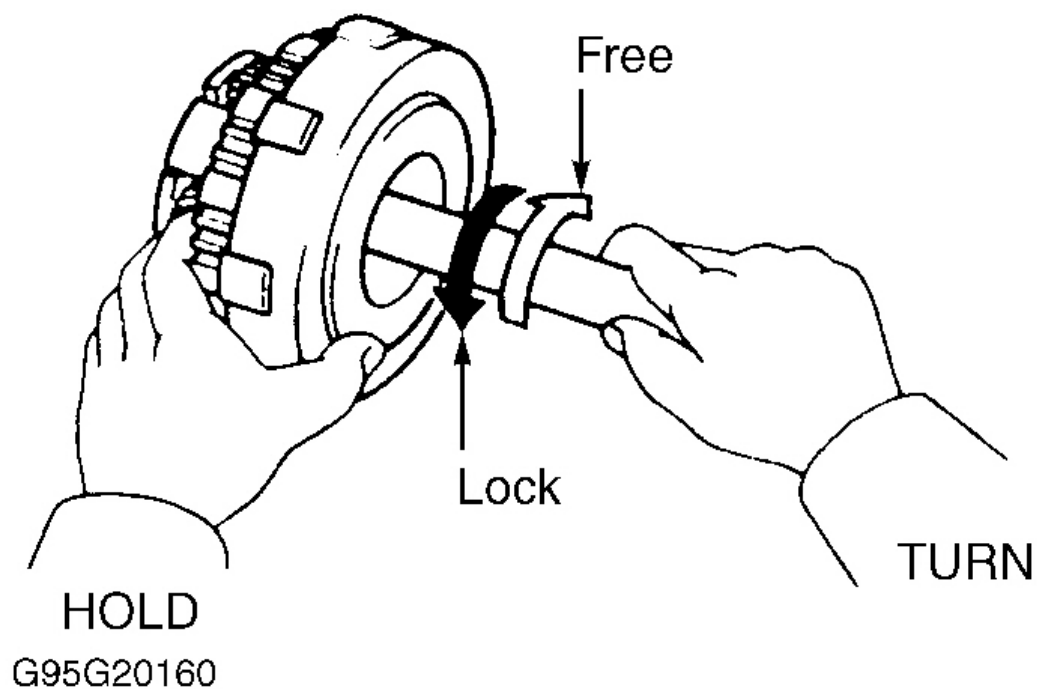
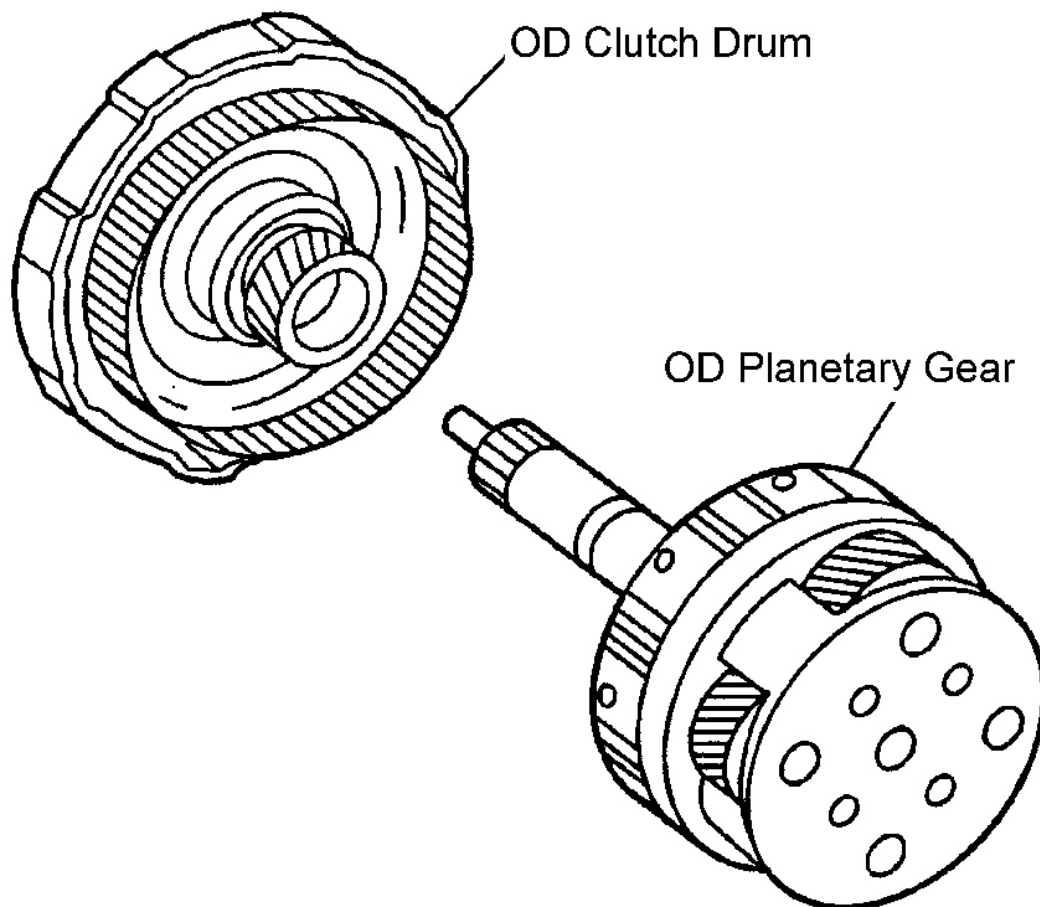
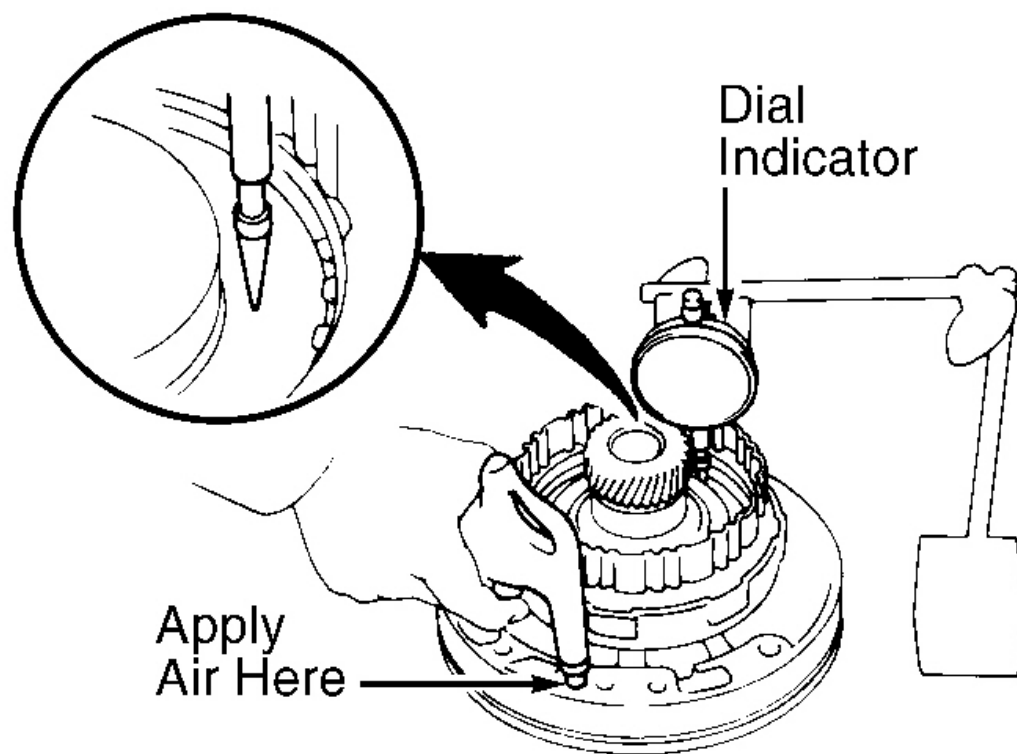


Fig. 70: Checking OD One-Way Clutch Operation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



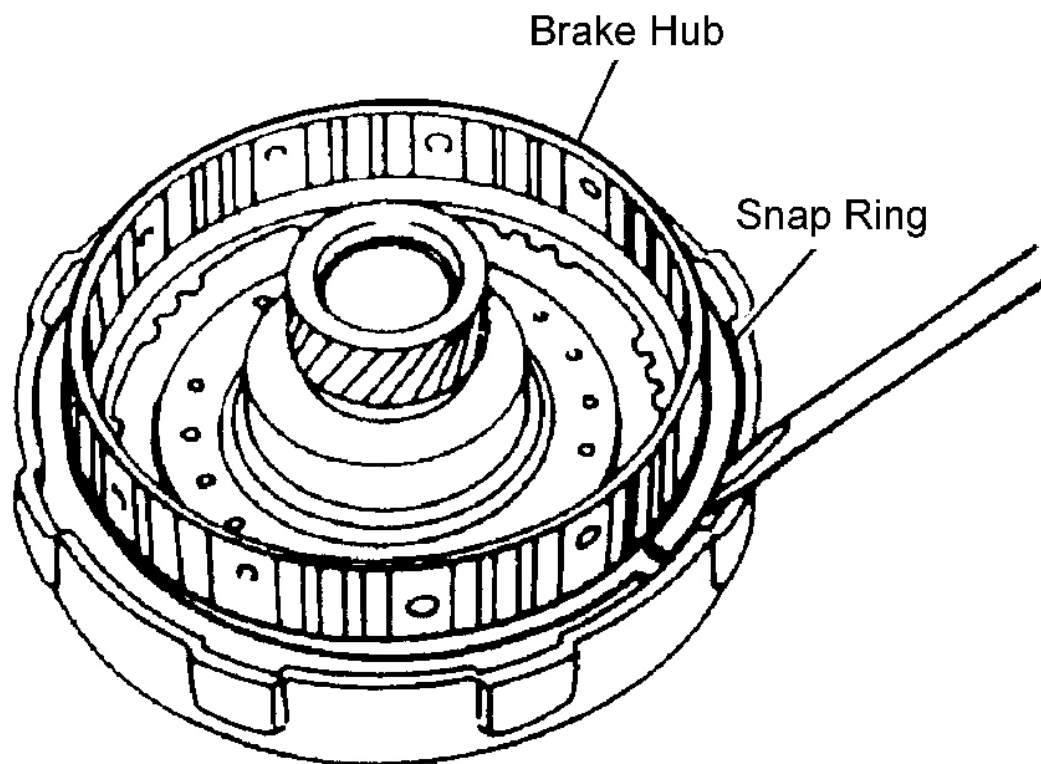
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Fig. 71: Removing OD Planetary Gear From Clutch Drum
Courtesy of GENERAL MOTORS CORP.



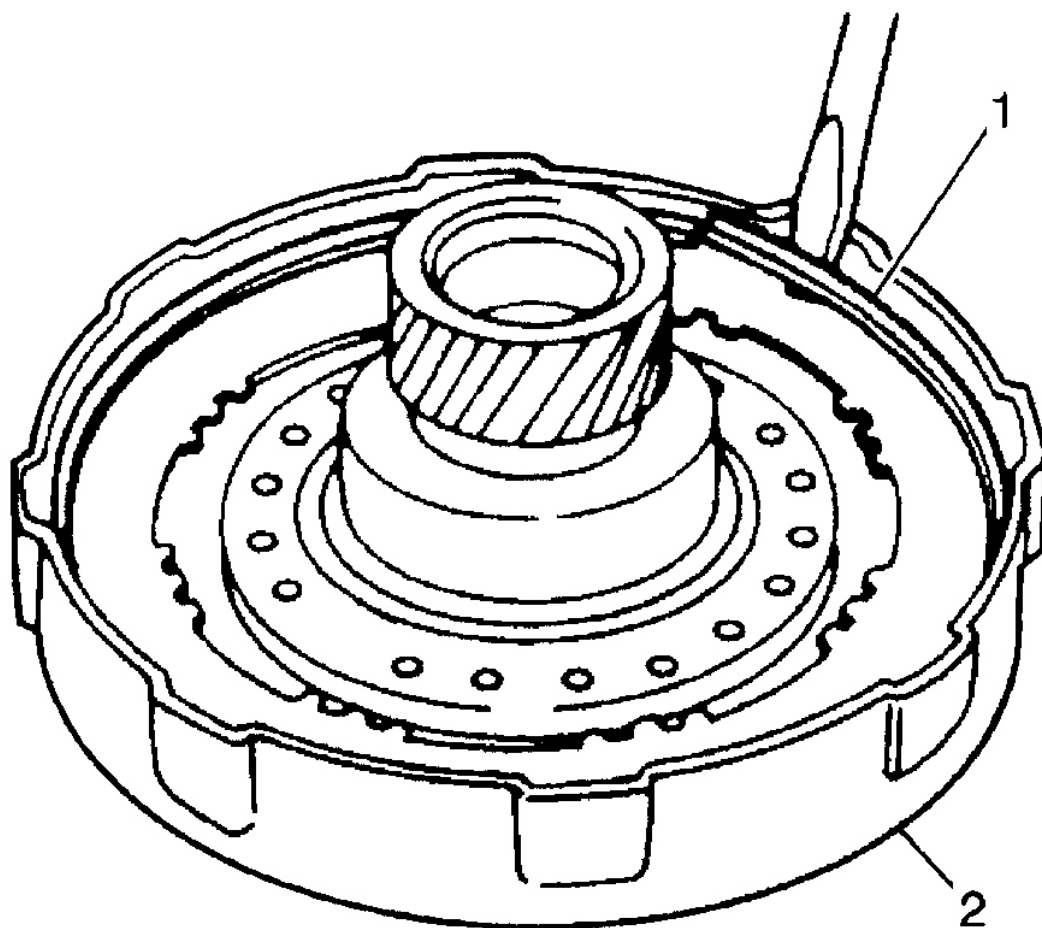
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Fig. 72: Measuring OD Direct Clutch Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 73: Removing Brake Hub Snap Ring From OD Clutch Drum
Courtesy of GENERAL MOTORS CORP.

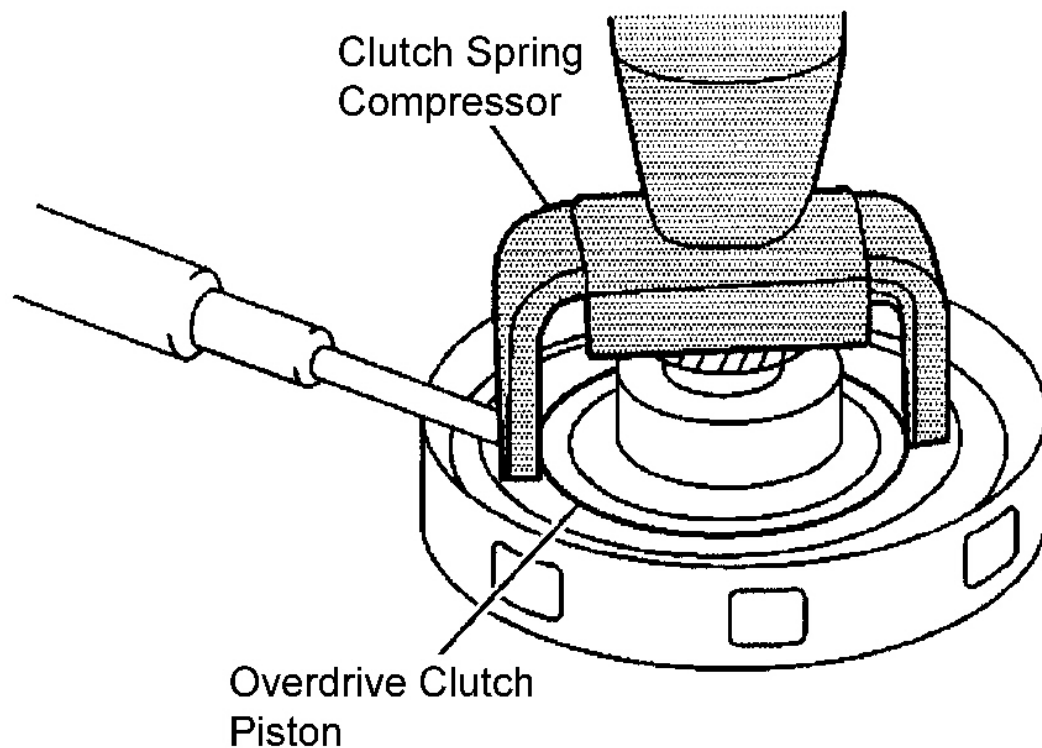


1. Cushion Plate Snap Ring

2. OD Clutch Drum

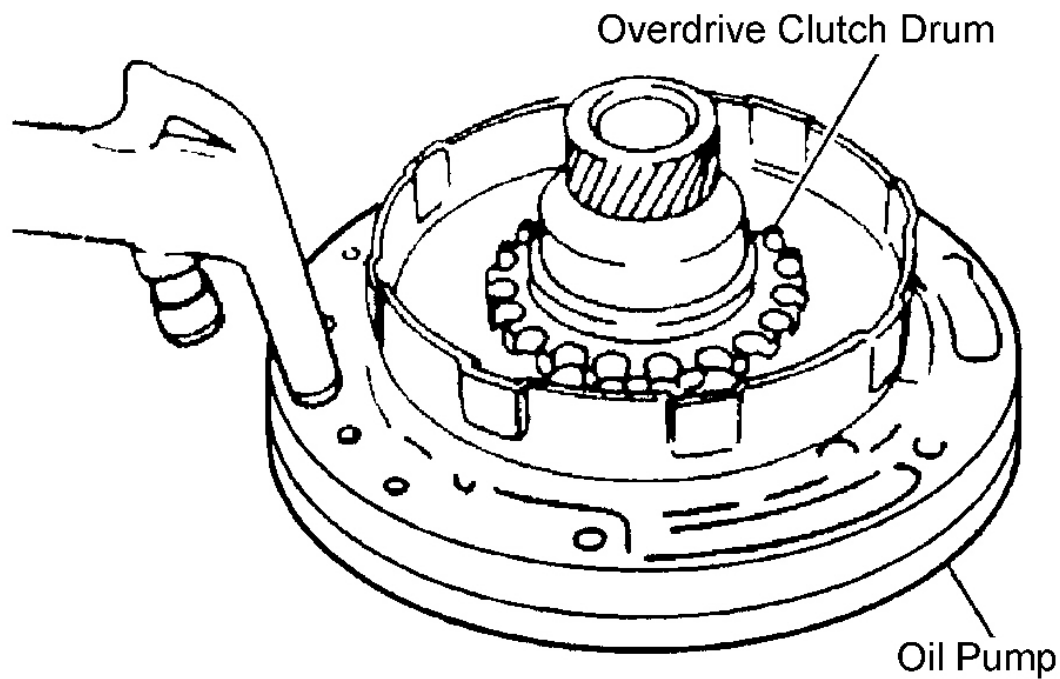
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Fig. 74: Removing Cushion Plate Snap Ring
Courtesy of GENERAL MOTORS CORP.



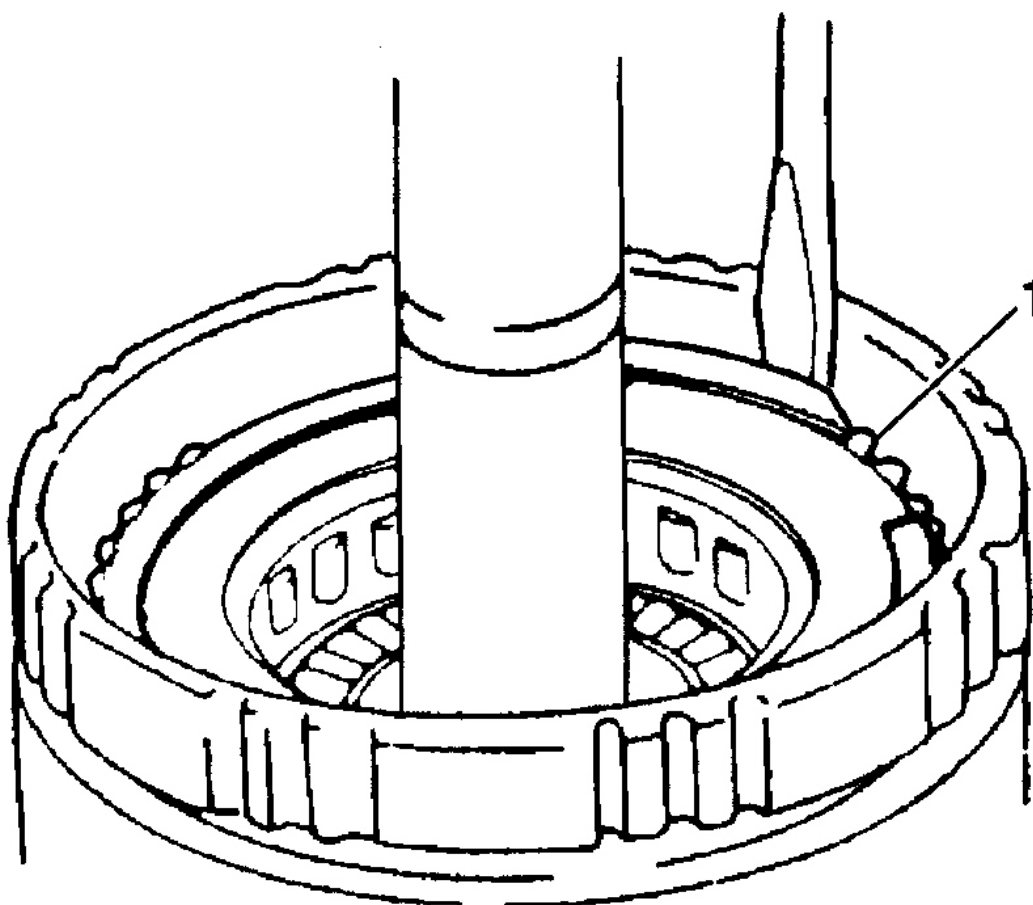
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Fig. 75: Removing OD Clutch Piston Snap Ring
Courtesy of GENERAL MOTORS CORP.



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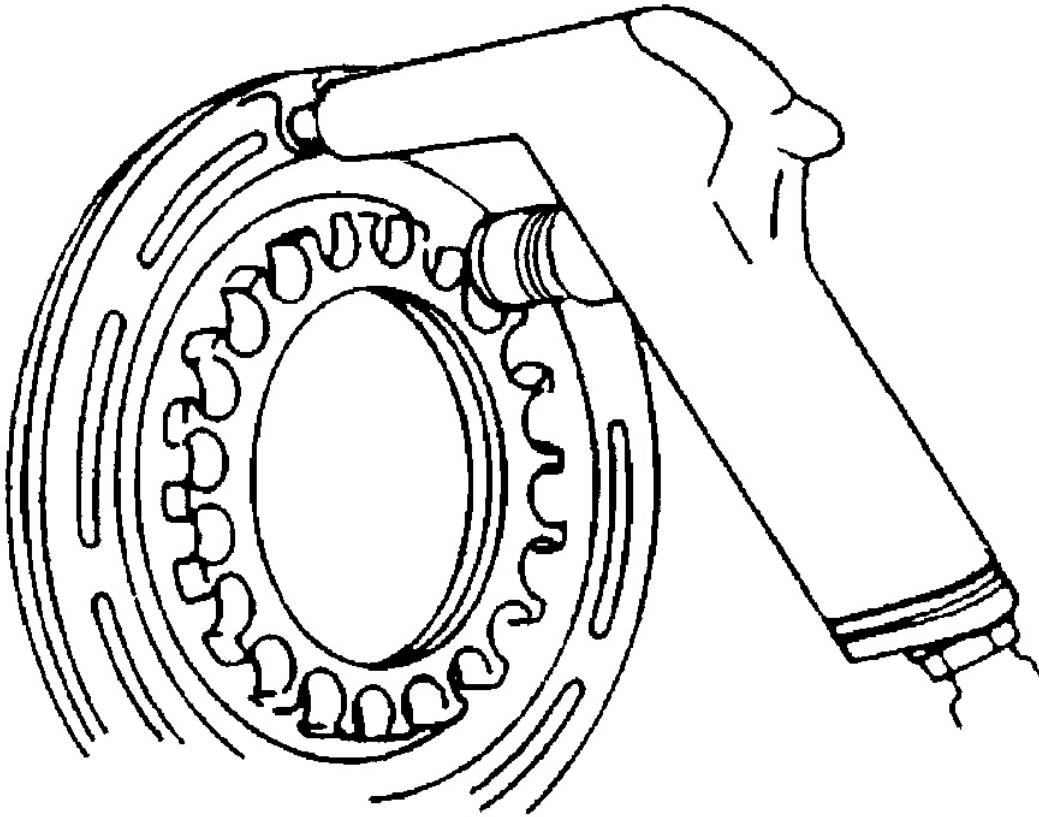
Fig. 76: Applying Air Pressure To Remove OD Clutch Drum From Oil Pump
Courtesy of GENERAL MOTORS CORP.



1. Overdrive Planetary Gear

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Fig. 77: Removing OD Planetary Gear Snap Ring
Courtesy of GENERAL MOTORS CORP.



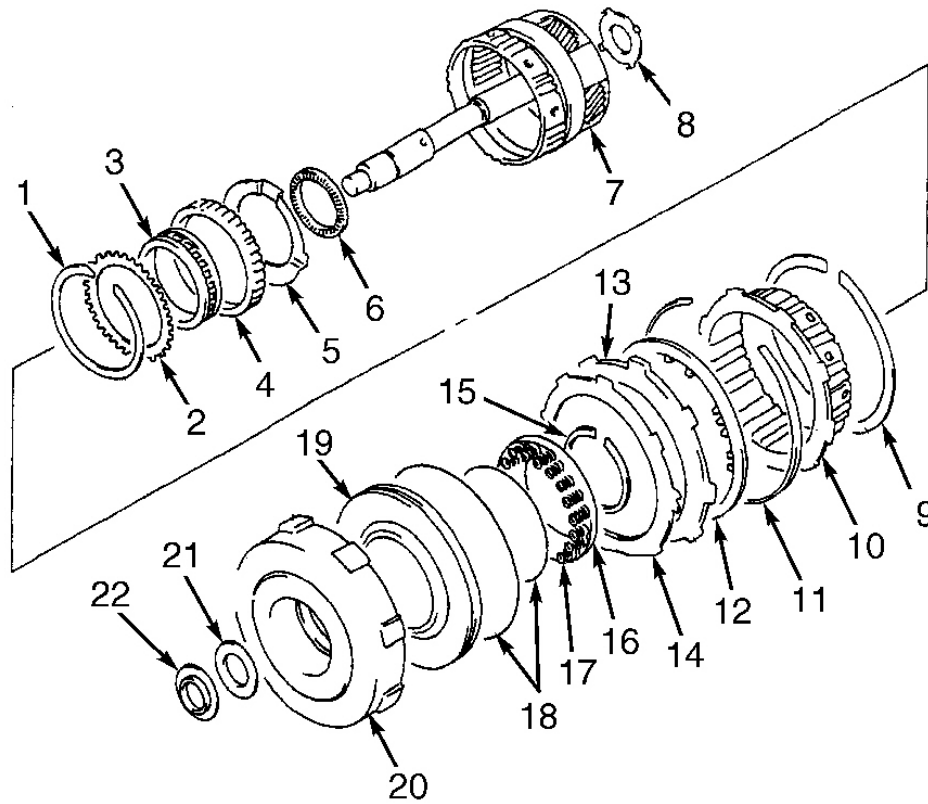
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Fig. 78: Applying Air Pressure To OD Clutch Piston Check Ball Opening To Check For Leaks
Courtesy of GENERAL MOTORS CORP.

Reassembly

- NOTE:** Clutch discs should be soaked in ATF for 15 minutes prior to installation. Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.
- NOTE:** For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .
- NOTE:** When installing the one-way clutch snap ring, **DO NOT** align the snap ring opening with the lug on the clutch piston spring retainer.
1. Refer to graphic for exploded view of Overdrive (OD) planetary gear set. See **Fig. 79** . Install the planetary thrust washer with the oil groove facing the front. See **Fig. 80** . Install the one-way clutch outer bearing race with the flange facing the front. Apply Transjel(R) to the following components:

- The thrust bearing.
 - The planetary thrust washer.
2. Install the thrust bearing and the planetary thrust washer into the OD planetary gear. Install the one-way clutch to the OD planetary gear. Install the OD planetary gear snap ring. See **Fig. 81** .
 3. Install NEW "O" Rings to the inner and outer OD clutch pistons. Install the OD clutch piston to the OD clutch drum. Install the OD clutch piston return springs and retainer. See **Fig. 81** .
 4. Compress the OD clutch piston using Clutch Spring Compressor, while installing the OD clutch piston snap ring. See **Fig. 75** . DO NOT align snap ring gap with retainer claw.
 5. Install the following components to the OD clutch drum:
 - The clutch disc.
 - The backing plate.
 - The cushion plate. See **Fig. 82** .
 - The snap ring.
 - The brake hub.
 6. Install the brake hub snap ring . Recheck OD clutch piston stroke. See 2 .
 7. Install the O/D planetary gear assembly and thrust washer. Install the thrust bearing race and thrust bearing onto the planetary gear assembly.



- | | |
|---------------------------------|-----------------------------|
| 1. Snap Ring | 12. Clutch Disc |
| 2. OD One-Way Clutch Retainer | 13. Retainer Plate |
| 3. OD One-Way Clutch | 14. Cushion Plate |
| 4. OD One-Way Clutch Outer Race | 15. Shaft Snap Ring |
| 5. Thrust Washer | 16. Return Spring Retainer |
| 6. Thrust Bearing | 17. Return Spring |
| 7. OD Planetary Gear Set | 18. "O" Rings |
| 8. Thrust Washer | 19. OD Direct Clutch Piston |
| 9. Snap Ring | 20. OD Direct Clutch Drum |
| 10. OD Brake Hub | 21. Thrust Bearing Race |
| 11. Snap Ring | 22. Thrust Bearing |

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Fig. 79: Exploded View Of OD Planetary Gear Set, Direct Clutch, One-Way Clutch
 Courtesy of KIA MOTORS AMERICA, INC.

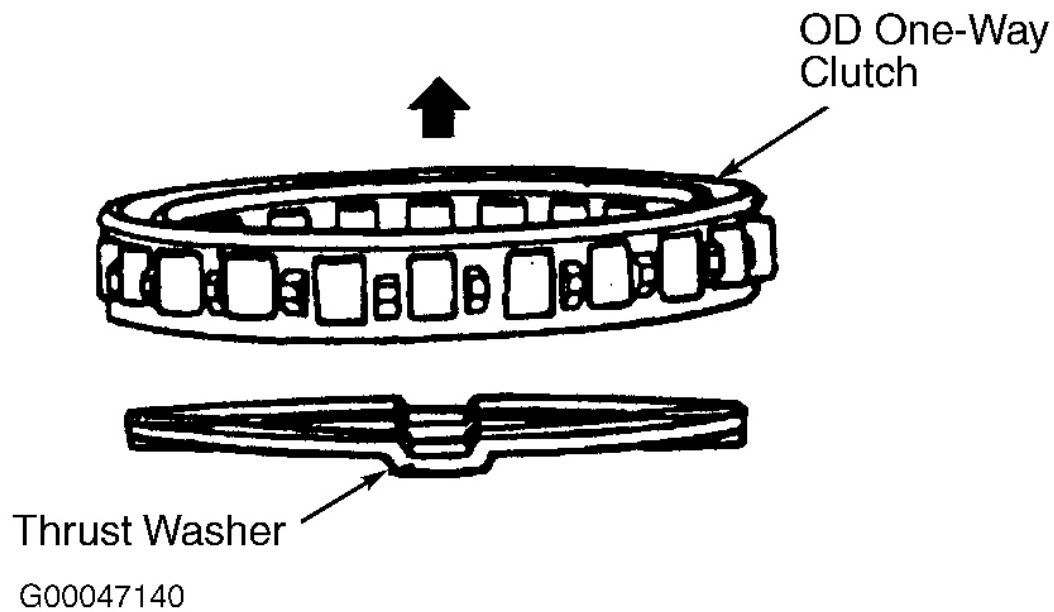
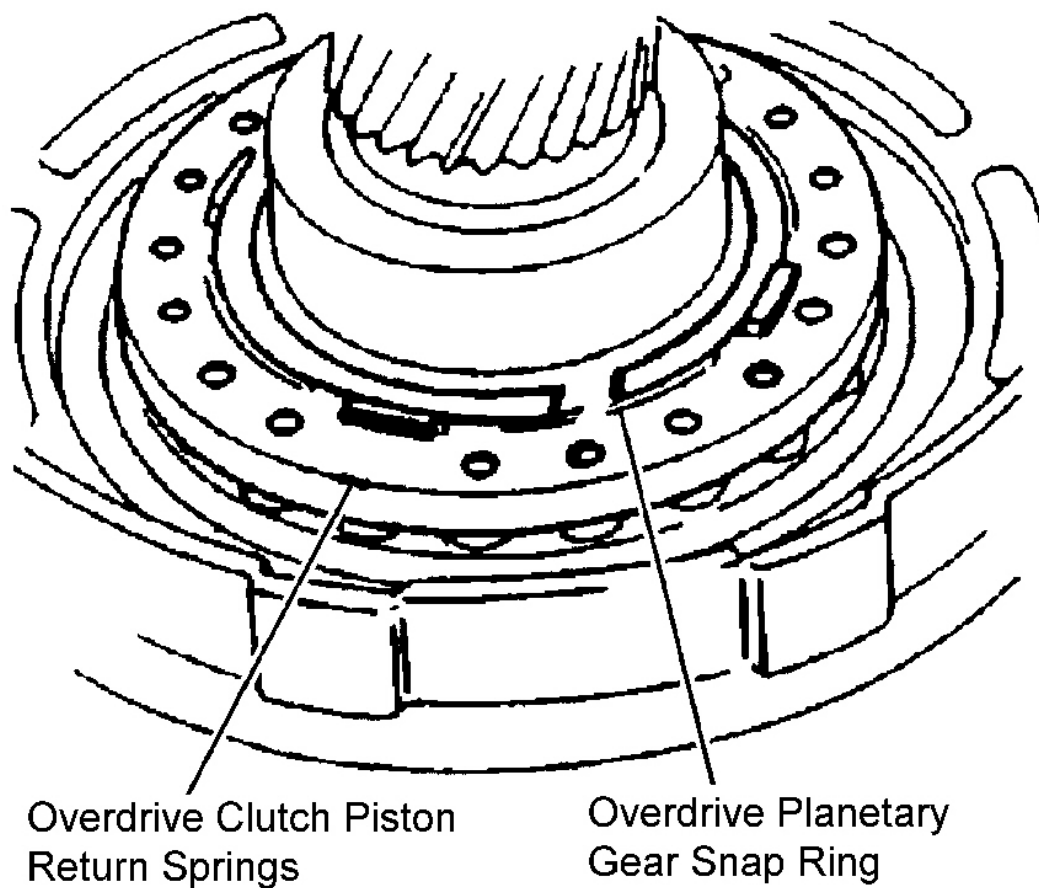


Fig. 80: Locating OD One-Way Clutch & Thrust Washer
Courtesy of SUZUKI OF AMERICA CORP.



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Fig. 81: Installing OD Planetary Gear Snap Ring & Clutch Piston Return Springs
Courtesy of GENERAL MOTORS CORP.

