

2003-04 AUTOMATIC TRANSMISSIONS

Servicing - Avalanche, Escalade, Sierra, Silverado, Suburban, Tahoe & Yukon (4L60-E & 4L65-E)

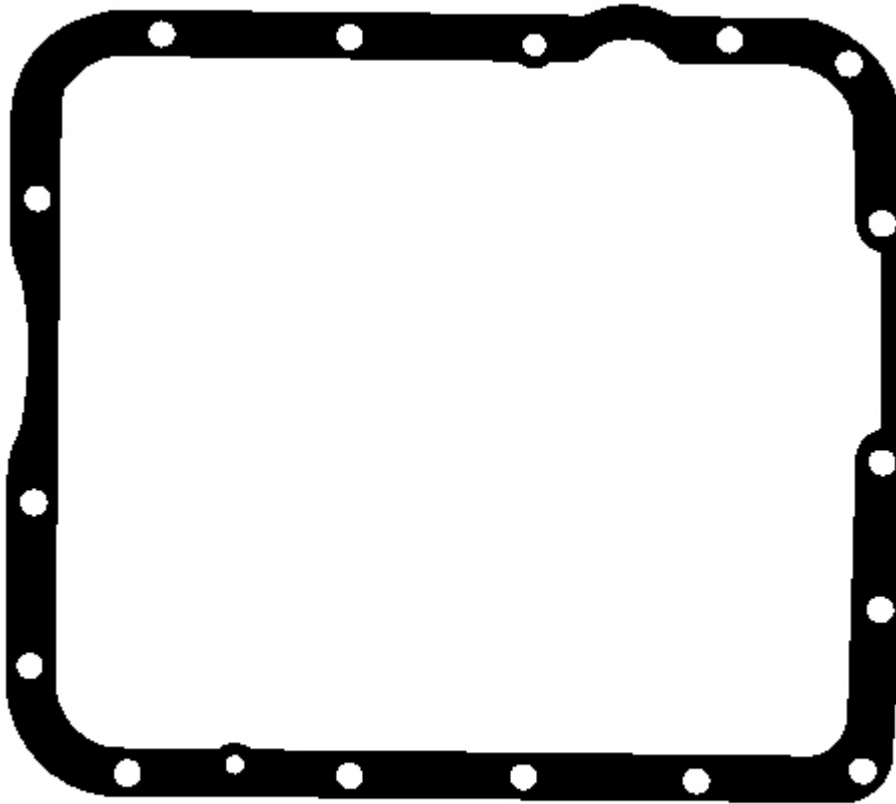
APPLICATION

TRANSMISSION APPLICATION

Application	Transmission Model (RPO Code)
Cadillac	
Escalade	
5.3L	4L60-E (M30)
6.0L	4L65-E (M32)
Escalade ESV 6.0L	4L65-E (M32)
Escalade EXT 6.0L	4L65-E (M32)
Chevrolet	
Avalanche 5.3L	4L60-E (M30)
Silverado 1500	
4.3L, 4.8L & 5.3L	4L60-E (M30)
6.0L	4L65-E (M32)
Suburban 5.3L	4L60-E (M30)
Tahoe 4.8L & 5.3L	4L60-E (M30)
GMC	
Sierra 1500	
4.3L, 4.8L & 5.3L	4L60-E (M30)
6.0L	4L65-E (M32)
Yukon 4.8L & 5.3L	4L60-E (M30)
Yukon XL 5.3L	4L60-E (M30)

IDENTIFICATION

OIL PAN GASKET



G95J13697

Fig. 1: Identifying Oil Pan Gasket (Hydra-Matic 4L60-E & 4L65-E)
Courtesy of GENERAL MOTORS CORP.

LUBRICATION

SERVICE INTERVALS

Check transmission fluid level at each engine oil change. Change the automatic transmission fluid and the filter at 50,000 miles.

CHECKING FLUID LEVEL & CONDITION

Checking Fluid Level

1. Start the engine and operate the vehicle for 15 minutes or until the transmission fluid reaches an operating temperature of 180-200°F (82-93°C).
2. Park the vehicle on a level surface.
3. With your foot on the brake, move the shift lever through each gear range. Pause for about 3 seconds in each range, ending in Park.
4. Apply the Parking brake and let the engine idle for 3 minutes.
5. Remove the transmission fluid level indicator. Wipe the indicator clean. Insert the indicator. Give the indicator a full twist in order to close.
6. Wait 3 seconds and remove the indicator.
7. Read both sides of the indicator. The fluid must be within the hot cross hatched area using the lowest level reading.

Checking Fluid Condition

1. Check the fluid color. Is the fluid Red in color? If so, go to step 5 . If not, go to next step.
2. Is the fluid a non transparent Pink in color? If so, go to step 14 . If not, go to next step.
3. Is the fluid a light Brown in color? If so, go to step 5 . If not, go to next step.

NOTE: **Fluid may turn a Dark Brown in color from normal use. This does not always indicate an oxidation or a contamination issue.**

4. Is the fluid Black in color and or have a burnt smell? If so, go to step 14 . If not, go to next step.
5. Does the fluid appear as a solid liquid and not foamy or full of bubbles on transmission fluid level indicator? If so, go to next step. If not, go to step 7 .
6. Check the fluid level. Proper level should be in middle of the cross hatched pattern, on transmission fluid level indicator. Is the level okay? If so, go to step 19 . If not, go to next step.
7. Is the fluid level high on indicator? If so, go to step 12 . If not, go to next step.
8. Is the fluid level low on indicator? If so, go to step 9 . If not, go to next step.
9. Check for any external leak or leaks. Did you find an external leak or leaks? If so, go to next step. If not, go to step 11 .
10. Correct leak or leaks as needed. Are any leak or leaks still present? If so, go to step 9 . If not, go to next step.
11. Add fluid until level is in middle of cross hatched pattern on the transmission fluid level indicator. Is the level okay? If so, go to step 19 . If not, go to step 6 .
12. Drain fluid until level is in middle of cross hatched pattern on the transmission fluid level indicator. Is level okay? If so, go to step 19 . If not, go to step 6 .
13. Replace oil cooler and flush lines. See **AUXILIARY OIL COOLER** under REMOVAL & INSTALLATION. Is the replacement complete? If so, go to step 15 .
14. Drain fluid and remove oil pan to inspect. Is there sign or signs of internal component damage noted in bottom of transmission oil pan? If so, go to step 16 . If not go to step 13 .

NOTE: A small amount of friction material in pan bottom is a normal condition, but large pieces and or metal particles will require complete transmission overhaul.

- 15. Replace the filter and fluid. See **DRAINING & REFILLING** . Is the replacement complete? If so, go to step 6 .
- 16. Flush oil cooler and lines, and check flow. See **OIL COOLER FLUSHING & FLOW CHECK** . Is transmission oil cooler flushing and flow test complete? If so, go to step 17 .
- 17. Overhaul transmission. See appropriate OVERHAUL article. Is the overhaul procedure complete? If so, go to next step.
- 18. Fill transmission with appropriate fluid to proper level. See **RECOMMENDED FLUIDS** and **FLUID CAPACITIES** . Is the procedure complete? If so, go to step 6 .
- 19. Check the fluid level and correct as necessary. Is the fluid level satisfactory? If so, system is okay. If not, go to step 1 .

RECOMMENDED FLUIDS

Manufacturer recommends Dexron-III ATF.

FLUID CAPACITIES

The following refill capacities given 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)
4L60-E & 4L65-E	5.0 (4.7)	11.2 (10.6)

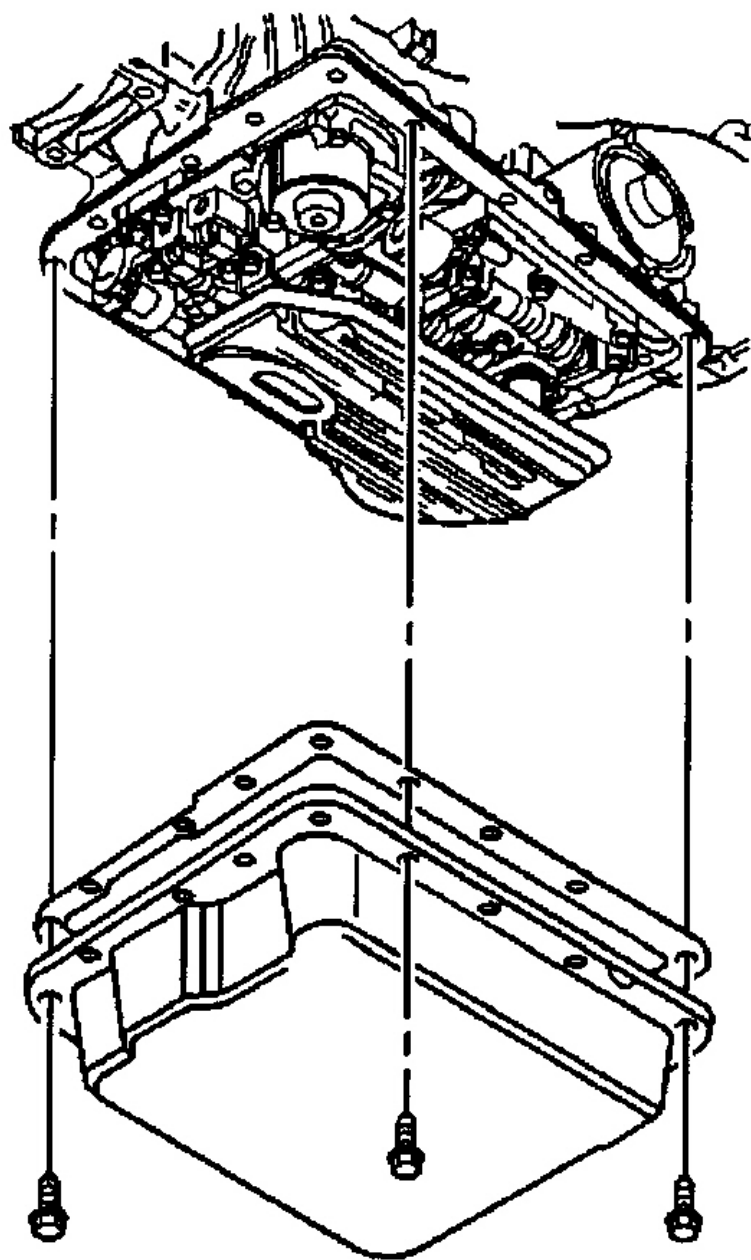
DRAINING & REFILLING

Draining & Cleaning

CAUTION: When the transmission is at operating temperatures, take necessary precautions when removing the drain plug, to avoid being burned by draining fluid.

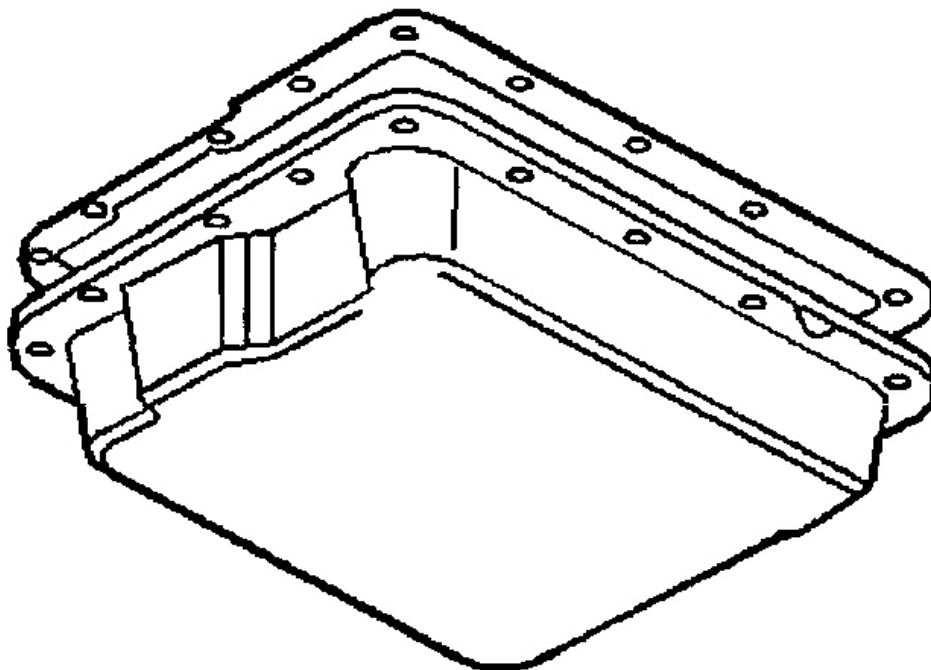
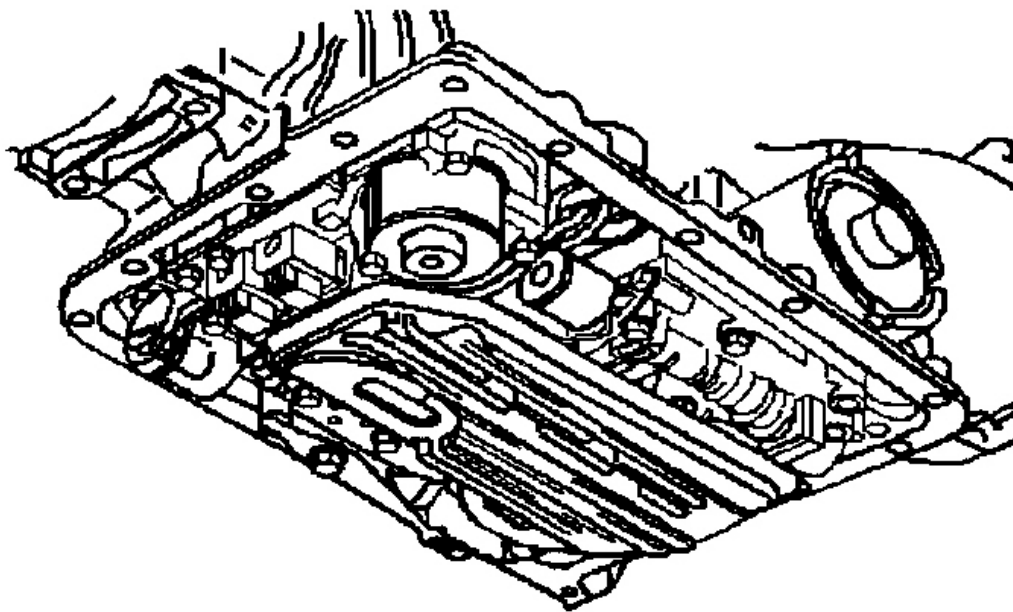
- 1. Raise and support vehicle.
- 2. Place a drain pan under the transmission oil pan.
- 3. Remove oil drain plug, if equipped.
- 4. If necessary, remove the bolts and position aside the range selector cable bracket for clearance while lowering the pan. It is not necessary to remove the cable from the lever or bracket.
- 5. Remove the oil pan bolts from the front and sides of the pan only.

6. Loosen the rear oil pan bolts approximately 4 turns.
7. Lightly tap the oil pan with a rubber mallet in order to loosen the pan to allow the fluid to drain.
8. Remove the remaining oil pan bolts. See **Fig. 2** .
9. Remove the oil pan and the gasket. See **Fig. 3** .
10. Grasp firmly while pulling down with a twisting motion in order to remove the filter. See **Fig. 4** .
11. Remove and discard the filter seal. The filter seal may be stuck in the pump; if necessary, carefully use pliers or another suitable tool to remove the seal. See **Fig. 5** .
12. Inspect the fluid color.
13. Inspect the filter. Pry the metal crimping away from the top of the filter and pull apart. The filter may contain clutch material, bronze slivers indicating bushing wear or steel particles.
14. Clean the transmission case and the oil pan gasket surfaces with solvent, and air dry. You must remove all traces of the old gasket material.



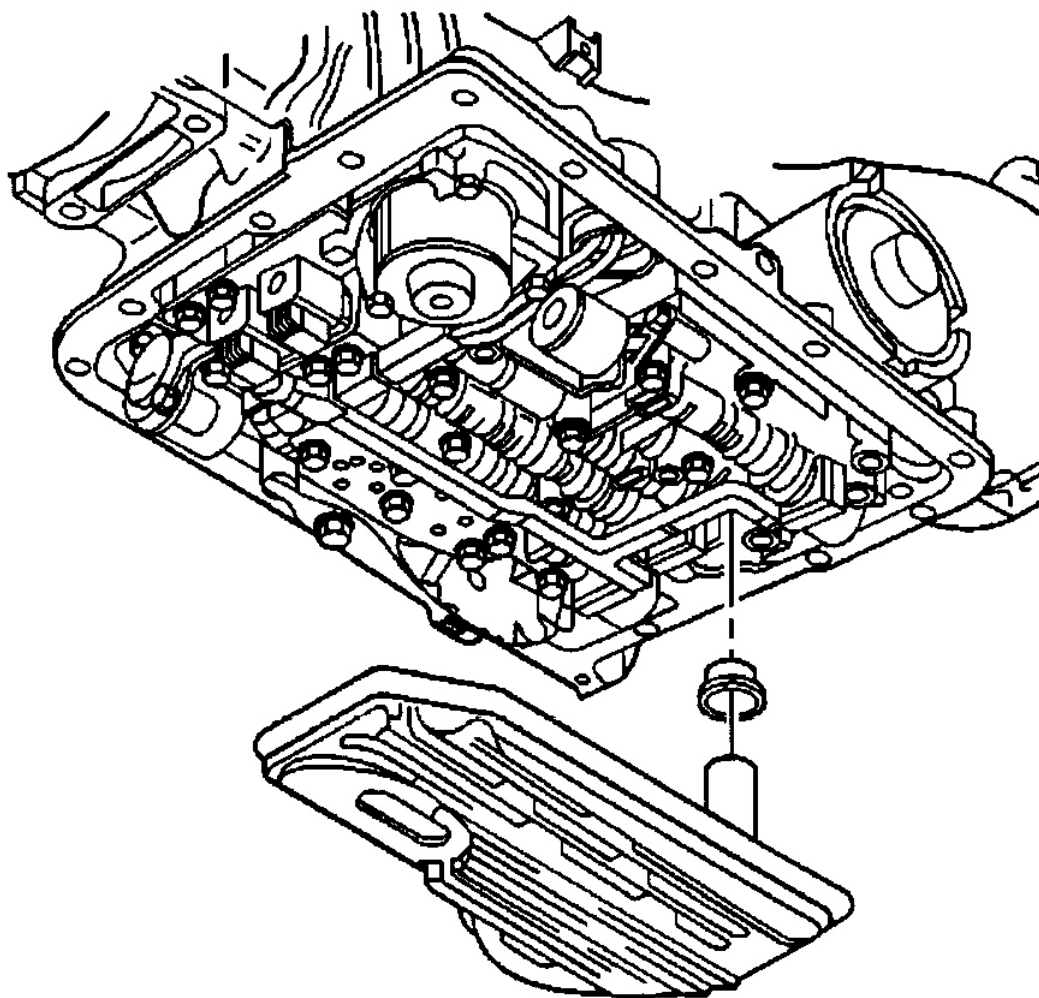
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Fig. 2: Removing Oil Pan Bolts
Courtesy of GENERAL MOTORS CORP.



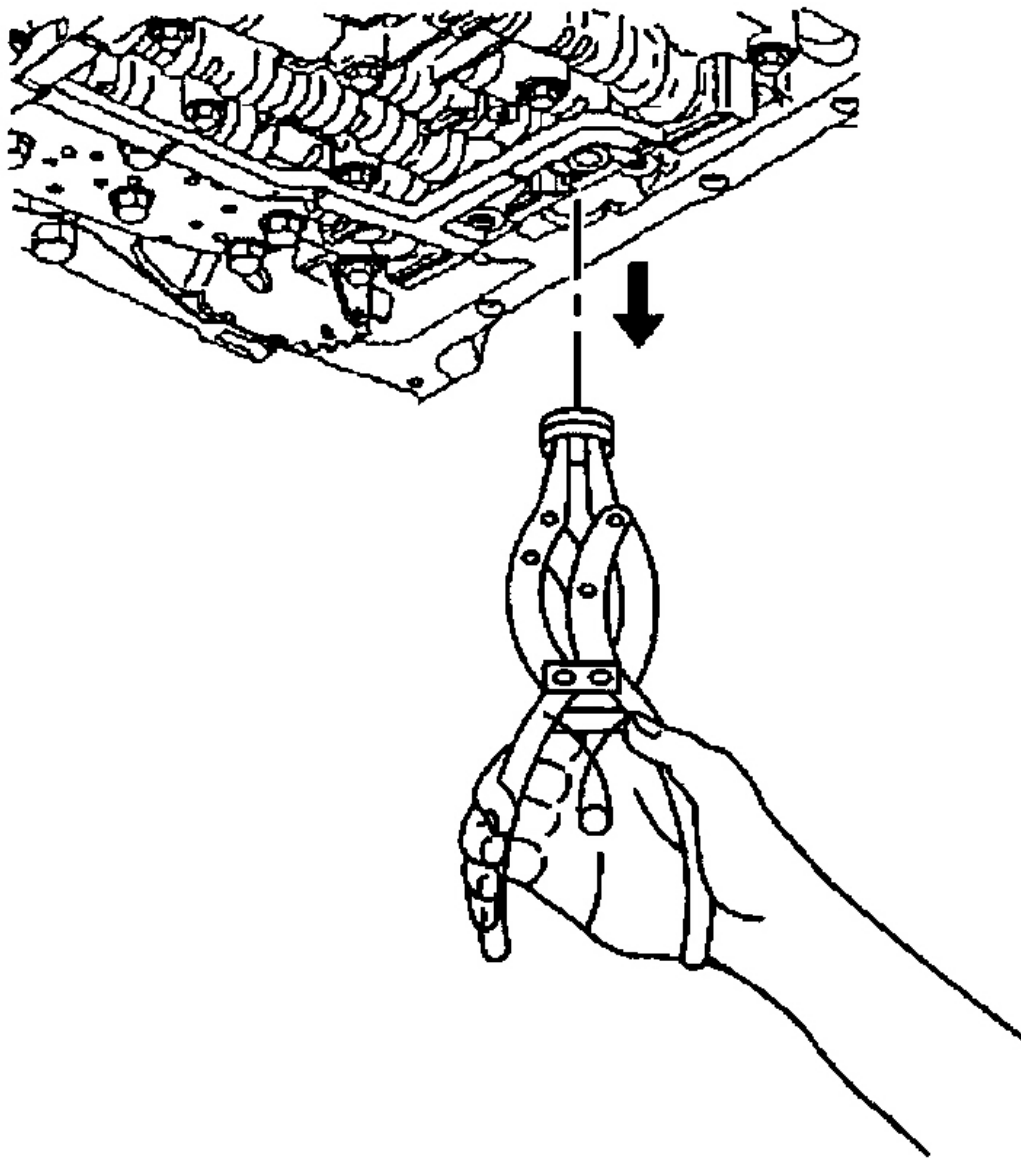
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Fig. 3: Removing Oil Pan & Gasket
Courtesy of GENERAL MOTORS CORP.



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Fig. 4: Removing & Installing Filter & Seal
Courtesy of GENERAL MOTORS CORP.



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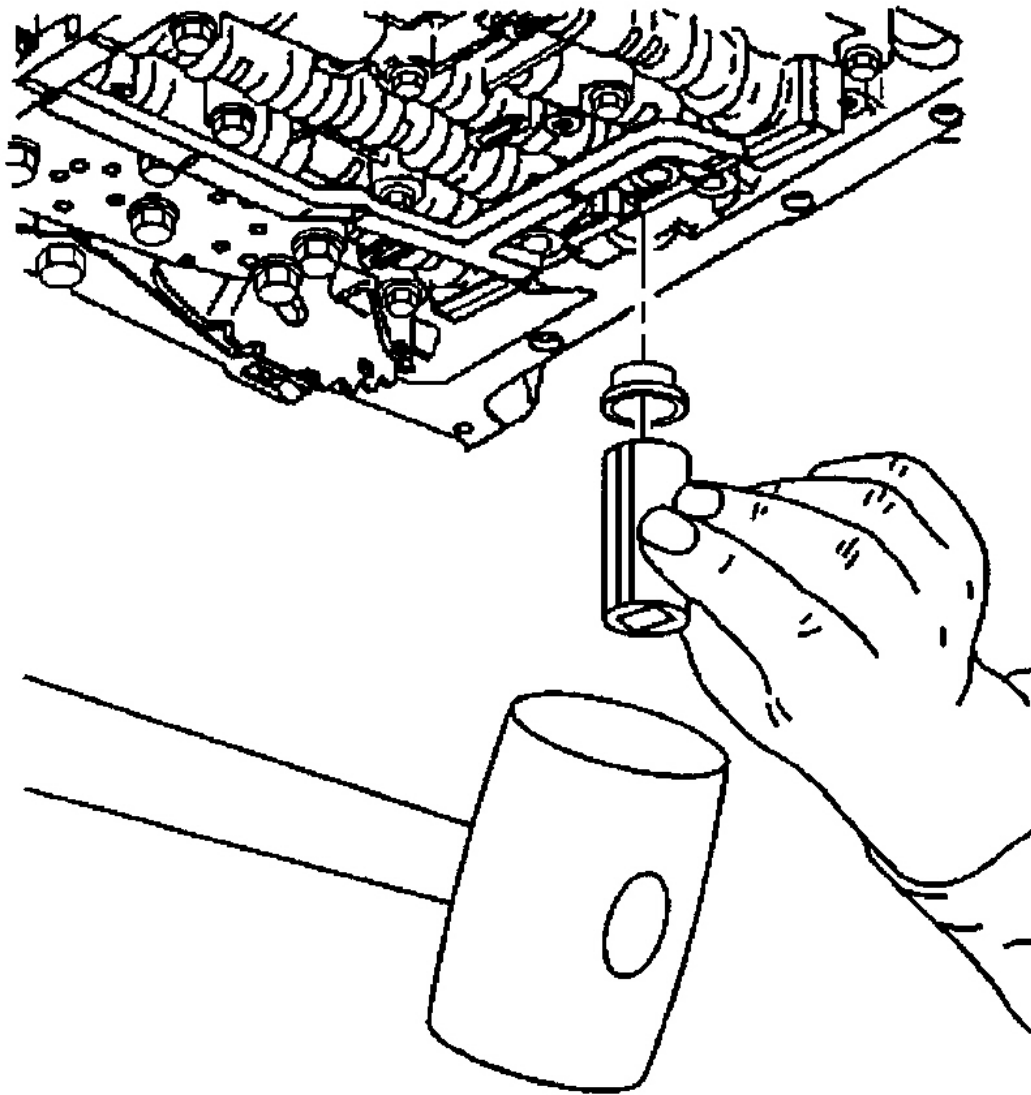
Fig. 5: Removing Seal Using Pliers
Courtesy of GENERAL MOTORS CORP.

Refilling & Inspecting

1. Coat the NEW filter seal with automatic transmission fluid.
2. Install the NEW filter seal into the transmission case. Tap the seal into place using a suitable size socket.

See **Fig. 6** .

3. Install the NEW filter.
4. Install the oil pan and NEW gasket. See **Fig. 3** .
5. Install the oil pan bolts. See **Fig. 2** . Tighten the bolts alternately and evenly to specification. See **TORQUE SPECIFICATIONS** .
6. If previously removed, install the range selector cable bracket and bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
7. Apply a small amount of sealant to the threads of the oil pan drain plug, if equipped.
8. Install the oil pan drain plug, if equipped. Tighten the plug to specification. See **TORQUE SPECIFICATIONS** .
9. Lower the vehicle.
10. Fill transmission to proper level with appropriate fluid. See **RECOMMENDED FLUIDS** and **FLUID CAPACITIES** .
11. Check the COLD fluid level reading for initial fill only.
12. Inspect the oil pan gasket for leaks.



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Fig. 6: Installing Filter Seal
Courtesy of GENERAL MOTORS CORP.

OIL COOLER FLUSHING & FLOW CHECK

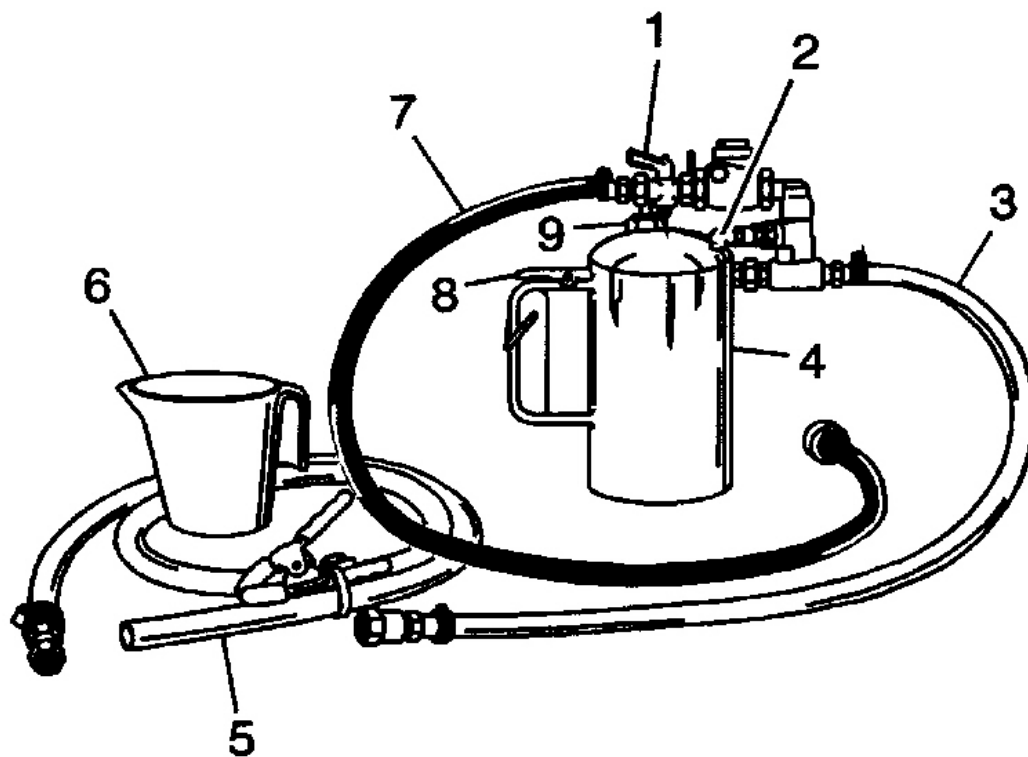
CAUTION: Flushing Solution (J-35944-22) is environmentally safe, yet powerful enough to cut through transmission fluid to dislodge any contaminants from the cooler. The safety precautions on the label regarding potential skin and eye irritations associated with prolonged exposure are typical

precautions that apply to many similar cleaning solutions. It should be noted that according to General Motors, use of other non-approved fluids for cooler flushing can have an adverse reaction to the seals inside the transmission.

NOTE: **DO NOT** use solutions that contain alcohol or glycol. Use of solutions that contain alcohol or glycol may damage flushing equipment, oil cooler components and/or transmission components.

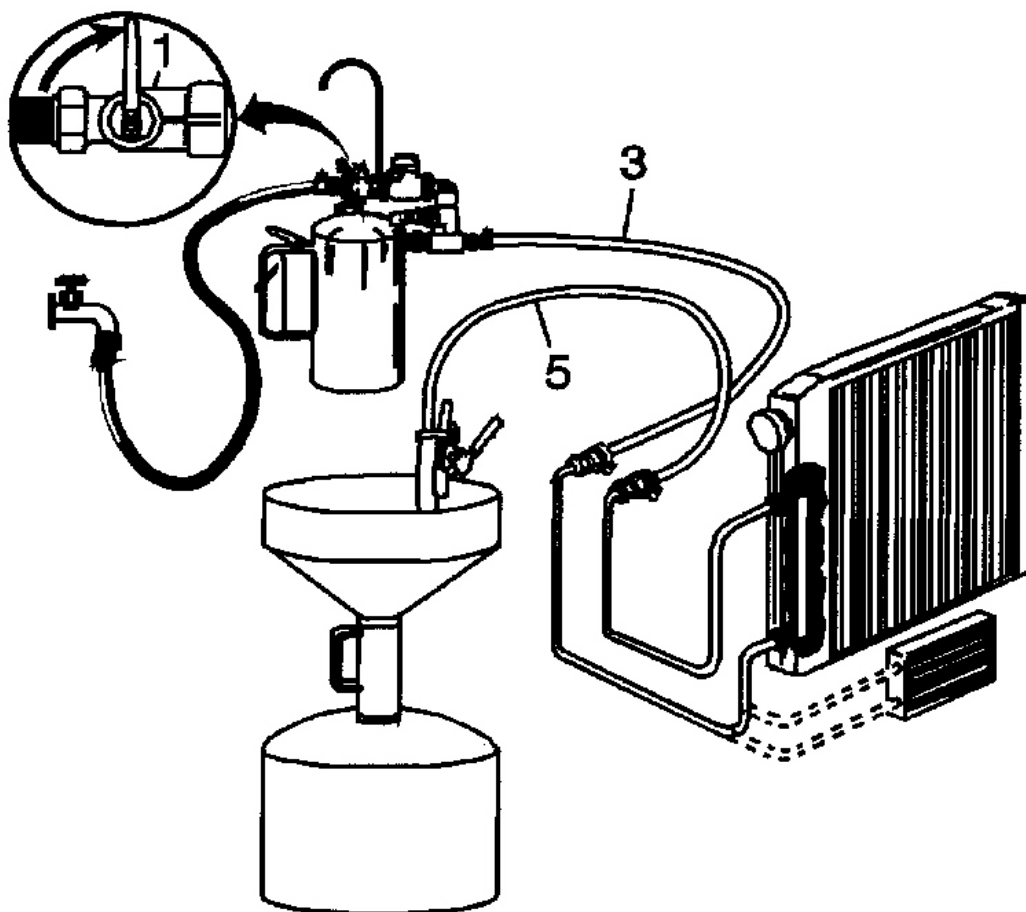
Preparation

1. After the repair or replacement transmission is installed in the vehicle, DO NOT reconnect the oil cooler pipes.
2. Remove the fill cap (9) on the Transmission Oil Cooler and Line Flusher (J-35944-A) and fill the flusher tank (4) with 20-21 oz. (0.6L) of flushing solution using the measuring cup (6). DO NOT overfill.
3. Install the fill cap (9) on the flusher and pressurize the flusher tank (4) to 80-100 psi (550-700 kPa), using the shop air supply at the tank air valve (9). See **Fig. 7** .
4. With the water supply valve (1) on the flusher in the OFF position, connect the water supply hose (7) from the flusher to the water supply at the faucet. See **Fig. 7** and **Fig. 8** .
5. Turn ON the water supply at the faucet.



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Fig. 7: Identifying Flushing Equipment
Courtesy of GENERAL MOTORS CORP.



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Fig. 8: Connecting Flushing Equipment
 Courtesy of GENERAL MOTORS CORP.

Back Flush

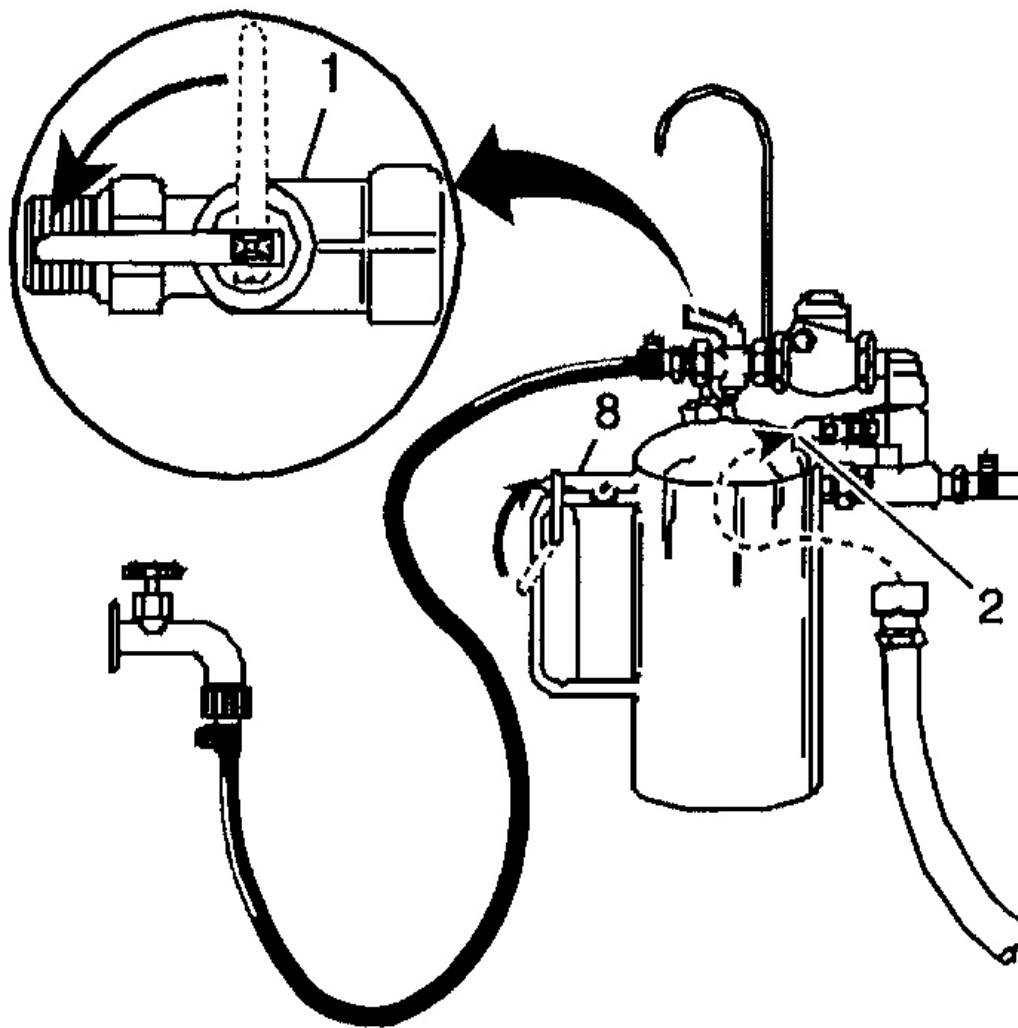
1. Inspect the transmission oil cooler pipes for kinks or damage. Repair as necessary.
2. Connect the transmission oil cooler and line flusher to the oil cooler feed bottom connector. Use the Cooler Flushing Adapter (J 35944-200), if required.
3. Clip the discharge hose (5) onto the oil drain container. See **Fig. 8**.
4. Attach the flusher to the undercarriage of the vehicle with the hook provided and connect the flushing system feed supply hose (3) from the flusher to the top connector oil cooler return pipe. Use the cooler flushing adapter, if required.
5. Turn the flusher water supply valve (1) to the ON position and allow water to flow through the oil cooler and pipes for 10 seconds to remove any remaining transmission fluid. If water does not flow through the

oil cooler and pipes, the cause of the blockage must be diagnosed and the plugged component must be repaired or replaced. Continue with the cooler flushing and flow check procedure once the blockage is corrected.

6. Turn the flusher water supply valve (1) to the OFF position and clip the discharge hose onto a 5 gallon pail with a lid, to avoid splashback.

NOTE: Flushing for approximately 2 minutes in each cooler line direction will result in a total of about 8-10 gallons of waste fluid. This mixture of water and flushing fluid is to be captured in a bucket or similar container.

7. Turn the flusher water supply valve (1) to the ON position and depress the trigger (8) to mix cooler flushing solution into the water flow. Use the clip provided on the handle to hold the trigger (8) down. See **Fig. 9** . The discharge will foam vigorously when the solution is introduced into the water stream.
8. Flush the oil cooler and pipes with water and solution for 2 minutes. During this flush, attach the shop air supply 120 psi (825 kPa) to the flushing system feed air valve (2) located on the flusher, for 3-5 seconds at the end of every 15-20 second interval to create a surging action.
9. Release the trigger (8) and turn the flusher water supply valve (1) to the OFF position.



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Fig. 9: Flushing Oil Cooling System
Courtesy of GENERAL MOTORS CORP.

Forward Flush

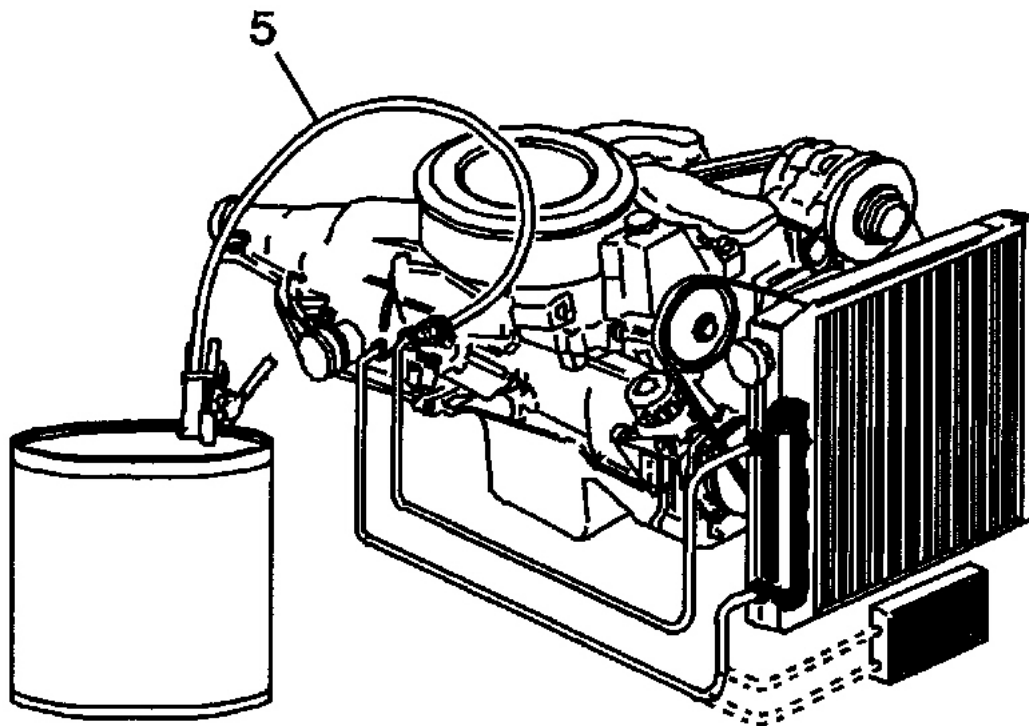
1. Disconnect both hoses (3 and 5) from the oil cooler pipes and connect them to the opposite oil cooler pipe. See **Fig. 8** . This will allow the oil cooler and pipes to be flushed in the normal flow direction.
2. Repeat Steps 6 and 7 of BACK FLUSH procedure.
3. Release the trigger (8) of the transmission oil cooler and line flusher and allow water only to rinse the oil cooler and pipes for one minute. See **Fig. 9** .
4. Turn the flusher water supply valve (1) to the OFF position and turn OFF the water supply at the faucet.

5. Attach the shop air supply to the flushing system feed air valve (2) on the flusher and blow out the water from the oil cooler and pipes. Continue, until no water comes out of the discharge hose.

Flow Test

NOTE: **The Flow Test must be performed after the flush to ensure that all flushing solution and water is removed from the oil cooling system.**

1. Disconnect the hose from the oil cooler pipe. Connect the oil cooler feed pipe, bottom connector, to the transmission for normal flow.
2. Clip the discharge hose (1) to an empty oil container. See **Fig. 10** .
3. Confirm the transmission is filled with automatic transmission fluid. See **FLUID CAPACITIES** for correct fluid capacity.
4. Start the engine with the transmission in Park range and run for 30 seconds after fluid begins to flow from the discharge hose (1). A minimum of 2 qt (1.9 L) must be discharged during this 30 second run time.
5. If the fluid flow meets or exceeds 2 qts (1.9 L) in 30 seconds, connect the oil cooler feed pipe to the bottom connector on the transmission.
6. If fluid flow is less than 2 qt (1.9 L) in 30 seconds, perform the following diagnosis:
 - A. Disconnect the transmission oil cooler and line flusher discharge hose (1) from the oil cooler return pipe.
 - B. Disconnect the oil cooler feed pipe at the radiator.
 - C. Connect the flusher discharge hose (1) to the oil cooler feed pipe, radiator end.
 - D. Clip the discharge hose (1) onto the oil drain container.
 - E. Start the engine with the transmission in Park range and run for 30 seconds after fluid begins to flow from the discharge hose (1). A minimum of 2 qt (1.9 L) must be discharged during this 30 second run time.
7. If the amount of transmission fluid flow remains less than 2 qt (1.9 L) in 30 seconds, inspect the oil cooler feed pipe, bottom connector, for restrictions or damage. If no condition is found with the feed pipe, bottom connector, inspect the transmission.



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Fig. 10: Capturing Fluid Discharge
Courtesy of GENERAL MOTORS CORP.

Clean-Up

1. Disconnect the water supply hose from the transmission oil cooler and line flusher and bleed any remaining air pressure from the flusher tank.
2. Remove the fill cap from the flusher and return any unused flushing solution to its container. Rinse the flusher with water. DO NOT store the flusher with flushing solution in it.
3. After every third use, clean the flusher as described in the instructions included with the tool.
4. Dispose of any waste water/solution and transmission fluid in accordance with local regulations.

ON-VEHICLE REPAIRS

NOTE: Various components may be serviced without transmission removal, depending on application. For servicing of these components, see appropriate component under ADJUSTMENTS and/or REMOVAL & INSTALLATION . For additional information on testing electrical components, see appropriate DIAGNOSIS article.

ADJUSTMENTS

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. DO NOT use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

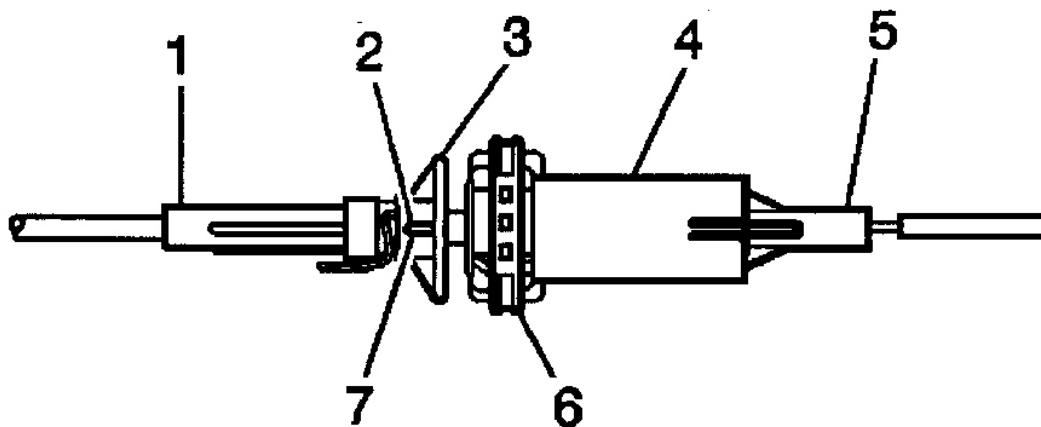
PARK/NEUTRAL POSITION SWITCH

NOTE: Apply the Park brake. The engine must start in the Park (P) or Neutral (N) positions only. Check the Park/Neutral Position (PNP) switch for proper operation.

1. Place the transmission range selector in the Neutral (N) position.
2. With an assistant in the drivers seat, raise and suitably support the vehicle.
3. Loosen the PNP switch bolts.
4. With the vehicle in the Neutral (N) position, rotate the switch while the assistant attempts to start the engine.
5. Following a successful start, turn the engine OFF.
6. Tighten the PNP switch bolts to specification. See **TORQUE SPECIFICATIONS** .
7. Lower the vehicle.
8. Check the PNP switch for proper operation. The engine must start in the Park (P) or Neutral (N) positions only.
9. Replace the PNP switch if proper operation can not be achieved. See **PARK/NEUTRAL POSITION SWITCH** .

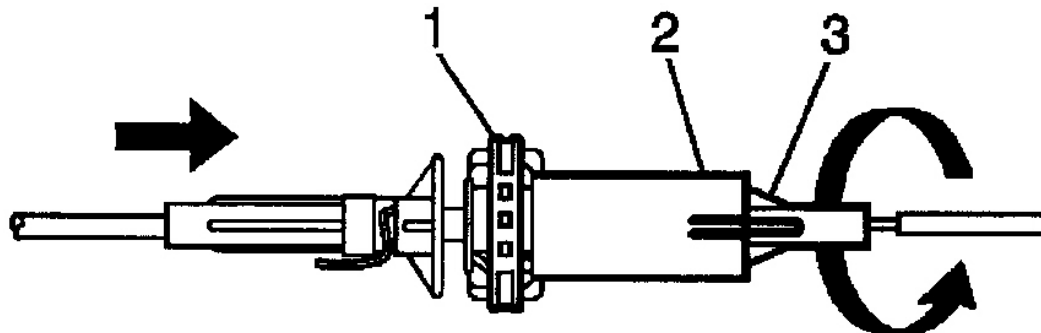
SHIFT CABLE

1. Ensure the steering column shift lever and the transmission manual shaft lever are in the Park (P) position.
2. Raise and suitably support the vehicle.
3. With right hand, push the flange (3) of the cable (transmission end) (5), inside the cable (1) (shifter end) until the connection is made, ensuring the flange ribs (7) align with the cable (shifter end) (1) slots (2). See [Fig. 11](#) .
4. Hold the red security ring (6) with left hand and with right hand, twist the blue rotating lock (4) until it snaps into position.
5. With left hand, push the red security ring (1) to the right. See [Fig. 12](#) .
6. The red security ring should cover the white (2) marks on the blue rotating lock (3).



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Fig. 11: Identifying Shift Cable Components
 Courtesy of GENERAL MOTORS CORP.



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Fig. 12: Adjusting Red Security Ring
 Courtesy of GENERAL MOTORS CORP.

REMOVAL & INSTALLATION

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. DO NOT use electrical test equipment on or near these circuits. If necessary,

deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. Before disconnecting battery, see COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION.

CAUTION: 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.

ACCUMULATOR ASSEMBLY

NOTE: Tools required: Pump and Valve Body Alignment Pin Set (J-25025-B), and Transjel Lubricant (J-36850).

Removal

1. Remove the transmission filter.
2. Remove the control valve body. See VALVE BODY & PRESSURE SWITCH .
3. Remove the accumulator cover bolts. See Fig. 13 .
4. Remove the 1-2 accumulator cover.
5. Disassemble the 1-2 accumulator as follows:
 - A. Blow compressed air into the 1-2 accumulator cover in order to remove the 1-2 accumulator piston. See Fig. 14 .
 - B. Remove the 1-2 accumulator inner and outer springs.
6. Inspect the 1-2 accumulator inner and outer springs for cracks.
7. Remove the 1-2 accumulator piston seal (1) from the 1-2 accumulator piston. See Fig. 15 .
8. Inspect the 1-2 accumulator piston for the following defects:
 - Porosity.
 - Cracks.
 - Scoring.
 - Nicks and scratches.
9. Inspect the 1-2 accumulator cover for the following defects:

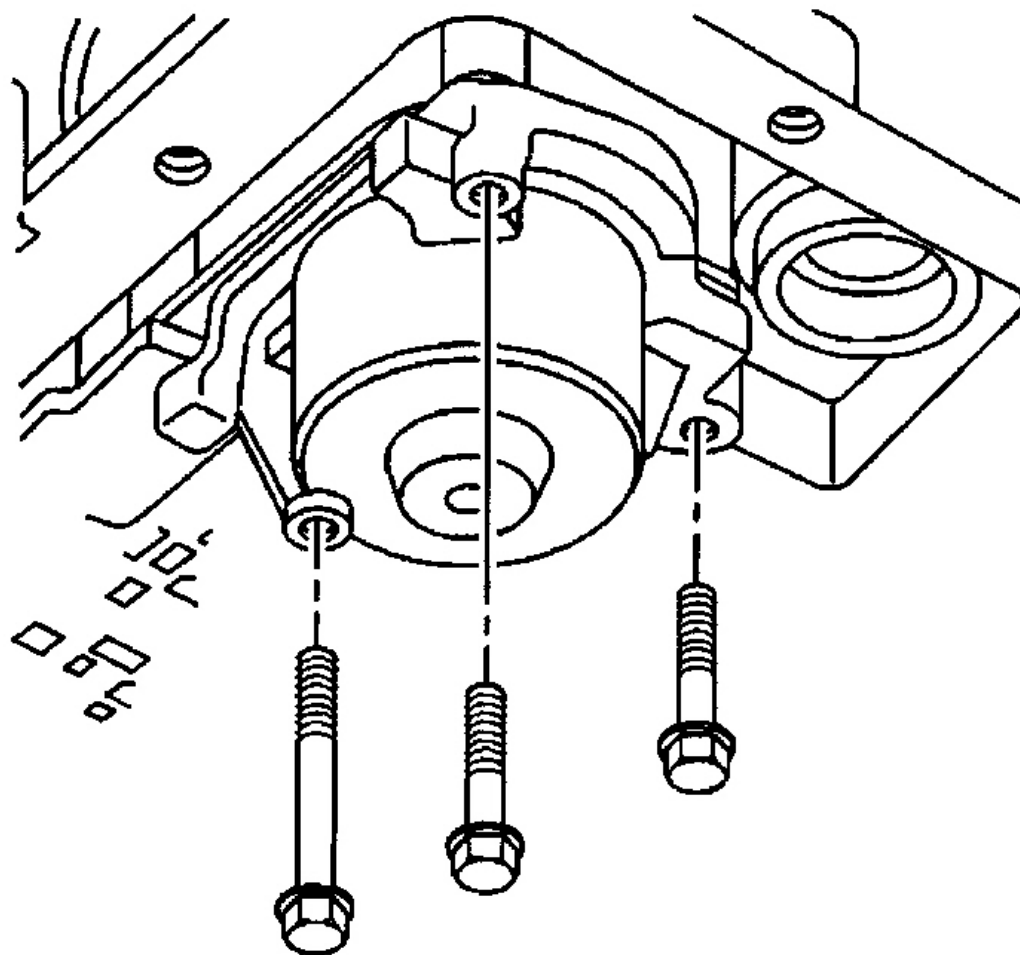
- Porosity.
- Cracks.
- Scoring.
- Nicks and scratches.

See **Fig. 16** .

10. Remove the spacer plate support bolts. See **Fig. 17** .

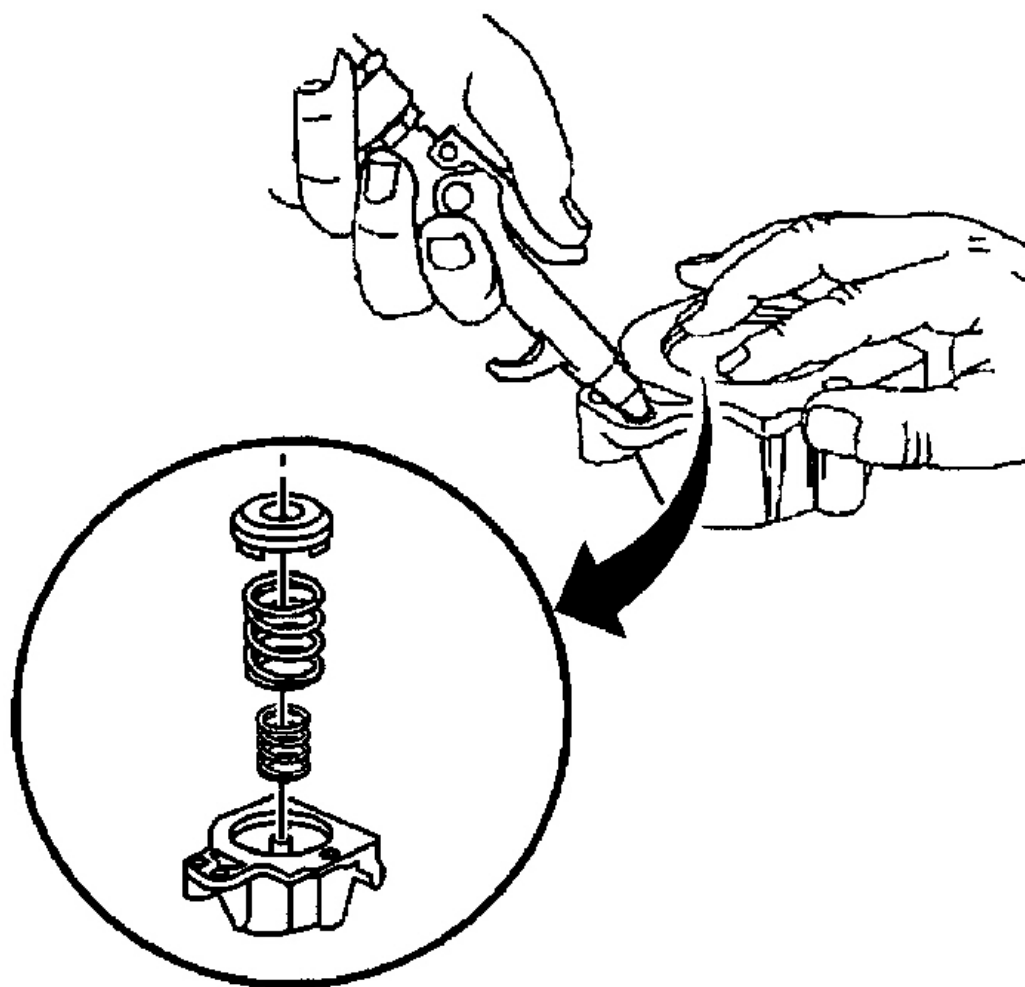
NOTE: **Use care not to drop the number one checkball, the 3-4 accumulator spring and the 3-4 accumulator pin.**

11. Remove the spacer plate support.
12. Remove the spacer plate to valve body gasket, the spacer plate and the spacer plate to transmission case gasket. See **Fig. 18** .
13. Remove the 3-4 accumulator piston. See **Fig. 19** .
14. Inspect the 3-4 accumulator spring for cracks.
15. Remove the 3-4 accumulator piston seal (1) from the 3-4 accumulator piston. See **Fig. 15** .
16. Inspect the 3-4 accumulator piston for the following defects:
 - Porosity.
 - Cracks.
 - Scoring.
 - Nicks and scratches.



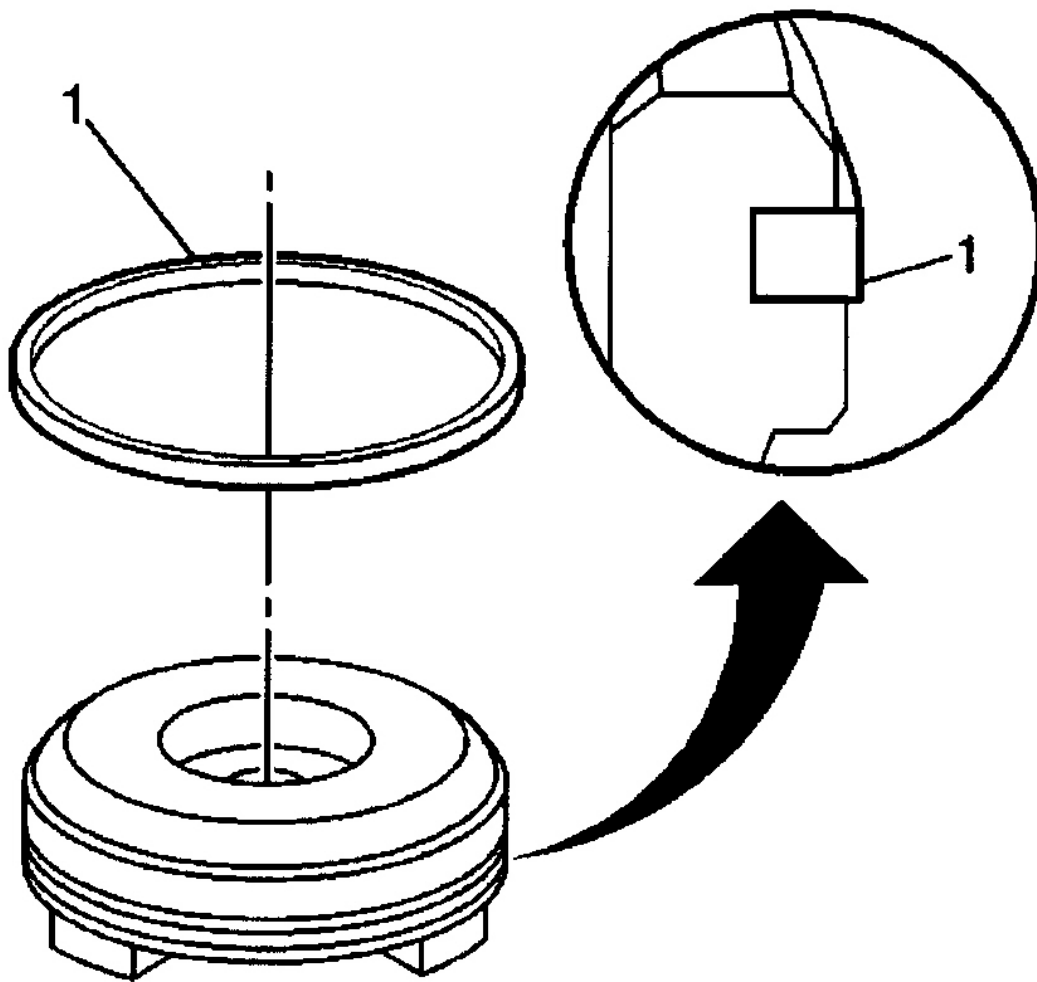
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Fig. 13: Removing Accumulator Assembly Bolts
Courtesy of GENERAL MOTORS CORP.



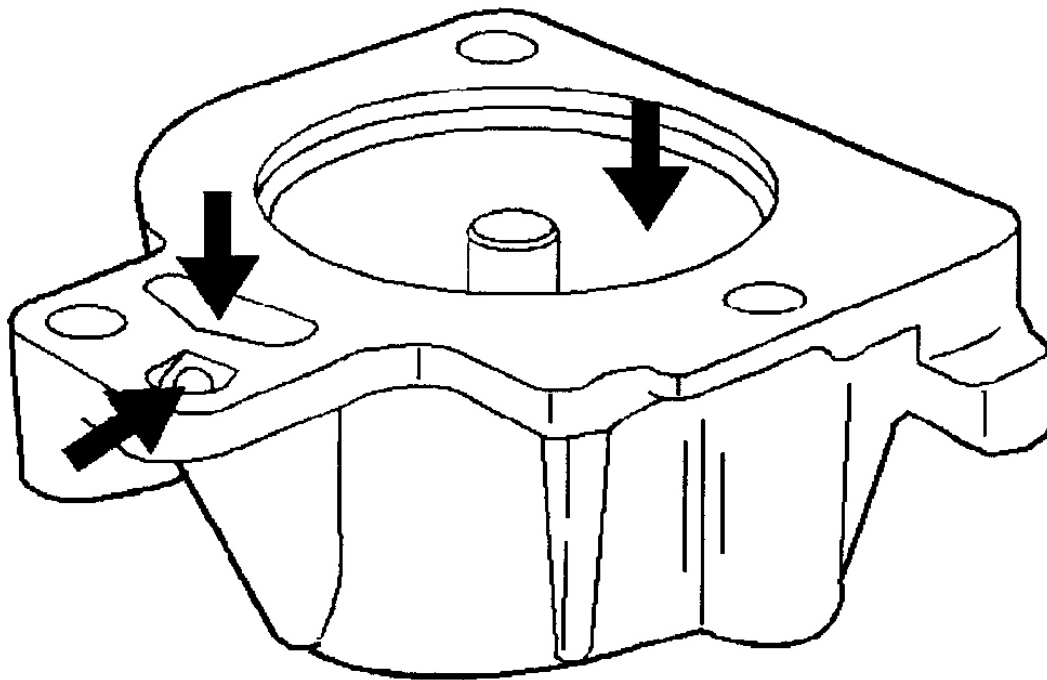
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Fig. 14: Removing & Installing 1-2 Accumulator Assembly
Courtesy of GENERAL MOTORS CORP.



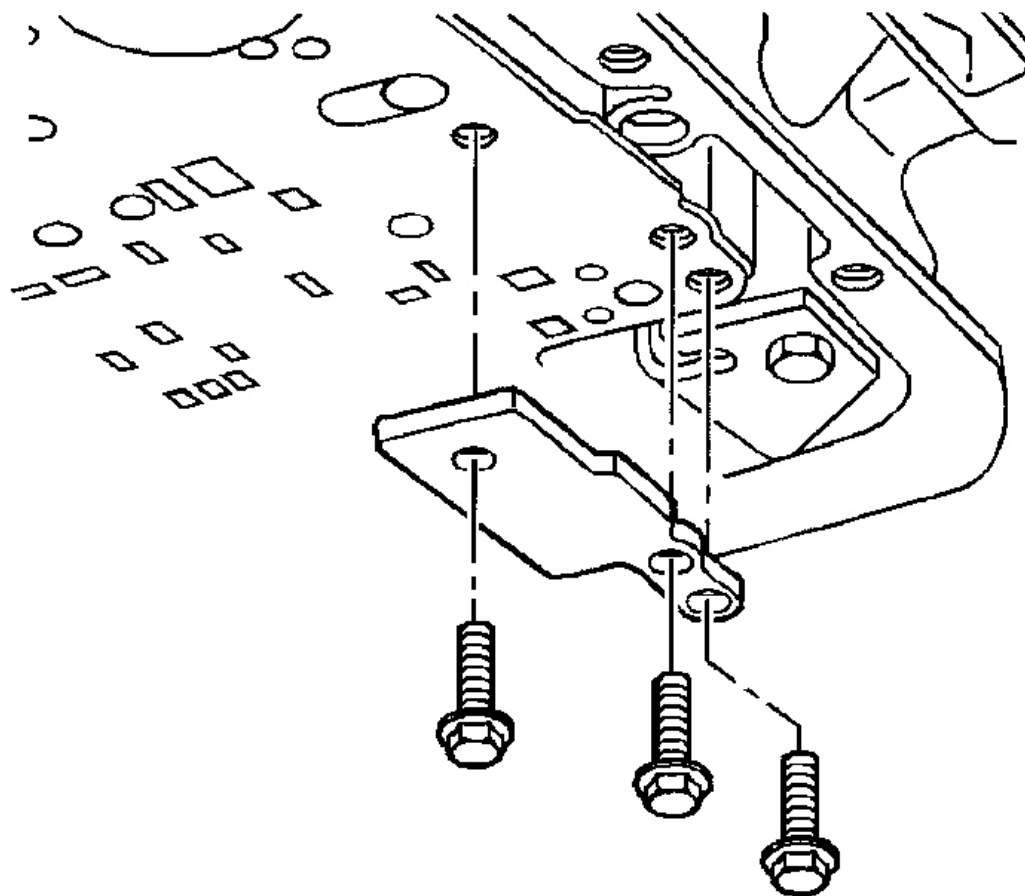
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Fig. 15: Removing 1-2 Accumulator Piston Seal
Courtesy of GENERAL MOTORS CORP.



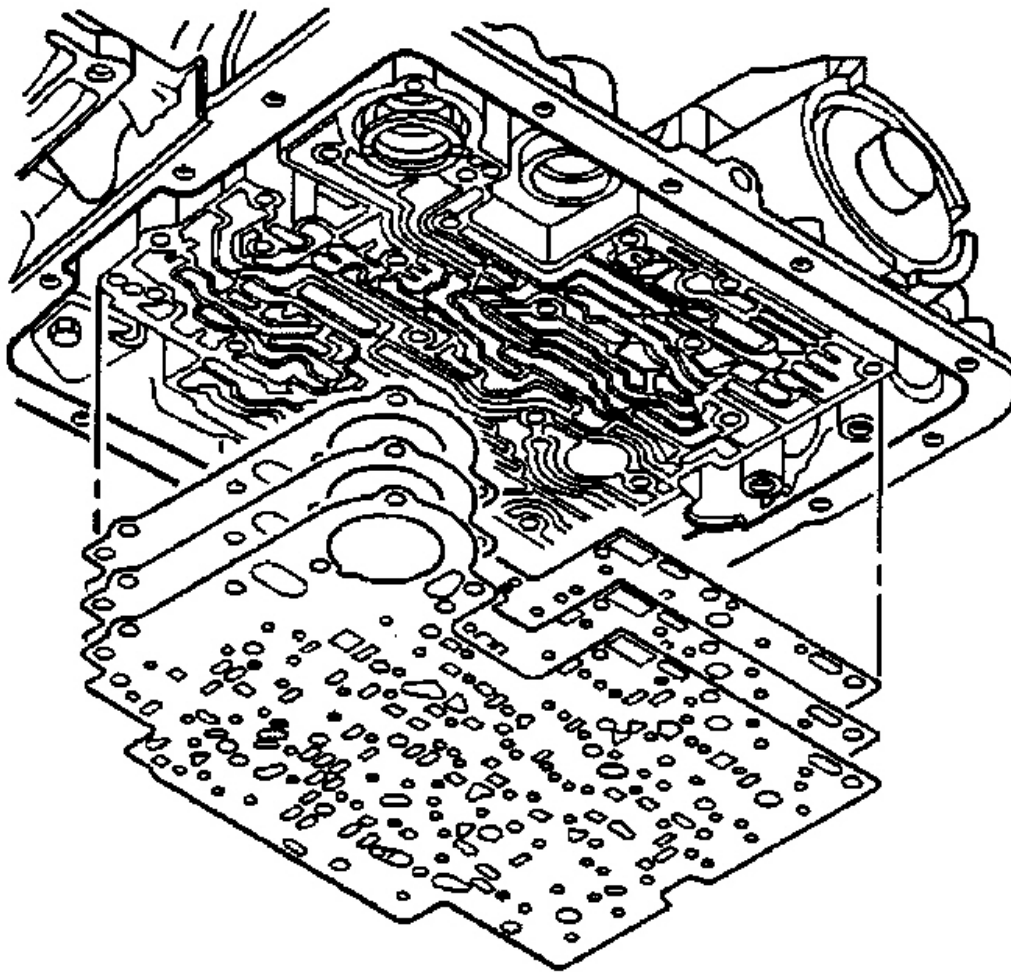
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Fig. 16: Inspecting 1-2 Accumulator Cover
Courtesy of GENERAL MOTORS CORP.



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Fig. 17: Removing & Installing Oil Pass Cover
Courtesy of GENERAL MOTORS CORP.



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Fig. 18: Removing & Installing Spacer Plates
Courtesy of GENERAL MOTORS CORP.