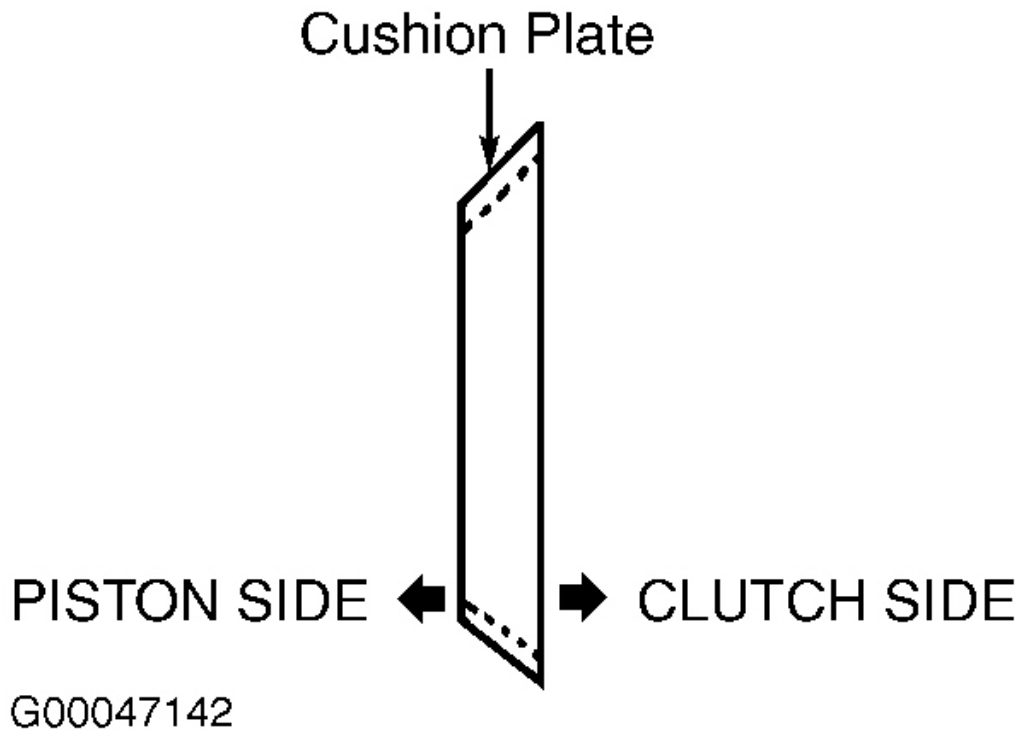


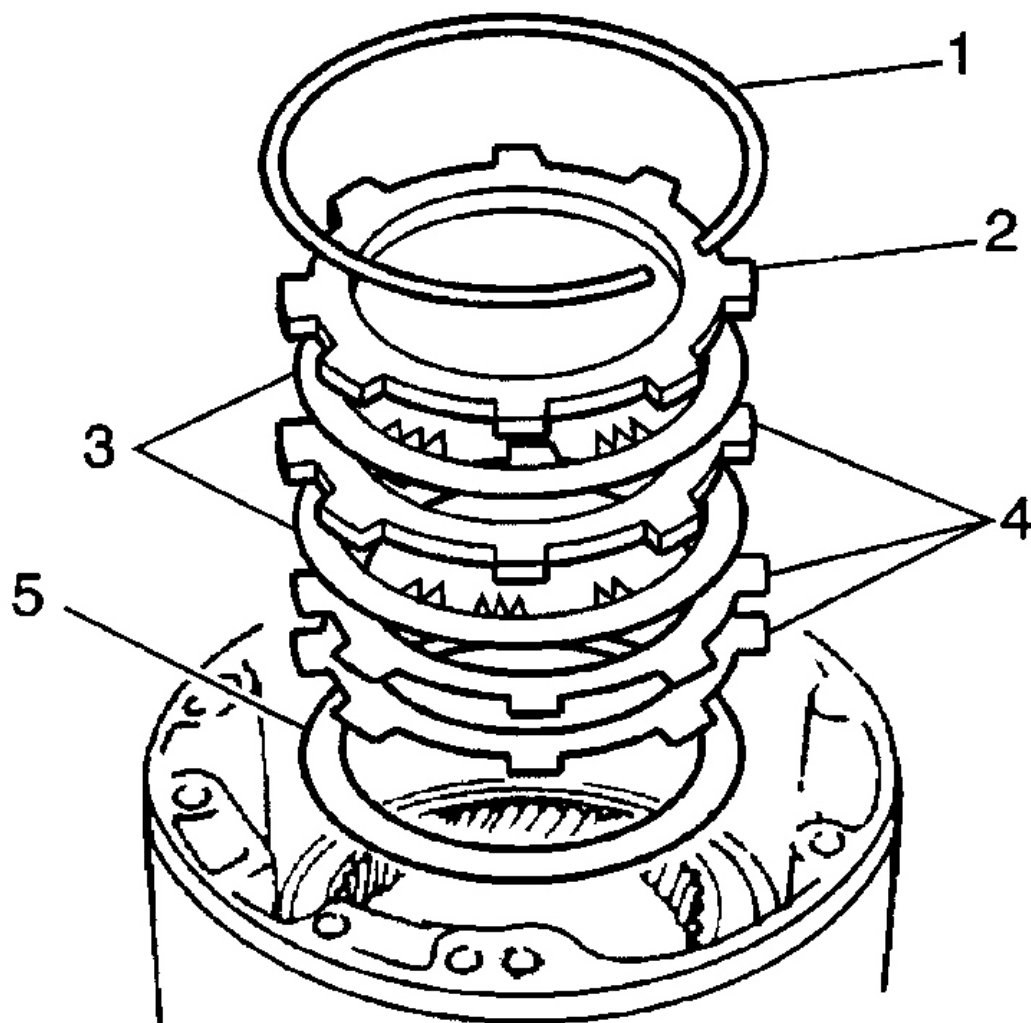
Fig. 82: Identifying Clutch Cushion Plate
Courtesy of SUZUKI OF AMERICA CORP.

OVERDRIVE - CASE SIDE

Disassembly & Inspection

1. Place the feeler gage between the brake flange and the snap ring in order to measure the clearance. See **Fig. 83** . Measure brake flange-to-snap ring clearance. See **TRANSMISSION SPECIFICATIONS** . Replace the clutch disc or plate if the readings are not as specified.
2. Remove the following components from the overdrive case:
 - The brake flange snap ring. See **Fig. 83** .
 - The brake flange.
 - The clutch discs.
 - The clutch plates.
 - The cushion brake plate.
 - The planetary ring gear.
 - The thrust bearing races.

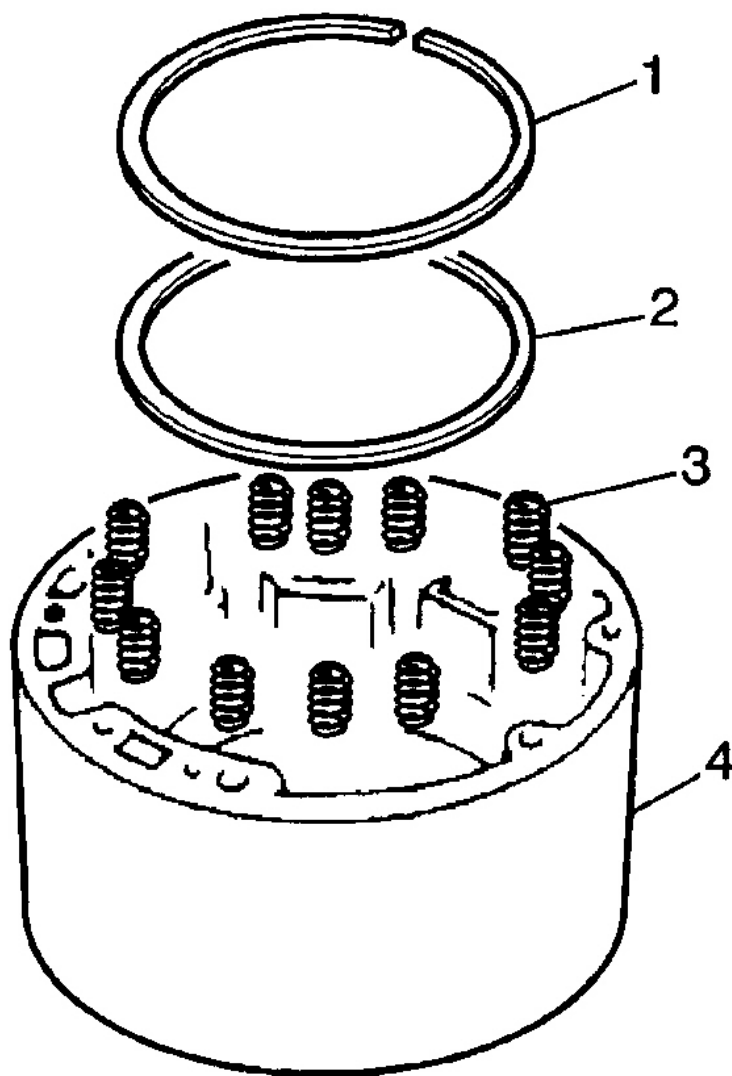
- The thrust bearing.
3. Remove the following clutch piston return spring components using a Flathead screwdriver:
 - The snap ring. See **Fig. 84** .
 - The retainer.
 - The springs.
 4. Apply low compressed air into the Overdrive (OD) case fluid hole in order to remove the brake piston. See **Fig. 85** . Remove the brake piston "O" Rings.
 5. Remove the following components from the rear of the OD case:
 - The 2 sealing rings. See **Fig. 86** .
 - The bearing.
 - The bearing race.
 6. Measure clutch piston return springs free length using a vernier caliper. See **TRANSMISSION SPECIFICATIONS** . Replace the springs which are not within specifications.



1. Snap Ring
2. Brake Flange
3. Clutch Discs
4. Clutch PLates
5. Cushion Brake Plate

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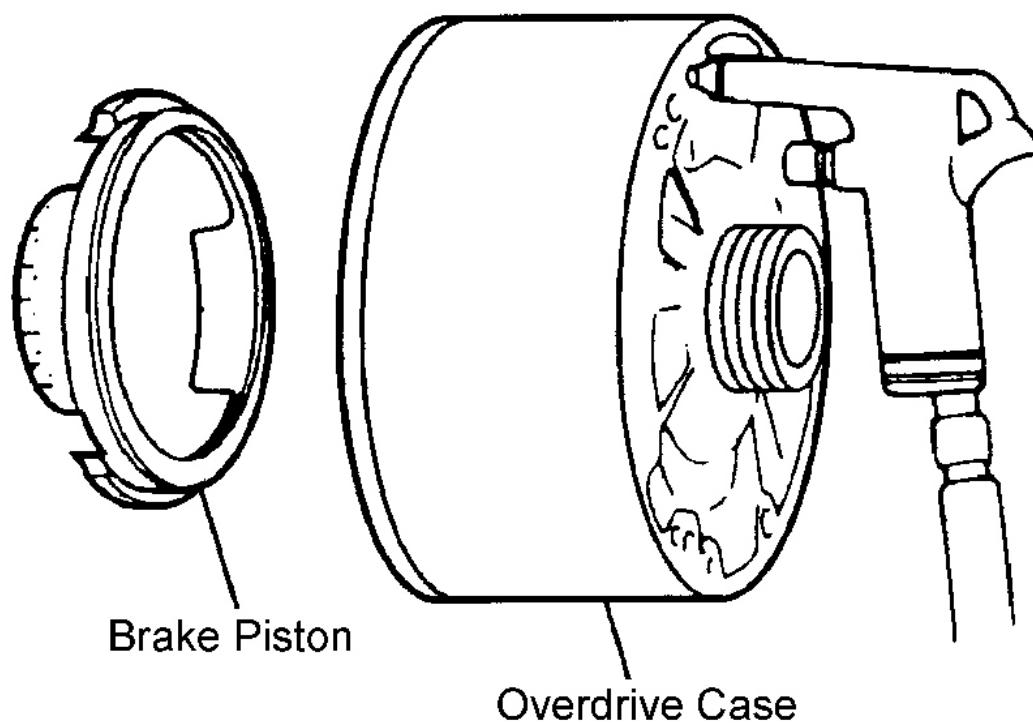
Fig. 83: Removing OD Case Components
Courtesy of GENERAL MOTORS CORP.



1. Snap Ring
2. Retainer
3. Springs
4. Overdrive Case

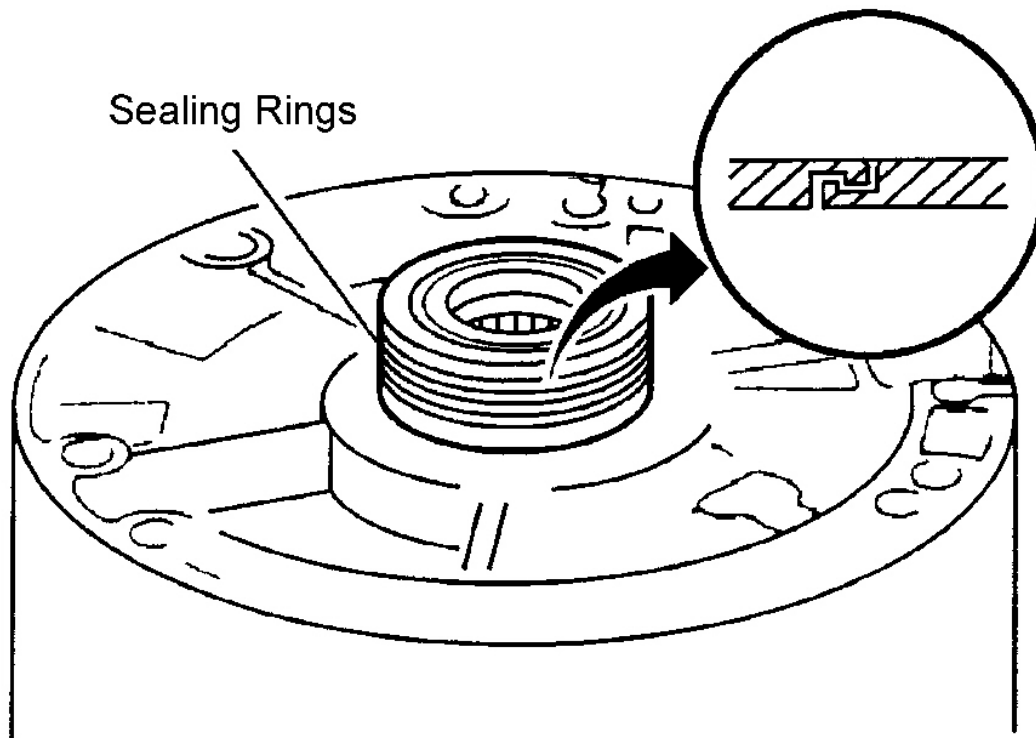
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Fig. 84: Removing Clutch Piston Return Spring Components
Courtesy of GENERAL MOTORS CORP.



G00286843

Fig. 85: Applying Air Pressure To Remove Brake Piston
Courtesy of GENERAL MOTORS CORP.



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Fig. 86: Identifying OD Case Rear Sealing Rings
Courtesy of GENERAL MOTORS CORP.

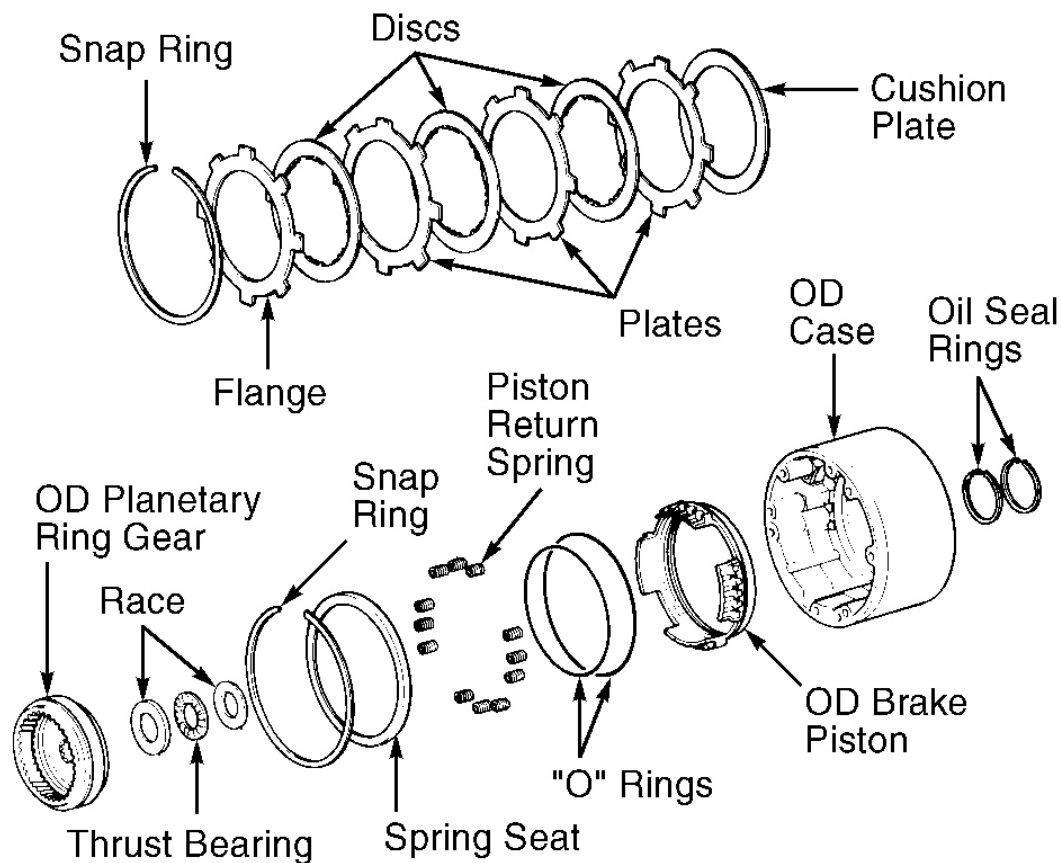
Reassembly

NOTE: Clutch discs should be soaked in ATF for 15 minutes prior to installation. Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

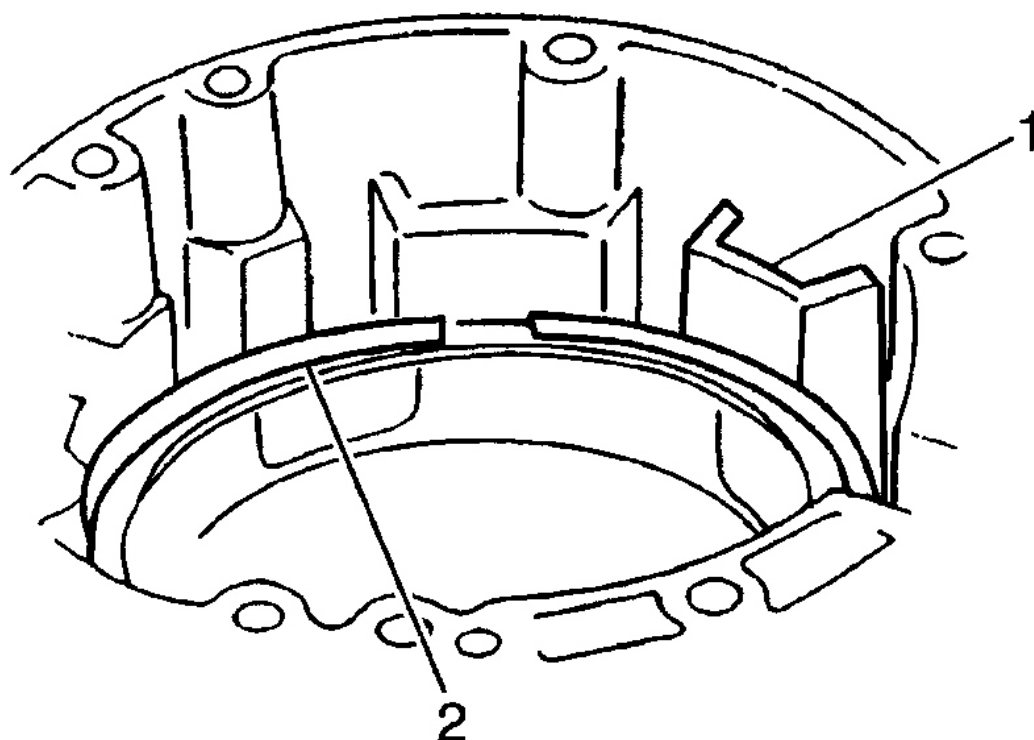
1. Refer to graphic for exploded view of Overdrive (OD) brake components. See **Fig. 87** . Install the bearing and race to the rear of the overdrive case. Install NEW seal rings to the rear of the overdrive case.
2. Install the brake piston. Install the following components into the overdrive case:
 - The 20 piston return springs.
 - The piston spring retainer.
 - The snap ring. See **Fig. 88** . Inspect that the snap ring end gap does not align with one of the overdrive case cutouts.
3. Install the following components in the exact order given to the overdrive case after applying Transjel:

- The bearing race.
 - The thrust bearing.
 - The thrust bearing race.
4. Install the planetary ring gear. Install the cushion brake plate. See **Fig. 89** . Install the overdrive clutch plates and discs in the following order:
 - A. The plate.
 - B. The plate.
 - C. The disc.
 - D. The plate.
 - E. The disc.
 5. Install the brake plate. Install the brake plate snap ring, making sure the end gap does not align with any of the overdrive case cutouts.
 6. Measure the brake backing plate-to-snap ring clearance using a feeler gage. Brake backing plate-to-snap ring clearance should be to specification. See **TRANSMISSION SPECIFICATIONS** . Disassemble and inspect if the clearance is not within specifications.



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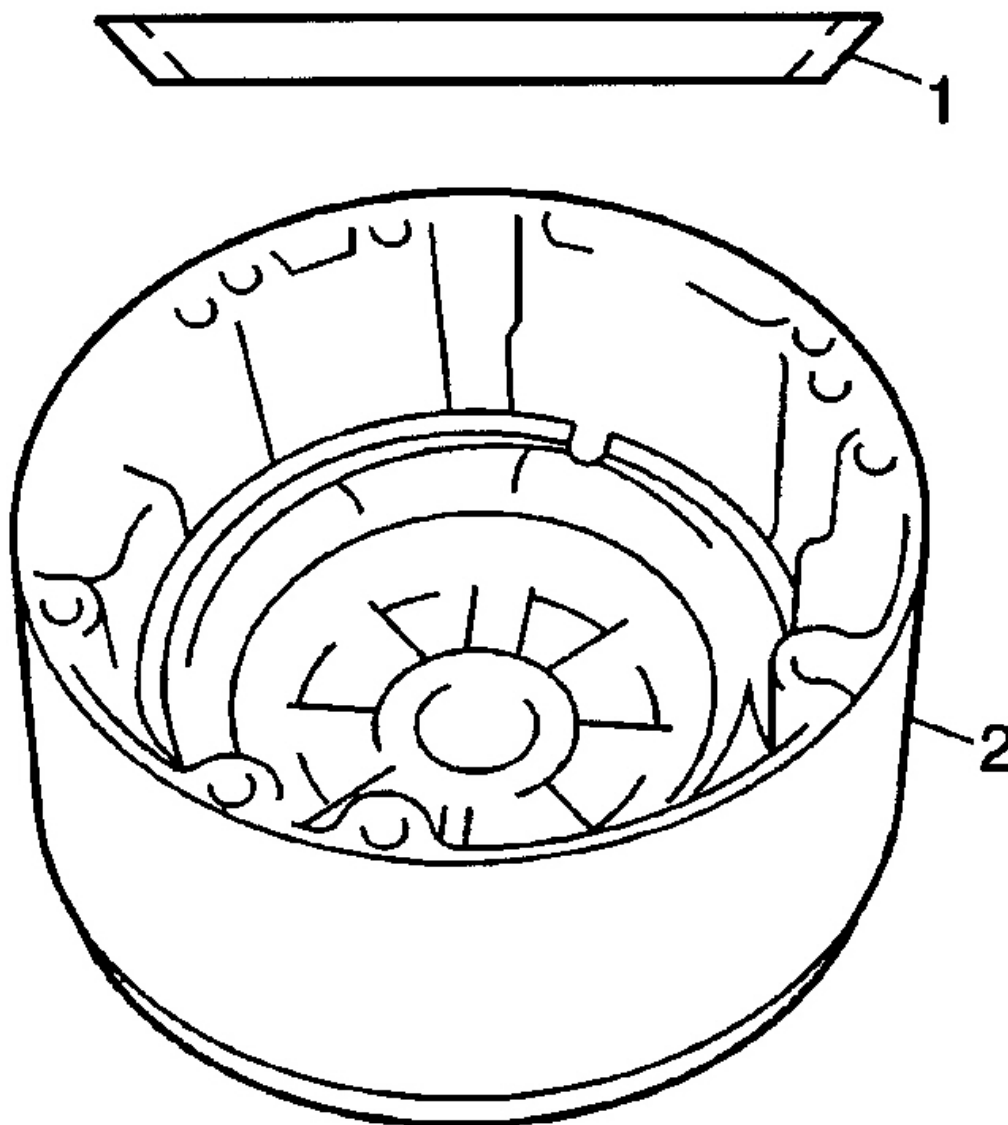
Fig. 87: Exploded View Of OD Brake Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



1. Overdrive Case Cutout
2. Snap Ring

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Fig. 88: Installing Overdrive Case Snap Ring
Courtesy of GENERAL MOTORS CORP.



1. Overdrive Clutch Plate

2. Overdrive Case

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Fig. 89: Installing Cushion Brake Plate
Courtesy of GENERAL MOTORS CORP.

VALVE BODY

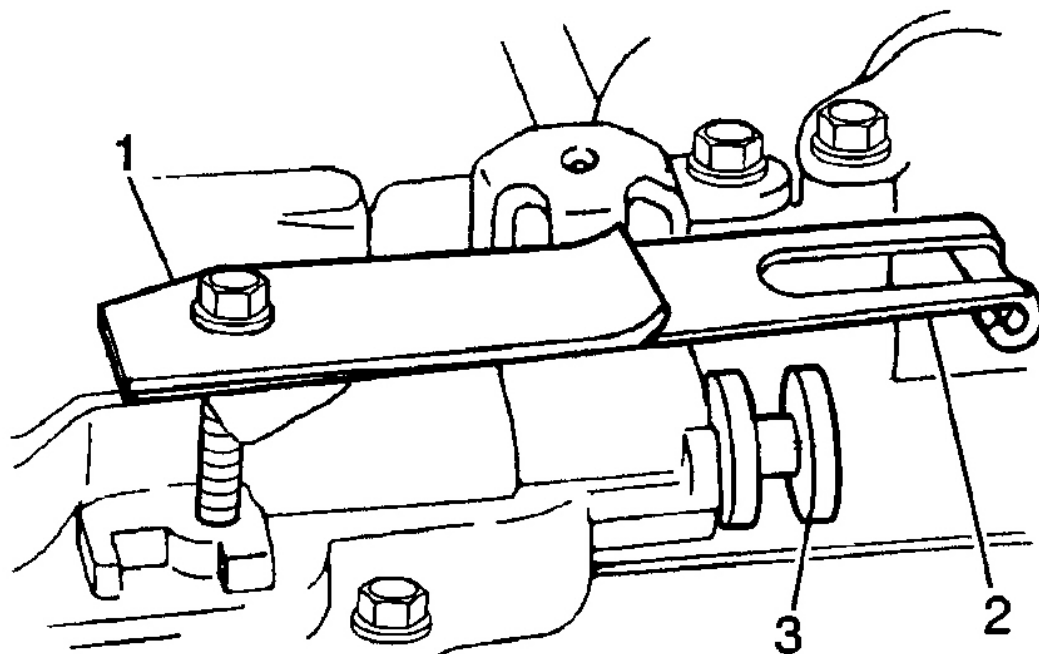
CAUTION: All valve body components must be installed in original location. Lay all components in sequence during removal for reassembly reference.

Valve Body Assembly Removal

1. Remove the following components from the valve body:
 - The bolt.
 - The detent spring. See **Fig. 90** .
 - The plate.
 - The manual valve.
2. Remove the 9 upper valve body bolts. See **Fig. 91** . Remove the 6 lower valve body bolts. See **Fig. 92** .

NOTE: Press the separator plate and the gasket against the lower valve body in order to prevent the check balls and the springs from falling out of the lower valve body.

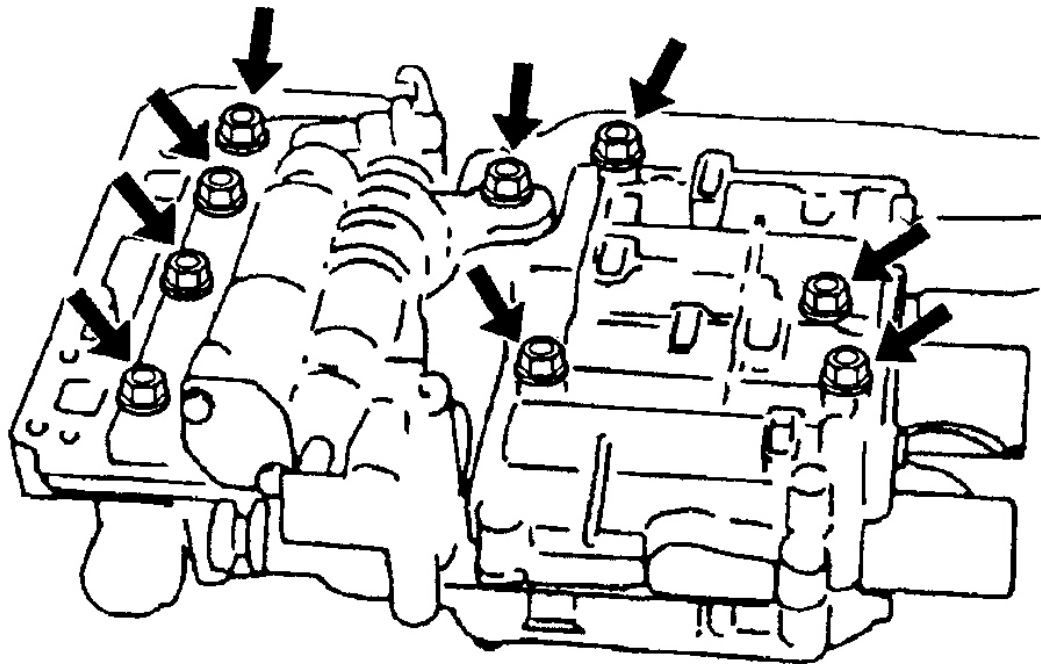
3. Remove the rear upper valve body check balls from the lower valve body. Remove the 5 valve body bolts from the upper valve body and remove the check balls. See **Fig. 93** . Inspect the front upper valve body for the proper locations of the valves and the retaining clip. See **Fig. 94** .
4. Inspect the rear upper valve body for the proper locations of the check balls. See **Fig. 95** .
5. Inspect the lower valve body for the proper locations of the following components:
 - The bypass valve. See **Fig. 96** .
 - The check balls.
 - The primary regulator valve sleeve retainer.



- 1. Plate
- 2. Detent Spring
- 3. Manual Valve

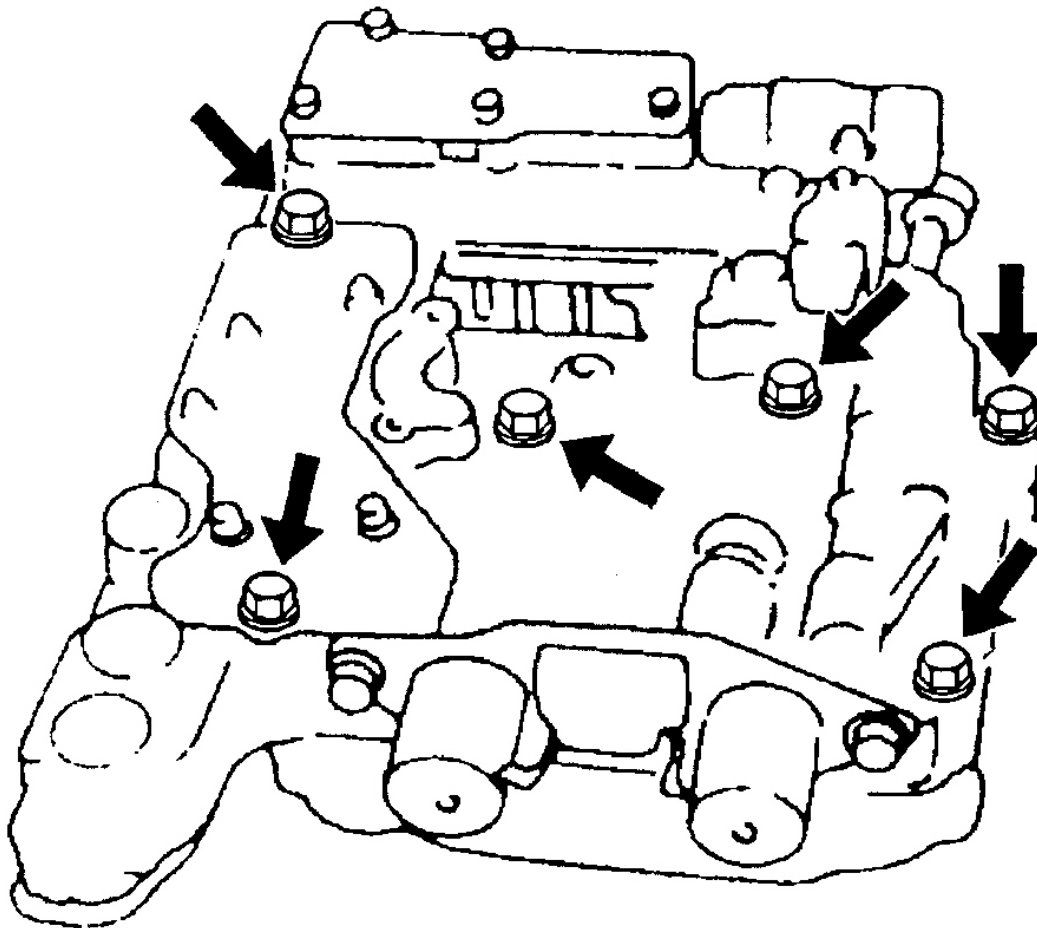
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Fig. 90: Removing Valve Body Components
Courtesy of GENERAL MOTORS CORP.