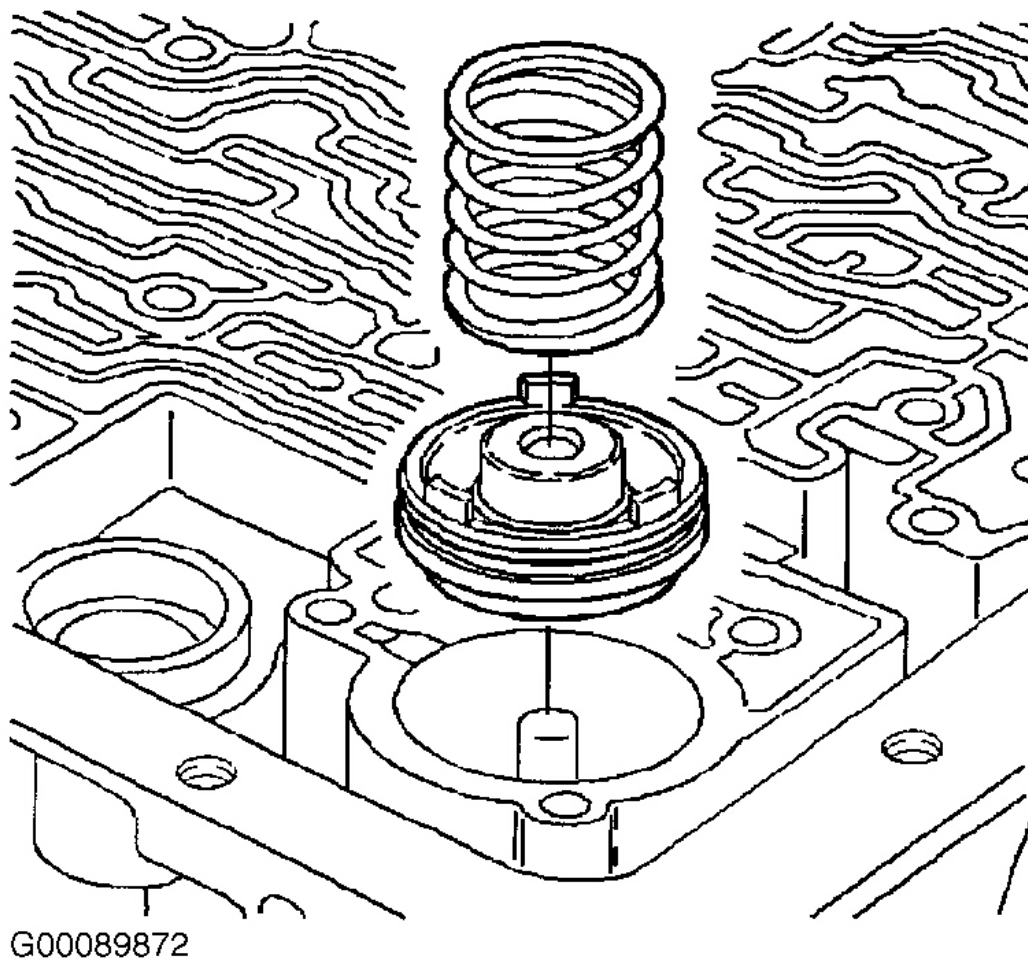


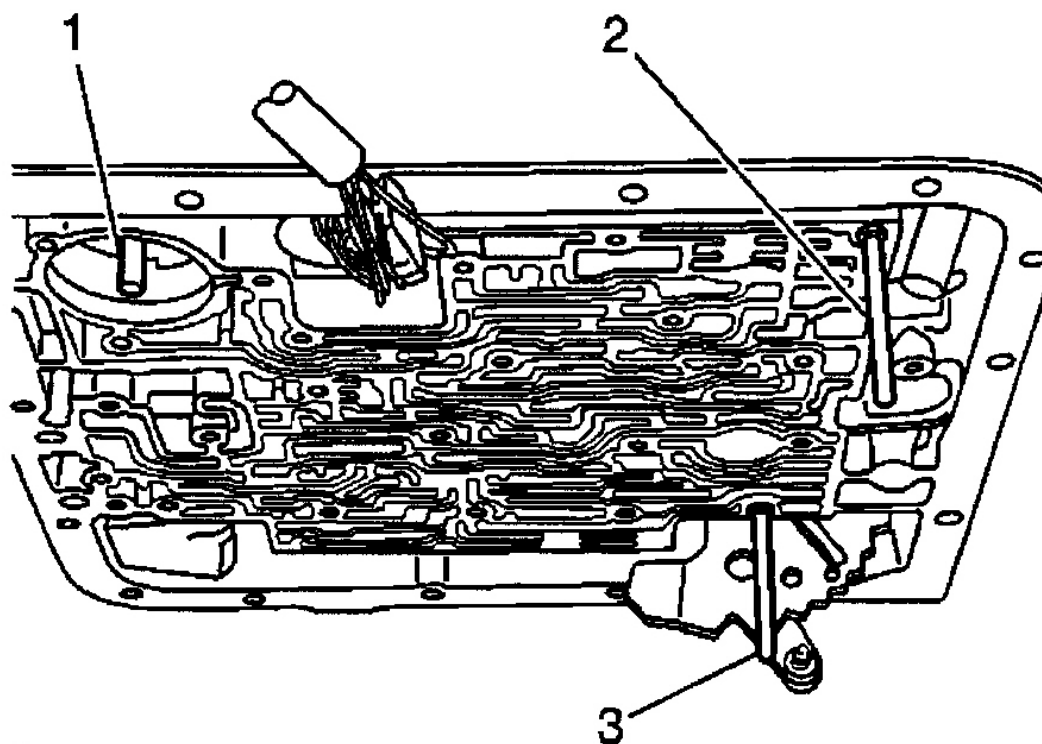
Fig. 19: Removing & Installing 3-4 Accumulator Assembly
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install a new 3-4 accumulator piston seal (1) to the 3-4 accumulator piston. See **Fig. 15** .
 2. Install the 3-4 accumulator pin (1) into the transmission case and retain the pin with Transjel(R) lubricant. See **Fig. 20** .
 3. Install the 3-4 accumulator piston onto the pin in the transmission case. See **Fig. 19** . Ensure that the 3-4 accumulator piston legs face away from the transmission case.
 4. Install the pump and valve body alignment pin set (2, 3) to the transmission case. See **Fig. 20** .
 5. Install the spacer plate to transmission case gasket and the spacer plate to valve body gasket to the spacer plate; use Transjel(R) lubricant in order to retain the gaskets to the spacer plate. See **Fig. 21** .
- The case gasket is identified by a "C". Be sure to place the case gasket on the transmission case

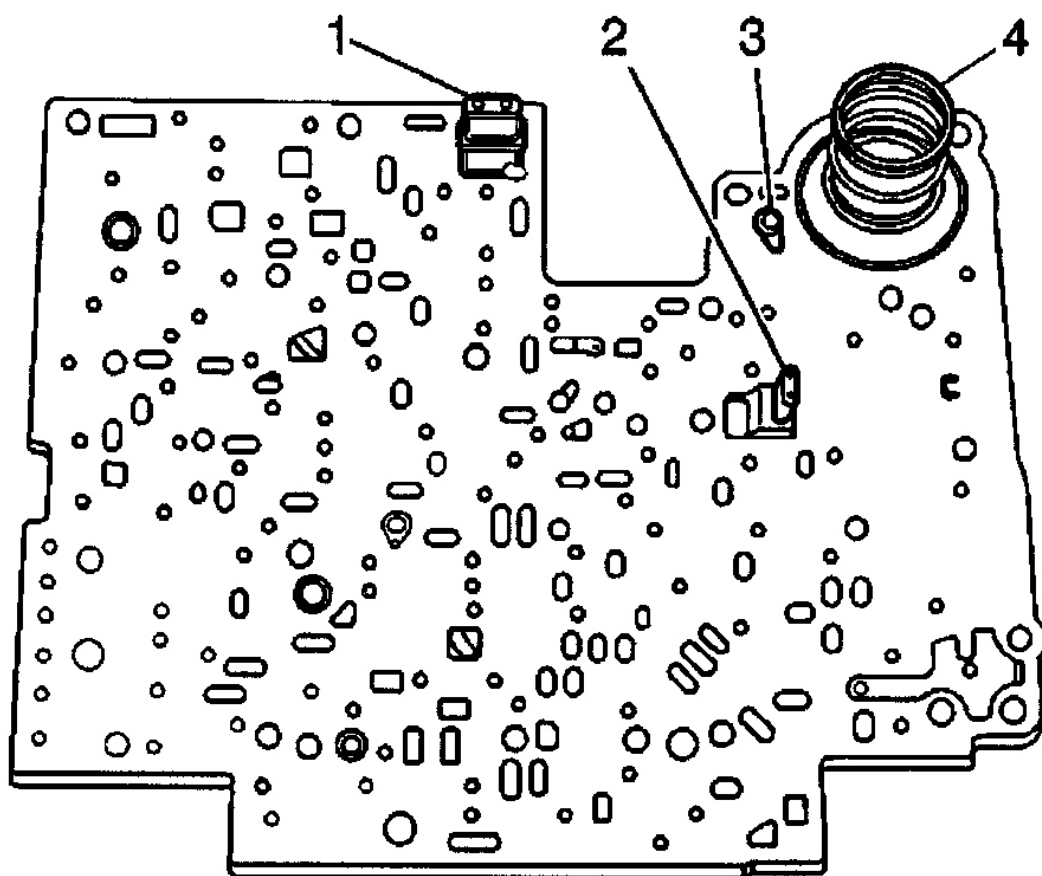
side of the spacer plate.

- The valve body gasket is identified by a "V". Be sure to place the valve body gasket on the valve body side of the spacer plate.
6. Ensure that the solenoid screens (1 and 2) are in place on the spacer plate.
 7. Place the checkball (3) on the spacer plate in the location shown.
 8. Place the 3-4 accumulator spring (4) on the spacer plate.
 9. Install the spacer plate and related components to the transmission.
 10. Install the spacer plate support and the spacer plate support bolts. See **Fig. 17** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
 11. After installing the spacer plate support (2), look through the hole in the spacer plate to ensure that the checkball (1) has remained in the proper location. See **Fig. 22** .
 12. Install a new 1-2 accumulator piston seal (1) to the 1-2 accumulator piston. See **Fig. 15** .
 13. Install the 1-2 accumulator inner and outer springs to the 1-2 accumulator cover. See **Fig. 23** .
 14. Install the 1-2 accumulator piston onto the pin in the 1-2 accumulator cover. Ensure that the piston legs face the accumulator cover.
 15. Install the 1-2 accumulator cover and the accumulator cover bolts. See **Fig. 13** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
 16. Remove the pump and valve body alignment pin set from the transmission case.
 17. Install the valve body. See **VALVE BODY & PRESSURE SWITCH** .
 18. Install the transmission filter.



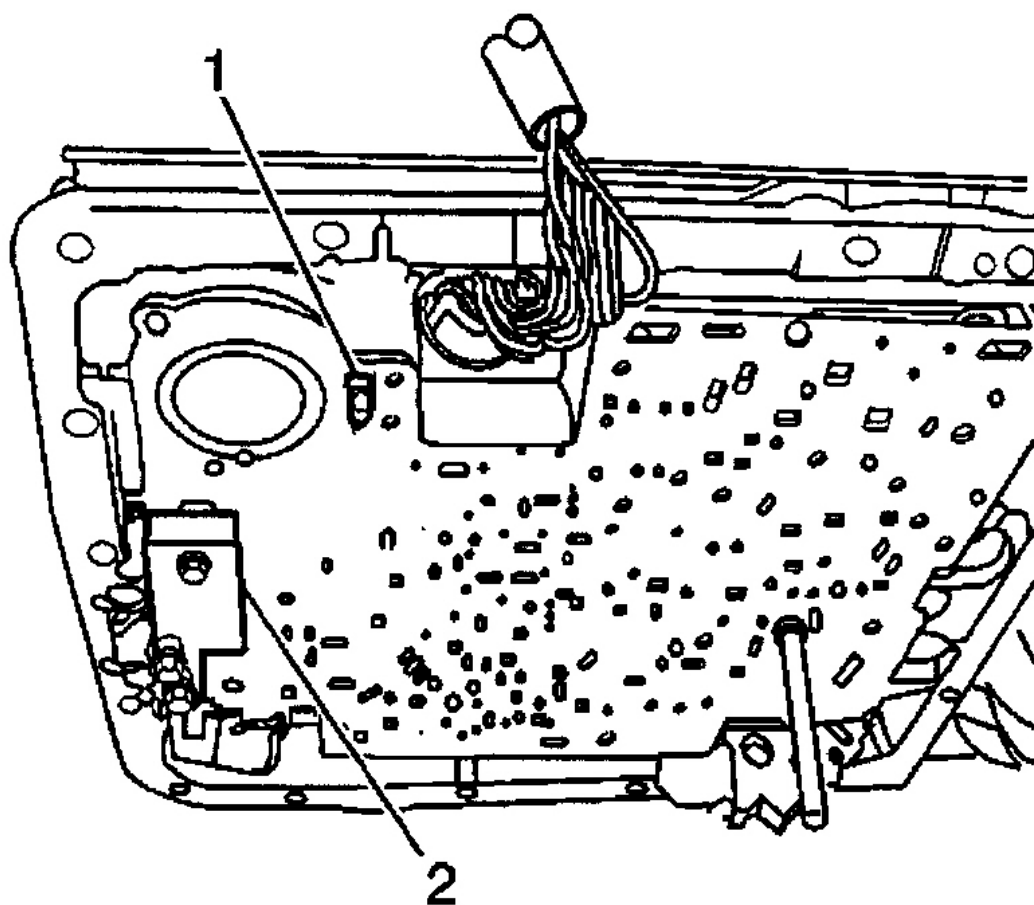
G00202970

Fig. 20: Installing 3-4 Accumulator Pin
Courtesy of GENERAL MOTORS CORP.



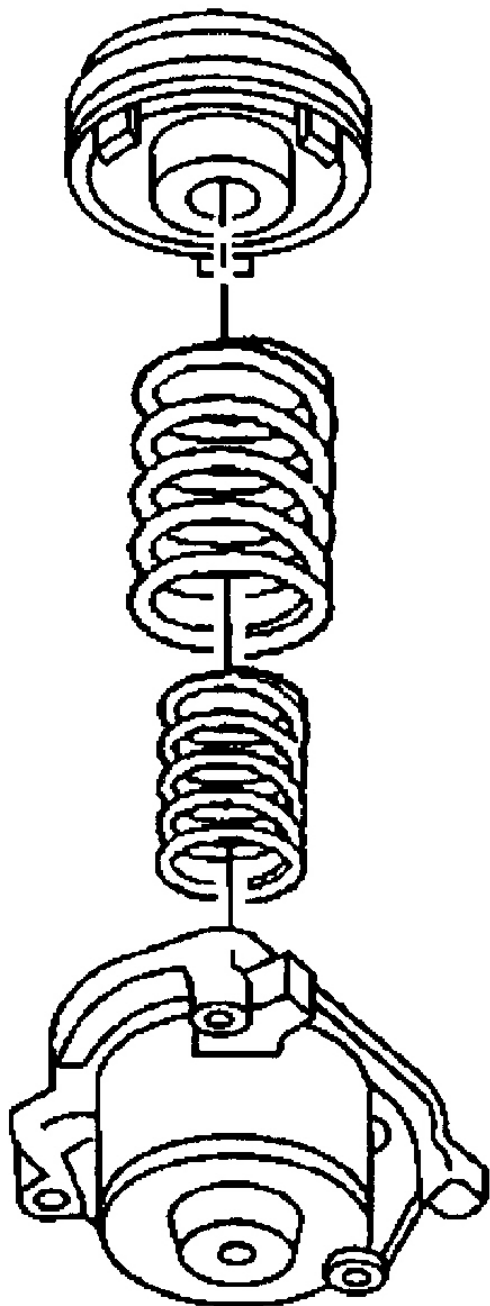
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Fig. 21: Installing Spacer Plate
Courtesy of GENERAL MOTORS CORP.



G00202972

Fig. 22: Installing Spacer Plate Support
Courtesy of GENERAL MOTORS CORP.



G00202973

Fig. 23: Installing 1-2 Accumulator Inner & Outer Springs
Courtesy of GENERAL MOTORS CORP.

AUXILIARY OIL COOLER

Removal

1. Remove the front grill assembly.
2. Place a drain pan under the vehicle.
3. Disconnect the transmission oil cooler lines from the auxiliary cooler.
4. Remove the auxiliary oil cooler bolts (1) and push pins (2). See **Fig. 24** .
5. Remove the auxiliary oil cooler from the vehicle.

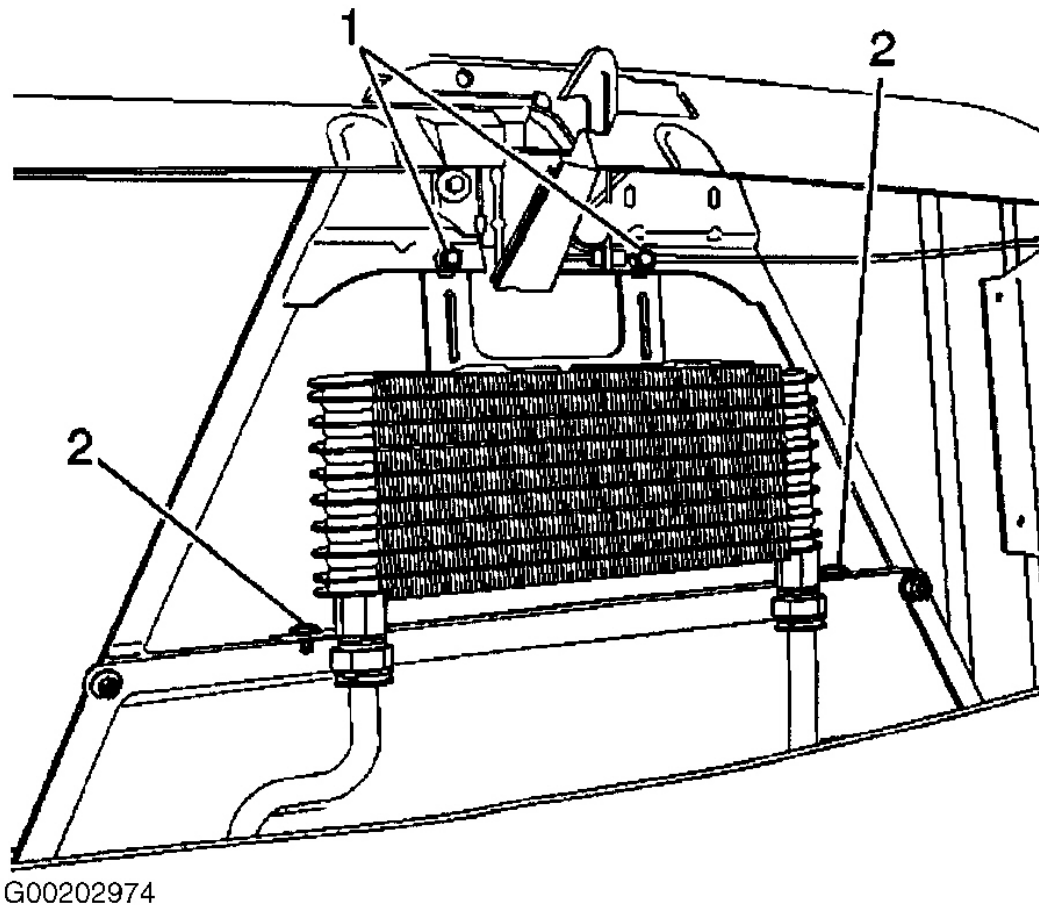


Fig. 24: Disconnecting Transmission Oil Cooler
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the auxiliary oil cooler to the vehicle.
2. Install the bolts (1) and the push pins (2) that retain the auxiliary oil cooler to the radiator brace. See **Fig. 24** . Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

3. Connect the transmission oil cooler lines to the auxiliary cooler.
4. Install the front grill assembly.

CONTROL & SHIFT SOLENOIDS

NOTE: Valve body removal is not necessary for the following procedure.

Removal

1. Remove the transmission oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.

NOTE: DO NOT remove the valve body for the following procedures. Removal of the 1-2 accumulator is necessary only if servicing the pressure control solenoid.

2. Remove the 1-2 accumulator if necessary. See **ACCUMULATOR ASSEMBLY** .
3. Disconnect the internal wiring harness electrical connectors from the following components:
 - Transmission fluid pressure switch. See **Fig. 25** .
 - 1-2 shift control solenoid.
 - 2-3 shift control solenoid.
 - Pressure control solenoid.
 - Torque Converter Clutch Pulse Width Modulation (TCC PWM) solenoid.
 - 3-2 shift control solenoid.
4. Remove the pressure control solenoid retainer. Remove the pressure control solenoid. See **Fig. 26** .
5. Remove the 1-2 and 2-3 shift control solenoid retainers. Remove the 1-2 and 2-3 shift control solenoids. See **Fig. 27** .
6. Remove the 3-2 control solenoid retainer. Remove the 3-2 control solenoid. See **Fig. 28** .

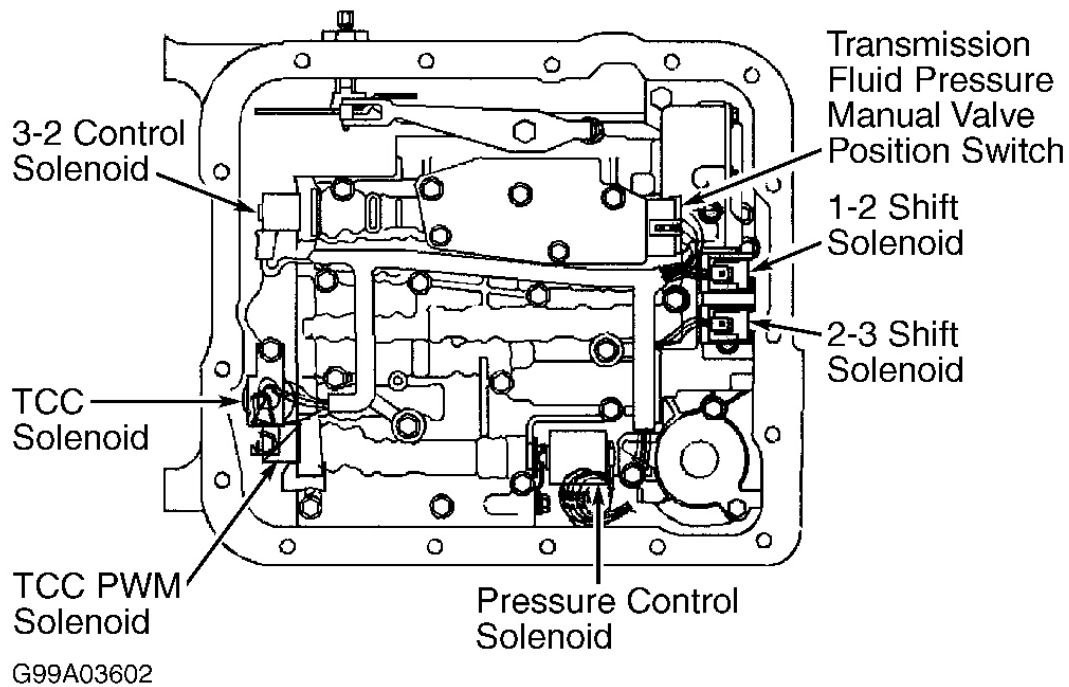
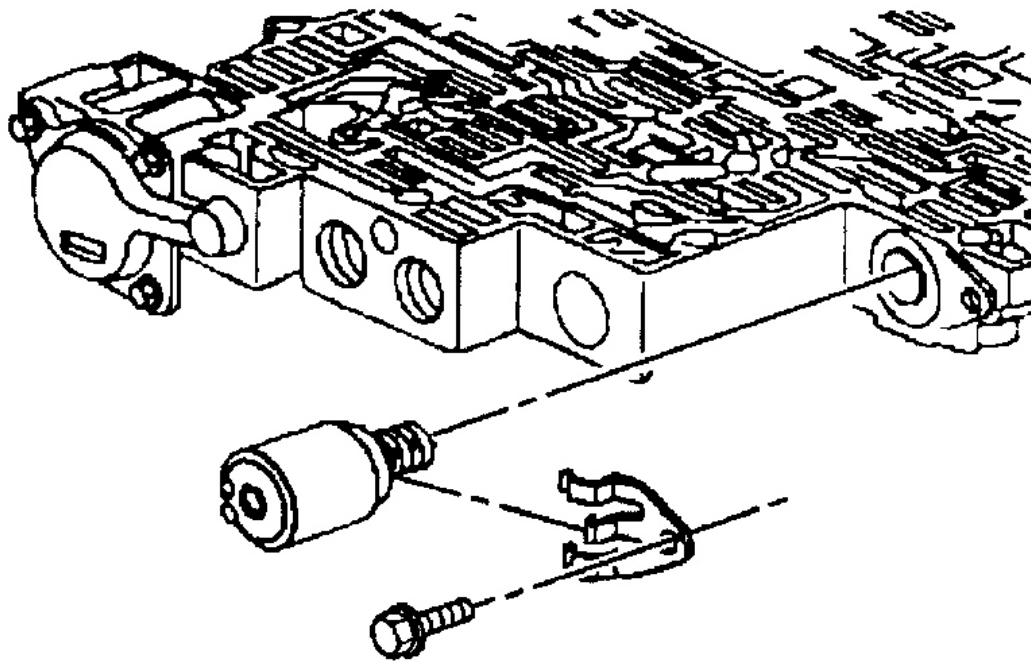
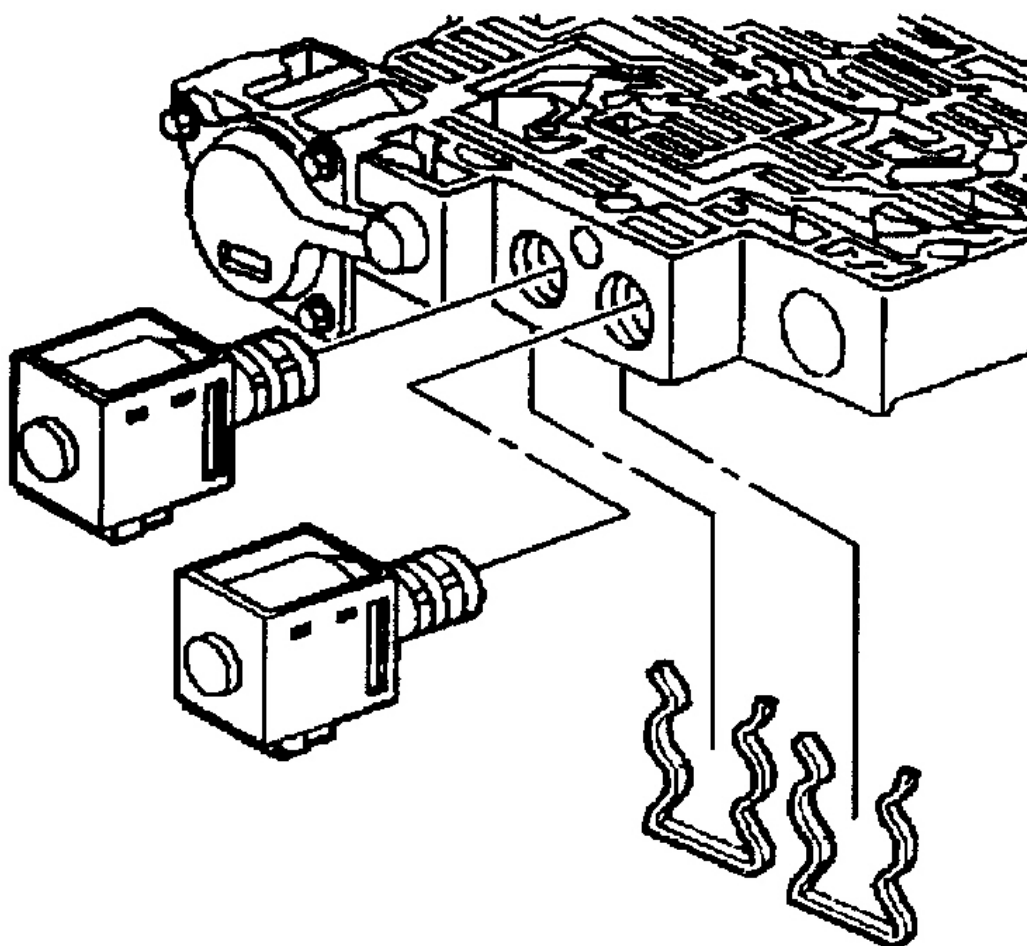


Fig. 25: View Of Control & Shift Control Solenoid Locations
Courtesy of GENERAL MOTORS CORP.



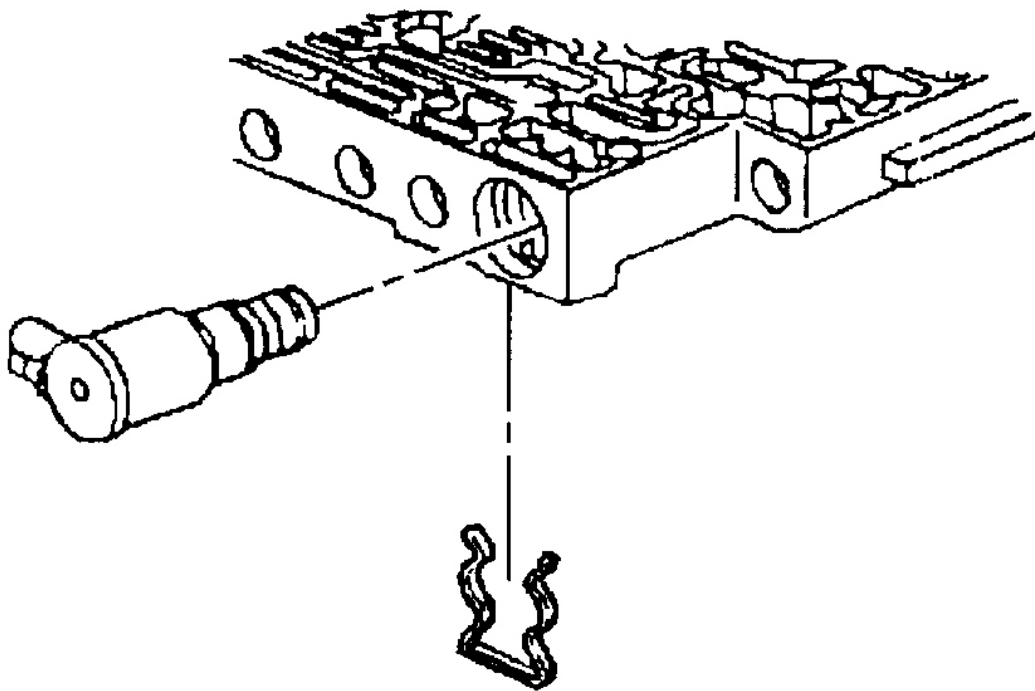
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Fig. 26: Disassembled View Of Pressure Control Solenoid
Courtesy of GENERAL MOTORS CORP.



G00056999

Fig. 27: Disassembled View Of Shift Control Solenoids
Courtesy of GENERAL MOTORS CORP.



G00202975

Fig. 28: Removing 3-2 Control Solenoid & Retainer
Courtesy of GENERAL MOTORS CORP.

Installation

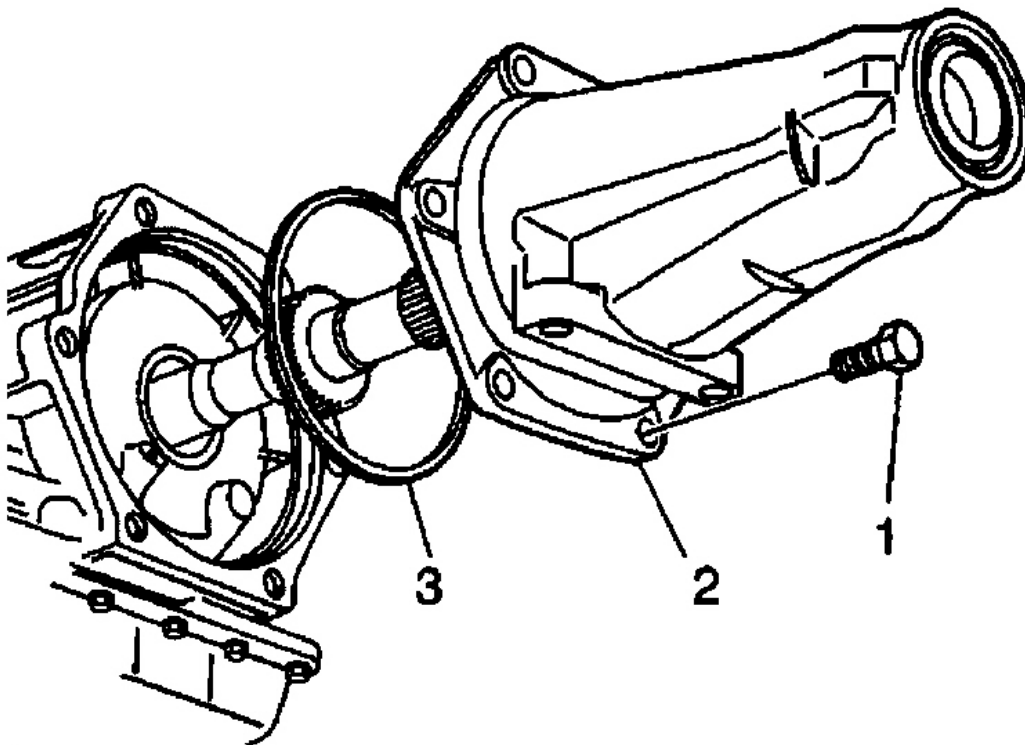
1. Install the 3-2 control solenoid. Install the 3-2 control solenoid retainer. Install the 1-2 and 2-3 shift control solenoids. See **Fig. 28** .
2. Install the 1-2 and 2-3 shift control solenoid retainers. Install the pressure control solenoid. Ensure the electrical tabs are facing outboard. See **Fig. 27** .
3. Install the pressure control solenoid retainer and retaining bolt and tighten to specification. See **TORQUE SPECIFICATIONS** .
4. Connect the internal wiring harness electrical connectors to the following components:
 - Transmission fluid pressure switch. See **Fig. 25** .
 - 1-2 shift control solenoid.
 - 2-3 shift control solenoid.
 - Pressure control solenoid.
 - TCC PWM solenoid.
 - 3-2 control solenoid.
5. Install the 1-2 accumulator. See **ACCUMULATOR ASSEMBLY** .

6. Install the transmission oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.
7. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .

EXTENSION HOUSING ASSEMBLY

Removal

1. Remove the drive shaft. See appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
2. Remove the transmission mount.
3. Support the transmission with a transmission jack.
4. Place a drain pan under the vehicle.
5. Remove the case extension bolts (1). See **Fig. 29** .
6. Remove the case extension (2).
7. Remove and discard the case extension "O" ring seal (3).



G00087663

Fig. 29: Removing & Installing Extension Housing

Courtesy of GENERAL MOTORS CORP.

Installation

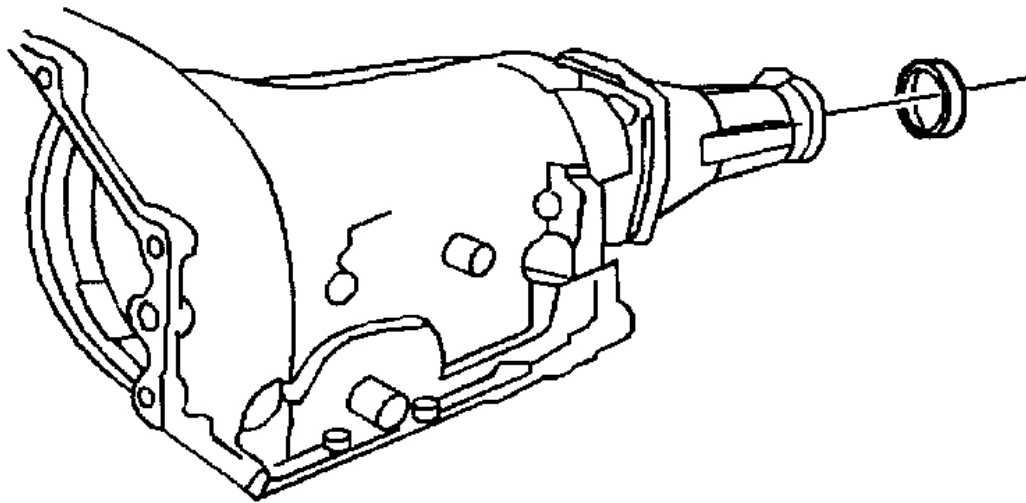
1. Install a new case extension "O" ring seal (3). See **Fig. 29** .
2. Install the case extension (2).
3. Install the case extension bolts (1). Tighten the case extension bolts to specification. See **TORQUE SPECIFICATIONS** .
4. Install the transmission mount.
5. Remove the drain pan and the transmission jack.
6. Install the drive shaft. See appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
7. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .

EXTENSION HOUSING REAR OIL SEAL

NOTE: **Tools required: Rear Extension Seal Installer (J-21426), and Transmission Assembly Lubricant (J-36850).**

Removal

1. Place a drain pan under the vehicle.
2. Remove the drive shaft. See appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
3. Remove the rear extension oil seal. See **Fig. 30** .
4. Inspect the case extension housing for damage. Replace the extension housing if necessary.

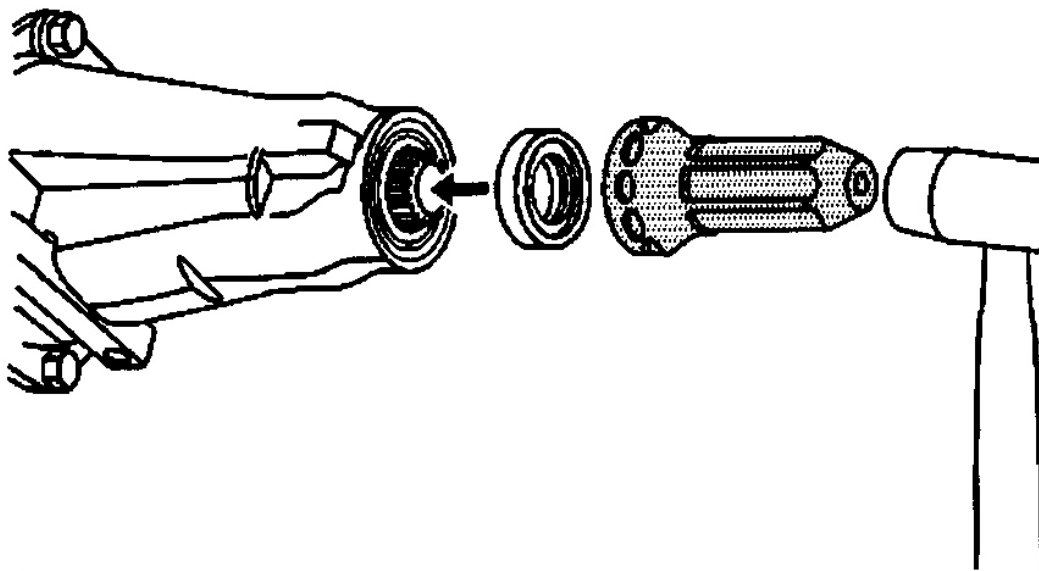


G00088371

Fig. 30: Removing Rear Extension Housing Seal
Courtesy of GENERAL MOTORS CORP.

Installation

1. Lubricate the inside diameter of the NEW seal with Transjel(R) lubricant.
2. Install the new seal using rear extension seal installer and a soft faced mallet. See **Fig. 31** .
3. Remove the drain pan.
4. Install the drive shaft. See appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
5. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .



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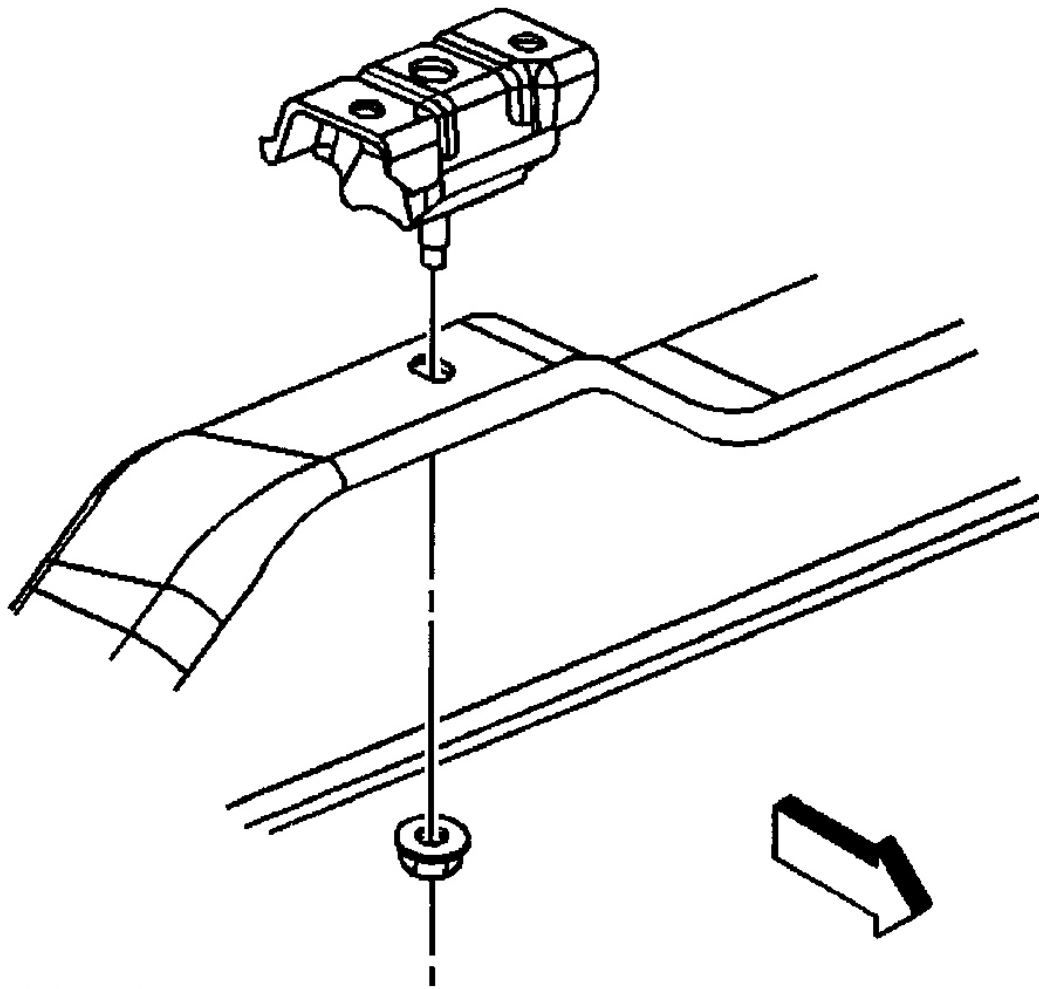
Fig. 31: Installing Rear Extension Housing Rear Oil Seal
Courtesy of GENERAL MOTORS CORP.

FILLER TUBE & SEAL

Removal

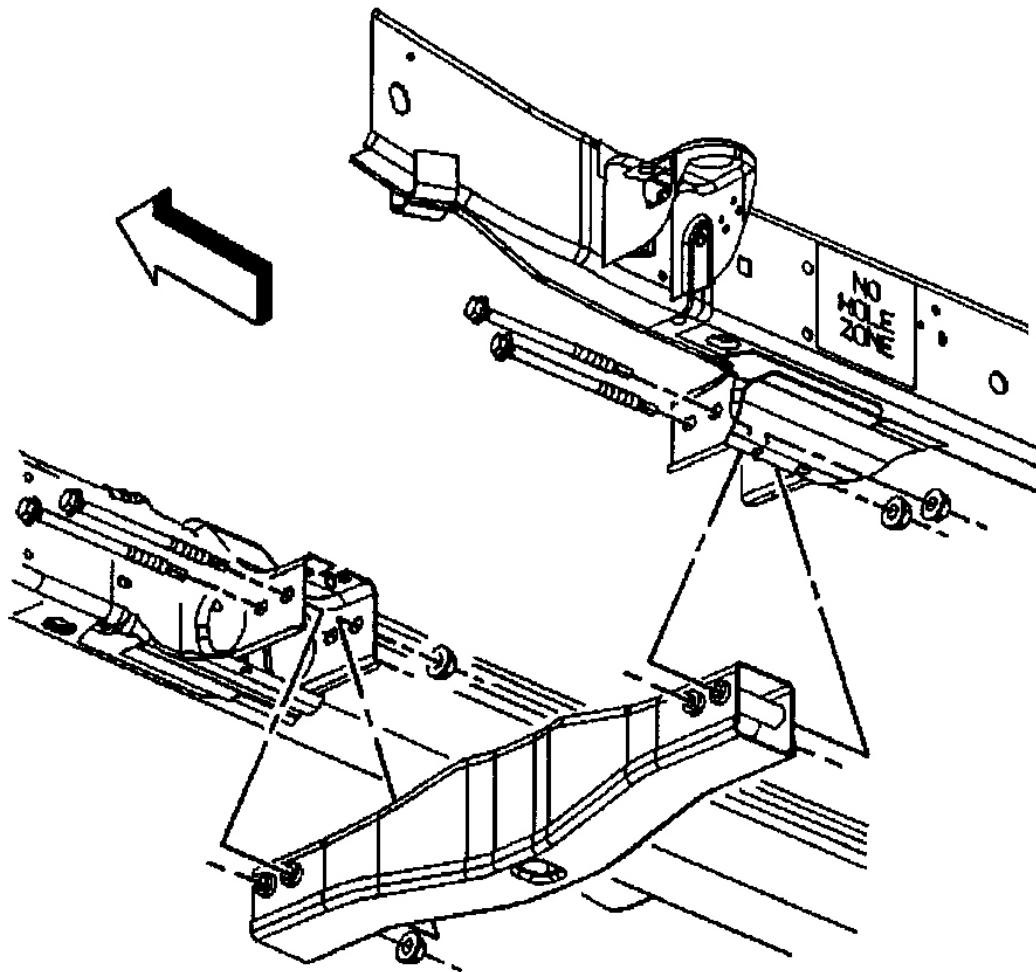
1. Remove the transmission oil level indicator.
2. Raise and suitably support the vehicle.
3. Support the transmission using a suitable jack.
4. Remove the transmission mount nut. See **Fig. 32** .
5. Remove the transmission crossmember bolts/nuts. See **Fig. 33** .
6. Remove the transmission crossmember.
7. Loosen the left exhaust pipe nuts. See **Fig. 34** .
8. Loosen the right exhaust pipe nuts. See **Fig. 35** .
9. Remove the insulator nuts and insulator from the bracket. See **Fig. 36** .
10. Remove the exhaust pipe hanger bracket bolts and bracket.
11. Lower the transmission slightly.
12. Disconnect the transmission oil cooler lines. See **Fig. 37** .
13. Plug the transmission oil cooler line fittings.
14. Remove the indicator tube nut. See **Fig. 38** .
15. Remove the oil level indicator tube. See **Fig. 39** .

16. Remove the seal from the transmission, if necessary.



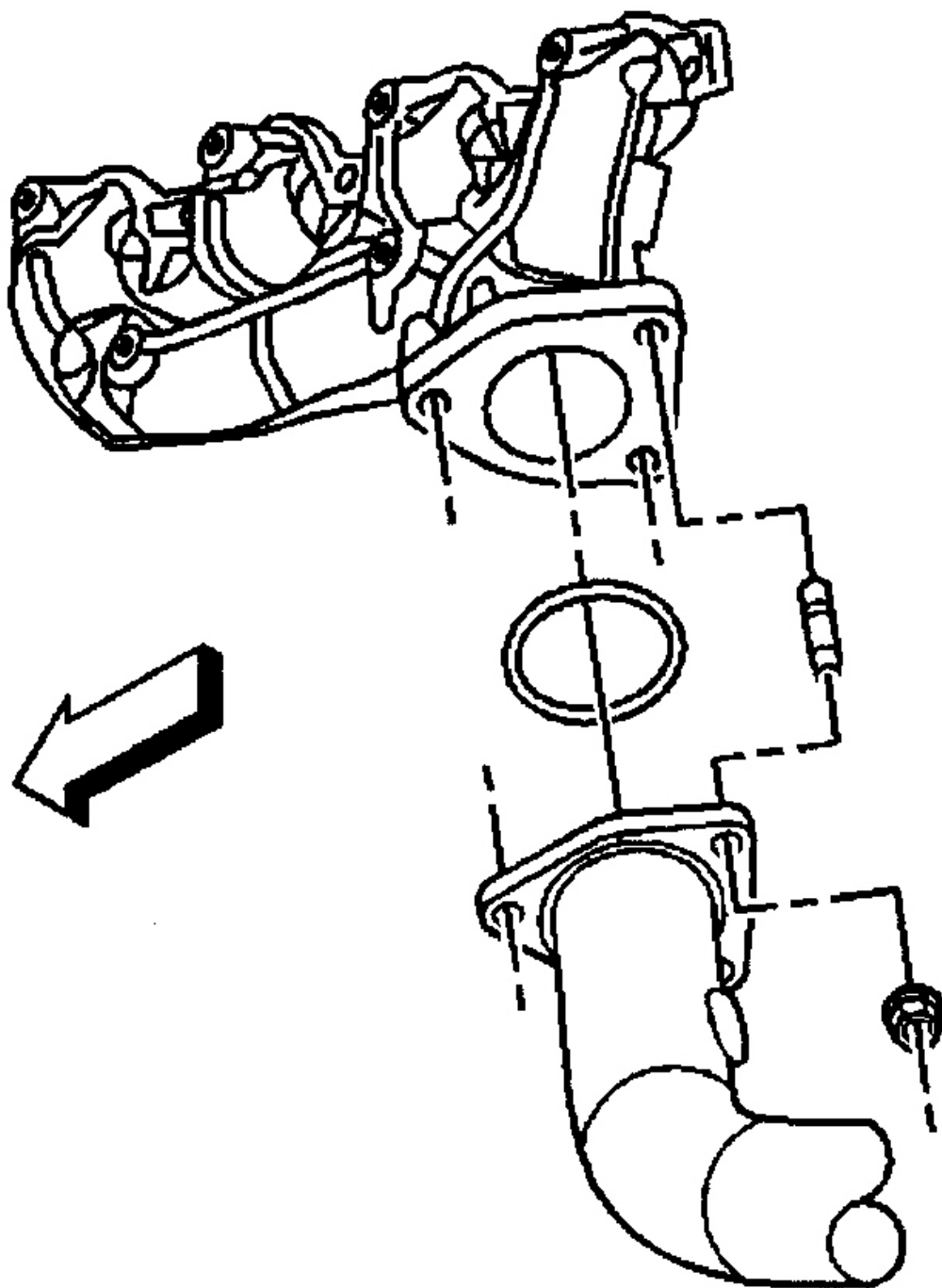
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Fig. 32: Removing/Installing Transmission Mount Nut
Courtesy of GENERAL MOTORS CORP.



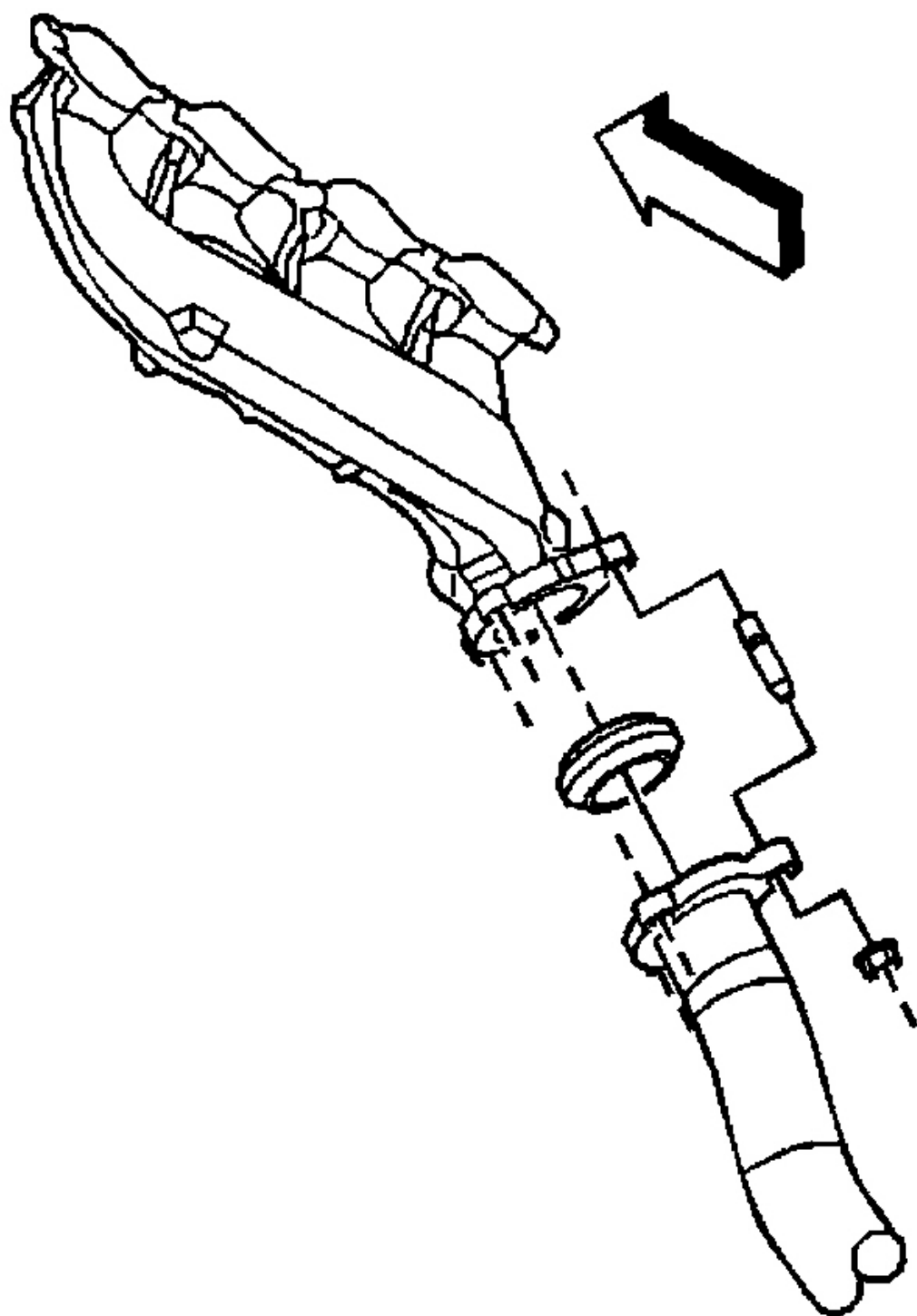
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Fig. 33: Removing Transmission Crossmember
Courtesy of GENERAL MOTORS CORP.



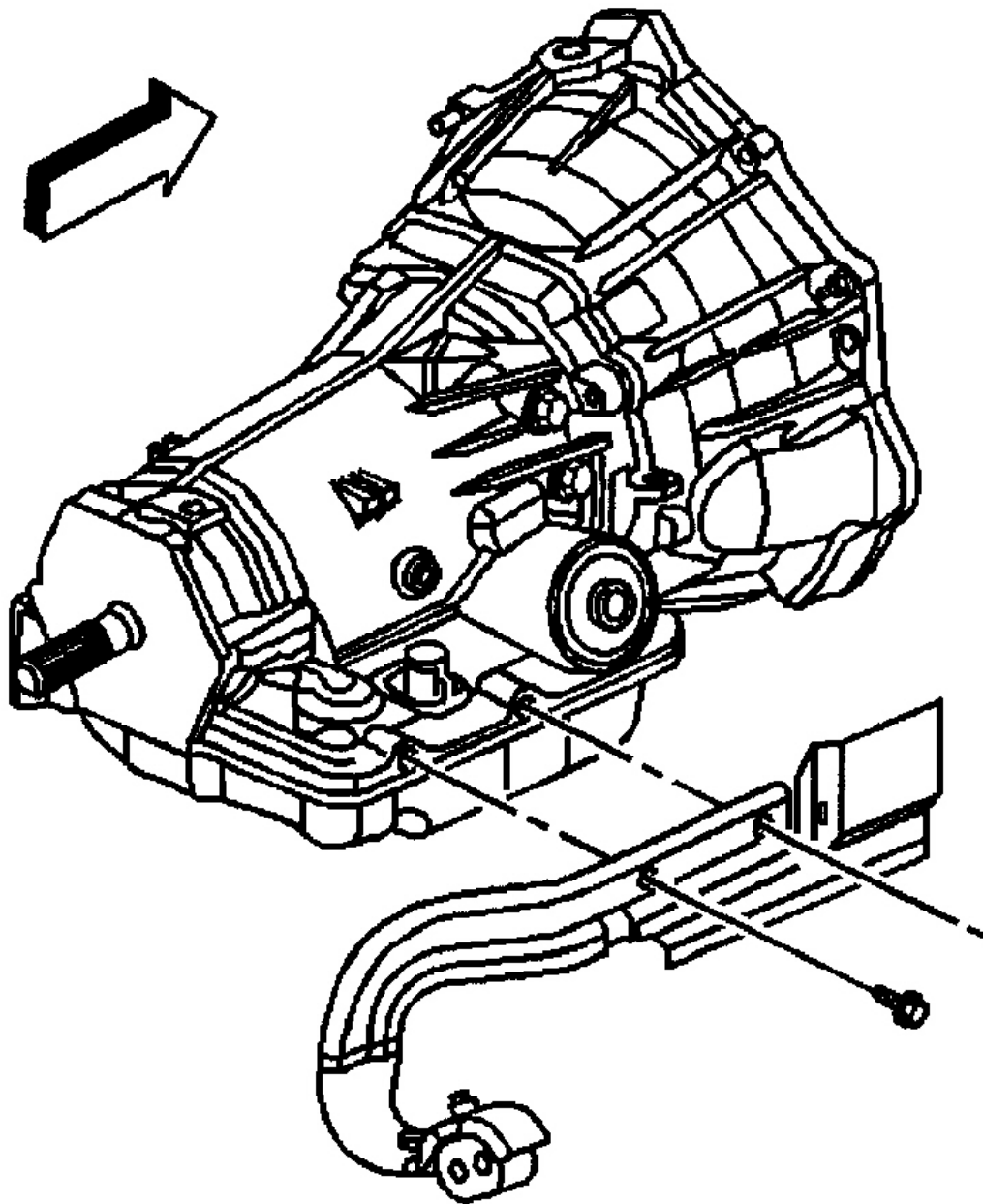
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Fig. 34: Removing Left Exhaust Pipe
Courtesy of GENERAL MOTORS CORP.



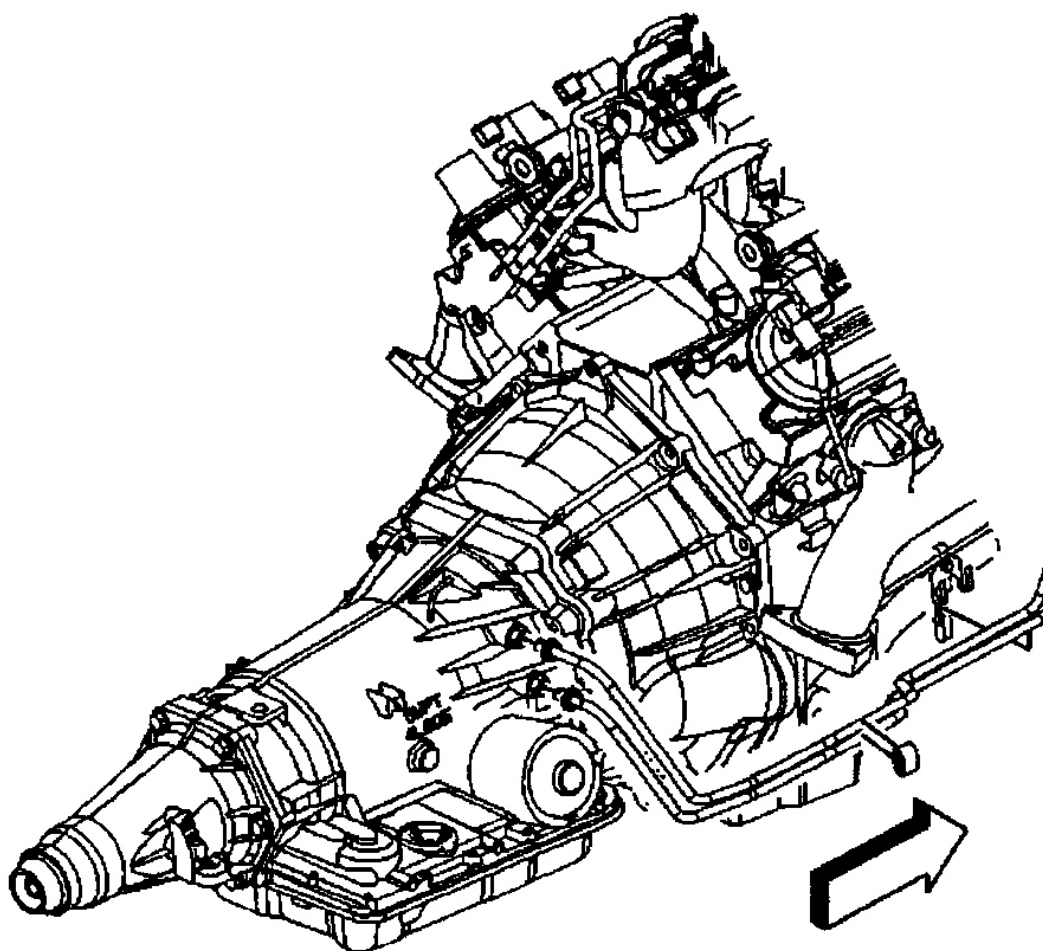
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Fig. 35: Removing Right Exhaust Pipe
Courtesy of GENERAL MOTORS CORP.



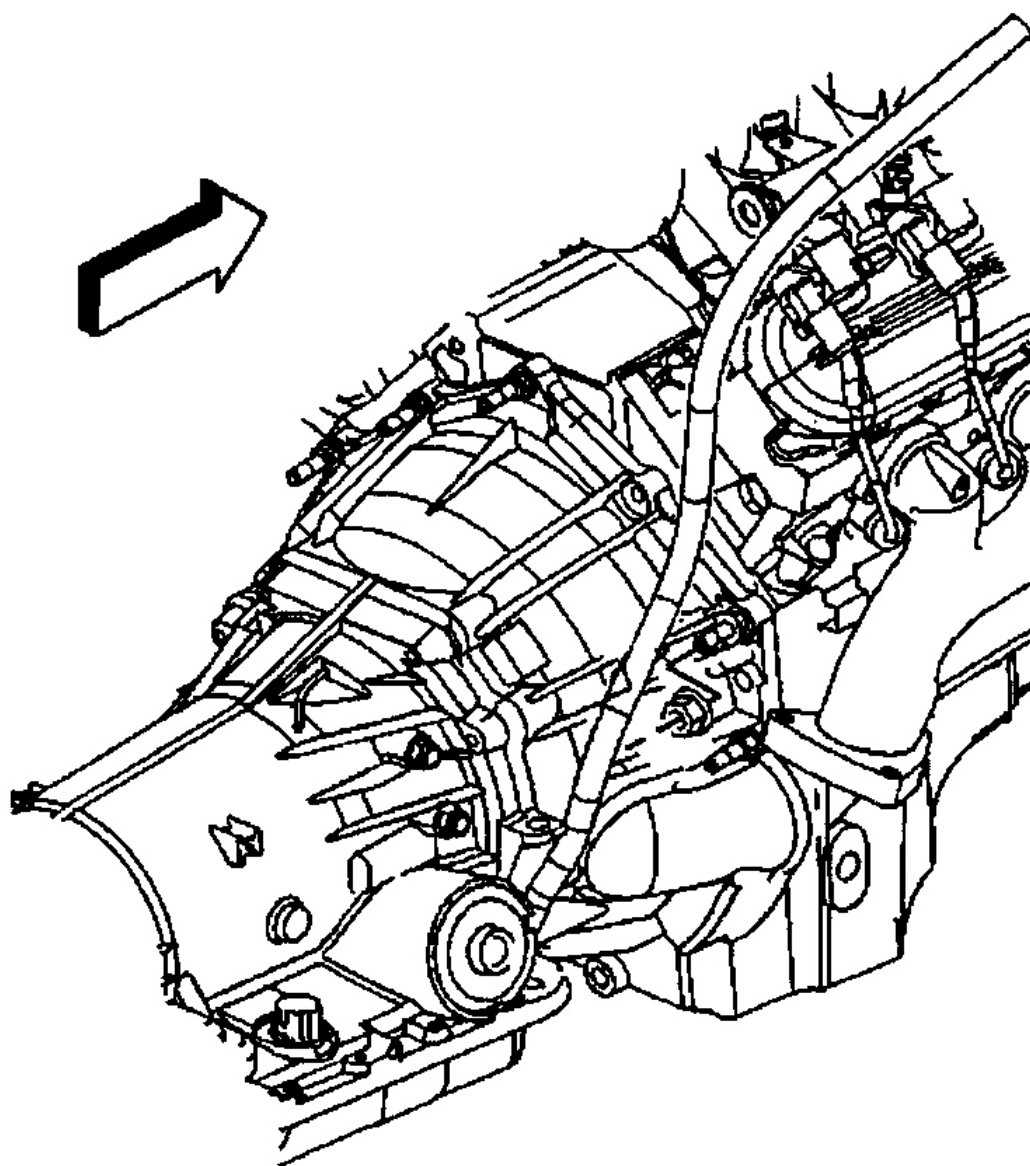
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Fig. 36: Removing Insulator
Courtesy of GENERAL MOTORS CORP.



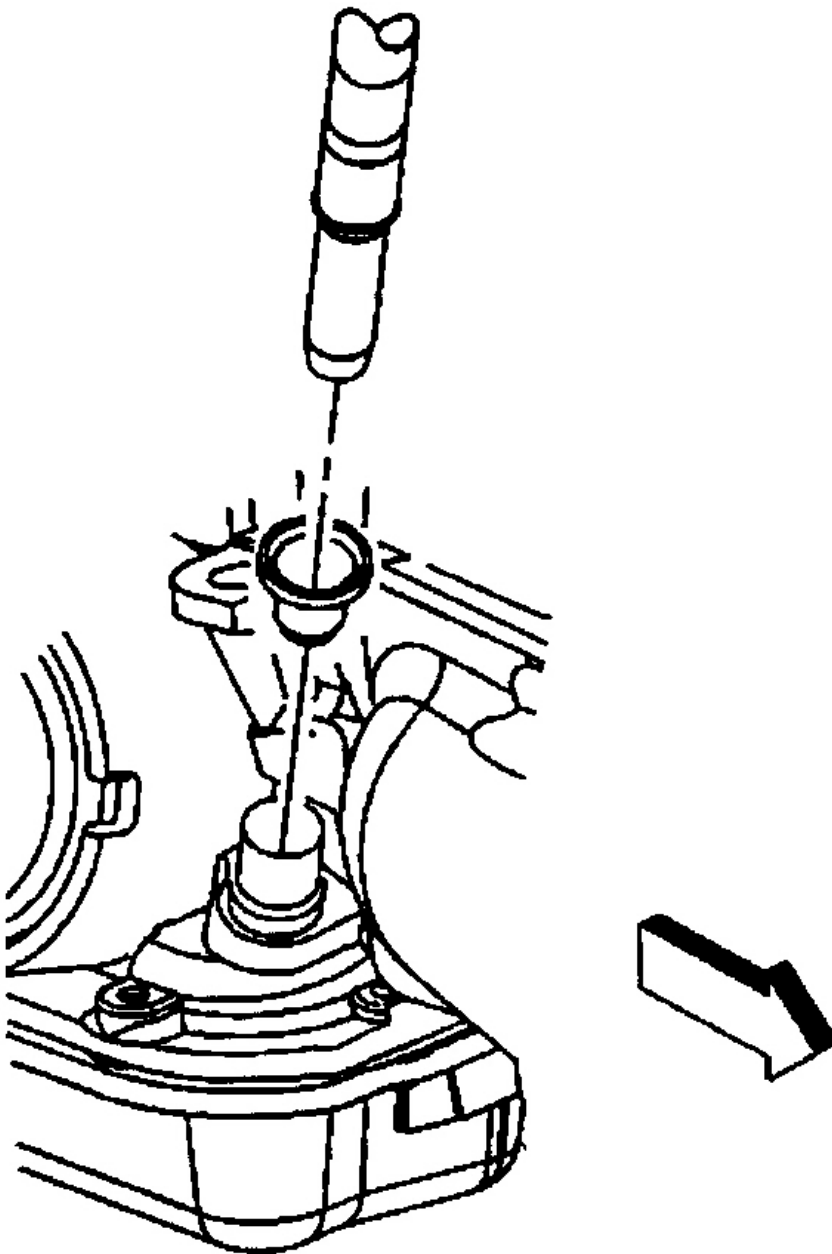
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Fig. 37: Disconnecting Transmission Oil Cooler Lines
Courtesy of GENERAL MOTORS CORP.



G00202982

Fig. 38: Removing Indicator Tube Nut
Courtesy of GENERAL MOTORS CORP.



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Fig. 39: Removing & Installing Filler Tube
Courtesy of GENERAL MOTORS CORP.

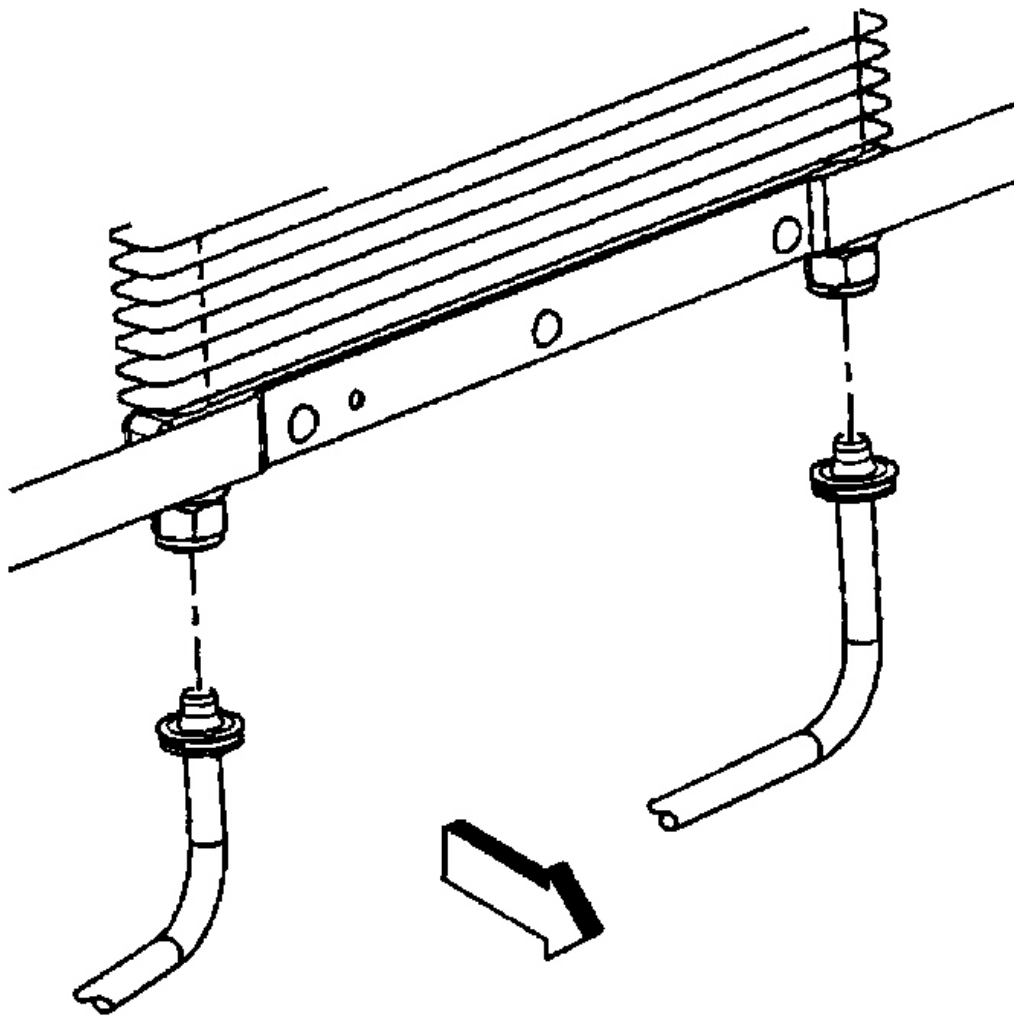
Installation

1. Install a NEW seal to the indicator tube.
2. Install the oil level indicator tube.
3. Install the indicator tube nut. See **Fig. 38** . Tighten nut to specification. See **TORQUE SPECIFICATIONS** .
4. Remove the plugs from the transmission oil cooler line fittings. See **Fig. 37** .
5. Connect the transmission oil cooler lines.
6. Install the exhaust pipe hanger bracket and bolts. See **Fig. 36** . Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
7. Install the insulator and nuts to the bracket. Tighten nuts to specification. See **TORQUE SPECIFICATIONS** .
8. Tighten the right exhaust pipe nuts. See **Fig. 35** . Tighten nuts to specification. See **TORQUE SPECIFICATIONS** .
9. Tighten the left exhaust pipe nuts. See **Fig. 34** . Tighten nuts to specification. See **TORQUE SPECIFICATIONS** .
10. Install the transmission crossmember. See **Fig. 33** .
11. Install the transmission crossmember bolts/nuts. Tighten bolts/nuts to specification. See **TORQUE SPECIFICATIONS** .
12. Install the transmission mount nut. See **Fig. 32** . Tighten nut to specification. See **TORQUE SPECIFICATIONS** .
13. Remove the support from the transmission.
14. Lower the vehicle.
15. Install the transmission oil level indicator.
16. Fill transmission to proper level with appropriate fluid. See **LUBRICATION** .

OIL COOLER LINES

Removal

1. Remove the front grill assembly.
2. Remove the transmission fluid cooler hose from the auxiliary oil cooler. See **Fig. 40** . See **OIL COOLER LINE QUICK CONNECT FITTING** .
3. Remove the transmission fluid cooler hose from the radiator. See **OIL COOLER LINE QUICK CONNECT FITTING** .
4. Raise the vehicle.
5. Remove the engine protection shield.
6. Remove the cooling lines from the transmission. See **Fig. 37** . See **OIL COOLER LINE QUICK CONNECT FITTING** .
7. Remove the oil cooling lines from the vehicle.



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Fig. 40: Disconnecting Connecting Fittings At Auxiliary Cooler
Courtesy of GENERAL MOTORS CORP.

Installation

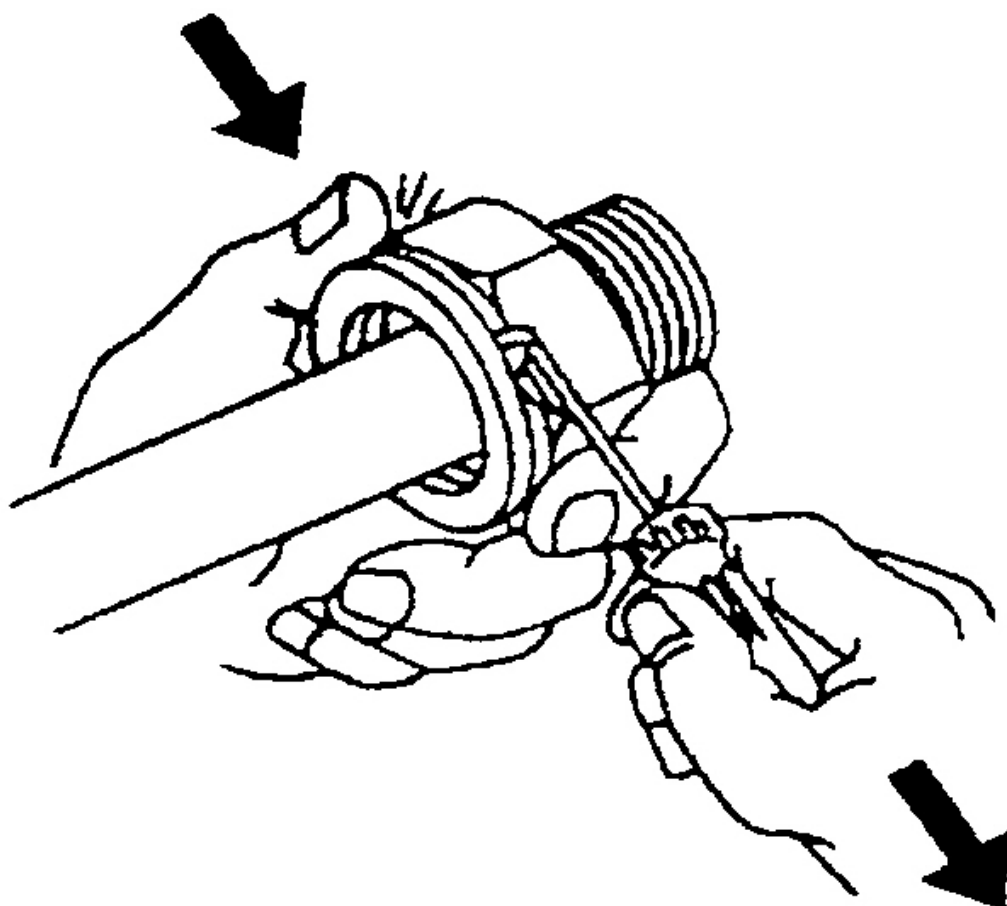
1. Install the transmission oil cooler lines to the vehicle.
2. Install the cooling lines to the transmission. See **Fig. 37** . See **OIL COOLER LINE QUICK CONNECT FITTING** .
3. Install the engine protection shield.
4. Lower the vehicle.

5. Install the transmission fluid cooler hose to the radiator. See **Fig. 40** . See **OIL COOLER LINE QUICK CONNECT FITTING** .
6. Install the transmission fluid cooler hose to the Auxiliary oil cooler. See **OIL COOLER LINE QUICK CONNECT FITTING** .
7. Install the front grill assembly.

OIL COOLER LINE QUICK CONNECT FITTING

Removal

1. Pull the plastic cap back from the quick connect fitting and down along the cooler line about 2 in (5 cm).
2. Using a bent-tip screwdriver, pull on one of the open ends of the retaining ring in order to rotate the retaining ring around the quick connect fitting until the retaining ring is out of position and can be completely removed. See **Fig. 41** .
3. Remove the retaining ring from the quick connect fitting.
4. Discard the retaining ring.
5. Pull the cooler line straight out from the quick connect fitting. See **Fig. 42** .



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Fig. 41: Removing Retaining Ring
Courtesy of GENERAL MOTORS CORP.

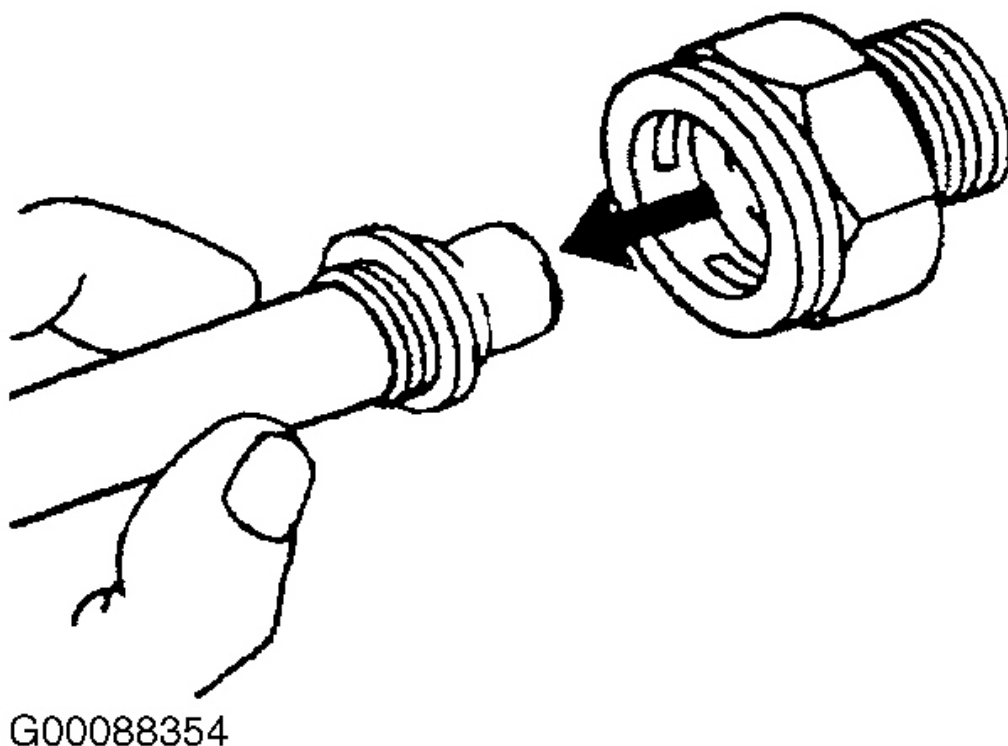


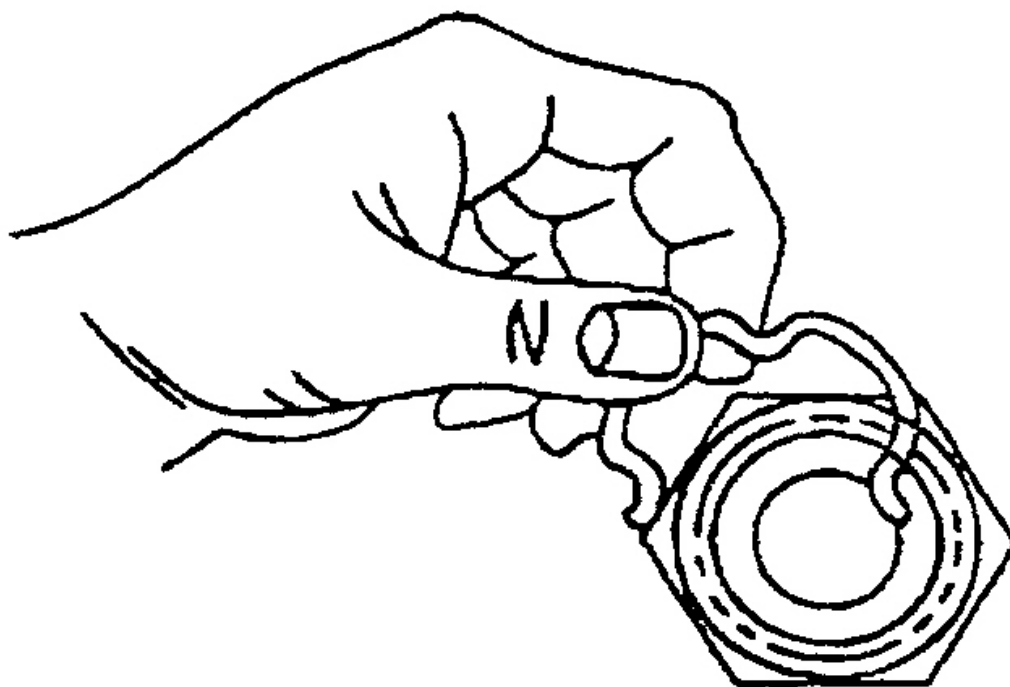
Fig. 42: Removing & Installing Cooler Line From Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: DO NOT reuse any of the existing oil lines or oil line fittings if there is excessive corrosion. DO NOT reuse any of the existing retaining rings that were removed from the existing quick connect fittings. Install new retaining rings.

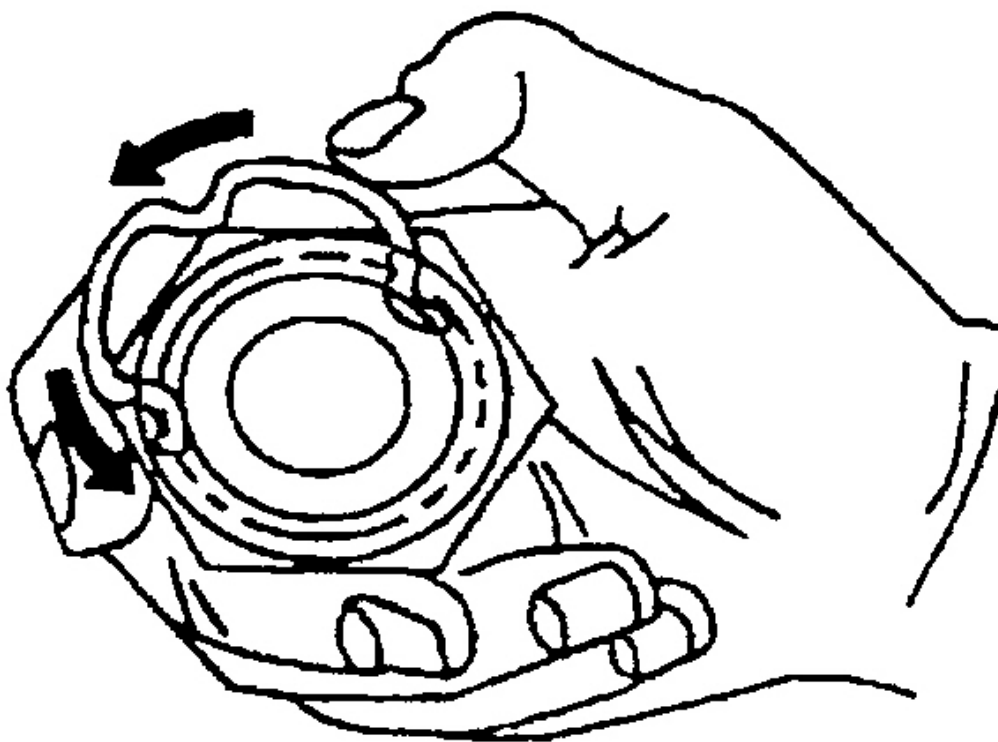
1. Install a new retaining ring into the quick connect fitting using the following procedure:
 - A. Hook one of the open ends of the retaining ring in one of the slots in the quick connect fitting. See **Fig. 43** .
 - B. Rotate the retaining ring around the fitting until the retaining ring is positioned with all three ears through the three slots on the fitting. See **Fig. 44** .
 - C. DO NOT install the new retaining ring onto the fitting by pushing the retaining ring. See **Fig. 45** .
 - D. Ensure that the three retaining ring ears are seen from inside the fitting and that the retaining ring moves freely in the fitting slots. See **Fig. 46** .
2. Install the cooler line into the quick connect fitting. See **Fig. 47** .

3. Insert the cooler line end into the quick connect fitting until a click is either heard or felt.
4. DO NOT use the plastic cap on the cooler line in order to install the cooler line into the fitting. See **Fig. 48**.
5. Pull back sharply on the cooler line in order to ensure that the cooler line is fastened into the quick connect fitting.
6. Position (snap) the plastic cap onto the fitting. DO NOT manually depress the retaining ring when installing the plastic cap onto the quick connect fitting. See **Fig. 49**.
7. Ensure that the plastic cap is fully seated against the fitting.
8. Ensure that no gap is present between the cap and the fitting. See **Fig. 50**.
9. Ensure that the yellow identification band on the tube is hidden within the quick connect fitting. See **Fig. 49**.
10. A hidden yellow identification band indicates proper joint seating. See **Fig. 51**.
11. Fill transmission to proper level with appropriate fluid. See **LUBRICATION**.



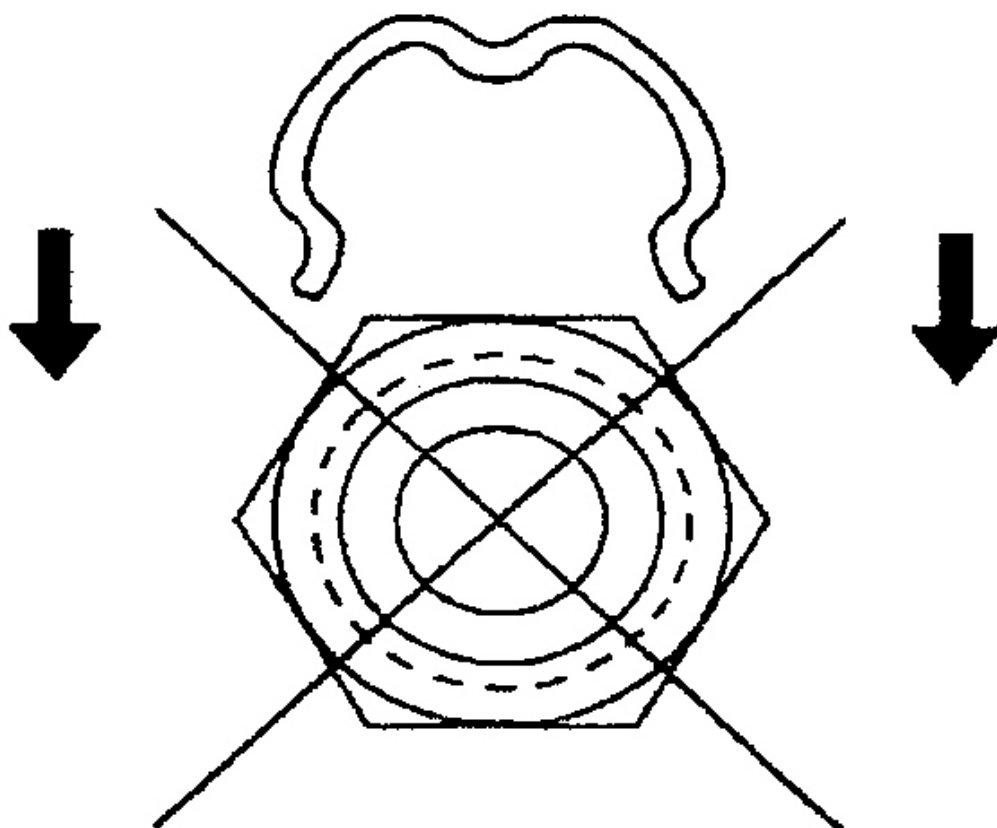
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Fig. 43: Starting Retaining Ring Onto Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



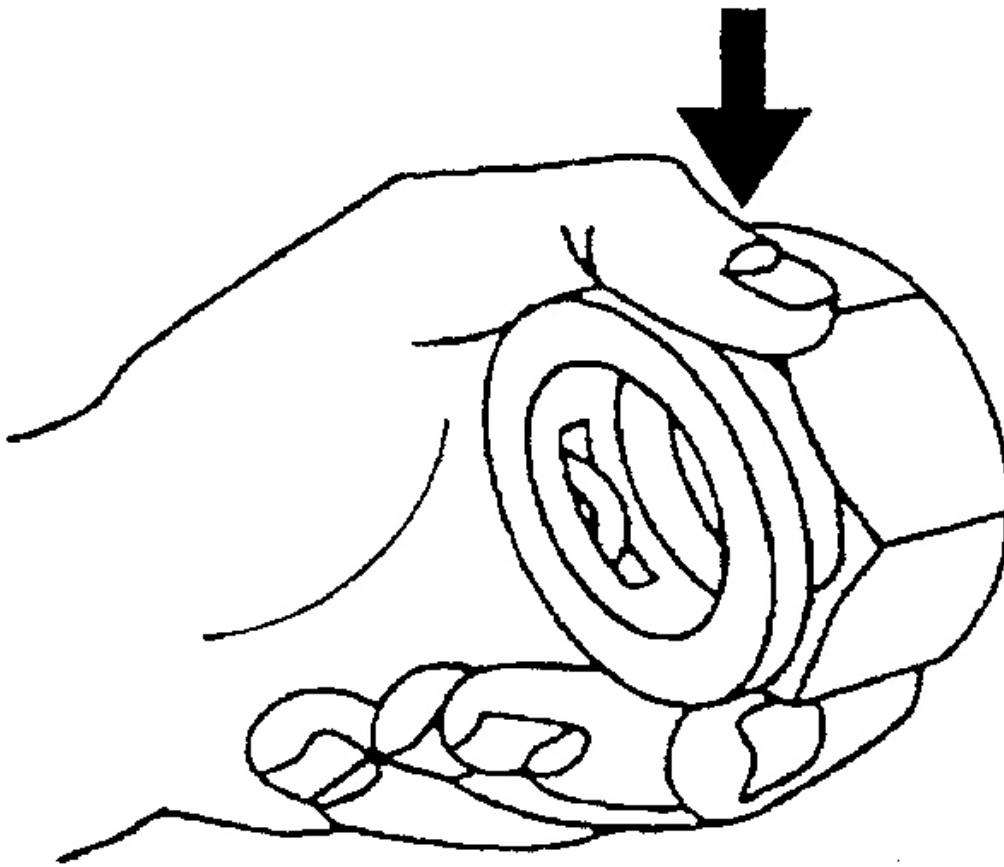
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Fig. 44: Installing Retaining Ring On Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



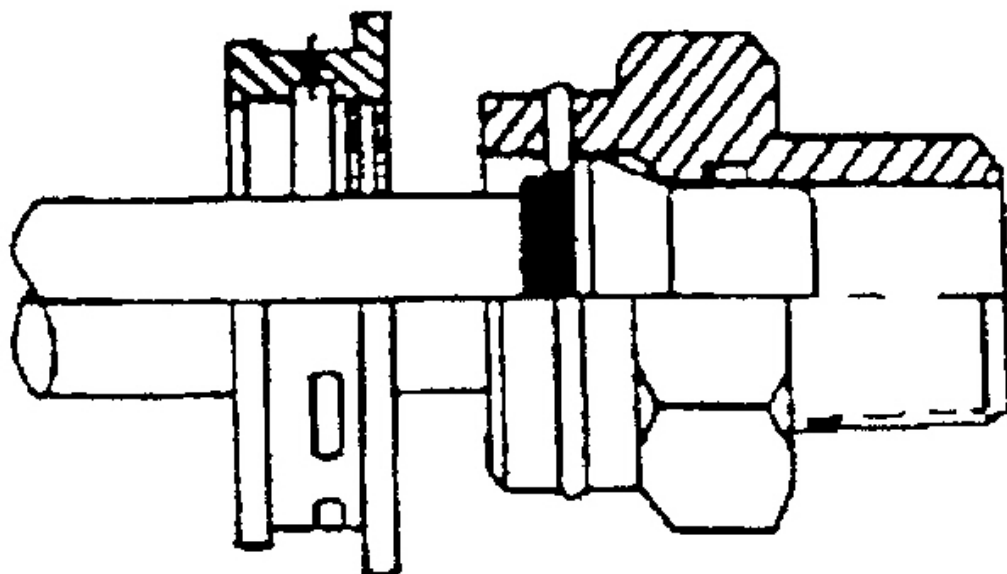
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Fig. 45: Incorrectly Installing Retainer Ring
Courtesy of GENERAL MOTORS CORP.



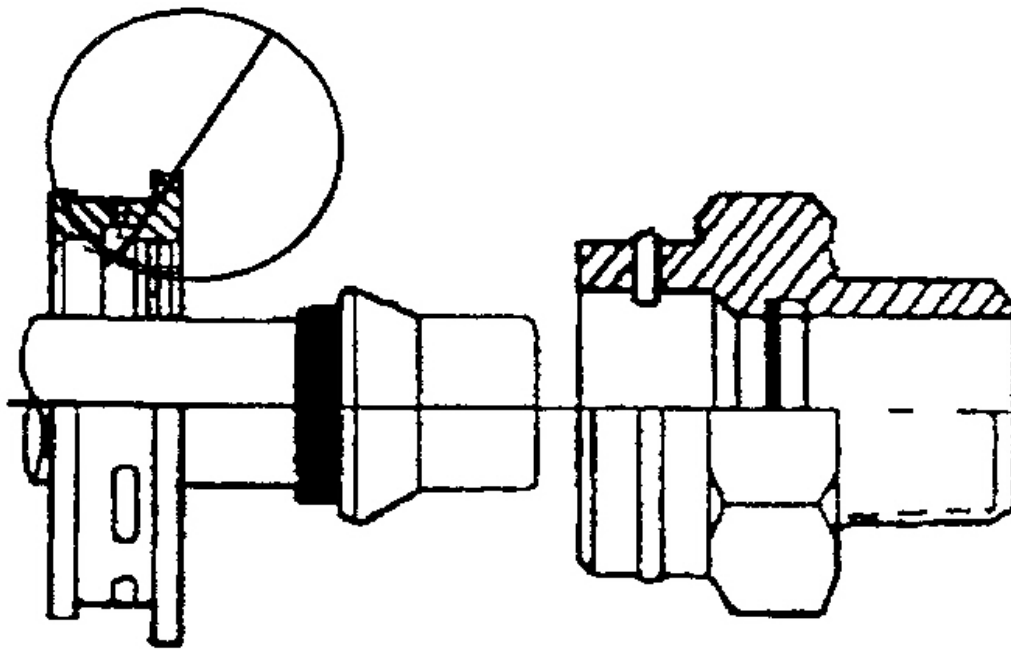
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Fig. 46: Correctly Installing Retainer Ring
Courtesy of GENERAL MOTORS CORP.



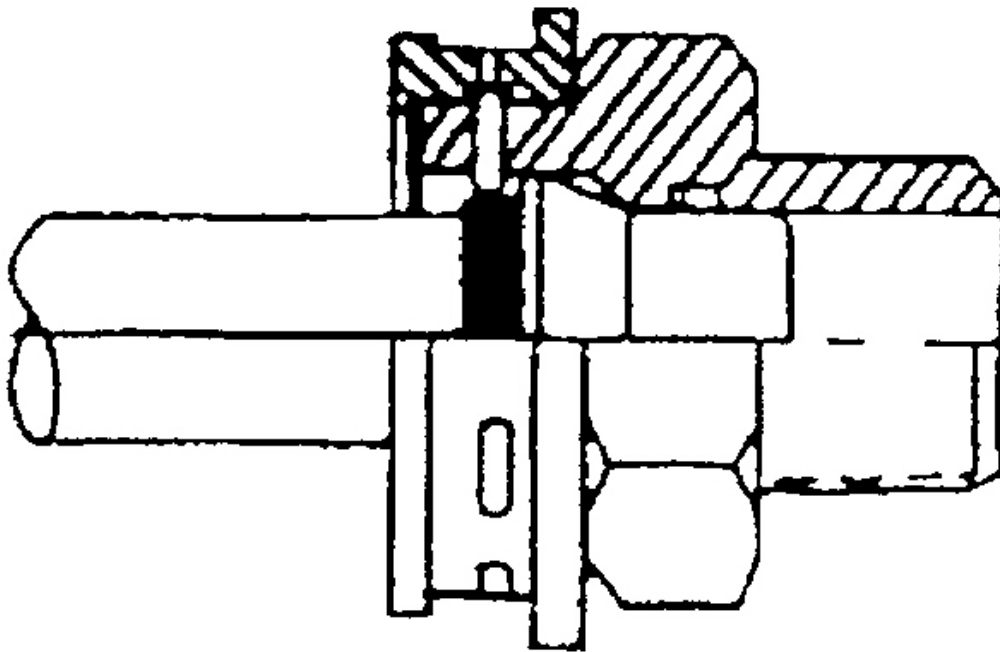
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Fig. 47: Installing Cooler Lines To Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



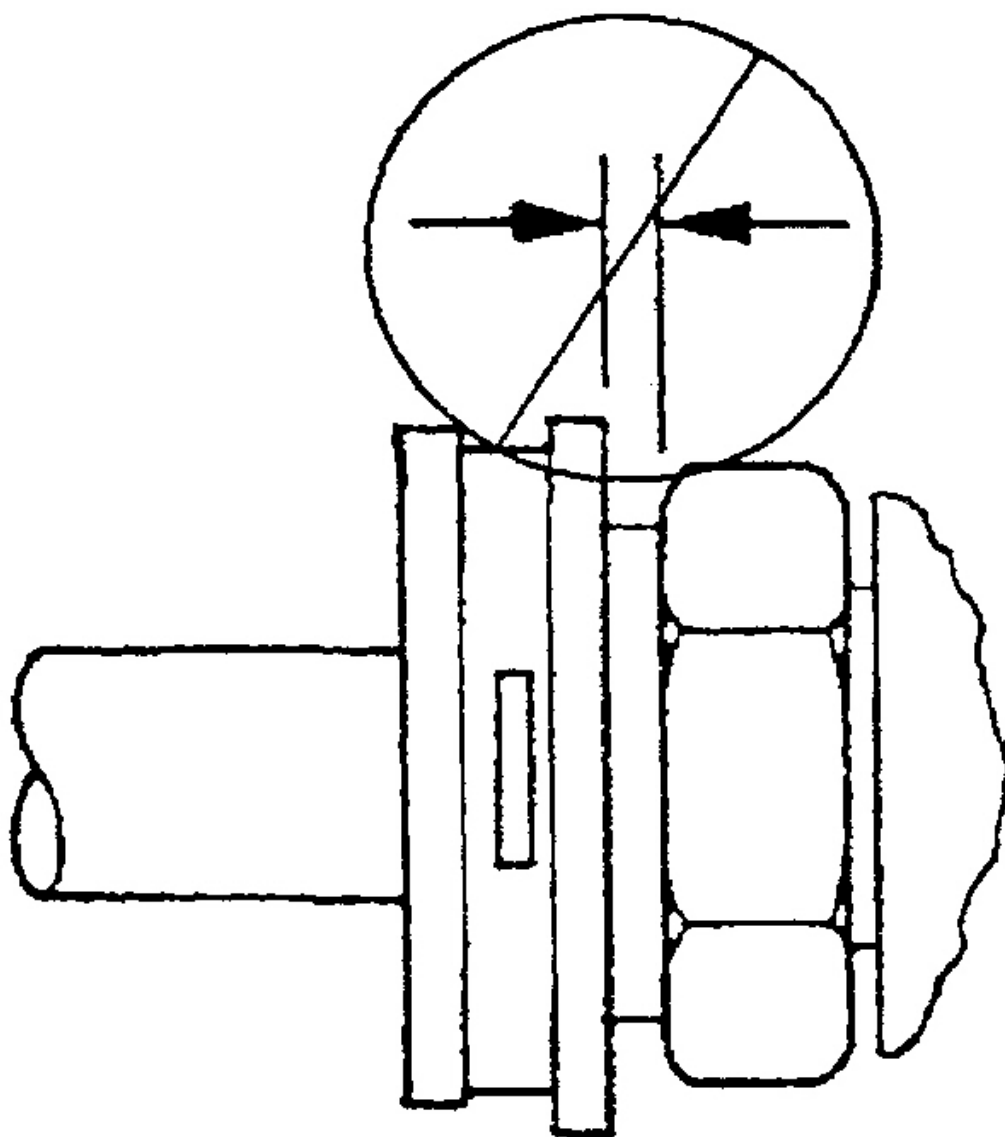
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Fig. 48: Incorrect Installation Method Using Plastic Cap
Courtesy of GENERAL MOTORS CORP.



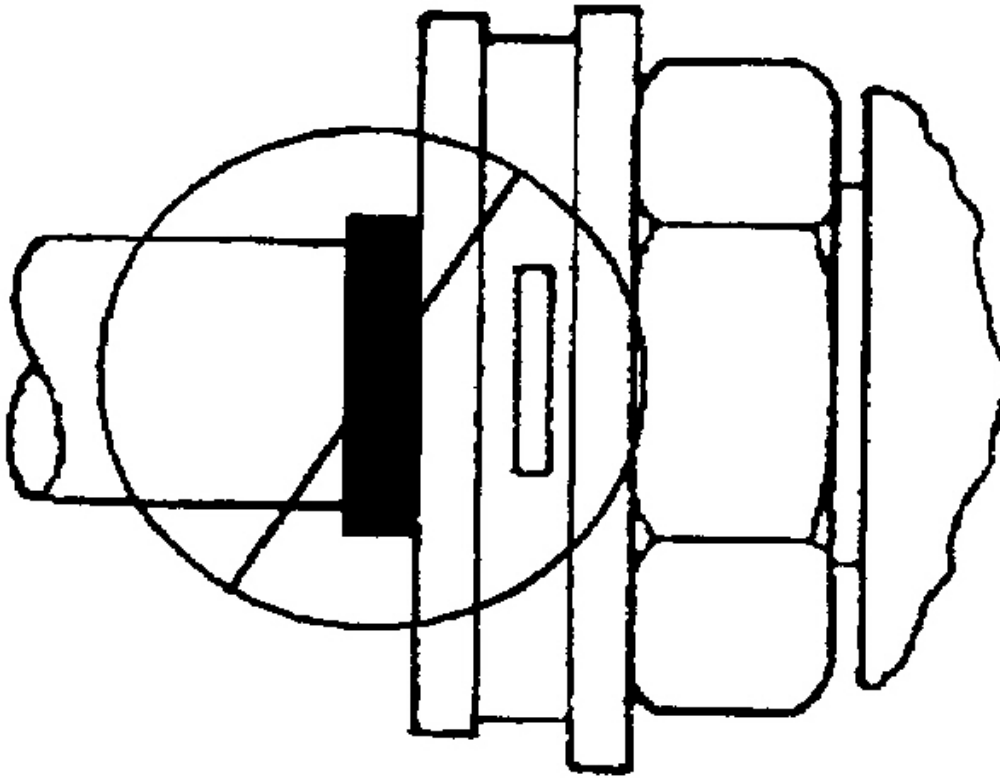
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Fig. 49: Installed View Of Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



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Fig. 50: Checking For Improper Gap
Courtesy of GENERAL MOTORS CORP.



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Fig. 51: Checking For Identification Band
Courtesy of GENERAL MOTORS CORP.

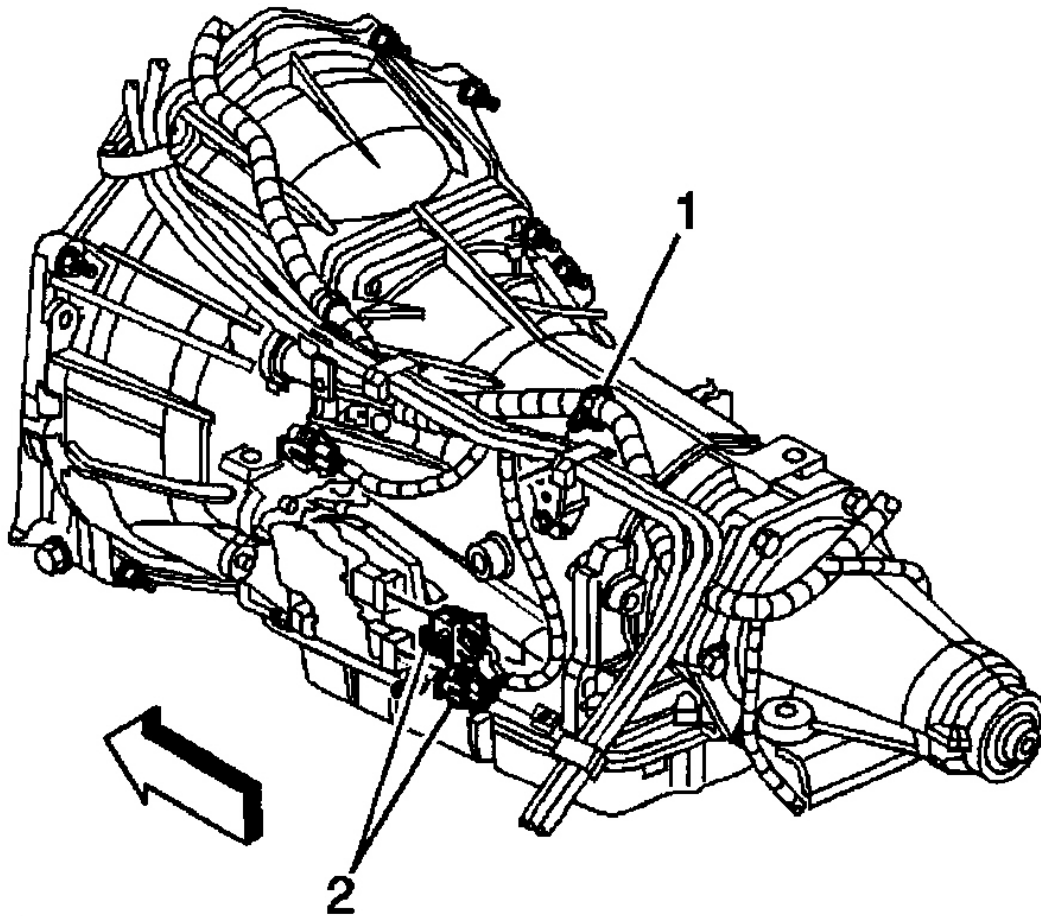
PARK/NEUTRAL POSITION SWITCH

NOTE: **Tools required: Park/Neutral Position Switch Aligner (J-41364-A).**

Removal

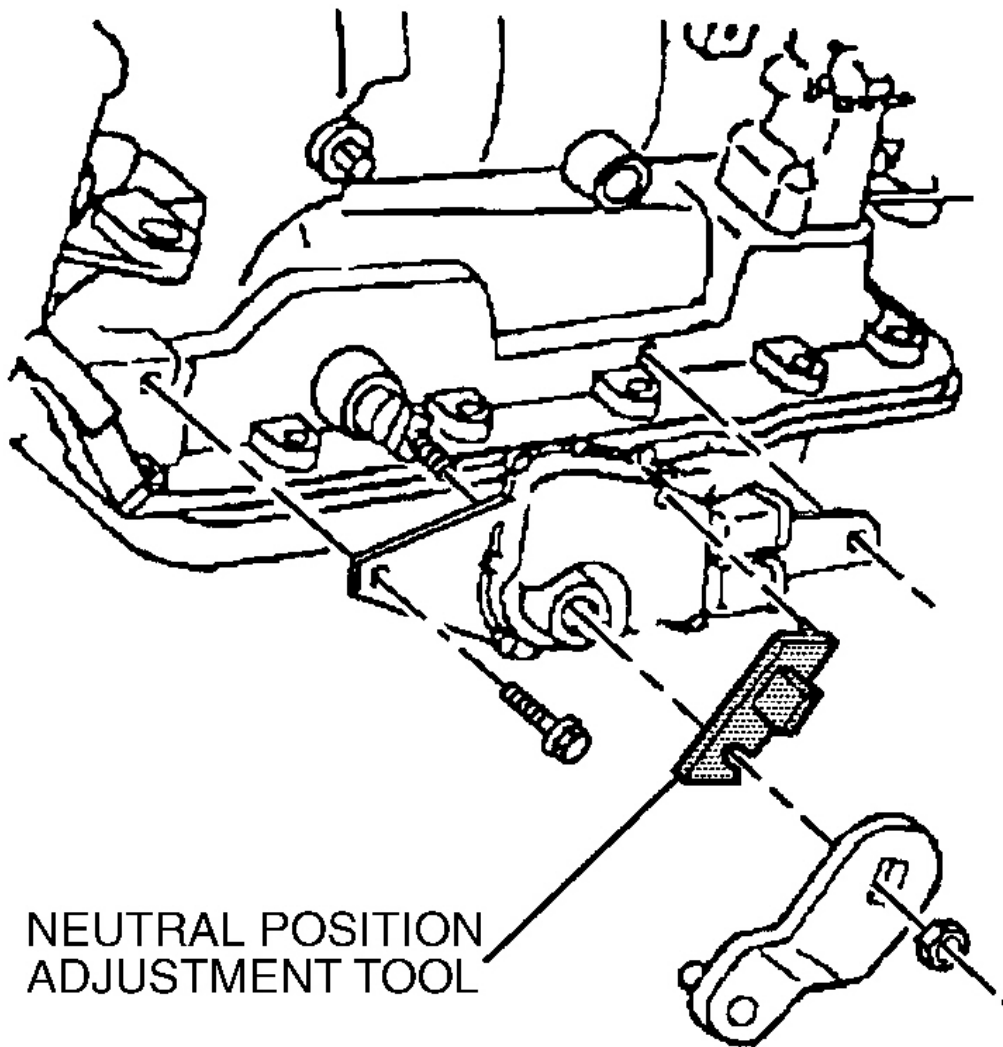
1. Apply the Parking brake.
2. Shift the transmission into Neutral.
3. If equipped with 4WD, remove the front drive shaft. See appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
4. Raise and suitably support the vehicle.
5. Disconnect the Park/Neutral Position (PNP) switch electrical connectors (2). See **Fig. 52** .

6. Remove the manual shaft lever nut. See **Fig. 53** .
7. Remove the transmission control lever from the manual shaft.
8. Remove the PNP switch bolts.
9. Remove the PNP switch from the manual shaft. If the PNP switch did not slide off the manual shaft, file the outer edge of the manual shaft in order to remove any burrs.



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Fig. 52: Disconnecting PNP Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.



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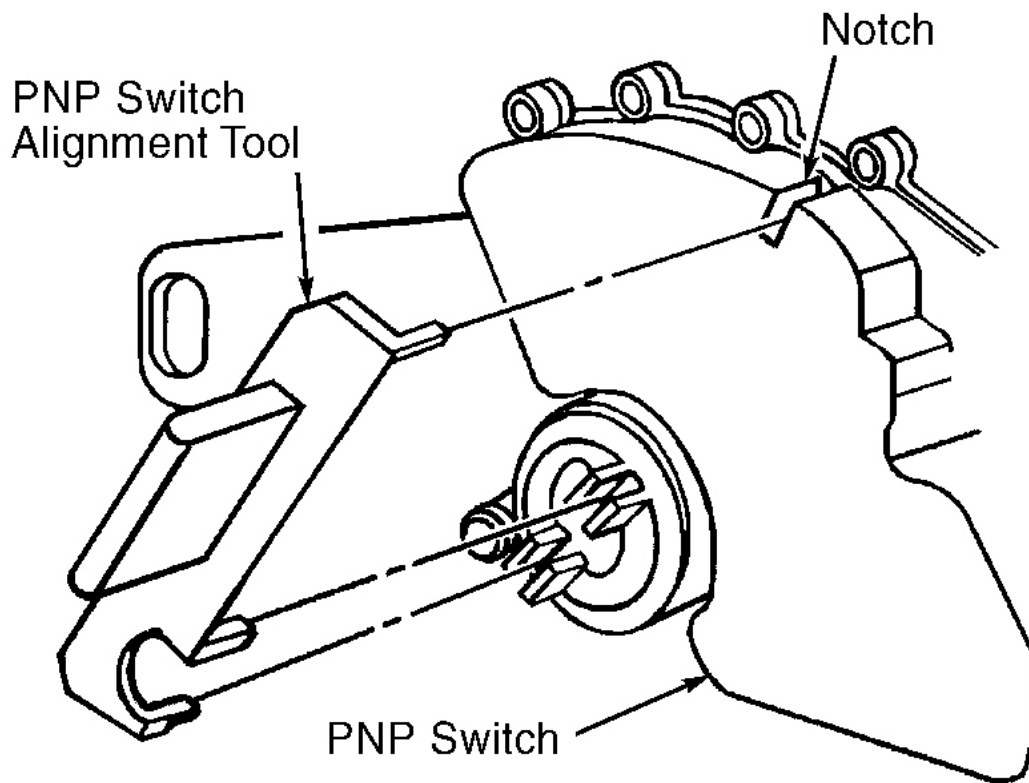
Fig. 53: Removing & Installing Park/Neutral Position Switch
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the PNP switch to the transmission manual shaft by aligning the switch hub flats with the manual shaft flats. See **Fig. 52** .
2. Slide the PNP switch onto the transmission manual shaft until the switch mounting bracket contacts the mounting bosses on the transmission.

NOTE: If a NEW PNP switch is being installed, the switch will come with a positive assurance bracket. The positive assurance bracket aligns the new switch in its proper position for installation and the use of the park neutral switch aligner will not be necessary.

3. Install the PNP switch bolts finger tight.
4. Install park/neutral position switch aligner onto the PNP switch. See **Fig. 54** . Ensure that the two slots on the switch where the manual shaft is inserted are lined up with the lower two tabs on the tool.
5. Rotate the tool until the upper locator pin on the tool is lined up with the slot on the top of the switch. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
6. Remove the park/neutral position switch aligner from the switch. If installing a new switch, remove the positive assurance bracket at this time.
7. Install the transmission control lever to the manual shaft with the nut. See **Fig. 52** . Tighten the nut to specification. See **TORQUE SPECIFICATIONS** .
8. Connect the PNP switch electrical connectors (2). See **Fig. 52** .
9. If equipped with 4WD, install the front drive shaft. See appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
10. Lower the vehicle.
11. Check the switch for proper operation. The engine must start in the Park (P) or Neutral (N) positions only. If proper operation of the switch can not be obtained, replace the switch.



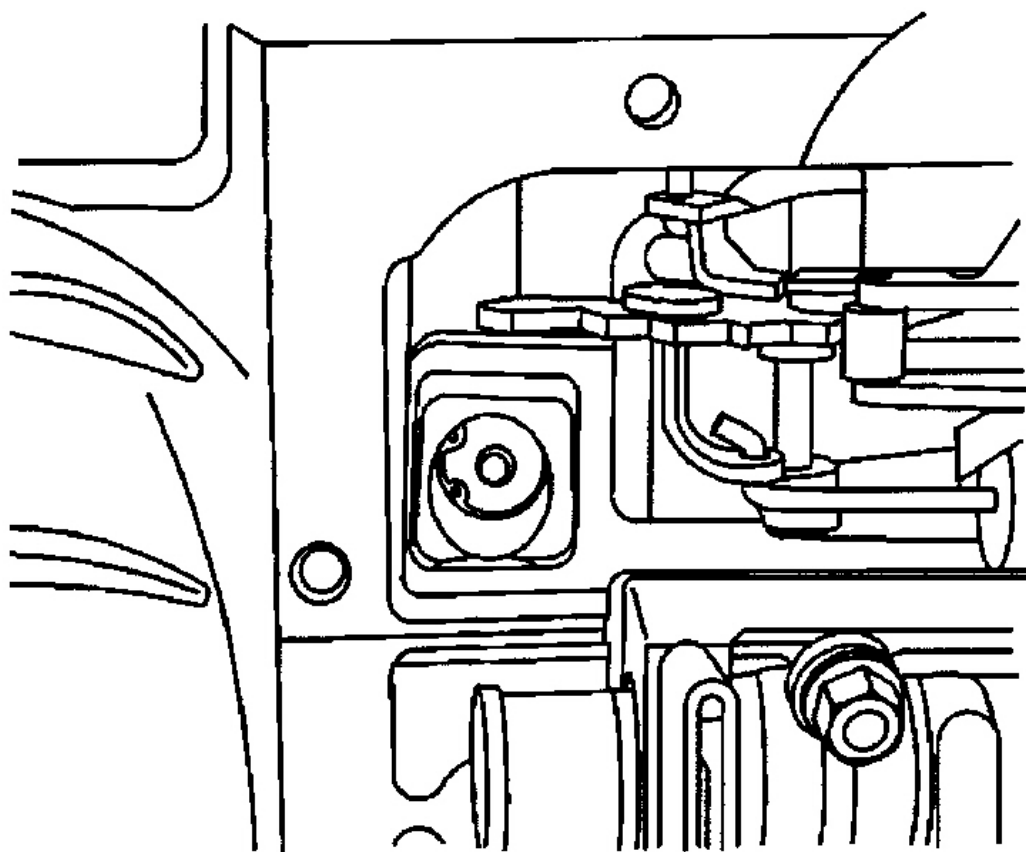
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Fig. 54: Adjusting Park/Neutral Position Switch
Courtesy of GENERAL MOTORS CORP.

PRESSURE REGULATOR

Removal

1. Remove the transmission oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.
2. Compress the reverse boost valve sleeve into the bore of the oil pump to release tension on the reverse boost valve retaining ring. See **Fig. 55** .
3. Remove the reverse boost valve retaining ring, then slowly release tension on the reverse boost valve sleeve.
4. Remove the reverse boost valve sleeve (5) and the reverse boost valve (4). See **Fig. 56** .
5. Remove the pressure regulator isolator spring (3) and the pressure regulator valve spring (2).
6. Remove the pressure regulator valve (1).



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Fig. 55: Installed View Of Pressure Regulator
Courtesy of GENERAL MOTORS CORP.

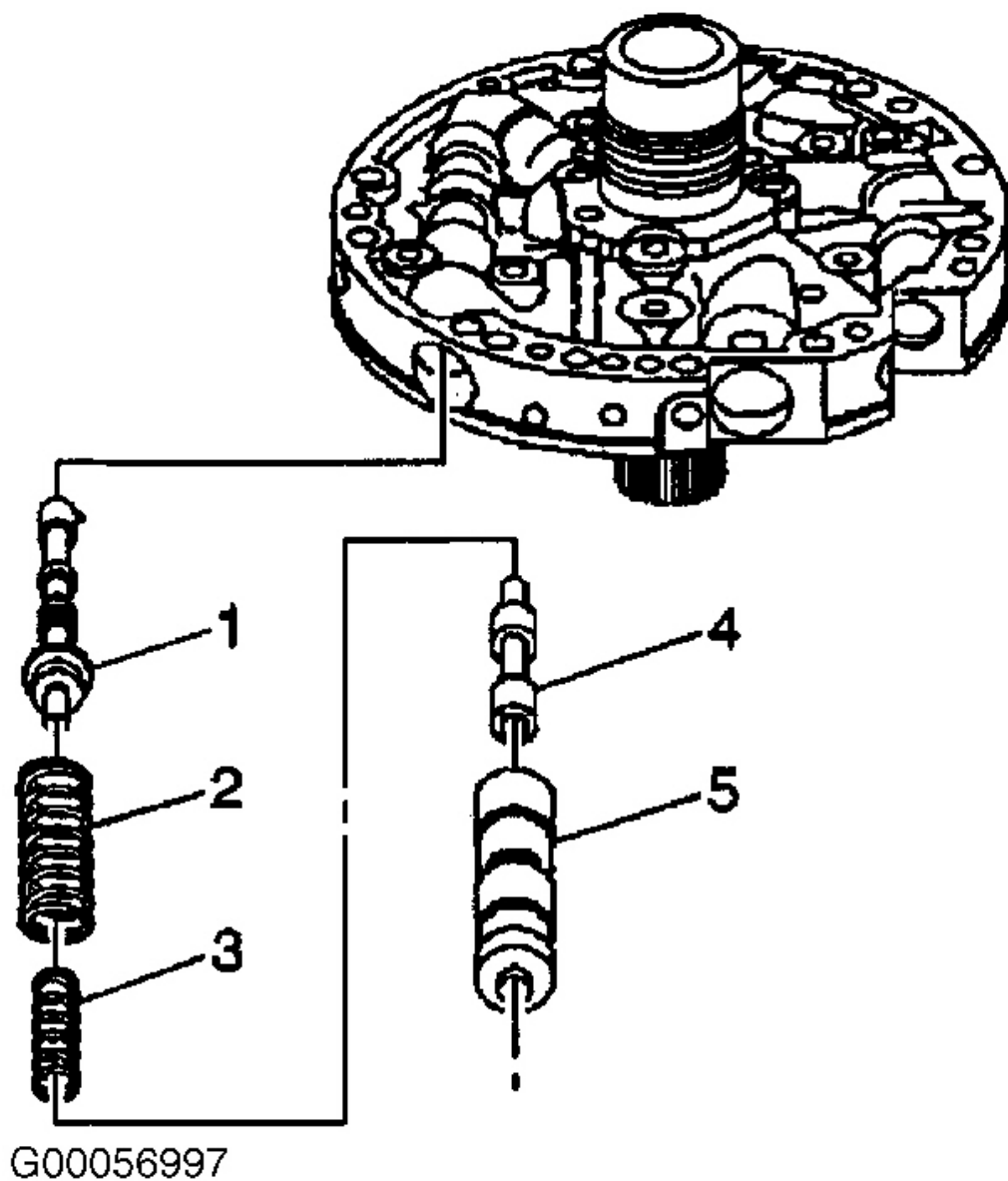


Fig. 56: Exploded View Of Pressure Regulator
Courtesy of GENERAL MOTORS CORP.

Installation

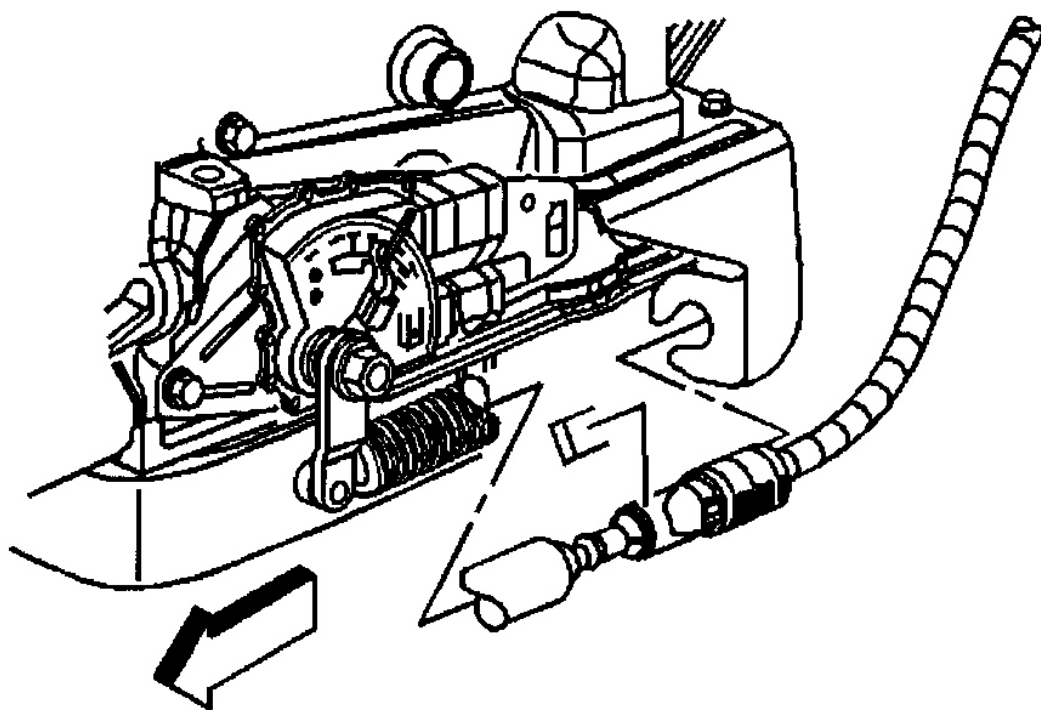
1. Install the pressure regulator valve (1). See **Fig. 56** .
2. Install the pressure regulator isolator spring (3) and the pressure regulator valve spring (2).

3. Install the reverse boost valve (4) in the reverse boost valve sleeve (5).
4. Install the reverse boost valve (4) and sleeve (5) in the oil pump cover.
5. Compress the reverse boost valve sleeve into the bore of the oil pump to expose the retaining ring slot.
6. Install the reverse boost valve retaining ring, then slowly release tension on the reverse boost valve sleeve. See **Fig. 55** .
7. Install the transmission oil filter and pan. See **DRAINING & REFILLING** under LUBRICATION.

SHIFT CABLE BRACKET

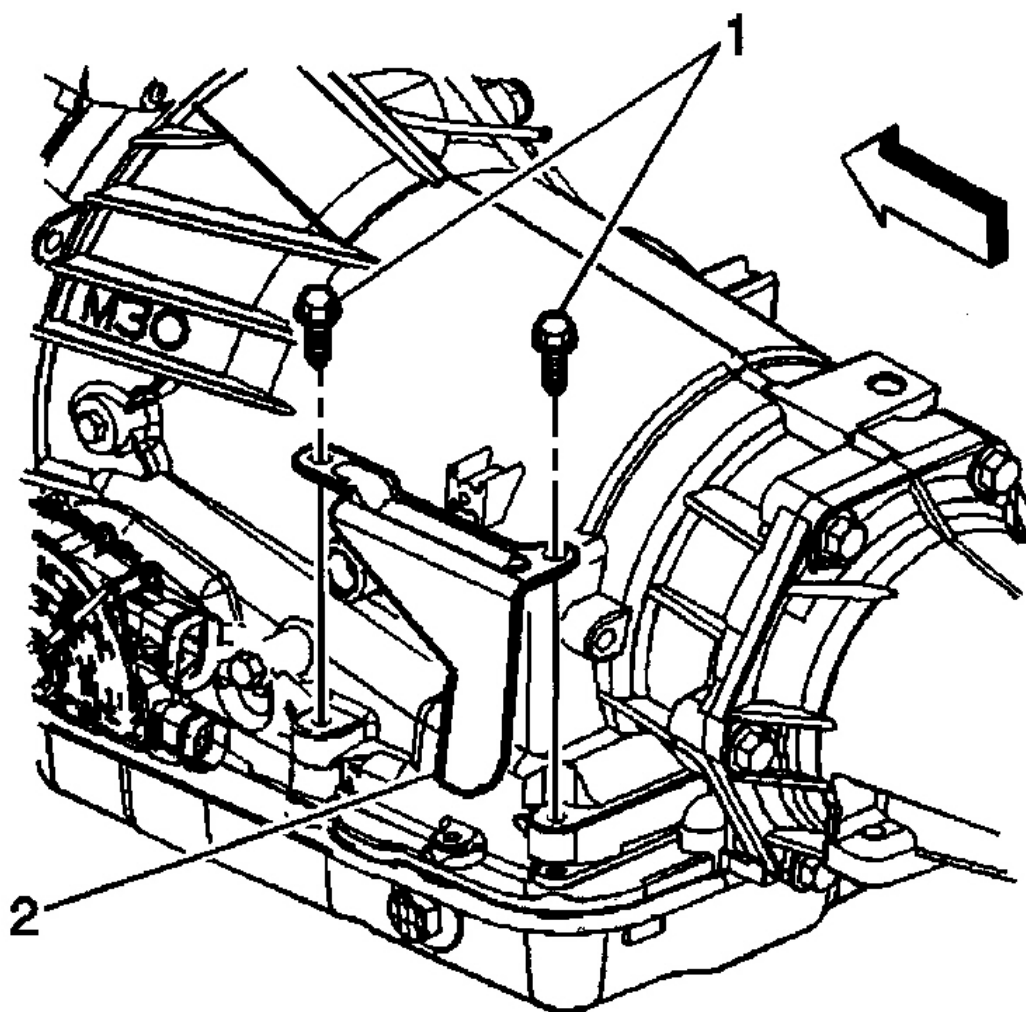
Removal

1. Apply the Parking brake.
2. Place the transmission into Neutral.
3. Raise and support the vehicle.
4. Remove the retainer that secures the cable to the bracket. See **Fig. 57** .
5. Depress the tangs and remove the cable from the bracket.
6. Remove the bolts (1) securing the transmission range selector cable bracket (2) to the transmission. See **Fig. 58** .
7. Remove the transmission range selector cable bracket.



G00202984

Fig. 57: Removing Shift Cable Retainer
Courtesy of GENERAL MOTORS CORP.



G00096160

Fig. 58: Removing & Installing Shift Cable Bracket
 Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the shift cable bracket to the vehicle.
2. Install the shift cable bracket bolts (1). See **Fig. 58** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Align and install the cable to the bracket. See **Fig. 57** .
4. Install the retainer that secures the cable to the bracket.
5. Lower the vehicle.

6. Check the vehicle for proper operation. If cable adjustment is necessary, see **SHIFT CABLE** under ADJUSTMENTS.

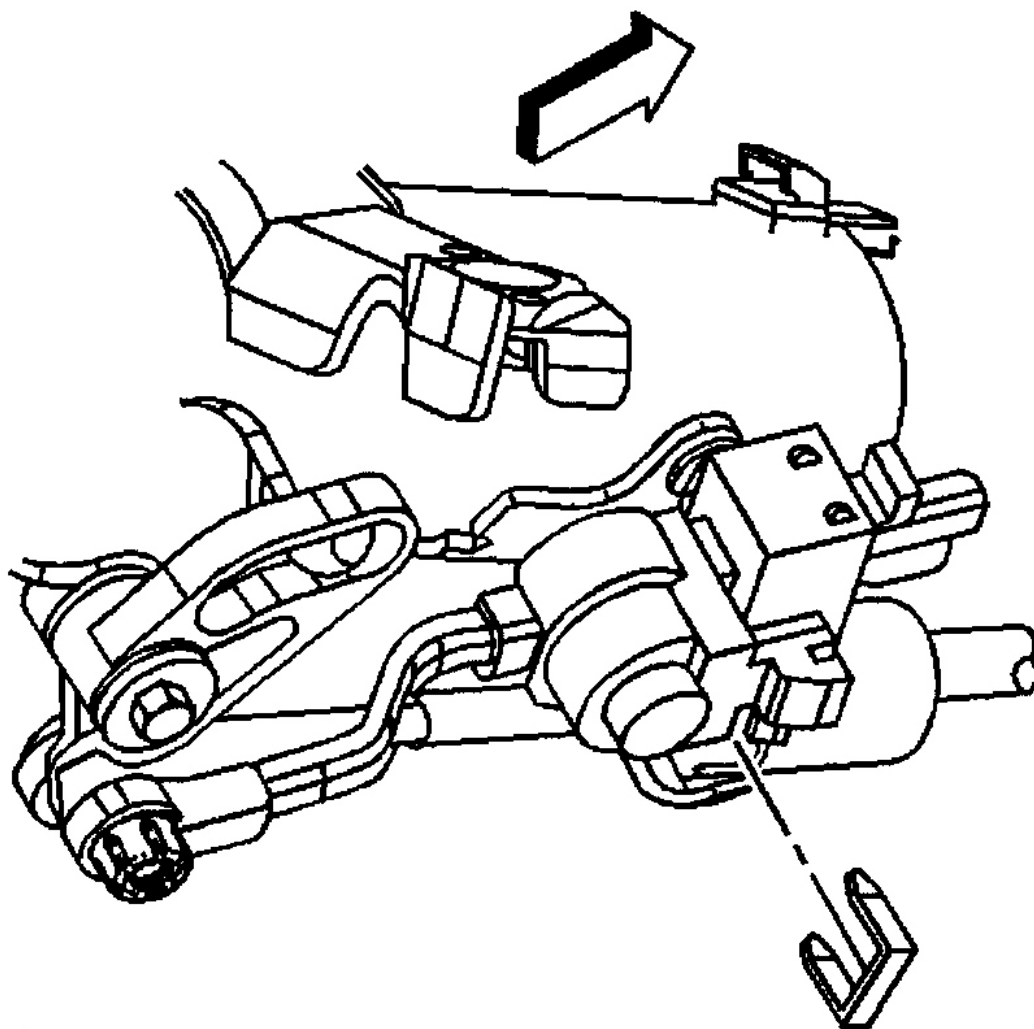
SHIFT CABLE

Removal

1. Position the steering column shift lever to the Park position.
2. Remove the instrument panel knee bolster.
3. Remove the driver's seat.
4. Pull back the carpet and insulation around the driver's area.
5. Remove the retainer securing the cable to the steering column. See **Fig. 59** .
6. Remove the cable end from the steering column ball stud. See **Fig. 60** .
7. Depress the tangs and remove the cable from the steering column bracket.
8. Remove the bolt securing the cable support to the brace. See **Fig. 61** .

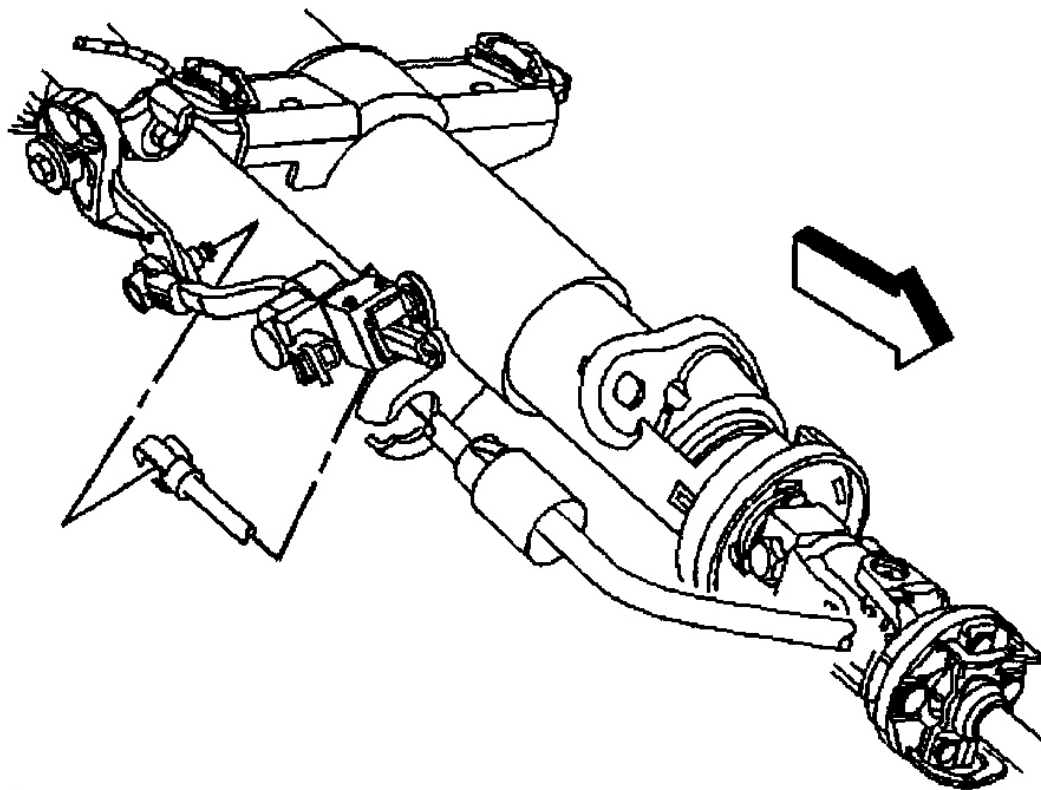
NOTE: **Avoid unnecessary twisting/bending of the range selector cable when removing the cable from the support.**

9. Remove the range selector cable from the support. See **Fig. 62** .
10. Remove the cable grommet from the floor panel. See **Fig. 63** .
11. Raise and suitably support the vehicle.
12. Remove the clips on the cable from the floor panel reinforcement. See **Fig. 64** .
13. Ensure the transmission manual shaft is positioned in mechanical Park.
14. Remove the retainer that secures the cable to the bracket. See **Fig. 57** .
15. Remove the cable clip on the transfer case, if equipped.
16. Remove the range selector cable end (2) from the transmission range selector lever ball stud (1). See **Fig. 65** .
17. Depress the tangs and remove the cable from the bracket.
18. Lower the vehicle and ensure that the steering column shift lever is still in the Park position.



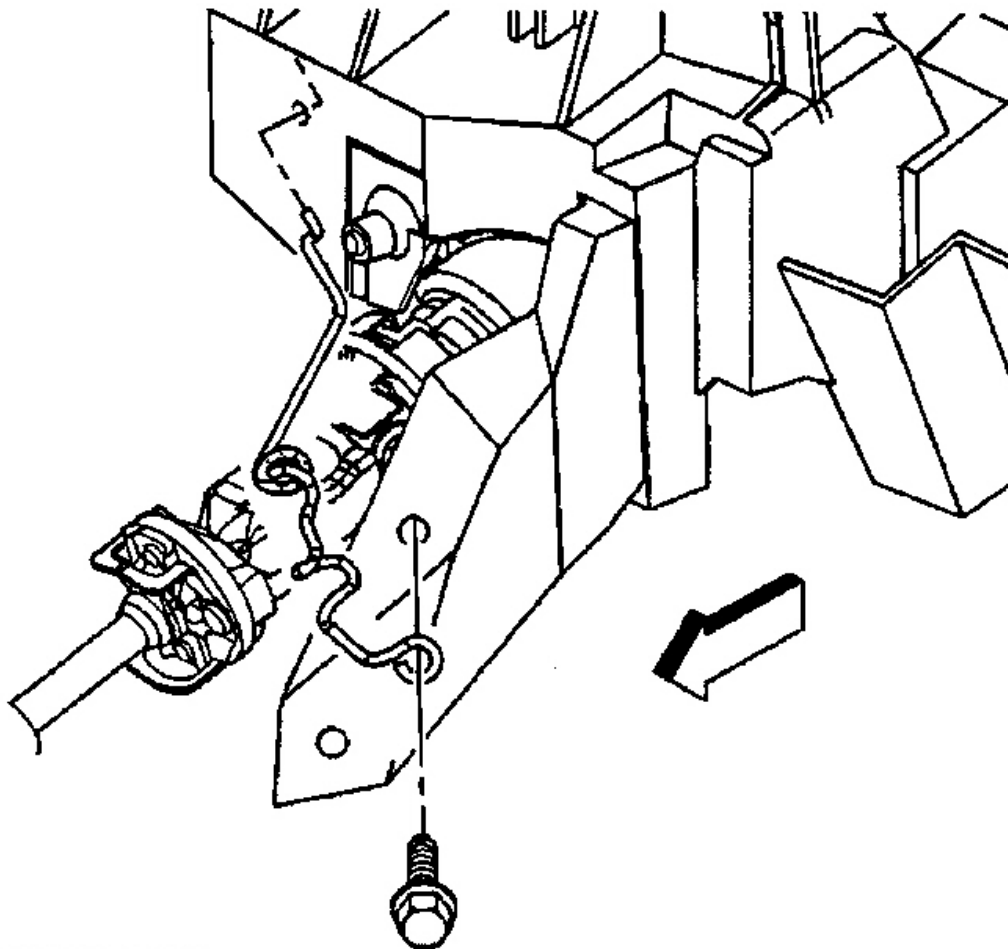
G00202985

Fig. 59: Removing Retainer Securing Cable To Steering Column
Courtesy of GENERAL MOTORS CORP.



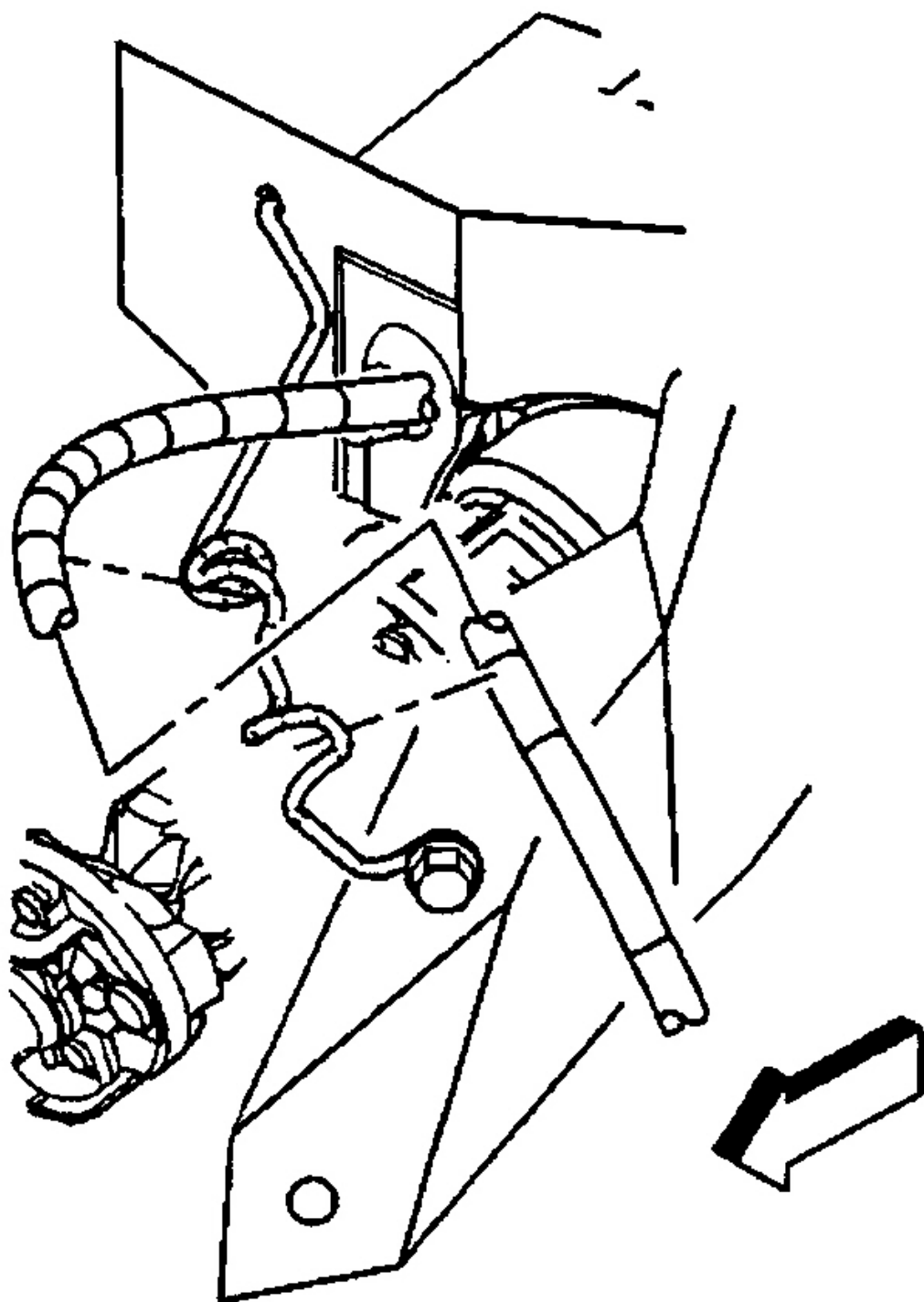
G00202986

Fig. 60: Removing Cable From Steering Column Ball Stud
Courtesy of GENERAL MOTORS CORP.