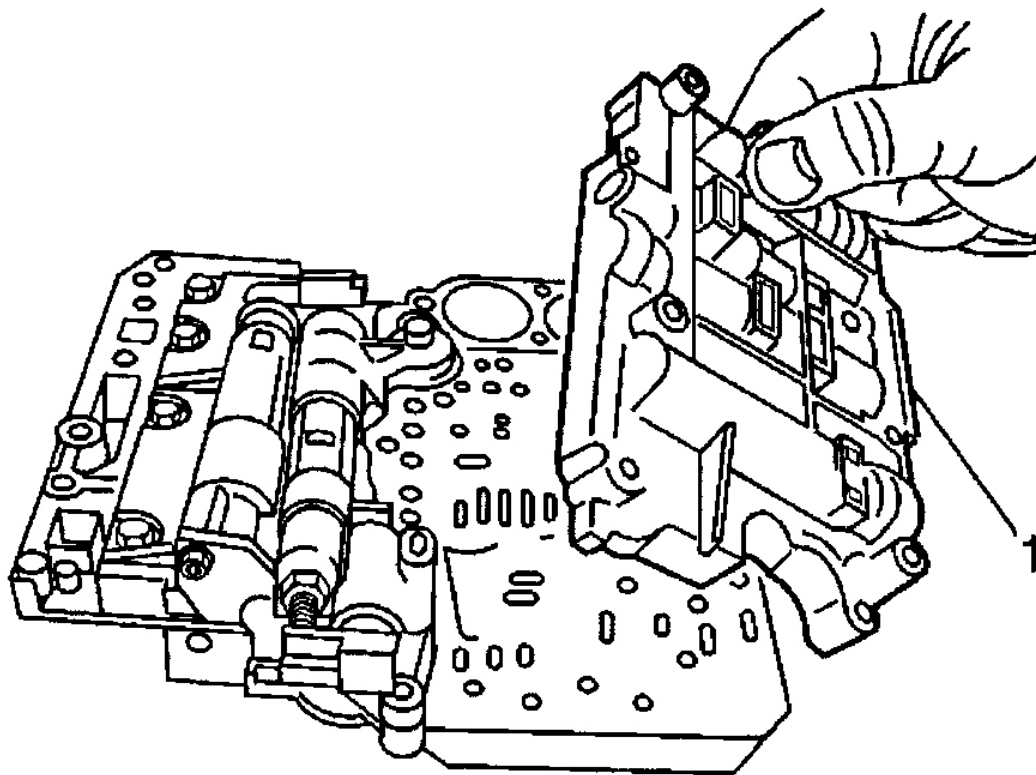
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Fig. 91: Identifying Upper Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.



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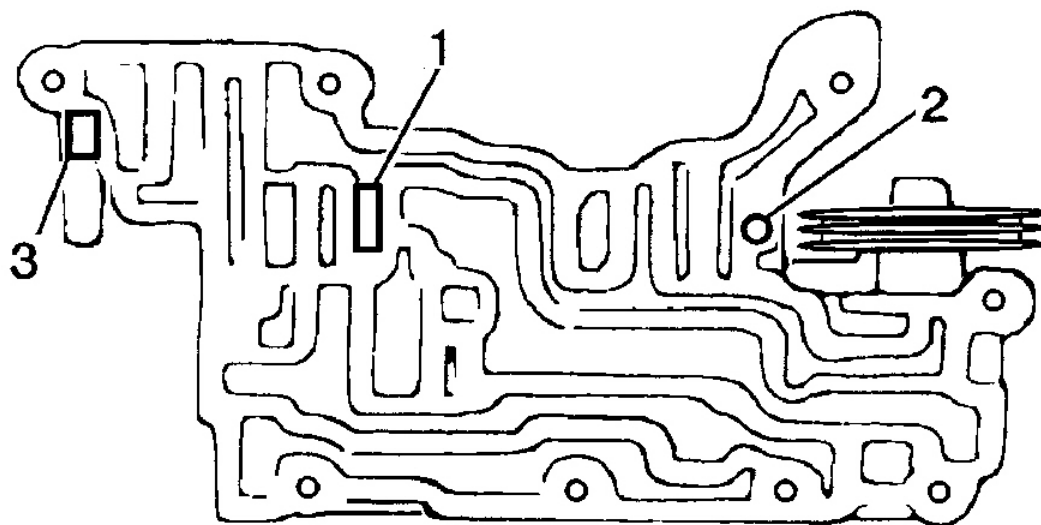
Fig. 92: Identifying Lower Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.



1. Upper Valve Body

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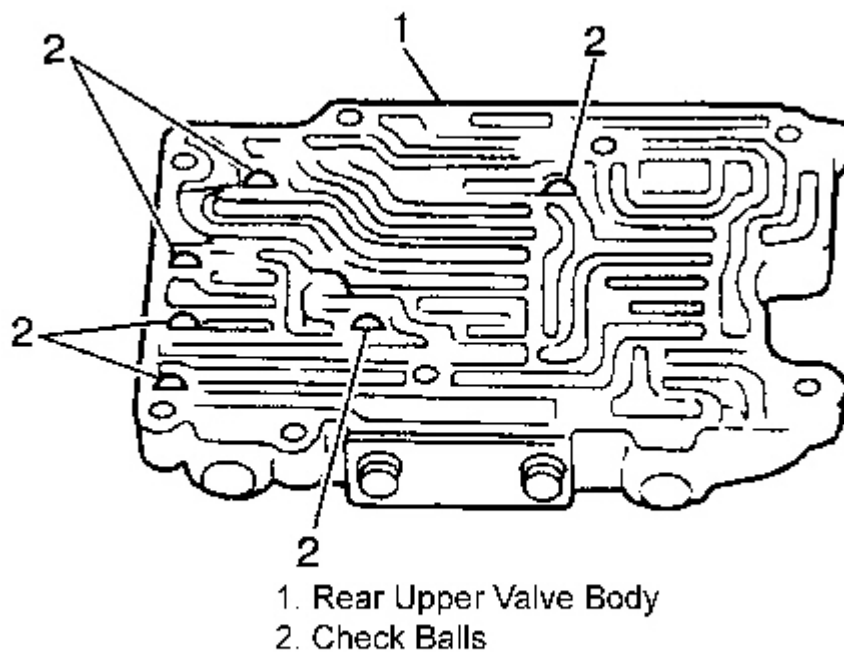
Fig. 93: Removing Upper Valve Body
Courtesy of GENERAL MOTORS CORP.



- 1. Valve
- 2. Check Ball
- 3. Valve

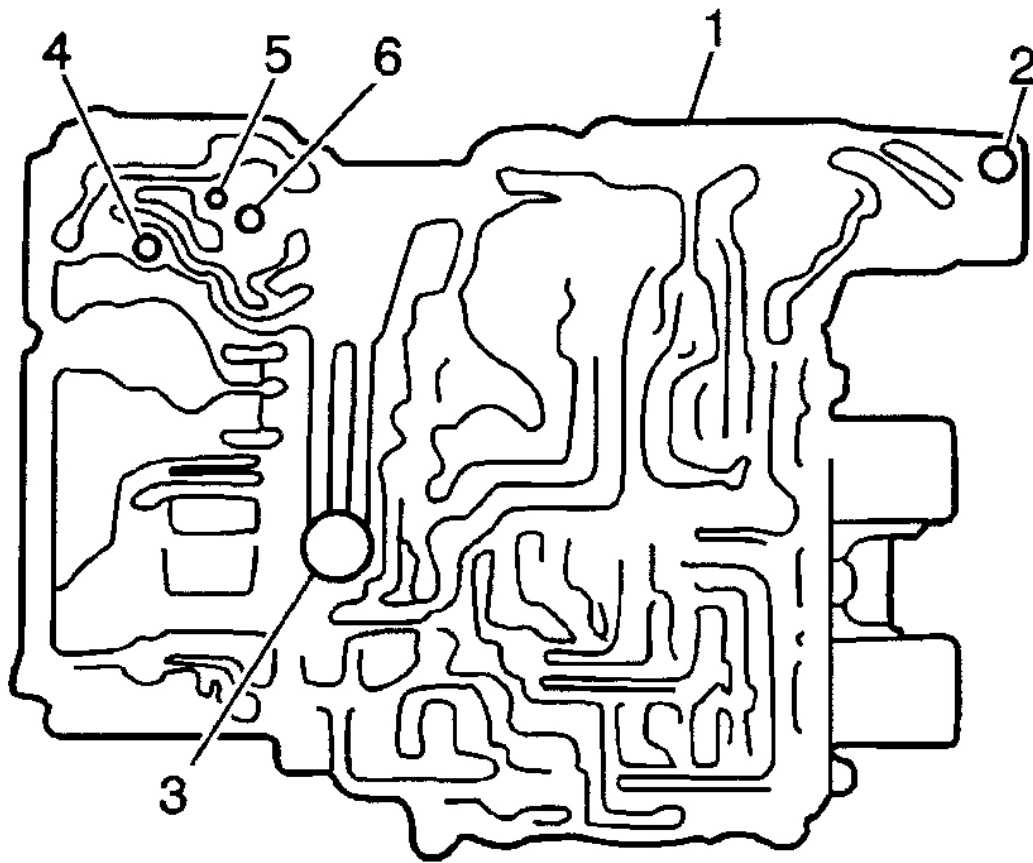
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Fig. 94: Identifying Location Of Upper Valve Body Valves & Retaining Clip
Courtesy of GENERAL MOTORS CORP.



G00286852

Fig. 95: Identifying Location Of Rear Upper Valve Body Check Balls
Courtesy of GENERAL MOTORS CORP.



1. Lower Valve Body
2. Check Ball
3. Bypass Valve
4. Check Ball
5. Primary Regulator Valve Sleeve Retainer
6. Check Ball

G00293979

Fig. 96: Identifying Location Of Lower Valve Body Components
 Courtesy of GENERAL MOTORS CORP.

Front Upper Valve Body Disassembly

NOTE: When disassembling the valve body halves, keep all valve springs, spring seats and plugs within their respective valves. Most valve springs are of different sizes and **CANNOT** be interchanged. Verify that all parts are clean and dry

before assembly.

1. Remove the throttle valve keep plate from the valve body. See **Fig. 97** .
2. Perform the following steps in order to remove the cut back valve and components:
 - A. Hold the cut back valve plug using a Flathead screwdriver.
 - B. Remove the cut back retainer using a magnet. See **Fig. 98** .
 - C. Remove the cut back plug.
 - D. Remove the cut back valve.
 - E. Remove the cut back valve spring.
3. Remove one of the front valve body end cover pressure relief valve bolts. Loosen the other front valve body end cover bolt. Move the end cover away. See **Fig. 99** . Remove the secondary regulator valve sub assembly. Remove the secondary regulator valve spring. Remove the second front valve body end cover pressure relief valve bolt. Remove the end cover.
4. Remove the following TV cable cam components:
 - The bolt. See **Fig. 100** .
 - The cam.
 - The return spring.
 - The spacer.

NOTE: **Note the number of throttle valve compensating rings before removal. The number of rings determines the transmission line pressure. Install the same number of rings that are removed in order to ensure the proper transmission line pressure. Some valve bodies DO NOT require these rings.**

5. Slightly push in the throttle valve while removing the locating pin from the down shift plug using a magnet. See **Fig. 101** .
6. Remove the following throttle valve components from the valve body:
 - The down shift plug.
 - The throttle valve primary spring. See **Fig. 102** .
 - The throttle valve.
 - The secondary valve spring.
 - The throttle valve compensating ring(s).
7. Clean all of the upper valve body components. Allow the components to air dry. Inspect all of the valves for cracks, scoring, or other damage. Replace as necessary. Inspect all of the valve springs for distortion or other damage. Replace as necessary.
8. Inspect the valve bores for scoring or cracks. Replace as necessary. Inspect the free length and outer coil diameter of all of the front upper valve body springs using vernier calipers. If the measurements DO NOT fall within specifications, replace the springs as necessary. See **FRONT UPPER VALVE BODY SPRING SPECIFICATIONS** table.

FRONT UPPER VALVE BODY SPRING SPECIFICATIONS

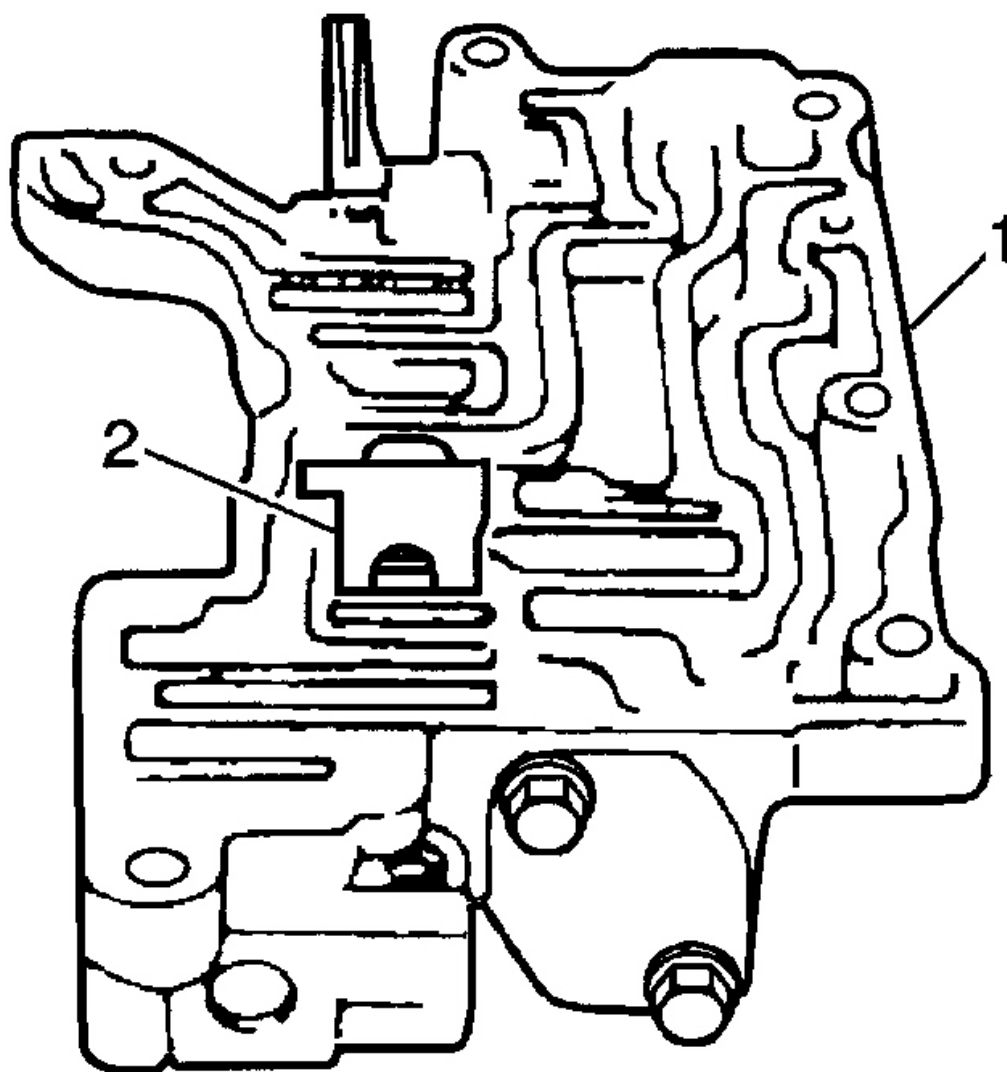
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2001-03 AUTOMATIC TRANSMISSIONS Aisin Warner AW 03-72LE & AW 03-73LE Overhaul

Spring Name (No.) ⁽¹⁾	Diameter - In. (mm)	Free Length - In. (mm)
Cut Back Valve Spring Coil (#4)	.269 (6.85)	.905 (23.00)
Secondary Regulator Valve Spring (#1)	.681 (17.43)	2.804 (71.23)
Secondary Valve Spring (#2) (Throttle)	⁽²⁾ .337 (8.58)	.757 (19.24)
Throttle Valve Primary Spring (#3)	.429 (10.90)	1.557 (39.55)

(1) See **Fig. 103** .

(2) On Grand Vitara/Vitara, spring diameter is .282" (7.16 mm).



- 1. Valve Body
- 2. Keep Plate

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Fig. 97: Removing Throttle Valve Keep Plate
Courtesy of GENERAL MOTORS CORP.

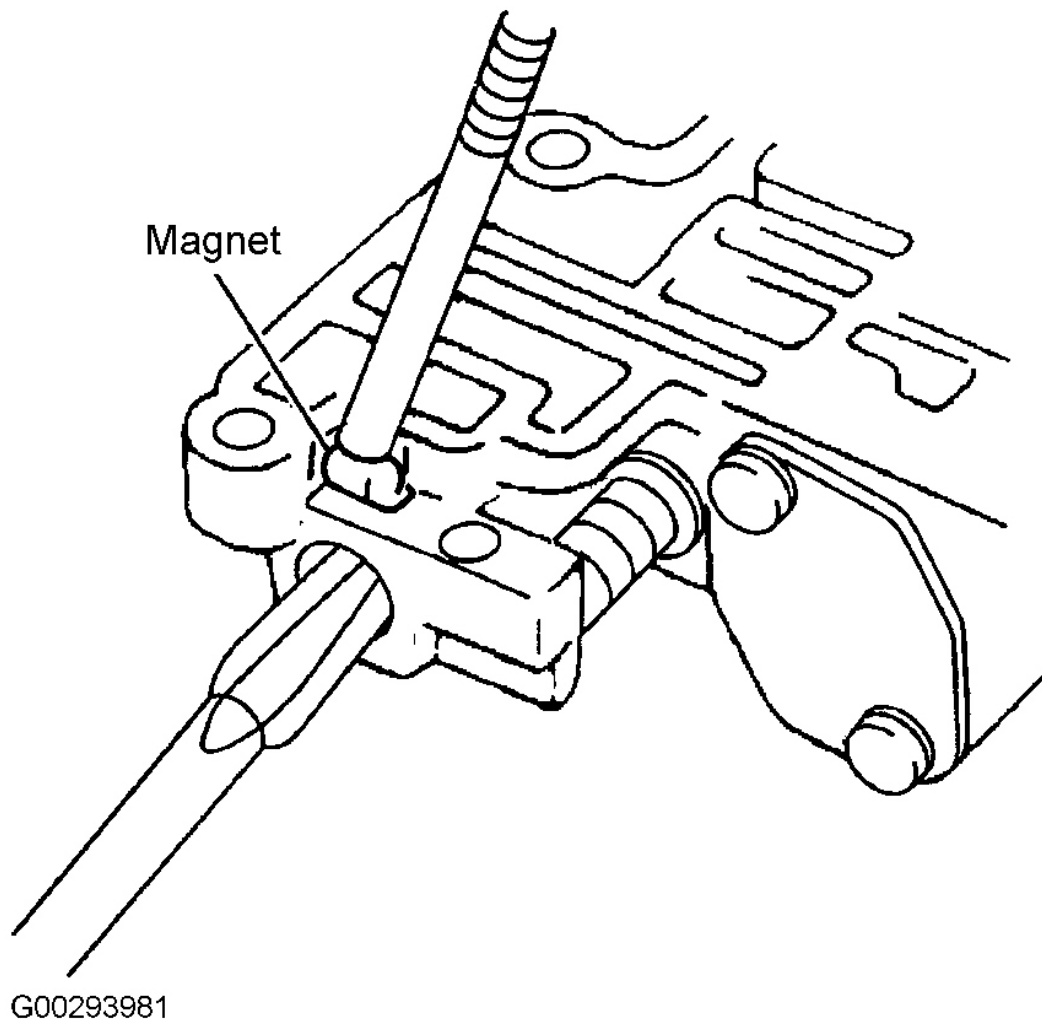


Fig. 98: Removing Cut Back Retainer
Courtesy of GENERAL MOTORS CORP.

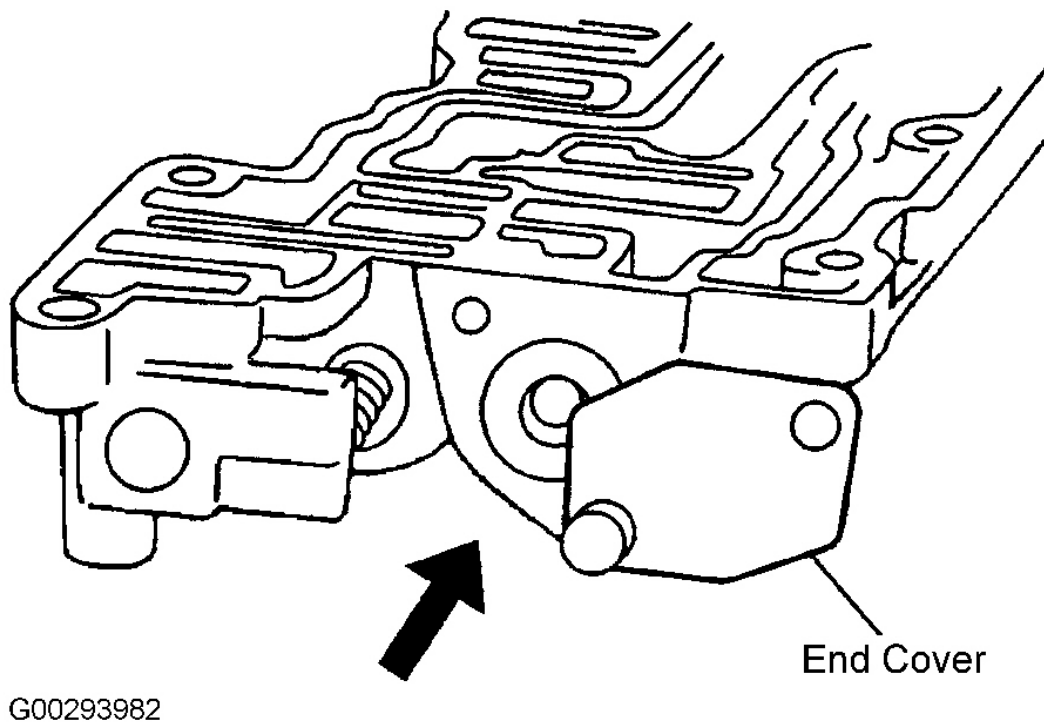
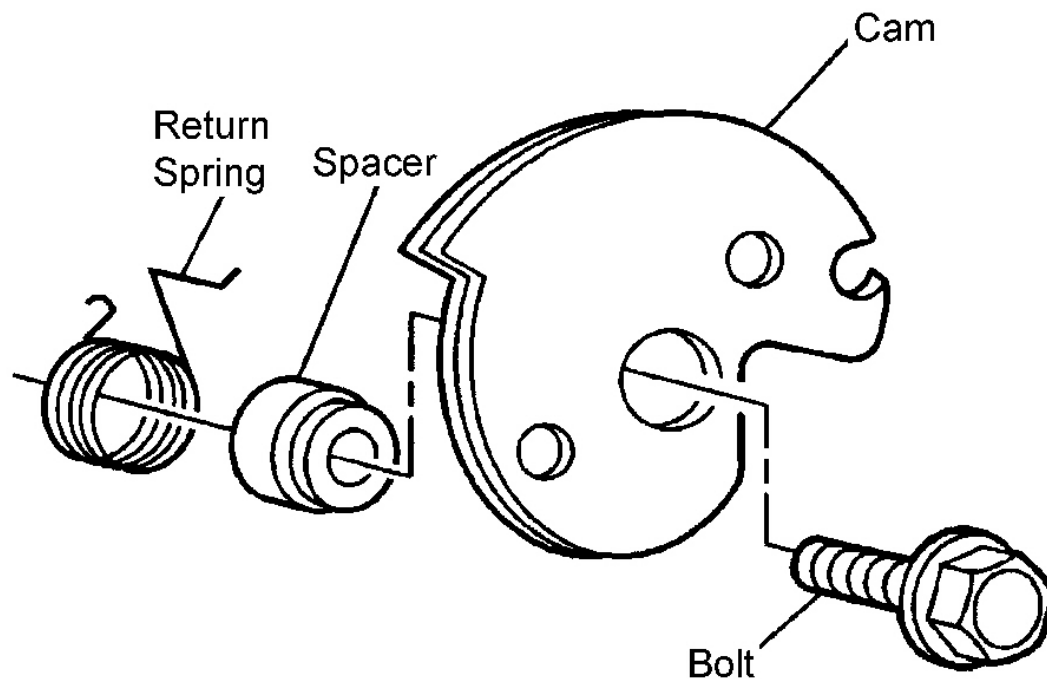
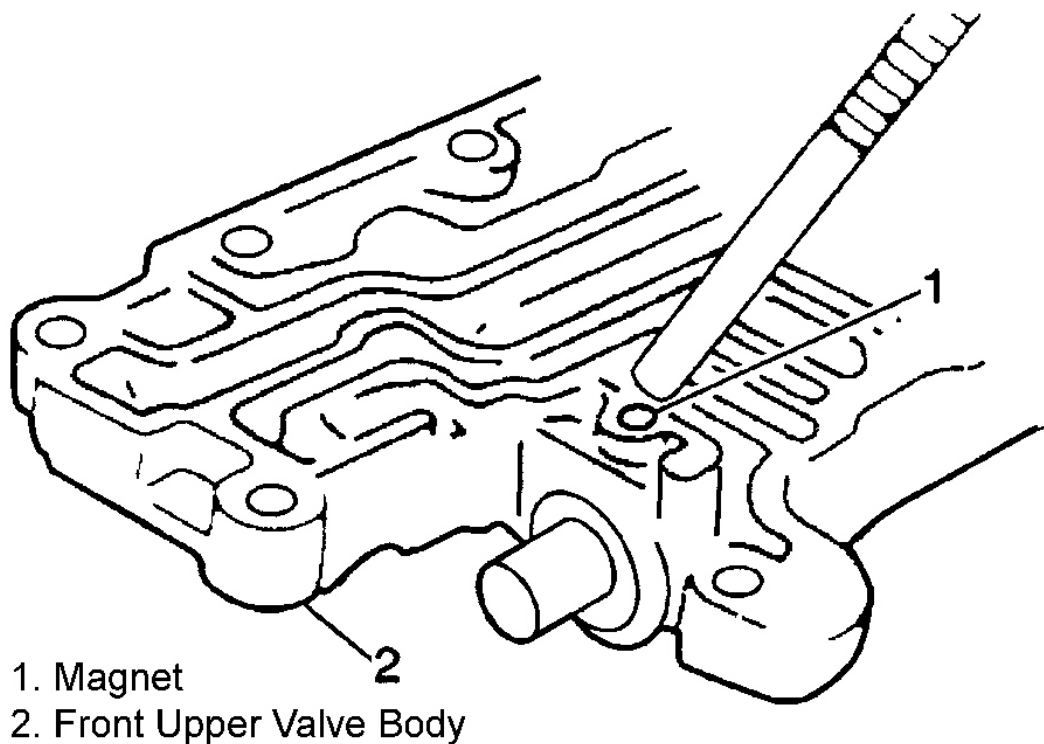


Fig. 99: Identifying Front Valve Body End Cover
Courtesy of GENERAL MOTORS CORP.



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Fig. 100: Removing TV Cable Cam Components
Courtesy of GENERAL MOTORS CORP.



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Fig. 101: Removing Throttle Valve Downshift Plug Locating Pin
Courtesy of GENERAL MOTORS CORP.

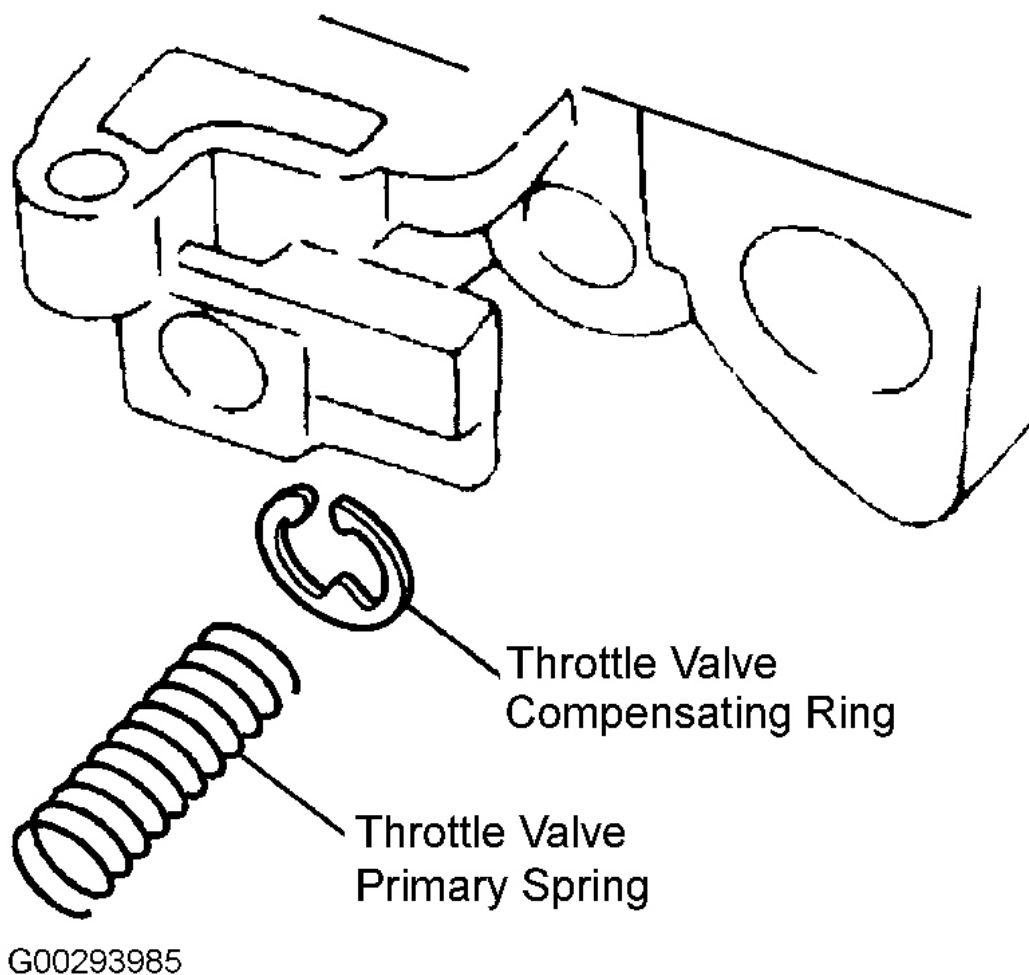
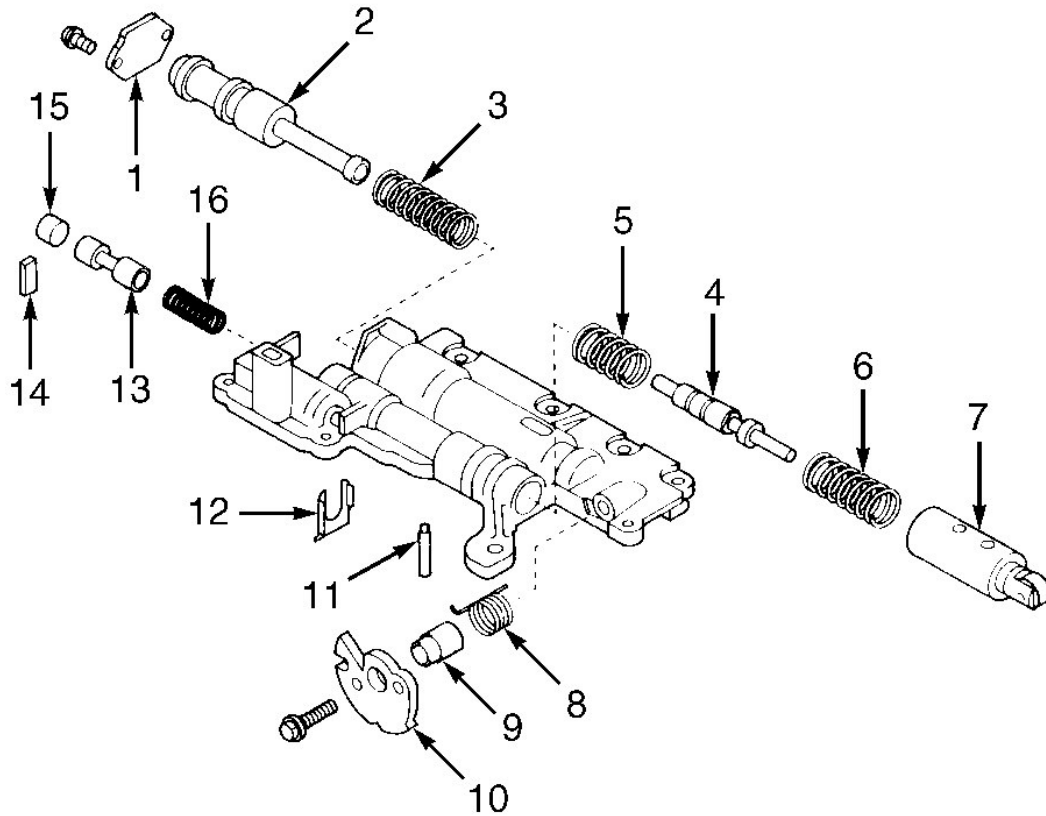


Fig. 102: Removing Throttle Valve Components
Courtesy of GENERAL MOTORS CORP.



- | | |
|------------------------------|--------------------|
| 1. Cover | 9. Sleeve |
| 2. Secondary Regulator Valve | 10. Cam |
| 3. Spring No. 1 | 11. Pin |
| 4. Throttle Valve | 12. Retainer |
| 5. Spring No. 2 | 13. Cut Back Valve |
| 6. Spring No. 3 | 14. Valve Retainer |
| 7. Downshift Plug | 15. Plug |
| 8. Spring | 16. Spring No. 4 |

G93J24892

Fig. 103: Exploded View Of Front Upper Valve Body
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Front Upper Valve Body Reassembly

1. Install the following Throttle Valve (TV) components to the valve body:
 - The secondary valve spring.
 - The TV compensating ring(s).
 - The throttle valve.

- The TV primary spring.
 - The down shift plug.
 - Secure with the locating pin.
2. Install the following TV cable cam components:
 - The return spring. See **Fig. 100** .
 - The spacer.
 - The cam.
 - The throttle valve bolt. Tighten the TV bolt to specification. See **TORQUE SPECIFICATIONS** .
 3. Install the front valve body end cover. Handstart one of the end cover pressure relief valve bolts. See **Fig. 99** . Install the secondary valve spring to the valve body. Install the secondary regulator valve to the valve body. Rotate the end cover over the valve. Install the second end cover pressure relief valve bolt and tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
 4. Install the following cut back valve components:
 - The spring.
 - The valve.
 - The plug.
 - The retainer.

Install the throttle valve keep plate to the valve body.

Rear Upper Valve Body Disassembly

NOTE: When disassembling the valve body halves, keep all valve springs, spring seats and plugs within their respective valves. Most valve springs are of different sizes and CANNOT be interchanged. Verify that all parts are clean and dry before assembly.

1. Remove the 6 valve body balls. See **Fig. 95** .
2. Perform the following steps in order to remove the 3-2 kickdown control valve plug. See **Fig. 104** :
 - A. Depress the plug.
 - B. Remove the needle holder using a magnet.
 - C. Remove the plug.
 - D. Remove the clutch sequence valve.
 - E. Remove the reverse brake sequence valve spring.
3. Perform the following steps in order to remove the 3-4 shift valve plug. See **Fig. 105** :
 - Depress the plug.
 - Remove the retainer using a magnet.
 - Remove the plug.
 - Remove the spring.
4. Remove the following rear upper valve body plate components:
 - The bolts.

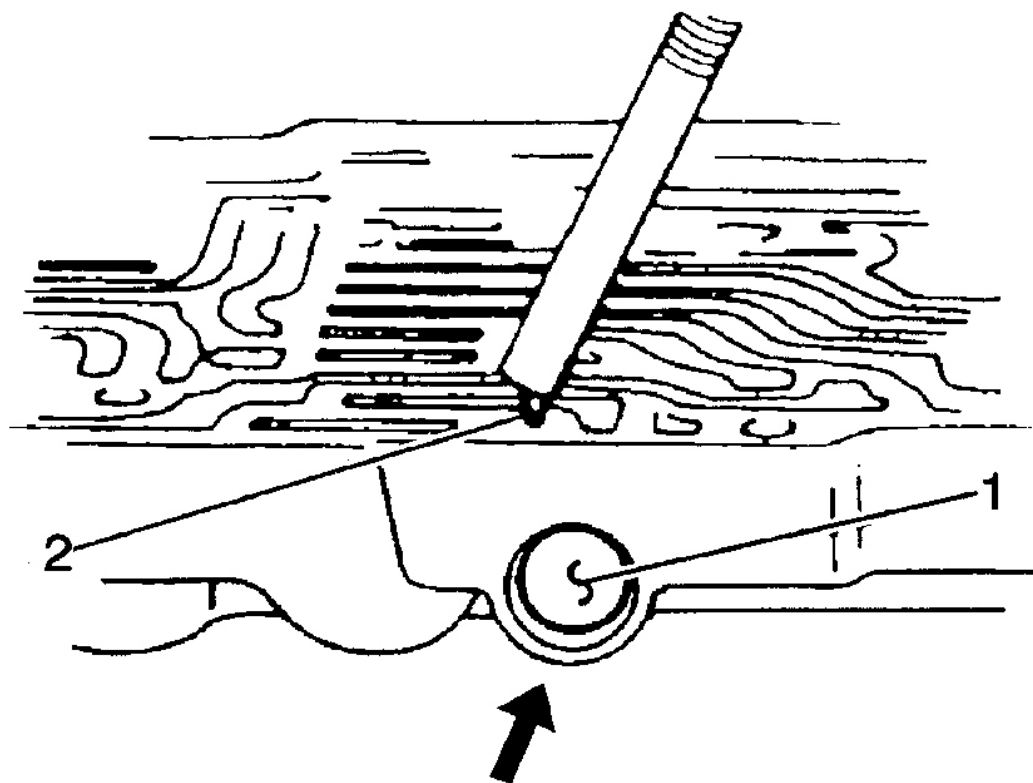
- The plate. See **Fig. 106** .
- The gasket.

Remove the 1-2 shift valve and spring.

5. Perform the following steps in order to remove the 2-3 shift valve and plug:
 - A. Depress the plug. See **Fig. 107** .
 - B. Remove the retainer using a magnet.
 - C. Remove the plug.
 - D. Remove the valve.
 - E. Remove the spring.
6. Clean all upper valve body components. All the components to air dry. Inspect all valves for cracks, scoring, or other damage. Replace as necessary. Inspect all valve springs for distortion or other damage. Replace as necessary. Inspect the valve bores for scoring or cracks. Replace as necessary.
7. Measure the free length and the outer diameter of all rear upper valve body springs using vernier calipers. If the spring free length does not meet the specifications as listed in the table below, replace as necessary. See [REAR UPPER VALVE BODY SPRING SPECIFICATIONS](#) table.

REAR UPPER VALVE BODY SPRING SPECIFICATIONS

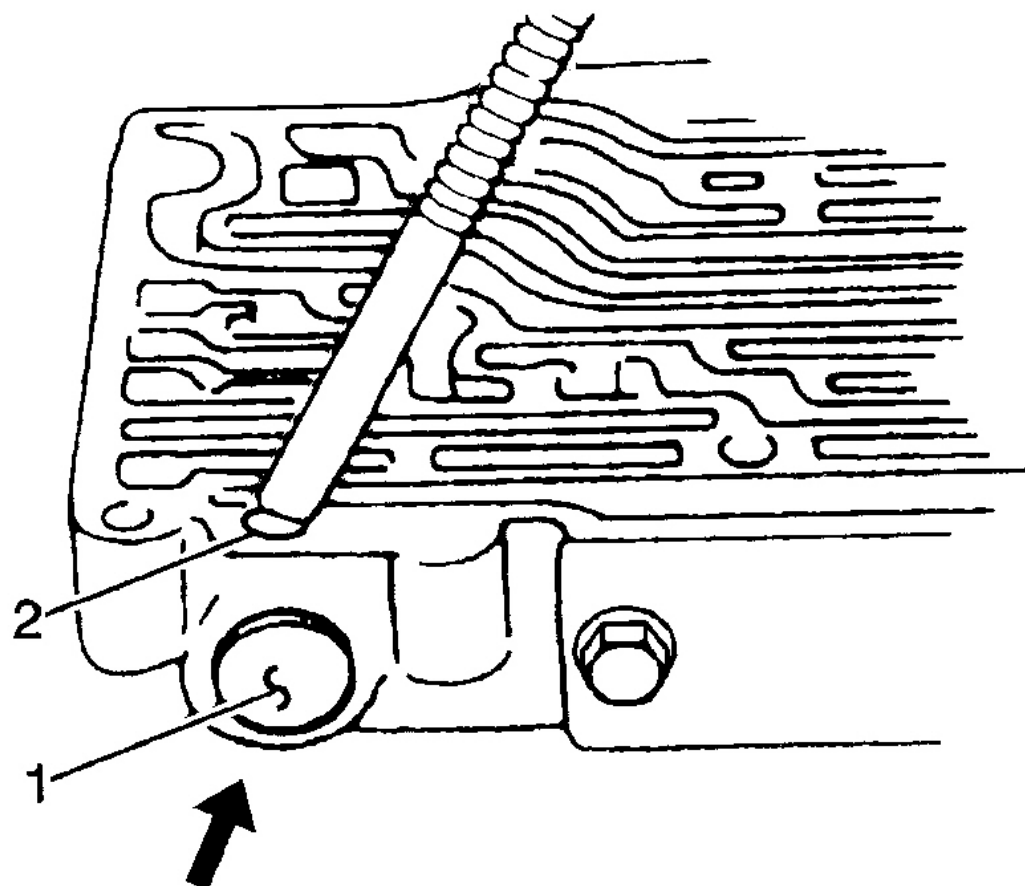
Spring Name (No.) ⁽¹⁾	Outer Diameter - In. (mm)	Free Length - In. (mm)
Reverse Brake Sequence Valve (#4)	.362 (9.20)	1.478 (37.55)
1-2 Shift Valve (#1)	.350 (8.90)	1.147 (29.15)
2-3 Shift Valve (#2)	.350 (8.90)	1.147 (29.15)
3-4 Shift Valve (#3)	.350 (8.90)	1.147 (29.15)
(1) See Fig. 108 .		



- 1. 3-2 Kickdown Control Valve Plug
- 2. Needle Holder

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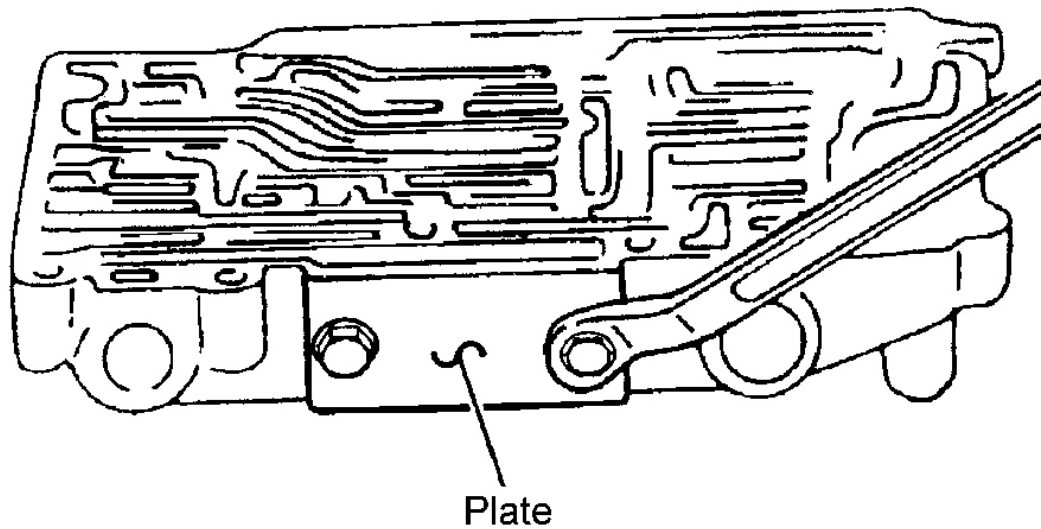
Fig. 104: Identifying 3-2 Kickdown Control Valve Plug
Courtesy of GENERAL MOTORS CORP.



- 1. 3-4 Shift Valve Plug
- 2. Retainer

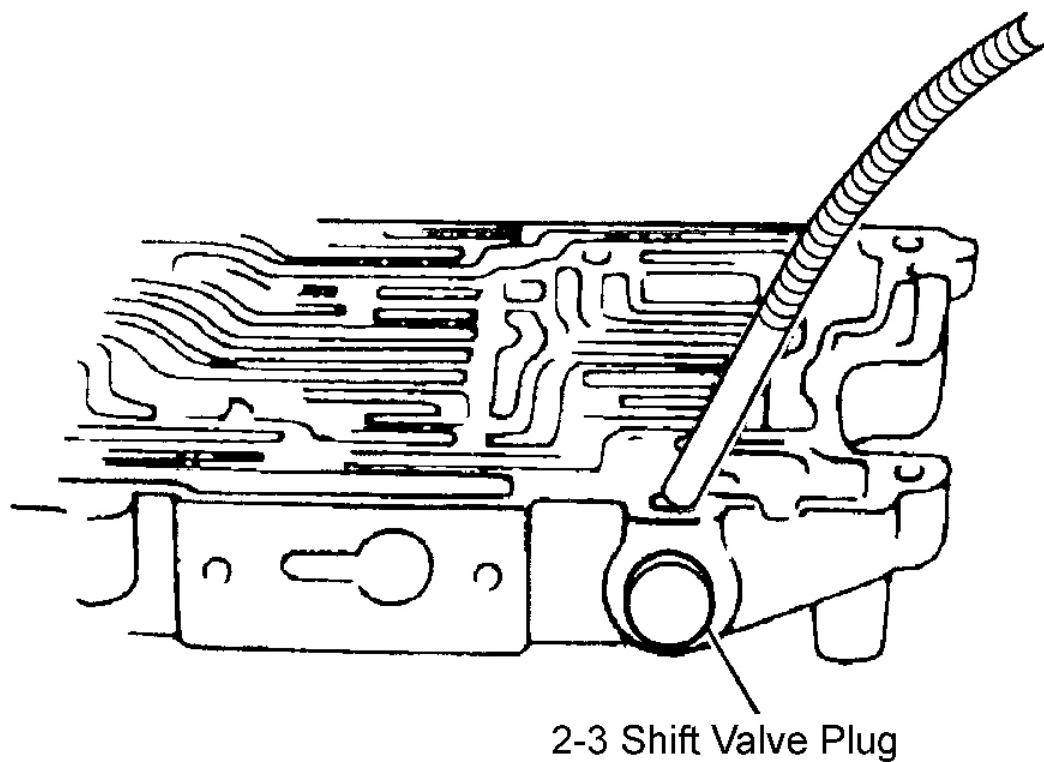
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Fig. 105: Identifying 4-3 Shift Valve Plug
Courtesy of GENERAL MOTORS CORP.



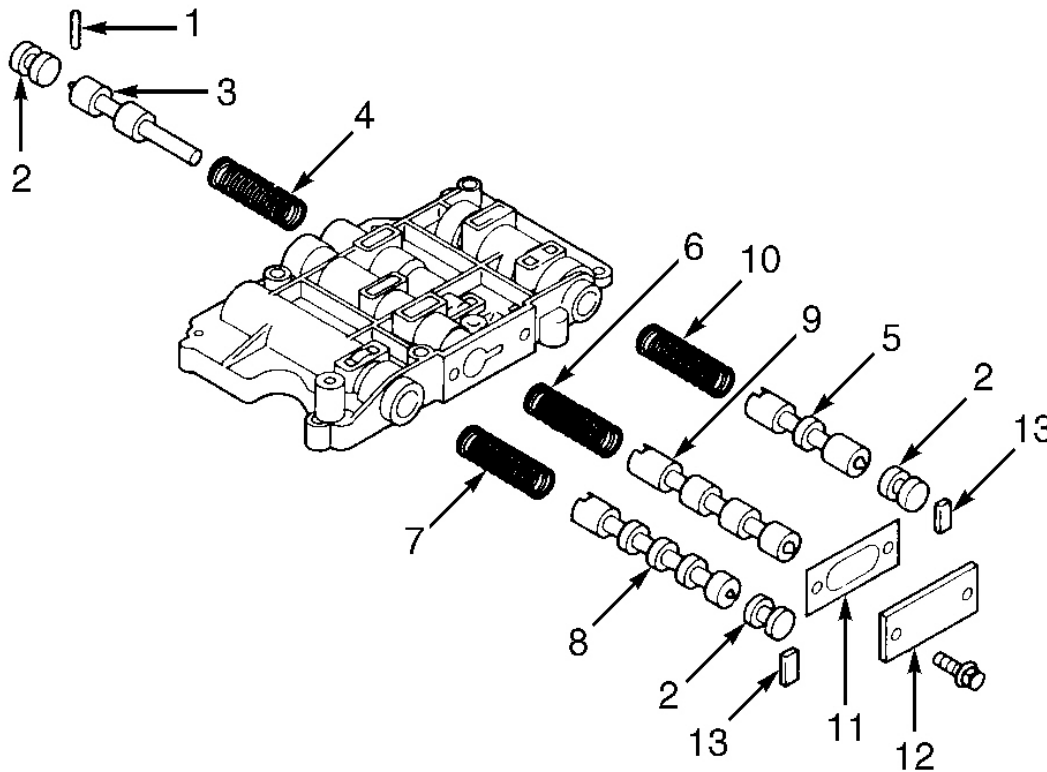
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Fig. 106: Removing Rear Upper Valve Body Plate
Courtesy of GENERAL MOTORS CORP.



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Fig. 107: Identifying 2-3 Shift Valve Plug
Courtesy of GENERAL MOTORS CORP.



1. Pin
2. Plug
3. Rear Clutch
Sequence Valve
4. Spring No. 4
5. 3-4 Shift Valve
6. Spring No. 3

7. Spring No. 2
8. 2-3 Shift Valve
9. 1-2 Shift Valve
10. Spring No. 1
11. Gasket
12. Cover
13. Retainer

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Fig. 108: Exploded View Of Rear Upper Valve Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Rear Upper Valve Body Reassembly

1. Install the following 2-3 shift valve components:
 - The spring.
 - The valve.
 - The plug.
 - The retainer.

Install the 1-2 shift valve and spring.

2. Install the following rear valve body plate components:
 - The gasket.
 - The plate.
 - The bolts. Tighten rear valve body plate bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Install the following 3-4 shift valve components:
 - The spring.
 - The valve.
 - The plug.
 - The retainer.
4. Install the following components to the valve body:
 - The reverse brake sequence valve spring.
 - The clutch sequence valve.
 - The 3-2 kickdown control valve plug.
 - The needle roller pin.
5. Install the 6 valve body balls. See **Fig. 95** .

Lower Valve Body Disassembly

NOTE: **When disassembling the valve body halves, keep all valve springs, spring seats and plugs within their respective valves. Most valve springs are of different sizes and CANNOT be interchanged. Verify that all parts are clean and dry before assembly.**

1. Remove the following components from the valve body:
 - The bypass valve. See **Fig. 96** .
 - The bypass valve spring.
 - The check ball.
 - The valve dampening spring.
 - The valve body ball.
 - The ball valve spring.
2. Remove the following lower valve body plate components from the valve body:
 - The bolts.
 - The gasket.
 - The plate. See **Fig. 109** .
3. Remove the following TCC lock-up control valve plate components from the valve body:
 - The bolts.
 - The gasket.
 - The plate. See **Fig. 109** .

4. Remove the following pressure relief valve components while depressing the retainer:
 - The bolt.
 - The retainer. See **Fig. 110** .
 - The spring.
 - The ball.
5. Remove the following TCC solenoid components:
 - The bolt.
 - The solenoid. See **Fig. 111** .
 - The "O" Ring.
6. Remove the following shift solenoid components:
 - The bolts.
 - The shift solenoids. See **Fig. 112** .
 - The gasket.
 - The low coast modulator valve spring.
 - The intercoast modulator valve spring.
 - The intermediate coast modulator valves.
7. Remove the following TCC lock-up control sleeve components while depressing the sleeve:
 - The locating pin (using a magnet). See **Fig. 113** .
 - The sleeve.
 - The spring.

NOTE: **There are 4 step positions on the primary regulator valve sleeve. See Fig. 114 . Note the position of the sleeve for assembly.**

8. Remove the primary regulator valve retainer using a magnet.
9. Using a magnet, remove the following primary regulator valve components while depressing the sleeve:
 - The retainer.
 - The sleeve. See **Fig. 115** .
 - The plunger.
 - The spring.
 - The valve.
10. Clean all upper valve body components. Allow the components to air dry. Inspect all valves and valve bores for cracks, scoring, or other damage. Replace as necessary. Inspect all valve springs for distortion or damage. Replace as necessary.
11. Measure the free length and the outer coil diameter of all lower valve body springs using the vernier calipers. If any spring is not within the specifications as listed in the following table, replace as necessary. See **LOWER VALVE BODY SPRING SPECIFICATIONS (GRAND VITARA/VITARA)** or **LOWER VALVE BODY SPRING SPECIFICATIONS (SPORTAGE & TRACKER)** tables.

LOWER VALVE BODY SPRING SPECIFICATIONS (GRAND VITARA/VITARA)

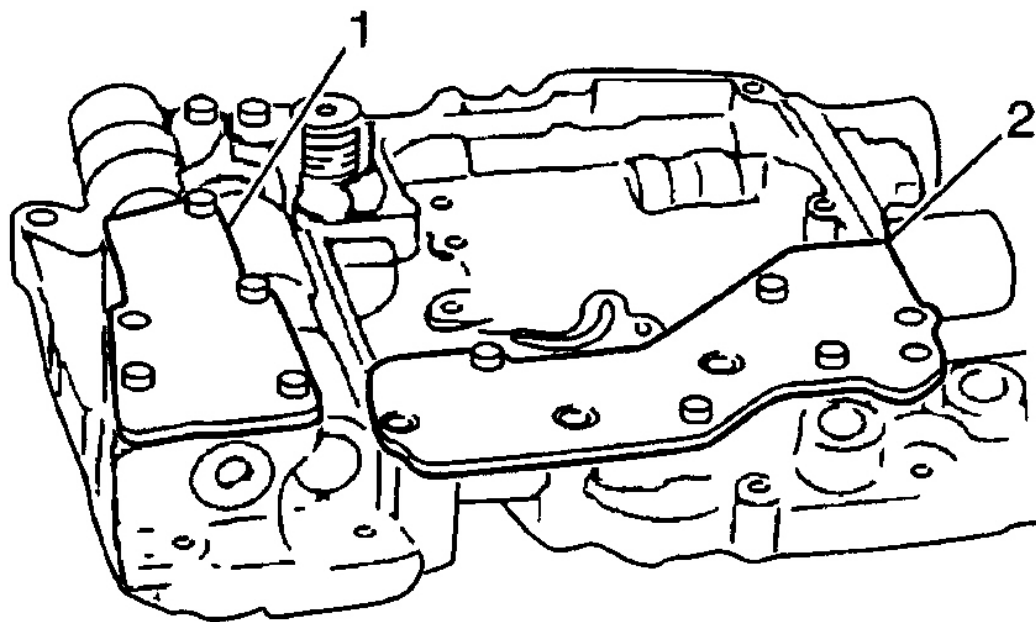
2001 Kia Sportage Limited

2001-03 AUTOMATIC TRANSMISSIONS Aisin Warner AW 03-72LE & AW 03-73LE Overhaul

Spring Name (No.) ⁽¹⁾	Diameter - In. (mm)	Free Length - In. (mm)
Ball Valve (#6)	.437 (13.13)	1.265 (32.14)
Bypass Valve (#8)	.544 (13.82)	1.138 (28.90)
Inter Coast Modulator Valve (#3)		
Grand Vitara	.394 (10.00)	1.008 (25.60)
Vitara	.356 (9.04)	1.073 (27.26)
Low Coast Modulator Valve (#2)	.394 (10.00)	1.395 (35.43)
Pressure Relief Valve (#5)	.517 (13.13)	1.265 (32.14)
Primary Regulator Valve (#1)	.536 (13.62)	1.980 (50.28)
TCC Lock-Up Control Valve (#4)	.449 (11.40)	1.283 (32.60)
Valve Damping (#7)	.195 (4.95)	0.787 (20.00)
(1) See Fig. 116 and Fig. 117 .		

LOWER VALVE BODY SPRING SPECIFICATIONS (SPORTAGE & TRACKER)

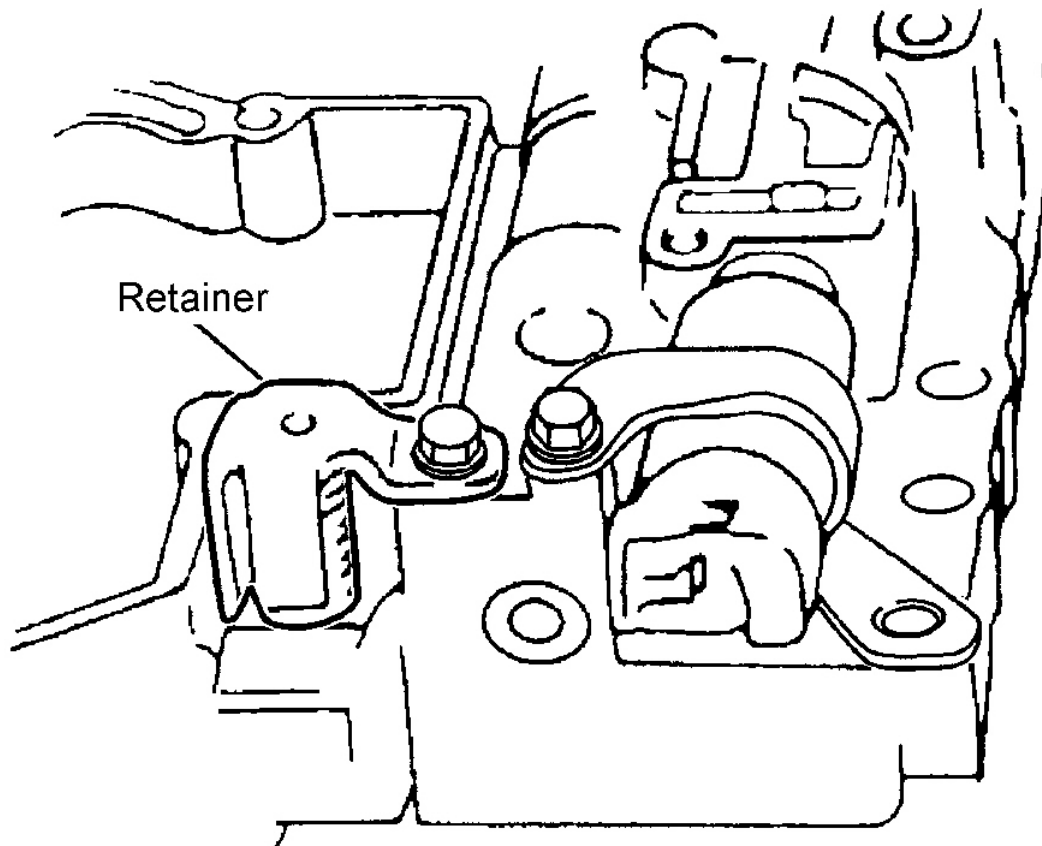
Spring Name (No.) ⁽¹⁾	Diameter - In. (mm)	Free Length - In. (mm)
Ball Valve (#6)	.437 (11.10)	1.265 (32.13)
Bypass Valve (#8)	.544 (13.82)	1.312 (33.32)
Inter Coast Modulator Valve (#3)	.394 (10.01)	1.395 (35.42)
Low Coast Modulator Valve (#2)	.394 (10.01)	1.667 (42.34)
Pressure Relief Valve (#5)	.517 (13.13)	1.501 (38.13)
Primary Regulator Valve (#1)	.677 (17.20)	2.216 (56.30)
TCC Lock-Up Control Valve (#4)	.445 (11.30)	1.362 (34.59)
Valve Damping (#7)	.195 (4.95)	.787 (20.00)
(1) See Fig. 116 and Fig. 117 .		



1. Lower Valve Body Plate
2. TCC Lock-Up Control Valve Plate

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Fig. 109: Identifying Lower Valve Body Components
Courtesy of GENERAL MOTORS CORP.



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Fig. 110: Identifying Pressure Relief Valve Retainer
Courtesy of GENERAL MOTORS CORP.

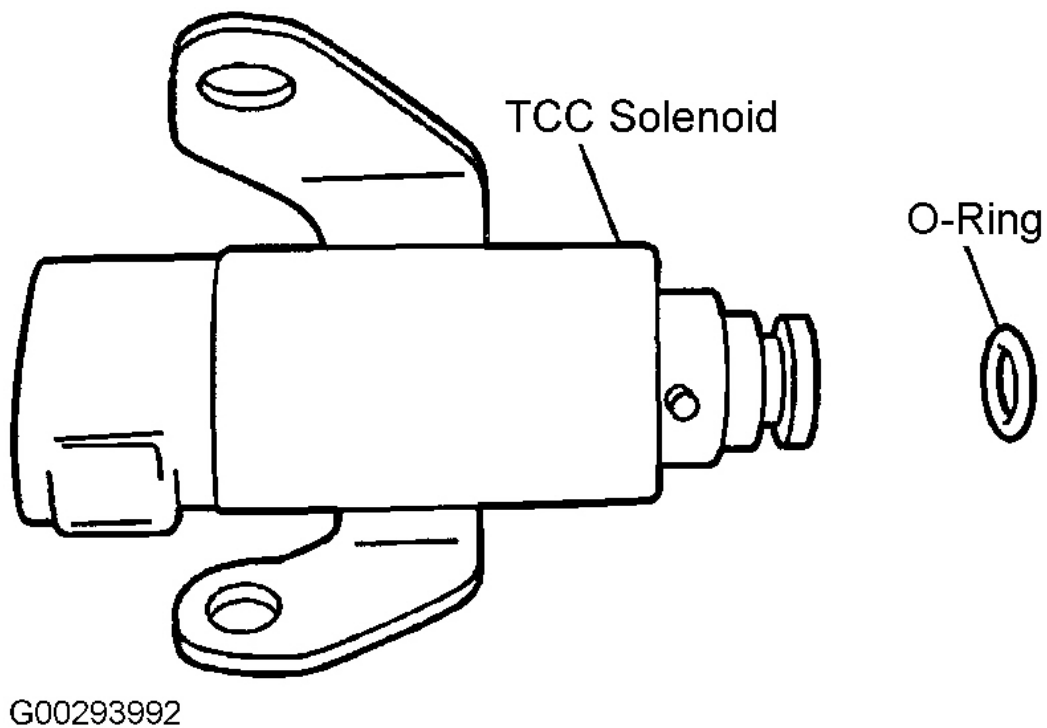
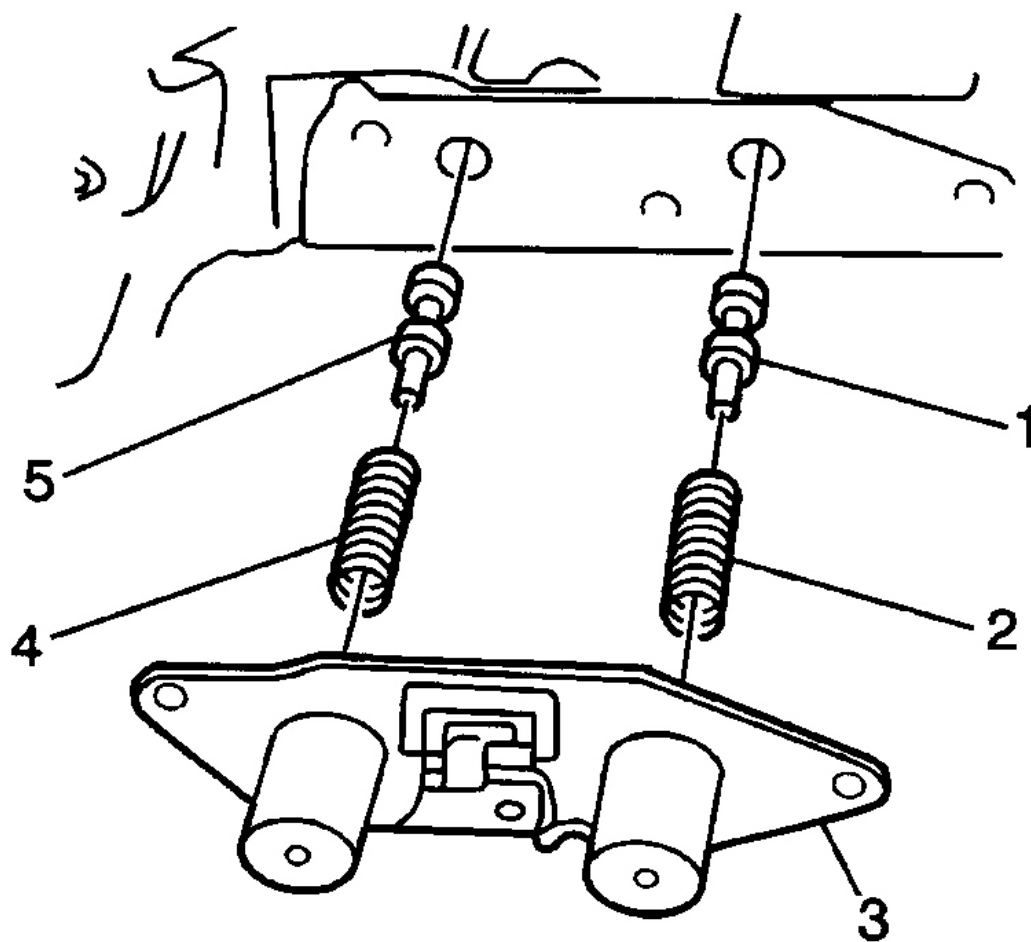


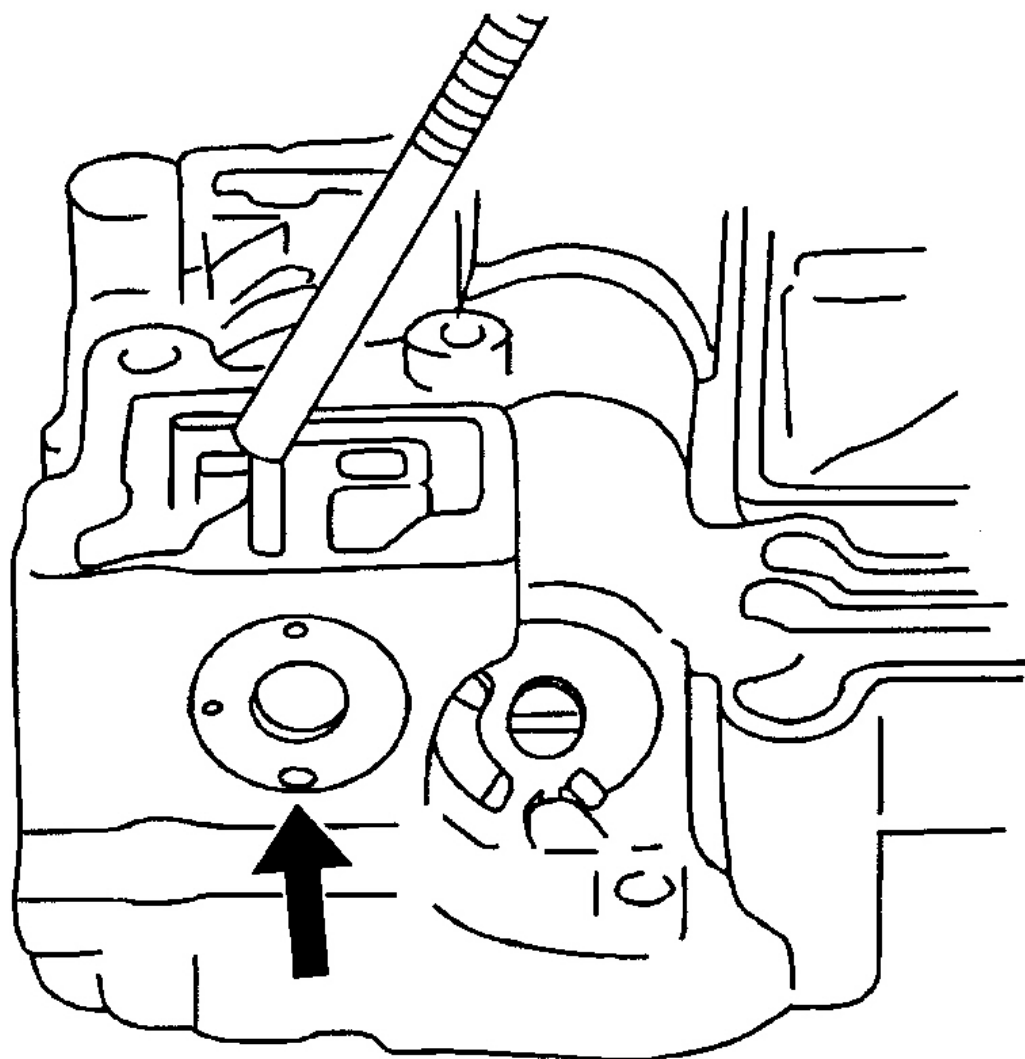
Fig. 111: Identifying TCC Solenoid
Courtesy of GENERAL MOTORS CORP.



1. Intercoast Modulator Valve
2. Spring
3. Shift Solenoid
4. Spring
5. Intermediate Coast Modulator Valve

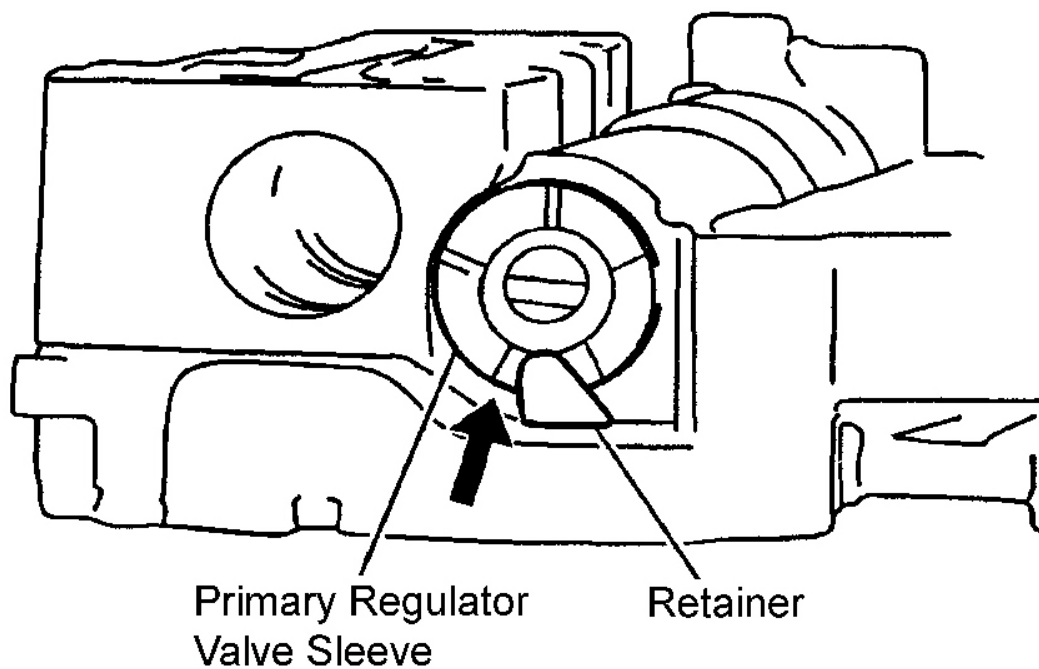
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Fig. 112: Removing & Installing Shift Solenoids
 Courtesy of GENERAL MOTORS CORP.