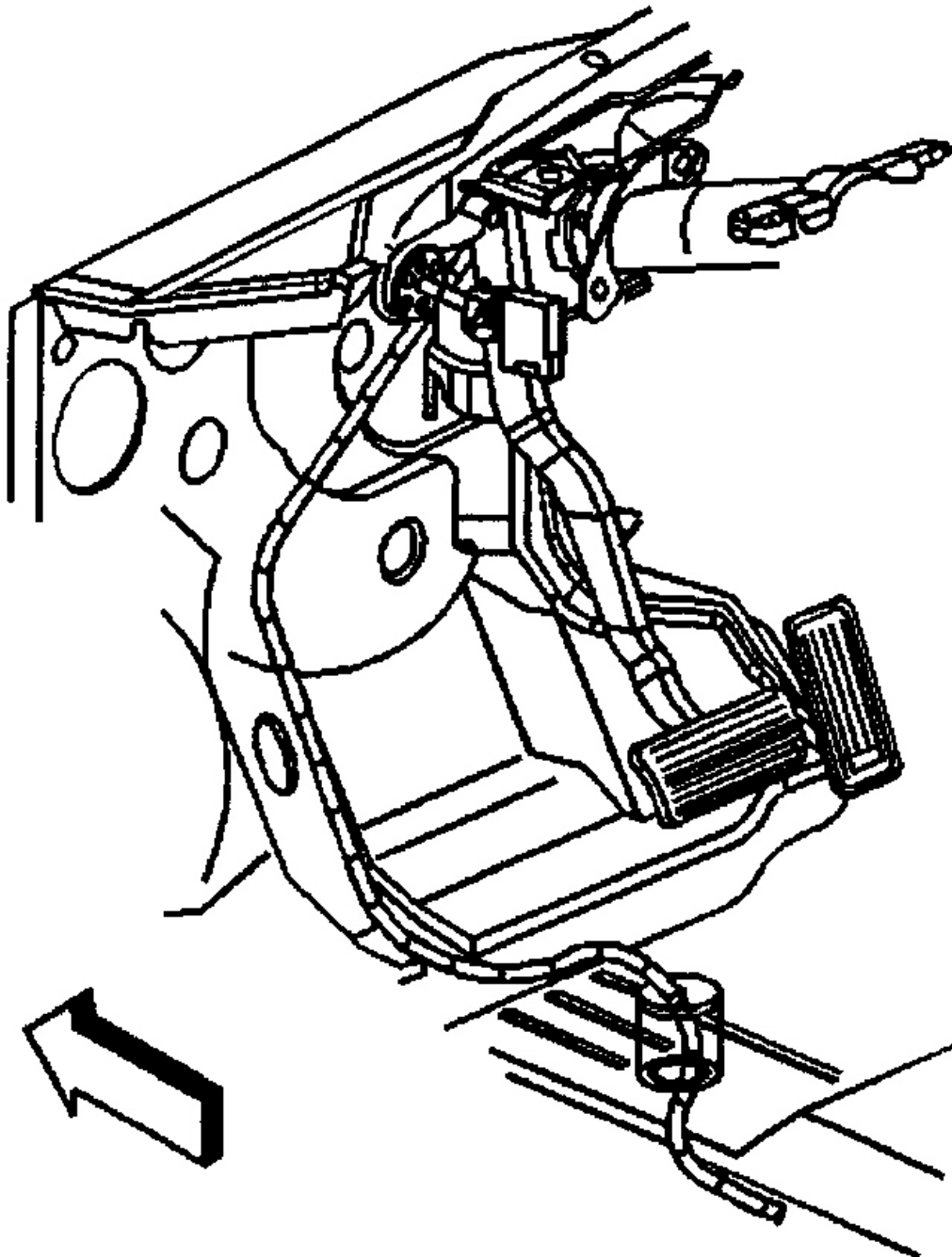
G00096126

Fig. 61: Removing & Installing Cable Support
Courtesy of GENERAL MOTORS CORP.



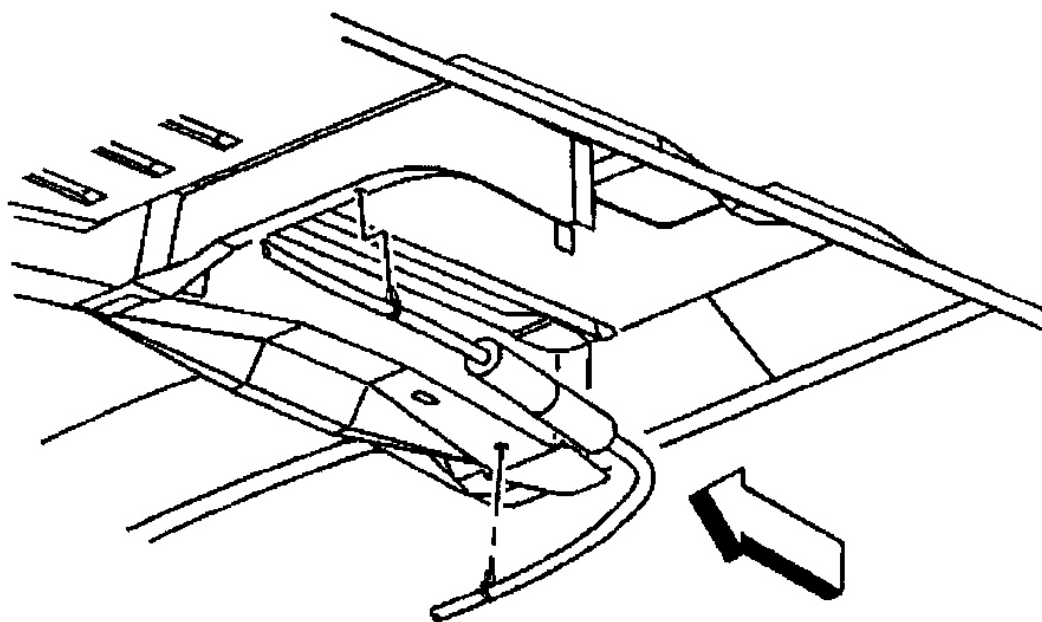
G00096127

Fig. 62: Removing & Installing Shift Cable At Support
Courtesy of GENERAL MOTORS CORP.



G00202987

Fig. 63: Removing Cable Grommet From Floor Panel
Courtesy of GENERAL MOTORS CORP.



G00202988

Fig. 64: Removing Floor Panel Reinforcement Clips
Courtesy of GENERAL MOTORS CORP.

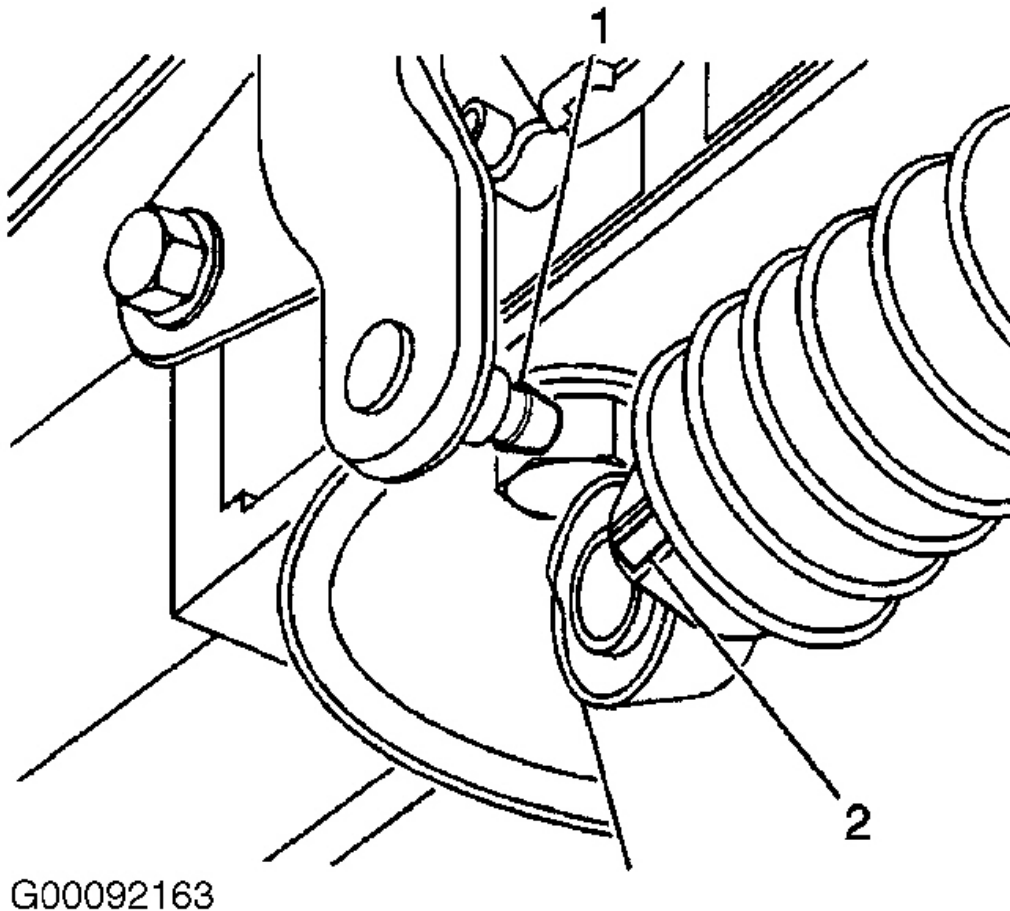


Fig. 65: Removing & Installing Shift Cable At Transmission Lever
Courtesy of GENERAL MOTORS CORP.

Installation

1. Ensure that the transmission manual shaft lever is in the mechanical Park position.
2. Align and install the cable to the bracket.
3. Install the range selector cable end (2) to the transmission range selector lever ball stud (1). See **Fig. 65** .
4. Install the cable clip on the transfer case, if equipped.
5. Install the retainer that secures the cable to the bracket. See **Fig. 57** .
6. Install the clips on the cable to the floor panel reinforcement. See **Fig. 64** .
7. Lower the vehicle.
8. Install the cable grommet to the floor panel. See **Fig. 63** .

NOTE: **Avoid unnecessary twisting/bending of the range selector cable when installing the cable to the support.**

9. Install the range selector cable to the support. See **Fig. 62** .
10. Install the bolt securing the cable support to the brace. See **Fig. 61** . Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .
11. Install the cable to the steering column bracket. See **Fig. 60** .
12. Ensure the tangs fully seat (snap) into the steering column bracket.
13. Install the cable end to the steering column ball stud.
14. Install the retainer securing the cable to the steering column. See **Fig. 59** .
15. Position the carpet and insulation around the driver's area.
16. Install the driver's seat.
17. Install the instrument panel knee bolster.
18. Test the transmission for proper shift operation.
19. If all of the gear positions cannot be achieved, adjust the cable.

TCC SOLENOID, TCC PWM SOLENOID & WIRING HARNESS

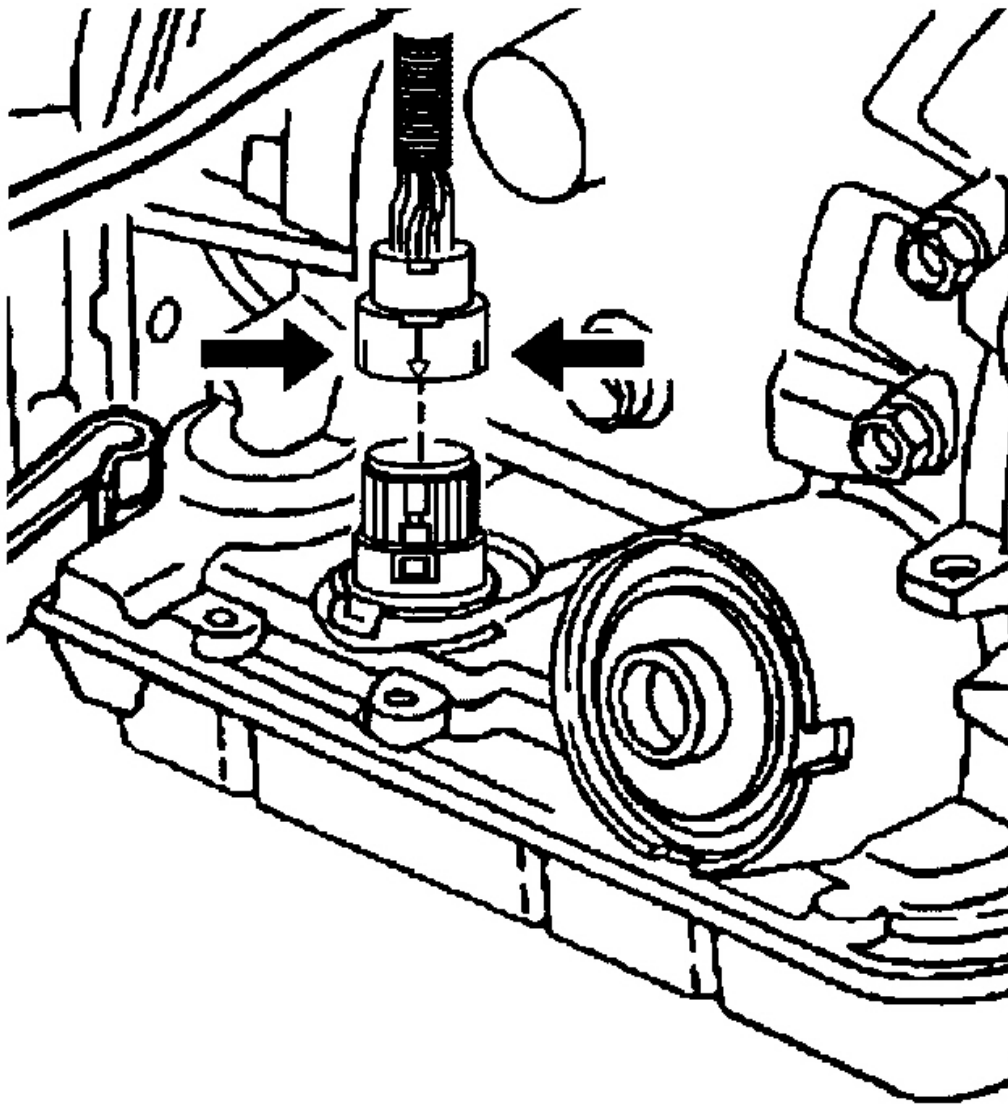
NOTE: **Tools required: Seal Protector Retainer Installer (J-28458).**

Removal

1. Raise and support the vehicle. Remove the transmission oil pan and the filter. See **DRAINING & REFILLING** under LUBRICATION.
2. Disconnect the transmission harness 20-way connector from the transmission internal harness pass-through connector. See **Fig. 66** . Depress both tabs on the connector and pull straight up, DO NOT pry the connector.
3. Remove the 1-2 accumulator assembly. See **ACCUMULATOR ASSEMBLY** .
4. Disconnect the internal wiring harness electrical connectors from the following components:
 - Transmission fluid pressure switch. See **Fig. 25** .
 - 1-2 shift control solenoid.
 - 2-3 shift control solenoid.
 - Pressure control solenoid.
 - TCC PWM solenoid.
 - 3-2 shift control solenoid.
5. Remove the TCC PWM solenoid retainer. See **Fig. 67** .
6. Remove the TCC PWM solenoid to access one of the TCC solenoid retaining bolts.
7. Remove the pressure control solenoid retainer.
8. Remove the pressure control solenoid. See **Fig. 26** .
9. Remove the TCC solenoid retaining bolts and the valve body bolts which retain the internal wiring

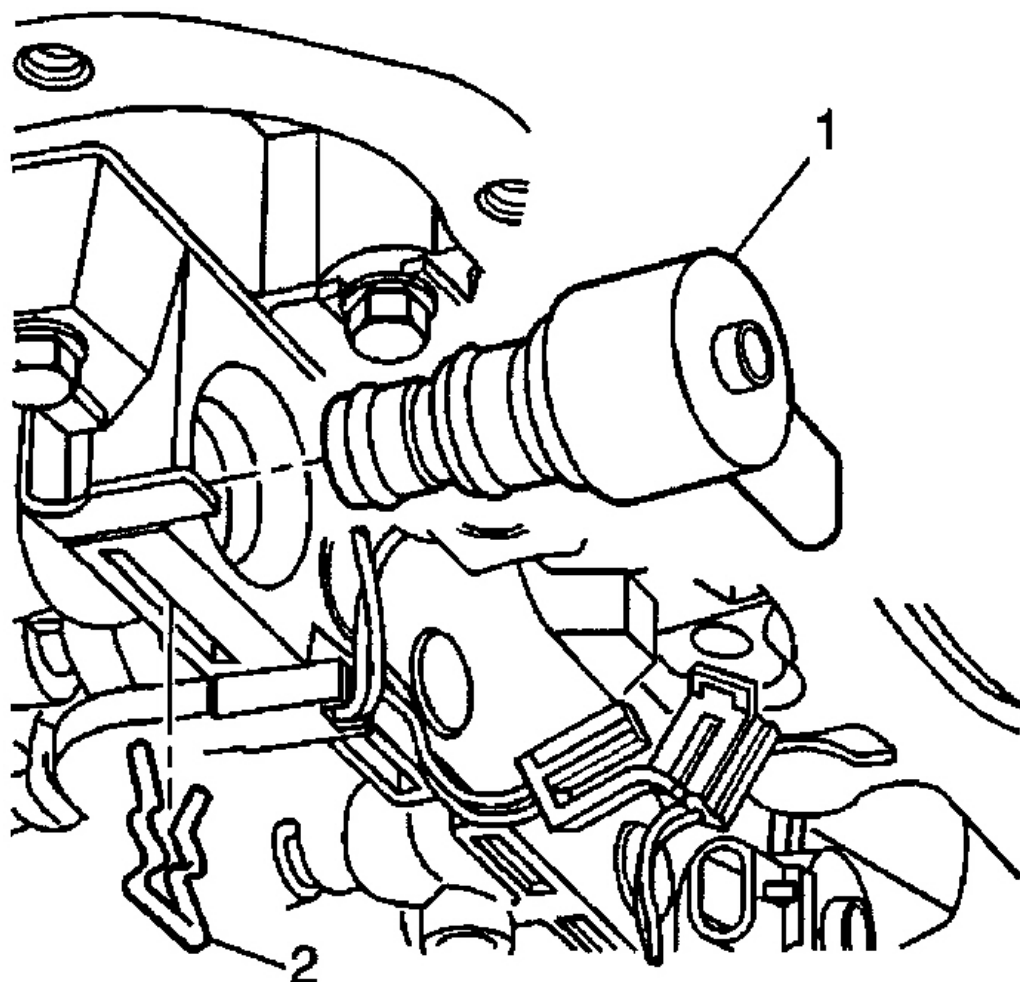
harness. See **Fig. 68** .

10. Using the seal protector retainer installer, release the pass-through electrical connector from the transmission case. See **Fig. 69** .
 - A. Use the small end of the seal protector retainer installer over the top of the connector.
 - B. Twist to release the 4 tabs retaining the connector.
 - C. Pull the harness connector down through the transmission case.
11. Remove the TCC solenoid (with "O" ring seal) and wiring harness.
12. Inspect the TCC solenoid and wiring harness assembly for the following defects:
 - Damage. See **Fig. 70** .
 - Cracked connectors.
 - Exposed wires.
 - Loose pins.



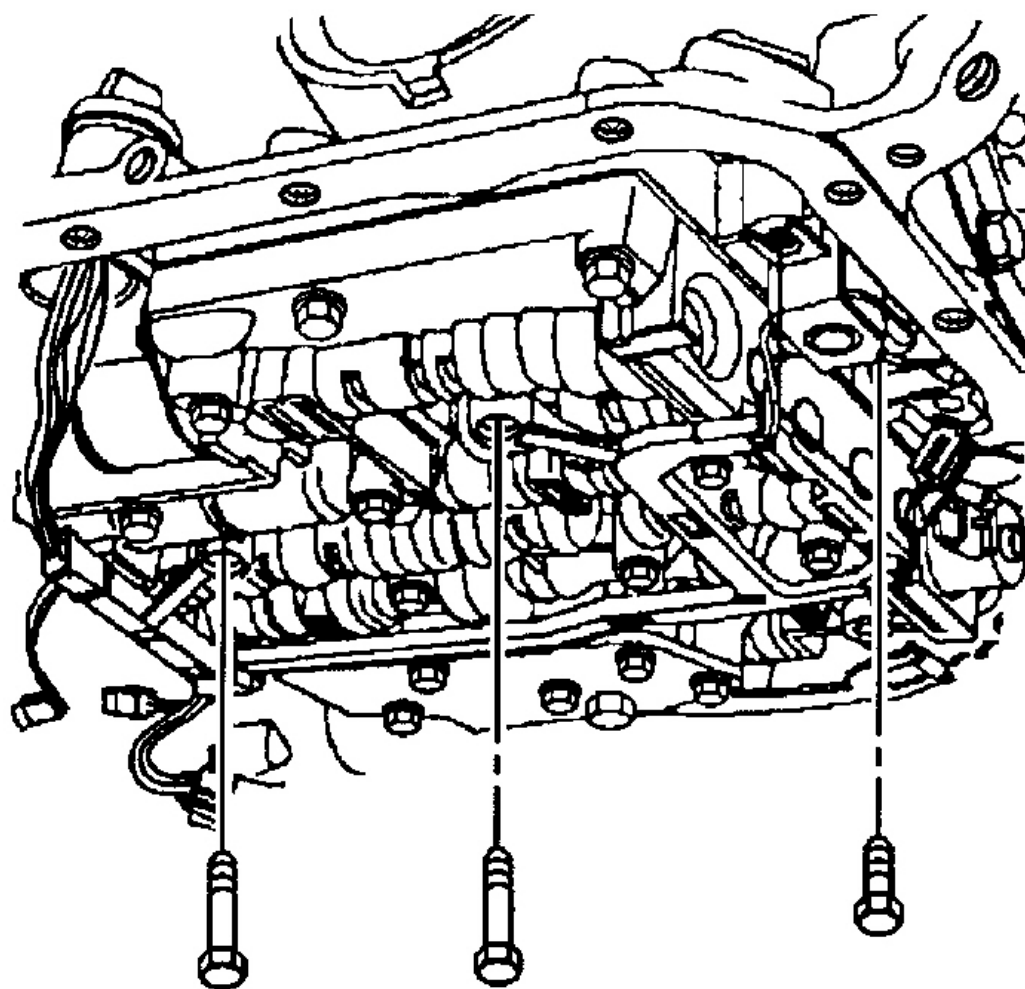
G00057010

Fig. 66: Disconnecting & Connecting Transmission Harness Connector
Courtesy of GENERAL MOTORS CORP.



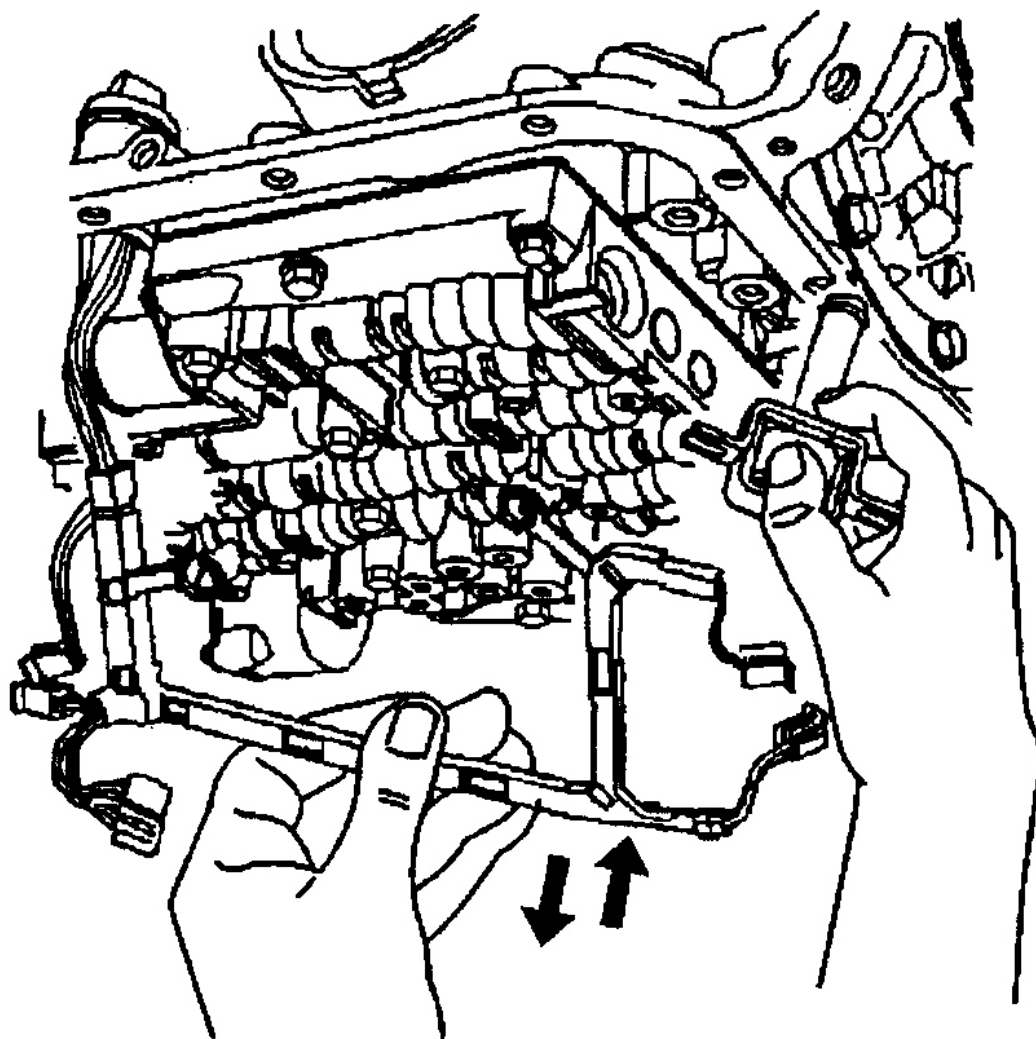
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Fig. 67: Removing & Installing TCC PWM Solenoid
Courtesy of GENERAL MOTORS CORP.



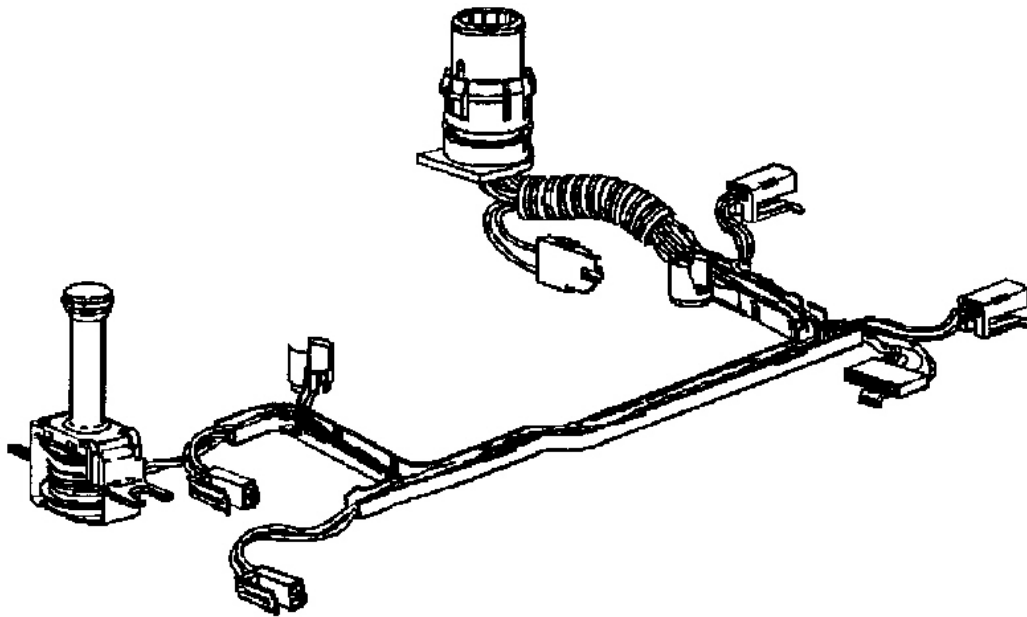
G00057011

Fig. 68: Removing & Installing Valve Body/TCC Solenoid Bolts
Courtesy of GENERAL MOTORS CORP.



G00089850

Fig. 69: Removing & Installing Internal Wiring Harness
Courtesy of GENERAL MOTORS CORP.



G00057012

Fig. 70: Identifying Internal Transmission Wire Harness
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the wiring harness and TCC solenoid assembly with a new "O" ring seal to the transmission. See **Fig. 69** .
2. Install the pass-through electrical connector to the transmission case.
3. Install the valve body bolts which retain the internal wiring harness and install the TCC solenoid retaining bolts. See **Fig. 68** .
 - Tighten the control valve body retaining bolts to specification. See **TORQUE SPECIFICATIONS** .
 - Tighten the TCC solenoid retaining bolts to specification. See **TORQUE SPECIFICATIONS** .
4. Install the pressure control solenoid. See **Fig. 26** . Ensure the electrical tabs are facing outboard.
5. Install the pressure control solenoid retainer and retaining bolt. Tighten the pressure control solenoid retaining bolt to specification. See **TORQUE SPECIFICATIONS** .
6. Install the TCC PWM solenoid to the control valve body. See **Fig. 67** .
7. Install the TCC PWM solenoid retainer.
8. Connect the internal wiring harness electrical connectors to the following components:
 - Transmission fluid pressure switch. See **Fig. 25** .

- 1-2 shift control solenoid.
 - 2-3 shift control solenoid.
 - Pressure control solenoid.
 - TCC PWM solenoid.
 - 3-2 shift control solenoid.
9. Install the 1-2 accumulator. See **ACCUMULATOR ASSEMBLY** .
 10. Connect the transmission harness 20-way connector to the transmission pass through connector. Align the arrows on each half of the connector and insert straight down. See **Fig. 66** .
 11. Install the transmission oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.

VALVE BODY & PRESSURE SWITCH

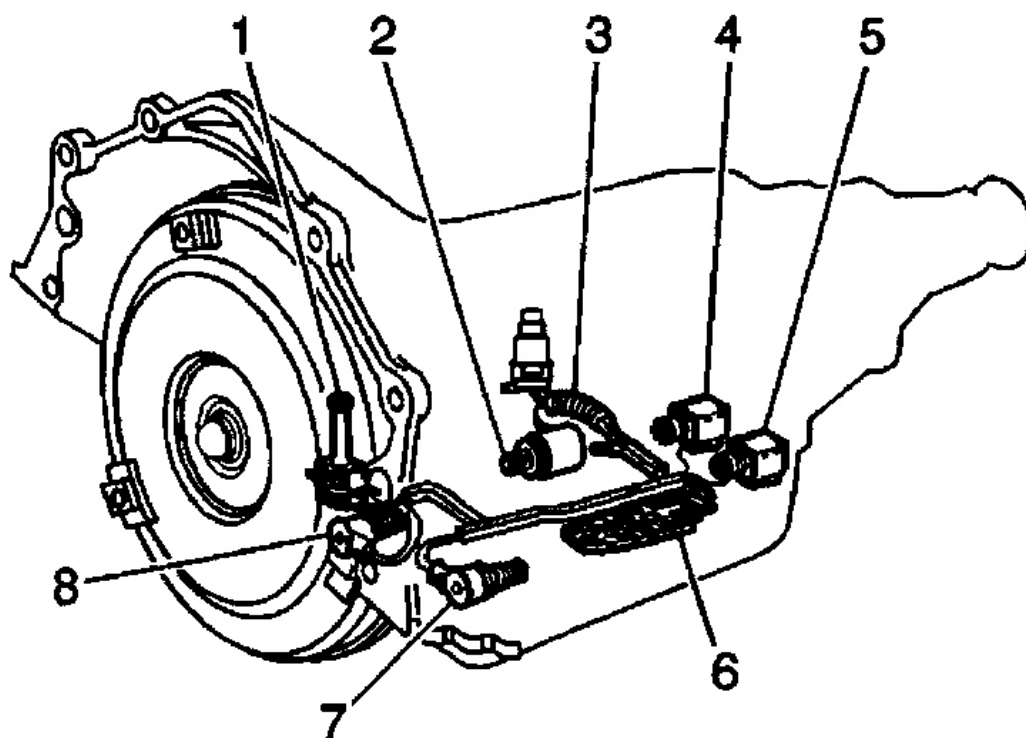
Removal

1. Ensure removal of the valve body is necessary before proceeding. The following components can be serviced without removing the valve body from the transmission. See **Fig. 71** .
 - Torque Converter Clutch Solenoid (1).
 - Pressure Control Solenoid (2).
 - Internal Wiring Harness (3).
 - 2-3 Shift Solenoid (4).
 - 1-2 Shift Solenoid (5).
 - Transmission Fluid Pressure Manual Valve Position Switch (6).
 - 3-2 Shift Solenoid (7).
 - Torque Converter Clutch Pulse Width Modulation (TCC PWM) Solenoid (8).
2. Remove the fluid level indicator.
3. Remove the filter. See **DRAINING & REFILLING** under LUBRICATION.
4. Disconnect the internal wiring harness electrical connectors from the following components:
 - Transmission fluid pressure manual valve position switch. See **Fig. 25** .
 - 1-2 shift control solenoid.
 - 2-3 shift control solenoid.
 - Pressure control solenoid.
 - TCC PWM solenoid.
 - 3-2 shift control solenoid.
 - Bracket bolt.
5. Remove the fluid indicator stop bracket bolt. See **Fig. 72** .
6. Remove the fluid indicator bracket (1).
7. Remove the TCC PWM solenoid retainer (2) with a small screwdriver. Rotate the solenoid (1) in the bore, if necessary, until the flat part of the retainer (2) is visible.
8. Remove the TCC PWM solenoid (1) to access the TCC solenoid retaining bolts. See **Fig. 67** .

9. Remove the TCC solenoid bolts. See **Fig. 73** .
10. Remove the TCC solenoid (with "O" ring seal) and wiring harness from the control valve body.
11. Reposition the harness to the side of the transmission case. See **Fig. 69** .
12. Remove the control valve body bolts which retain the transmission fluid pressure switch to the control valve body. See **Fig. 74** .
13. Remove the transmission fluid pressure switch.
14. Inspect the transmission fluid pressure switch for damage or debris. See **Fig. 75** .
15. Remove the manual detent spring retaining bolt.
16. Remove the manual detent spring. See **Fig. 76** .
17. Inspect the manual detent spring for cracks or damage.

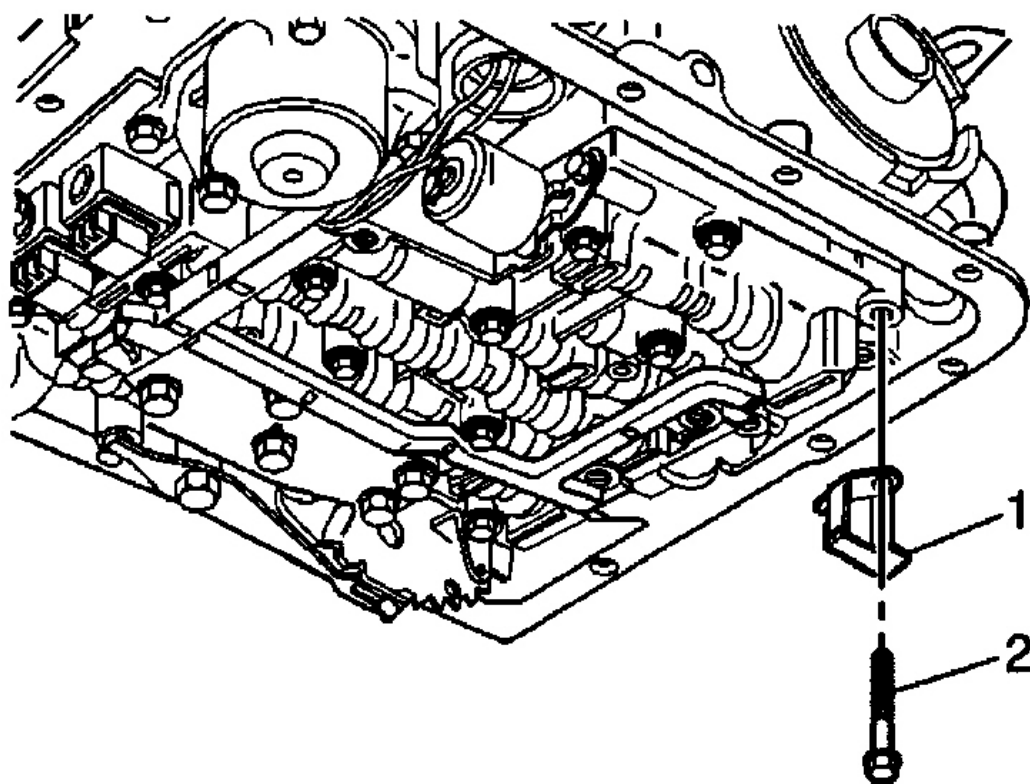
**CAUTION: Keep the control valve body level when lowering it from the vehicle.
This will prevent the loss of checkballs located in the control valve
body passages.**

18. Remove the remaining valve body bolts.
19. Carefully begin to lower the control valve body down from the transmission case while simultaneously disconnecting the manual valve link. See **Fig. 77** .



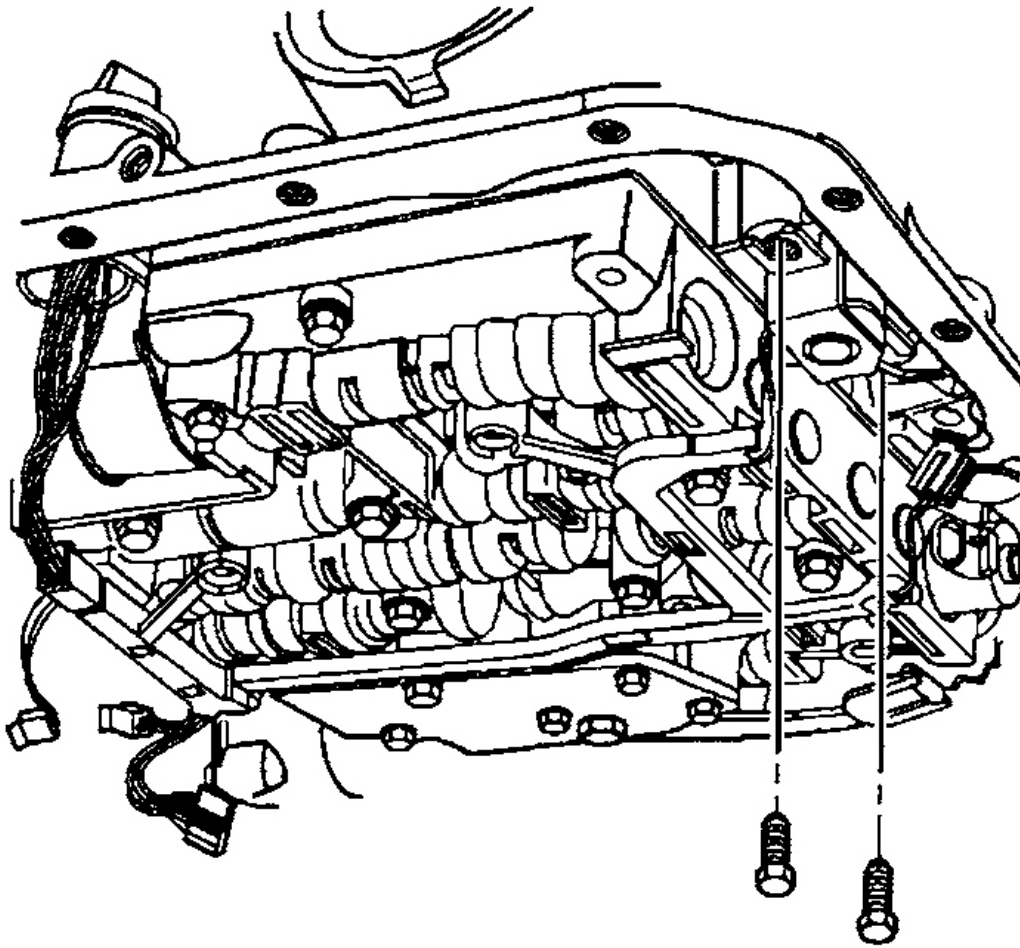
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Fig. 71: Identifying Serviceable Components
Courtesy of GENERAL MOTORS CORP.



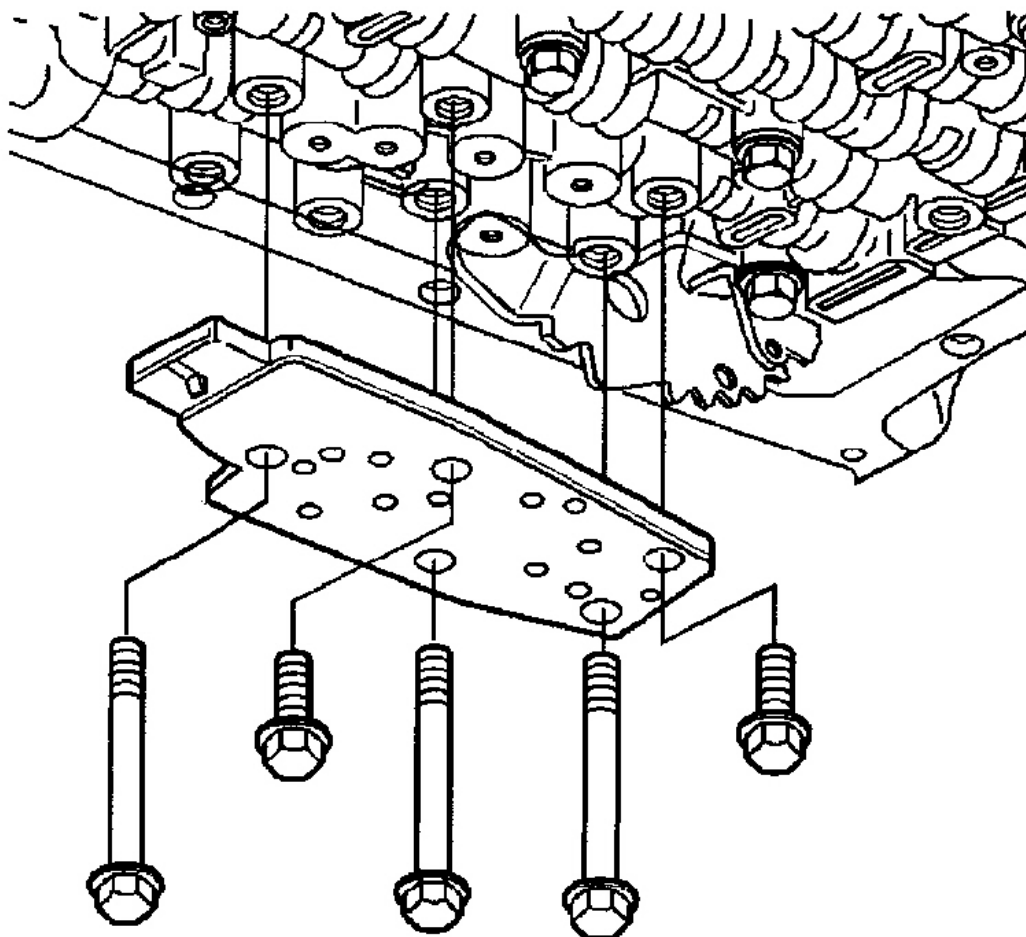
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Fig. 72: Removing & Installing Fluid Indicator Stop Bracket
Courtesy of GENERAL MOTORS CORP.



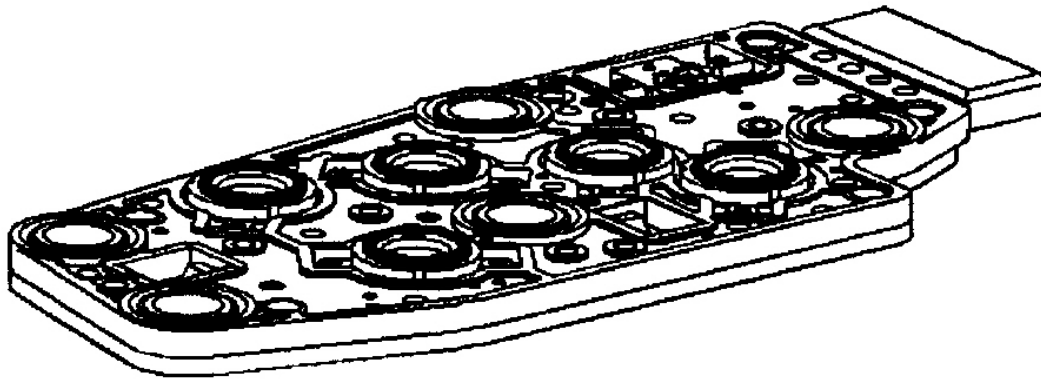
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Fig. 73: Removing & Installing TCC Retainer Bolts
Courtesy of GENERAL MOTORS CORP.



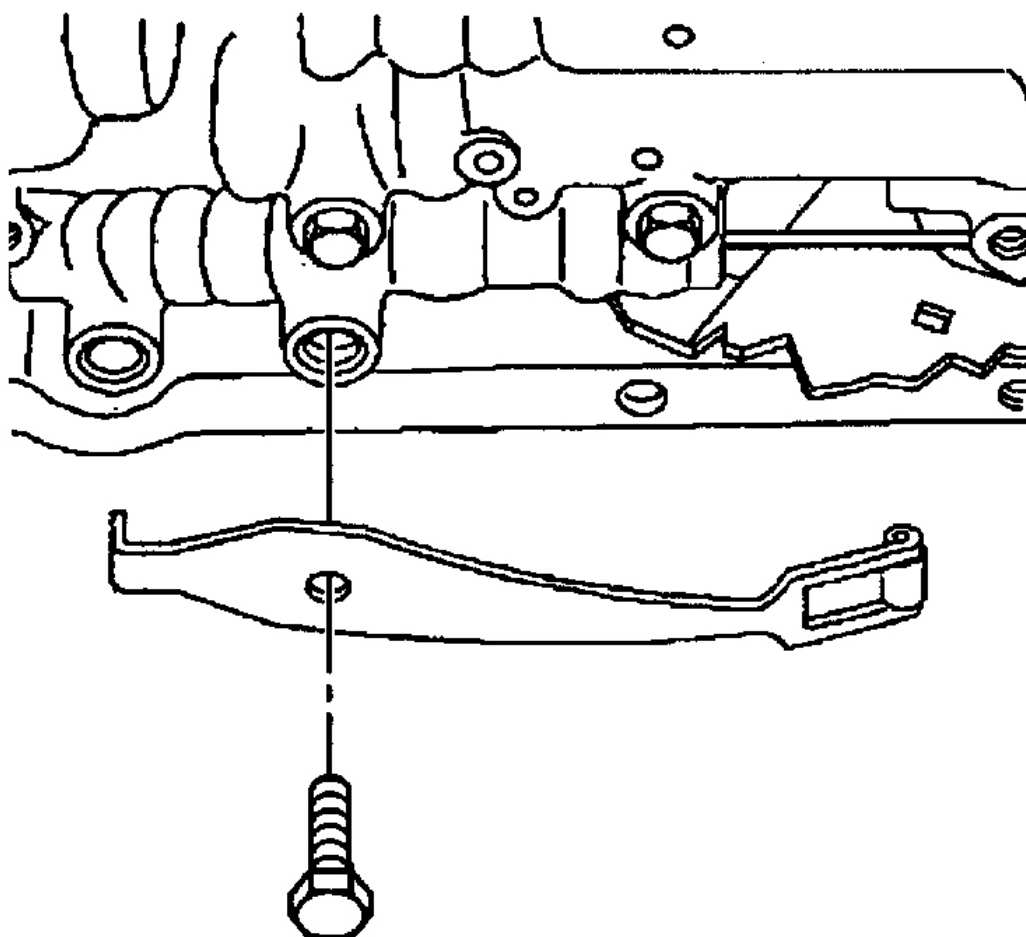
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Fig. 74: Removing & Installing Fluid Pressure Switch Bolts
Courtesy of GENERAL MOTORS CORP.



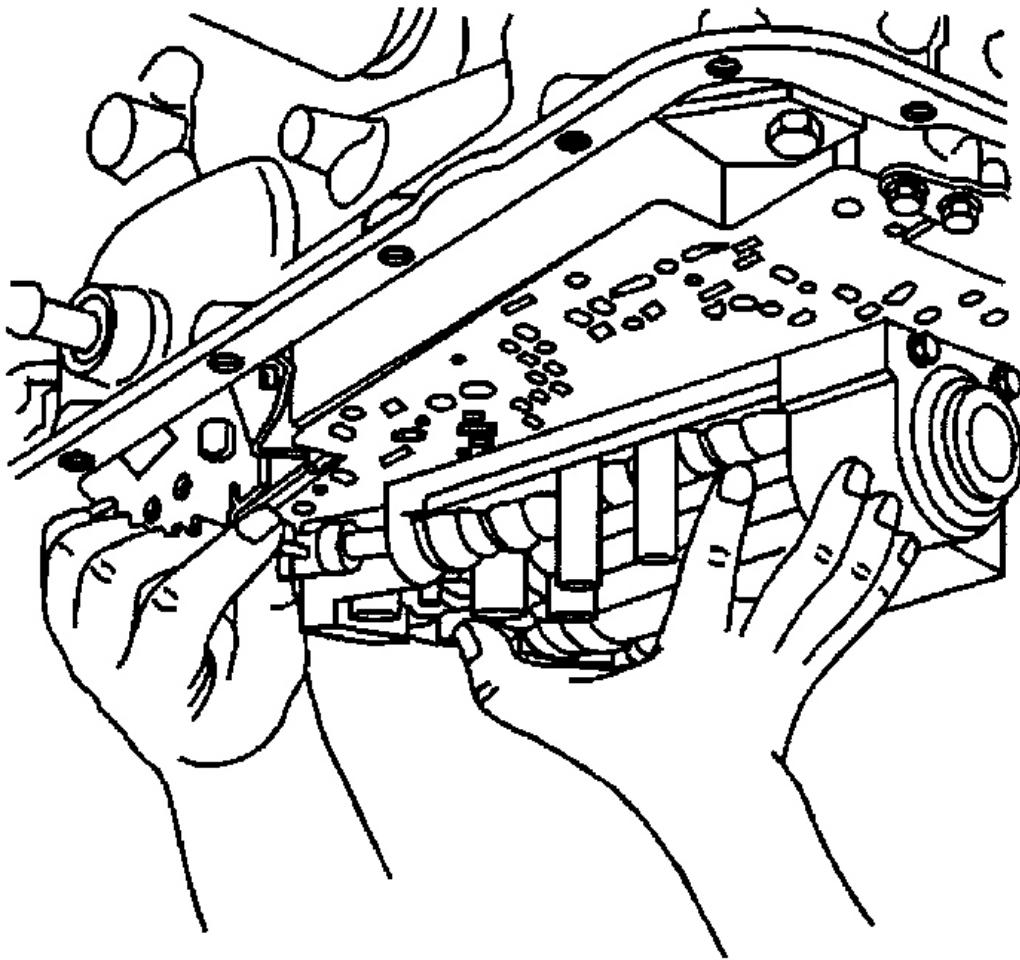
G00089856

Fig. 75: Inspecting Fluid Pressure Switch For Damage
Courtesy of GENERAL MOTORS CORP.



G00089857

Fig. 76: Removing & Installing Manual Detent Lever
Courtesy of GENERAL MOTORS CORP.



G00056992

Fig. 77: Lowering & Raising Valve Body
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the 7 checkballs in the valve body. See **Fig. 78** .
2. Install the control valve body to the transmission case while simultaneously connecting the manual valve link to the manual valve. See **Fig. 77** .
3. Verify the manual valve link (3) is installed properly to the inside detent lever (1) and the manual valve (2). See **Fig. 79** .
4. Install one bolt (M6 X 1.0 X 47.5) hand tight in the center (1) of the valve body to hold it in place. See **Fig. 80** .

NOTE: When installing bolts throughout this procedure, be sure to use the correct bolt size and length in the correct location as specified.

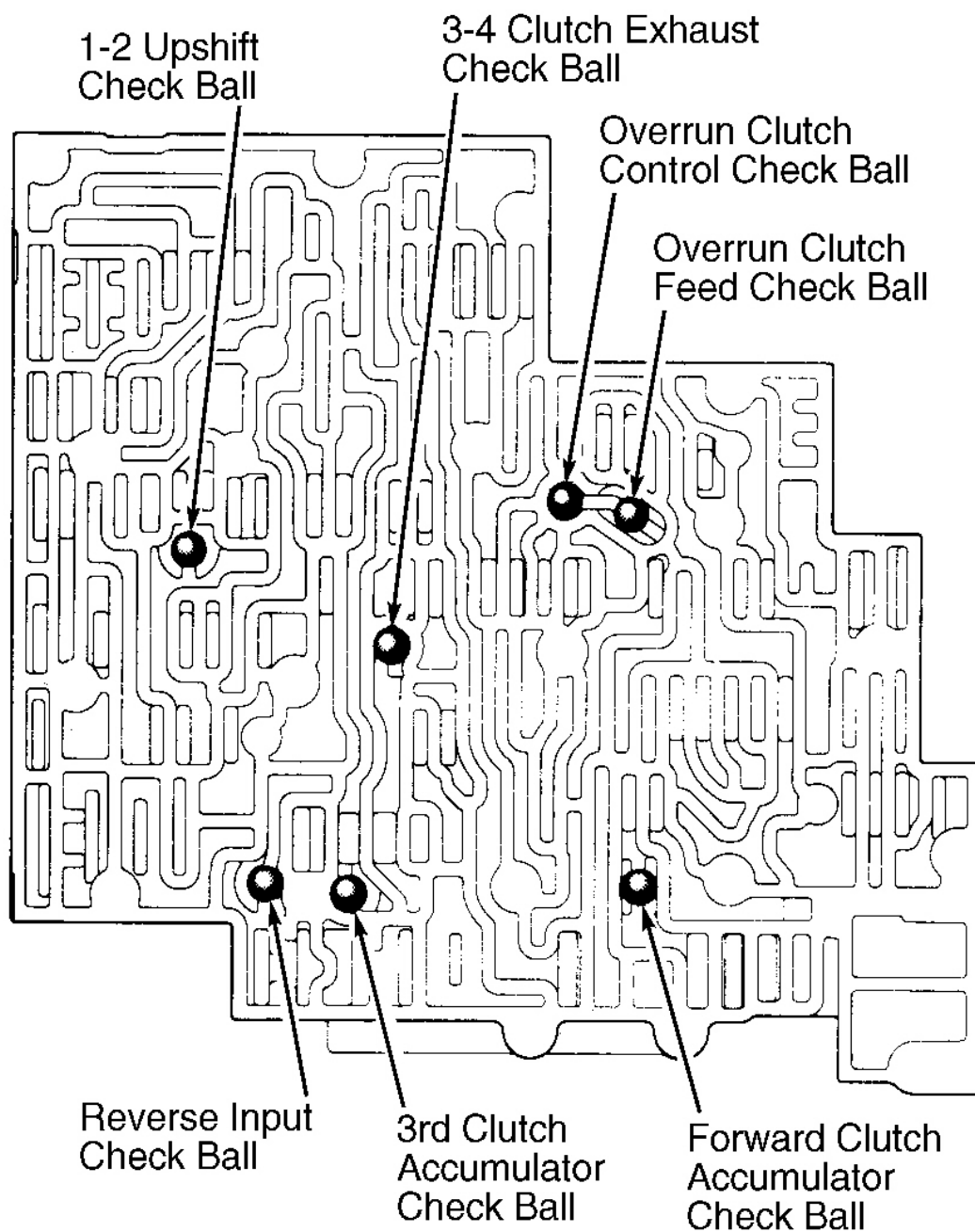
5. DO NOT install the transmission fluid indicator stop bracket and bolt at this time. Install but DO NOT tighten the control valve body bolts which retain only the valve body directly. See **Fig. 81** . Each numbered bolt location corresponds to a specific bolt size and length, as indicated by the following:
 - M6 X 1.0 X 65.0 (1).
 - M6 X 1.0 X 54.4 (2).
 - M6 X 1.0 X 47.5 (3).
 - M6 X 1.0 X 35.0 (4).
 - M8 X 1.0 X 20.0 (5).
 - M6 X 1.0 X 12.0 (6).
 - M6 X 1.0 X 18.0 (7).
6. Install the manual detent spring.
7. Install but DO NOT tighten the manual detent spring retaining bolt. See **Fig. 76** .
8. Install the transmission fluid pressure switch. See **Fig. 74** .
9. Install but DO NOT tighten the control valve body bolts which retain the transmission fluid pressure switch to the control valve body. See **Fig. 74** .

NOTE: Torque valve body bolts in a spiral pattern starting from the center. If the bolts are torqued at random, valve bores may be distorted and inhibit valve operation.

10. Tighten the control valve body bolts in a spiral pattern starting from the center, as indicated by the arrows. See **Fig. 81** . Tighten the control valve body bolts (in sequence) to specification. See **TORQUE SPECIFICATIONS** .
11. Ensure the manual detent spring is aligned properly with the detent lever. Tighten the manual detent spring bolt to specification. See **TORQUE SPECIFICATIONS** .
12. Install the TCC solenoid with a new "O" ring seal to the valve body.
13. Install the TCC solenoid bolts. Tighten the TCC solenoid retaining bolts to specification. See **TORQUE SPECIFICATIONS** .
14. Install the internal wiring harness to the valve body. The internal wiring harness has a tab (1) on the edge of the conduit. See **Fig. 82** .
15. Place the tab between the valve body and the pressure switch in the location shown (2). See . Press the harness into position on the valve body bolt bosses (1, 3). See **Fig. 83** .
16. Install the TCC PWM solenoid (1) to the control valve body.
17. Install the TCC PWM solenoid retainer (2). See **Fig. 67** .
18. Install the transmission fluid indicator stop bracket (1) and bolt (2). See **Fig. 72** . Tighten the transmission fluid indicator stop bracket bolt to specification. See **TORQUE SPECIFICATIONS** .
19. Connect the internal wiring harness electrical connectors to the following components:
 - The transmission fluid pressure manual valve position switch. See **Fig. 25** .

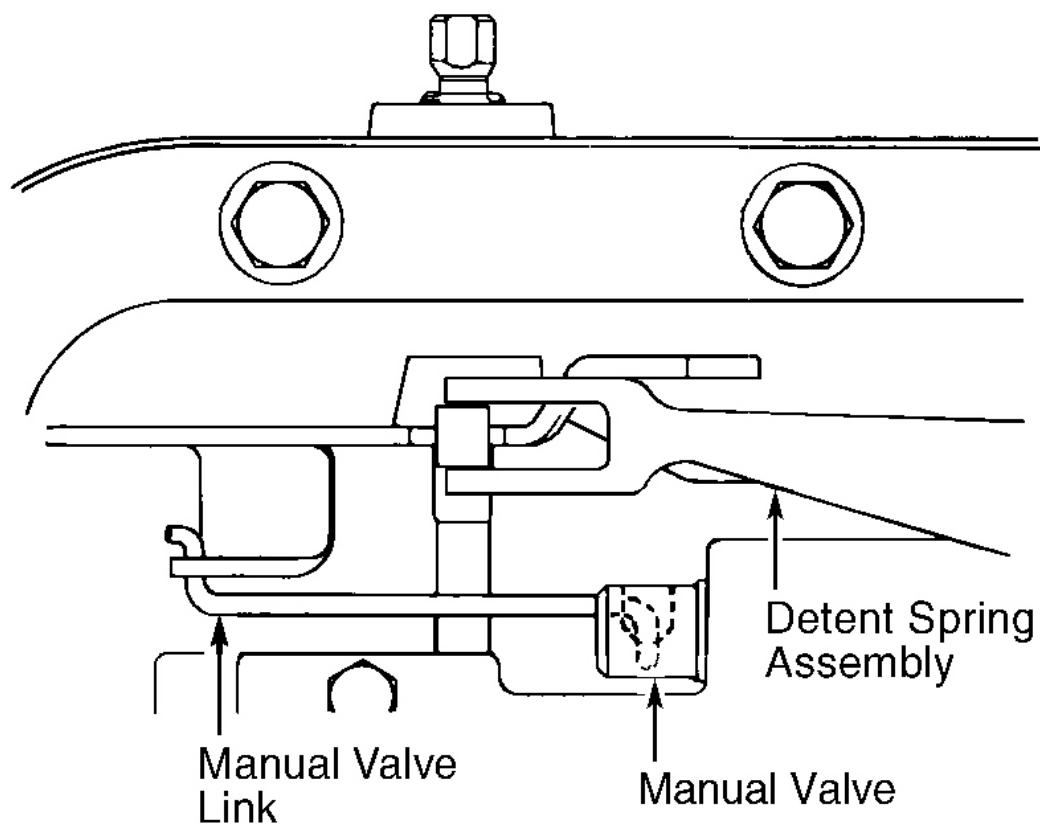
- 1-2 shift control solenoid.
- 2-3 shift control solenoid.
- Pressure control solenoid.
- TCC PWM solenoid.
- 3-2 shift control solenoid.

20. Install the transmission oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.



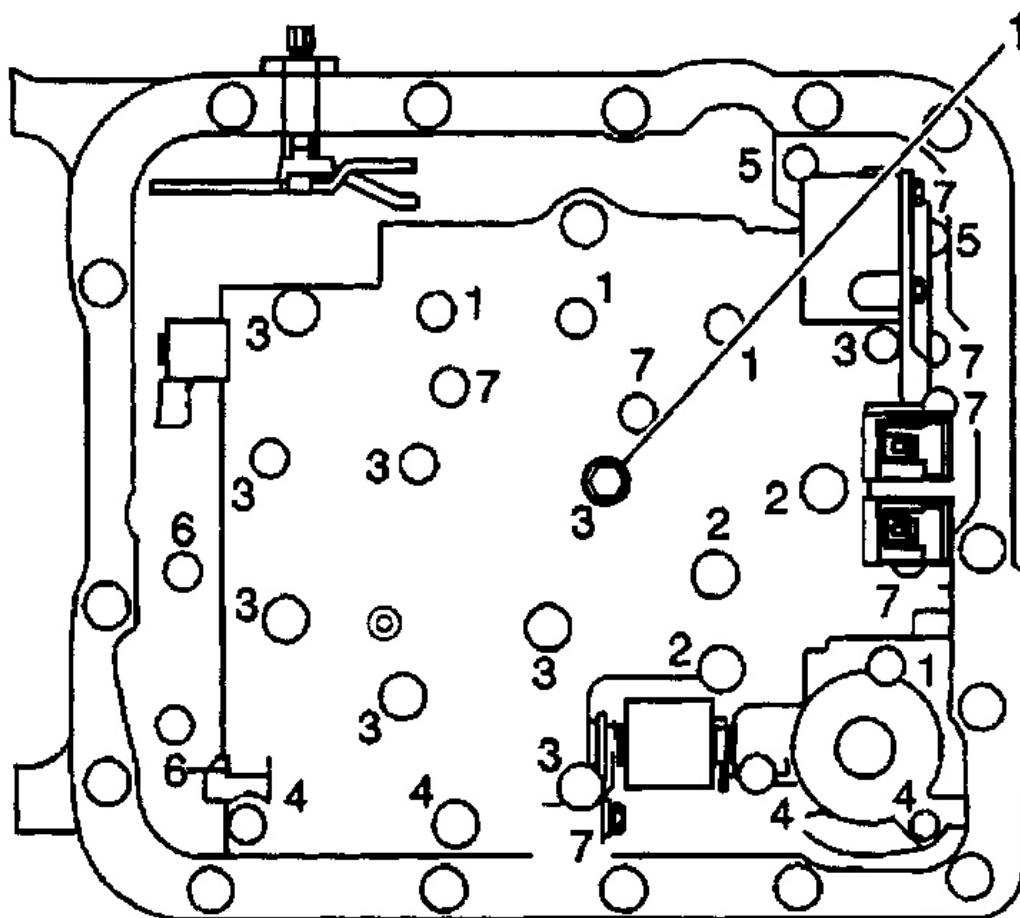
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Fig. 78: Installing Check Balls In Valve Body
Courtesy of GENERAL MOTORS CORP.



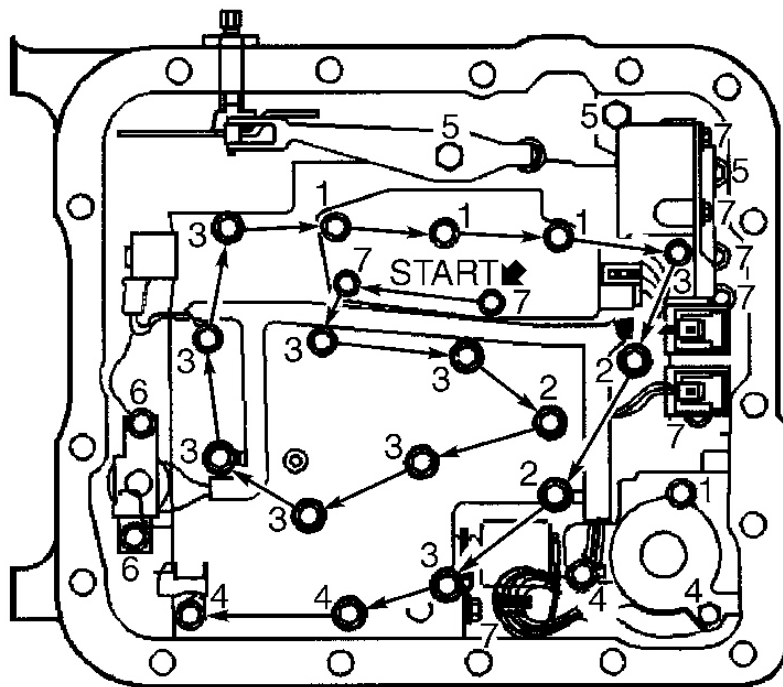
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Fig. 79: Installing Manual Valve To Detent Lever
Courtesy of GENERAL MOTORS CORP.



G00089861

Fig. 80: Location Of 1st Bolt To Hold Valve Body In Place
Courtesy of GENERAL MOTORS CORP.



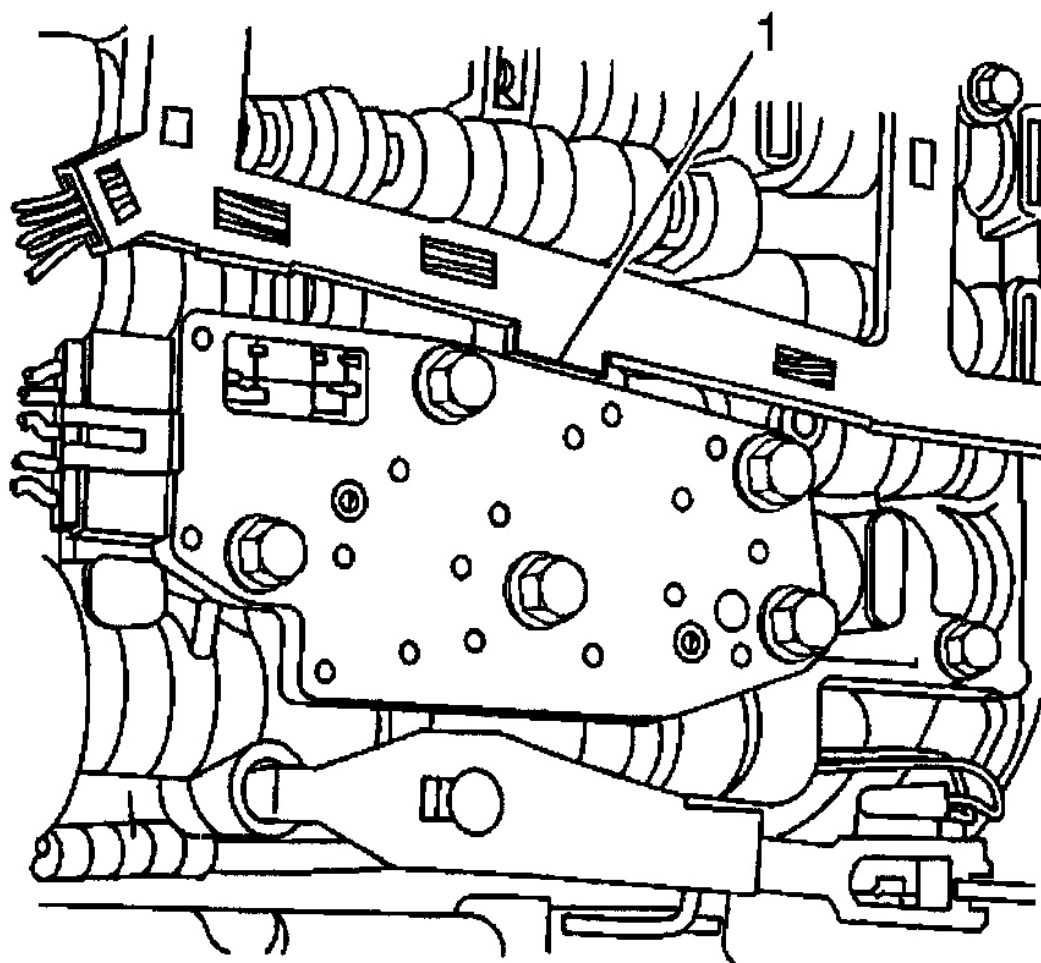
NOTE: Numbers identify bolt length.
Arrows identify tightening sequence.

VALVE BODY BOLT IDENTIFICATION

Bolt No.	Length In. (mm)
1	2.56 (65)
2	2.14 (54.4)
3	1.87 (47.5)
4	1.38 (35)
5	.79 (20)
6	.47 (12)
7	.71 (18)

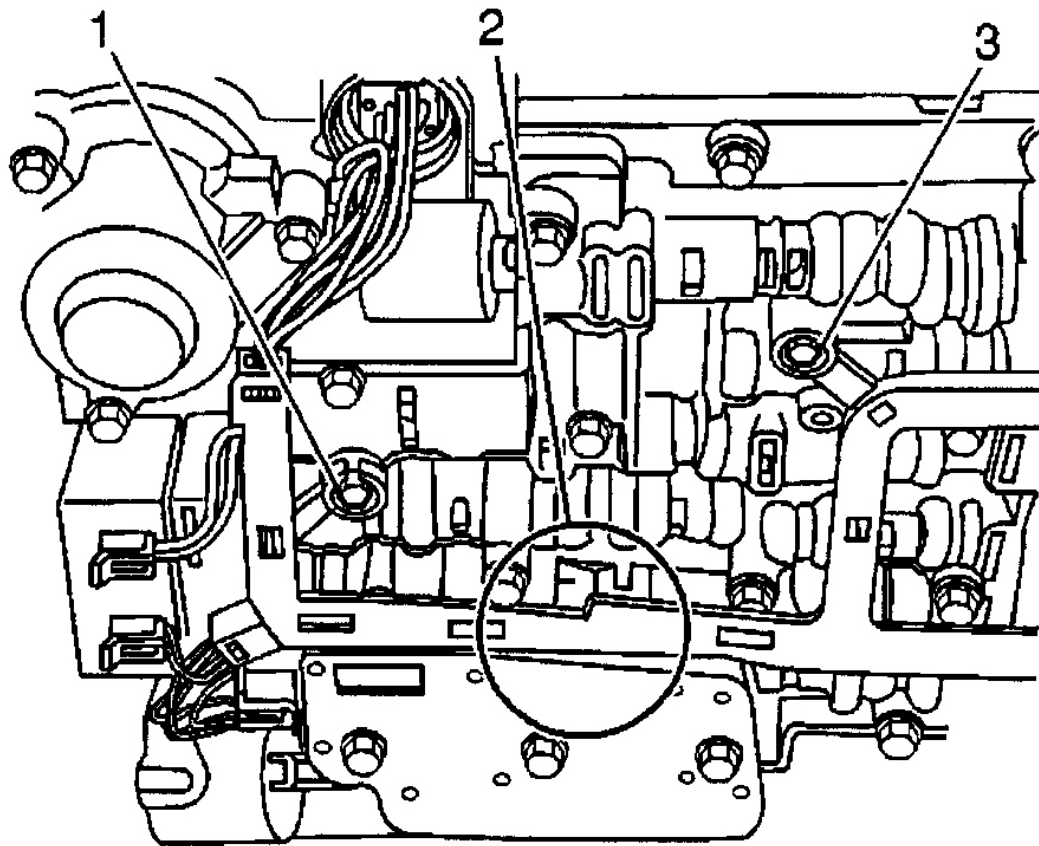
G99C03603

Fig. 81: Valve Body Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.



G00202989

Fig. 82: Installing Internal Wiring Harness To Valve Body
Courtesy of GENERAL MOTORS CORP.