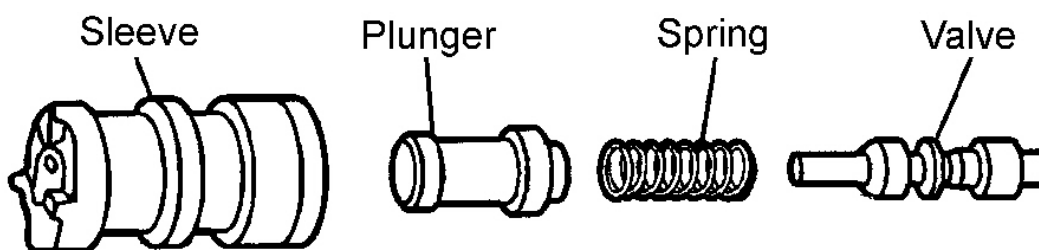
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Fig. 113: Removing TCC Lock-Up Control Sleeve Locating Pin
Courtesy of GENERAL MOTORS CORP.



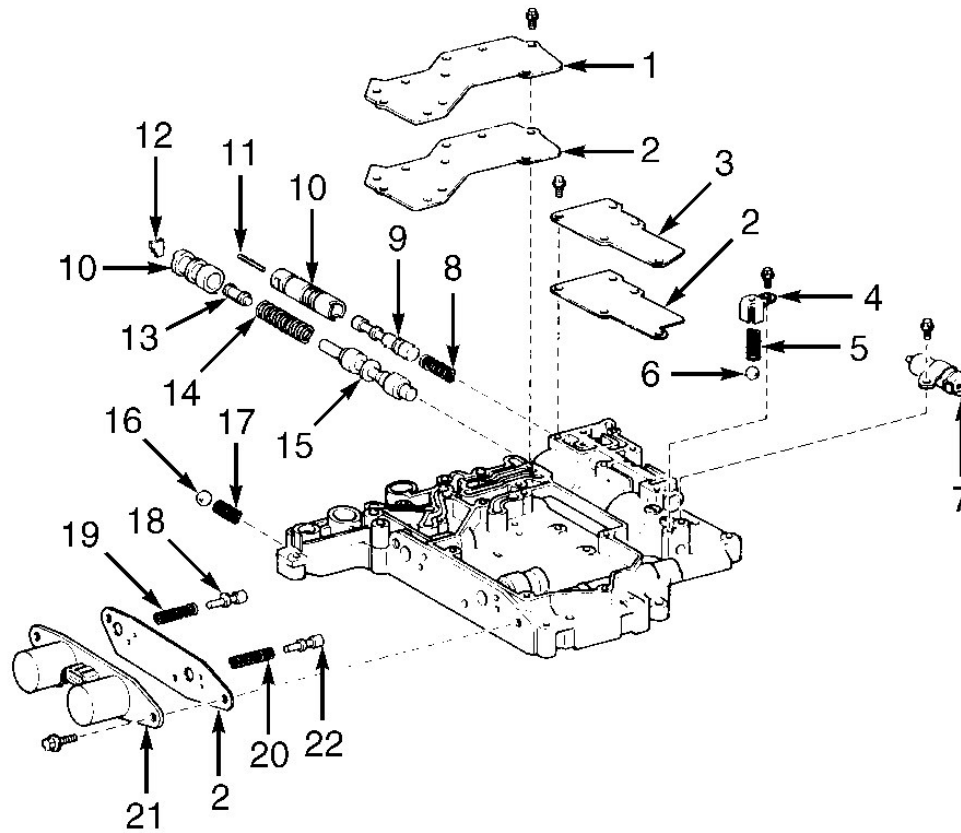
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Fig. 114: Identifying Primary Regulator Valve Sleeve & Retainer
Courtesy of GENERAL MOTORS CORP.



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Fig. 115: Identifying Primary Regulator Valve Components
Courtesy of GENERAL MOTORS CORP.



- | | |
|-----------------------------|----------------------------------|
| 1. Valve Body Cover (Rear) | 12. Retainer |
| 2. Gasket | 13. Plunger |
| 3. Valve Body Cover (Front) | 14. Spring No. 1 |
| 4. Pressure Relief Valve | 15. Primary Regulator Valve |
| 5. Spring No. 5 | 16. Cooler Return Check Ball |
| 6. Check Ball | 17. Spring No. 6 |
| 7. No. 3 Solenoid (TCC) | 18. Intermediate Modulator Valve |
| 8. Spring No. 4 | 19. Spring No. 3 |
| 9. Lock-Up Relay Valve | 20. Spring No. 2 |
| 10. Sleeve | 21. No. 1 & No. 2 Shift Solenoid |
| 11. Pin | 22. Low Coast Modulator Valve |

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Fig. 116: Exploded View Of Lower Valve Body
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

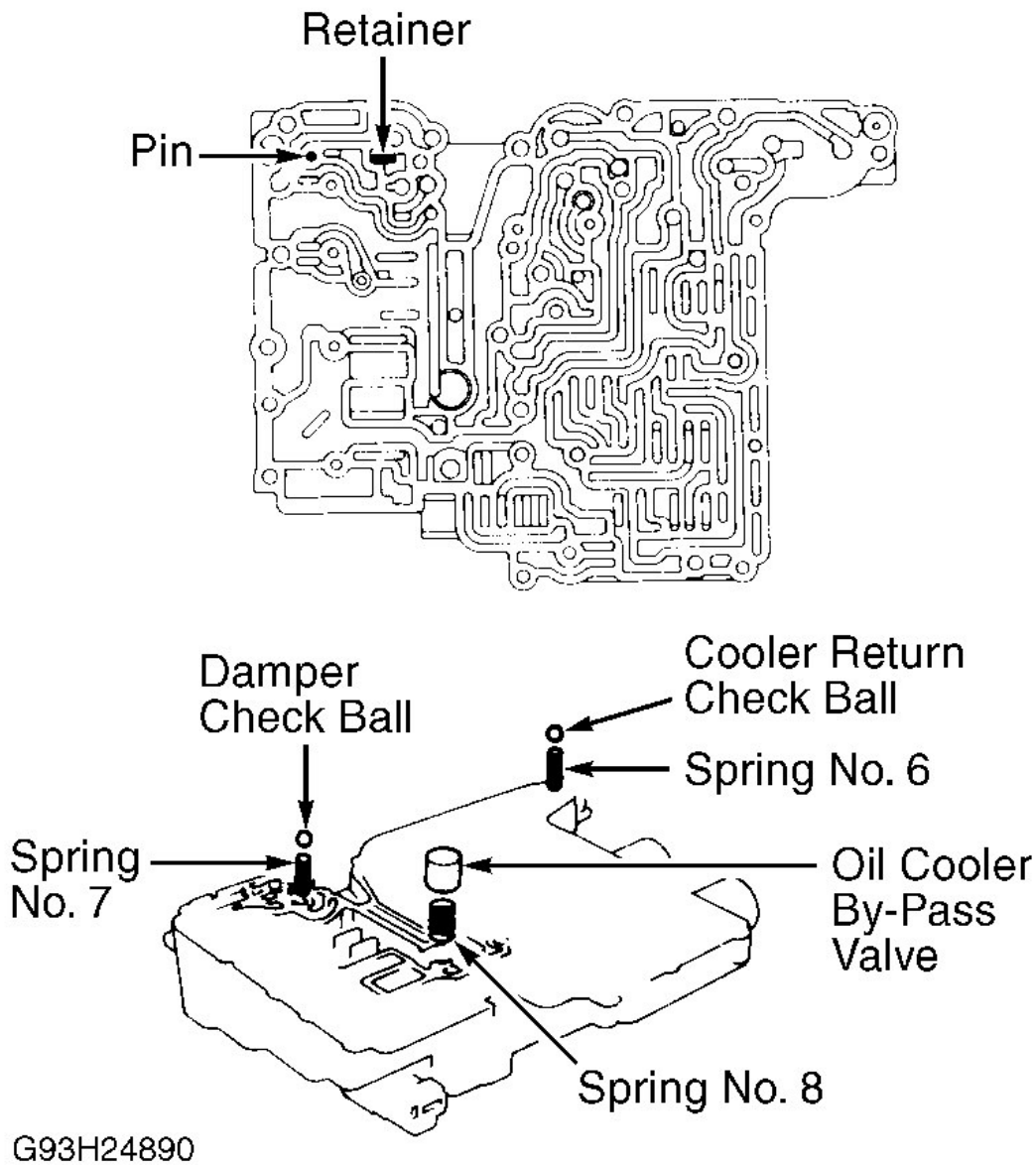


Fig. 117: Identifying Lower Valve Body Check Ball Pin, Spring & Retainer Locations
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Lower Valve Body Reassembly

1. Install the following primary regulator valve components:
 - The valve. See **Fig. 115** .
 - The spring.
 - The plunger.

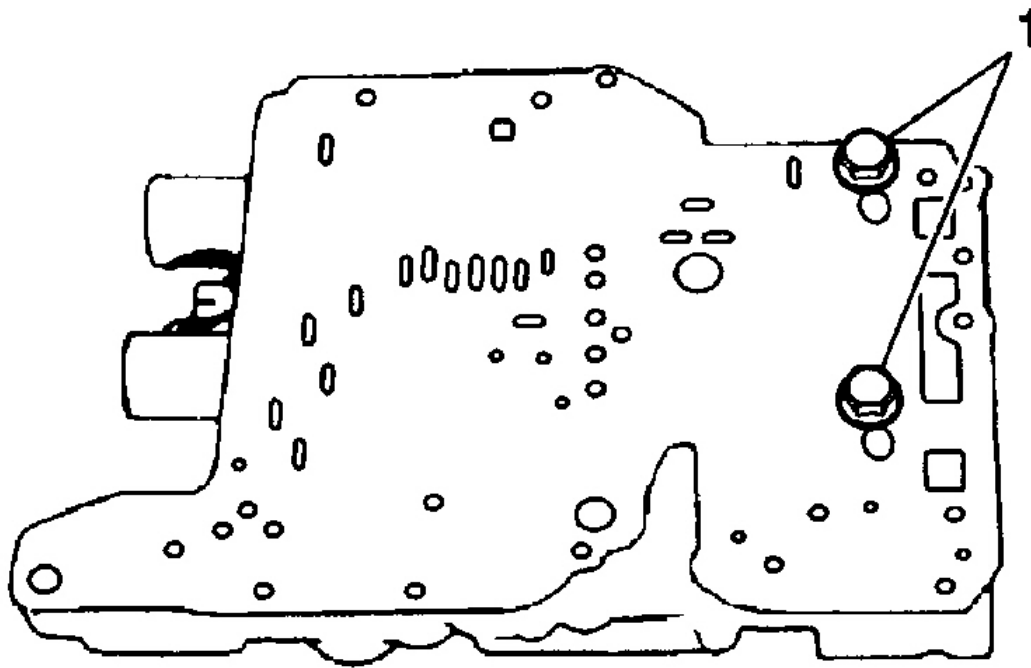
- The sleeve.
 - The sleeve retainer.
2. Install the following TCC lock-up control valve components. See **Fig. 113** :
 - The spring.
 - The sleeve.
 - The locating pin.
 3. Install the following shift solenoid components:
 - The intermediate coast modulator valves. See **Fig. 112** .
 - The intercoast modulator valve spring.
 - The low coast modulator valve spring.
 - The gasket.
 - The solenoid.
 - The bolts. Tighten shift solenoid bolts to specification. See **TORQUE SPECIFICATIONS** .
 4. Install a NEW "O" Ring to the TCC solenoid. See **Fig. 111** . Install the TCC solenoid. Install the TCC solenoid bolt. Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .
 5. Install the following pressure relief valve components:
 - The ball.
 - The spring.
 - The retainer. See **Fig. 110** .
 - The bolt. Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .
 6. Install the following TCC lock-up control valve plate components:
 - The gasket.
 - The plate.
 - The bolts. Tighten TCC lock-up control valve plate bolts to specification. See **TORQUE SPECIFICATIONS** .
 7. Install the following lower valve body plate components:
 - The gasket.
 - The plate.
 - The bolts. Tighten lower valve body plate bolts to specification. See **TORQUE SPECIFICATIONS** .
 8. Install the following components to the valve body:
 - The ball valve spring.
 - The valve body ball. See **Fig. 109** .
 - The valve dampening spring.
 - The check ball.
 - The bypass valve spring.
 - The bypass valve.

Valve Body Assembly Installation

NOTE: Torque sequence and specification is very important to valve body operation. If bolts are torqued at random, valve bores may become distorted and inhibit valve operation. Ensure valve body and gasket holes are aligned prior to each torque sequence. **DO NOT** use air powered tools when assembling the valve bodies.

1. Place the separator plate with the NEW gasket in the lower valve body. Temporarily install 2 plate bolts. See **Fig. 118** .
2. Install a NEW upper valve body gasket to the lower valve body. See **Fig. 119** . Install the upper valve body gasket and the lower valve body together to the rear upper valve body.
3. Handstart the 3 lower valve body bolts. See **Fig. 120** . Turn the lower valve body upside down. Handstart the 4 upper valve body bolts. See **Fig. 121** .
4. Remove the 2 temporarily installed bolts. Install the lower valve body to the front upper valve body. Handstart the remaining 3 lower valve body bolts. See **Fig. 122** .
5. Turn over the valve body assembly. Handstart the 5 front upper valve body bolts. See **Fig. 123** . Tighten the upper valve body bolts to specification. See **Fig. 91** . See **TORQUE SPECIFICATIONS** .
6. Tighten the lower valve body bolts to specification. See **Fig. 92** . See **TORQUE SPECIFICATIONS** .
7. Install the following components to the valve body:
 - The manual valve. See **Fig. 90** .
 - The detent spring and plate.
 - The detent spring bolt.

Tighten the detent spring bolt to specification. See **TORQUE SPECIFICATIONS** .



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Fig. 118: Installing Temporary Valve Body Retainer Bolts
Courtesy of GENERAL MOTORS CORP.

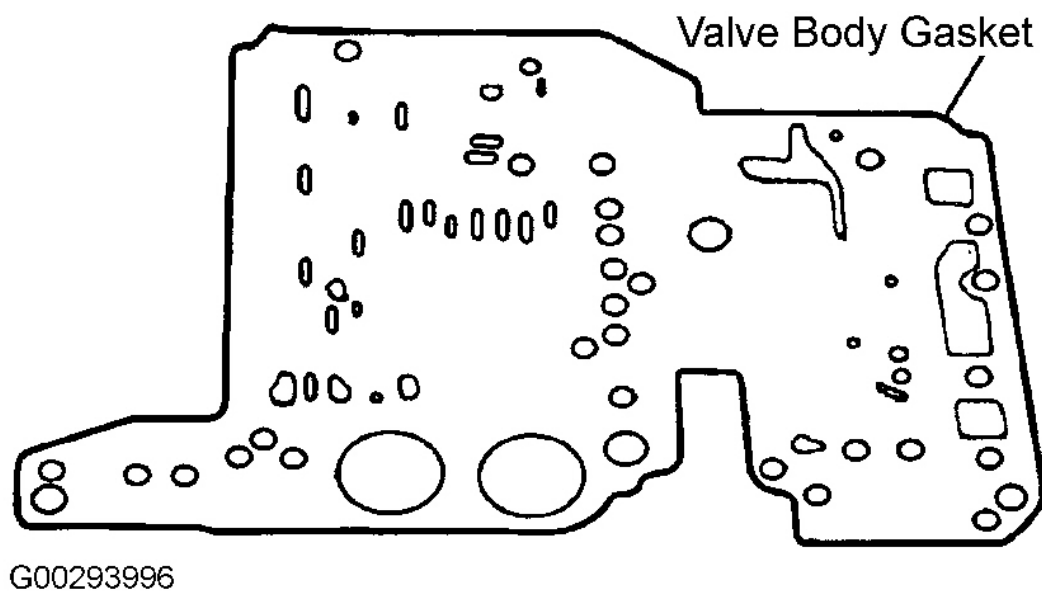
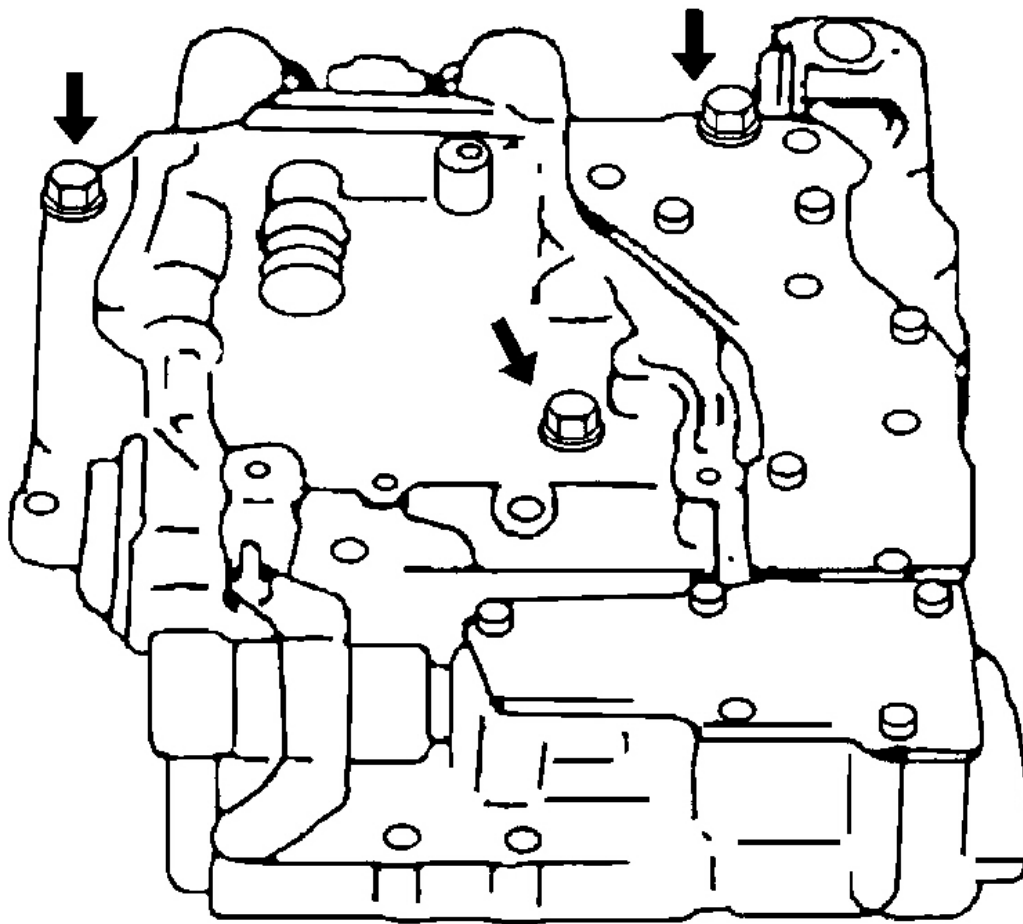
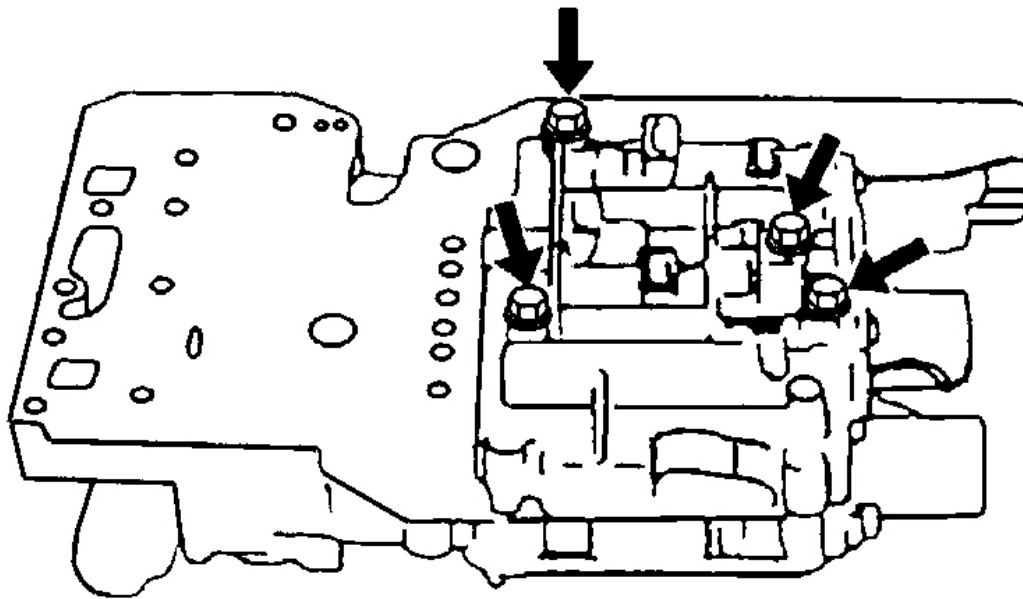


Fig. 119: Identifying Upper Valve Body Gasket
Courtesy of GENERAL MOTORS CORP.



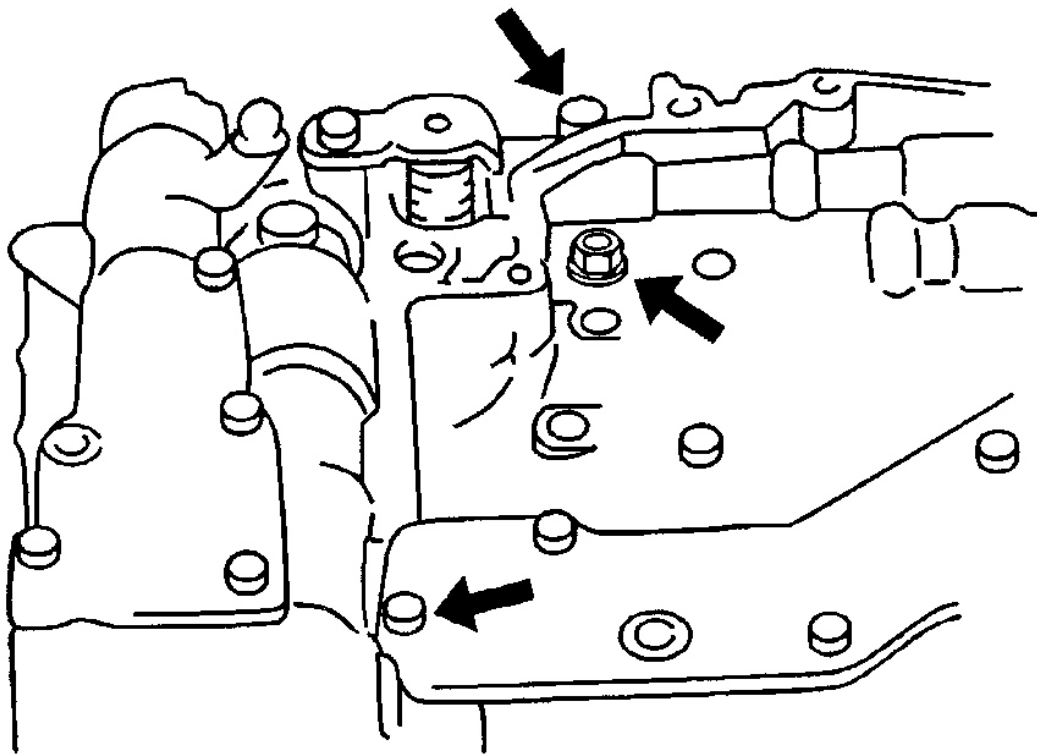
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Fig. 120: Installing 3 Lower Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.



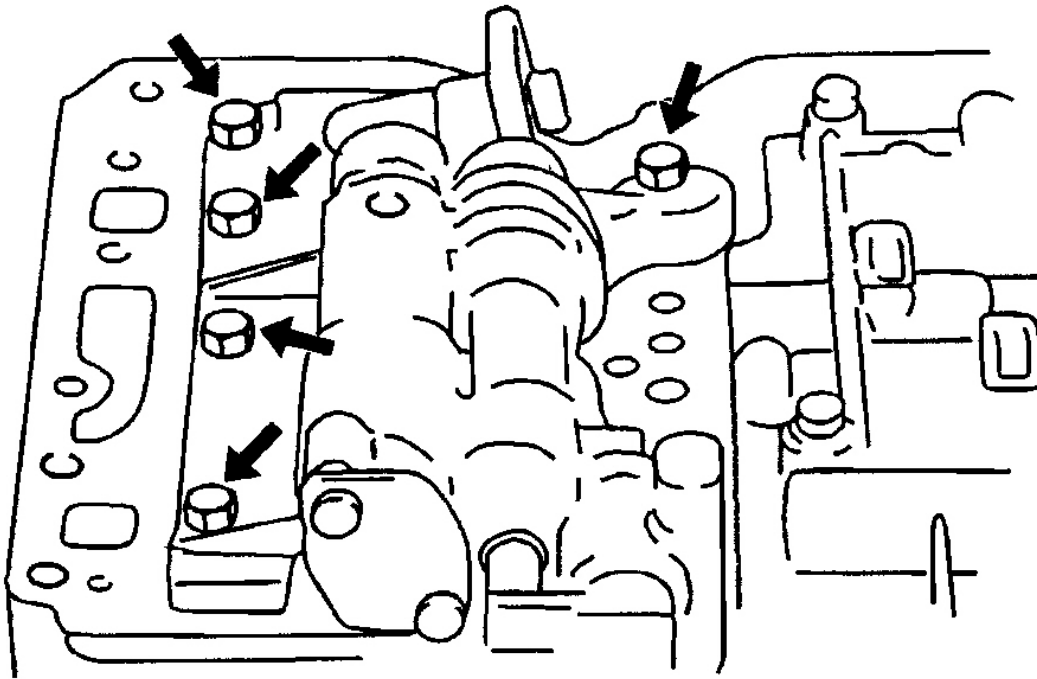
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Fig. 121: Installing 4 Upper Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.



G00293997

Fig. 122: Installing 3 Lower Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.



G00293998

Fig. 123: Installing 5 Front Upper Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.

TRANSMISSION REASSEMBLY

NOTE: Clutch discs should be soaked in ATF for 15 minutes prior to installation. Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.

REVERSE BRAKE PISTON

Installation

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

1. Install NEW "O" Rings at the following locations:
 - The inner reverse brake piston.
 - The reaction sleeve.
 - The outer (secondary) reverse brake piston.
2. Install the following components to the transmission case:

- The outer reverse brake piston.
- The reaction sleeve.
- The inner reverse brake piston.
- The brake piston return spring.

NOTE: Install snap ring so that opening in snap ring does not align with any of 3 lugs of spring seat.

3. Compress the reverse brake piston using Clutch Spring Compressors in order to install the snap ring. See **Fig. 23** .

PLANETARY GEARS & OUTPUT SHAFT

Installation

NOTE: Clutch discs should be soaked in ATF for 15 minutes prior to installation. Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.

NOTE: Place transmission in upright position and secure in place.

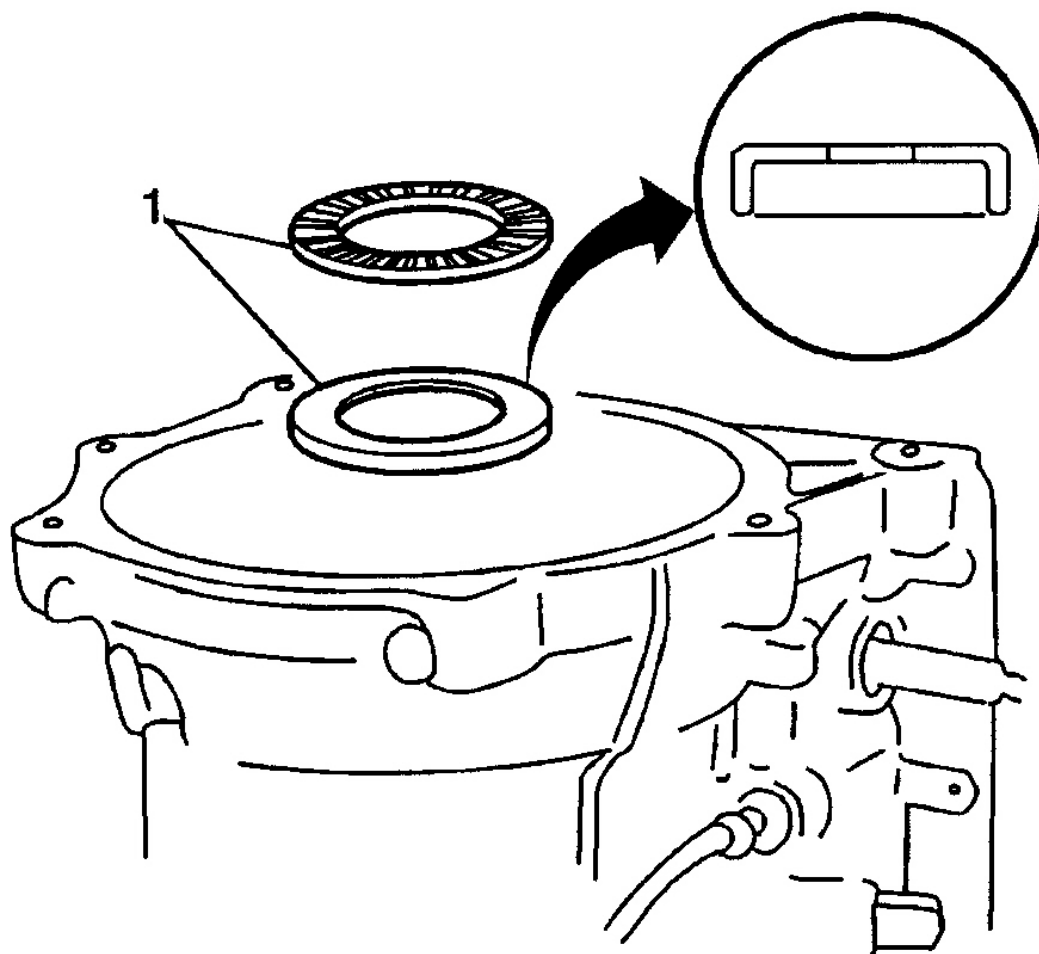
NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

1. Install the output shaft thrust bearing and race to the transmission case. See **Fig. 124** .
2. Install the brake applying tube and leaf spring to the transmission case. Align the tube lug with the cutout in the case. See **Fig. 27** .
3. Install the planetary gear/output shaft together to the transmission case. See **Fig. 125** . Install the reverse brake plates and discs in the following order:
 - A. The plate.
 - B. The disc.
 - C. The plate.
 - D. The disc.
 - E. The plate.
 - F. The disc.
 - G. The plate.
 - H. The disc.
4. Measure the reverse brake plate-to-transmission case lug clearance. See **Fig. 126** :
 - A. Take the measurement: Reverse brake plate-to-transmission case lug clearance should be to specification. See **TRANSMISSION SPECIFICATIONS** .
 - B. If clearance is less than the specification, perform the following steps:
 - Inspect for proper installation.

- Inspect for dust or fluid on the reverse brake disc.
- C. If clearance is more than the specification, replace one of the following components:
- The reverse brake disc.
 - The reverse brake plate.
 - The reverse backing plate.
5. Install the reverse brake reaction plate to the transmission case. Align the notch in the reverse brake reaction plate with the leaf spring. See **Fig. 127** .
 6. Install the snap ring to the front of the reverse brake reaction plate. See **Fig. 26** .

LOW & REVERSE BRAKE CLEARANCE SPECIFICATIONS

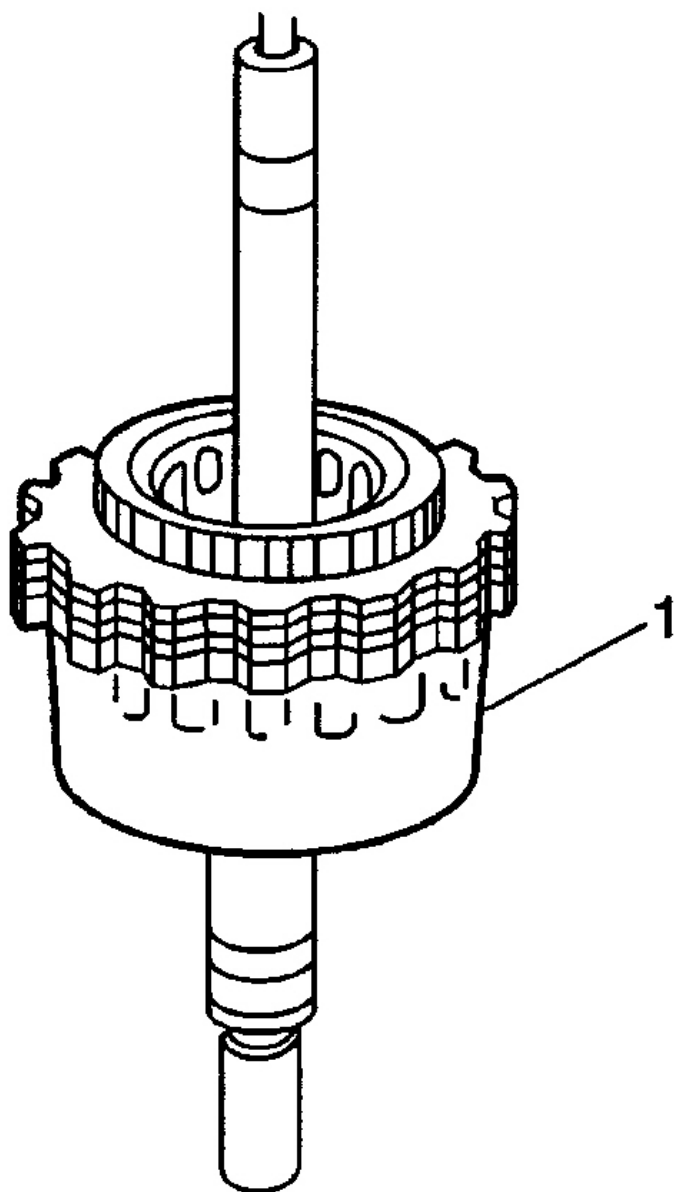
Application	Clearance - In. (mm)
Grand Vitara	.024-.103 (.61-2.64)
Sportage & Tracker	.029-.098 (.72-2.50)
Vitara	
1.6L	.022-.090 (.56-2.29)
2.0L	.024-.103 (.61-2.64)



1. Output Shaft Thrust Bearing & Race

G00293999

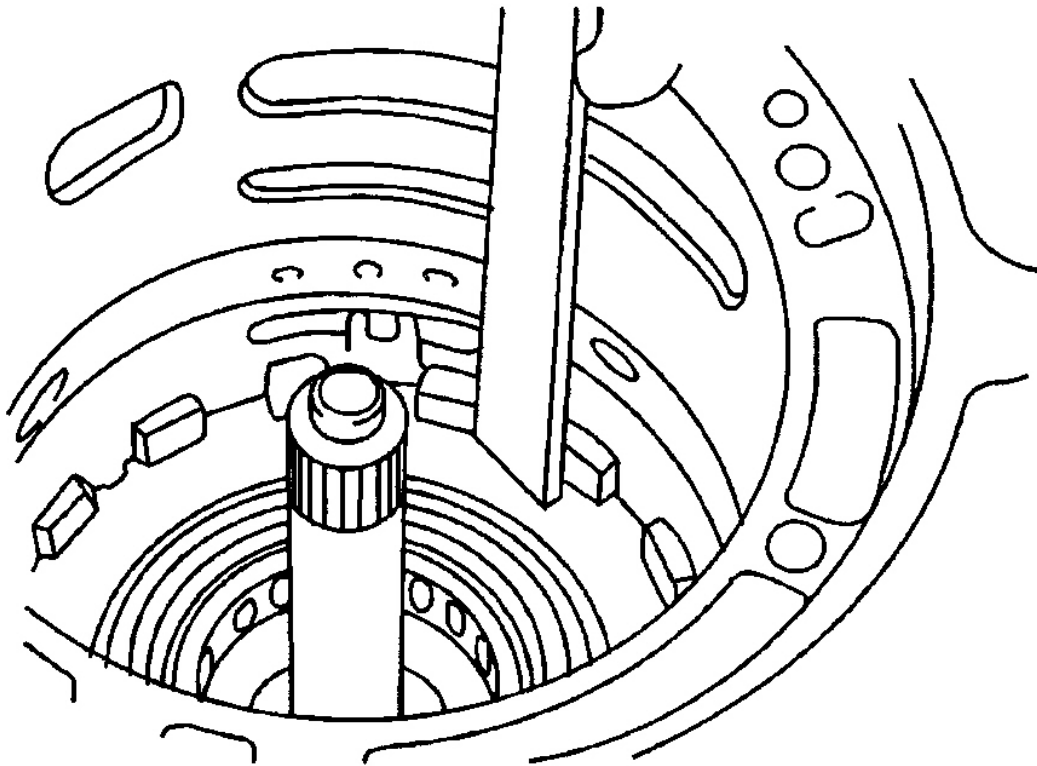
Fig. 124: Installing Output Shaft Thrust Bearing & Race
Courtesy of GENERAL MOTORS CORP.



1. Planetary Gear/Output Shaft

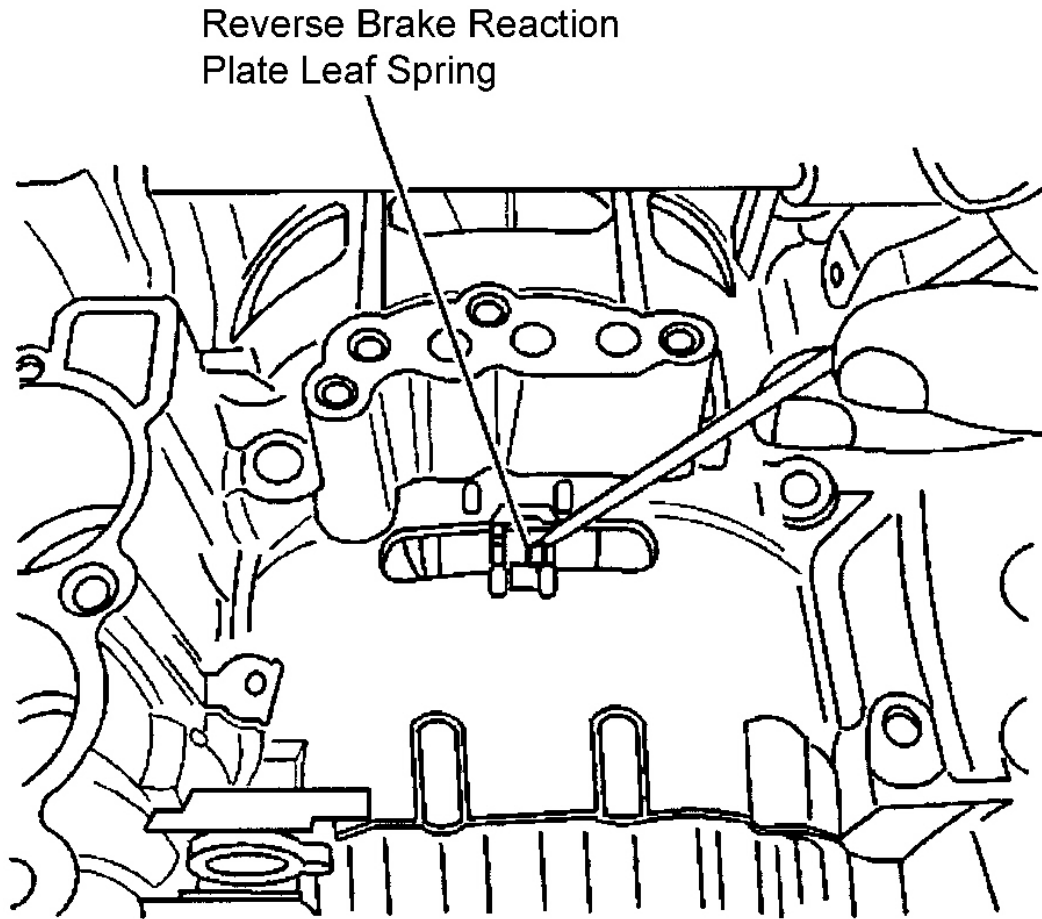
G00294000

Fig. 125: Installing Planetary Gear/Output Shaft Together
Courtesy of GENERAL MOTORS CORP.



G00294001

Fig. 126: Measuring Reverse Brake Plate-To-Transmission Case Lug Clearance
Courtesy of GENERAL MOTORS CORP.



G00294002

Fig. 127: Aligning Reverse Brake Reaction Plate Notch With Leaf Spring
Courtesy of GENERAL MOTORS CORP.

CENTER SUPPORT & PLANETARY SUN GEAR

Reassembly

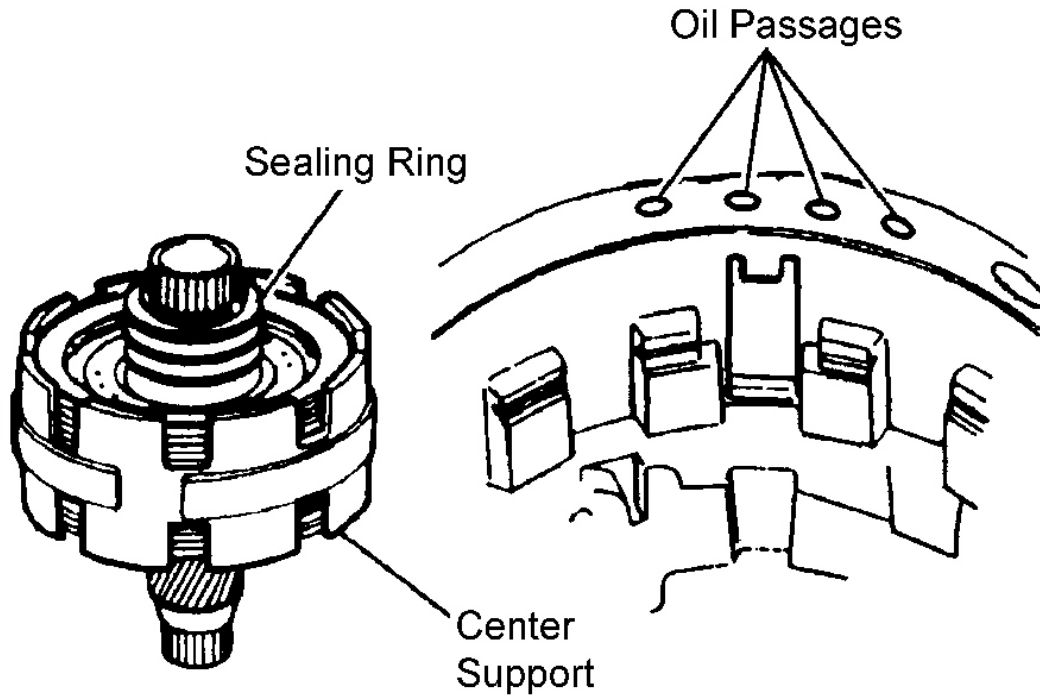
NOTE: Clutch discs should be soaked in ATF for 15 minutes prior to installation. Lubricate all parts with ATF. Coat thrust bearings and races with Transjel(R) Transmission Assembly Lubricant or petroleum jelly.

1. Install the center support to the transmission case, aligning the oil passages in the case with the center support mounting bolt holes. See **Fig. 128**.

NOTE: Unless retaining direct clutch ring of planetary sun gear is held, brake

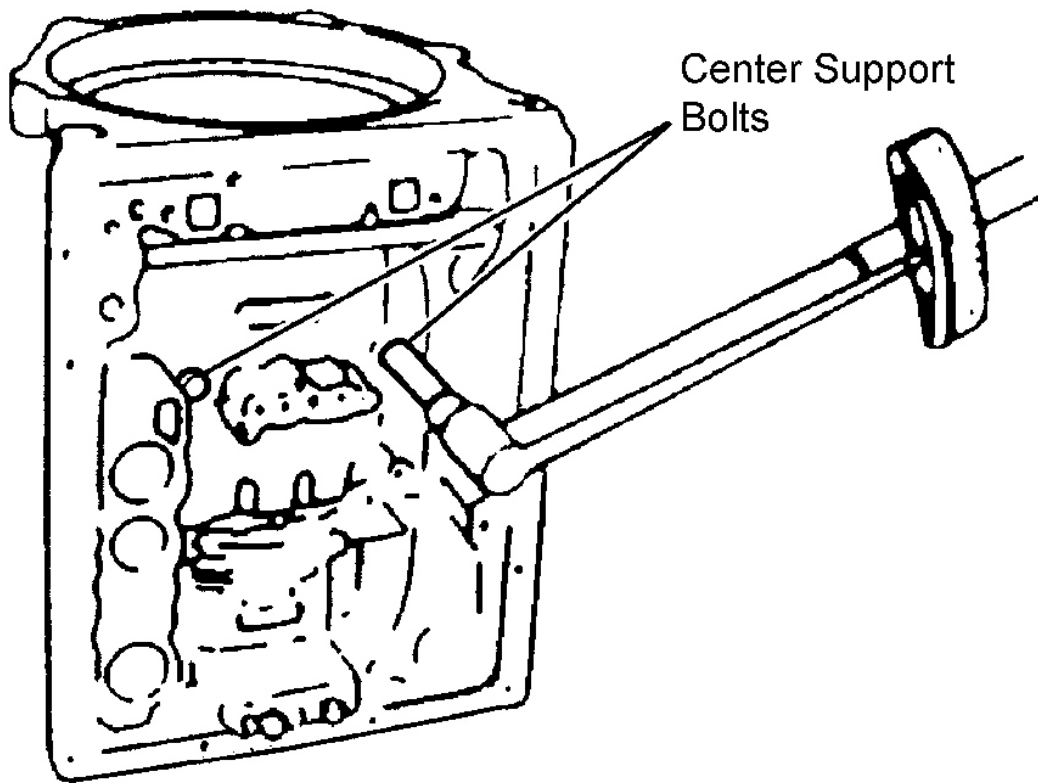
valve will get off center support, making it impossible to align oil passages with bolt holes.

2. Install the center support bolts. See **Fig. 129** . Tighten center support bolts to specification. See **TORQUE SPECIFICATIONS** .



G00294003

Fig. 128: Installing Center Support-To-Transmission Case
 Courtesy of GENERAL MOTORS CORP.



G00294004

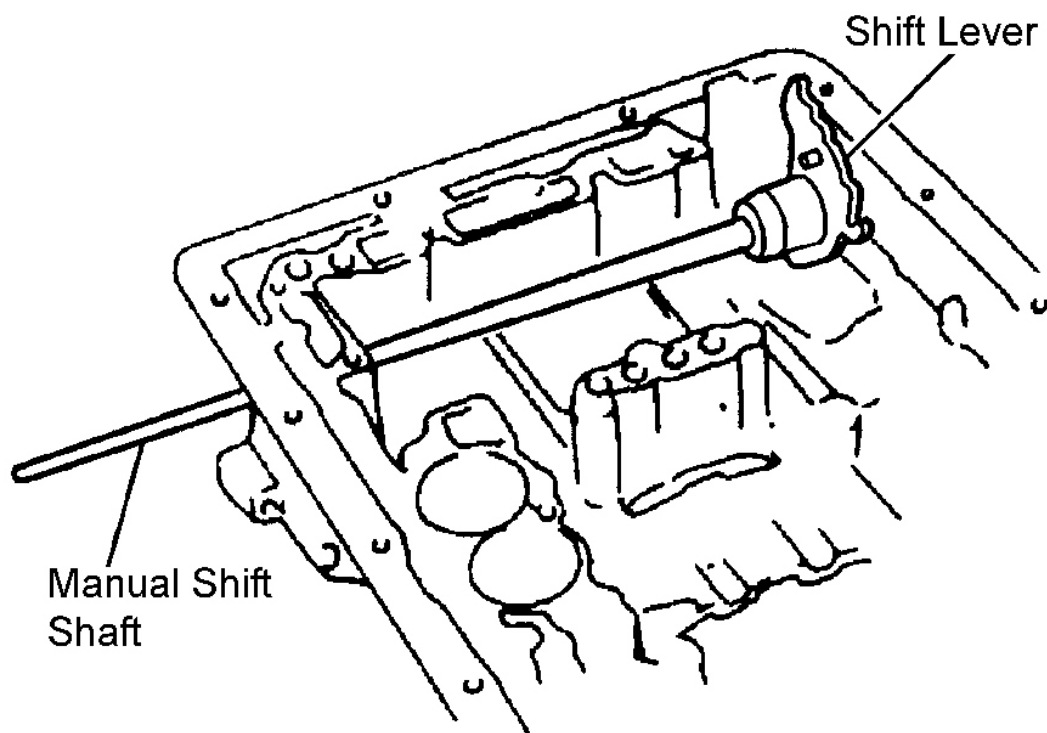
Fig. 129: Identifying Center Support Bolts
Courtesy of GENERAL MOTORS CORP.

PARKING PAWL AND MANUAL SHIFT LINKAGE

Installation

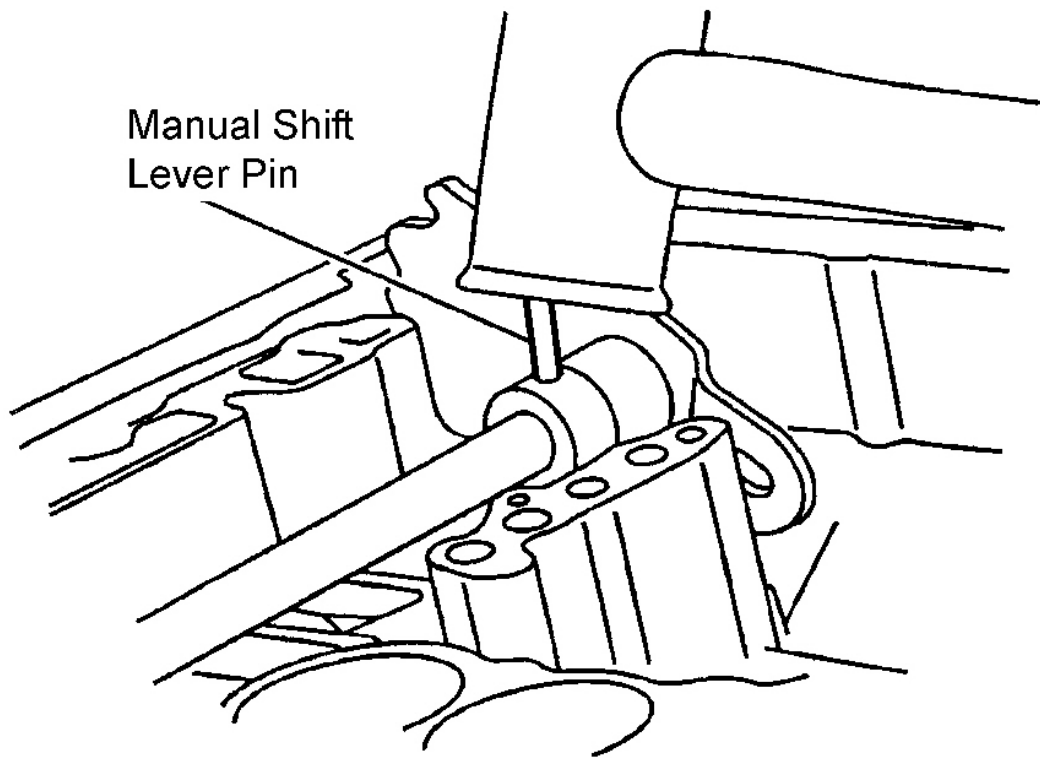
1. Install NEW manual shaft oil seals to both sides of the transmission case using a socket and a hammer. Lubricate NEW oil seals with ATF.
2. Install the manual shift shaft and shift lever to the transmission case. See **Fig. 130**.
3. Install the manual shift lever pin to the manual shift lever hub using a hammer. See **Fig. 131**.
4. Slide the manual lever hub protection sleeve over the manual detent lever hub using a hammer and a chisel. See **Fig. 132**. Install the parking pawl rod to the manual shift shaft. See **Fig. 133**.
5. Install the following parking pawl components to the transmission case:
 - The pawl. See **Fig. 134**.
 - The pivot pin.
 - The torsion spring.

- The plate.
- The plate bolts. Tighten plate bolts to specification. See **TORQUE SPECIFICATIONS** .



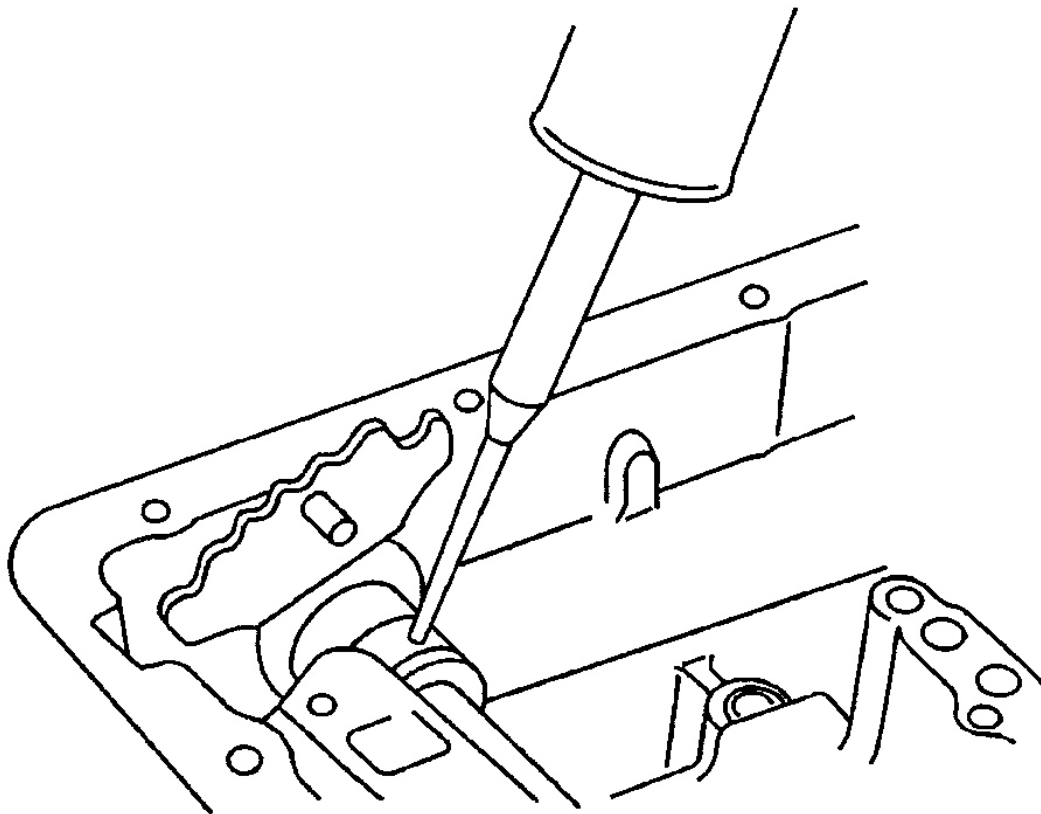
G00294005

Fig. 130: Identifying Manual Shift Shaft & Lever
Courtesy of GENERAL MOTORS CORP.



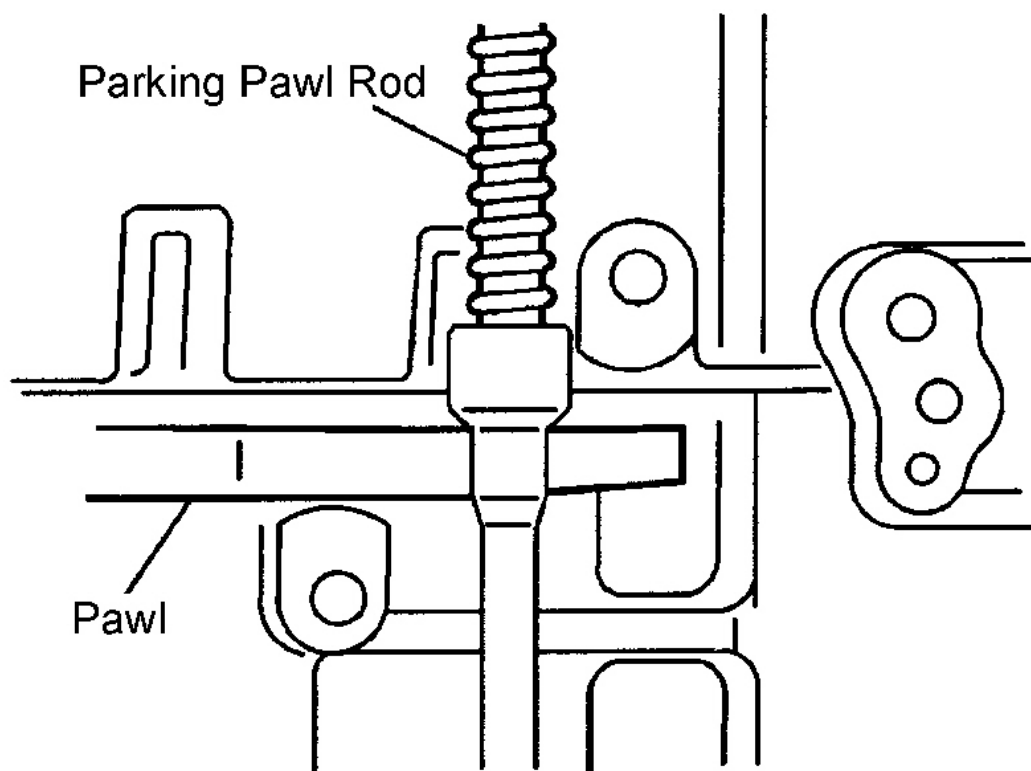
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Fig. 131: Installing Manual Shift Lever Pin
Courtesy of GENERAL MOTORS CORP.



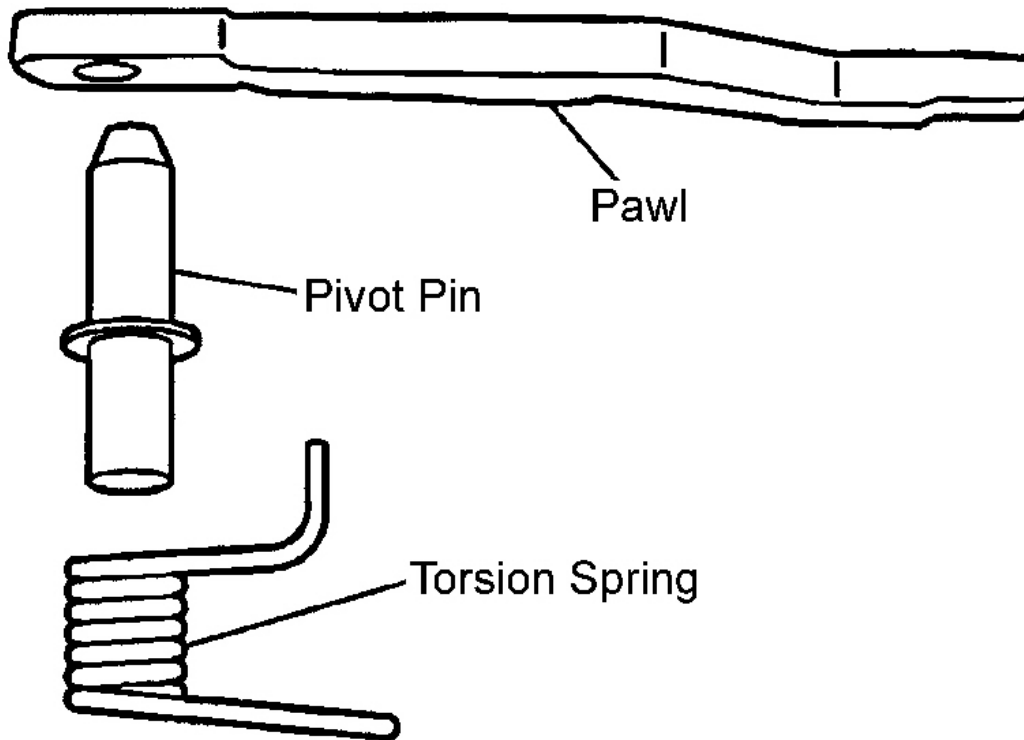
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Fig. 132: Installing Manual Lever Hub Protection Sleeve
Courtesy of GENERAL MOTORS CORP.



G00294008

Fig. 133: Identifying Parking Pawl Rod
Courtesy of GENERAL MOTORS CORP.



G00294009

Fig. 134: Identifying Parking Pawl Components
Courtesy of GENERAL MOTORS CORP.

FORWARD AND DIRECT CLUTCH ASSEMBLY

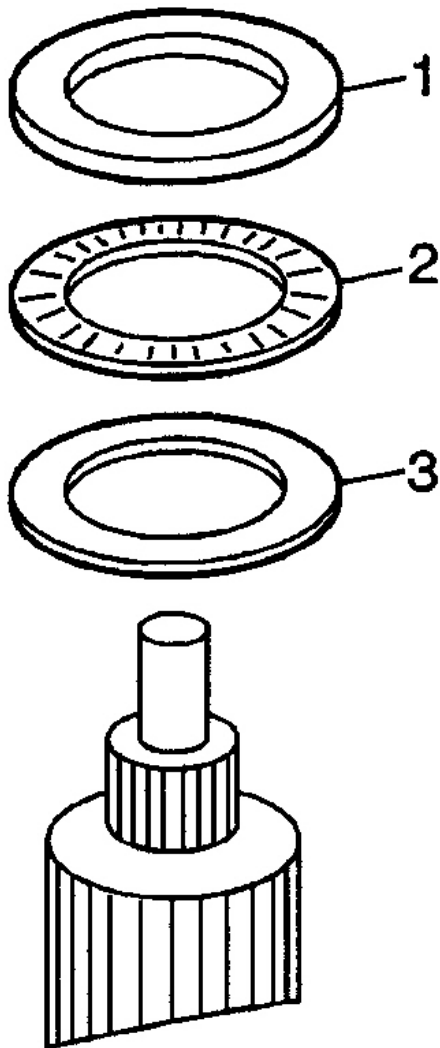
Installation

NOTE: For special tool part numbers, refer to special tools list. See SPECIAL TOOLS .

1. Install the direct clutch to the transmission case. Apply Transjcl(R) Transmission Assembly Lubricant to the thrust bearing and races.
2. Install the following components to the forward clutch:
 - The rear planetary ring gear thrust bearing race. See Fig. 135 .
 - The thrust bearing.
 - The forward clutch No. 1 race.
3. Carefully install the forward clutch to the transmission case in order to prevent dropping the thrust bearing and races. See Fig. 136 .
4. Measure the height difference between the forward clutch input shaft and the transmission case using

vernier calipers. See **Fig. 137** . See **TRANSMISSION SPECIFICATIONS** .

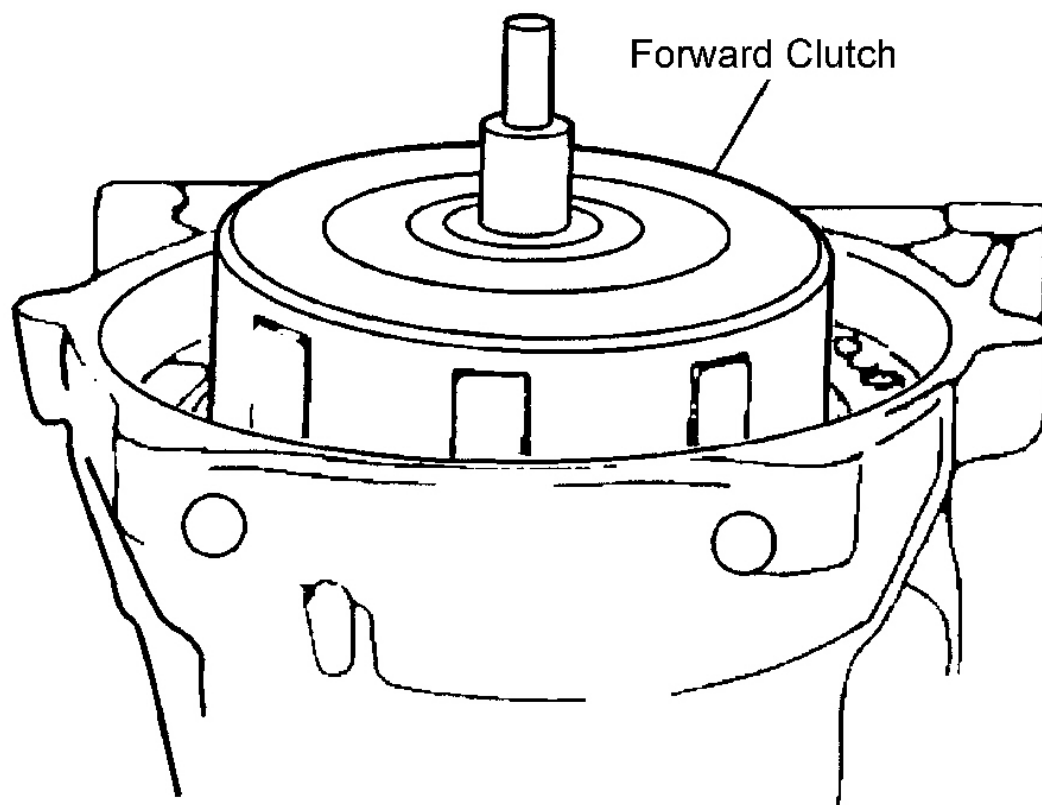
5. Remove and reinstall if less than the specification. Apply Transjel to the forward thrust bearing and race. Install the forward thrust bearing and race to the front of the forward clutch. See **Fig. 138** .



1. Forward Clutch No. 1 Race
2. Thrust Bearing
3. Rear Planetary Ring Gear
Thrust Bearing Race

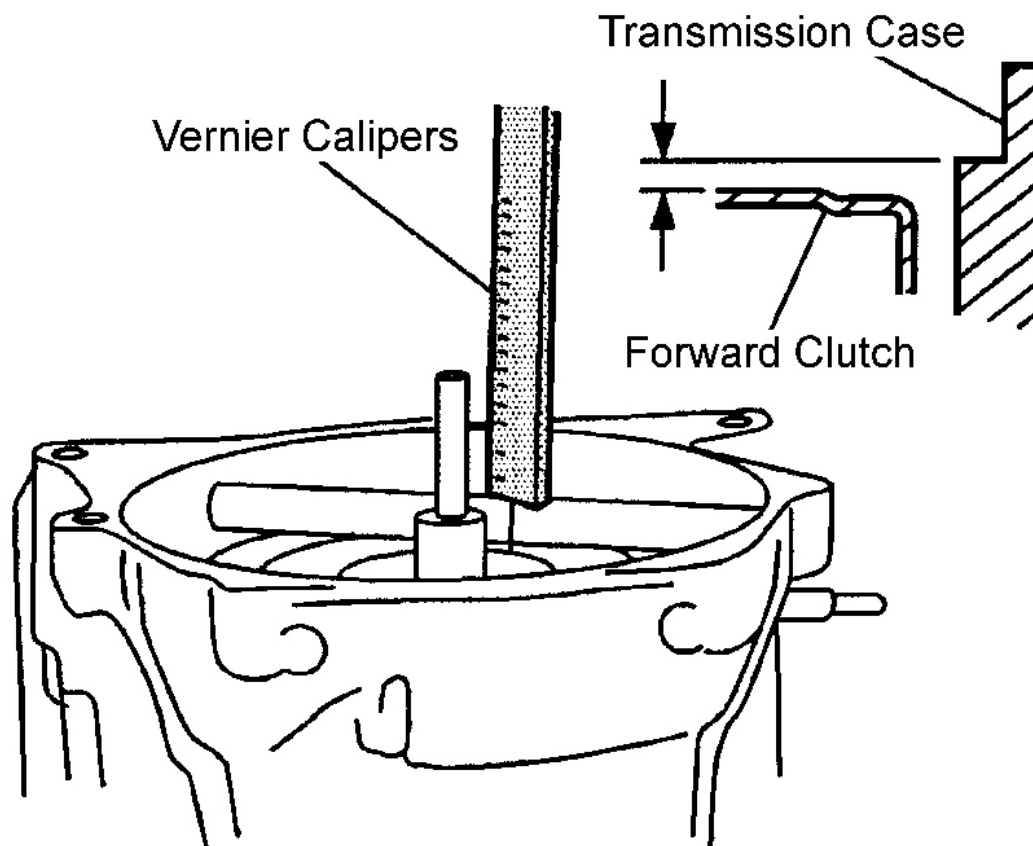
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Fig. 135: Installing Forward Clutch Components
Courtesy of GENERAL MOTORS CORP.