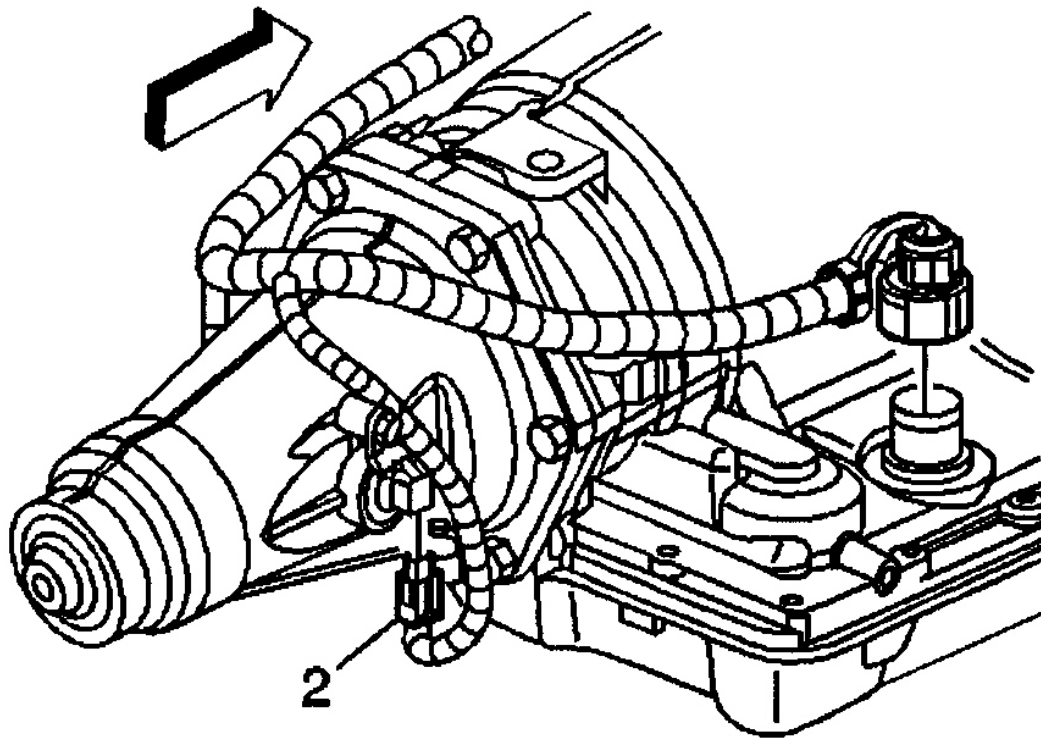
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Fig. 83: Positioning Wiring Harness
Courtesy of GENERAL MOTORS CORP.

VEHICLE SPEED SENSOR

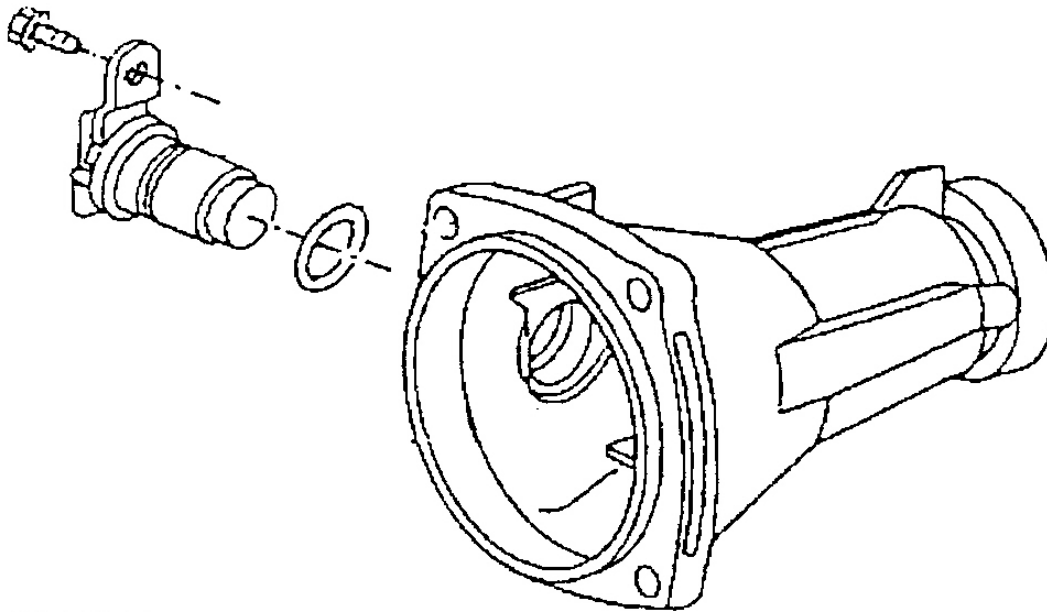
Removal

1. Raise and support the vehicle.
2. Disconnect the Vehicle Speed Sensor (VSS) electrical connector (2). See **Fig. 84** .
3. Remove the bolt. See **Fig. 85** .
4. Remove the VSS.
5. Remove the "O" ring seal.



G00202991

Fig. 84: Disconnecting VSS Electrical Connector
Courtesy of GENERAL MOTORS CORP.



G00089912

Fig. 85: Removing & Installing Vehicle Speed Sensor Assembly
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the "O" ring seal onto the VSS. See **Fig. 85** .
2. Coat the "O" ring seal with a thin film of transmission fluid.
3. Install the VSS.
4. Install the VSS bolt. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .
5. Connect the VSS electrical connector (2). See **Fig. 84** .
6. Lower the vehicle.
7. Refill the fluid as required. See **LUBRICATION** .

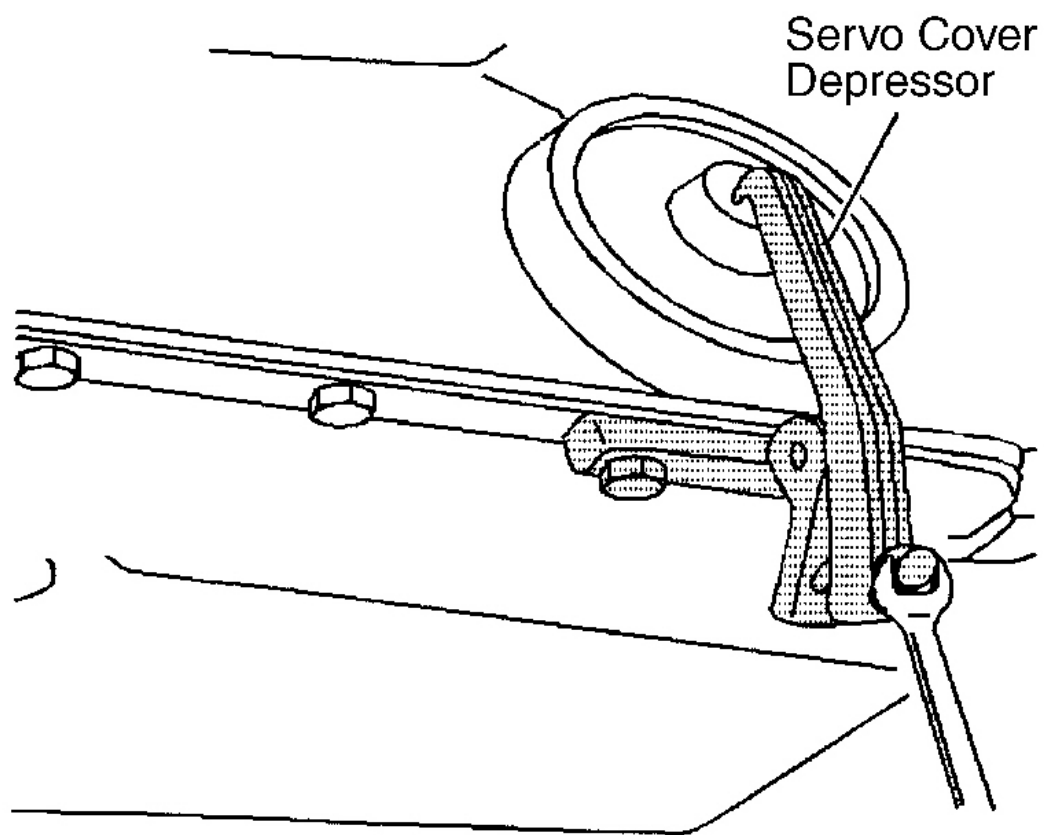
2-4 SERVO

NOTE: **Tools required: Servo Cover Depressor (J-29714-A).**

Removal

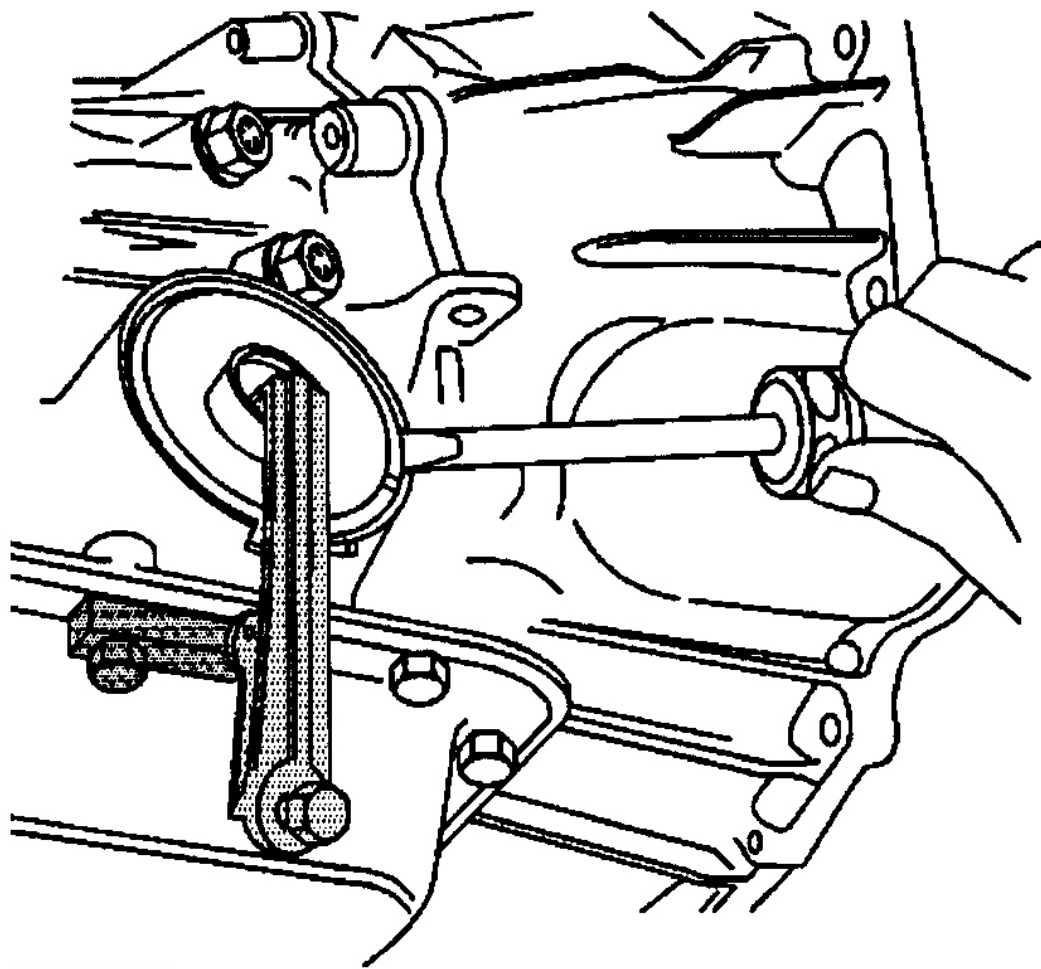
1. Remove the exhaust pipe. See .
2. Remove the heat shield bolts. See **Fig. 36** .
3. Remove the heat shield.

4. Remove the oil pan bolt below the servo.
5. Install the servo cover depressor. See **Fig. 86** .
6. Tighten the bolt on servo cover depressor in order to compress the servo cover.
7. Remove the servo cover ring. See **Fig. 87** .
8. Remove the servo cover depressor.
9. Remove the servo cover and "O" ring seal. If the cover is hung up on the seal, use a pick (2) in order to pull and stretch the seal (1) out of the groove. Cut and remove the "O" ring seal before removing the cover. See **Fig. 88** .
10. Remove the 2-4 servo. See **Fig. 89** .
11. Inspect the 4th apply piston, 2-4 servo converter, 2nd apply piston, and the servo piston inner housing for the following defects:
 - Cracks.
 - Scoring.
 - Burrs and nicks.



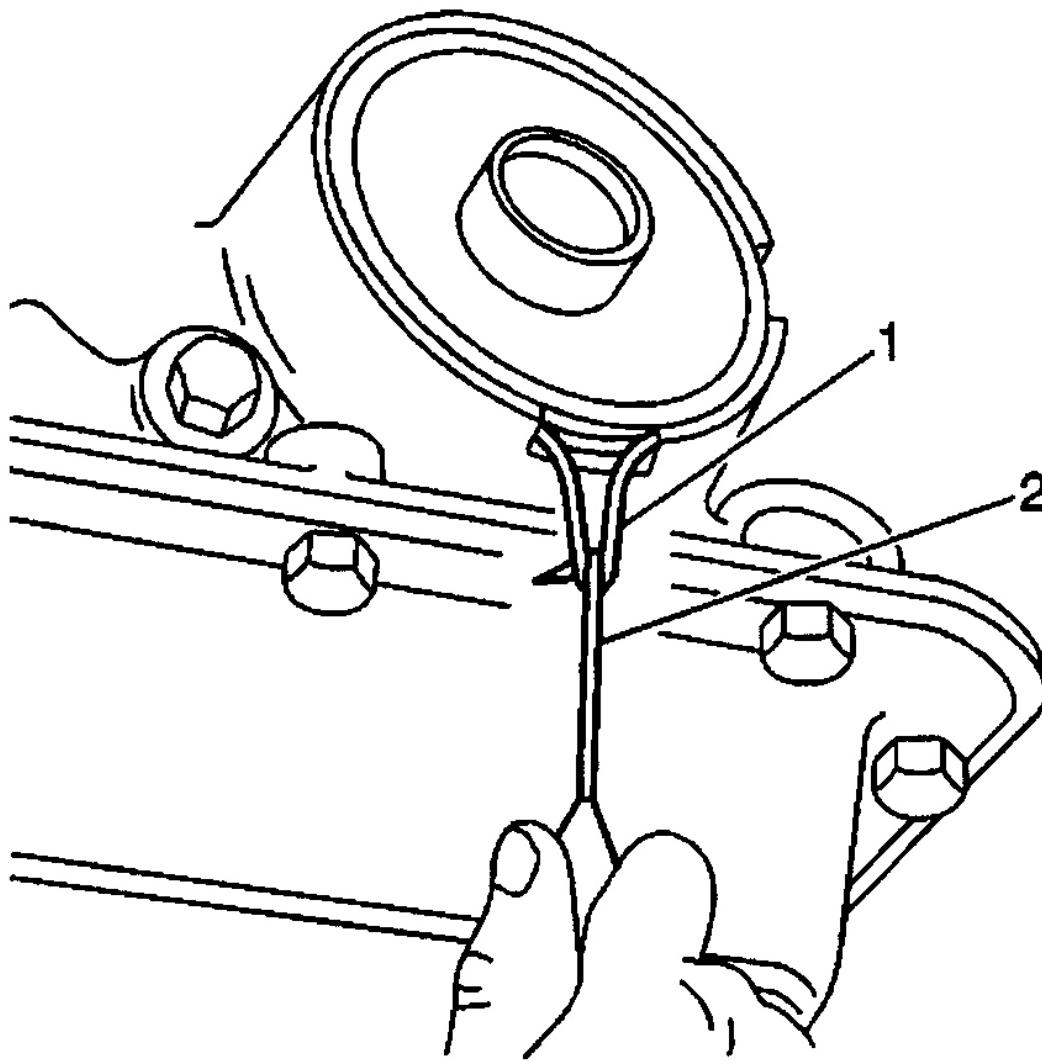
G00089864

Fig. 86: Installing Servo Cover Depressor On Transmission
Courtesy of GENERAL MOTORS CORP.



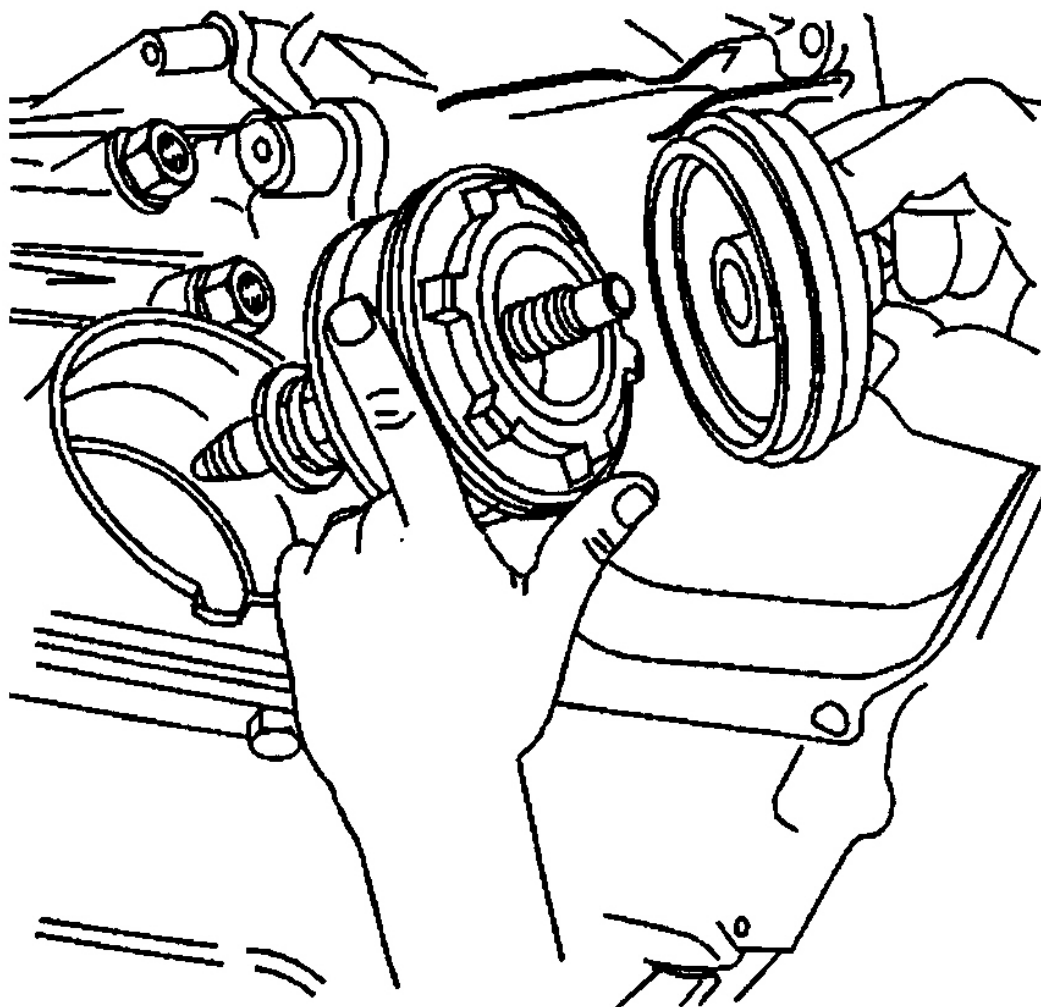
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Fig. 87: Removing Servo Cover Retaining Ring
Courtesy of GENERAL MOTORS CORP.



G00089866

Fig. 88: Removing Servo "O" Ring
Courtesy of GENERAL MOTORS CORP.



G00089867

Fig. 89: Inspecting Servo Components For Damage
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install NEW seals onto the servo pistons and the servo cover.
2. Install the 2-4 servo. See **Fig. 89** .
3. Install the servo cover depressor.
4. Tighten the bolt on servo cover depressor in order to compress the servo cover. See **Fig. 86** .
5. Install the servo cover ring.
6. Remove the servo cover depressor.
7. Install the oil pan bolt. Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .

8. Install the heat shield and bolts. See **Fig. 36** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
9. Install the exhaust pipe.
10. Fill transmission to proper level with appropriate fluid. See **LUBRICATION** .

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Exhaust Pipe Hanger Bracket Bolts	12 (17)
Extension Housing Bolt	33 (45)
Filler Tube Stud	35 (47)
Forward Servo Cover Bolt	18 (24)
Heat Shield Bolt	13 (17)
Indicator Tube Nut	13 (18)
Insulator Nuts	12 (17)
Left Exhaust Pipe Nuts	37 (50)
Oil Pan Drain Plug	13 (18)
Park Lock Bracket Bolt	18 (24)
Park/Neutral Position Switch Bolt	18 (24)
Reverse Servo Cover Bolt	18 (24)
Right Exhaust Pipe Nuts	37 (50)
Shift Cable Bracket Bolt	18 (24)
Transmission Control Lever Nut	18 (24)
Transmission Crossmember Bolts & Nuts	70 (95)
Transmission Mount Nut	37 (50)
INCH Lbs. (N.m)	
Accumulator-To-Case Bolt	97 (11)
Auxiliary Oil Cooler Support Bolt	106 (12)
Control Valve Body Bolts	97 (11)
Filler Tube Bolt	53 (6)
Fluid Pressure Switch	97 (11)
Manual Detent Spring Bolt	97 (11)
Oil Pan Bolt	97 (11)
Oil Pass Cover Bolt	97 (11)
Pressure Control Solenoid Bolt	97 (11)
Shift Cable Brace Bolt	89 (10)
TCC Solenoid Bolt	97 (11)
Transmission Fluid Indicator Stop Bolt	97 (11)
Valve Body-To-Case Bolt ⁽¹⁾	97 (11)

Vent Tube Clamp	89 (10)
VSS Bolt	97 (11)
(1) Tighten valve body bolts in a spiral pattern starting in center of valve body.	

2003-04 AUTOMATIC TRANSMISSIONS

A/T Servicing - Avalanche, Sierra, Silverado, Suburban & Yukon (4L80-E & 4L85-E)

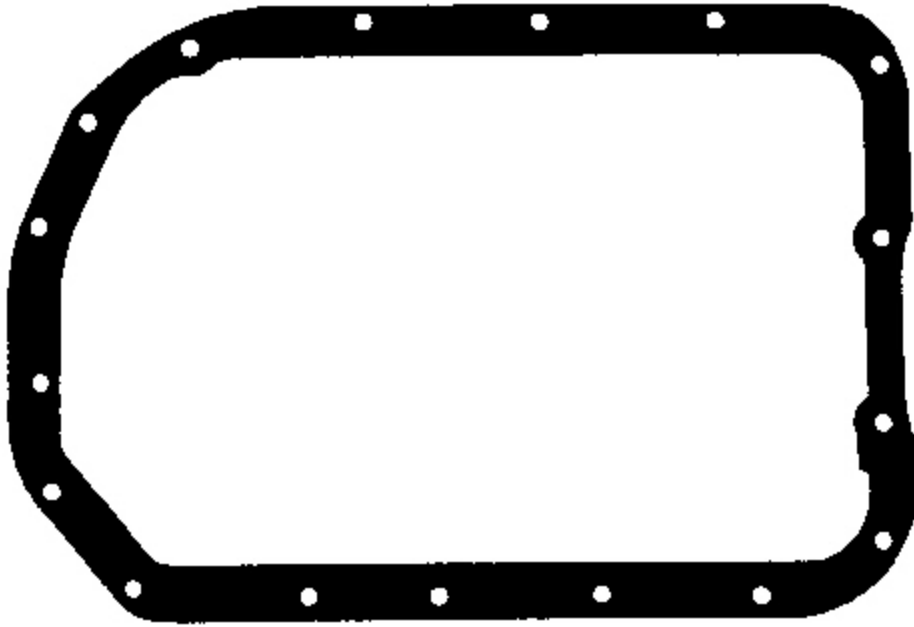
APPLICATION

TRANSMISSION APPLICATION

Application	Transmission Model (RPO Code)
Chevrolet	
Avalanche	4L85-E (MN8)
Cab & Chassis Silverado	4L80-E (MT1)
Silverado	4L80-E (MT1)
Silverado HD	4L80-E (MT1)
Suburban	
6.0L	4L80-E (MT1)
8.1L	4L85-E (MN8)
GMC	
Cab & Chassis Sierra	4L80-E (MT1)
Sierra	4L80-E (MT1)
Sierra HD	4L80-E (MT1)
Yukon	4L80-E (MT1)
Yukon XL	
6.0L	4L80-E (MT1)
8.1L	4L85-E (MN8)

IDENTIFICATION

OIL PAN GASKET



G91B13525

Fig. 1: Identifying Oil Pan Gasket (Hydra-Matic 4L80-E & 4L85-E)
Courtesy of GENERAL MOTORS CORP.

LUBRICATION

SERVICE INTERVALS

Check transmission fluid level at each engine oil change. Change the automatic transmission fluid and the filter at 50,000 miles.

CHECKING FLUID LEVEL & CONDITION

Checking Fluid Level

1. Start the engine and operate the vehicle for 15 minutes or until the transmission fluid reaches an operating temperature of 180-200°F (82-93°C).
2. Park the vehicle on a level surface.
3. With your foot on the brake, move the shift lever through each gear range. Pause for about 3 seconds in

each range, ending in Park.

4. Apply the parking brake and let the engine idle for 3 minutes.
5. Remove the transmission fluid level indicator. Wipe the indicator clean. Insert the indicator. Give the indicator a full twist in order to close.
6. Wait 3 seconds and remove the indicator.
7. Read both sides of the indicator. The fluid must be within the hot cross hatched area using the lowest level reading.

Checking Fluid Condition

NOTE: Diagnose transmission fluid conditions by color.

1. Check the fluid color. Is the fluid color Red? If so, go to next step. If not, go to step 11 .
2. Is the fluid level satisfactory? If so, system is okay. If not, go to next step.
3. Check the fluid. Is the fluid foamy? If so, go to step 8 . If not, go to next step.
4. Check the fluid level. The proper fluid level should be in the middle of the cross hatched area on the fluid indicator. Is the level high? If so, go to step 9 . If not, go to next step.
5. The fluid will be low. Add fluid to the proper fluid level. After repairs, go to next step.
6. Check for external leaks. Were any leaks found? If so, go to next step. If not, go to step 20 .
7. Correct the leak condition. After repairs, go to step 20 .
8. Is the fluid level too high? If so, go to next step. If not, go to step 10 .
9. Remove excess fluid to the proper fluid level. Is the fluid level satisfactory? If so, go to step 20 .
10. Check for contaminants in the fluid. Drain the fluid to determine the source of the contamination. Was the fluid drained? If so, go to step 15 .
11. Is the fluid color non transparent Pink? If so, go to next step. If not, go to step 13 .
12. Replace the cooler. After repairs, go to step 15 .

NOTE: Transmission fluid may turn Dark with normal use. This does not always indicate oxidation or contamination.

13. The fluid color should be Light Brown. Is the fluid color Light Brown? If so, go to next step.

NOTE: A very small amount of material in the bottom pan is a normal condition, but large pieces of metal or other material in the bottom pan require a transmission overhaul.

14. Drain the fluid to determine if the fluid is contaminated. Was the fluid contaminated? If so, go to next step. If not, go to step 18 .
15. Overhaul transmission. See appropriate OVERHAUL article. Is the overhaul procedure complete? If so, go to next step.
16. Using scan tool, press clear TRANS ADAPT function. Are the reset procedures complete? If so, go to

next step.

- 17. Fill transmission with appropriate fluid to proper level. See **RECOMMENDED FLUIDS** and **FLUID CAPACITIES** . Is the procedure complete? If so, go to step 20 .
- 18. Change the fluid and the filter. See **DRAINING & REFILLING** . After repairs, go to step 19 .
- 19. Are the reset procedures complete? If so, go to next step.
- 20. Is the fluid level satisfactory? If so, system okay. If not, go to step [1](#) .

RECOMMENDED FLUIDS

Manufacturer recommends Dexron(R) III ATF.

FLUID CAPACITIES

The following refill capacities given 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)
4L80-E & 4L85-E	7.7 (7.3)	13.5 (12.8)

DRAINING & REFILLING

Draining

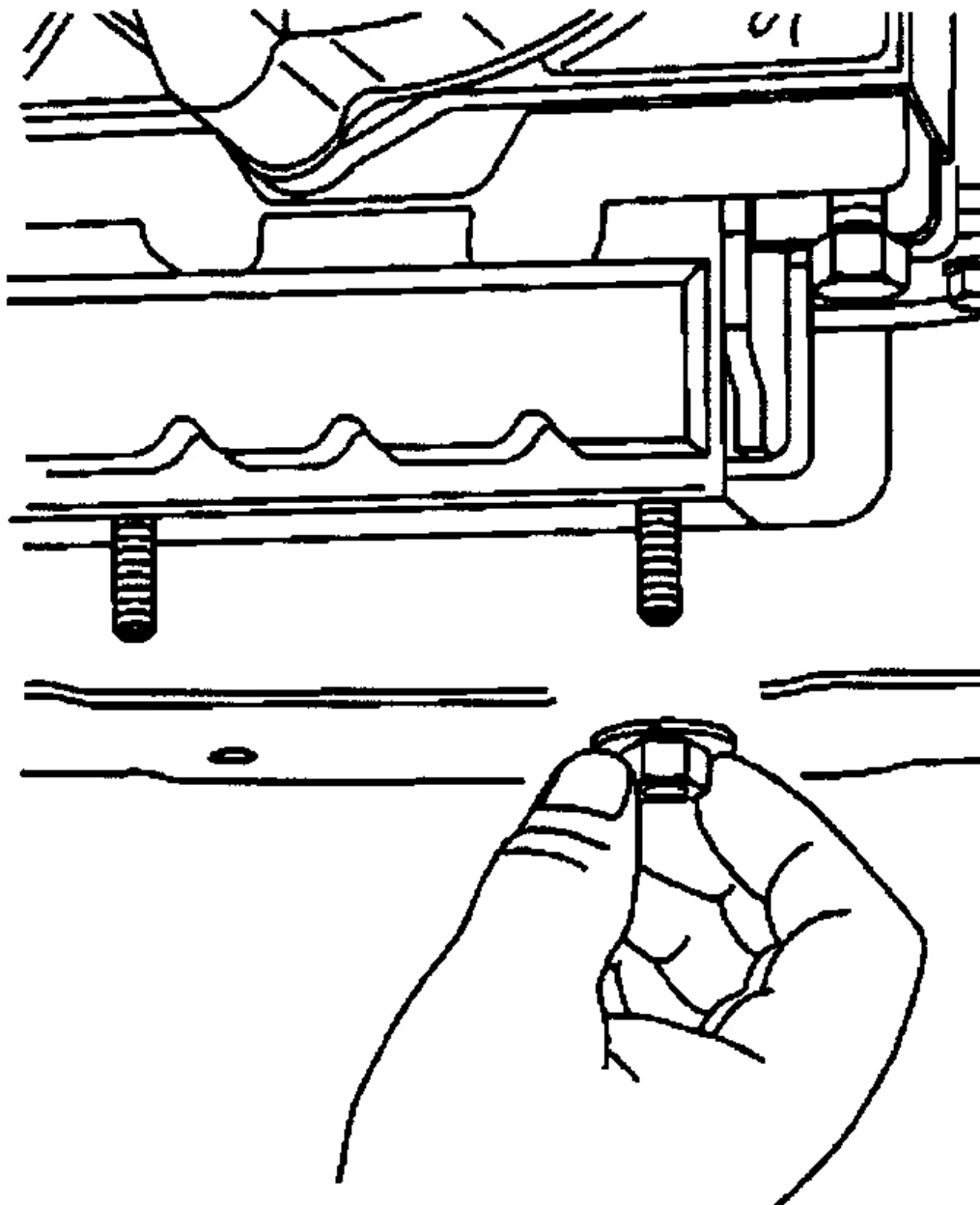
- 1. Raise and suitably support the vehicle.
- 2. Place a drain pan under the transmission oil pan.
- 3. Remove the oil pan drain plug, if equipped.
- 4. Allow the transmission fluid to drain completely.
- 5. Apply a small amount of sealant to the threads of the drain plug, if equipped.
- 6. Install the oil pan drain plug. Tighten the oil pan drain plug to specification. See **TORQUE SPECIFICATIONS** .
- 7. Remove the drain pan from under the transmission oil pan.
- 8. Support the transmission with a transmission jack.
- 9. Remove the transmission mount nuts. See **Fig. 2** .
- 10. Remove the transmission support bolts and nuts. See **Fig. 3** .
- 11. Remove the transmission support side bracket bolts and bracket.
- 12. Remove the transmission support.
- 13. Disconnect the range selector cable end (2) from the transmission range selector lever ball stud (1). See **Fig. 4** .

NOTE: It is not necessary to remove the selector cable from the bracket.

14. Remove the transmission range selector cable bracket (2) bolts and bracket from the transmission. Reposition the bracket with cable. See **Fig. 5** .
15. Remove the oil pan bolts. See **Fig. 6** .

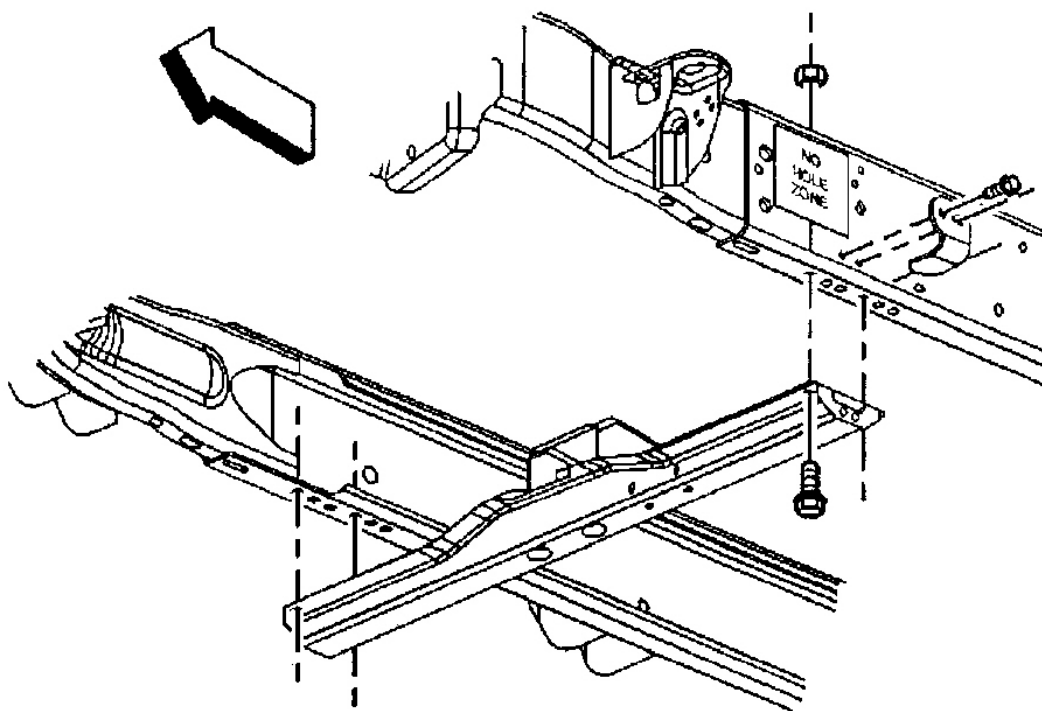
NOTE: **The transmission oil pan gasket is reusable. Inspect the gasket and replace as needed.**

16. Remove the oil pan and gasket.
17. Remove the magnet from the bottom of the pan, if necessary.
18. Remove the oil filter. See **Fig. 7** .
19. Remove the filter neck seal.
20. Clean the transmission case and the oil pan gasket surfaces with solvent.



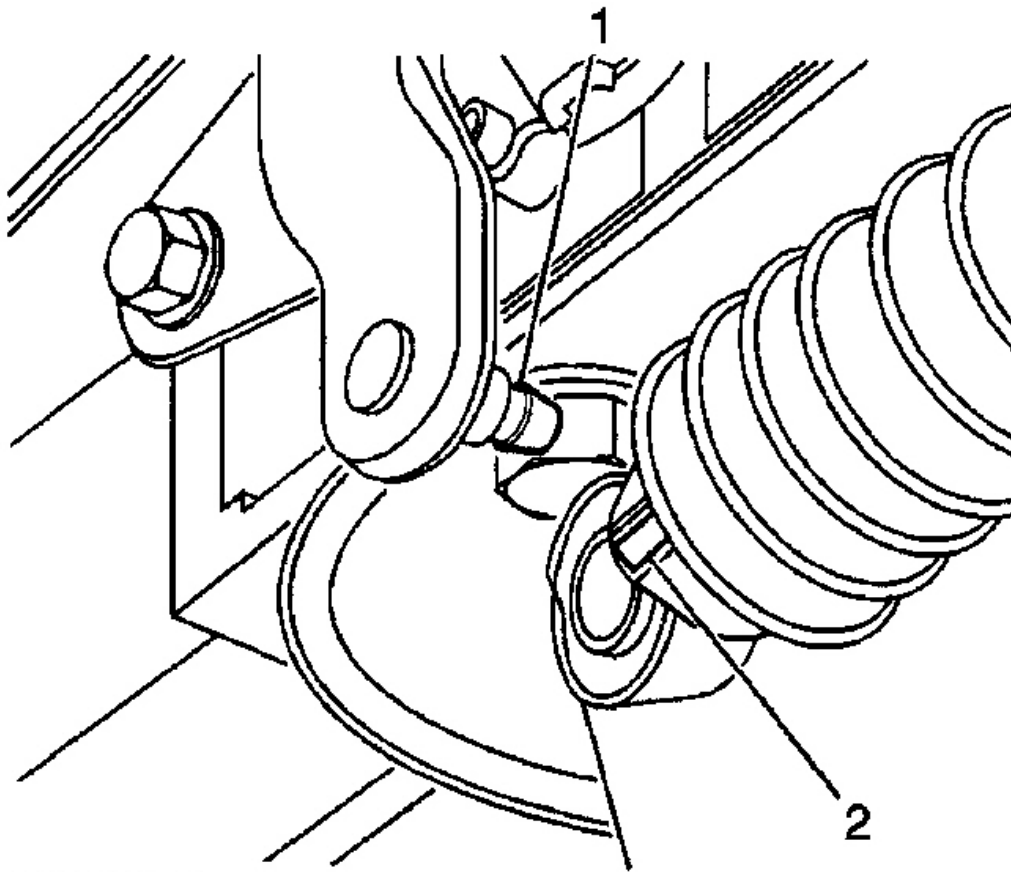
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Fig. 2: Removing Transmission Mount-To-Transmission Support Nut
Courtesy of GENERAL MOTORS CORP.



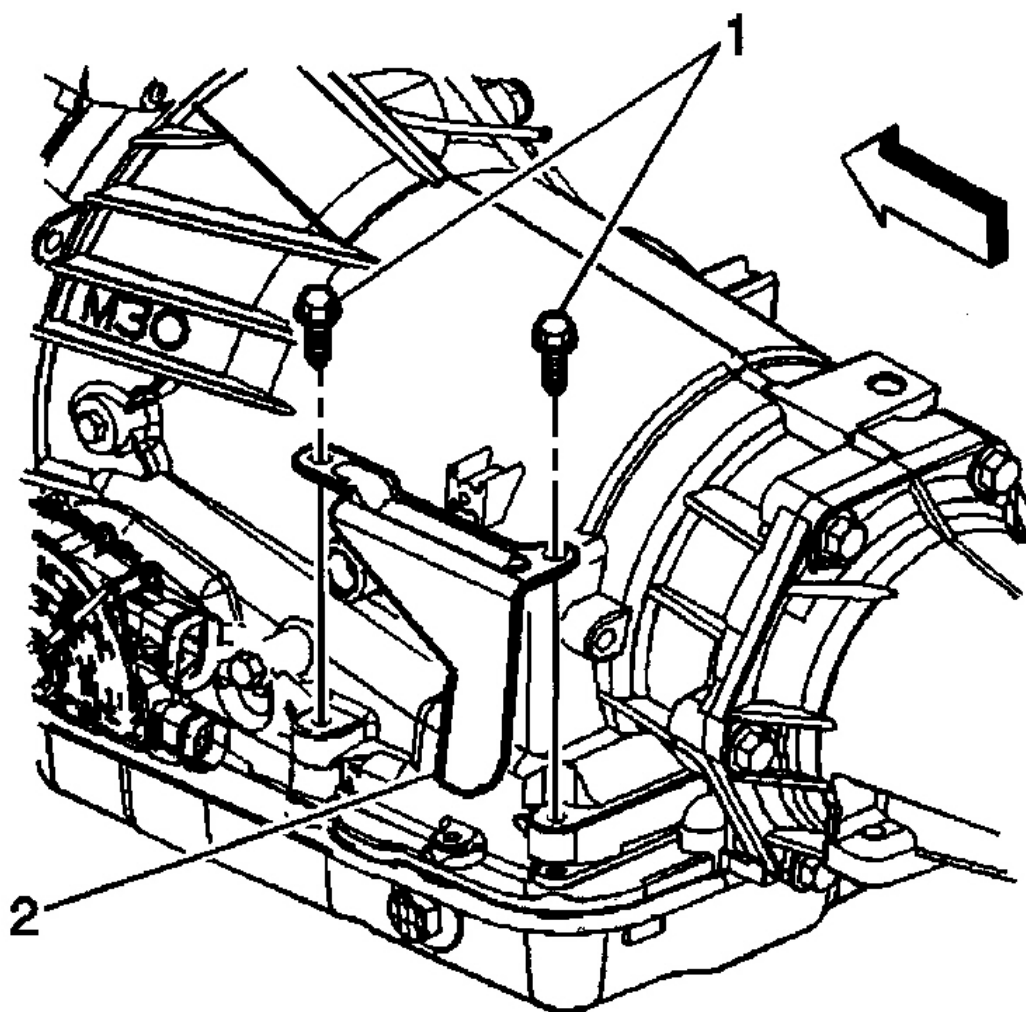
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Fig. 3: Removing Transmission Support Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.



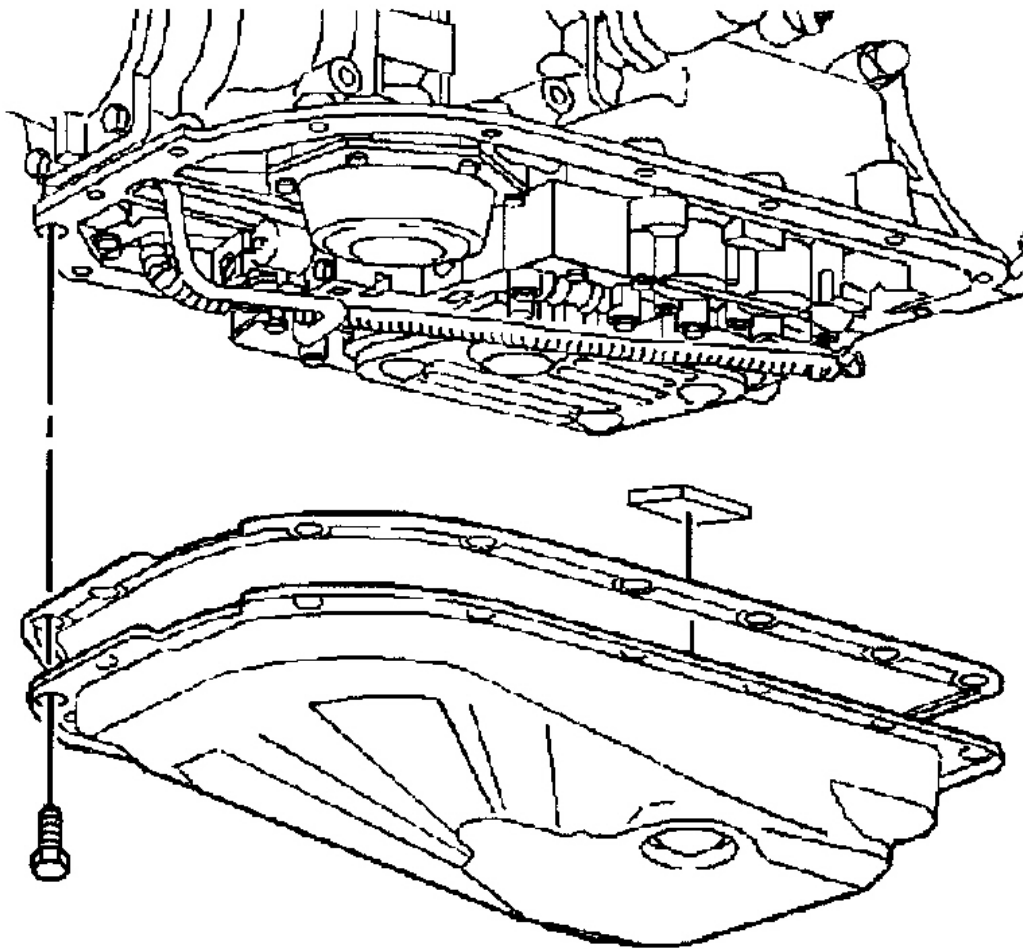
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Fig. 4: Removing & Installing Shift Cable At Transmission Lever
Courtesy of GENERAL MOTORS CORP.



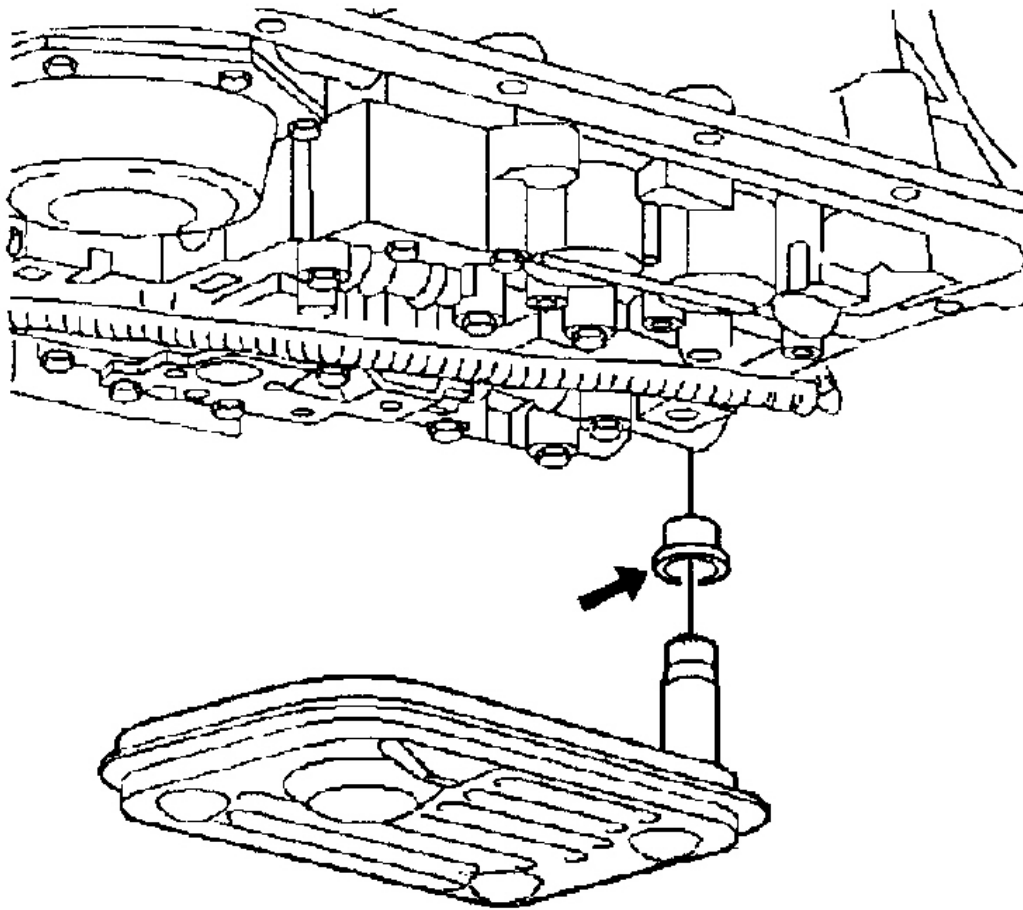
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Fig. 5: Removing & Installing Shift Cable Bracket
Courtesy of GENERAL MOTORS CORP.



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Fig. 6: Removing Oil Pan Bolts
Courtesy of GENERAL MOTORS CORP.



G00202994

Fig. 7: Removing Oil Filter & Neck Seal
Courtesy of GENERAL MOTORS CORP.

Refilling

1. Install the filter neck seal. See **Fig. 7** .
2. Install the oil filter.
3. Install the oil pan gasket to the pan. See **Fig. 6** .
4. Install the magnet into the bottom of the pan, if necessary.
5. Install the oil pan and bolts. Tighten the oil pan bolts to specification. See **TORQUE SPECIFICATIONS** .
6. Position the bracket with cable. Install the transmission range selector cable bracket (2) and bolts to the transmission. See **Fig. 5** . Tighten the selector bracket bolts to specification. See **TORQUE SPECIFICATIONS** .

7. Connect the range selector cable end (2) to the transmission range selector lever ball stud (1). See **Fig. 4** .
8. Install the transmission support. See **Fig. 3** .
9. Install the transmission support side bracket and bolts.
10. Install the transmission support bolts and nuts. Tighten the bolts and nuts to specification. See **TORQUE SPECIFICATIONS** .
11. Install the transmission mount nuts. See **Fig. 2** . Tighten the nuts to specification. See **TORQUE SPECIFICATIONS** .
12. Remove the transmission jack.
13. Lower the vehicle.
14. Fill the transmission to the proper level with appropriate transmission fluid. See **FLUID CAPACITIES** .

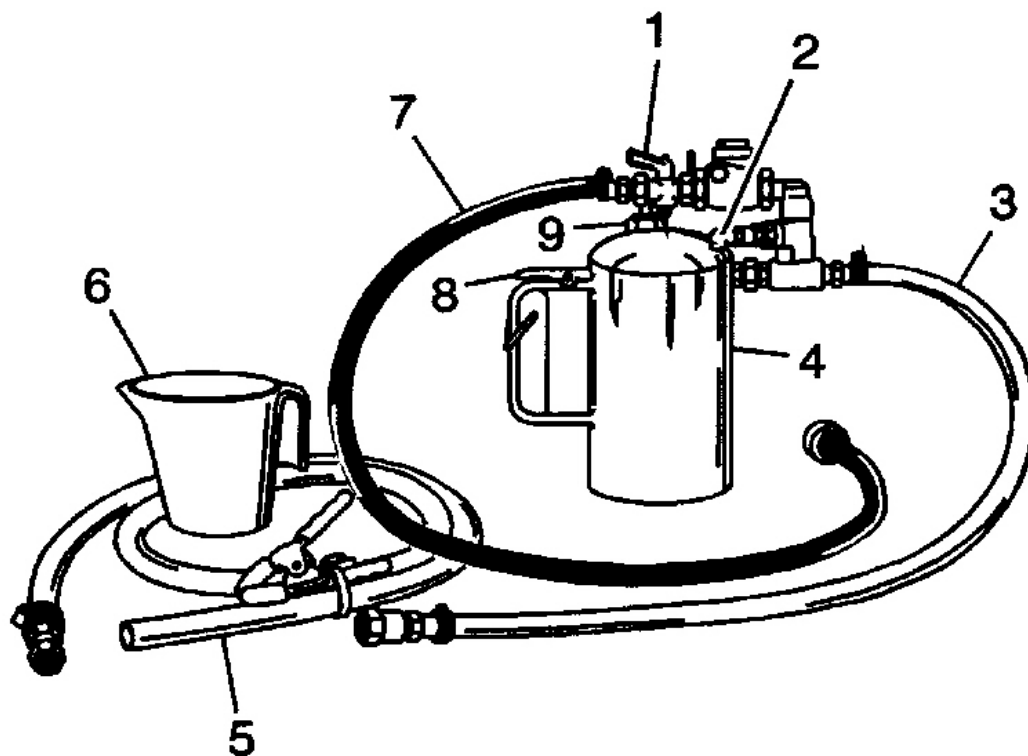
OIL COOLER FLUSHING

CAUTION: Flushing Solution (J-35944-22) is environmentally safe, yet powerful enough to cut through transmission fluid to dislodge any contaminants from the cooler. The safety precautions on the label regarding potential skin and eye irritations associated with prolonged exposure are typical precautions that apply to many similar cleaning solutions. It should be noted that according to General Motors, use of other non-approved fluids for cooler flushing can have an adverse reaction to the seals inside the transmission.

NOTE: DO NOT use solutions that contain alcohol or glycol. Use of solutions that contain alcohol or glycol may damage flushing equipment, oil cooler components and/or transmission components.

Preparation

1. After the repair or replacement transmission is installed in the vehicle, DO NOT reconnect the oil cooler pipes.
2. Remove the fill cap (9) on the Transmission Oil Cooler and Line Flusher (J-35944-A) and fill the flusher tank (4) with 20-21 oz. (0.6L) of flushing solution using the measuring cup (6). DO NOT overfill.
3. Install the fill cap (9) on the flusher and pressurize the flusher tank (4) to 80-100 psi (550-700 kPa), using the shop air supply at the tank air valve (2). See **Fig. 8** .
4. With the water supply valve (1) on the flusher in the OFF position, connect the water supply hose (7) from the flusher to the water supply at the faucet. See **Fig. 8** .
5. Turn ON the water supply at the faucet.



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Fig. 8: Identifying Flushing Equipment
 Courtesy of GENERAL MOTORS CORP.

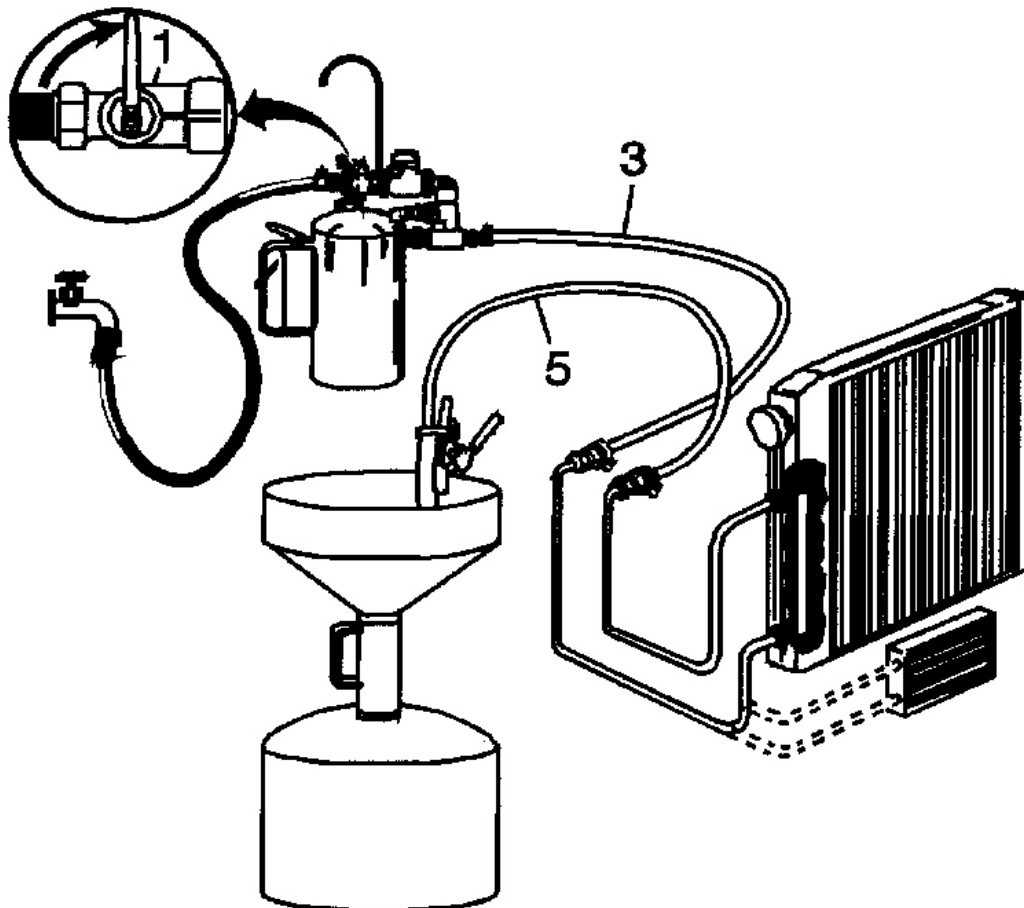
Back Flush

1. Inspect the transmission oil cooler pipes for kinks or damage. Repair as necessary.
2. Connect the transmission oil cooler and line flusher to the oil cooler feed front connector. Use the Cooler Flushing Adapter (J 35944-200), if required. See **Fig. 9** .
3. Clip the discharge hose (2) onto the oil drain container.
4. Attach the flusher to the undercarriage of the vehicle with the hook provided and connect the flushing system feed supply hose (3) from the flusher to the rear connector oil cooler return pipe. Use the cooler flushing adapter, if required.
5. Turn the flusher water supply valve (1) to the ON position and allow water to flow through the oil cooler and pipes for 10 seconds to remove any remaining transmission fluid. If water does not flow through the oil cooler and pipes, the cause of the blockage must be diagnosed and the plugged component must be repaired or replaced. Continue with the cooler flushing and flow check procedure once the blockage is corrected.
6. Turn the flusher water supply valve (1) to the OFF position and clip the discharge hose onto a 5 gallon

(19 L) pail with a lid, to avoid splashback.

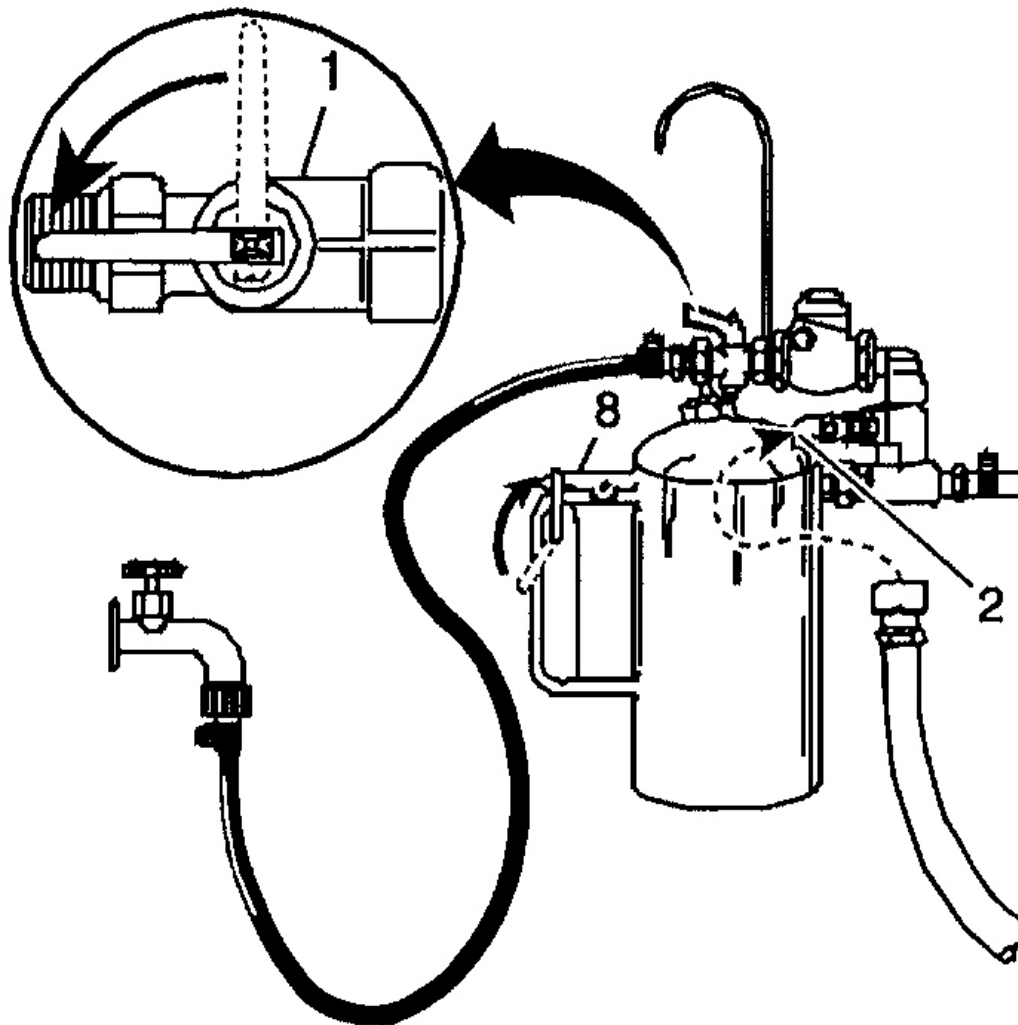
NOTE: Flushing for approximately 2 minutes in each cooler line direction will result in a total of about 8-10 gallons of waste fluid. This mixture of water and flushing fluid is to be captured in a bucket or similar container.

7. Turn the flusher water supply valve (1) to the ON position and depress the trigger (8) to mix cooler flushing solution into the water flow. Use the clip provided on the handle to hold the trigger (8) down. The discharge will foam vigorously when the solution is introduced into the water stream. See **Fig. 10**.
8. Flush the oil cooler and pipes with water and solution for 2 minutes. During this flush, attach the shop air supply 120 psi (825 kPa) to the flushing system feed air valve (2) located on the flusher, for 3-5 seconds at the end of every 15-20 second interval to create a surging action.
9. Release the trigger (8) and turn the flusher water supply valve (1) to the OFF position.



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Fig. 9: Connecting Flushing Equipment
Courtesy of GENERAL MOTORS CORP.



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Fig. 10: Flushing Oil Cooling System
Courtesy of GENERAL MOTORS CORP.

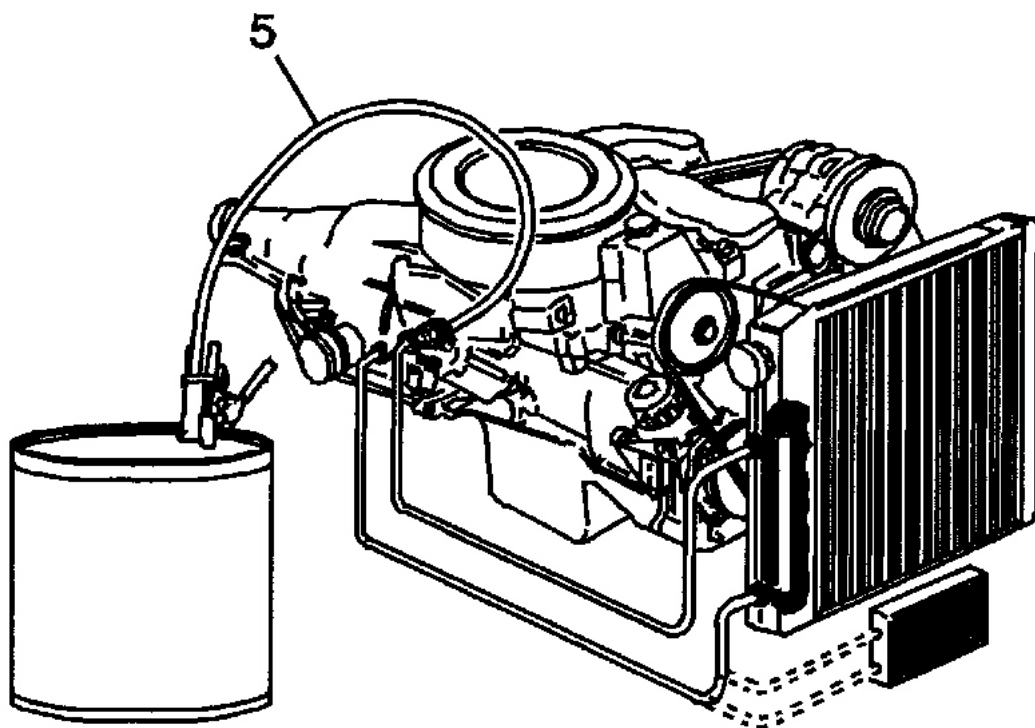
Forward Flush

1. Disconnect both hoses (3 and 5) from the oil cooler pipes and connect them to the opposite oil cooler pipe. This will allow the oil cooler and pipes to be flushed in the normal flow direction. See **Fig. 9**.
2. Repeat steps 6 and 7 of the BACK FLUSH procedure.

3. Release the trigger (8) of the transmission oil cooler and line flusher and allow water only to rinse the oil cooler and pipes for one minute. See **Fig. 10** .
4. Turn the flusher water supply valve (1) to the OFF position and turn OFF the water supply at the faucet.
5. Attach the shop air supply to the flushing system feed air valve (2) on the flusher and blow out the water from the oil cooler and pipes. Continue, until no water comes out of the discharge hose.

Flow Test

1. Disconnect both hoses from the oil cooler pipes. Connect the oil cooler feed pipe (front connector) to the transmission for normal flow.
2. Clip the discharge hose (5) onto the empty oil drain container. See **Fig. 11** .
3. Confirm the transmission is filled with ATF. See **CHECKING FLUID LEVEL & CONDITION** .
4. Start the engine with the transmission in Park range and run for 30 seconds after fluid begins to flow from discharge hose (5). A minimum of 2 qts. (1.9 L) must be discharged during this 30 second run time.
5. If fluid flow is meets or exceeds 2 qts. (1.9 L) in 30 seconds, connect the oil cooler feed pipe to the front connector of the transmission.
6. If fluid flow is less than 2 qts. (1.9 L) in 30 seconds, perform the following diagnosis:
 - A. Disconnect the transmission oil cooler and line flusher discharge hose (5) from the oil cooler return pipe.
 - B. Disconnect the oil cooler feed pipe at the radiator.
 - C. Connect the flusher discharge hose (5) to the oil cooler feed pipe, radiator end.
 - D. Clip the discharge hose (5) onto the oil drain container.
 - E. Start the engine with the transmission in Park range and run for 30 seconds after fluid begins to flow from the discharge hose (5). A minimum of 2 qts. (1.9 L) must be discharged during this 30 second run time.
7. If the amount of transmission fluid flow remains less than 2 qts. (1.9 L) in 30 seconds, inspect the oil cooler feed pipe, front connector, for restrictions or damage. If no condition is found with the feed pipe, front connector, inspect the transmission.



G00056985

Fig. 11: Capturing Fluid Discharge
Courtesy of GENERAL MOTORS CORP.

Clean-Up

1. Disconnect the water supply hose from the transmission oil cooler and line flusher and bleed any remaining air pressure from the flusher tank.
2. Remove the fill cap from the flusher and return any unused flushing solution to its container. Rinse the flusher with water. DO NOT store the flusher with flushing solution in it.
3. After every third use, clean the flusher as described in the instructions included with the tool.
4. Dispose of any waste water/solution and transmission fluid in accordance with local regulations.

ON-VEHICLE REPAIRS

NOTE: Various components may be serviced without transmission removal, depending on application. For servicing of these components, see appropriate component under ADJUSTMENTS and/or REMOVAL & INSTALLATION . For additional information on testing electrical components, see appropriate DIAGNOSIS article.

ADJUSTMENTS

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. DO NOT use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

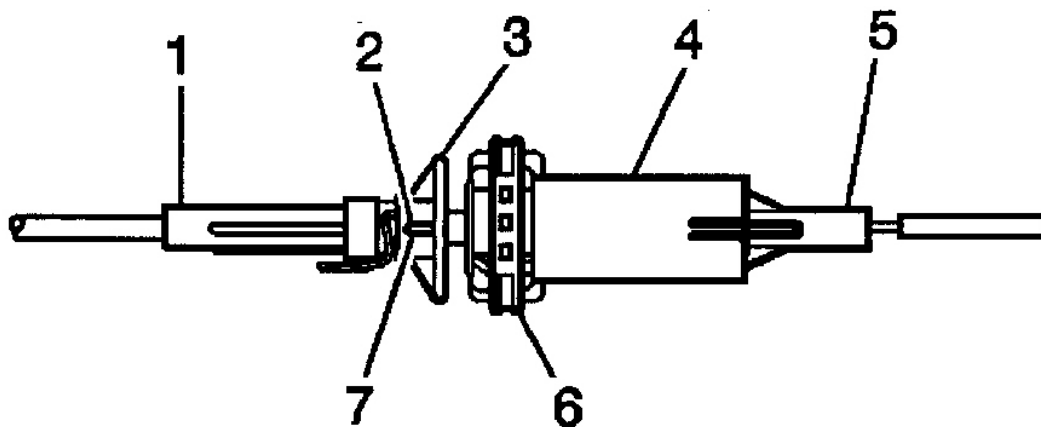
PARK/NEUTRAL POSITION SWITCH

NOTE: Apply the park brake. The engine must start in the Park (P) or Neutral (N) positions only. Check the PNP switch for proper operation.

1. Place the shift lever in the N position.
2. With an assistant in the drivers seat, raise and suitably support the vehicle.
3. Loosen the PNP switch bolts.
4. With the vehicle in N, rotate the PNP switch while the assistant attempts to start the engine.
5. Following a successful start, turn the engine OFF.
6. Tighten the PNP switch bolts. Tighten the bolts to specification. See TORQUE SPECIFICATIONS .
7. Lower the vehicle.
8. Check the PNP switch for proper operation. The engine must start in the P or N positions only.
9. Replace the PNP switch if proper operation can not be achieved. See PARK/NEUTRAL POSITION SWITCH under REMOVAL & INSTALLATION.

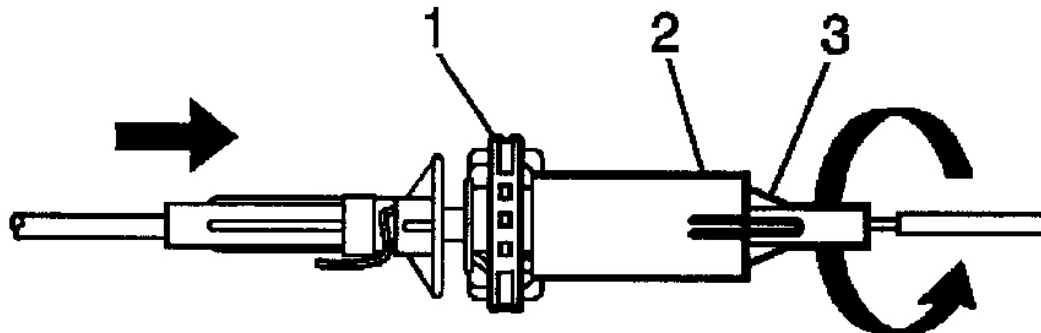
SHIFT CABLE

1. Ensure the gearshift lever and the transmission manual shaft lever are in the Park position.
2. Raise and support the vehicle.
3. With right hand, push the flange (3) of the cable (transmission end) (5), inside the cable (1) (shifter end) until the connection is made, ensuring the flange ribs (7) align with the cable (shifter end) (1) slots (2). See [Fig. 12](#) .
4. Hold the red security ring (6) with left hand and with right hand, twist the blue rotating lock (4) until it snaps into position.
5. With left hand, push the red security ring (1) to the right. See [Fig. 13](#) .
6. The red security ring should cover the white (2) marks on the blue rotating lock (3).



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Fig. 12: Identifying Shift Cable Components
 Courtesy of GENERAL MOTORS CORP.



G00202967

Fig. 13: Adjusting Red Security Ring
 Courtesy of GENERAL MOTORS CORP.

REMOVAL & INSTALLATION

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. DO NOT use electrical test equipment on or near these circuits. If necessary,

deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. Before disconnecting battery, see COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION.

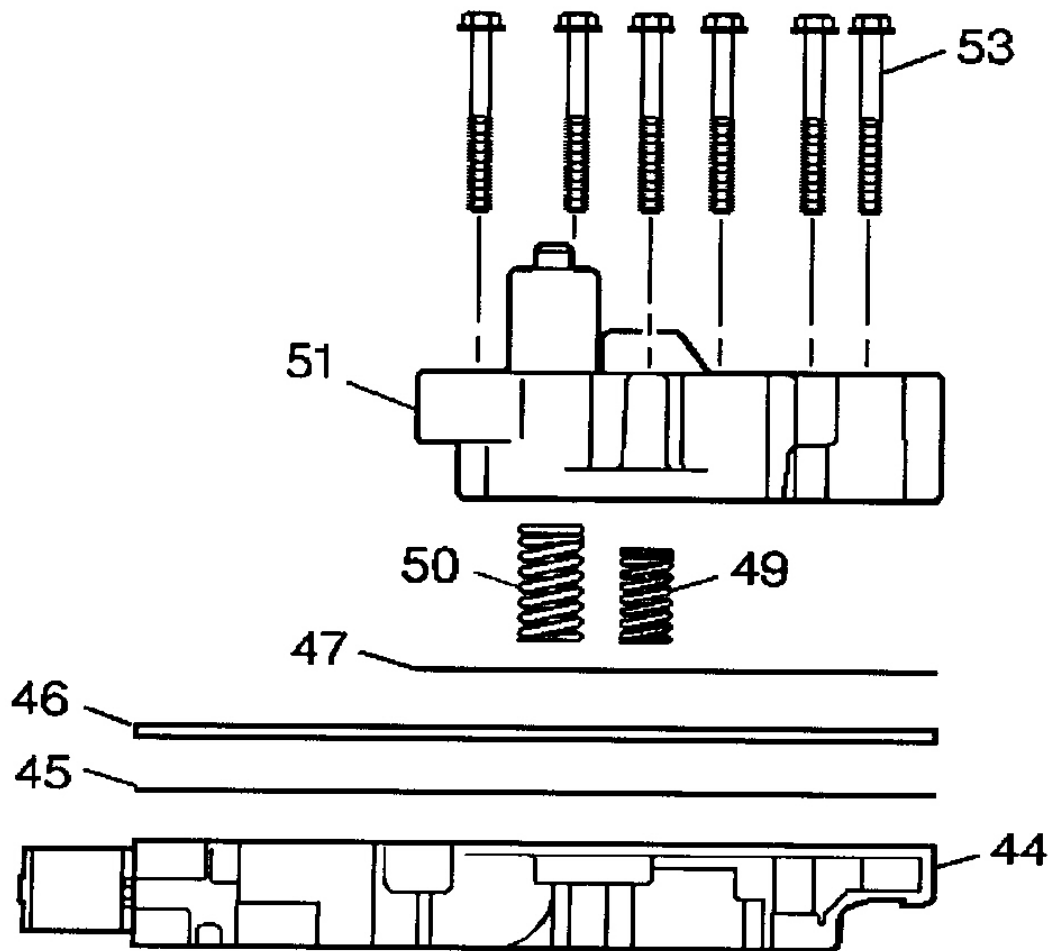
CAUTION: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. DO NOT use paints, lubricants, 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.