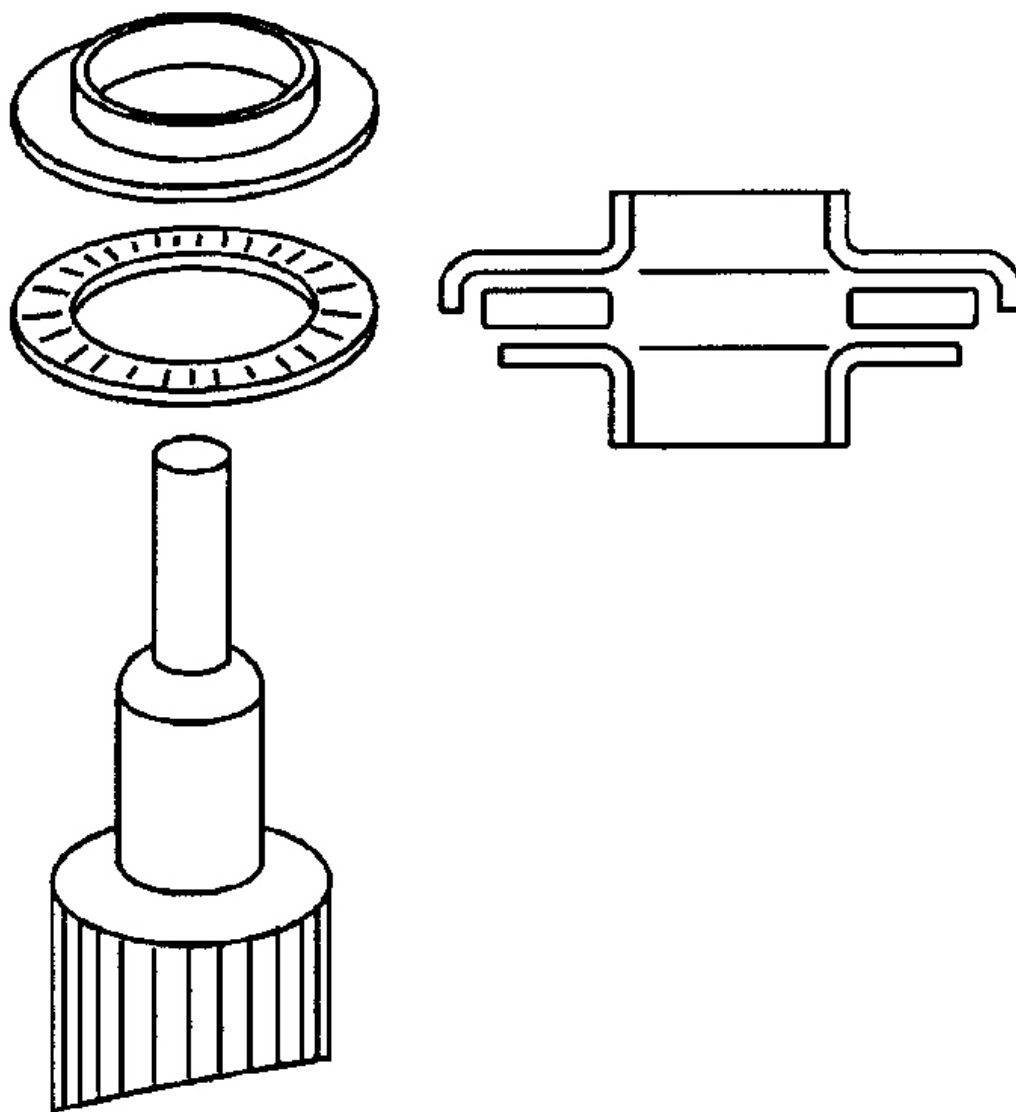
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Fig. 136: Installing Forward Clutch-To-Transmission Case Height
Courtesy of GENERAL MOTORS CORP.



G00294012

Fig. 137: Measuring Forward Clutch-To-Transmission Case Height Difference
Courtesy of GENERAL MOTORS CORP.



G00294013

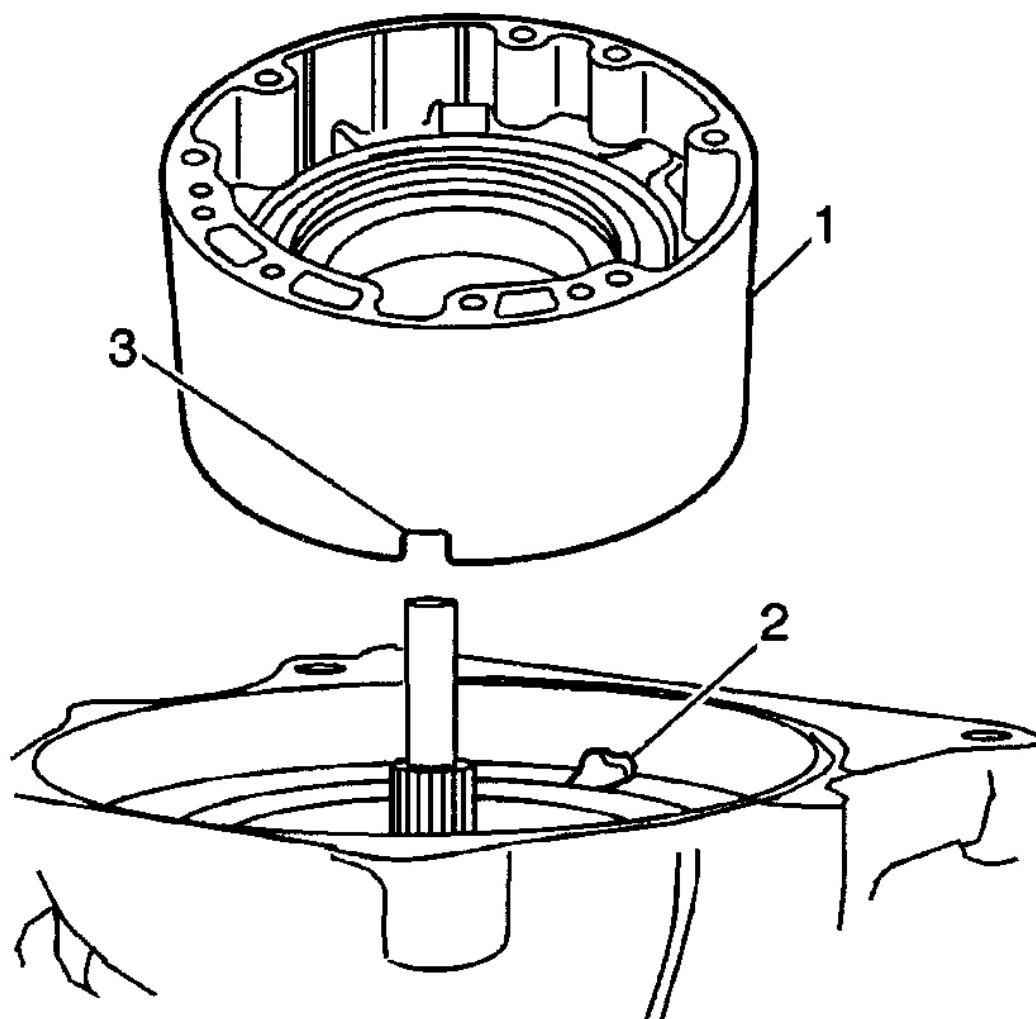
Fig. 138: Installing Forward Thrust Bearing & Race
Courtesy of GENERAL MOTORS CORP.

OVERDRIVE CLUTCH DRUM, OVERDRIVE CASE

NOTE: For special tool part numbers, refer to special tools list. See SPECIAL TOOLS .

Installation

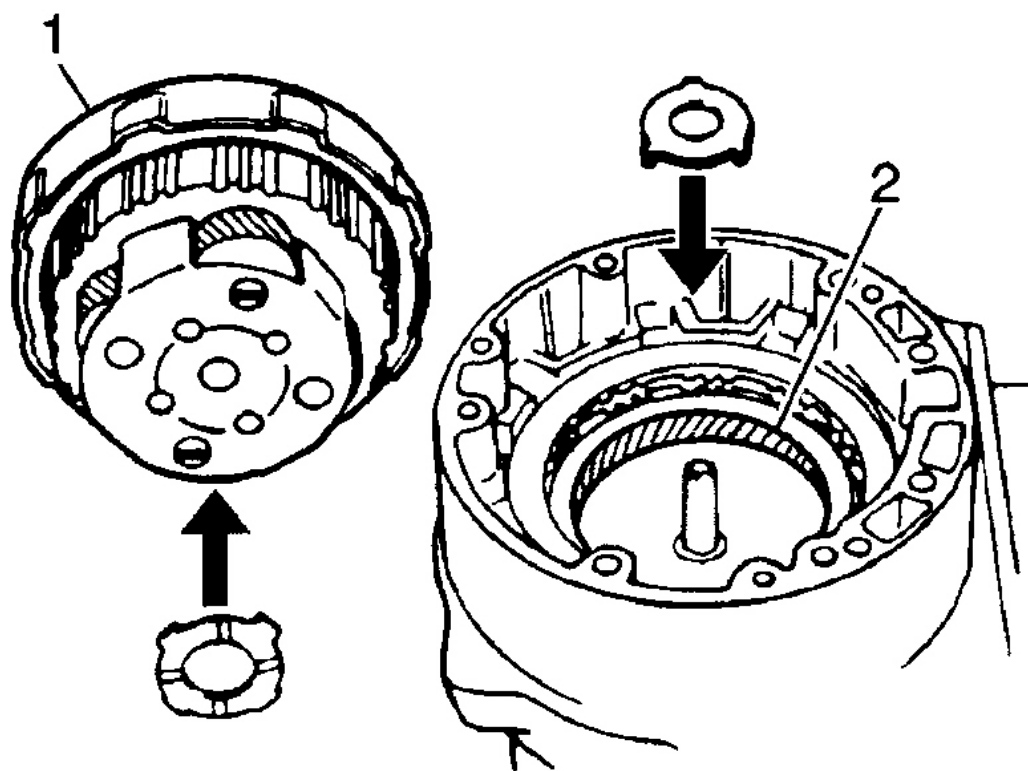
1. Apply Transjel(R) Transmission Assembly Lubricant to the thrust rear race. Install the race to the rear of the overdrive case. Install the overdrive case to the transmission case, aligning the cutouts on each case. See [Fig. 139](#) .
2. Apply Transjel to the thrust planetary rear washer. Install the washer to the overdrive planetary gear. See **Fig. 140** .
3. Apply Transjel to the thrust planetary ring front race. See **Fig. 140** . Install the race to the planetary ring gear.
4. Install the overdrive clutch/planetary gear into the overdrive case. Measure the height difference between the overdrive case and the overdrive clutch drum using vernier calipers. See **Fig. 141** . See **TRANSMISSION SPECIFICATIONS** . Remove and reinstall if less than the specification.



- 1. Overdrive Case
- 2. Transmission Case Cutout
- 3. OD Case Cutout

G00294014

Fig. 139: Installing Overdrive Case-To-Transmission
Courtesy of GENERAL MOTORS CORP.



- 1. Overdrive Planetary Gear
- 2. Thrust Planetary Ring Front Race

G00294015

Fig. 140: Installing Overdrive Clutch Drum Components
Courtesy of GENERAL MOTORS CORP.

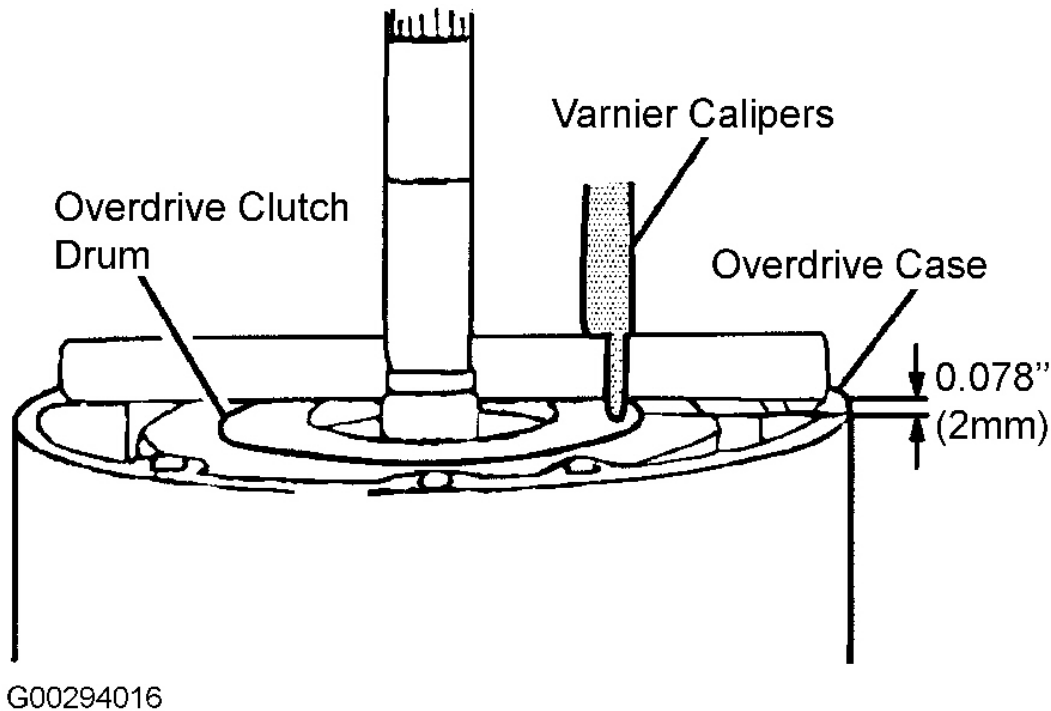


Fig. 141: Measuring Overdrive Case-To-Clutch Drum Height Difference
 Courtesy of GENERAL MOTORS CORP.

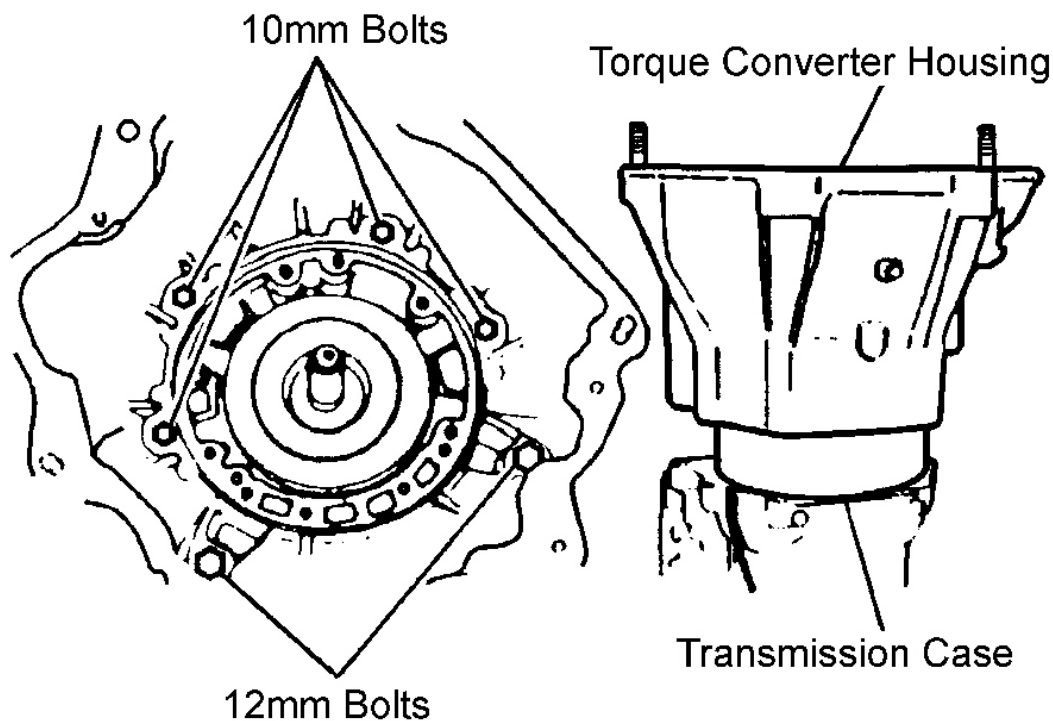
OIL PUMP AND TORQUE CONVERTER HOUSING

NOTE: For special tool part numbers, refer to special tools list. See SPECIAL TOOLS .

Installation

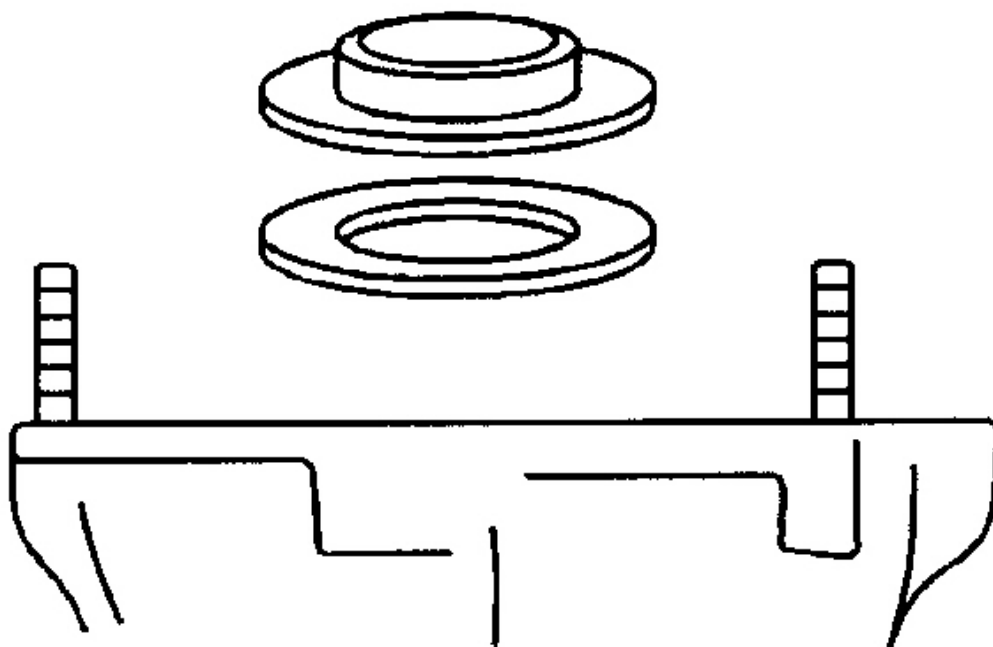
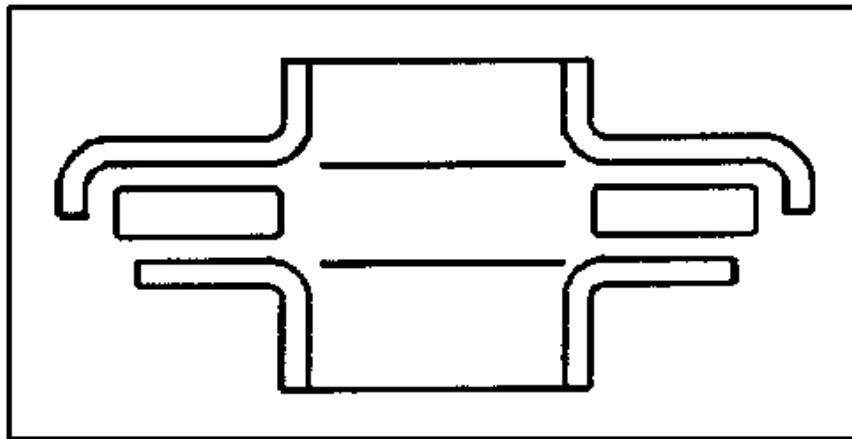
1. Lubricate a NEW "O" Ring with ATF. Install the NEW "O" Ring to the overdrive case. Install the torque converter housing to the transmission case. See Fig. 142 .
2. Install the converter housing bolts. See TORQUE SPECIFICATIONS .
3. Apply Transjel(R) Transmission Assembly Lubricant to the thrust front race. See Fig. 143 . Install the thrust front race to the overdrive clutch drum. Apply Transjel to the thrust bearing and race. Install the thrust bearing and race to the oil pump.
4. Lubricate outer oil pump "O" Ring with ATF. Install the oil pump to the transmission case. Apply sealant to the oil pump bolts. See Fig. 144 .
5. Install the oil pump bolts, aligning the holes in the oil pump with those in the transmission case. Tighten oil pump bolts to specification. See TORQUE SPECIFICATIONS .
6. Apply low air pressure to each oil circuit hole in order to inspect the operation of each of the following internal components. See Fig. 145 :

1. The overdrive clutch.
 2. The overdrive brake.
 3. The forward clutch.
 4. The direct clutch.
 5. The B1 (second coast) brake.
 6. The B2 (second) brake.
 7. The reverse brake.
7. Measure the output shaft end play using Dial Indicator Set and Magnetic Base. See **Fig. 146** . Output shaft end play should be to specification. See **TRANSMISSION SPECIFICATIONS** .



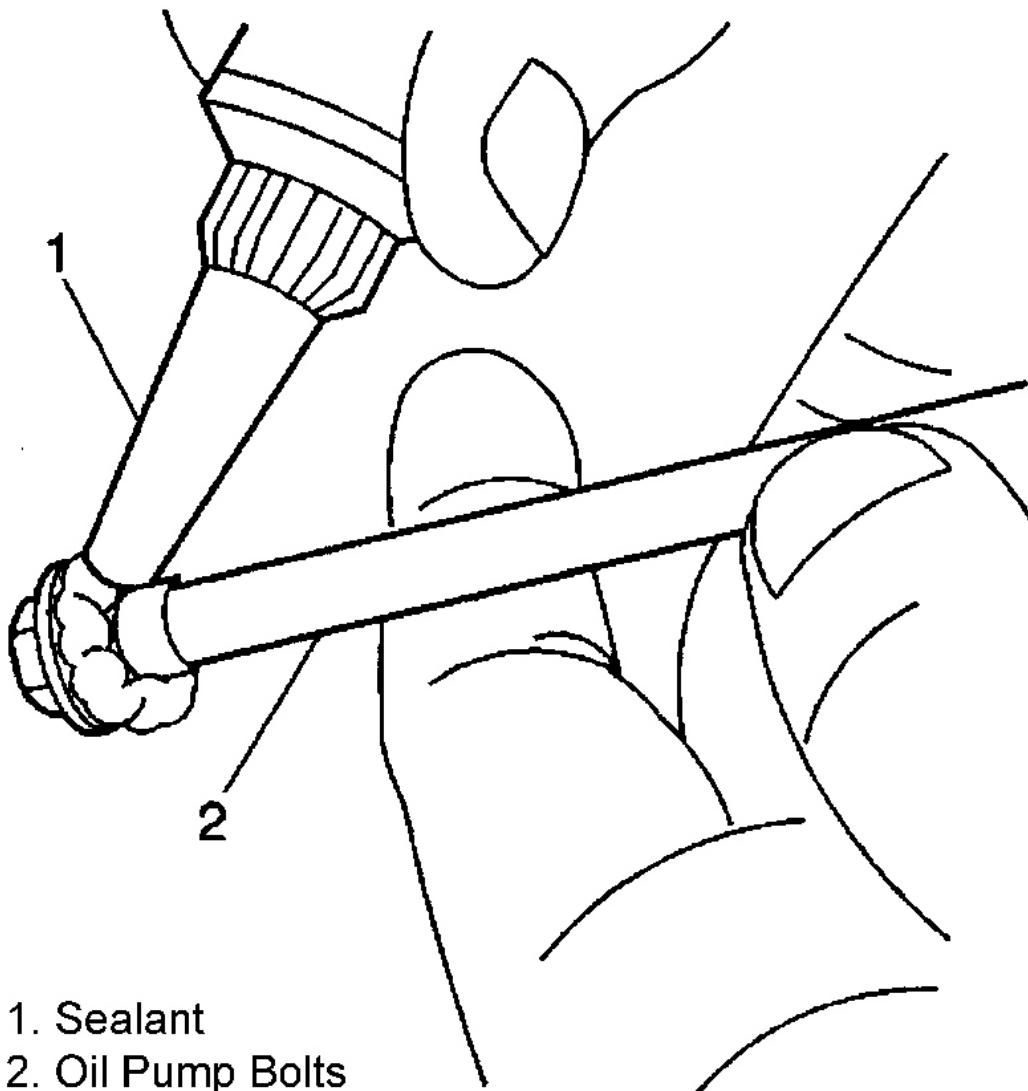
G00294017

Fig. 142: Installing Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.



G00294018

Fig. 143: Installing Thrust Bearing & Races
Courtesy of GENERAL MOTORS CORP.

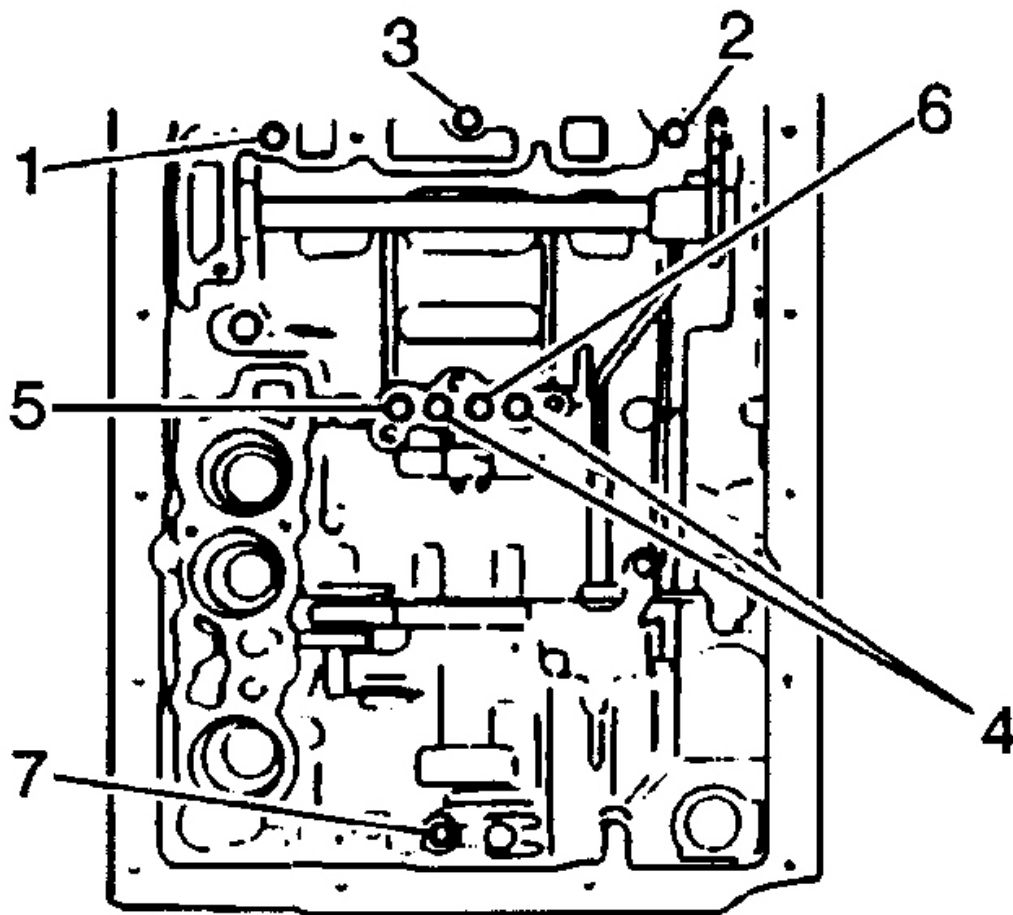


- 1. Sealant
- 2. Oil Pump Bolts

G00294019

Fig. 144: Applying Sealant To Oil Pump Bolts
Courtesy of GENERAL MOTORS CORP.

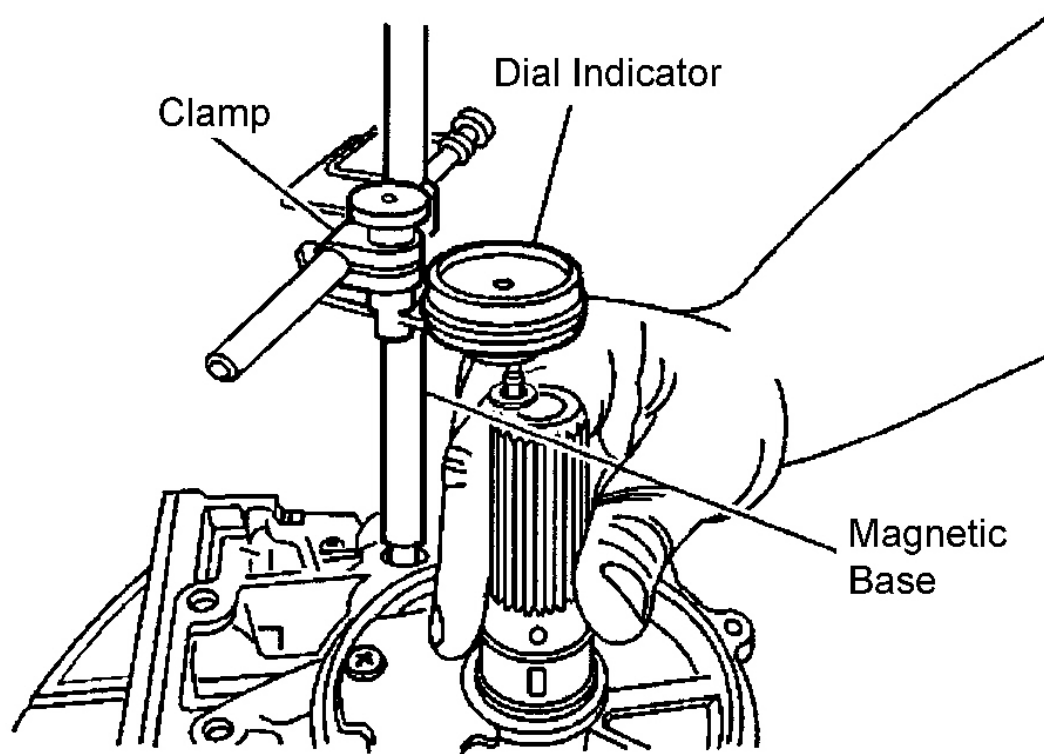
OIL CIRCUIT HOLES



1. Overdrive Clutch
2. Overdrive Brake
3. Forward Clutch
4. Direct Clutch
5. B1 Brake
6. B2 Brake
7. Reverse Brake

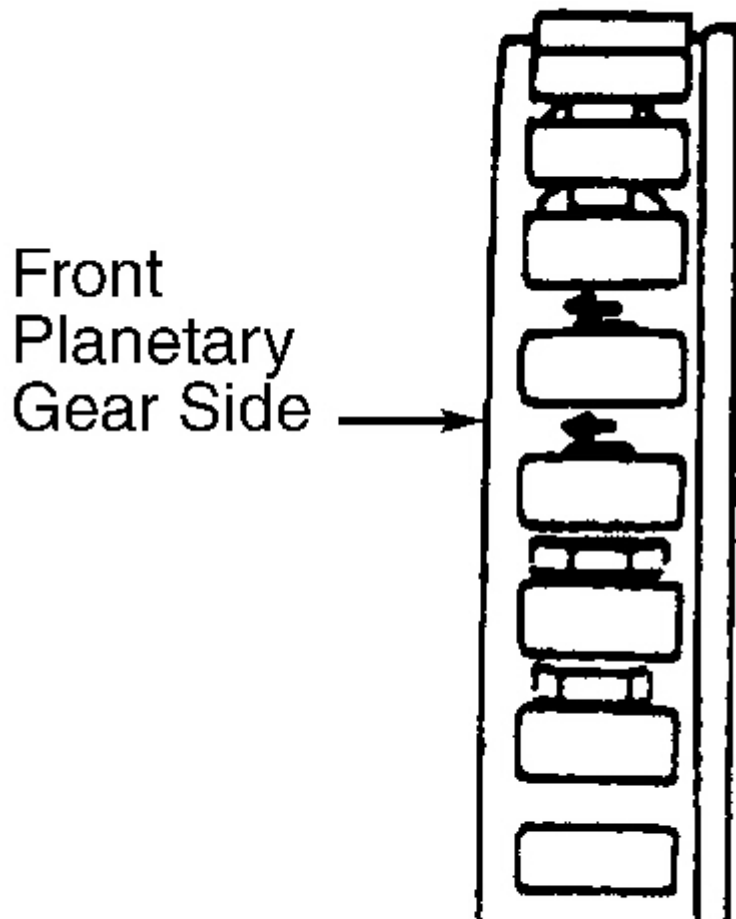
G00294020

Fig. 145: Applying Air Pressure To Inspect Operation Of Internal Components
Courtesy of GENERAL MOTORS CORP.



G00294021

Fig. 146: Measuring Output Shaft End Play
Courtesy of GENERAL MOTORS CORP.



G00047152

Fig. 147: Installing No. 2 One-Way Clutch
Courtesy of SUZUKI OF AMERICA CORP.

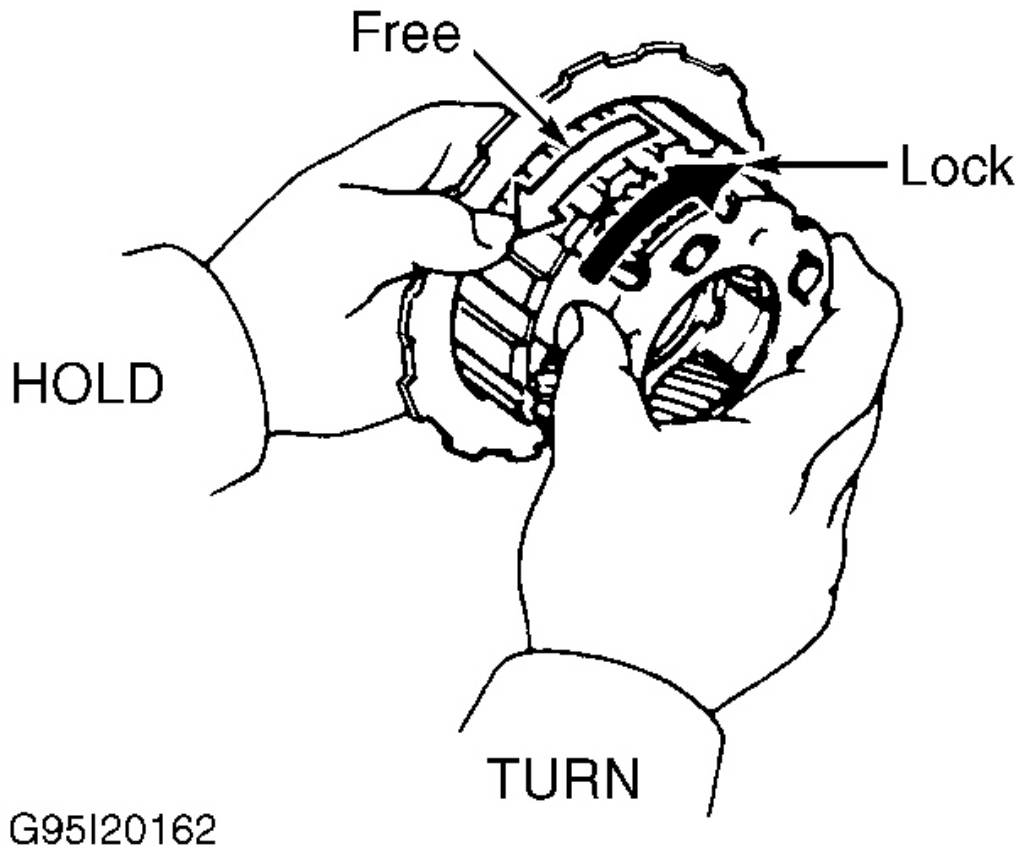


Fig. 148: Checking No. 2 One-Way Clutch Operation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

VALVE BODY, ACCUMULATORS, SOLENOID WIRING HARNESS

Installation

1. Lubricate a NEW TV cable "O" Ring with ATF. Install the NEW "O" Ring to the TV cable. See **Fig. 149** . Install the TV cable to the transmission case.
2. Measure the accumulator piston outer diameter and accumulator spring length before installation. See **ACCUMULATOR SPECIFICATIONS** . Replace as necessary.
3. Lubricate the following components with ATF:
 - The NEW piston "O" Rings.
 - The accumulator springs.