ACCUMULATOR HOUSING

NOTE: Tools required: Valve Body Align Pin (J-25025-5).

Removal

1. Remove the valve body. See VALVE BODY & PRESSURE SWITCH .
2. Remove the 3rd and 4th clutch accumulator housing bolts (53). See Fig. 14 .
3. Remove the 3rd and 4th clutch accumulator housing (51).
4. Remove the accumulator housing gasket (47). The accumulator housing gasket may be stuck to the spacer plate (46).
5. Remove the 3rd clutch accumulator piston spring (50).
6. Remove the 4th clutch accumulator piston spring (49).
7. Remove the valve body spacer plate (46).
8. Remove the valve body to spacer plate gasket (45) from the spacer plate (46).



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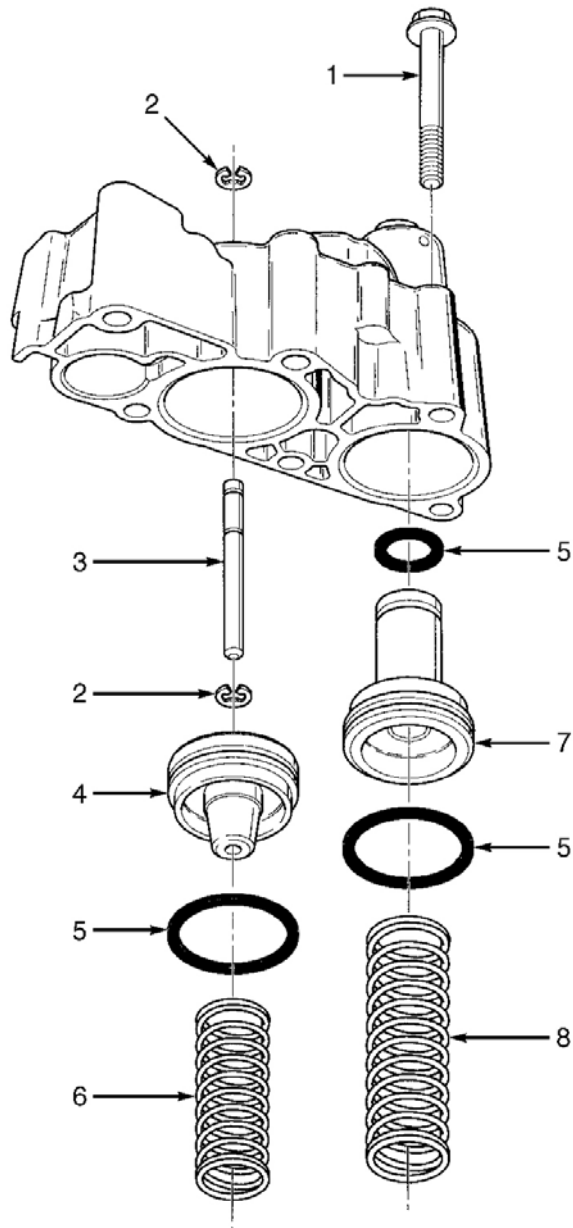
Fig. 14: Disassembling & Assembling Accumulator Housing
 Courtesy of GENERAL MOTORS CORP.

Third & Fourth Clutch Accumulator Disassembly

NOTE: Apply low pressure compressed air to the hole at the top of the accumulator housing to assist with the piston removal.

1. Remove the 3rd clutch accumulator piston. See **Fig. 15** .
2. Remove the 3rd clutch accumulator piston seals.
3. Remove the 4th clutch accumulator piston pin retainer ring.
4. Remove the 4th clutch accumulator piston and pin from the accumulator housing.
5. Remove the 4th clutch accumulator piston pin from the accumulator housing.

6. Remove the 4th clutch accumulator piston seal from the accumulator housing.



- | | |
|----------------------------------|----------------------------------|
| 1. Bolt | 5. Seal (Square Cut) |
| 2. Snap Ring | 6. 4th Clutch Accumulator Spring |
| 3. 4th Clutch Pin | 7. 3rd Clutch Accumulator Piston |
| 4. 4th Clutch Accumulator Piston | 8. 3rd Clutch Accumulator Spring |

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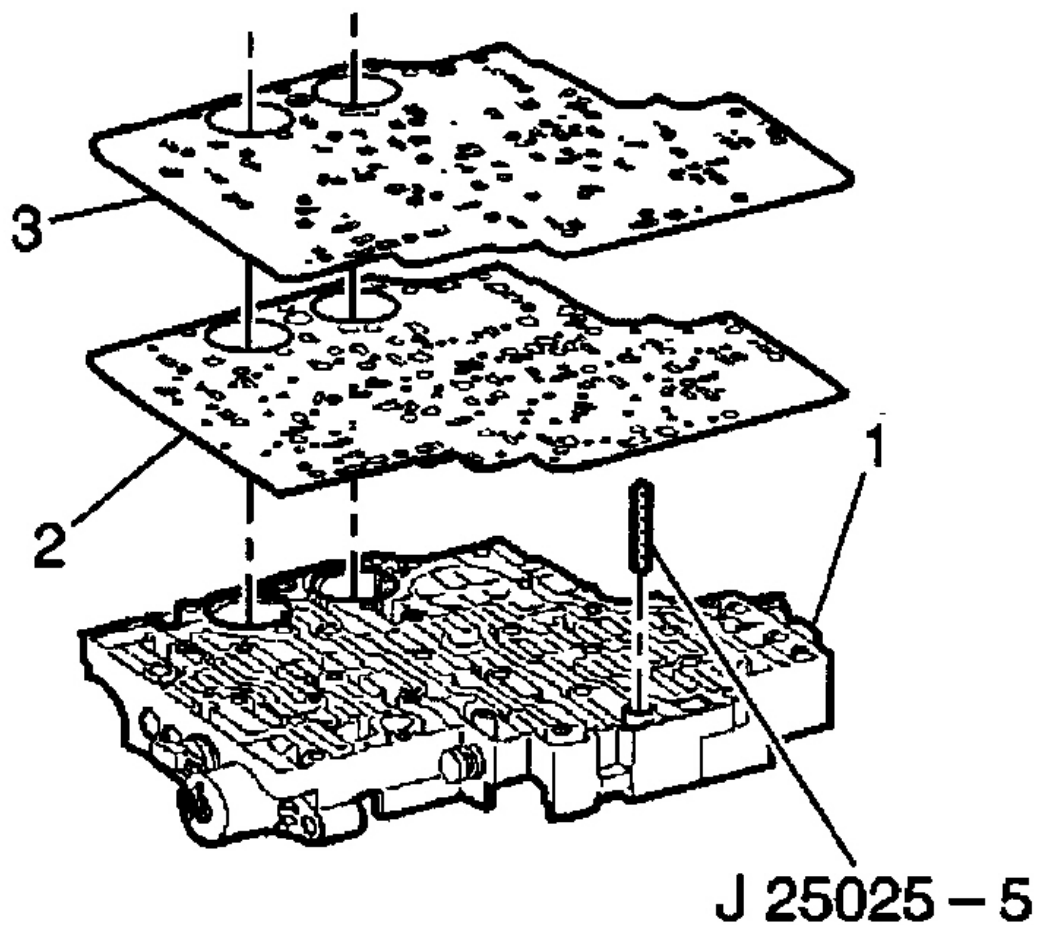
Fig. 15: Exploded View Of Accumulator Assembly
Courtesy of GENERAL MOTORS CORP.

Third & Fourth Clutch Accumulator Reassembly

1. Install the 3rd clutch accumulator piston inner and outer seals. Lubricate the 3rd clutch accumulator piston seals with appropriate automatic transmission fluid. See **Fig. 15** .
2. Install the 3rd clutch accumulator piston.
3. Install the 4th clutch accumulator piston seal. Lubricate the 4th clutch accumulator piston seal with appropriate automatic transmission fluid.
4. Assemble the 4th clutch accumulator piston pin with the 4th clutch accumulator piston.
5. Install the 4th clutch accumulator piston assembly into the accumulator housing.
6. Install the 4th clutch accumulator piston pin retainer ring onto the 4th clutch accumulator piston pin.

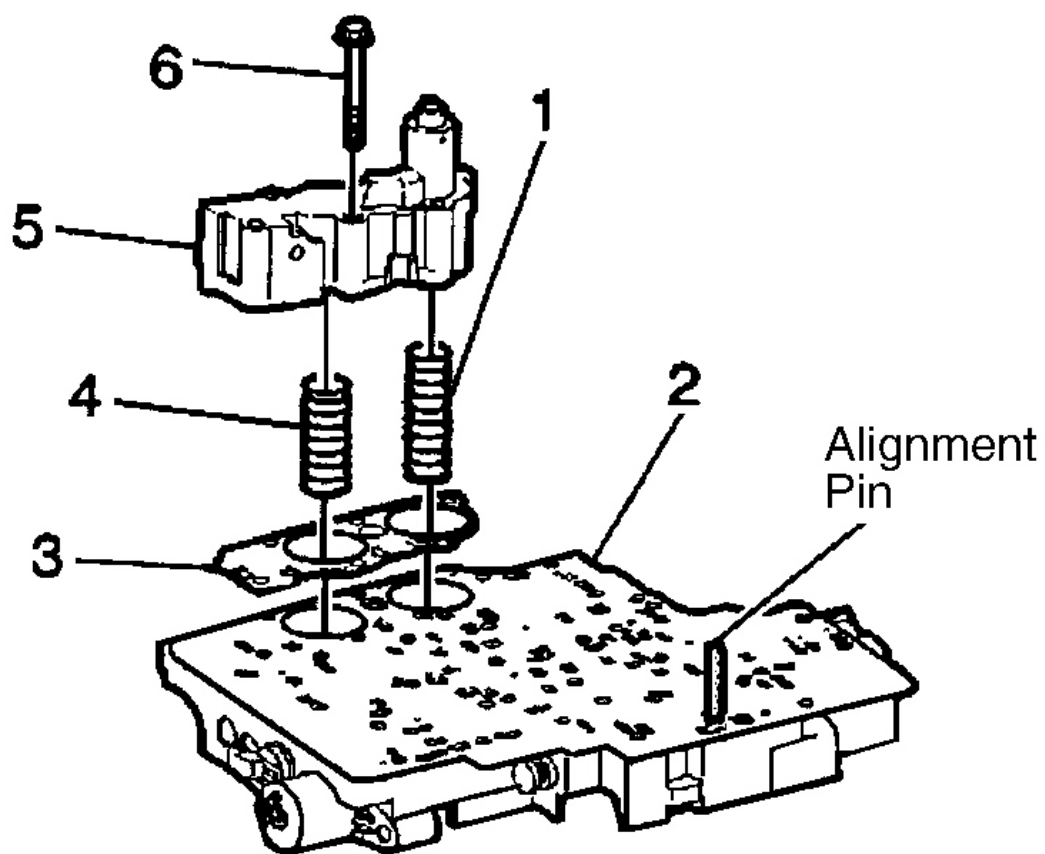
Installation

1. Install valve body align pin into the valve body bolt hole where the manual shaft detent roller and spring is mounted.
2. Install the valve body gasket (2) onto the accumulator housing (1). See **Fig. 16** .
3. Install the valve body spacer plate (3) onto the valve body gasket (2).
4. Install the third and fourth clutch accumulator housing gasket (3). See **Fig. 17** .
5. Install the third clutch accumulator piston spring (1). This spring is the longer of the two springs.
6. Install the fourth clutch accumulator piston spring (4).
7. Install the third and fourth clutch accumulator housing assembly (5) onto the control valve body assembly (2).
8. Install the six accumulator housing bolts (6). Start the bolts finger tight and work towards the opposite end.
9. Tighten the accumulator housing bolts sequentially. See **Fig. 18** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
10. Remove the valve body align pin.
11. Install the valve body. See **VALVE BODY & PRESSURE SWITCH** .



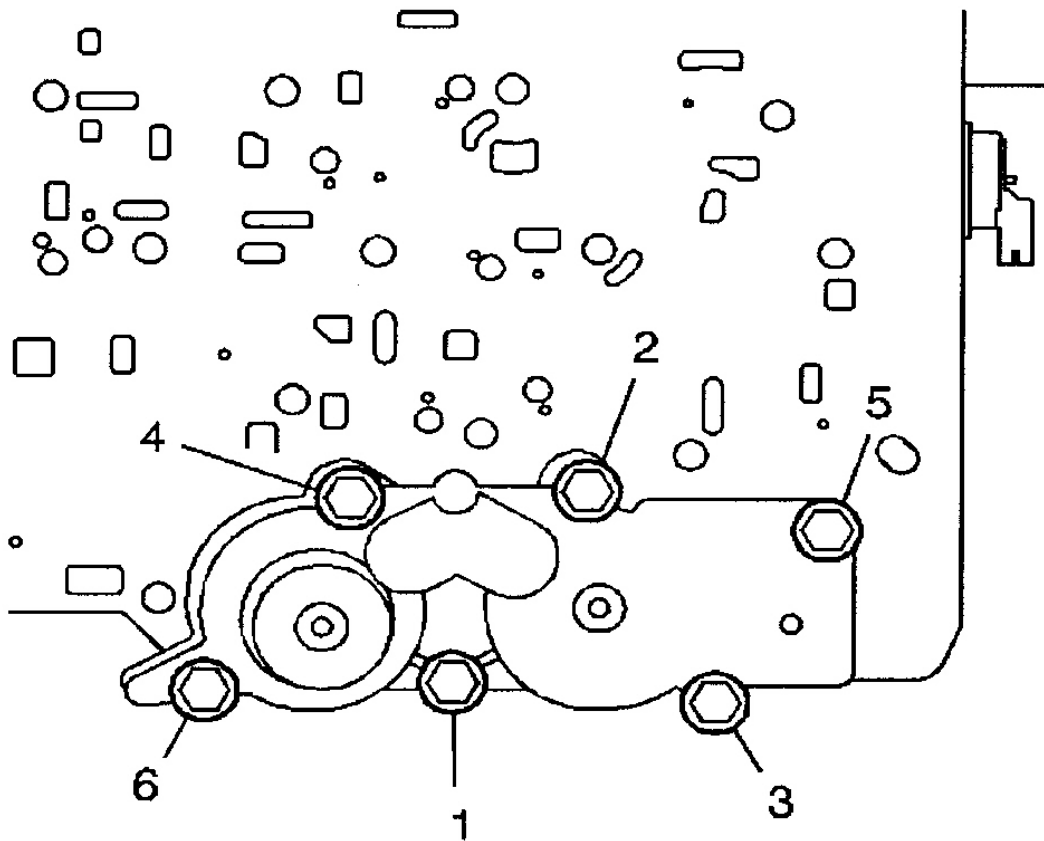
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Fig. 16: Installing Valve Body Align Pin
Courtesy of GENERAL MOTORS CORP.



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Fig. 17: Removing & Installing Accumulator Assembly
Courtesy of GENERAL MOTORS CORP.



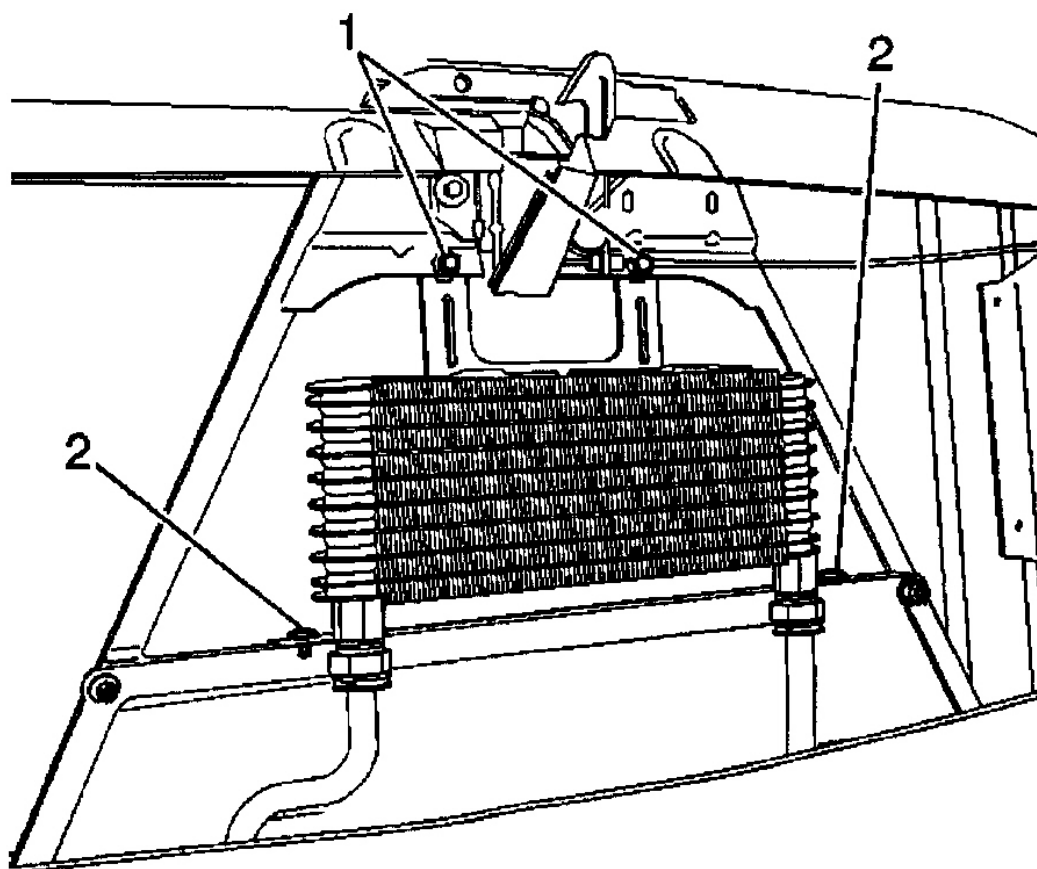
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Fig. 18: Accumulator Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS CORP.

AUXILIARY OIL COOLER

Removal

1. Remove the grille assembly.
2. Remove the transmission fluid cooler hoses from the auxiliary cooler. See **OIL COOLER LINE QUICK CONNECT FITTING** .
3. Remove the auxiliary oil cooler bolts (1). See **Fig. 19** .
4. Remove the auxiliary oil cooler push pins (2).
5. Remove the auxiliary oil cooler from the vehicle.



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Fig. 19: Disconnecting Transmission Oil Cooler
 Courtesy of GENERAL MOTORS CORP.

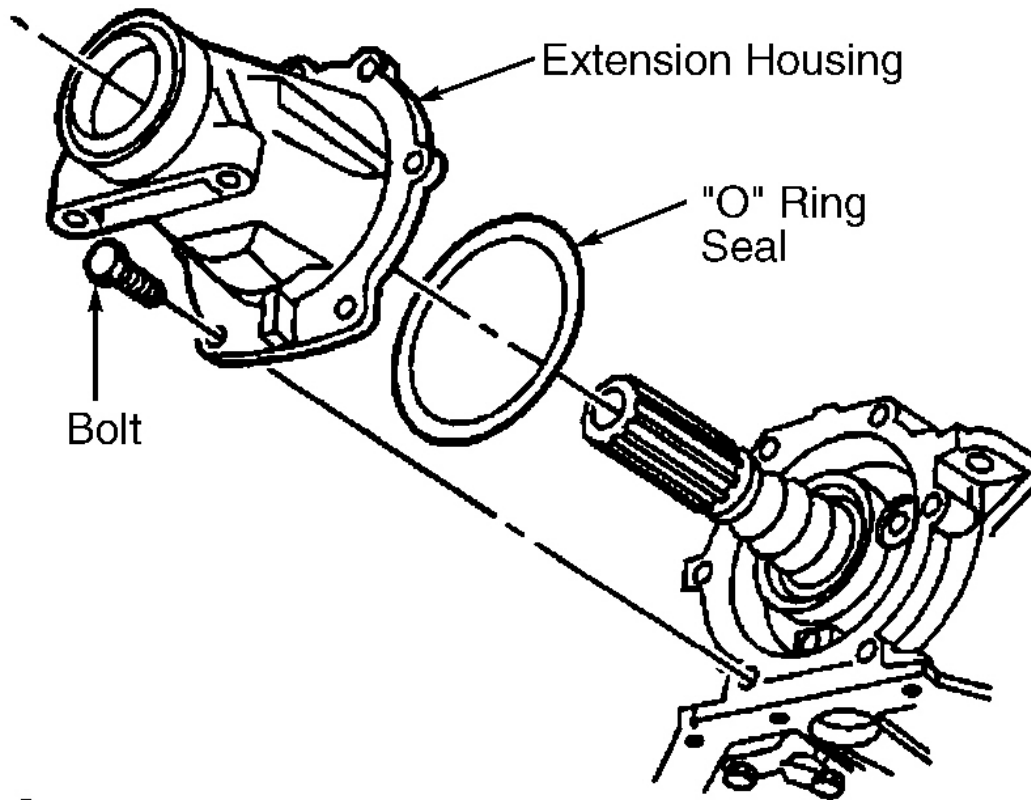
Installation

1. Install the auxiliary oil cooler to the vehicle.
2. Install the bolts (1) to the radiator brace. See **Fig. 19** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Install the push pins (2) to the radiator brace.
4. Connect the transmission oil cooler lines to the auxiliary cooler. See **OIL COOLER LINE QUICK CONNECT FITTING** .
5. Install the grille assembly.

EXTENSION HOUSING ASSEMBLY

Removal

1. Support the transmission with a transmission jack.
2. Place a drain pan under the vehicle.
3. Remove the drive shaft. See REMOVAL & INSTALLATION in appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
4. Remove the transmission mount. See appropriate REMOVAL & INSTALLATION article.
5. Remove the case extension bolts.
6. Remove the case extension. See **Fig. 20** .
7. Remove and discard the case extension "O" ring seal.



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Fig. 20: Removing & Installing Extension Housing Assembly
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install a NEW case extension "O" ring seal.
2. Install the case extension. See **Fig. 20** .

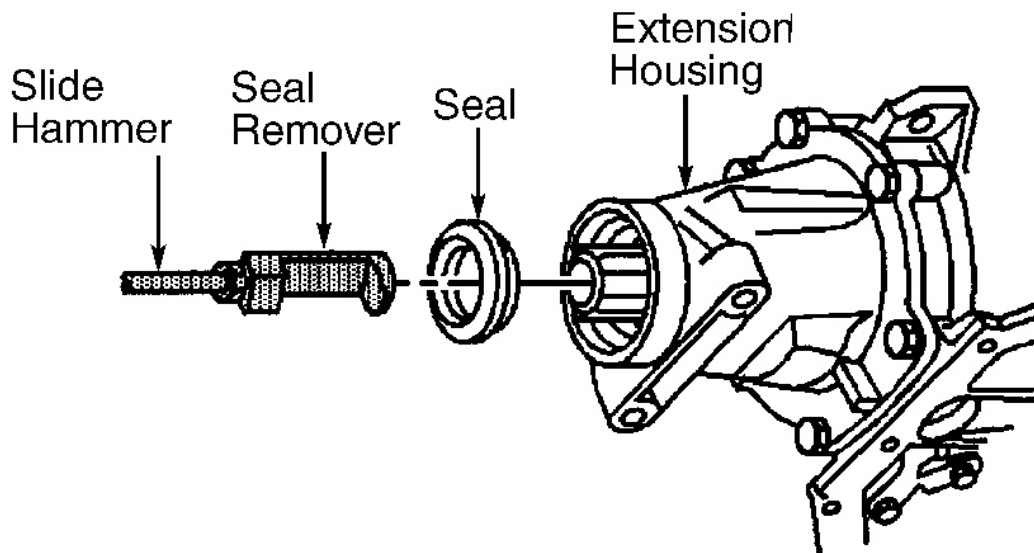
3. Install the case extension bolts. Tighten the case extension bolts to specification. See **TORQUE SPECIFICATIONS** .
4. Install the transmission mount. See appropriate REMOVAL & INSTALLATION article.
5. Install the drive shaft. See REMOVAL & INSTALLATION in appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
6. Remove the drain pan and the transmission jack.
7. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .

EXTENSION HOUSING REAR OIL SEAL

NOTE: **Tools required: Output Shaft Seal Installer (J-41505), Slide Hammer (J-6125-1B), Universal Seal Remover (J-23129) and Transjel(R) (J-36850).**

Removal

1. Place a drain pan under the vehicle.
2. Remove the drive shaft. See REMOVAL & INSTALLATION in appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
3. Using the slide hammer and the universal seal remover, remove the output shaft seal from the extension housing. See **Fig. 21** .
4. Inspect the case extension housing for damage. Replace the extension housing if necessary. See **EXTENSION HOUSING ASSEMBLY** .



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Fig. 21: Removing Rear Extension Seal
Courtesy of GENERAL MOTORS CORP.

Installation

1. Lubricate the inside diameter of the new seal with assembly lubricant.
2. Use the output shaft seal installer with a soft faced mallet to install the seal. See **Fig. 22** .
3. Install the seal to the extension housing.
4. Install the drive shaft. See REMOVAL & INSTALLATION in appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
5. Remove the drain pan and lower the vehicle.
6. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .

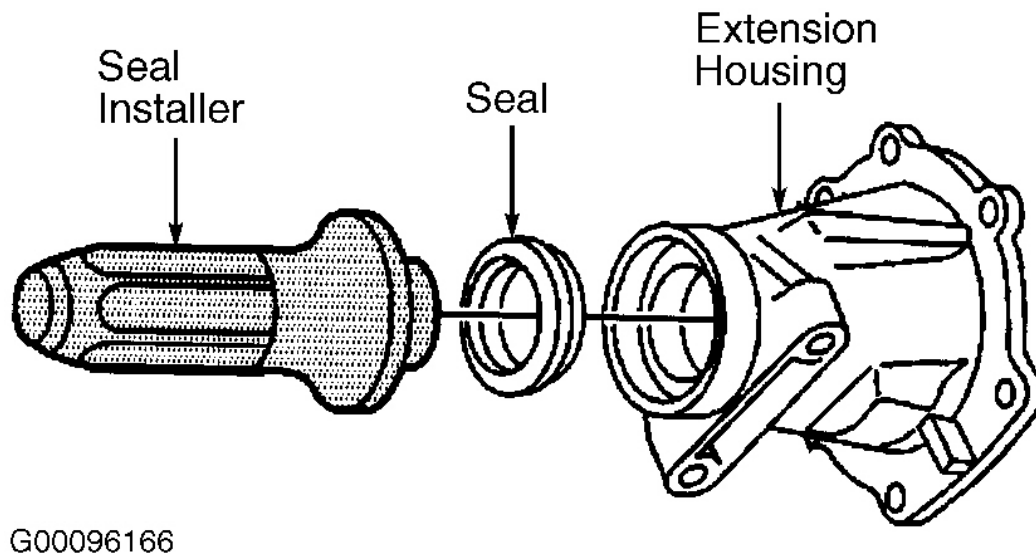


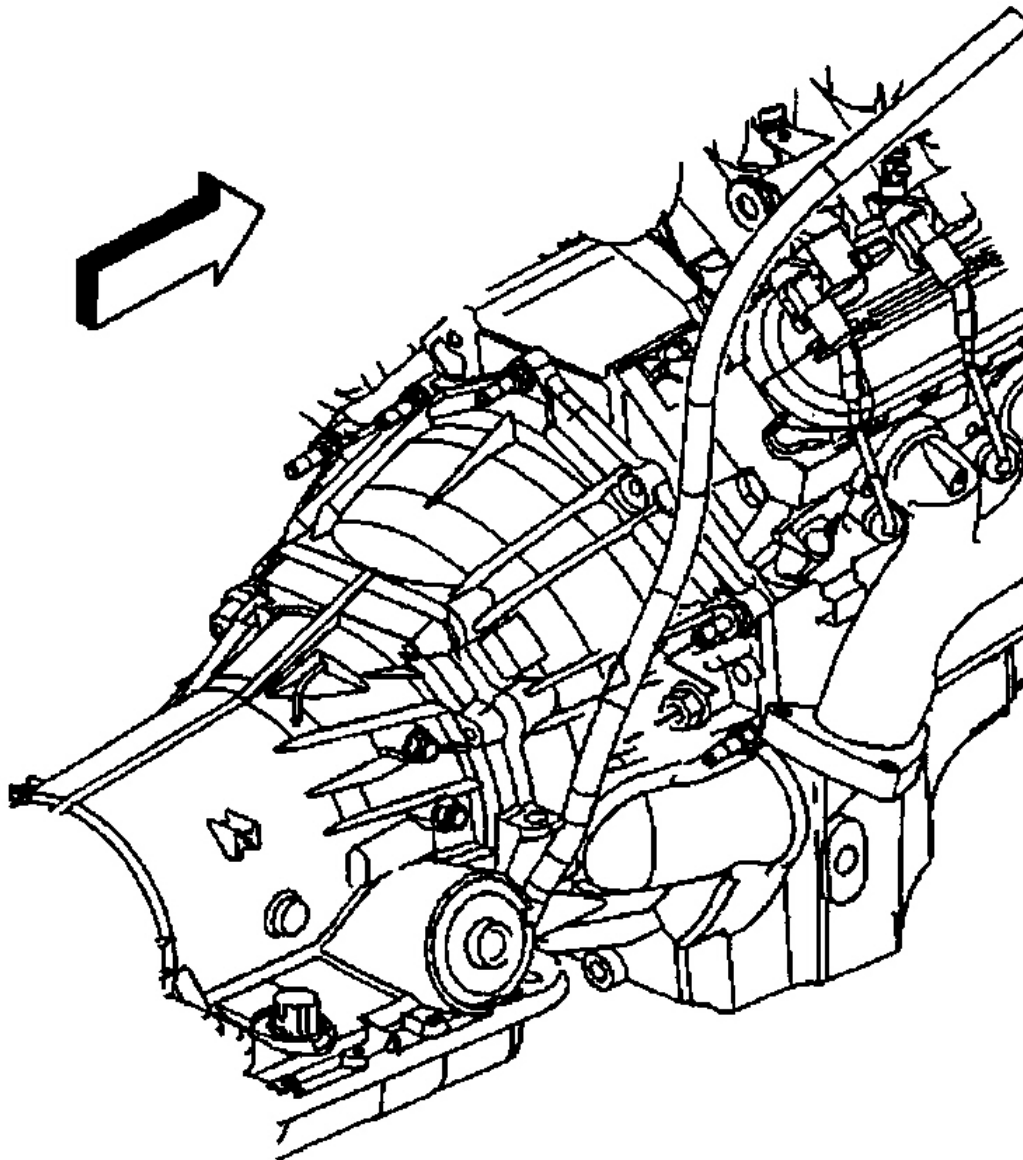
Fig. 22: Installing Rear Extension Seal
Courtesy of GENERAL MOTORS CORP.

FILLER TUBE & SEAL

Removal

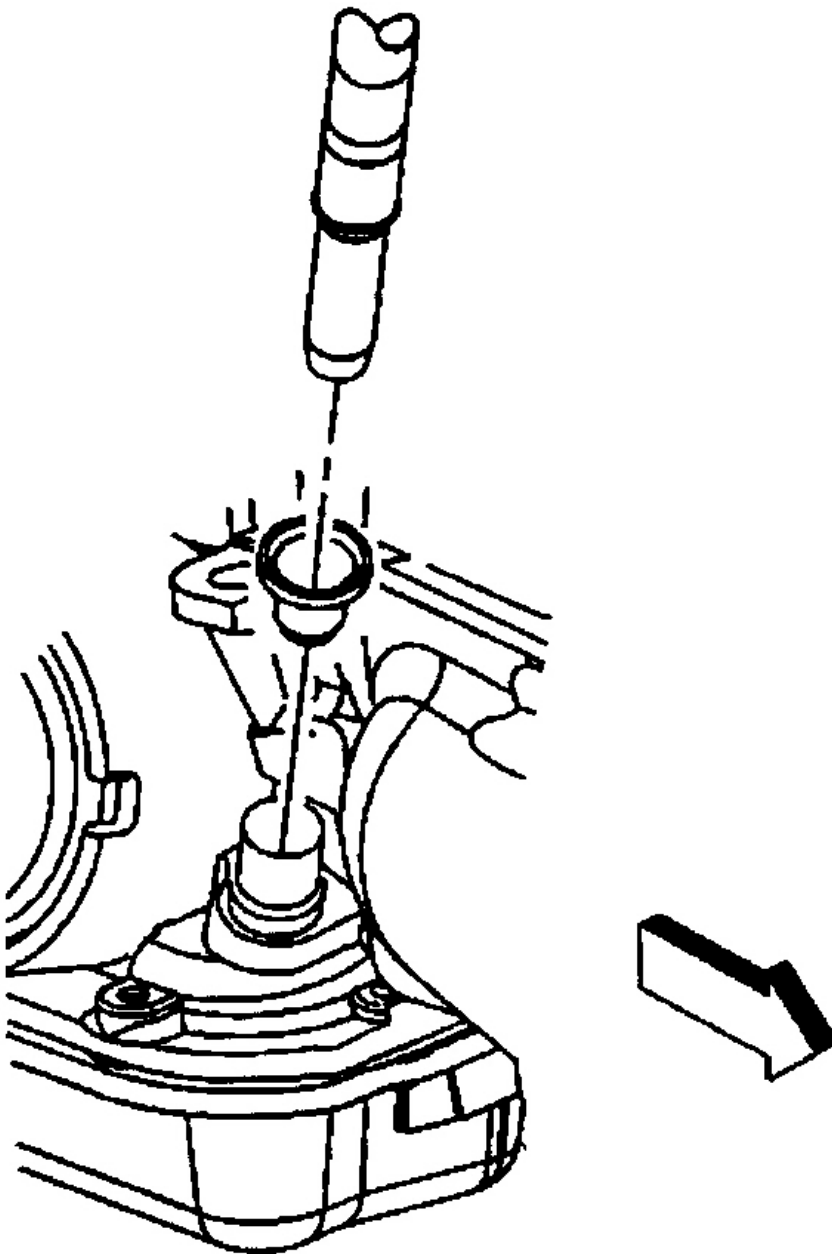
1. Remove the transmission fluid level indicator. See **Fig. 23** .
2. Raise and support the vehicle.
3. Remove the fill tube bracket nut.
4. Place a drain pan under the transmission.

5. Remove the fill tube. See **Fig. 24** .
6. Remove the transmission fill tube seal.



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Fig. 23: Removing Indicator Tube Nut
Courtesy of GENERAL MOTORS CORP.



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Fig. 24: Removing & Installing Filler Tube
Courtesy of GENERAL MOTORS CORP.

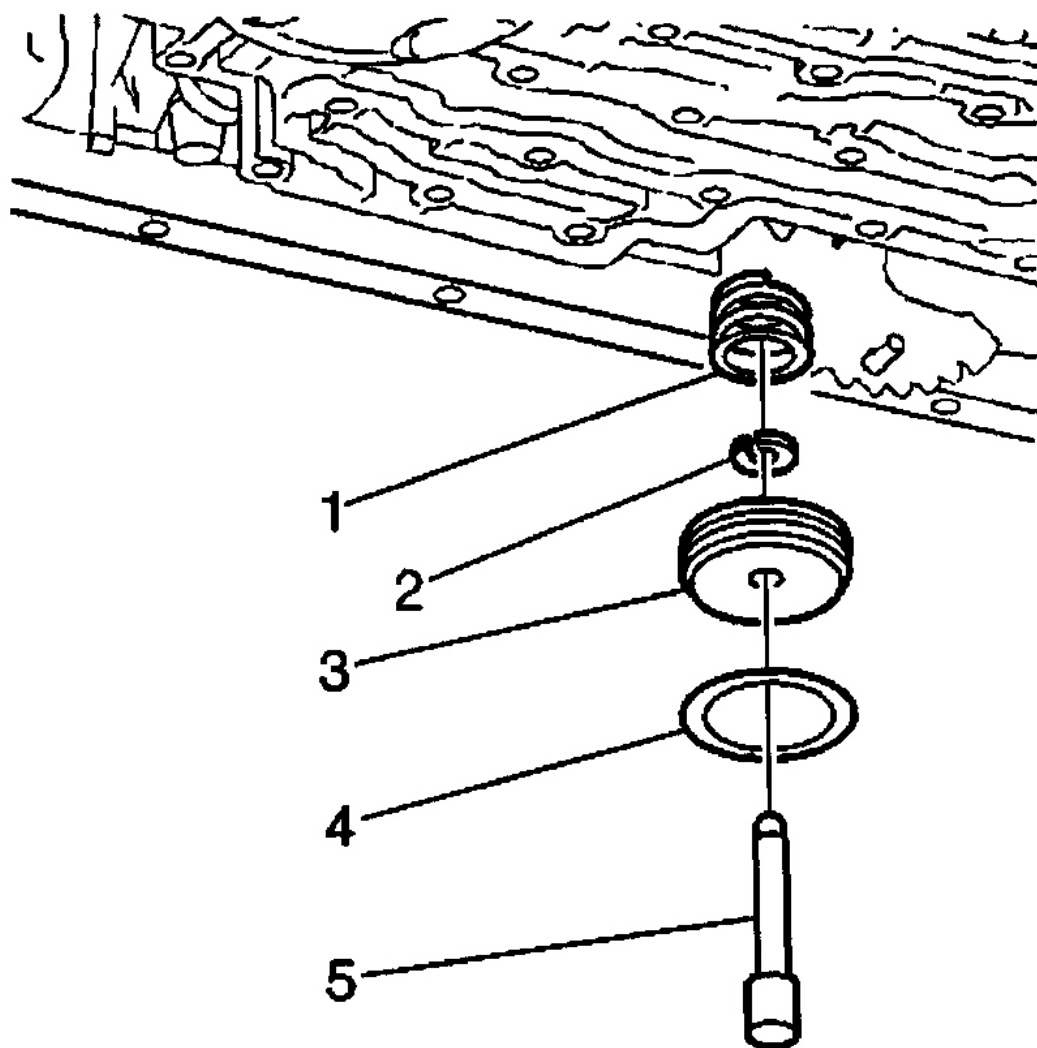
Installation

1. Install the transmission fill tube seal. See **Fig. 24** .
2. Install the fill tube.
3. Remove the drain pan from under the transmission.
4. Install the fill tube bracket nut. See **Fig. 23** .
5. Lower the vehicle.
6. Install the oil level indicator. Tighten the nut to specification. See **TORQUE SPECIFICATIONS** .
7. Fill the transmission to the proper level with appropriate transmission fluid. See **LUBRICATION** .

FORWARD SERVO

Removal

1. Remove the oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.
2. Remove the forward servo cover bolts, cover and gasket.
3. Remove the following parts:
 - A. Forward servo piston pin (5). See **Fig. 25** .
 - B. "O" ring seal (4).
 - C. Servo piston (3).
 - D. Retainer (2).
 - E. Piston spring (1).



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Fig. 25: Removing & Installing Forward Servo Assembly
Courtesy of GENERAL MOTORS CORP.

Installation

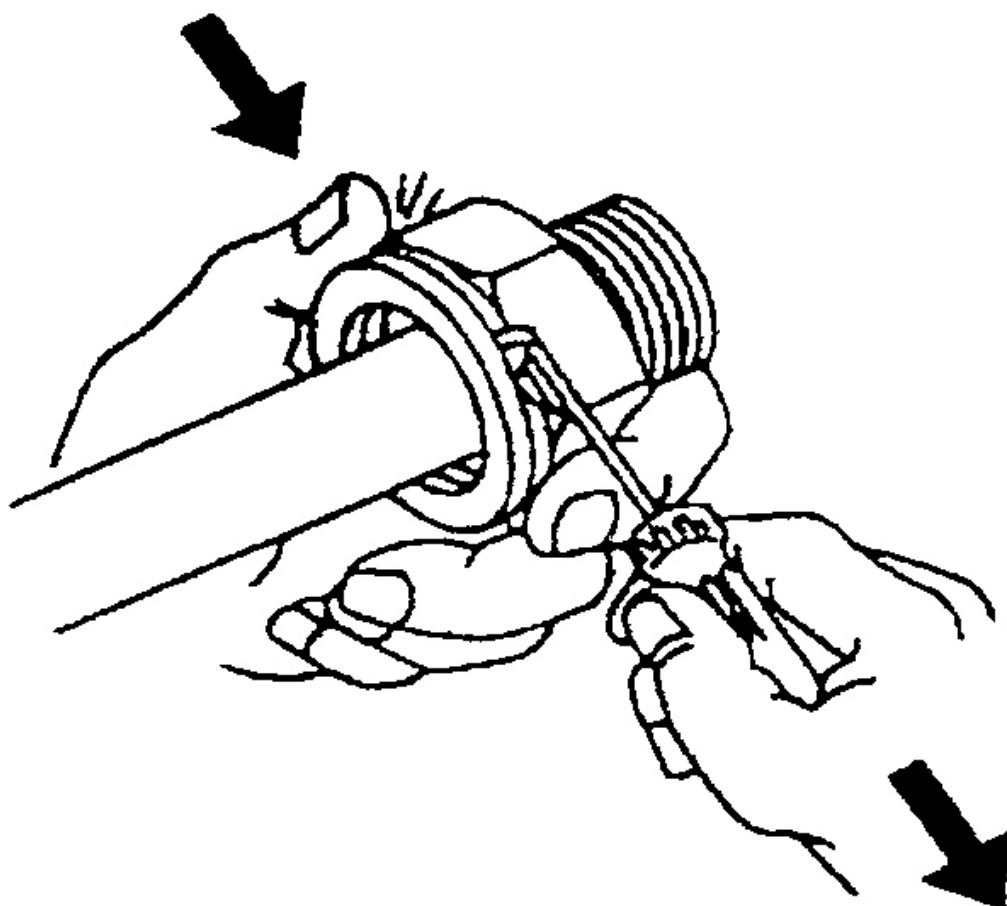
1. Install the following parts:
 - A. Piston spring (1). See **Fig. 25** .
 - B. Retainer (2).
 - C. Servo piston (3).
 - D. "O" ring seal (4).

- E. Forward servo piston pin (5).
2. Install the forward servo gasket, cover, and bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Install the oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.

OIL COOLER LINE QUICK CONNECT FITTING

Removal

1. Pull the plastic cap back from the quick connect fitting and down along the cooler line about 2" (5 cm).
2. Using a bent-tip screwdriver, pull on one of the open ends of the retaining ring in order to rotate the retaining ring around the quick connect fitting until the retaining ring is out of position and can be completely removed. See **Fig. 26** .
3. Remove the retaining ring from the quick connect fitting.
4. Discard the retaining ring.
5. Pull the cooler line straight out from the quick connect fitting. See **Fig. 27** .



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Fig. 26: Removing Retaining Ring
Courtesy of GENERAL MOTORS CORP.

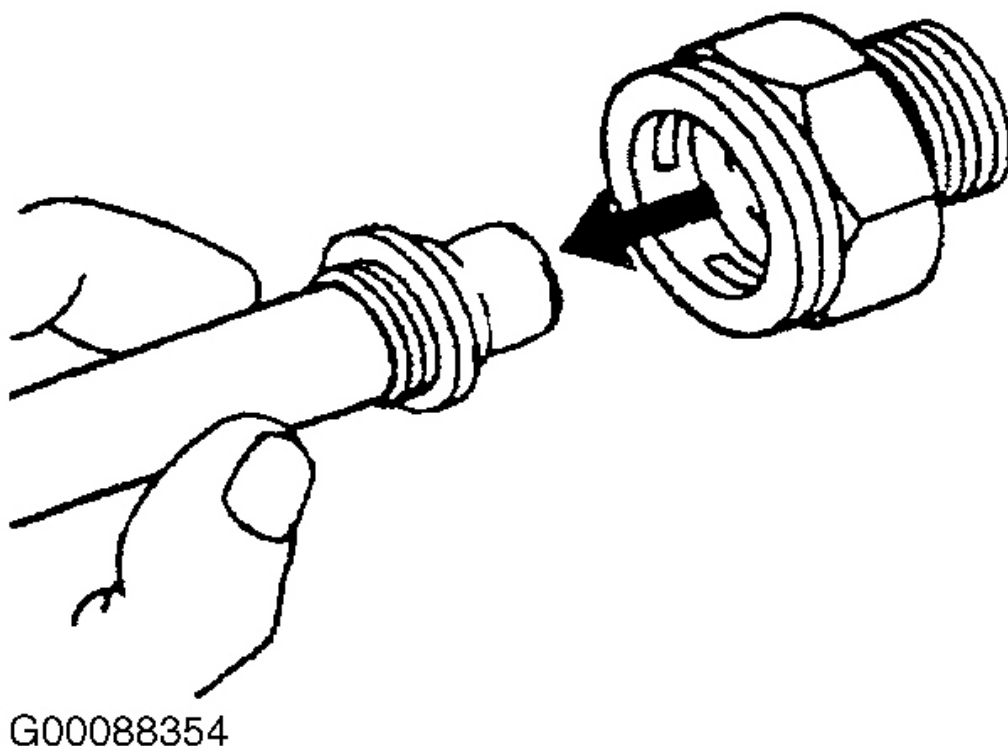


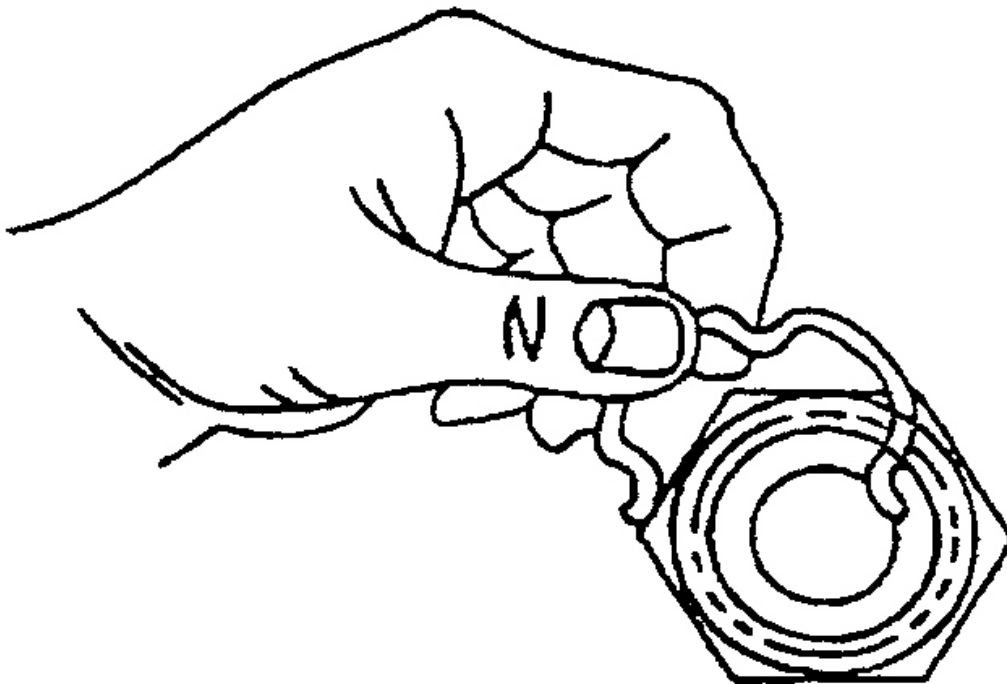
Fig. 27: Removing & Installing Cooler Line From Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: DO NOT reuse any of the existing oil lines or oil line fittings if there is excessive corrosion. DO NOT reuse any of the existing retaining rings that were removed from the existing quick connect fittings. Install new retaining rings.

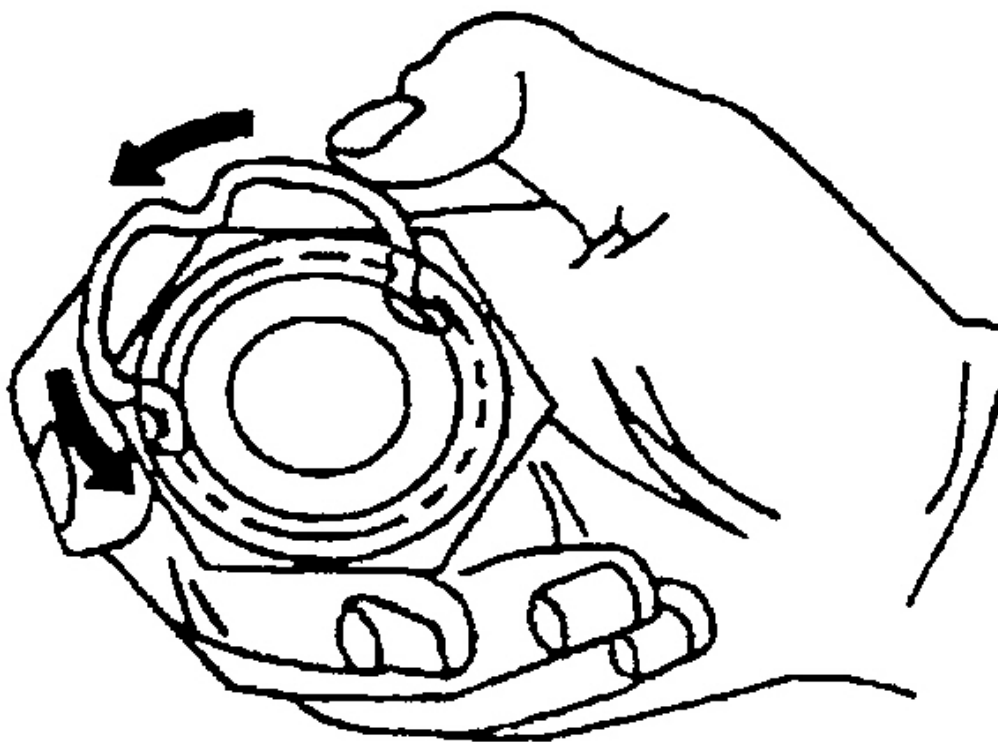
1. Install a new retaining ring into the quick connect fitting using the following procedure:
 - A. Hook one of the open ends of the retaining ring in one of the slots in the quick connect fitting. See **Fig. 28** .
 - B. Rotate the retaining ring around the fitting until the retaining ring is positioned with all three ears through the three slots on the fitting. See **Fig. 29** .
 - C. DO NOT install the new retaining ring onto the fitting by pushing the retaining ring. See **Fig. 30** .
 - D. Ensure that the three retaining ring ears are seen from inside the fitting and that the retaining ring moves freely in the fitting slots. See **Fig. 31** .
2. Install the cooler line into the quick connect fitting. See **Fig. 32** .

3. Insert the cooler line end into the quick connect fitting until a click is either heard or felt.
4. DO NOT use the plastic cap on the cooler line in order to install the cooler line into the fitting. See **Fig. 33**.
5. Pull back sharply on the cooler line in order to ensure that the cooler line is fastened into the quick connect fitting.
6. Position (snap) the plastic cap onto the fitting. DO NOT manually depress the retaining ring when installing the plastic cap onto the quick connect fitting. See **Fig. 34**.
7. Ensure that the plastic cap is fully seated against the fitting.
8. Ensure that no gap is present between the cap and the fitting. See **Fig. 35**.
9. Ensure that the yellow identification band on the tube is hidden within the quick connect fitting. See **Fig. 34**.
10. A hidden yellow identification band indicates proper joint seating. See **Fig. 36**.
11. Fill the transmission to the proper level with appropriate transmission fluid. See **LUBRICATION**.



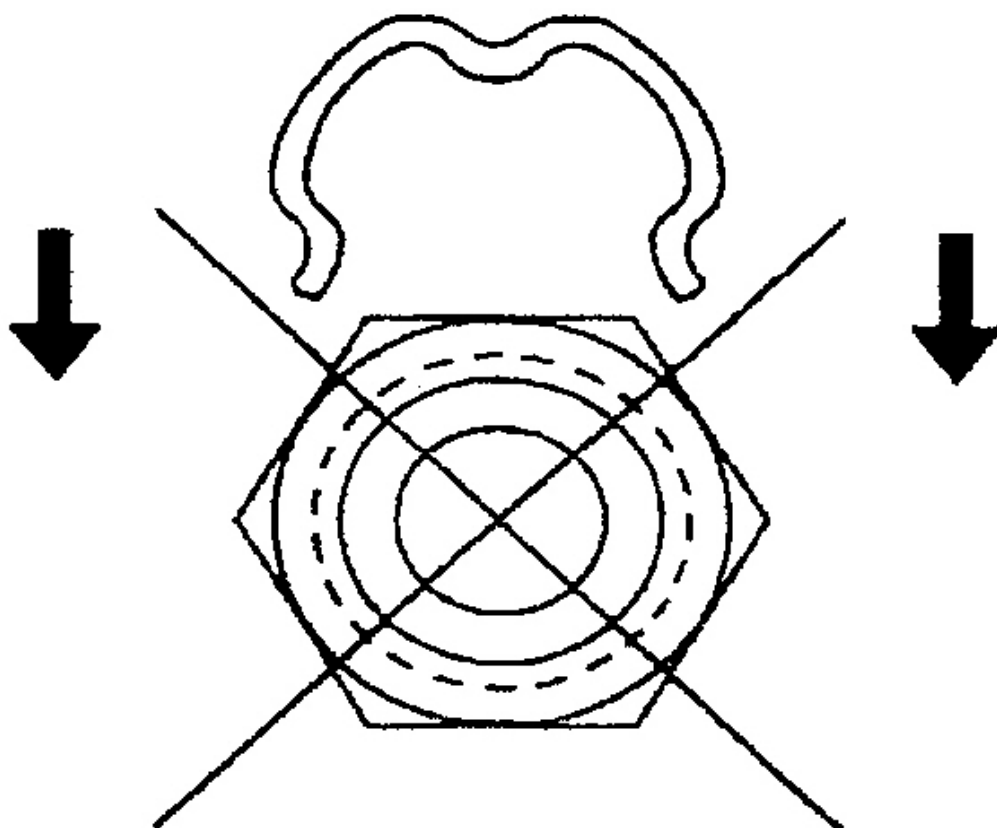
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Fig. 28: Starting Retaining Ring Onto Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



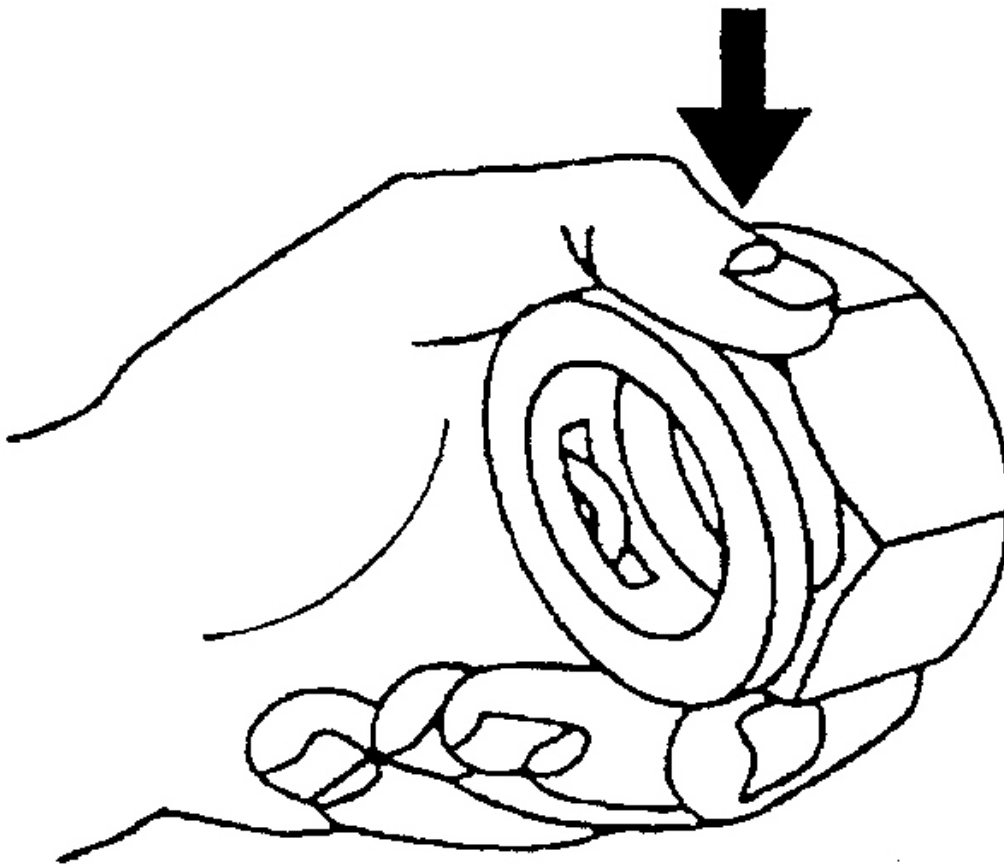
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Fig. 29: Installing Retaining Ring On Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



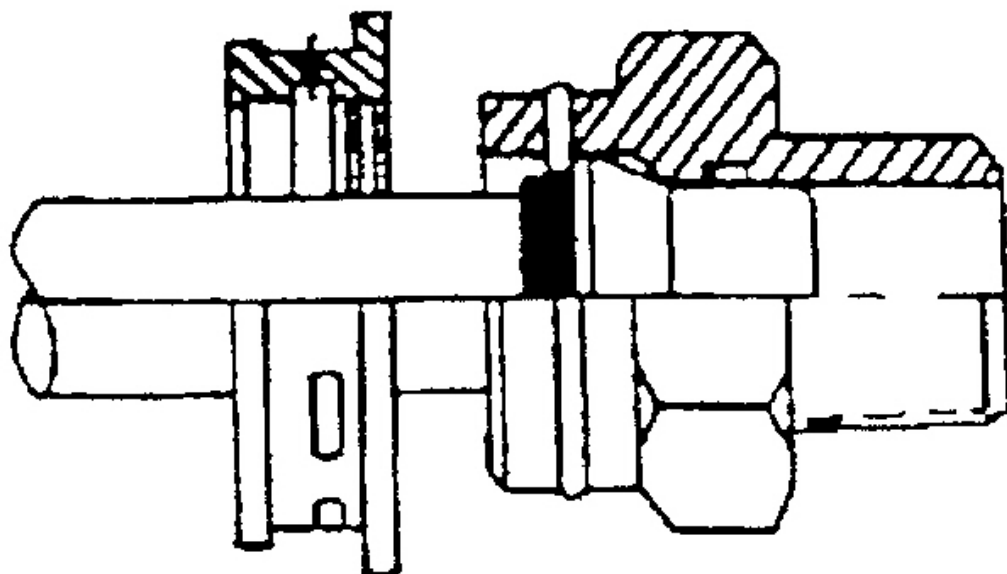
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Fig. 30: Incorrectly Installing Retainer Ring
Courtesy of GENERAL MOTORS CORP.



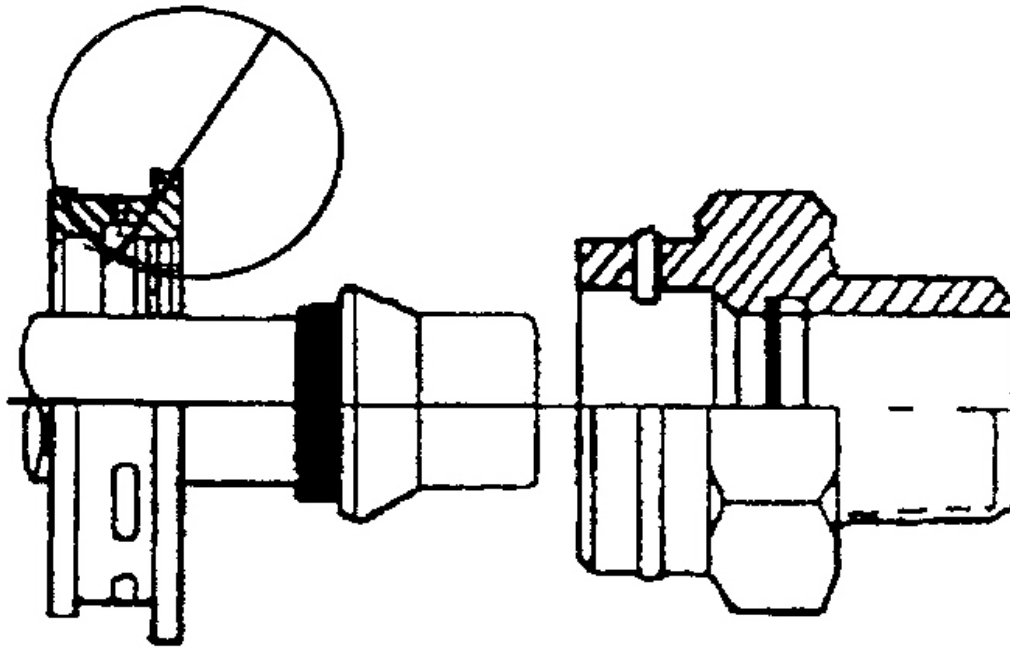
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Fig. 31: Correctly Installing Retainer Ring
Courtesy of GENERAL MOTORS CORP.



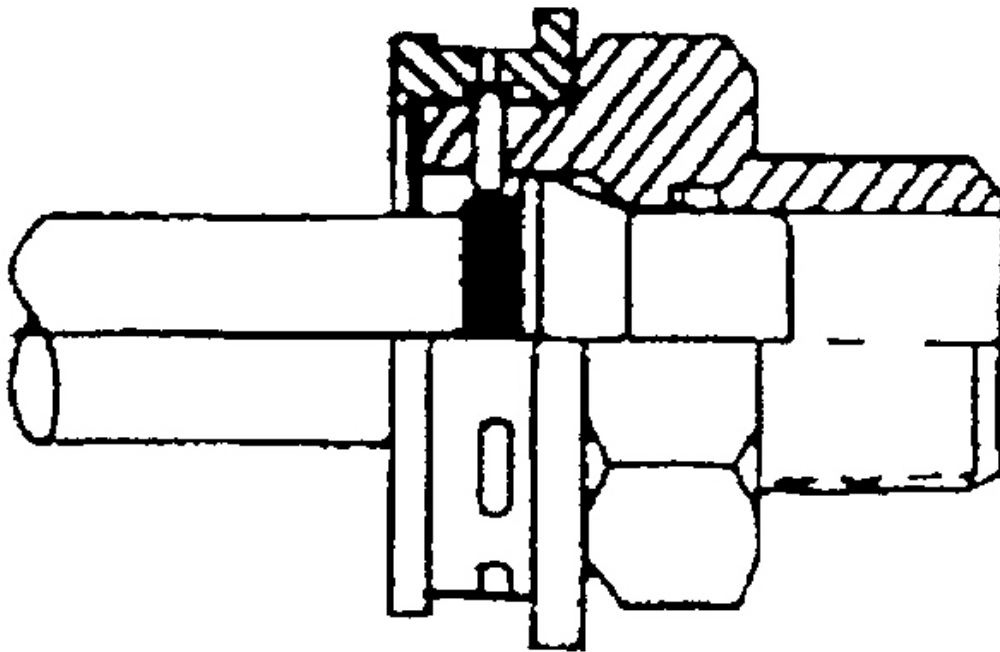
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Fig. 32: Installing Cooler Lines To Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



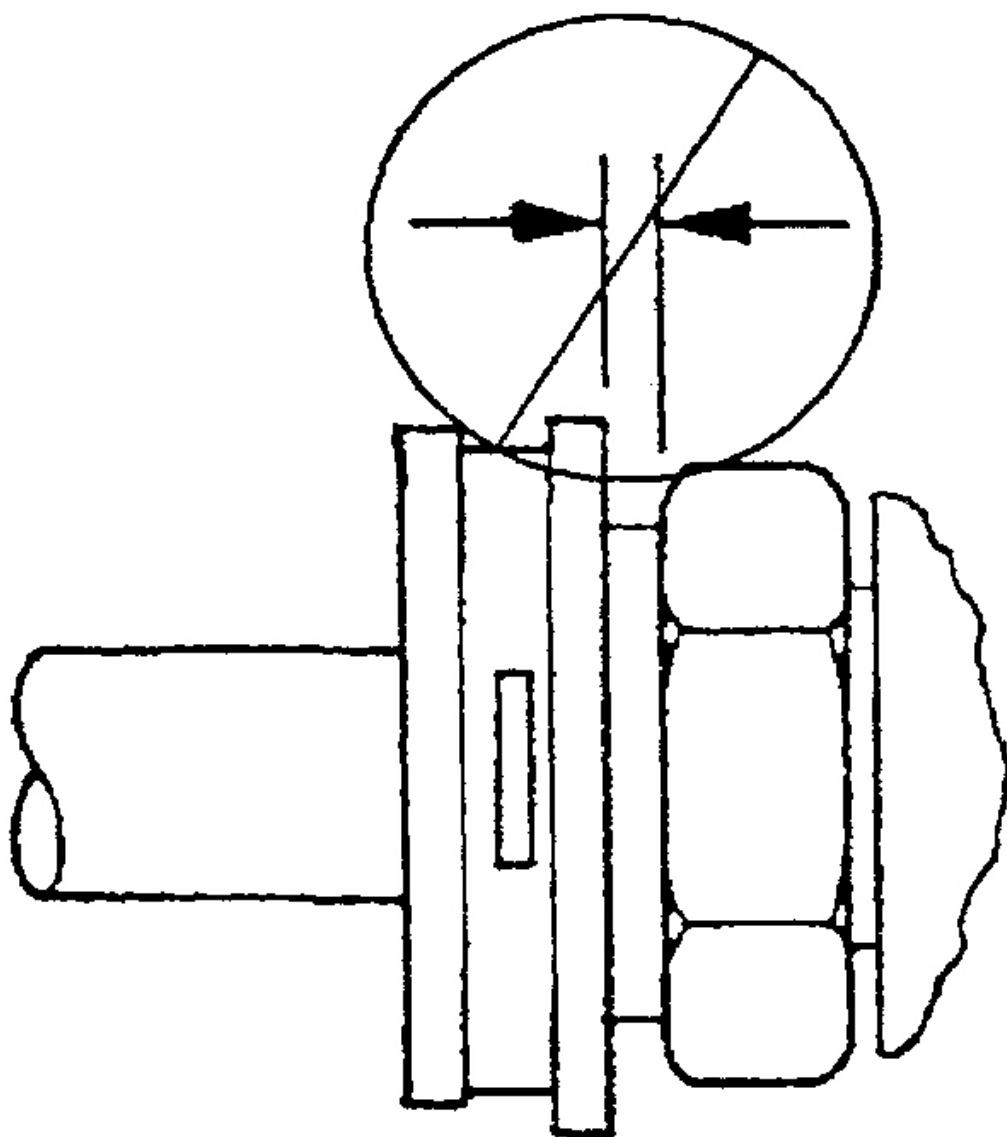
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Fig. 33: Incorrect Installation Method Using Plastic Cap
Courtesy of GENERAL MOTORS CORP.



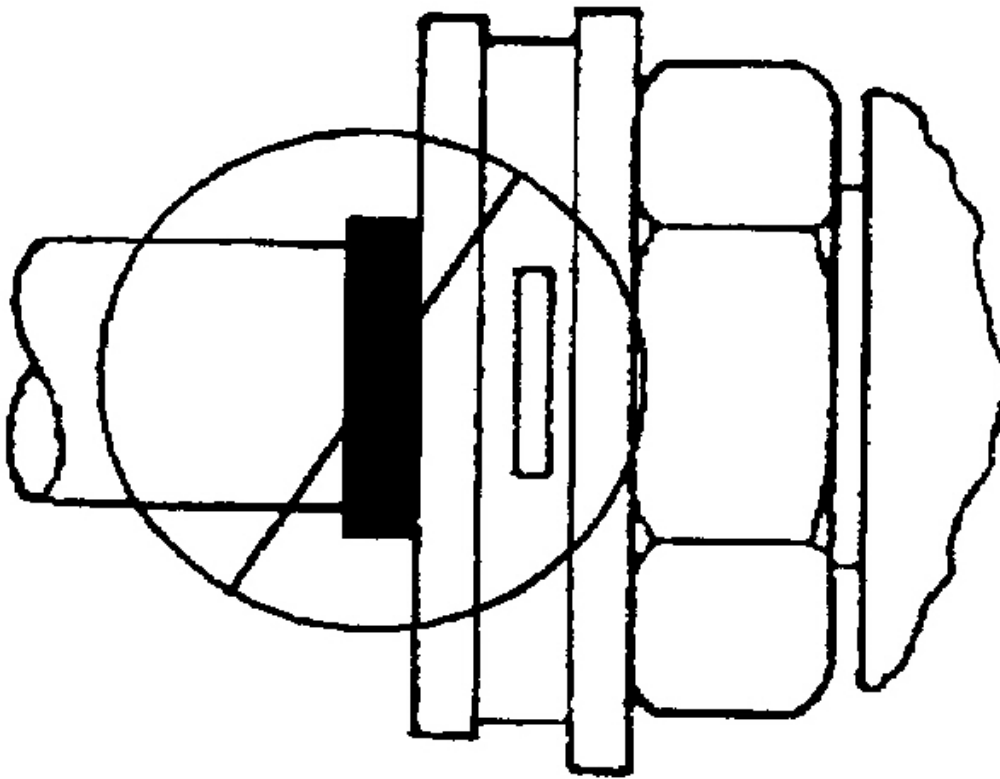
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Fig. 34: Installed View Of Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



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Fig. 35: Checking For Improper Gap
Courtesy of GENERAL MOTORS CORP.



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Fig. 36: Checking For Identification Band
Courtesy of GENERAL MOTORS CORP.

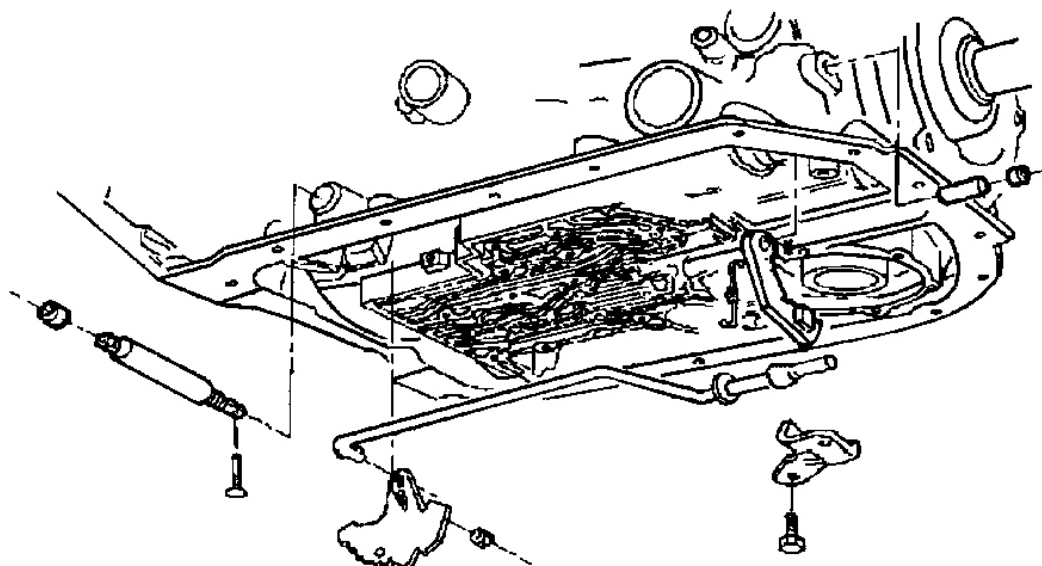
PARK LOCK PAWL & ACTUATOR

Removal

1. Remove the oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.
2. Remove the PNP switch. See **PARK/NEUTRAL POSITION SWITCH** .
3. Remove the manual shaft nut and the pin. See **Fig. 37** .
4. Remove the detent lever and the actuator assembly.
5. Remove the bolts and the parking pawl bracket.
6. Remove the parking pawl return spring. See **Fig. 37** .
7. Use a modified screw extractor in order to remove the plug.
8. Remove the parking pawl shaft retainer, the shaft and the pawl. See **Fig. 37** .