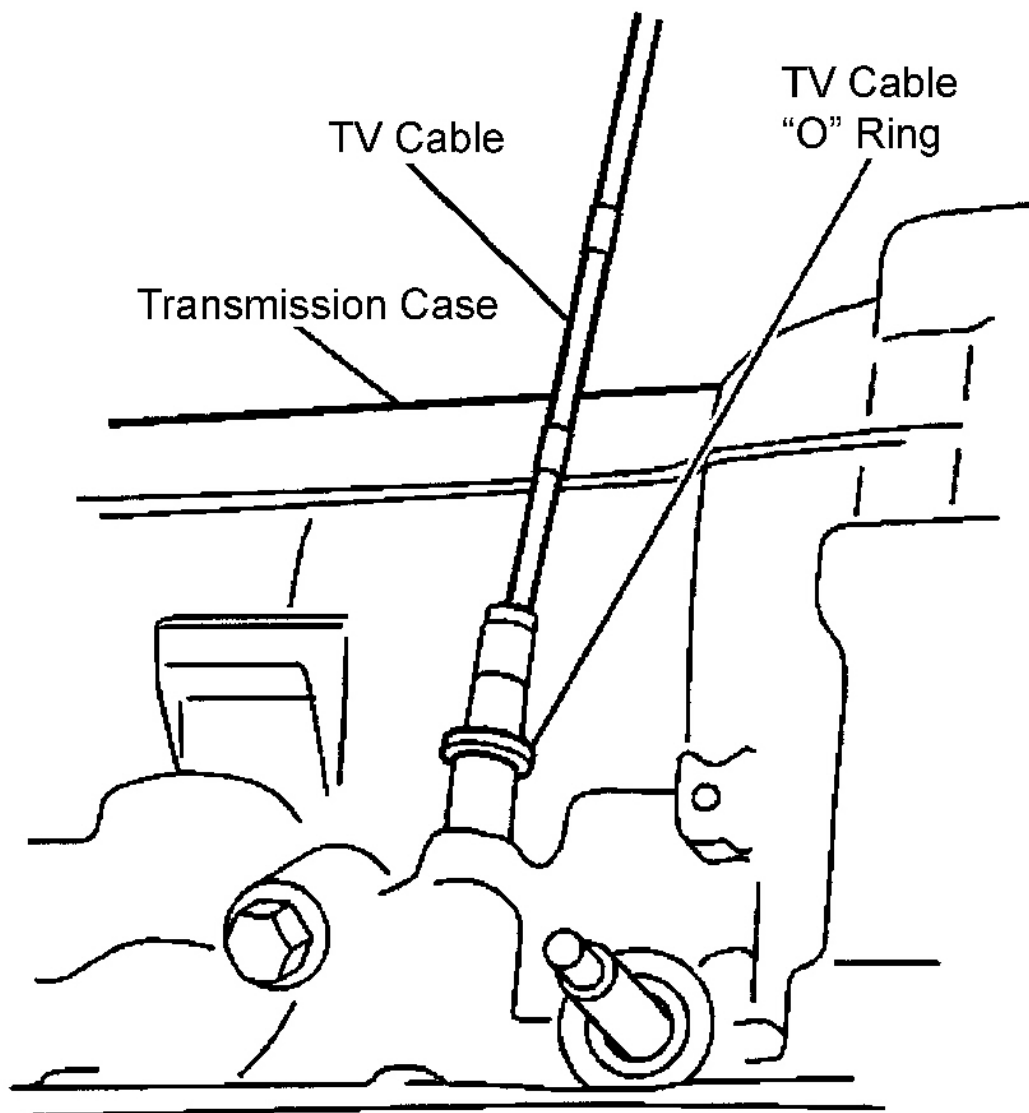
Install the NEW "O" Rings to the accumulator pistons. See **Fig. 150** . Install the accumulator springs.

4. Install the accumulator pistons to the transmission case. Install the valve body to the transmission case.

5. Slowly lift the valve body in order to install the TV cable to the cam. Inspect that the accumulator pistons are fully seated.
6. Match the manual shift lever pin with the manual valve groove. See **Fig. 151** .
7. Install the 14 valve body bolts according to the following lengths. See **Fig. 152** :
 - 10 each - 1.18" (30.0 mm) bolts.
 - 2 each - 1.85" (47.0 mm) bolts.
 - 1 each - 0.98" (25.0 mm) bolt.
 - 1 each - 2.36" (60.0 mm) bolt.

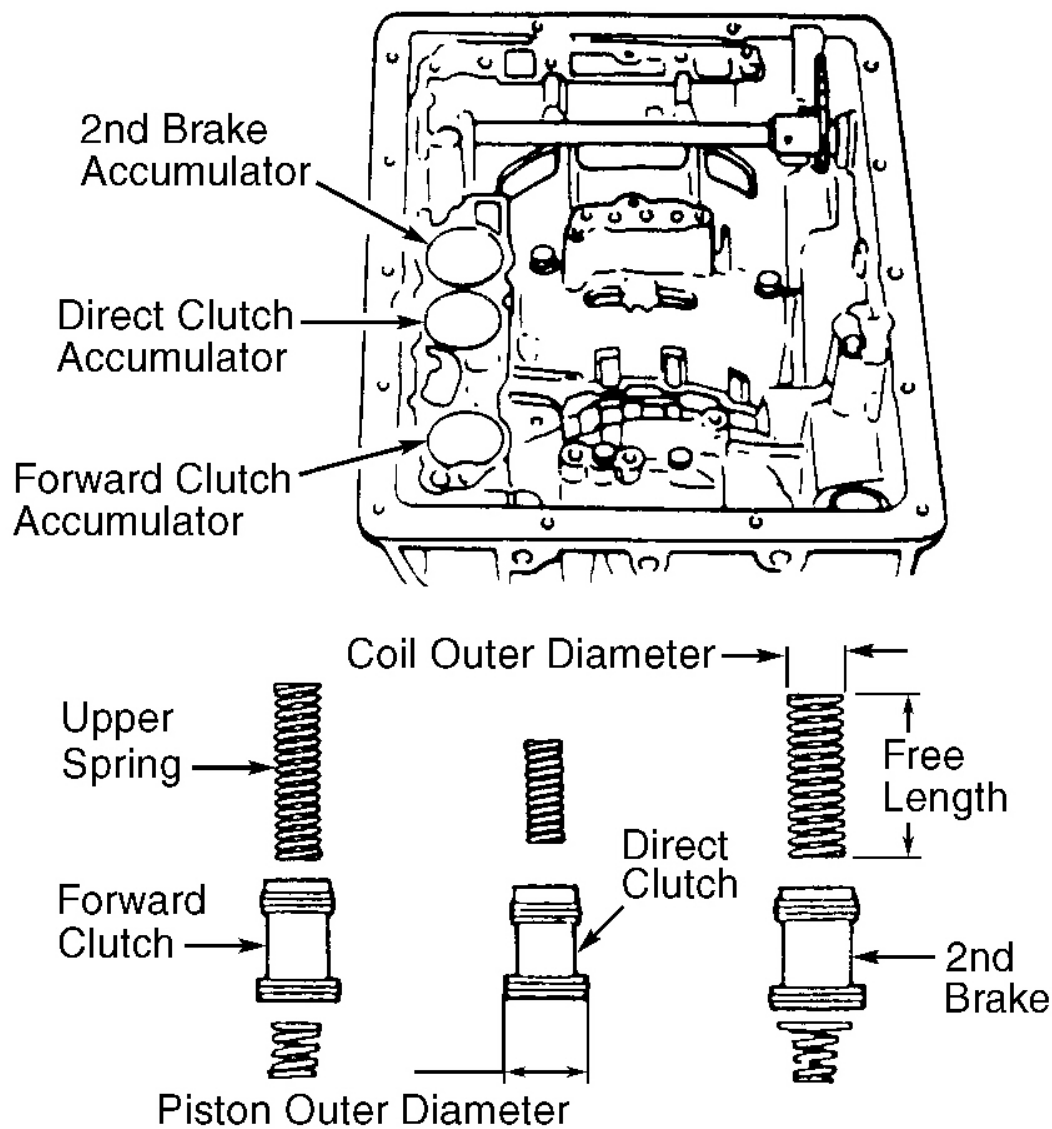
Tighten all valve body bolts to specification. See **TORQUE SPECIFICATIONS** .

8. Lubricate a NEW solenoid wiring harness grommet "O" Ring with ATF. Install the NEW "O" Ring to the solenoid wiring harness grommet. Install the solenoid wiring harness to the transmission case. Install the solenoid wiring harness bolt. See **TORQUE SPECIFICATIONS** .



G00294022

Fig. 149: Installing TV Cable
Courtesy of GENERAL MOTORS CORP.



G95J21252

Fig. 150: Identifying Accumulator Pistons & Springs
 Courtesy of SUZUKI OF AMERICA CORP.

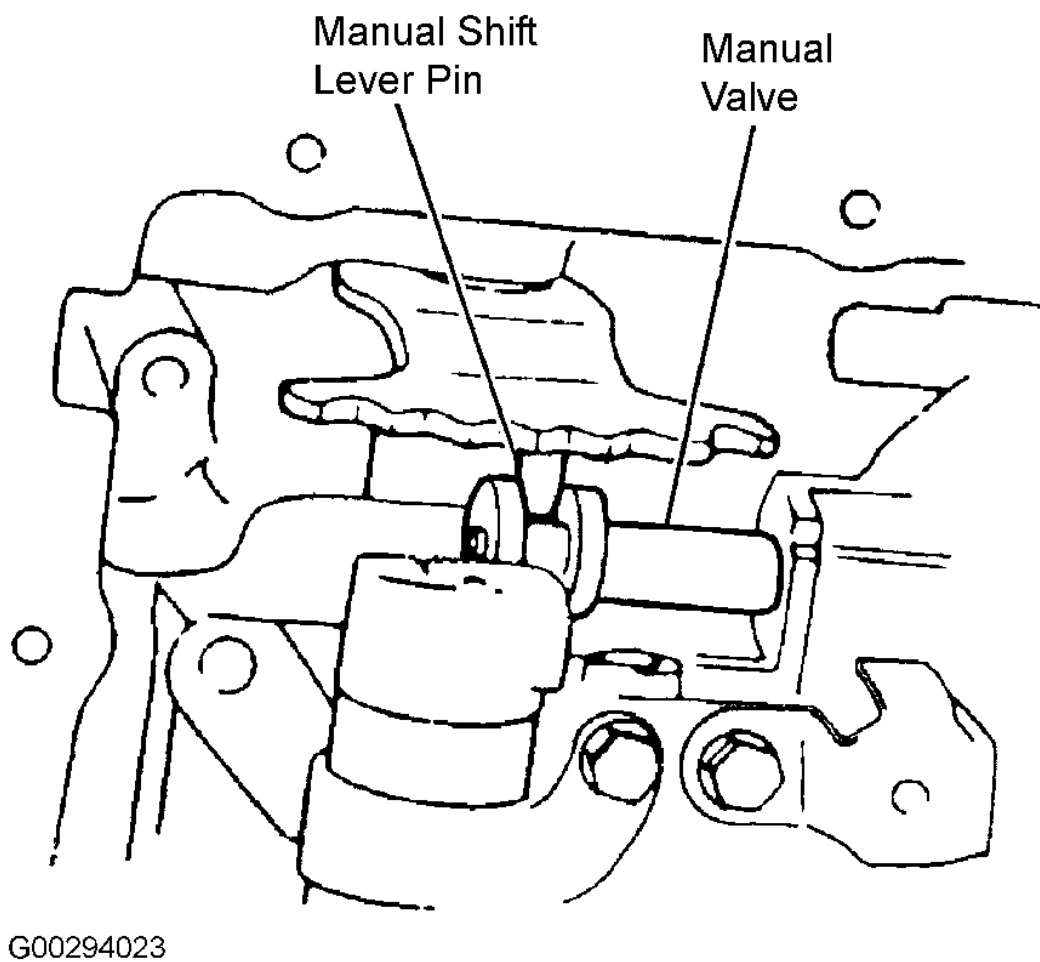
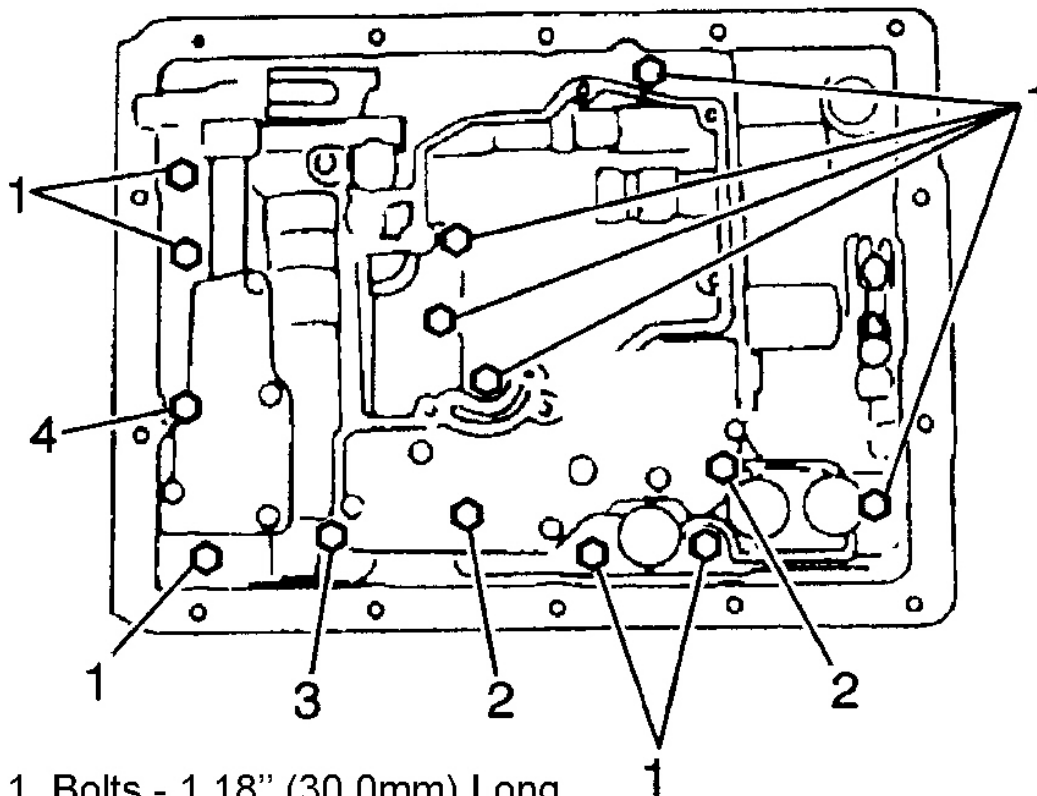


Fig. 151: Aligning Manual Shift Lever Pin With Manual Valve Groove
Courtesy of GENERAL MOTORS CORP.



- 1. Bolts - 1.18" (30.0mm) Long
- 2. Bolts - 1.85" (47.0mm) Long
- 3. Bolt - 0.98" (25.0mm) Long
- 4. Bolt - 2.36" (60.0mm) Long

G00294024

Fig. 152: Identifying Valve Body Bolts
 Courtesy of GENERAL MOTORS CORP.

ACCUMULATOR SPECIFICATIONS

ACCUMULATOR PISTON DIAMETER ⁽¹⁾

Application	Diameter - In. (mm)
Direct & Forward Clutch	1.252-1.254 (31.80-31.85)
No. 2 Brake	1.370-1.372 (34.80-34.85)

(1) See illustration for accumulator piston locations. See **Fig. 150** .

ACCUMULATOR SPRING SPECIFICATIONS (GRAND VITARA)⁽¹⁾

2001 Kia Sportage Limited

2001-03 AUTOMATIC TRANSMISSIONS Aisin Warner AW 03-72LE & AW 03-73LE Overhaul

Application	Free Length - In. (mm)
Direct Clutch Spring	
Lower	1.213 (30.80)
Upper	1.715 (43.56)
Forward Clutch Spring	
Lower	N/A
Upper	2.546 (64.68)
No. 2 Brake Spring	
Lower	1.383 (35.13)
Upper	2.135 (58.80)
(1) See illustration for accumulator piston locations. See Fig. 150 .	

ACCUMULATOR SPRING SPECIFICATIONS (TRACKER)⁽¹⁾

Application	Free Length - In. (mm)
Direct Clutch Spring	
Sportage	2.172 (55.18)
Tracker	1.667 (42.35)
Forward Clutch Spring	
Lower	1.161 (29.49)
Upper	2.251 (57.18)
No. 2 Brake Spring	
Lower	1.383 (35.13)
Upper	2.172 (55.18)
(1) See illustration for accumulator piston locations. See Fig. 150 .	

ACCUMULATOR SPRING SPECIFICATIONS (VITARA)⁽¹⁾

Application	Free Length - In. (mm)
Direct Clutch Spring	
Lower	N/A
Upper	
1.6L	2.410 (61.21)
2.0L	2.355 (59.82)
Forward Clutch Spring	
Lower	N/A
Upper	2.546 (64.68)
No. 2 Brake Spring	
Lower	1.383 (35.13)
Upper	2.172 (55.18)
(1) See illustration for accumulator piston locations. See Fig. 150 .	

FLUID PAN, FILTER SCREEN, FLUID PIPES**Installation**

1. Install the following fluid filter screen components to the valve body:

- NEW gaskets.
- The spacer.
- The screen.
- The bolts.

Tighten fluid filter screen bolts to specification. See **TORQUE SPECIFICATIONS** .

2. Connect the electrical connectors at the following locations:

- The shift solenoid 1-2.
- The TCC solenoid.

3. Install the following brake apply cover components to the transmission case:

- A NEW gasket.
- The cover.
- The bolts.

Tighten brake apply cover bolts to specification. See **TORQUE SPECIFICATIONS** .

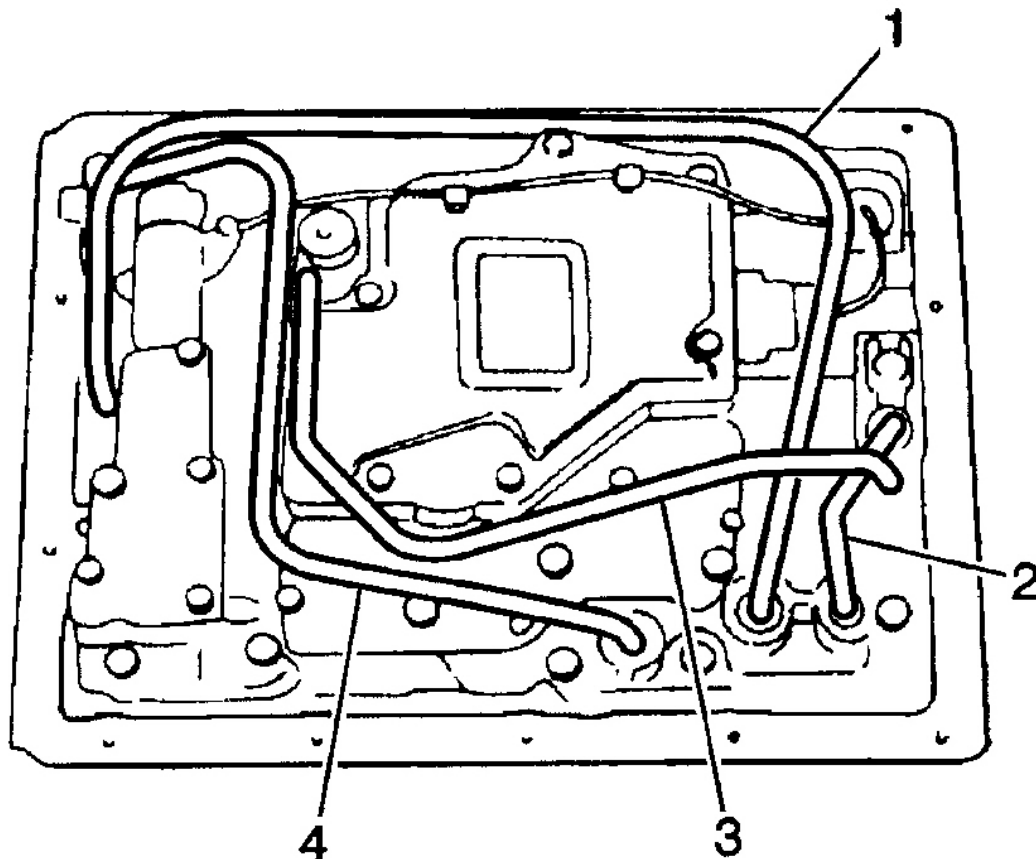
4. Install the 4 fluid tubes to the valve body in the following order:

- A. The forward clutch. See **Fig. 153** .
- B. The lube applying.
- C. The reverse brake.
- D. The brake applying.

Install the 2 oil pan magnets to the oil pan.

5. Install a NEW oil pan gasket. Install the oil pan to the transmission case, aligning the cutouts in the pan and the case. Install the 14 oil pan bolts. Tighten oil pan bolts to specification. See **TORQUE SPECIFICATIONS** .

FLUID TUBES



1. Forward Clutch
2. Lube Applying
3. Reverse Brake
4. Brake Applying

G00294025

Fig. 153: Identifying Oil Applying Tubes
Courtesy of GENERAL MOTORS CORP.

REAR ADAPTER CASE, VEHICLE SPEED SENSOR

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

Installation

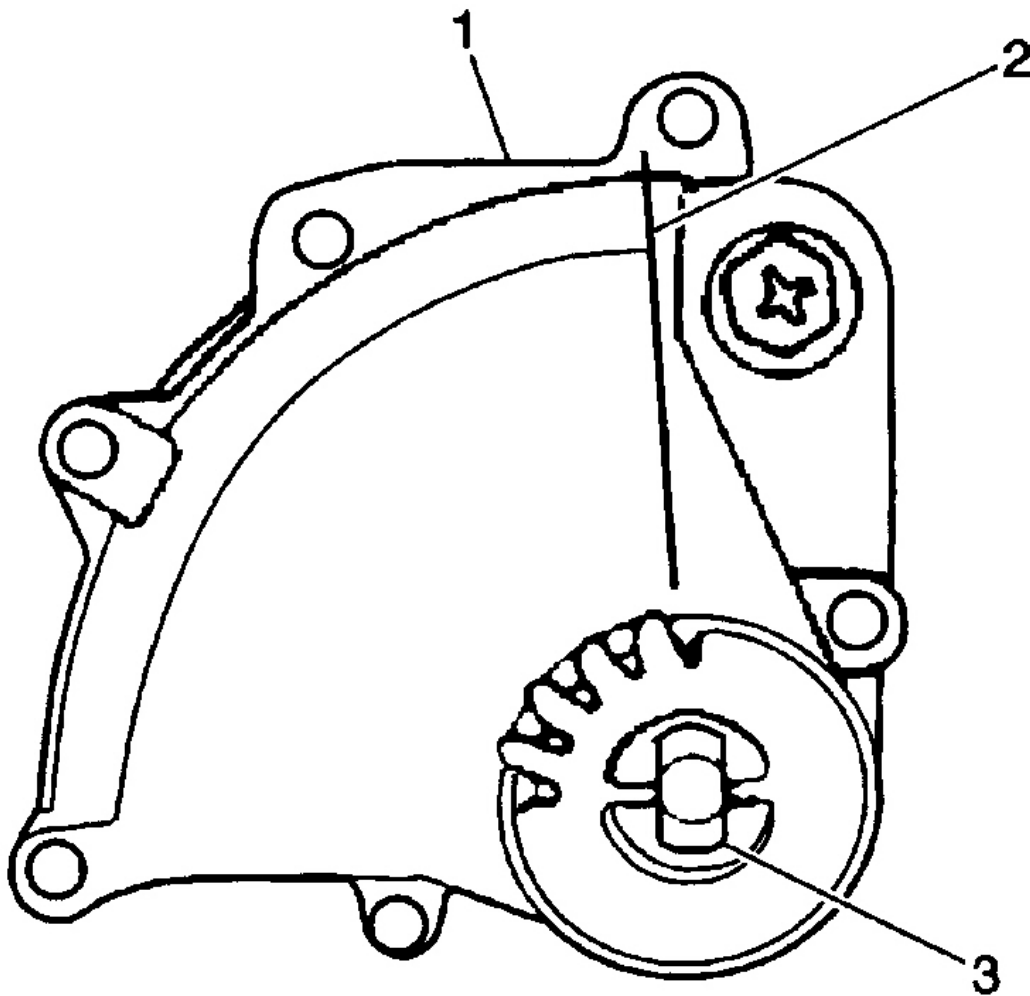
1. Install the key-way to the output shaft. Install the output shaft sensor ring. Install a NEW oil seal to the adapter case using the Axle Shaft Seal Installer.
2. Install a NEW gasket to the adapter case. Install the adapter case to the rear of the transmission.
3. Install the 6 adapter case bolts. Tighten adapter case bolts to specification. See **TORQUE SPECIFICATIONS** .
4. Lubricate a NEW VSS "O" Ring with ATF. Install the NEW "O" Ring to the VSS. Install the VSS to the adapter case. Install the VSS bolt. Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .

TRANSMISSION RANGE SWITCH

Installation

NOTE: For special tool part numbers, refer to special tools list. See **SPECIAL TOOLS** .

1. Perform the following steps in order to install the transmission range switch:
 - A. Turn the manual shaft rearward.
 - B. Turn the shaft back 2 notches.
 - C. Set the shaft to the "N" range.
 - D. Install the switch.
 - E. Handstart the bolt.
 - F. Install the lock washer.
 - G. Install the set nut. Tighten the set nut to specification. See **TORQUE SPECIFICATIONS** .
2. Bend the lock washer claws over the set nut. With the neutral reference line and the cutout in the switch aligned, tighten the switch bolt. See **Fig. 154** . Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .
3. Install the manual lever to the manual shaft. Install the manual shaft lever nut. Tighten the nut to specification. See **TORQUE SPECIFICATIONS** .
4. Install the vent hose to the vent elbow at the top of the transmission case. Install the vent hose clamp.
5. Install a NEW "O" Ring to the fluid filler tube. Install the fluid filler tube to the transmission case. Install the fluid filler tube bolt. Install the fluid level indicator to the fluid filler tube.
6. Remove the Holding Fixture with the transmission case, from the Holding Fixture Base. Remove the Holding Fixture from the transmission case.
7. Install the 3 remaining converter housing bolts. Tighten converter housing bolts to specification. See **TORQUE SPECIFICATIONS** .



G00092173

Fig. 154: Removing & Installing Transmission Range Switch
Courtesy of GENERAL MOTORS CORP.

TORQUE CONVERTER

NOTE: Before you overhaul the transaxle, clean the exterior thoroughly in order to protect its inner components against dust and dirt. Keep the transaxle in an upright position with the fluid pan on the bottom until all of the fluid has been drained from the transaxle. If you turn the transaxle on its side or over before the fluid stops draining, clutch material or other foreign matter may contaminant the fluid passages of the valve body and case. Failure to follow this precaution may result in unnecessary valve body overhaul.

Inspection

1. Replace the torque converter if any of the following conditions exist:
 - Pump damage.
 - Metal particles found after flushing the cooler and the cooler pipes.
 - External leaks in the hub weld area.
 - Converter pilot cup damage or poor fit in the crankshaft.
 - Converter hub damage or scoring.
 - Internal stator damage.
 - Engine coolant contamination.
2. DO NOT replace the torque converter if the following conditions exist:
 - The fluid has an odor or is discolored, but with no metal particles.
 - No external damage.
 - Converter bolt thread damage.

Installation

NOTE: **DO NOT flush the torque converter before installation. Only drain as much fluid as possible.**

1. Install the torque converter to the input shaft, being careful not to damage the oil pump body fluid seal.
2. Measure the distance between the outer edge of the transmission case housing and the torque converter flange nut:
 - A. Place a straightedge across the housing. See **Fig. 155**.
 - B. Using the vernier calipers, measure torque converter depth. See **TORQUE CONVERTER INSTALLED DEPTH SPECIFICATIONS** table.
 - C. If the distance is not within the specification, remove and reinstall.
3. Inspect the torque converter for smooth rotation.
4. Apply grease to the converter pilot cup.

TORQUE CONVERTER INSTALLED DEPTH SPECIFICATIONS

Application	(1) Minimum Distance - In. (mm)
Grand Vitara	.685 (17.40)
Sportage	N/A
Tracker	.669 (17.00)
Vitara	
1.6L	.846 (21.50)
2.0L	.681 (17.30)
(1) See Fig. 155 .	

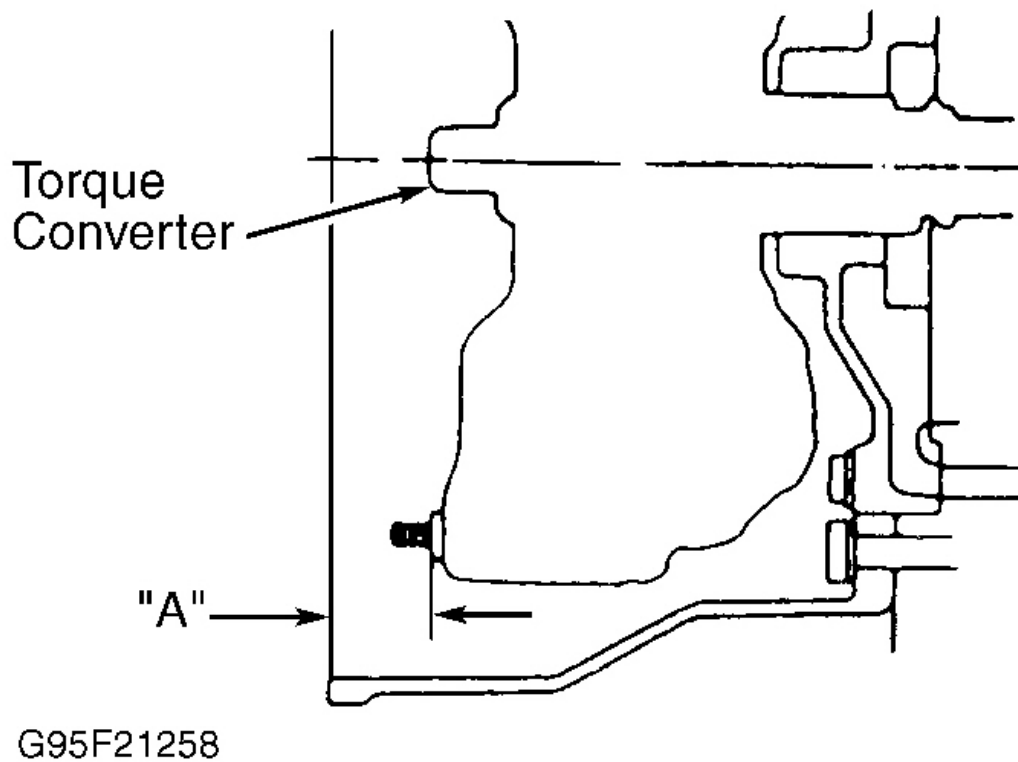


Fig. 155: Measuring Torque Converter Installed Depth
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS ⁽¹⁾

Application	Ft. Lbs. (N.m)
Adapter Case Bolts	
1.6L	26 (35)
2.0L & 2.5L	31 (42)
Center Support-To-Case Bolt	19 (26)
Drain Plug	17 (23)
Oil Pump Assembly Bolts (Kia ⁽²⁾)	16 (22)
Transmission Case-To-Converter Housing Bolt	
10 mm	26 (35)
12 mm	43 (58)
Transmission Mounting Bolt	37 (50)

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VSS Bolt	17 (23)
INCH Lbs. (N.m)	
Brake Apply Cover Bolts	89 (10)
Fluid Filter Screen Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)
Suzuki	49 (5.5)
Holding Fixture Bolts	97 (11)
Manual Shaft Lever Nut	115 (13)
Oil Pan Bolts	
Chevrolet	35 (4)
Kia	35-44 (4-5)
Suzuki	40 (4.5)
Oil Pump Cover-To-Oil Pump Body Bolts	
Chevrolet	80 (9)
Kia	53-80 (6-9)
Suzuki	66 (7.5)
Park/Neutral Position (Transmission Range) Switch	
Shift Switch Lock Bolt	
Chevrolet	44 (5)
Kia	(2)
Suzuki	49 (5.5)
Shift Shaft Set Nut	
Chevrolet	44 (5)
Kia	(2)
Suzuki	35 (4)
Parking Pawl Plate Bolts	62 (7)
Valve Body	
Assembly-To-Case Bolts	89 (10)
Detent Spring Plate Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)
Suzuki	49 (5.5)
Lower Valve Body	
Mounting Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)
Suzuki	49 (5.5)
Plate Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)

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Suzuki	49 (5.5)
Pressure Relief Valve Retainer Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)
Suzuki	49 (5.5)
Shift Solenoid Bolts	89 (10)
TCC	
Control Valve (Lock-Up) Plate Bolts	44 (5)
Solenoid Bolt	44 (5)
Upper Valve Body	
Front Assembly	
Mounting Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)
Suzuki	49 (5.5)
Secondary Regulator Valve End Cover Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)
Suzuki	49 (5.5)
TV Cable Cam Bolt	
Chevrolet	71 (8)
Kia	53-80 (6-9)
Suzuki	66 (7.5)
Rear Assembly	
Mounting Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)
Suzuki	49 (5.5)
Plate (1-2 Shift Valve End Cover) Bolts	
Chevrolet	44 (5)
Kia	44-53 (5-6)
Suzuki	49 (5.5)

(1) Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

(2) Information not available.

TRANSMISSION SPECIFICATIONS

TRANSMISSION SPECIFICATIONS

Application	In. (mm)
Forward Clutch Input Shaft-To-Transmission Case Height Difference	
Grand Vitara & Vitara	.078 (2.00)
Sportage	(1)
Tracker	.118 (3.00)
Output Shaft End Play	.012-.035 (.30-.89)
Overdrive Case-To-Overdrive Clutch Cylinder	
Grand Vitara & Vitara	.138 (3.50)
Sportage	(1)
Tracker	.078 (2.00)
Overdrive Clutch Piston Return Spring Free Length	.594 (15.10)
Overdrive Clutch Piston Stroke	.058-.089 (1.47-2.28)
Overdrive Snap Ring-To-Brake Flange Clearance	
Grand Vitara	.016-.054 (.40-1.38)
Sportage & Tracker	.014-.075 (.36-1.91)
Vitara	.022-.054 (.56-1.38)
Reverse Brake Plate-To-Transmission Case Lug Clearance	
Grand Vitara	.024-.103 (.61-2.64)
Sportage	.029-.098 (.74-2.49)
Tracker	N/A
Vitara	
1.6L	.088-.090 (.56-2.29)
2.0L	.024-.103 (.61-2.64)
(1) Refer to measure taken prior to disassembly.	

SPECIAL TOOLS

SPECIAL TOOL LIST

Tool Name	Manufacturer (Part Number)
Axle Shaft Seal Installer	GM (J-35538)
Clutch Spring Compressor	GM (J-41681 & J-23327), Kia (K95B-4200 AT1, AT2 & AT3), Suzuki (09926-98310 & 09926-98320)
Dial Indicator Set	GM (J-8001), Suzuki (09900-20606)
Flat Gage Bar	GM (J-34673), Kia (K95B-4202 AT)
Holding Fixture	GM (J-41626)
Holding Fixture Base	GM (J-3289-20)
Magnetic Base	GM (J-26900-13), Suzuki (09900-20701)
Parallel Jaws	GM (J-8059), Suzuki (09920-76010)

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Pump Seal Installer	GM (J-9617)
Side Bearing Remover	GM (J-22888-D), Kia (K95B-4201 AT), Suzuki (09941-84510)
Transjel(R) Transmission Assembly Lubricant	GM (J-36850)