NOTE: If the manual shaft binds in the case during removal, file or sand the shaft in the area adjacent to the detent lever.

9. Remove the manual shaft.
10. Remove the manual shaft seal.



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Fig. 37: Removing & Installing Park Lock Pawl & Actuator
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the pawl shaft.
2. Install the parking pawl.
3. Install the plug using a 5/16 INCH or (8 mm) rod with Loctite(R) or the equivalent. See **Fig. 37** .
4. Install the retainer.
5. Install the pawl return spring.
6. Install the detent lever to the actuator assembly.
7. Install actuator assembly over the parking pawl.
8. Install the manual shaft seal.
9. Lubricate the manual shaft with transmission oil and install the manual shaft into the case.
10. Install the nut on the shaft.
11. Install the roll pin.

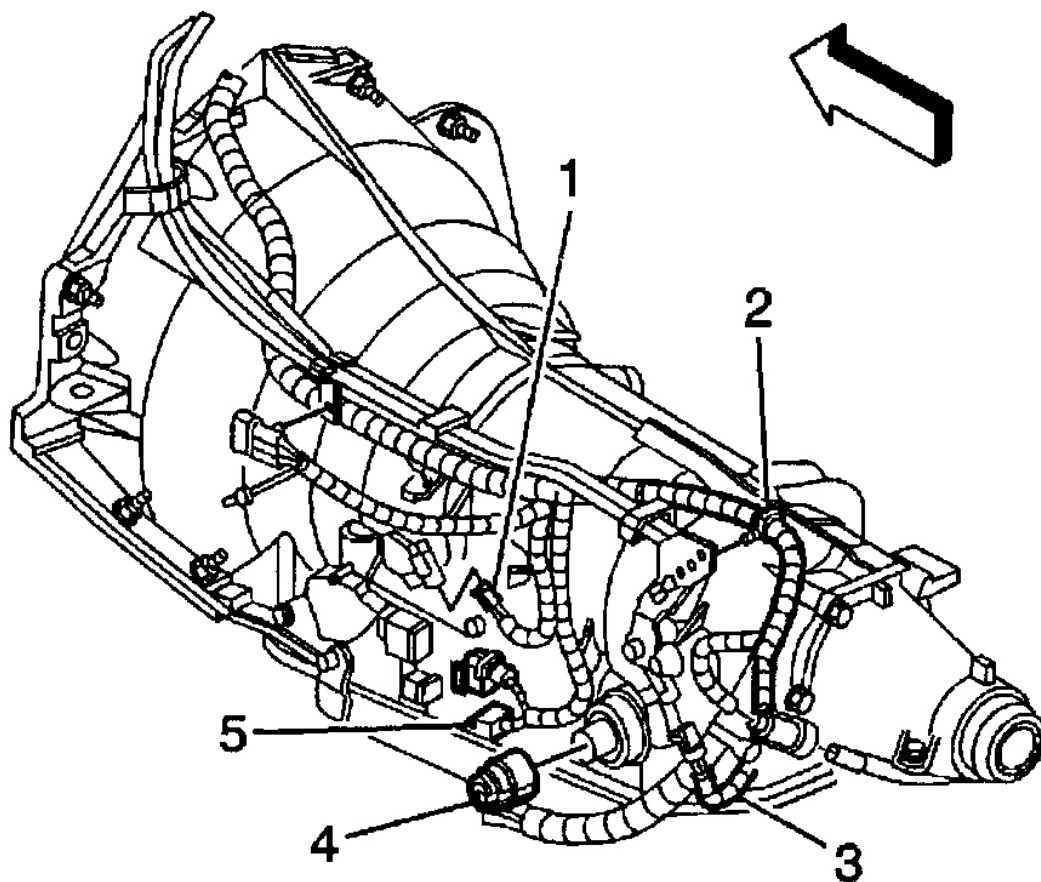
12. Install the parking lock bracket bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
13. Install the PNP switch. See **PARK/NEUTRAL POSITION SWITCH** .
14. Install the oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.
15. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .

PARK/NEUTRAL POSITION SWITCH

NOTE: **Tools required: Park/Neutral Position Switch Adjustment Tool (J-41364-A).**

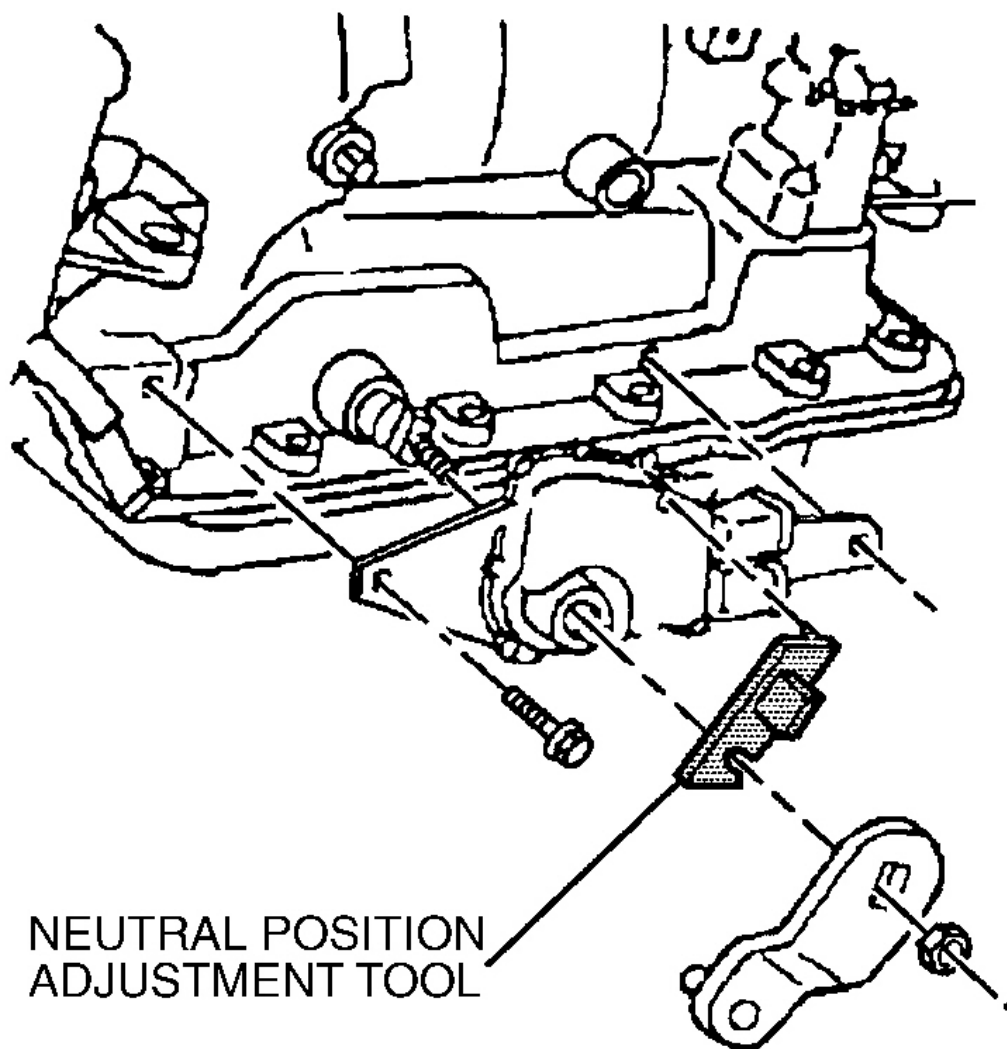
Removal

1. Apply the parking brake.
2. Place the transmission into Neutral.
3. If equipped with 4-Wheel Drive (4WD), remove the front drive shaft. See appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
4. Raise and support the vehicle.
5. Disconnect the park/neutral position (PNP) switch electrical connectors (5). See **Fig. 38** .
6. Remove the range selector cable end (2) from the range selector lever ball stud (1). See **Fig. 4** .
7. Remove the control lever to the manual shaft nut. See **Fig. 39** .
8. Remove the control lever from the manual shaft.
9. Remove the PNP switch bolts.
10. Remove the PNP switch from the manual shaft. If the PNP switch does not slide off the manual shaft, file the outer edge of the manual shaft in order to remove any burrs.



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Fig. 38: Disconnecting PNP Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.



G00089910

Fig. 39: Removing & Installing Park/Neutral Position Switch
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the PNP switch to the manual shaft by aligning the switch hub flats with the manual shaft flats. See **Fig. 39** .
2. Slide the PNP switch onto the manual shaft until the switch mounting bracket contacts the mounting bosses on the transmission.

NOTE: If a new PNP switch is being installed, the switch will come with a positive assurance bracket. The positive assurance bracket aligns the new switch in its proper position for installation and the use of the park neutral switch aligner will not be necessary.

3. Install the PNP switch bolts finger tight.
4. Position the park neutral switch aligner onto the PNP switch. Ensure that the two slots on the switch where the manual shaft is inserted are lined up with the lower two tabs on the tool. See **Fig. 40** .
5. Rotate park neutral switch aligner until the upper locator pin on the tool is lined up with the slot on the top of the switch. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
6. Remove park neutral switch aligner from the PNP switch. If installing a new switch, remove the positive assurance bracket at this time.
7. Install the control lever to the manual shaft with the nut. See **Fig. 39** .
8. Install the manual shaft nut. Tighten the nut to specification. See **TORQUE SPECIFICATIONS** .
9. Install the range selector cable end (2) to the range selector lever ball stud (1). See **Fig. 4** .
10. Connect the PNP switch electrical connectors (5). See **Fig. 38** .
11. If equipped with 4WD, install the front drive shaft. See appropriate DRIVE SHAFTS & UNIVERSAL JOINTS article in DRIVELINE/AXLES.
12. Lower the vehicle.
13. Check the PNP switch for proper operation. The engine must start in the Park (P) or Neutral (N) positions only. If proper operation of the switch can not be obtained, replace the switch.

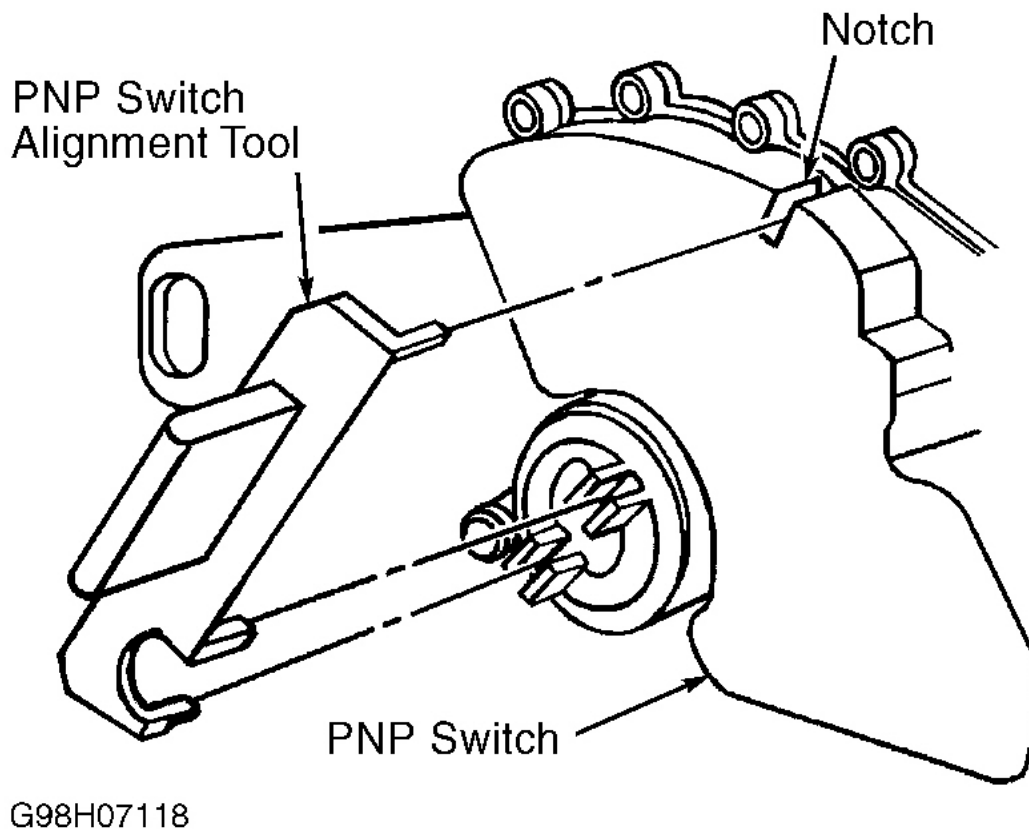


Fig. 40: Adjusting Park/Neutral Position Switch
 Courtesy of GENERAL MOTORS CORP.

PRESSURE REGULATOR

NOTE: Tools required: Transjel(R) (J-36850)

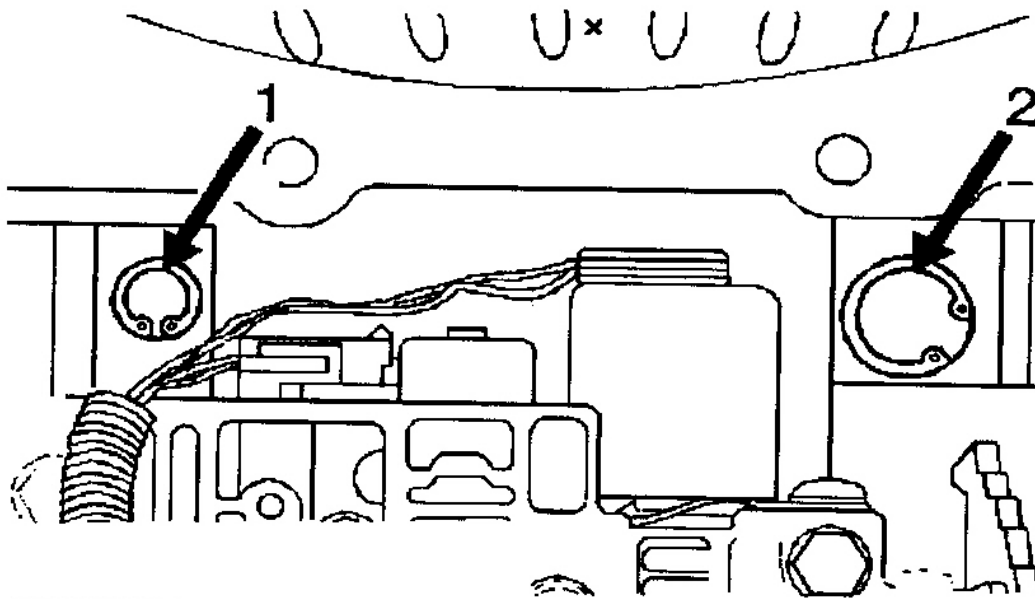
Removal

1. Raise and suitably support the vehicle.
2. Remove the transmission filter.

WARNING: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.

3. Remove the reverse boost valve bushing retainer ring (2). See **Fig. 41**.
4. Remove the following from the reverse boost valve cylinder:

- The reverse boost valve bushing. See **Fig. 42** .
- The reverse boost valve.
- The pressure regulator spring retainer.
- The pressure regulator spring.
- The pressure regulator valve.
- The reverse boost valve bushing.



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Fig. 41: Removing Reverse Boost Valve Bushing Retainer Ring
 Courtesy of GENERAL MOTORS CORP.

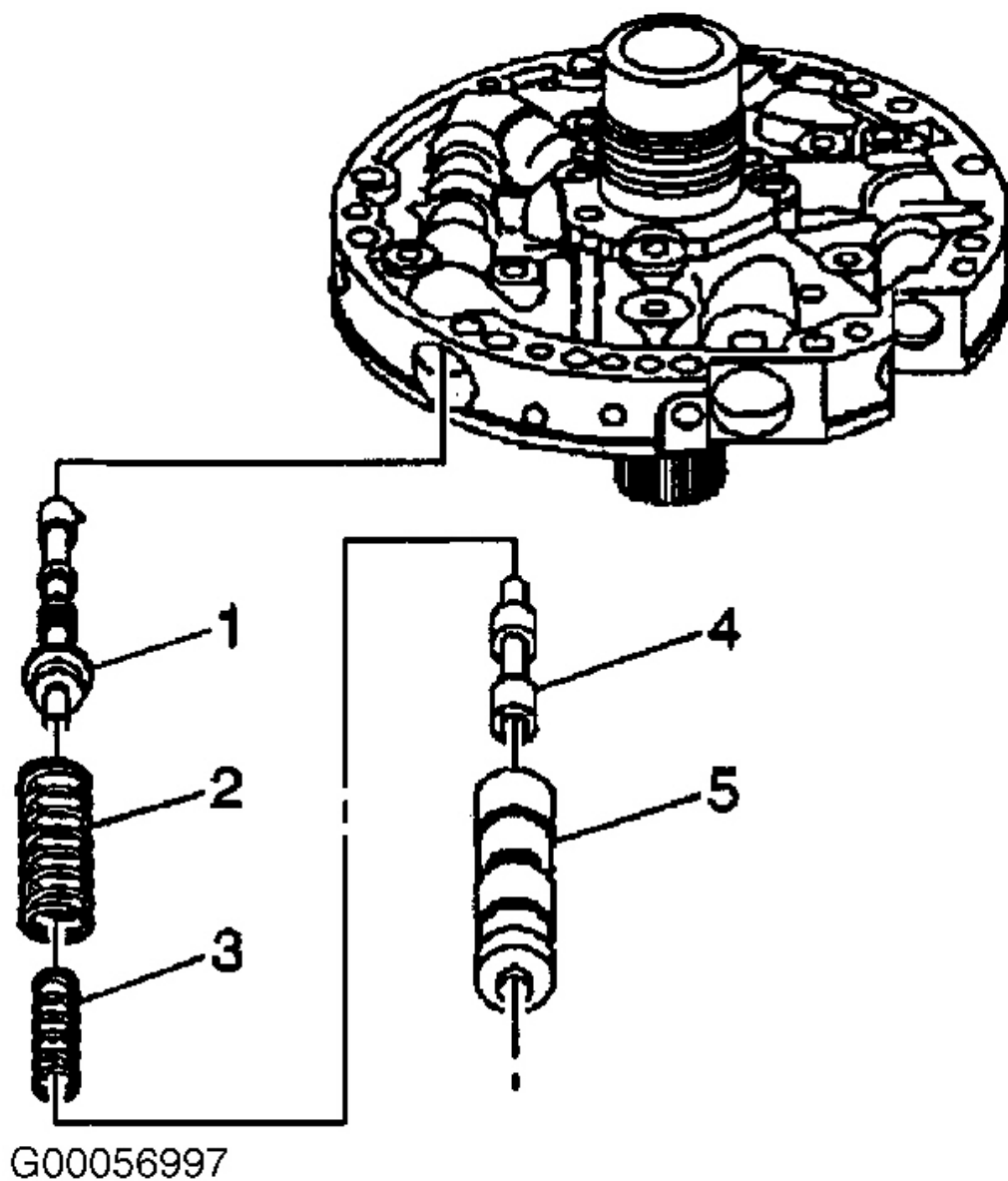


Fig. 42: Exploded View Of Pressure Regulator
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the pressure regulator valve using Transjel(R).
2. Pre-assemble the following parts:

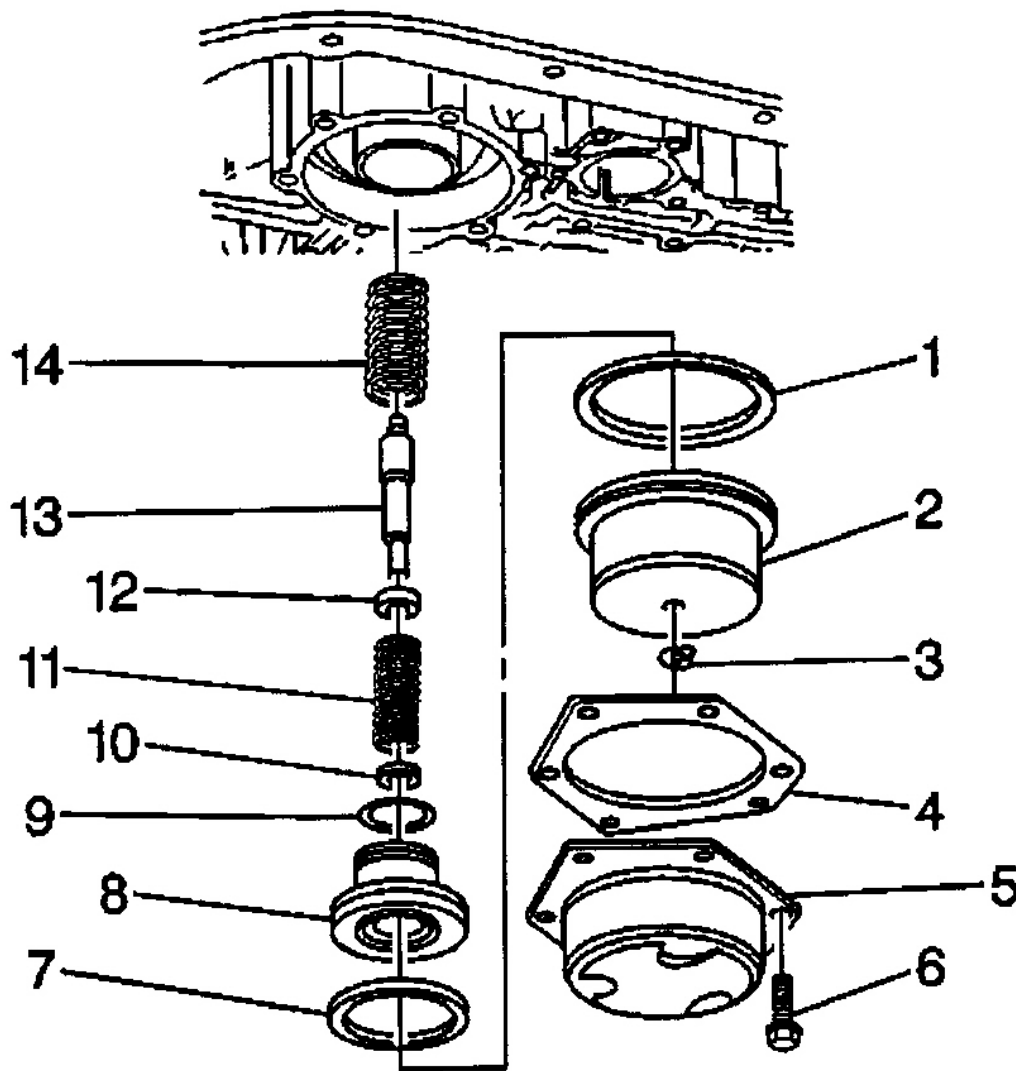
- The reverse boost valve bushing. See **Fig. 42** .
 - A new reverse boost valve.
 - A new pressure regulator spring retainer.
 - The added isolator pressure regulator spring.
 - The pressure regulator spring.
3. Install the pre-assembled parts into the pump bore.
 4. Install the reverse boost valve bushing retainer ring while holding the reverse boost valve bushing in place. Ensure the retainer ring (2) is in the groove. See **Fig. 41** .
 5. Install the transmission filter.
 6. Fill the transmission to the proper level with appropriate transmission fluid. See **LUBRICATION** .

REVERSE SERVO

Removal

Remove the transmission oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION. Remove the rear servo assembly from the transmission case as follows:

- Cover bolts (6). See **Fig. 43** .
- Cover (5).
- Cover gasket (4).
- Bottom retaining clip (3).
- Servo piston (2).
- Outer ring oil seal (1).
- Inner ring oil seal (7).
- Accumulator piston (8).
- Piston seal (9).
- Washer (10).
- Servo spring (11).
- Servo spring retainer (12).
- Selective pin (13).
- Accumulator spring (14).



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Fig. 43: Removing & Installing Reverse Servo Assembly
Courtesy of GENERAL MOTORS CORP.

Installation

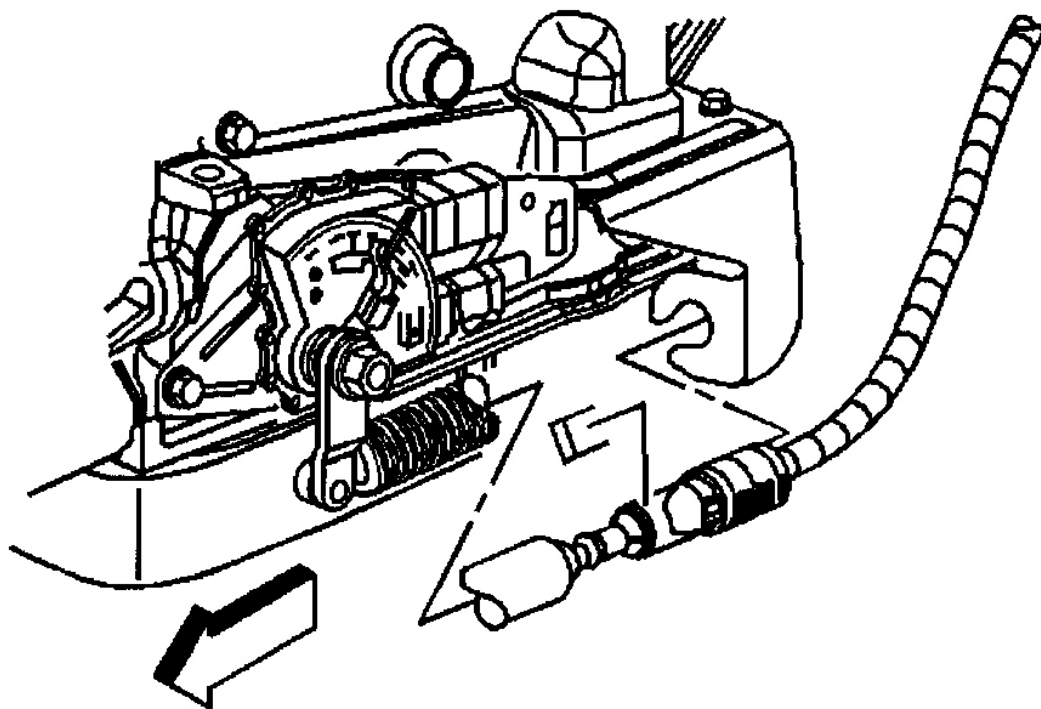
1. Install the rear servo assembly into the transmission case as follows:
 - Accumulator spring (14).
 - Selective pin (13).
 - Servo spring retainer (12).
 - Servo spring (11).

- Washer (10).
 - Piston seal (9).
 - Accumulator piston (8).
 - Inner ring oil seal (7).
 - Outer ring oil seal (1).
 - Servo piston (2).
 - Bottom retaining clip (3).
 - Cover gasket (4).
 - Cover (5).
 - Cover Bolt (6).
2. Install the cover bolts and tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
 3. Install the transmission oil pan and filter. See **DRAINING & REFILLING** .

SHIFT CABLE BRACKET

Removal

1. Apply the parking brake.
2. Place the transmission into Neutral.
3. Raise and support the vehicle.
4. Remove the retainer that secures the cable to the bracket. See **Fig. 44** .
5. Depress the tangs and remove the cable from the bracket.
6. Remove the bolts (1) securing the transmission range selector cable bracket (2) to the transmission. See **Fig. 5** .
7. Remove the transmission range selector cable bracket.



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Fig. 44: Removing Shift Cable Retainer
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the transmission range selector cable bracket.
2. Install the shift cable bracket bolts (1). See **Fig. 5** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Align and install the cable to the bracket. See **Fig. 44** .
4. Install the retainer that secures the cable to the bracket.
5. Lower the vehicle.
6. Check the vehicle for proper operation. If cable adjustment is necessary, see **SHIFT CABLE BRACKET** under ADJUSTMENTS.

SHIFT CABLE

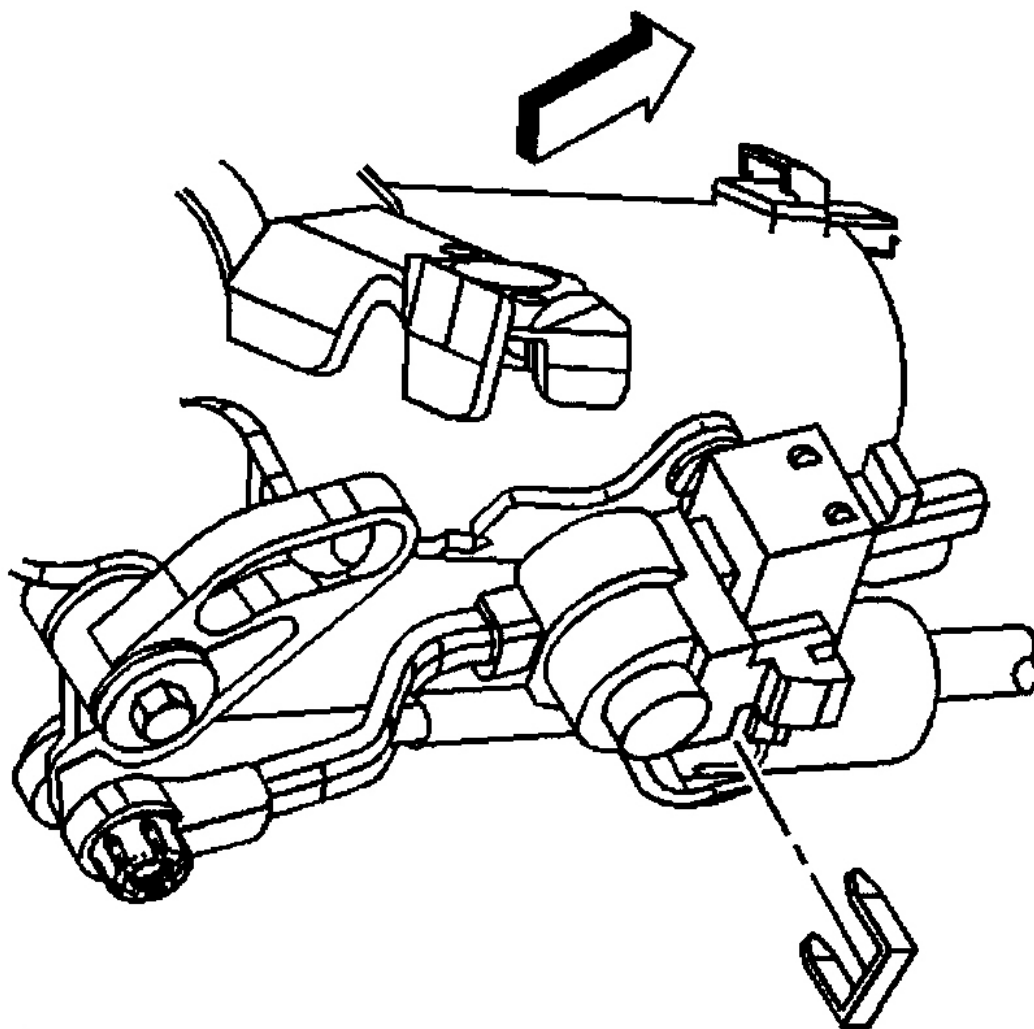
Removal

1. Position the steering column shift lever to the Park position.
2. Remove the instrument panel knee bolster.

3. Remove the driver's seat.
4. Pull back the carpet and insulation around the driver's area.
5. Remove the retainer securing the cable to the steering column. See **Fig. 45** .
6. Remove the cable end from the steering column ball stud. See **Fig. 46** .
7. Depress the tangs and remove the cable from the steering column bracket.
8. Remove the bolt securing the cable support to the brace. See **Fig. 47** .

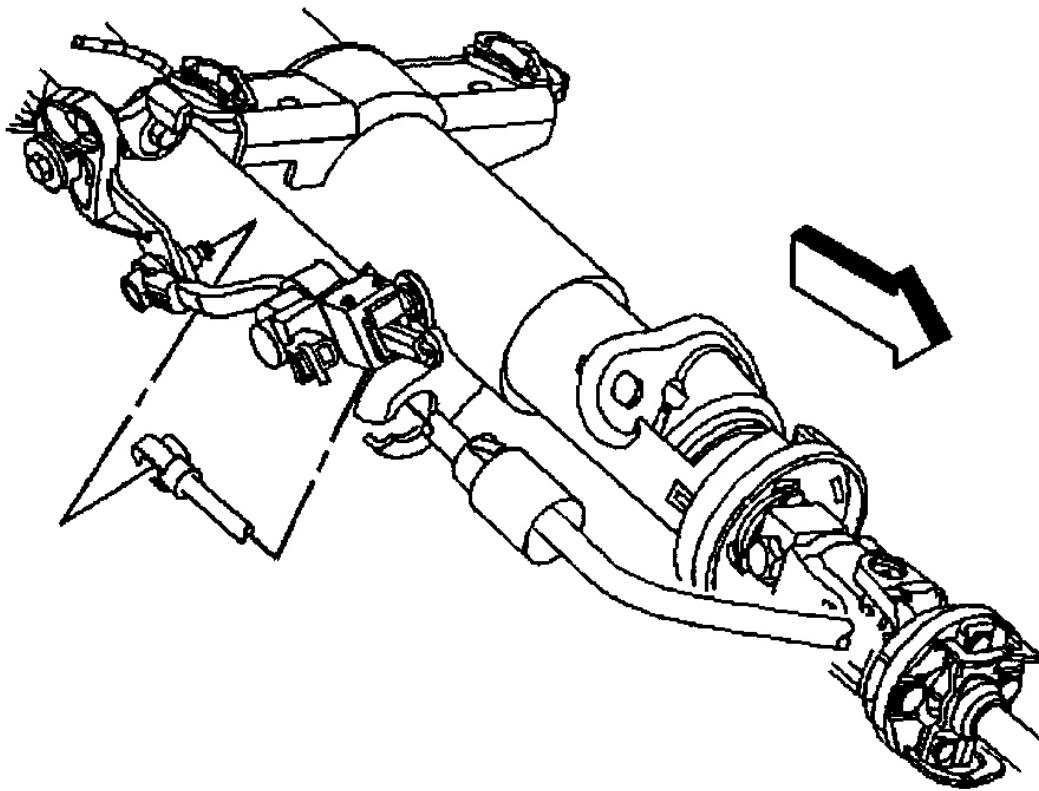
NOTE: **Avoid unnecessary twisting/bending of the range selector cable when removing the cable from the support.**

9. Remove the range selector cable from the support. See **Fig. 48** .
10. Remove the cable grommet from the floor panel. See **Fig. 49** .
11. Raise and suitably support the vehicle.
12. Remove the clips on the cable from the floor panel reinforcement. See **Fig. 50** .
13. Ensure the transmission manual shaft is positioned in mechanical Park.
14. Remove the retainer that secures the cable to the bracket. See **Fig. 44** .
15. Remove the cable clip on the transfer case, if equipped.
16. Remove the range selector cable end (2) from the transmission range selector lever ball stud (1). See **Fig. 4** .
17. Depress the tangs and remove the cable from the bracket.
18. Lower the vehicle and ensure that the steering column shift lever is still in the Park position.



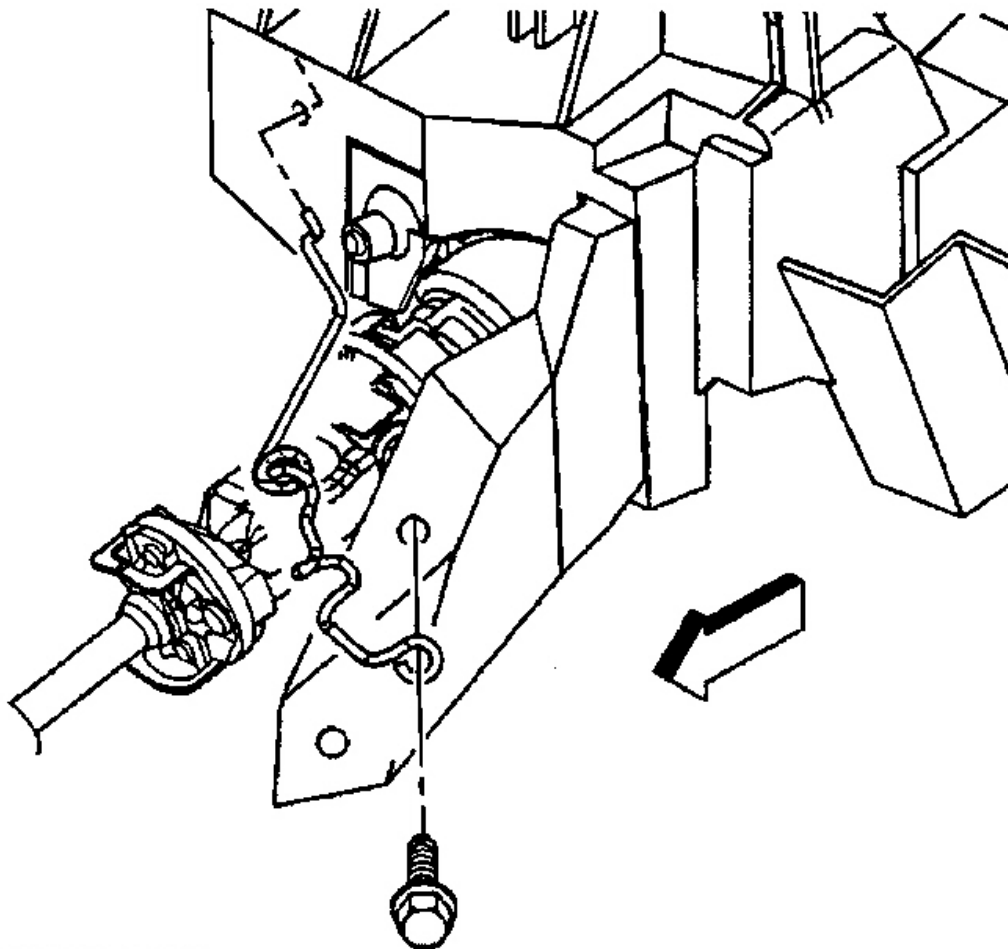
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Fig. 45: Removing Retainer Securing Cable To Steering Column
Courtesy of GENERAL MOTORS CORP.



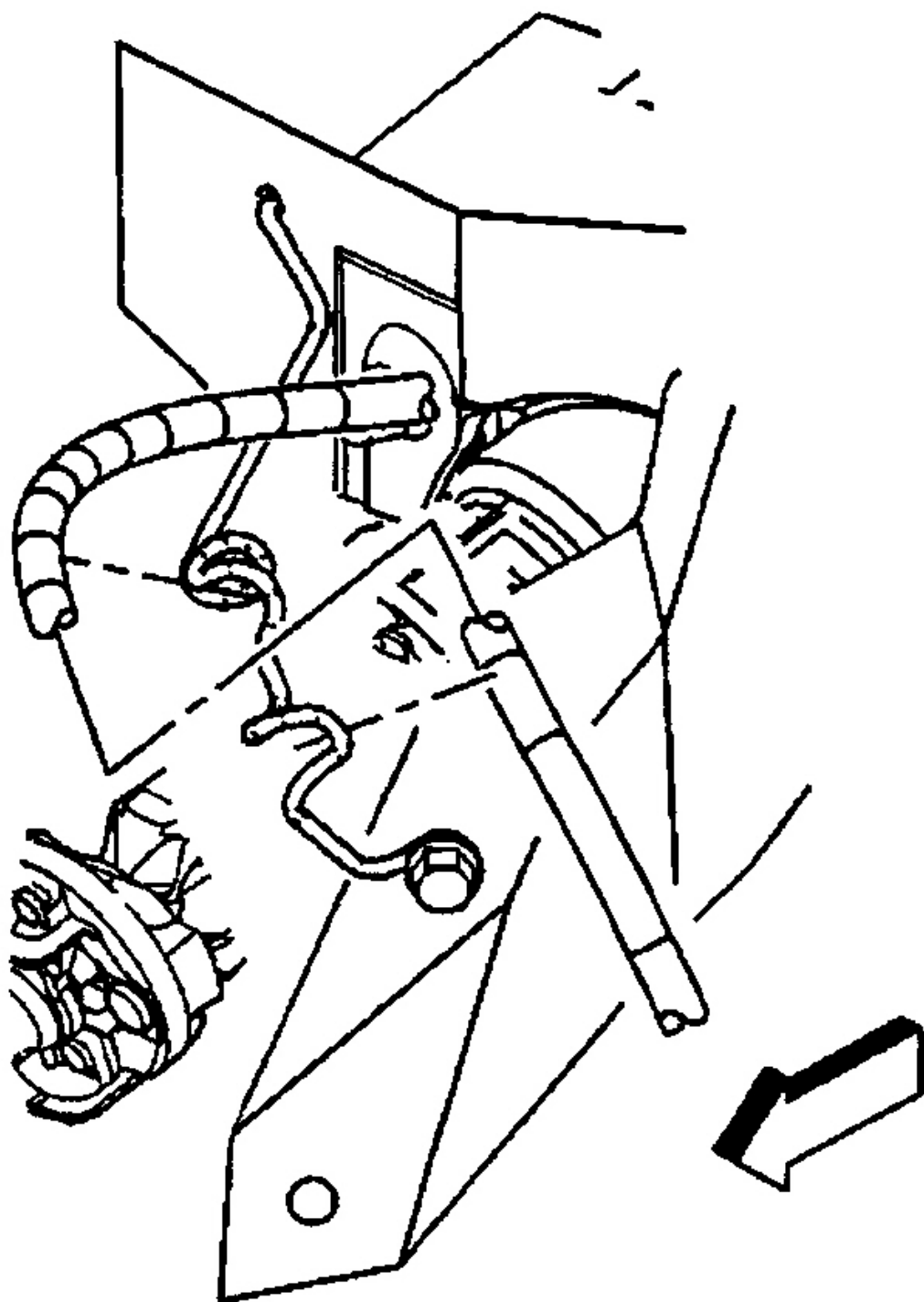
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Fig. 46: Removing Cable From Steering Column Ball Stud
Courtesy of GENERAL MOTORS CORP.



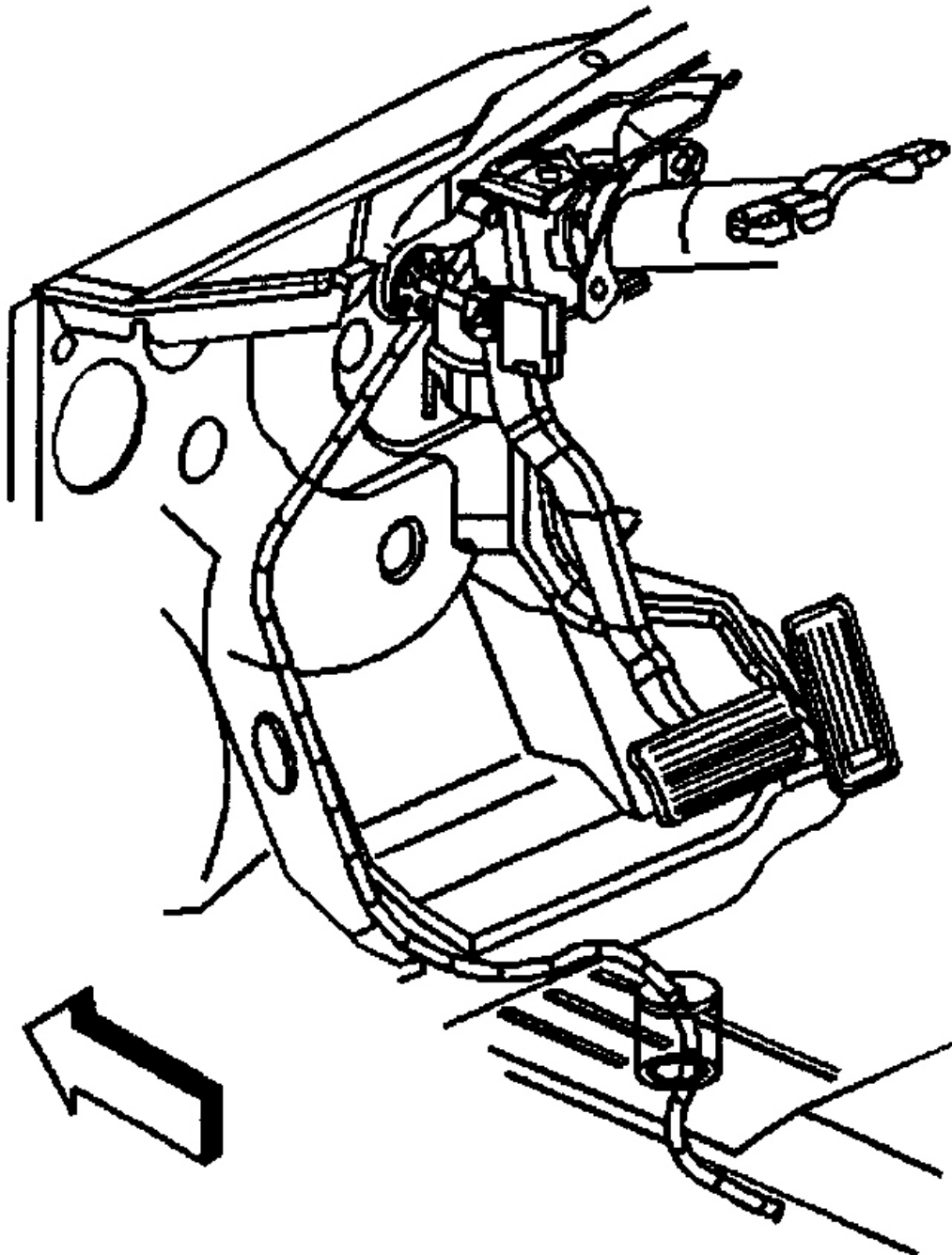
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Fig. 47: Removing & Installing Cable Support
Courtesy of GENERAL MOTORS CORP.



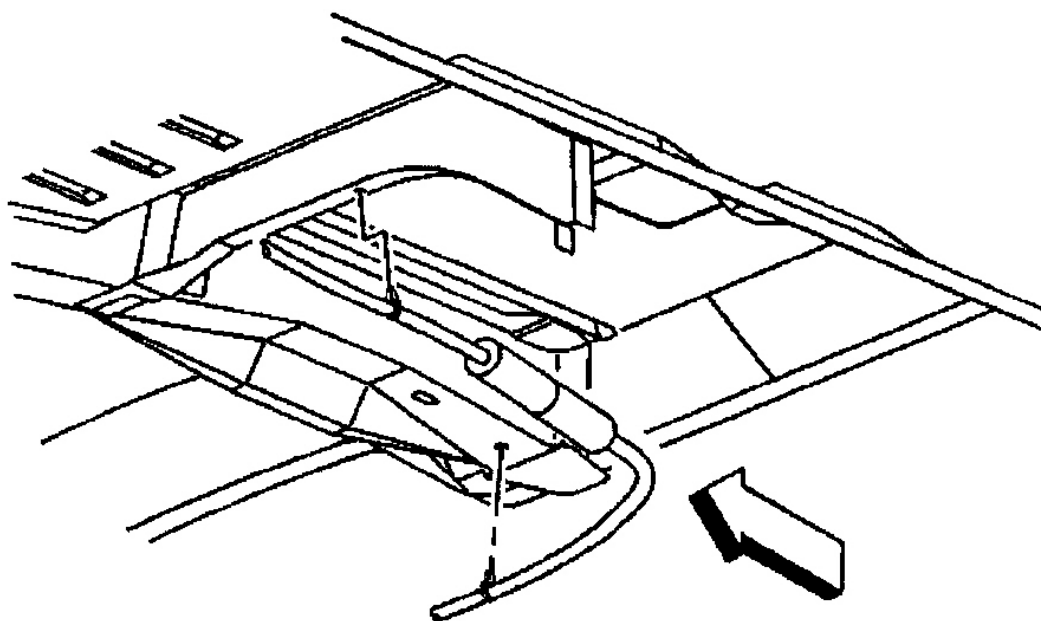
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Fig. 48: Removing & Installing Shift Cable At Support
Courtesy of GENERAL MOTORS CORP.



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Fig. 49: Removing Cable Grommet From Floor Panel
Courtesy of GENERAL MOTORS CORP.



G00202988

Fig. 50: Removing Floor Panel Reinforcement Clips
Courtesy of GENERAL MOTORS CORP.

Installation

1. Ensure that the transmission manual shaft lever is in the mechanical Park position.
2. Align and install the cable to the bracket.
3. Install the range selector cable end (2) to the transmission range selector lever ball stud (1). See **Fig. 4** .
4. Install the cable clip on the transfer case, if equipped.
5. Install the retainer that secures the cable to the bracket. See **Fig. 44** .
6. Install the clips on the cable to the floor panel reinforcement. See **Fig. 50** .
7. Lower the vehicle.
8. Install the cable grommet to the floor panel. See **Fig. 49** .

NOTE: **Avoid unnecessary twisting/bending of the range selector cable when installing the cable to the support.**

9. Install the range selector cable to the support. See **Fig. 48** .
10. Install the bolt securing the cable support to the brace. See **Fig. 47** . Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .
11. Install the cable to the steering column bracket. See **Fig. 46** .

12. Ensure the tangs fully seat (snap) into the steering column bracket.
13. Install the cable end to the steering column ball stud.
14. Install the retainer securing the cable to the steering column. See **Fig. 45** .
15. Position the carpet and insulation around the driver's area.
16. Install the driver's seat.
17. Install the instrument panel knee bolster.
18. Test the transmission for proper shift operation.
19. If all of the gear positions cannot be achieved, adjust the cable.

TORQUE CONVERTER CLUTCH VALVE & SPRING

Removal

1. Remove the oil pan and the filter. See **DRAINING & REFILLING** under LUBRICATION.

WARNING: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.

2. Remove the valve bore plug retainer ring (1). See **Fig. 41** .
3. Remove the following parts:
 - The valve bore plug. See **Fig. 42** .
 - The TCC valve.
 - The TCC valve spring.

Installation

1. Install the following parts:
 - The TCC valve spring. See **Fig. 42** .
 - The TCC valve.
 - The valve bore plug.
2. Install the valve bore plug retainer ring (1). See **Fig. 41** .
3. Install the filter and oil pan. See **DRAINING & REFILLING** under LUBRICATION.

VALVE BODY & PRESSURE SWITCH

NOTE: **Tools required: Transjel(R) (J-36850) and Valve Body Align Pin (J-25025-5).**

Removal

1. Ensure that removal of the valve body is necessary before proceeding. See **Fig. 51** . The following components can be serviced without removing the valve body:

- The 2-3 solenoid (1).
 - The internal wiring harness (2).
 - The 1-2 shift solenoid (3).
 - The transmission fluid temperature sensor (4).
 - The transmission fluid pressure manual valve position switch (5).
 - The pressure control solenoid (6).
 - The Torque Converter Clutch Pulse Width Modulation (TCC PWM) solenoid (7).
2. Remove the fluid level indicator.
 3. Remove the transmission filter. See **DRAINING & REFILLING** under LUBRICATION.
 4. Disconnect the internal wire harness from the Transmission Fluid Pressure (TFP) manual valve position switch.

NOTE: **Use care not to loose the 5 "O" rings that are located between the TFP manual valve position switch and the valve body.**

5. Remove the valve body bolts (1) that retain the TFP manual valve position switch (2). See **Fig. 52** .
6. Remove the TFP manual valve position switch.
7. Disconnect the internal wiring harness electrical connectors from the remaining valve body electrical components.
8. Remove the lube oil pipe bolt (6) and retainer (7). See **Fig. 53** .
9. Remove the lube oil pipe (5).
10. Remove the manual shaft detent spring bolt and spring (3).

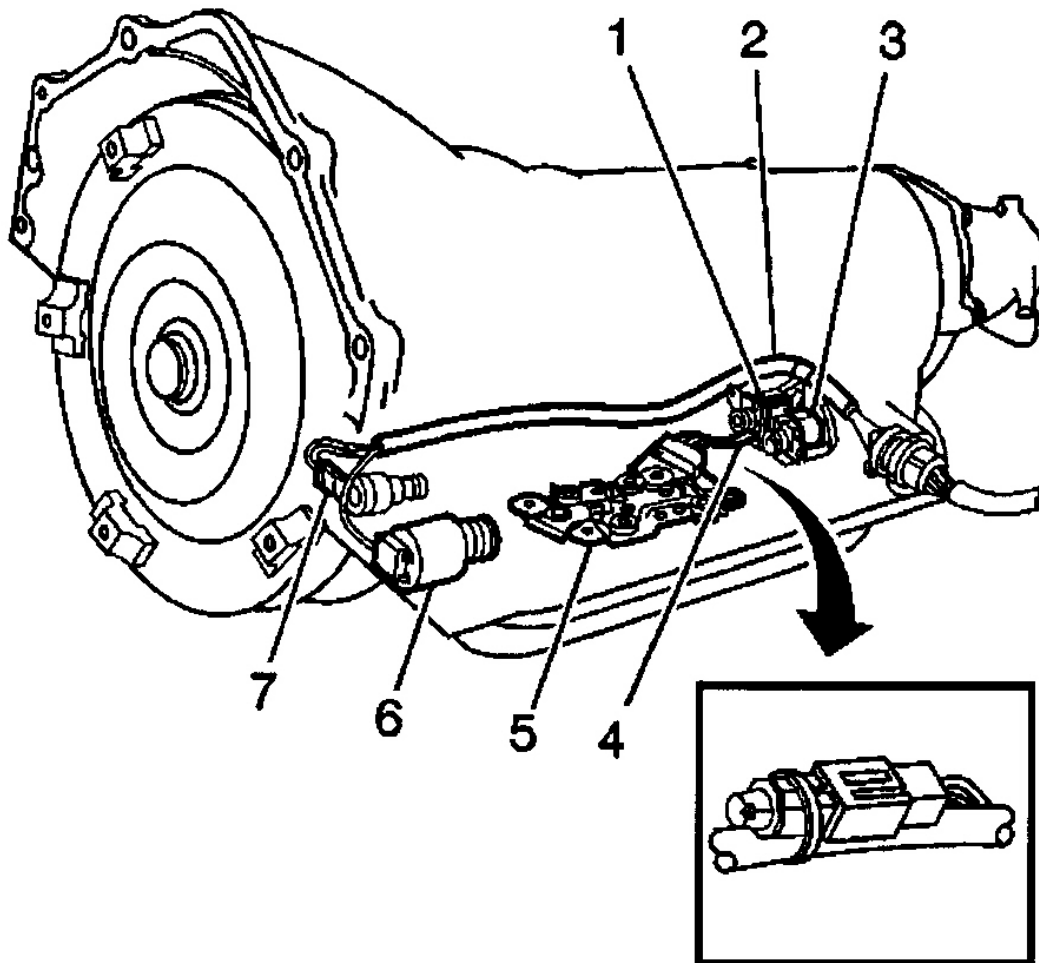
NOTE: **Keep the control valve body level when lowering it from the vehicle. This will prevent the loss of checkballs located in the valve body passages.**

11. Remove the remaining valve body bolts.
12. Carefully lower the valve body from the transmission. Use care not to drop the manual shaft valve.
13. Remove the valve body (2) which includes the following:
 - The accumulator housing (1).
 - The valve body to the spacer plate gasket.
 - The spacer plate.
14. Remove the manual valve (1) from the valve body. See **Fig. 54** .
15. Inspect the manual valve for nicks and burrs.
16. Remove the spacer plate to case gasket (2) from the case. The gasket may stick to the spacer plate. See **Fig. 55** .
17. Remove the PWM screen (1) from the case passage.
18. Remove the manual 2-1 band servo (1). See **Fig. 56** .
19. Remove the servo piston cushion spring (2).

20. Remove the manual 2-1 band servo piston pin retainer ring (2). See **Fig. 25** .
21. Remove the manual 2-1 band servo piston pin (5).
22. Remove the manual 2-1 band servo piston seal (4).

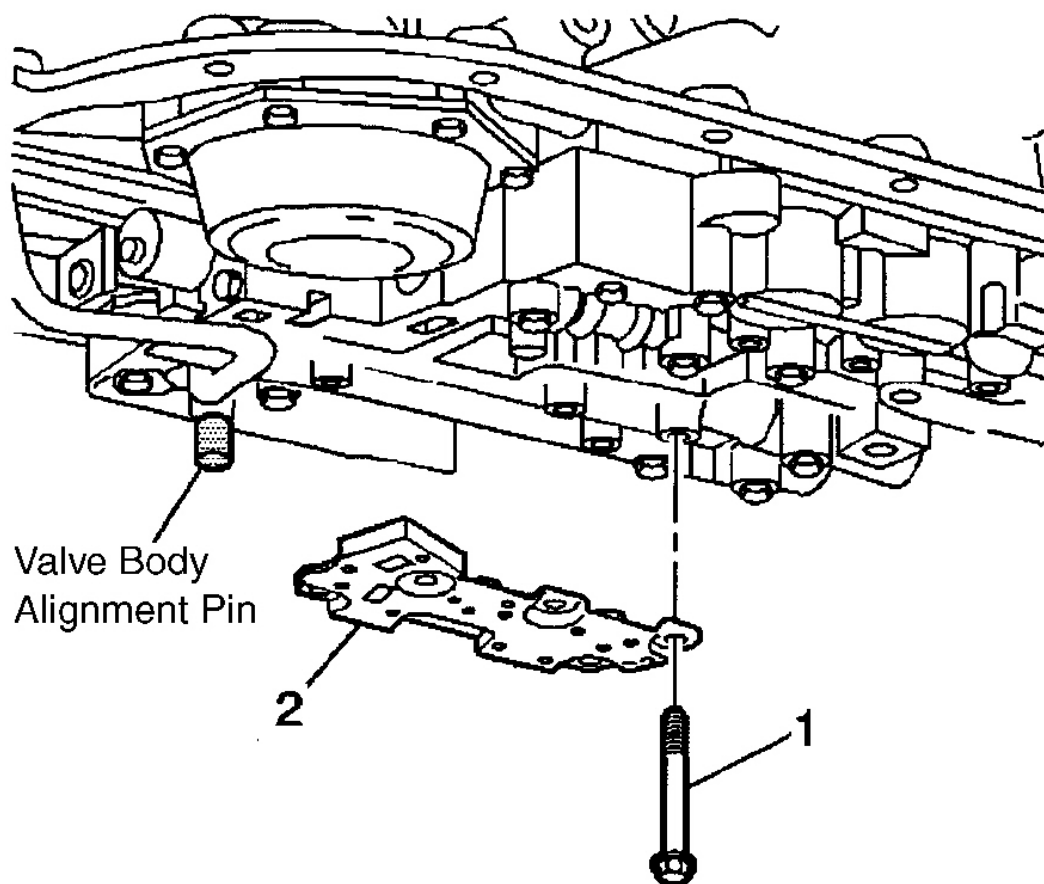
NOTE: **DO NOT** use a magnet in order to remove the checkballs. Using a magnet to remove the checkballs may magnetize the checkballs, causing metal particles to stick.

23. Remove the 8 checkballs (9 checkballs for some models). See **Fig. 57** .



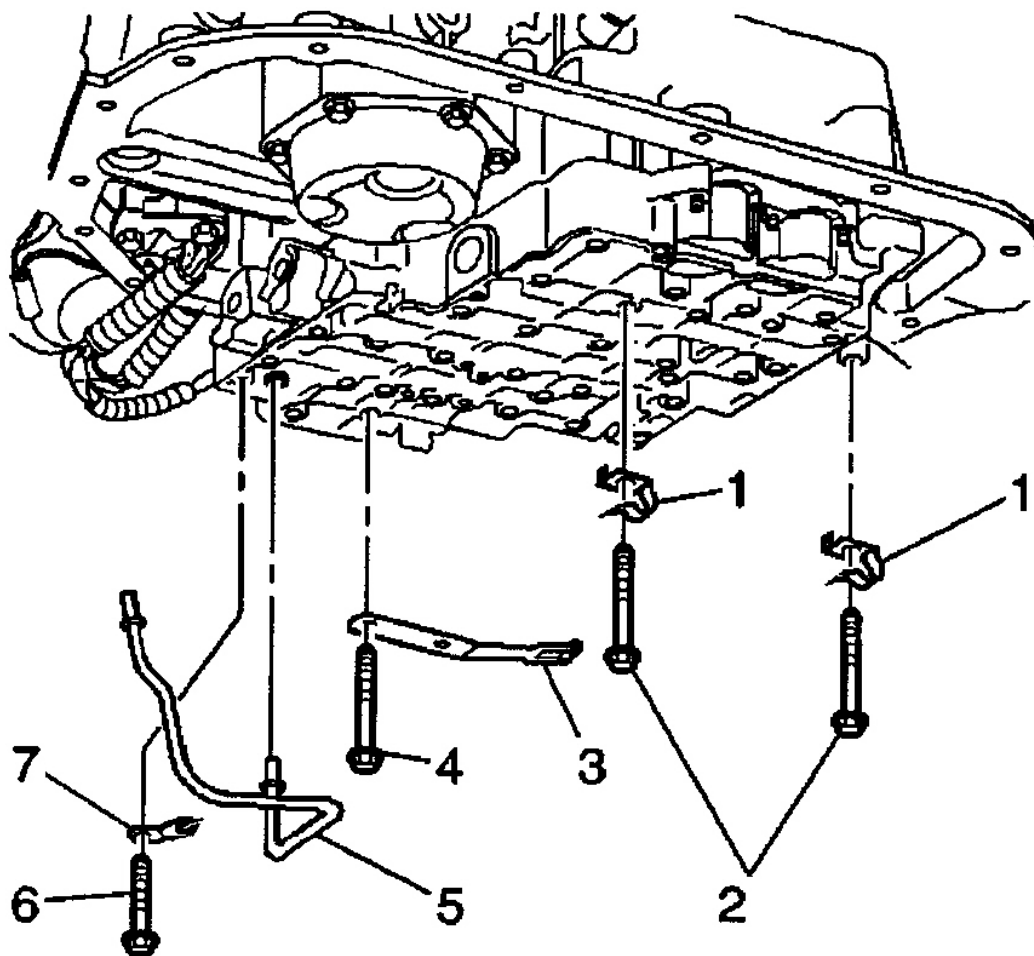
G00202998

Fig. 51: Locating Valve Body Components
Courtesy of GENERAL MOTORS CORP.



G00203003

Fig. 52: Removing Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.



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Fig. 53: Installing Valve Body Bolts & Related Parts
Courtesy of GENERAL MOTORS CORP.

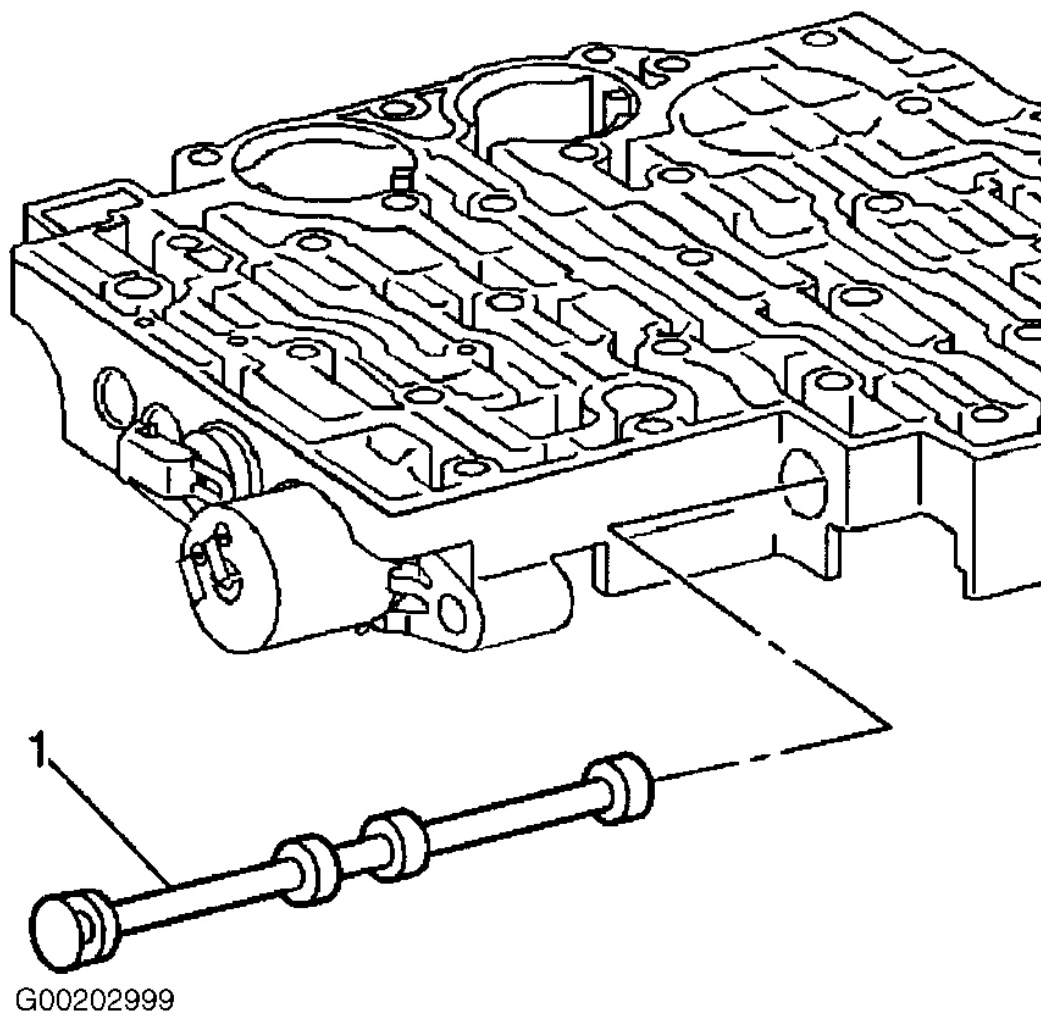
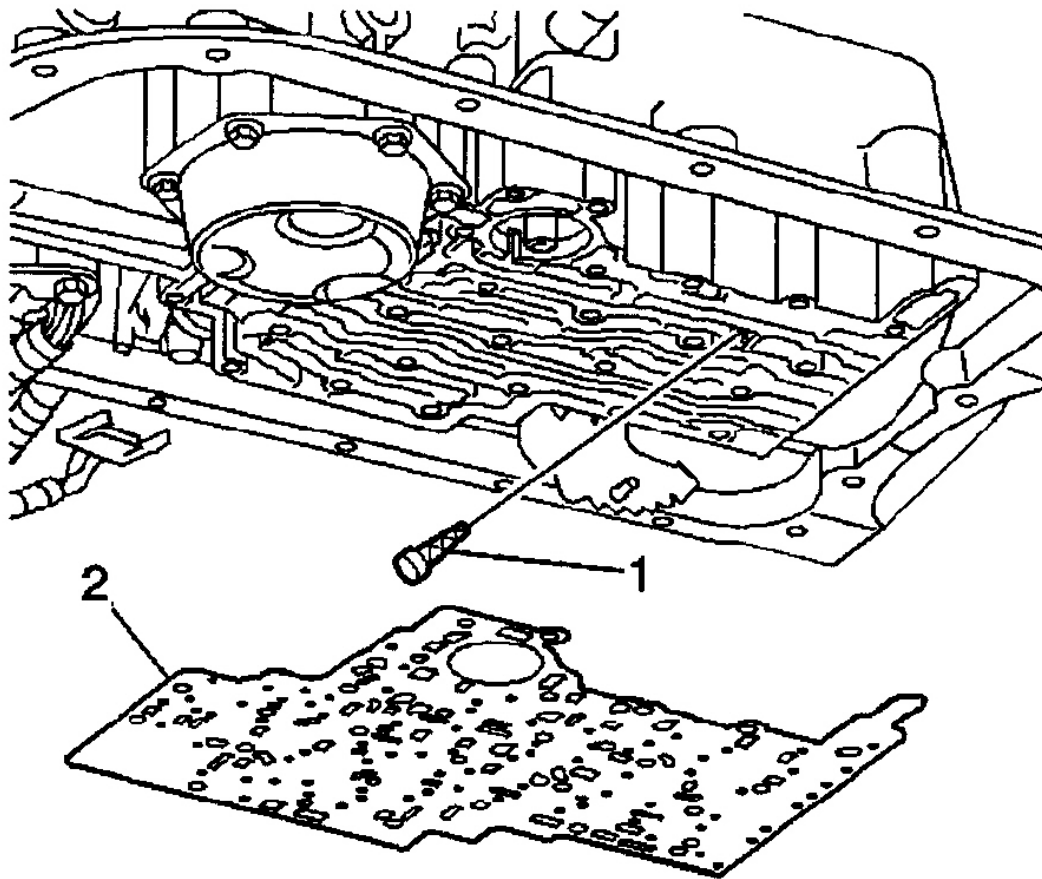
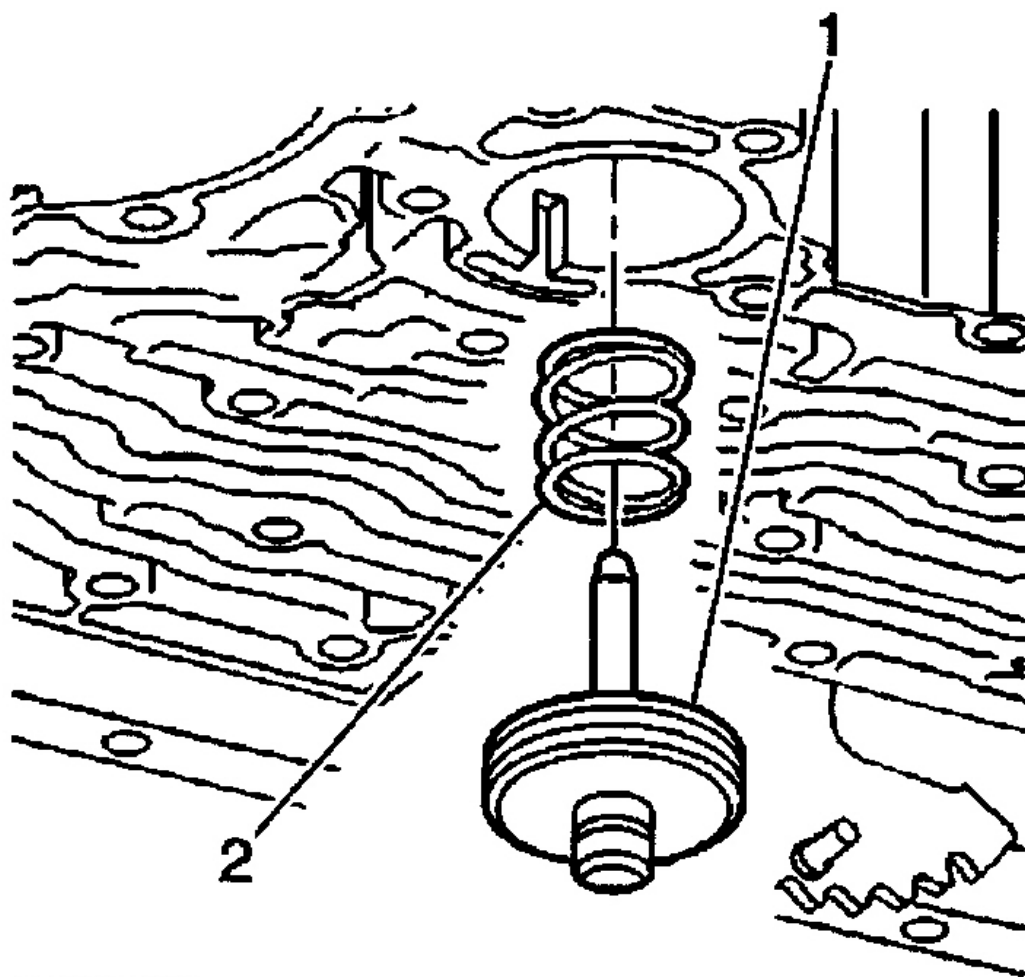


Fig. 54: Removing Manual Valve
Courtesy of GENERAL MOTORS CORP.



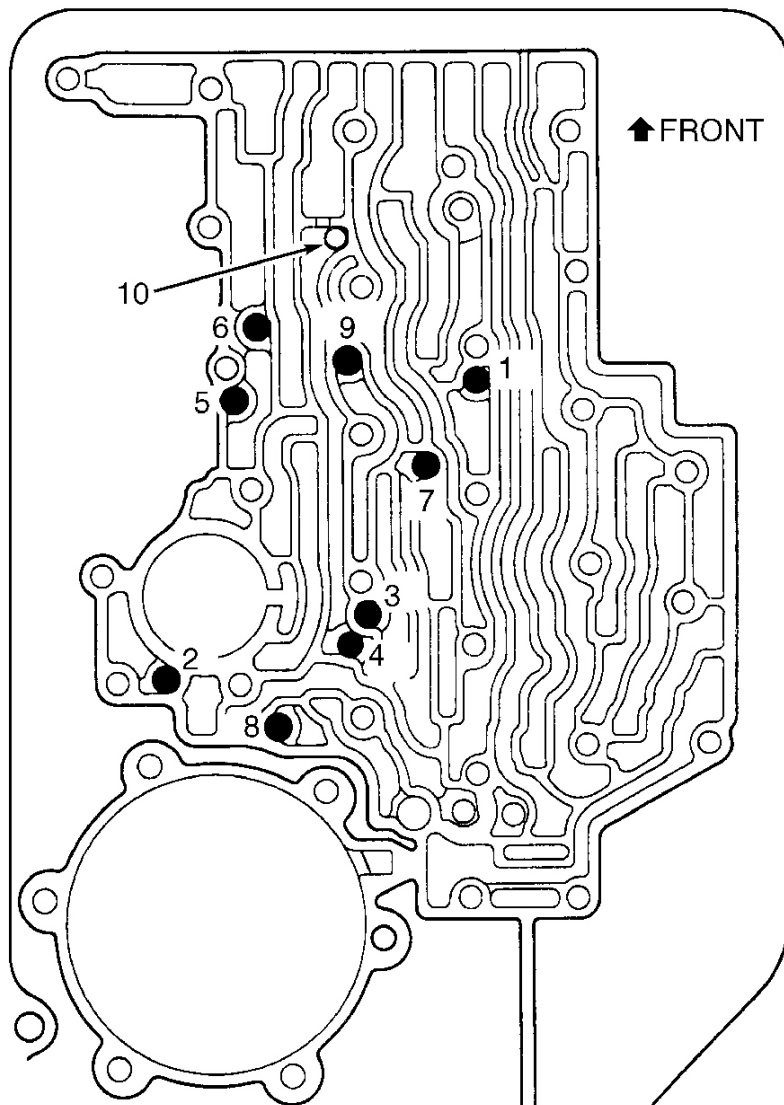
G00203000

Fig. 55: Removing Spacer Plate To Case Gasket
Courtesy of GENERAL MOTORS CORP.



G00203001

Fig. 56: Removing 2-1 Manual Band Servo
Courtesy of GENERAL MOTORS CORP.



- | | |
|-------------------------------------|-------------------------|
| 1. Overrun Clutch | 6. 4th Accumulator |
| 2. 2nd Accumulator
(Some Models) | 7. 3rd Clutch |
| 3. Front Band Apply | 8. Reverse |
| 4. 2nd Clutch | 9. 4th Clutch |
| 5. 3rd Accumulator | 10. PWM Solenoid Screen |

NOTE: Identifying check balls located at numbers 1-9.

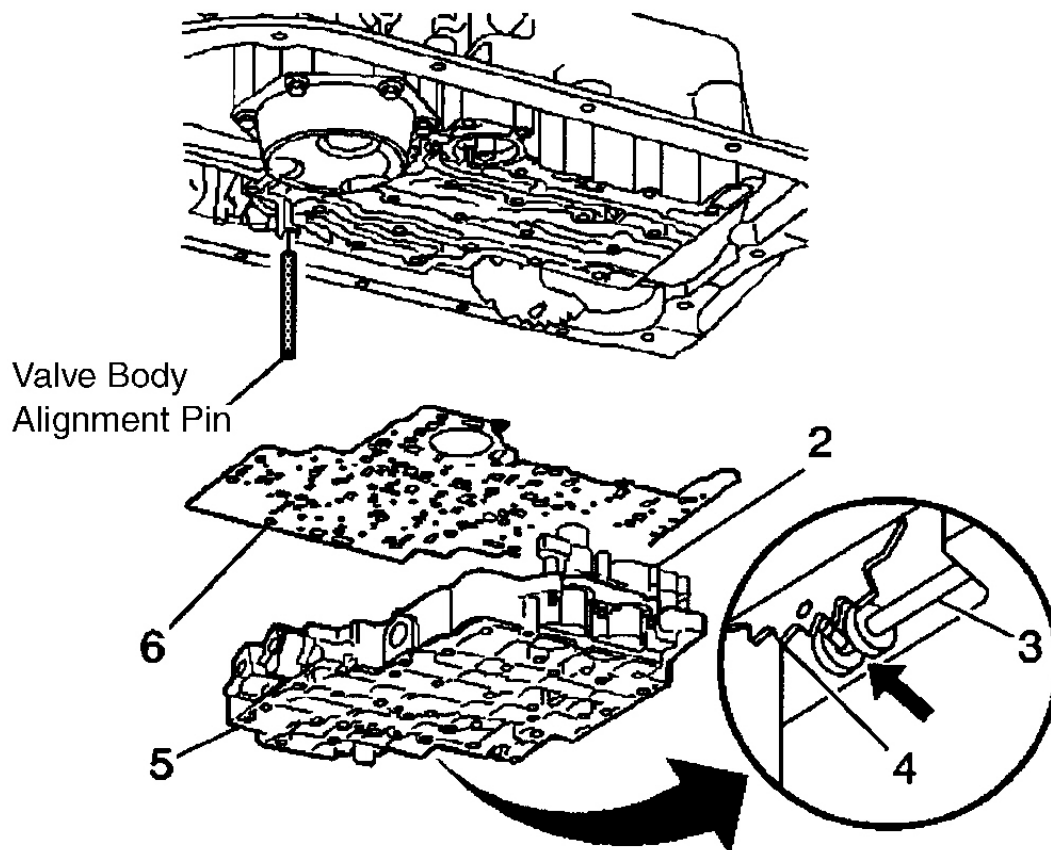
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Fig. 57: Identifying Check Ball Locations
Courtesy of GENERAL MOTORS CORP.

1. Install the 8 checkballs (9 checkballs for some models) into the valve body. See **Fig. 57** .
 - The checkball marked as number 2, is used on RCP, RDP, ZJP and ZLP models only.
 - To hold the checkballs in place, use the Transjel(R).
2. Install the PWM screen into the valve body.
3. Install a new manual 2-1 band servo piston seal (4) onto the manual 2-1 band servo piston (3). See **Fig. 25** .
4. Install the manual 2-1 band servo piston pin (5) into the manual 2-1 band servo piston (3).
5. Install the manual 2-1 band servo piston pin retainer ring (4).
6. Install the manual 2-1 band servo piston cushion spring (2). See **Fig. 56** .

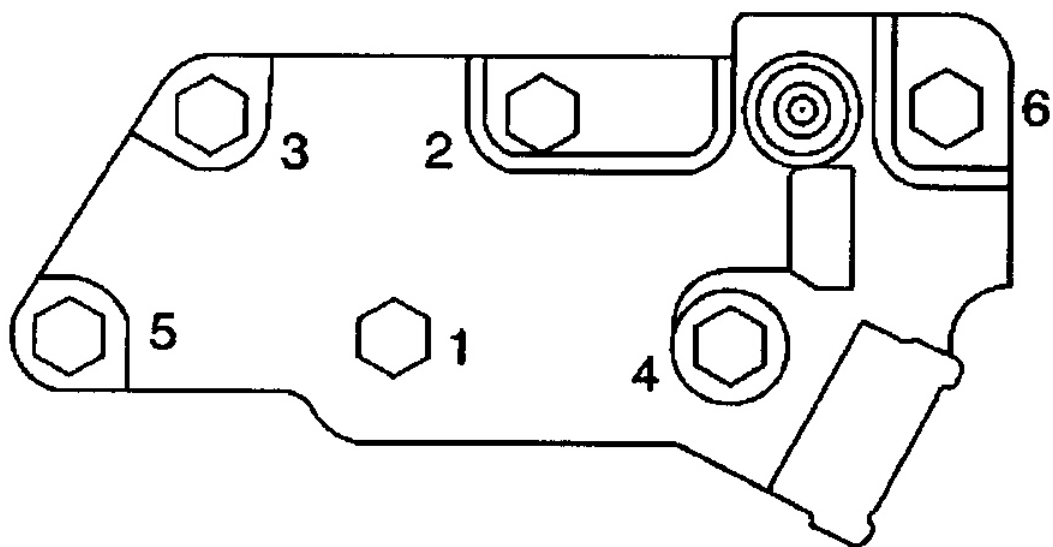
NOTE: **Make certain that the tapered end of the manual 2-1 band servo piston pin contacts the manual 2-1 band.**

7. Install the manual 2-1 band servo piston (1).
8. Install the manual valve (1) into the valve body. See **Fig. 54** .
9. To aid in alignment and assembly, install valve body align pin. See **Fig. 58** .
10. Install the valve body gasket (6).
11. Install the valve body (5). Attach the manual valve to the detent lever while installing the valve body.
12. Install the transmission fluid pressure manual valve position switch (2). See **Fig. 52** .
13. Install the transmission fluid pressure manual valve position switch bolts (1) finger tight.
14. Tighten the bolts in the order shown. See **Fig. 59** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
15. Remove valve body align pin.
16. Install the manual shaft detent roller and spring (3) and bolts. See **Fig. 53** .
17. Install the 2 wiring harness clips (1) and bolts (2).
18. Install the wiring harness clip (1) and bolts (2).
19. Install the lube oil pipe (5) with the short end into the valve body.
20. Install the lube oil pipe retainer (7) and the bolt (6).
21. Install the valve body bolts and tighten in the order shown. See **Fig. 60** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
22. Install the remaining valve body bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
23. Connect the internal wiring harness to the valve body electrical components.
24. Install the transmission filter. See **DRAINING & REFILLING** under LUBRICATION.



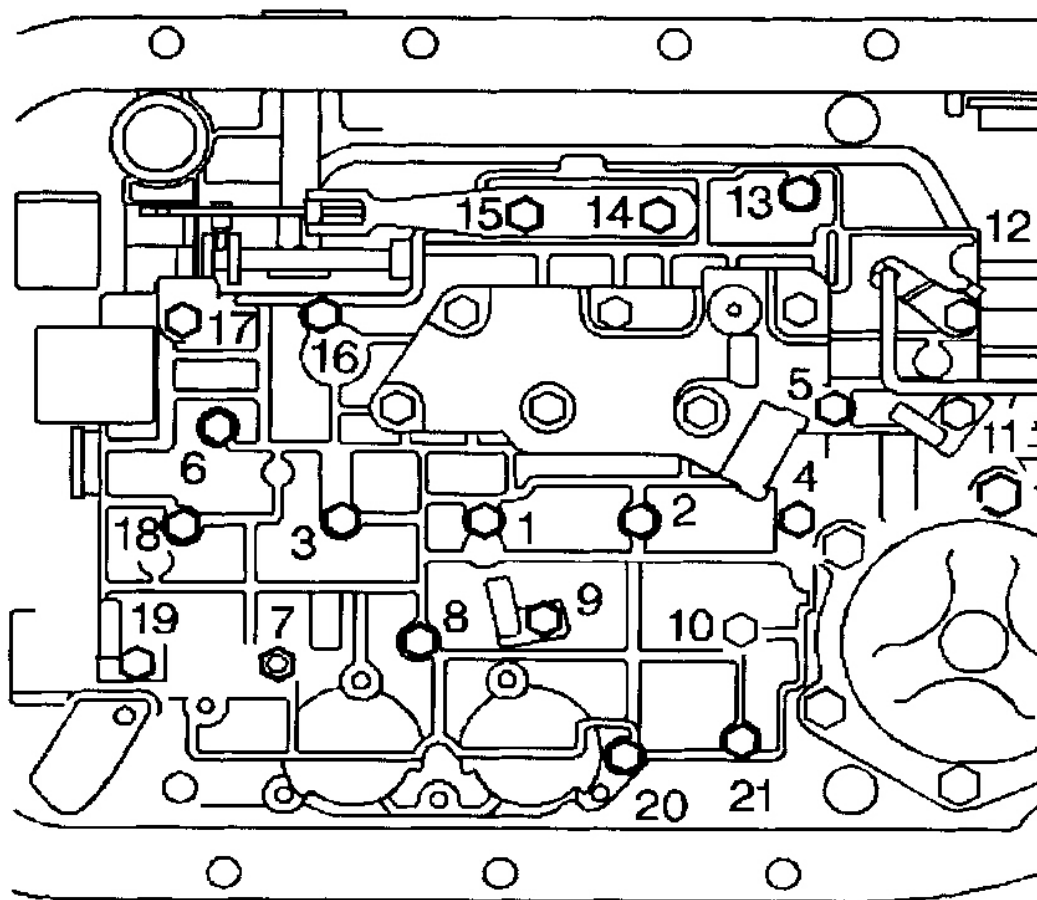
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Fig. 58: Installing Valve Body Alignment Pin
Courtesy of GENERAL MOTORS CORP.



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Fig. 59: TFP Switch Tightening Sequence
Courtesy of GENERAL MOTORS CORP.



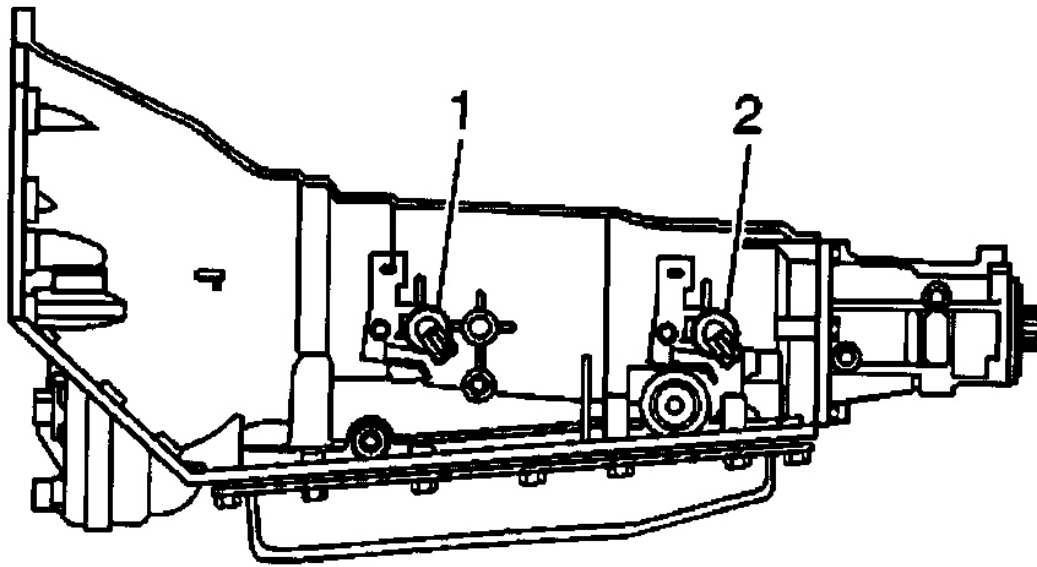
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Fig. 60: Valve Body Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS CORP.

VEHICLE SPEED SENSOR (INPUT)

Removal

1. Raise the vehicle.
2. Disconnect the input speed sensor (1) electrical connector. See **Fig. 38** .
3. Remove the input speed sensor bolt.
4. Remove the input speed sensor (1). See **Fig. 61** .
5. Inspect the vehicle speed sensor assembly (1) for any evidence of damage.



G00096159

Fig. 61: Identifying Vehicle Speed Sensors
Courtesy of GENERAL MOTORS CORP.

Installation

1. Lubricate the input speed sensor seal with automatic transmission fluid.
2. Install the input speed sensor (1). See **Fig. 61** .
3. Install speed sensor bolt. Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .
4. Connect the input speed sensor electrical connector. See **Fig. 38** .
5. Lower the vehicle.

VEHICLE SPEED SENSOR (OUTPUT)

Removal

NOTE: **This procedure is for 2WD vehicles. If the vehicle is equipped with 4WD, the output speed sensor is located on the transfer case.**

1. Raise and support the vehicle.
2. Disconnect the output speed sensor (2) electrical connector. See **Fig. 38** .
3. Remove the output speed sensor bolt.
4. Remove the output speed sensor (2). See **Fig. 61** .
5. Inspect the output speed sensor assembly (2) for any evidence of damage.

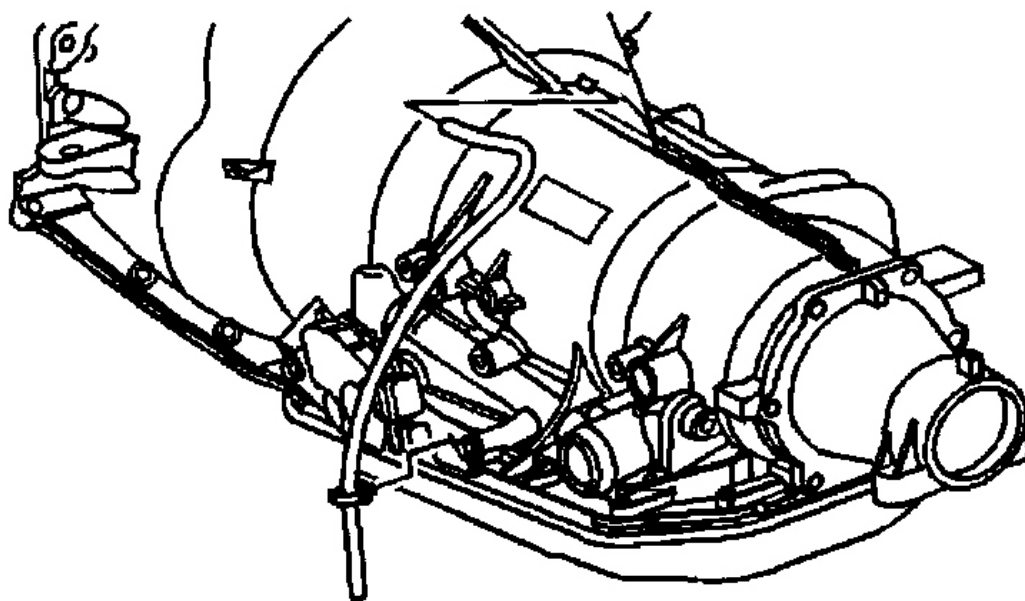
Installation

1. Lubricate the output speed sensor seal with ATF.
2. Install the output speed sensor (2). See **Fig. 61** .
3. Install the output speed sensor bolt. Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .
4. Connect the output speed sensor (2) electrical connector. See **Fig. 38** .
5. Lower the vehicle.

VENT HOSE

Removal

Remove the vent hose clip. Remove the vent hose from the transmission vent. See **Fig. 62** .



G00096151

Fig. 62: Removing & Installing Vent Hose
Courtesy of GENERAL MOTORS CORP.

Installation

Install the vent hose to the transmission. Install the vent hose to the clip. Install the bolt and the clamp. See **Fig. 62** . Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Auxiliary Oil Cooler Nut	17 (23)
Extension Housing Bolt	25 (34)
Filler Tube Nut	18 (24)
Filler Tube Stud	35 (47)
Forward Servo Cover Bolt	18 (24)
Heat Shield Bolt	13 (17)
Manual Shaft Nut	18 (24)
Oil Level Indicator Nut	35 (47)
Oil Pan Bolts	18 (24)
Oil Pan Drain Plug	13 (18)
Park Lock Bracket Bolt	18 (24)
Park/Neutral Position Switch Bolt	18 (24)
Reverse Servo Cover Bolt	18 (24)
Shift Cable Bracket Bolt	18 (24)
Transmission Control Lever Nut	18 (24)
Transmission Mount Nuts	30 (40)
Transmission Support Bolts & Nuts	70 (95)
INCH Lbs. (N.m)	
Accumulator-To-Case Bolt	97 (11)
Auxiliary Oil Cooler Support Bolt	106 (12)
Fluid Pressure Switch	97 (11)
Manual Detent Spring Bolt	97 (11)
Oil Pass Cover Bolt	97 (11)
Pressure Control Solenoid Bolt	97 (11)
Shift Cable Bracket Bolt	89 (10)
TCC Solenoid Bolt	97 (11)
Transmission Fluid Indicator Stop Bolt	97 (11)
Valve Body-To-Case Bolt	97 (11)
Vent Tube Clamp	89 (10)
VSS Bolt	97 (11)

2003-04 AUTOMATIC TRANSMISSIONS

A/T Servicing - Sierra & Silverado (Allison LCT 1000)

APPLICATION

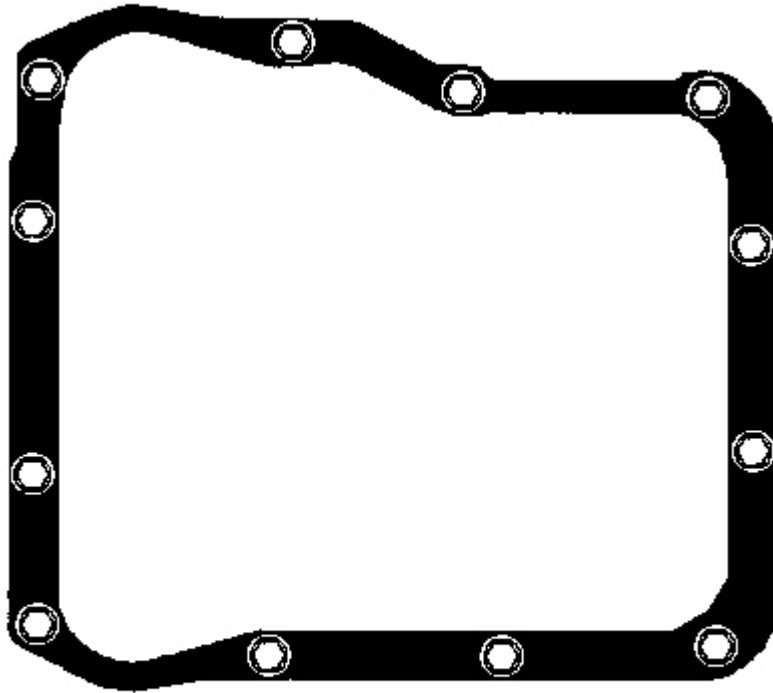
CAUTION: Please refer to latest revision of any General Motor's technical service bulletin pertaining to this transmission. A manufacturer's exchange/parts restriction program may be in force.

TRANSMISSION APPLICATION

Application	Engine Size	Transmission Model (RPO Code)
Chevrolet		
Cab & Chassis Silverado 3500, Silverado 2500 HD & Silverado 3500	6.6L Or 8.1L	LCT 1000 (M74)
GMC		
Cab & Chassis Sierra 3500, Sierra 2500 HD & Sierra 3500	6.6L Or 8.1L	LCT 1000 (M74)

IDENTIFICATION

OIL PAN GASKET



G00031937

Fig. 1: Identifying Oil Pan Gasket (Allison LCT 1000)
Courtesy of GENERAL MOTORS CORP.

LUBRICATION

SERVICE INTERVALS

NOTE: Follow the Short Trip/City Maintenance Schedule if any one of these conditions is true for your vehicle:

- Most trips are less than 5-10 miles. This is particularly important when outside temperatures are below freezing.
- Most trips include extensive idling (such as frequent driving in stop and go traffic).
- Most trips are through dusty areas or off road frequently.

- **Vehicle is frequently operated in dusty areas or off road.**
- **Vehicle is frequently used to tow a trailer or use a carrier on top of your vehicle.**
- **If the vehicle is used for delivery service, police, taxi or other commercial application.**

Under the above conditions or severe driving conditions, change transmission fluid every 25,000 miles. Under normal driving conditions, change transmission fluid every 50,000 miles.

CHECKING FLUID LEVEL & CONDITION

Checking Level (Cold)

NOTE: The fluid level rises as fluid temperature increases. **DO NOT** fill above the "COLD CHECK" band if the transmission fluid is below normal operating temperatures. If the fluid level is within the "COLD CHECK" band, the transmission may be operated until the fluid is hot enough to perform a "HOT RUN" check. If the fluid level is not within the "COLD CHECK" band, add or drain as necessary to bring it to the middle of the "COLD CHECK" band. Always check the fluid level at least twice using Checking Level (Cold). Consistent readings are important to maintaining proper fluid level. If inconsistent readings persist, check the transmission vent assembly to be sure that it is clean and unclogged. If readings are still inconsistent, contact your nearest Allison dealer.

NOTE: The purpose of the cold check is to determine if the transmission has enough fluid to be operated safely until a hot check can be made.

1. Bring the vehicle to a complete stop on a level surface using the service brakes.
2. Ensure the engine is at low idle (500-800 RPM).
3. With the service brakes applied, put the transmission in Park position.
4. Engage the park pawl by slowly releasing the service brakes. The vehicle may move slightly as the pawl engages.
5. Apply the parking brake and make sure it is properly engaged.
6. Run the engine for at least one minute. Apply the service brakes and shift to Drive, then to Neutral, and then shift to Reverse to fill the hydraulic system.
7. Ensure the engine is at low idle (500-800 RPM).
8. With the service brakes applied, place the transmission in the Park position.
9. Engage the park pawl by slowly releasing the service brakes. The vehicle may move slightly as the pawl engages.
10. With the engine running, remove the fluid level indicator from the fill tube and wipe the indicator clean.
11. Insert the fluid level indicator into the fill tube and remove. Check the fluid level reading. Repeat the check procedure to verify the reading.

12. Perform a hot check at the first opportunity after the normal operating sump temperature of 160-200°F (71-93°C) is reached.

Checking Level (Hot)

NOTE: **The fluid must be hot to ensure an accurate check. The fluid level rises as temperature increases.**

1. Operate the transmission in Drive range until normal operating temperature is reached. Normal operating temperature is indicated by a sump temperature of 160-200°F (71-93°C) or a converter-out temperature of 180-220°F (82-104°C). If a transmission temperature gauge is not present, check fluid level when the engine water temperature gauge has stabilized and the transmission has been operated under load for at least one hour.
2. Bring the vehicle to a complete stop on a level surface using the service brake.
3. Ensure the engine is at low idle RPM (500-800 RPM).
4. With the service brakes applied, put the transmission in the Park position.
5. Engage the park pawl by slowly releasing the service brakes. The vehicle may move slightly as the pawl engages.
6. Apply the parking brake and make sure it is properly engaged.
7. With the engine running, remove the fluid level indicator from the fill tube and wipe the indicator clean.

NOTE: **Always check the fluid level at least twice using the procedure described above. Consistent readings are important to maintaining proper fluid level. If inconsistent readings persist, check the transmission vent assembly to ensure it is clean and unclogged. If readings are still inconsistent, contact your nearest Allison distributor or dealer.**

8. Insert the fluid level indicator into fill the tube and remove. Check fluid level reading. Repeat the check procedure to verify the reading.

NOTE: **Safe operating level is within the "HOT RUN" band on the fluid level indicator. The width of the "HOT RUN" band represents approximately 1.06 qts. (1.0L) of fluid at normal operating sump temperature.**

9. If the fluid level is not within the "HOT RUN" band, add or drain as necessary to bring the fluid level to within the "HOT RUN" band.

Checking Fluid Condition

NOTE: **Transmission fluid must be changed whenever there is evidence of dirt or a high temperature condition. High temperature causes the transmission fluid to be discolored or to have a strong odor. Local conditions, severity of operation, or duty cycle may require more or less frequent fluid or filter change intervals.**

1. Examine the drained fluid for evidence of dirt.

NOTE: Cooler water may be contaminated by engine oil if equipped with an engine oil cooler. Ensure to locate the correct source of cooler water contamination.

2. Examine the drained fluid for evidence of water. Obvious water contamination of the transmission fluid or transmission fluid in the cooling water from the heat exchanger indicates a leak between the water and fluid areas of the cooler. Inspect and pressure test the cooler to confirm the leak. Replace leaking coolers.

NOTE: Engine coolant in the transmission hydraulic system requires immediate action. Failure to clean or replace all contaminated components may result in premature transmission failure.

3. Examine the drained fluid for evidence of engine coolant.
4. Examine the drained fluid for evidence of metal. Metal particles in the fluid, other than minute particles normally trapped in the oil filter, indicate internal transmission damage. When this occurs, check the inside of the oil pan for excessive metal particles. See **INTERNAL FILTER** .
5. Metal contamination requires complete transmission disassembly.

NOTE: Flush the transmission cooling system and inspect for restrictions following a transmission failure. Failure to repair or replace restricted oil cooling system components may result in premature transmission failure.

6. Clean all internal and external hydraulic circuits, cooler, and all other areas where the particles could lodge. See **OIL COOLER FLUSHING** .

RECOMMENDED FLUIDS

Manufacturer recommends Dexron-III ATF.

FLUID CAPACITIES

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

TRANSMISSION FLUID CAPACITIES

Application	Refill - Qts. (L)	Dry Fill - Qts. (L)
Allison LCT 1000	7.4 (7.0)	12.7 (12.0)

DRAINING & REFILLING

1. Remove drain plug (6) and drain plug seal (5). See **Fig. 2** . Drain the transmission fluid into a suitable

container.

2. Inspect the drained fluid. See **CHECKING FLUID CONDITION** under CHECKING FLUID LEVEL & CONDITION.

NOTE: **Use a standard strap type filter wrench to remove the control main filter.**

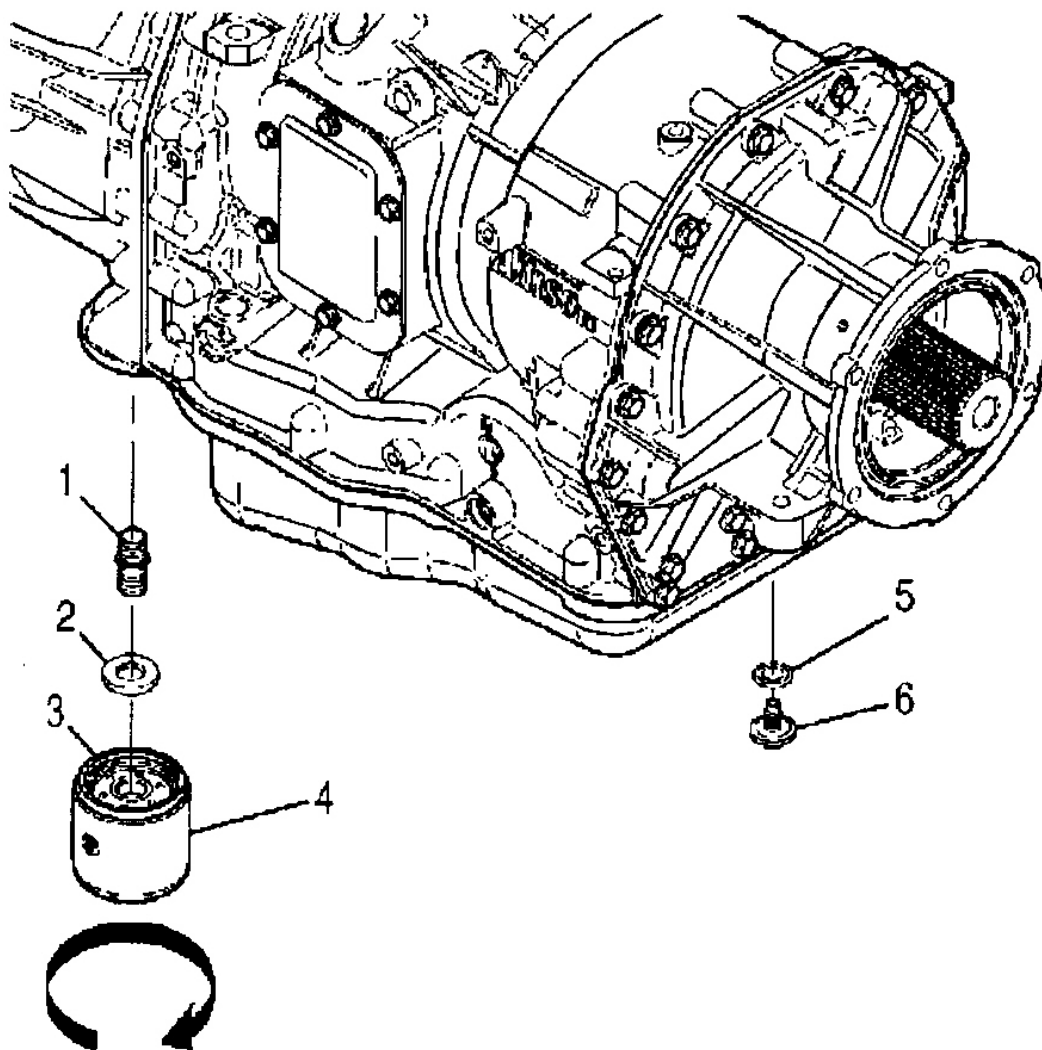
3. Remove filter (4) by rotating it in the counterclockwise direction. See **Fig. 2** .
4. Remove the magnet (2) from the filter attachment tube (1) in the converter housing or from the top of the control main filter (3).
5. Clean any metal debris from the magnet. Presence of any metal pieces larger than dust may indicate that transmission replacement or overhaul is required.
6. Reinstall the magnet (2) onto the filter attachment tube (1) which is in the converter housing. See **Fig. 2** .
7. Lubricate the gasket (3) on the control main filter with transmission fluid.
8. Install, by hand, the control main filter (4) until the gasket on the control main filter touches the converter housing.

NOTE: **Turning the control main filter more than one full turn after gasket contact will damage the filter and may cause fluid leakage.**

9. Turn the filter ONE FULL TURN ONLY after gasket contact.
10. Reinstall the drain plug (6) and drain plug seal (5). Tighten the drain plug to specification. See **TORQUE SPECIFICATIONS** .
11. Fill transmission with appropriate fluid to proper level. See **RECOMMENDED FLUIDS** and **FLUID CAPACITIES** .

NOTE: **DTC P0701 may often set following fluid service. Cycling the ignition clears the code and allows Drive or Reverse range to be attained.**

12. Cycle the ignition until Drive or Reverse range is attained.
13. Check the transmission fluid level. See **CHECKING FLUID LEVEL & CONDITION** .



G00092185

Fig. 2: Removing & Installing Oil Filter & Drain Plug
 Courtesy of GENERAL MOTORS CORP.

OIL COOLER FLUSHING & FLOW TEST

CAUTION: Flushing Fluid (J-35944-22) is environmentally safe, yet powerful enough to cut through transmission fluid to dislodge any contaminants from the cooler. The safety precautions on the label regarding potential skin and eye irritations associated with prolonged exposure are typical precautions that apply to many similar cleaning solutions. It should be noted that according to General Motors, use of other non-approved fluids for cooler

flushing can have an adverse reaction to the seals inside the transmission.

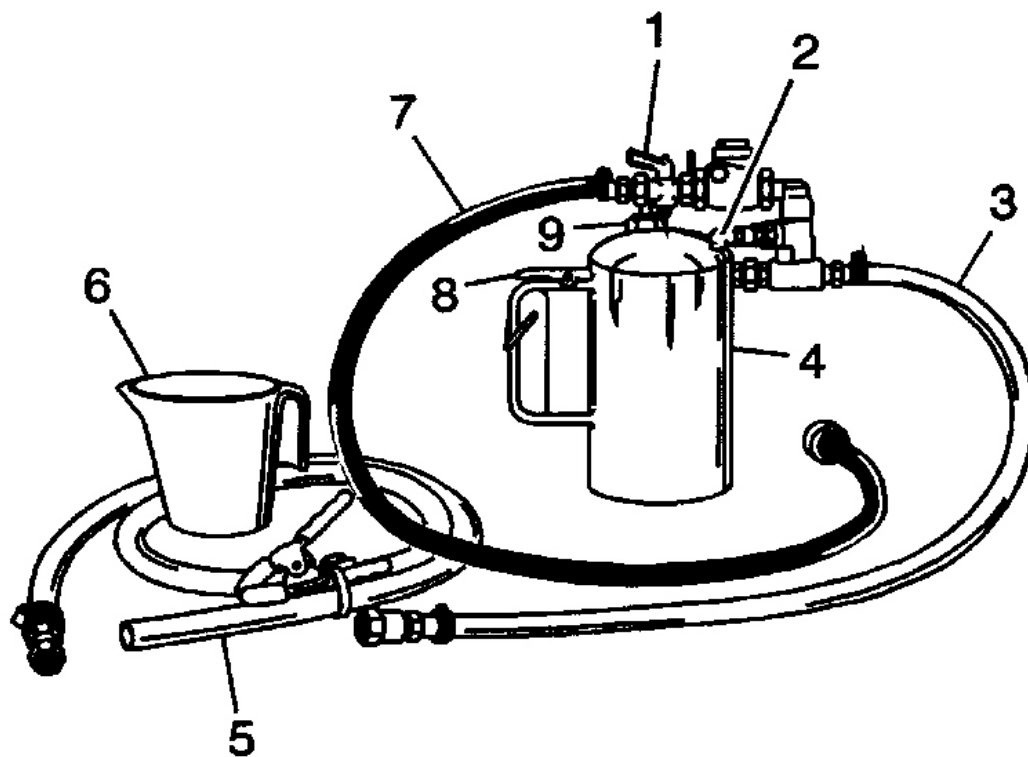
CAUTION: DO NOT use solutions that contain alcohol or glycol. Use of solutions that contain alcohol or glycol may damage flushing equipment, oil cooler components and/or transmission components.

NOTE: GM studies indicate that plugged or restricted transmission oil coolers and pipes cause insufficient transmission lubrication and elevated operating temperatures which can lead to premature transmission wear out. Many cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flushing and flow checking the auxiliary oil cooler, if equipped. GM requires that oil cooler flushing and flow checking be performed whenever a transmission is removed from the vehicle for service within warranty, including: Goodwin, SWAT, major overhaul, torque converter replacement and oil pump replacement.

NOTE: Tools Required: Transmission Oil Cooler and Line Flusher (J-35944-A), Transmission Oil Cooler Flushing Fluid (J 35944-22) and Transmission Oil Cooler Flusher Adapters (J-44835-1).

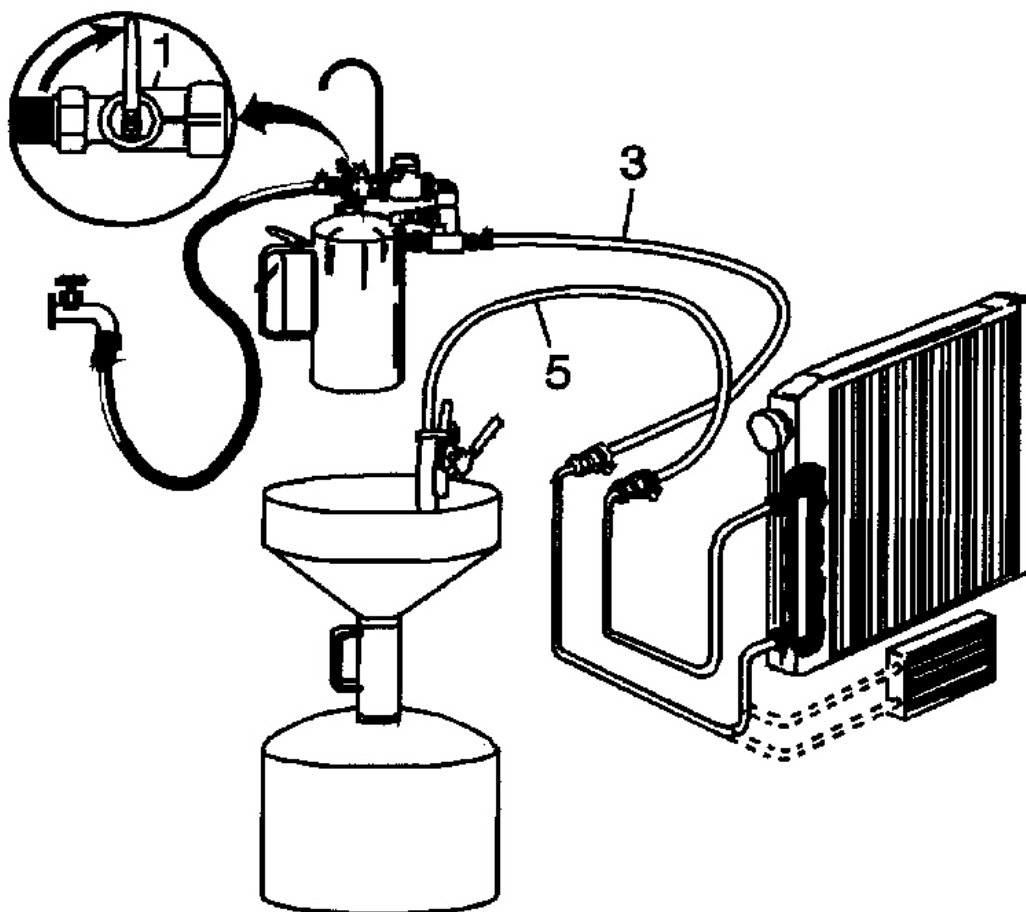
Preparation

1. After the repair or replacement transmission is installed in the vehicle, DO NOT reconnect the oil cooler pipes.
2. Remove the fill cap (9) on the Transmission Oil Cooler and Line Flusher and fill the flusher tank (4) with 20 oz. (0.6L) of flushing fluid using the measuring cup (6). DO NOT overfill. See **Fig. 3**.
3. Install the fill cap (9) on the transmission oil cooler and line flusher and pressurize the flusher tank (4) to 80-100 psi, using the shop air supply at the tank air valve (9).
4. Connect the transmission oil cooler flusher adapters to the transmission oil cooler lines.
5. Connect the transmission oil cooler and line flusher discharge hose (5) to the oil cooler return pipe (top connector). See **Fig. 4**.
6. Clip the discharge hose (5) onto the oil drain container.
7. Attach the transmission oil cooler and line flusher to the undercarriage of the vehicle with the hook provided, and connect the flushing system feed supply hose (3) from the transmission oil cooler and line flusher to the oil cooler feed pipe (bottom connector).
8. With the water supply valve (1) on the transmission oil cooler and line flusher in the OFF position, connect the water supply hose (7) from the transmission oil cooler and line flusher to the water supply at the faucet.
9. Turn ON the water supply at the faucet.



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Fig. 3: Identifying Flushing Equipment
Courtesy of GENERAL MOTORS CORP.



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Fig. 4: Connecting Flushing Equipment
 Courtesy of GENERAL MOTORS CORP.

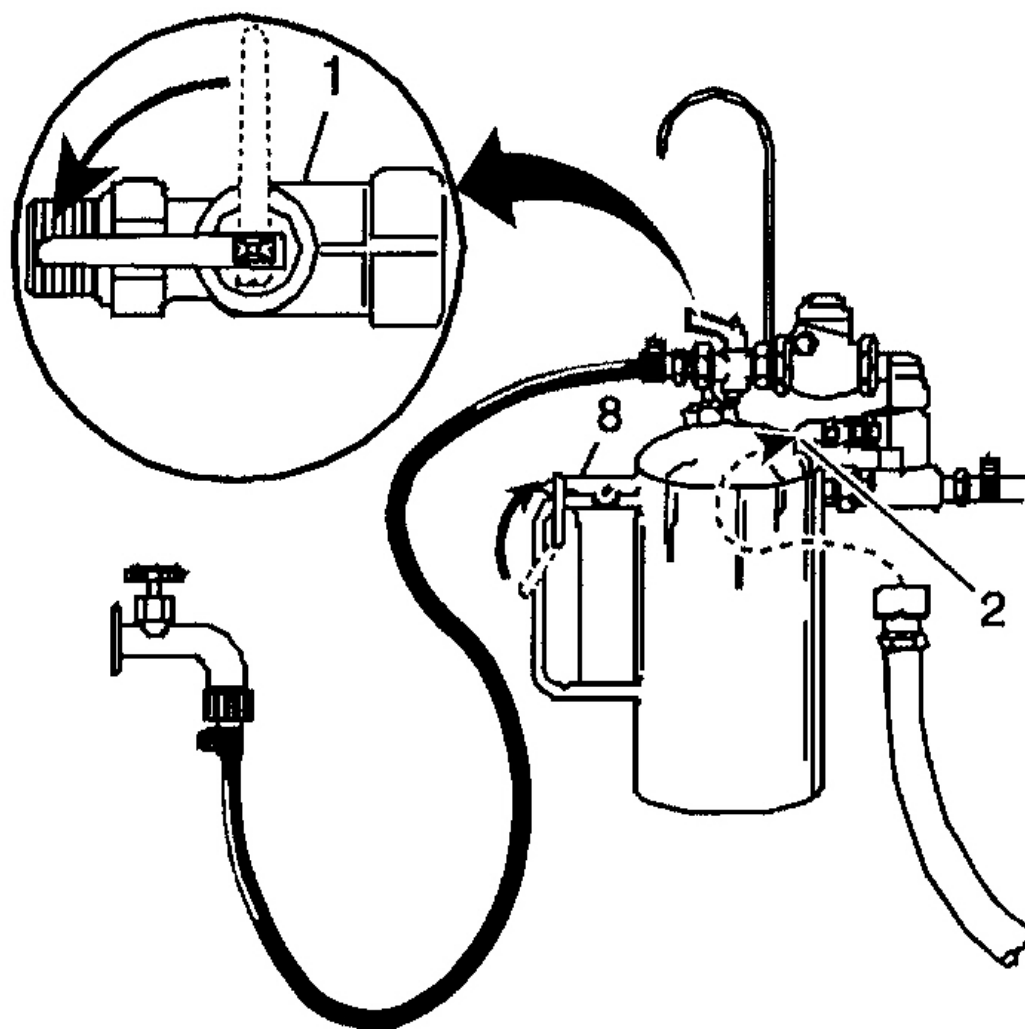
Initial Flush

1. Turn the transmission oil cooler and line flusher water supply valve (1) to the ON position and allow water to flow through the oil cooler and pipes for 10 seconds to remove any remaining transmission fluid. See **Fig. 5** . If water does not flow through the oil cooler and pipes, the cause of the blockage must be diagnosed and the plugged component must be repaired or replaced. Continue with the cooler flushing and flow check procedure once the blockage is corrected.
2. Turn the transmission oil cooler and line flusher water supply valve (1) to the OFF position and clip the discharge hose (5) onto an appropriate container with a lid, to avoid splashback. See **Fig. 6** .
3. Turn the transmission oil cooler and line flusher water supply valve (1) to the ON position and depress the trigger (8) to mix cooler flushing solution into the water flow. See **Fig. 3** . Use the clip provided on the handle to hold the trigger (8) down. The discharge will foam vigorously when the solution is

introduced into the water stream.

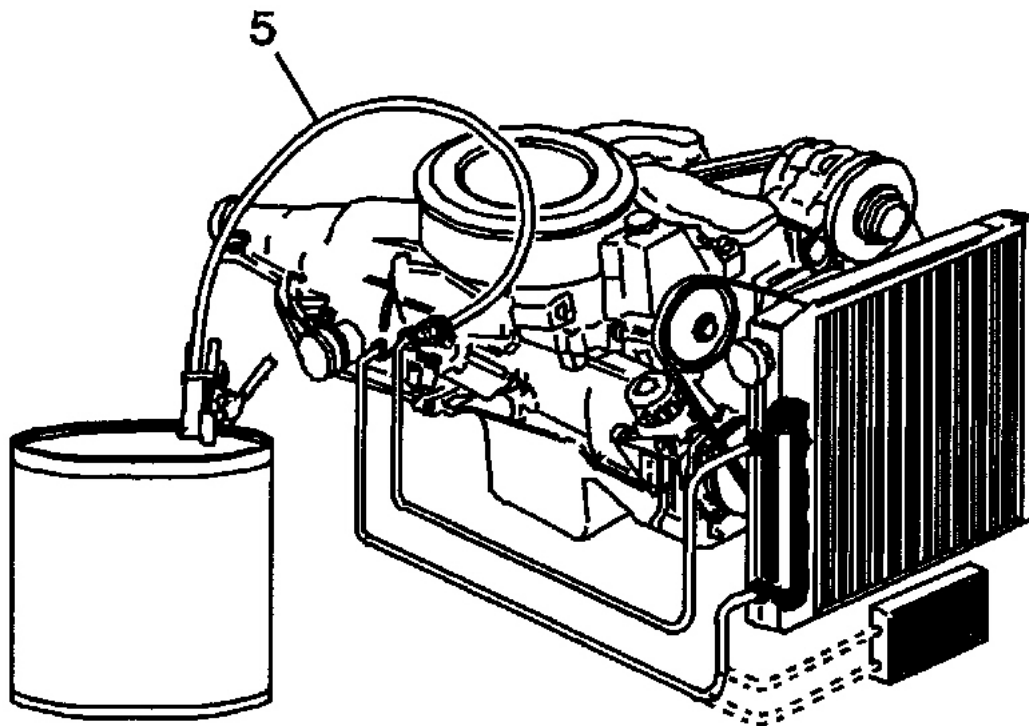
NOTE: **Flushing for approximately 2 minutes in each cooler line direction will result in a total of about 8-10 gallons of waste fluid. This mixture of water and flushing fluid is to be captured in an appropriate container for proper disposal.**

4. Flush the oil cooler and pipes with water and solution for 2 minutes. During this flush, attach the shop air supply of 120 psi to the flushing system feed air valve (2) located on the transmission oil cooler and line flusher for 3-5 seconds at the end of every 15-20 second interval to create a surging action.
5. Release the trigger (8) and turn the transmission oil cooler and line flusher water supply valve (1) to the OFF position.



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Fig. 5: Flushing Oil Cooling System
Courtesy of GENERAL MOTORS CORP.



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Fig. 6: Capturing Fluid Discharge
Courtesy of GENERAL MOTORS CORP.

Back Flush

1. Disconnect both hoses from the oil cooler pipes and then connect them to the opposite oil cooler pipe. This will allow the oil cooler and pipes to be back flushed.
2. Repeat steps 2 and 4 of the INITIAL FLUSH procedure.
3. Release the trigger (8) of the transmission oil cooler and line flusher and allow water only to rinse the oil cooler and pipes for one minute.
4. Turn the transmission oil cooler and line flusher water supply valve (1) to the OFF position and turn OFF the water supply at the faucet. See **Fig. 4**.
5. Attach the shop air supply to the flushing system feed air valve (2) on the transmission oil cooler and line flusher, and blow out the water from the oil cooler and pipes. Continue until no water comes out of the discharge hose (5).

Flow Check

1. Disconnect both hoses from the oil cooler pipes. Connect the oil cooler feed pipe (vertical/top connector)

to the transmission and the return pipe (horizontal/bottom connector) to the discharge hose (5). Clip the discharge hose (5) onto the empty oil drain container. See **Fig. 6** .

2. Confirm the transmission is filled with ATF. See **CHECKING FLUID LEVEL & CONDITION** .
3. Start the engine with the transmission in Park range and run for 30 seconds. A minimum of 2 qts. (1.9L) must be discharged during this 30-second run time. If fluid flow is greater than 2 qts. (1.9L) in 30 seconds, go to next step. If fluid flow is less than 2 qts. (1.9L) in 30 seconds, perform the following diagnosis: Disconnect the oil cooler feed line at the radiator. Connect the discharge hose (5) to the cooler feed line. Clip the discharge hose (5) to the empty oil drain container. See **Fig. 6** . Start the engine with the transmission in Park range and run for 30 seconds. A minimum of 2 qts. (1.9L) must be discharged during this 30-second run time. Perform the following according to the flow rate:
 - Insufficient feed flow: inspect the transmission.
 - Sufficient feed flow: inspect the oil cooler return pipe and the oil cooler (and auxiliary cooler, if equipped).
4. Remove the discharge hose (5), reconnect the cooler feed and return pipes to the transmission and refill the unit to the proper fluid level. Inspect the transmission oil cooler pipe connections at the radiator, the auxiliary cooler (if equipped) and the transmission for leaks.

Clean-up

1. Disconnect the water supply hose (7) from the transmission oil cooler and line flusher and bleed any remaining air pressure from the flusher tank (4). See **Fig. 3** .
2. Remove the fill cap (9) from the transmission oil cooler and line flusher and return any unused flushing solution to its container. Rinse the transmission oil cooler and line flusher with water. DO NOT store the transmission oil cooler and line flusher with flushing solution in it.
3. After every 3rd use, clean the transmission oil cooler and line flusher as described in the instructions included with the tool.
4. Dispose of any waste water/solution and transmission fluid in accordance with local regulations.

ON-VEHICLE REPAIRS

NOTE: Various components may be serviced without transmission removal, depending on application. For servicing of these components, see appropriate component under **ADJUSTMENTS** and/or **REMOVAL & INSTALLATION** . For additional information on testing electrical components, see appropriate **DIAGNOSIS** article.

ADJUSTMENTS

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. DO NOT use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See **AIR BAG**

DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

WARNING: Before servicing any electrical component, the ignition key must be in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures. If a tool or equipment could easily come in contact with a live exposed electrical terminal, also disconnect the negative battery cable. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.

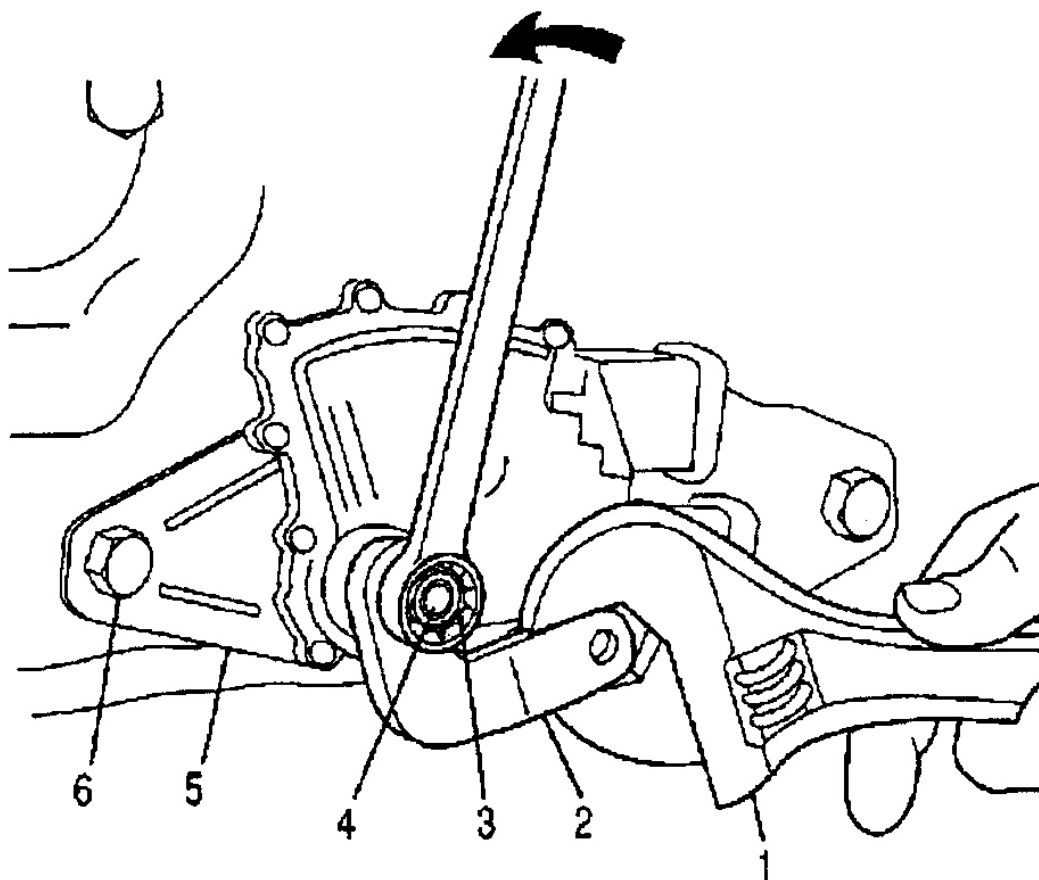
PARK/NEUTRAL POSITION SWITCH

NOTE: Tools required: Park/Neutral Position Switch Alignment Tool (J-41364-A).

1. Disconnect the external wiring harness from the PNP switch (5). See **Fig. 7** .
2. Disconnect the shift linkage/cable from the shift lever at the transmission.
3. Use a wrench (1) to keep the shift lever (2) from rotating. Remove the nut (3) from the end of the selector shaft (4). Carefully remove the shift lever (2) from the selector shaft (4).
4. Loosen the 2 bolts (6) so PNP switch may be rotated with slight effort.
5. Place the selector shaft in the Neutral position as follows: Place a wrench on the selector shaft flats and rotate the shaft to its furthest clockwise position. See **Fig. 7** . Rotate the selector shaft counter clockwise 2 detents.
6. Remove the splash shield.
7. Position the PNP switch alignment tool over the selector shaft (3) so the 2 tabs on the tool engage the 2 slots in the PNP switch (2) just outside the selector shaft. See **Fig. 8** . Rotate the PNP switch (2) until the single tab (1) at the other end of the tool engages the single slot at the top of the PNP switch.
8. Hold the tool in engagement with the PNP switch to maintain alignment of the PNP switch with the selector shaft. Tighten the 2 bolts (4) to specification. See **TORQUE SPECIFICATIONS** .
9. Re-install the splash shield.

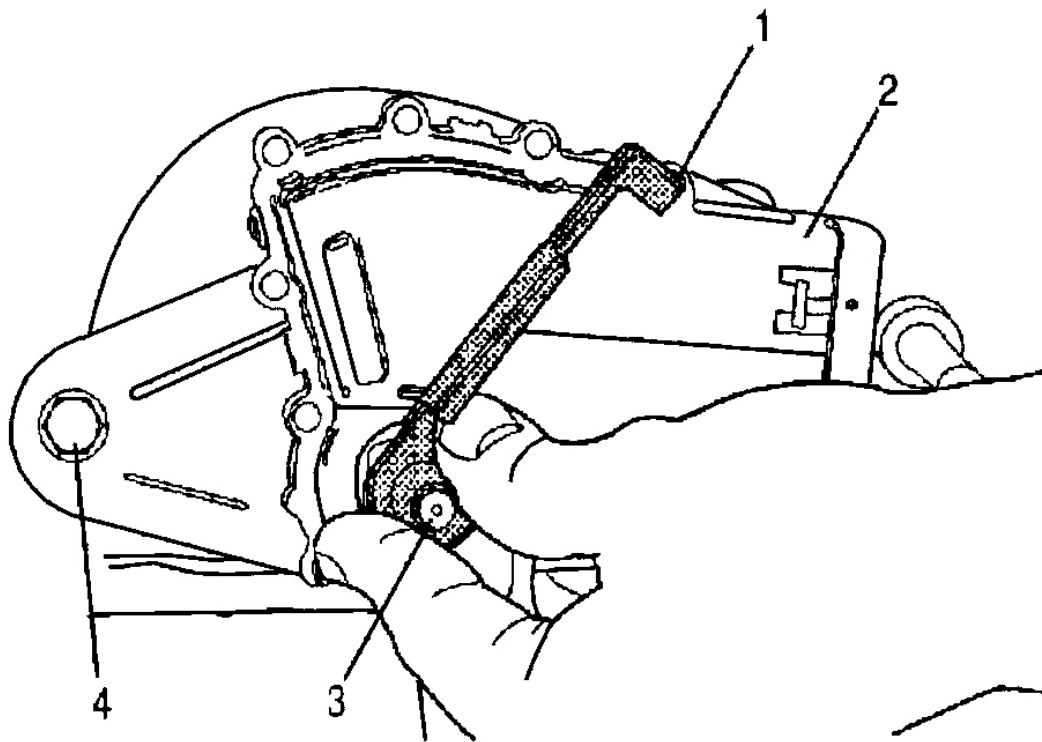
CAUTION: DO NOT drive the selector lever onto the selector shaft. DO NOT use an impact wrench in order to tighten the selector lever nut. Hold the lever with a wrench while tightening the nut. Failure to follow these instructions may result in transmission damage.

10. Reinstall shift lever (2). Install nut (3), by hand, on the end of selector shaft (4). Use a wrench (1) to keep the shift lever from rotating. See **Fig. 7** . Tighten nut (3) to specification. See **TORQUE SPECIFICATIONS** .
11. Reconnect the shift selector linkage/cable to the shift lever (2).
12. Connect the external wiring harness connector to the PNP switch.



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Fig. 7: Removing & Installing Shift Lever Nut
Courtesy of GENERAL MOTORS CORP.



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Fig. 8: Using Park/Neutral Position Switch Alignment Tool
Courtesy of GENERAL MOTORS CORP.

SHIFT CABLE

1. Ensure the gearshift lever and the transmission manual shaft lever are in the Park position.
2. Raise and support the vehicle.
3. Pull back the white plastic cover (1) on the center connector. See **Fig. 9** .
4. Pull up on the center tabs of the lock button (2). See **Fig. 10** .

NOTE: **This step must be performed correctly to avoid a misadjusted cable. Do not grasp the shift cable end (2) during this procedure.**

5. Release the shift cable end (2) and allow the Blue spring to tension/adjust the shift cable system. See **Fig. 11** .
6. Pull the White cover (3) on the shift cable end (1) back.
7. Push the Natural colored lock button (2) down to engage the locking teeth on the shift cable end (1). See **Fig. 12** .

8. Release the White cover (1). See **Fig. 13** .
9. Verify the White cover (1) conceals the Natural colored lock (2). See **Fig. 14** .
10. If the White cover (1) does not conceal the Natural colored lock (2), the shift cable must be readjusted.
11. Test the transmission for proper shift operation.
12. If all of the gear positions cannot be achieved, the shift cable must be readjusted.

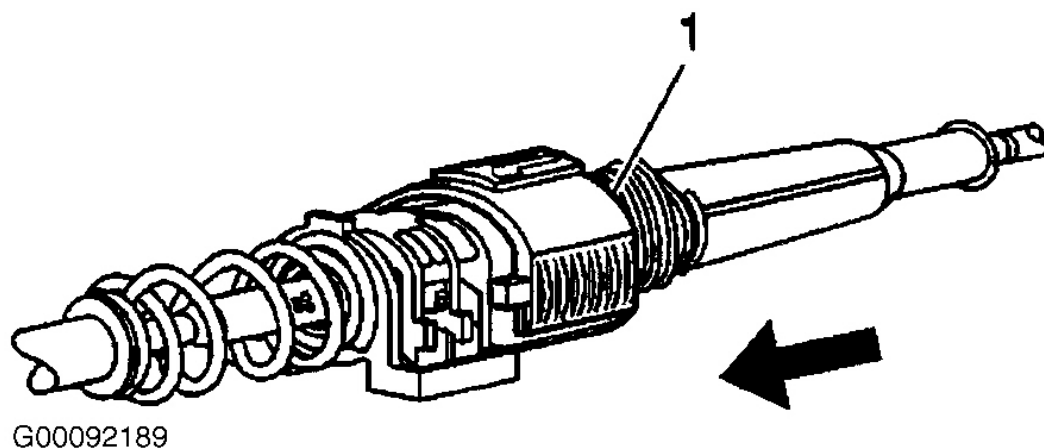


Fig. 9: Pulling Back White Plastic Cover
Courtesy of GENERAL MOTORS CORP.

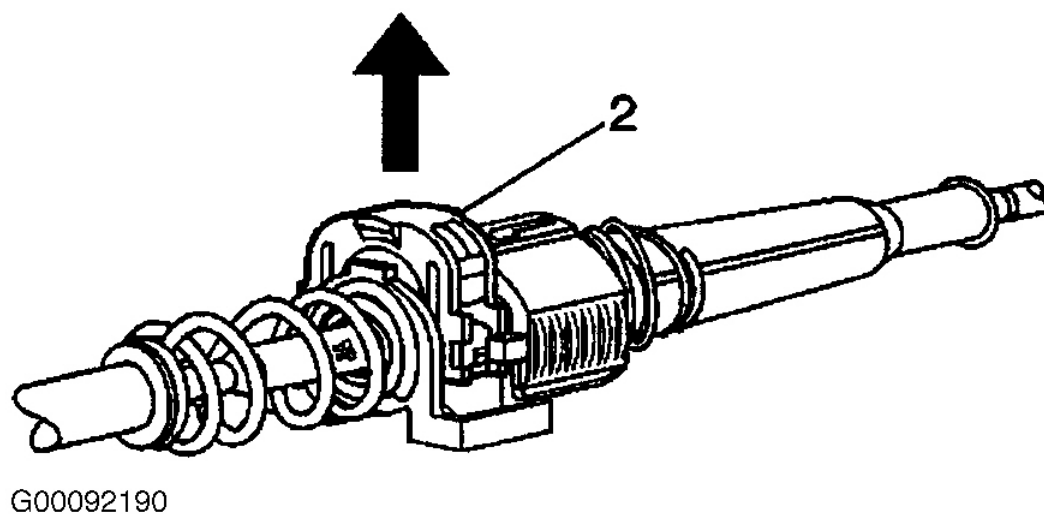
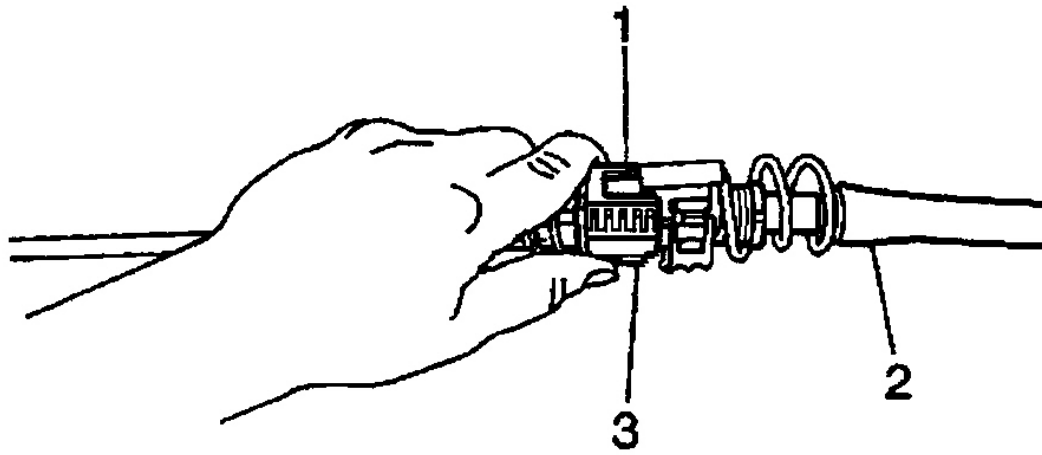
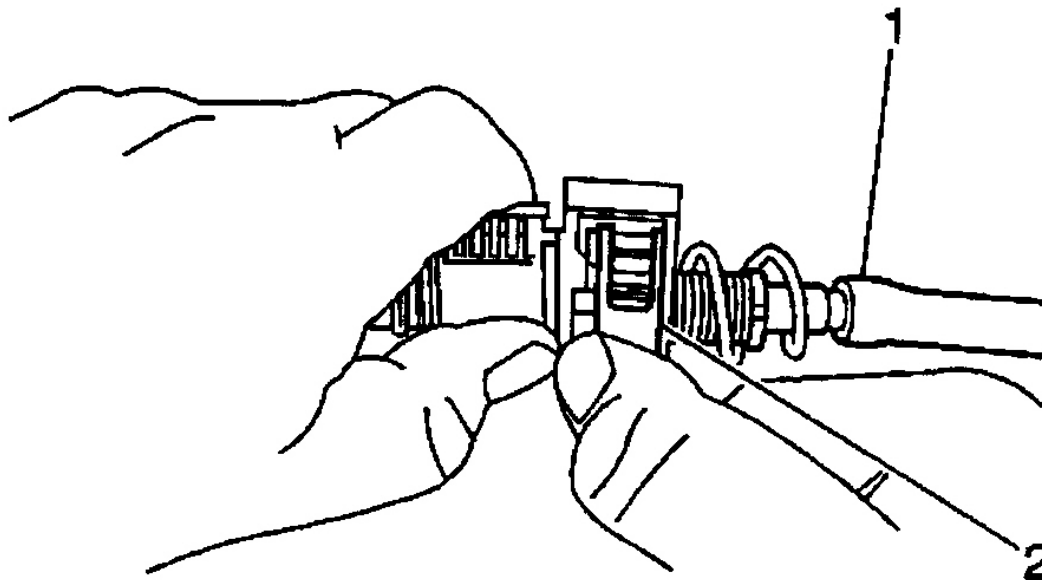


Fig. 10: Pulling Up Lock Button Tab
Courtesy of GENERAL MOTORS CORP.



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Fig. 11: Releasing Shift Cable End
Courtesy of GENERAL MOTORS CORP.



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Fig. 12: Pushing Natural Colored Lock Button Down To Engage Locking Teeth

Courtesy of GENERAL MOTORS CORP.

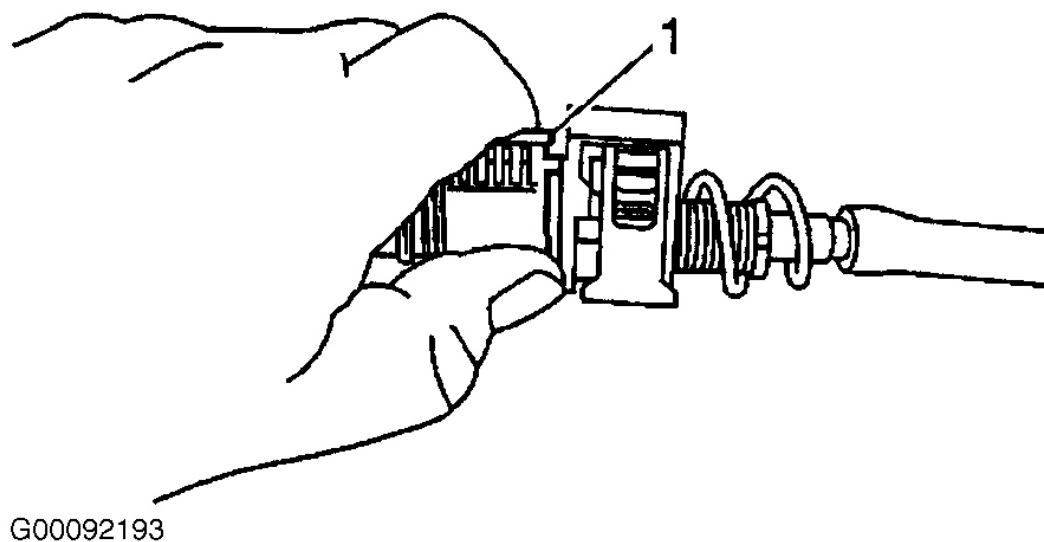


Fig. 13: Releasing White Cover
Courtesy of GENERAL MOTORS CORP.

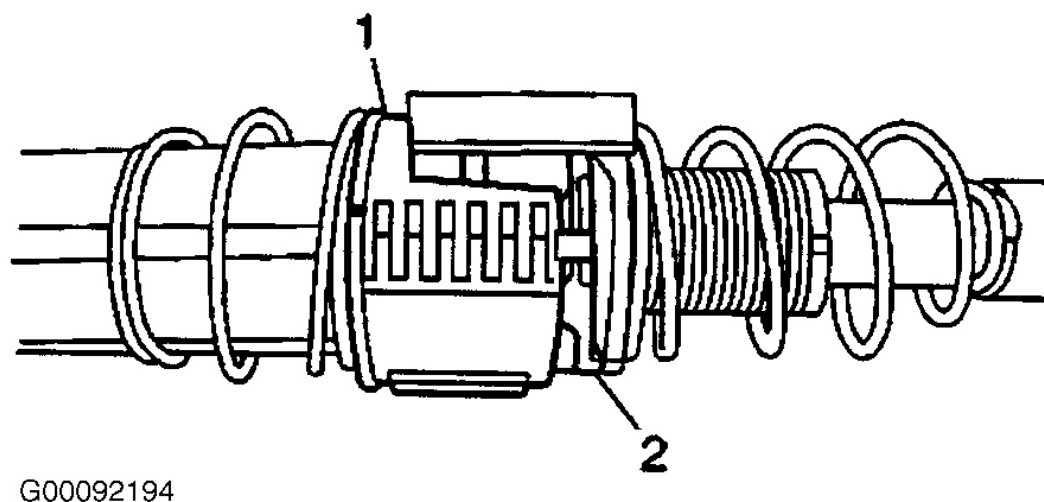


Fig. 14: Verifying White Cover Conceals The Lock
Courtesy of GENERAL MOTORS CORP.

REMOVAL & INSTALLATION

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. DO NOT use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

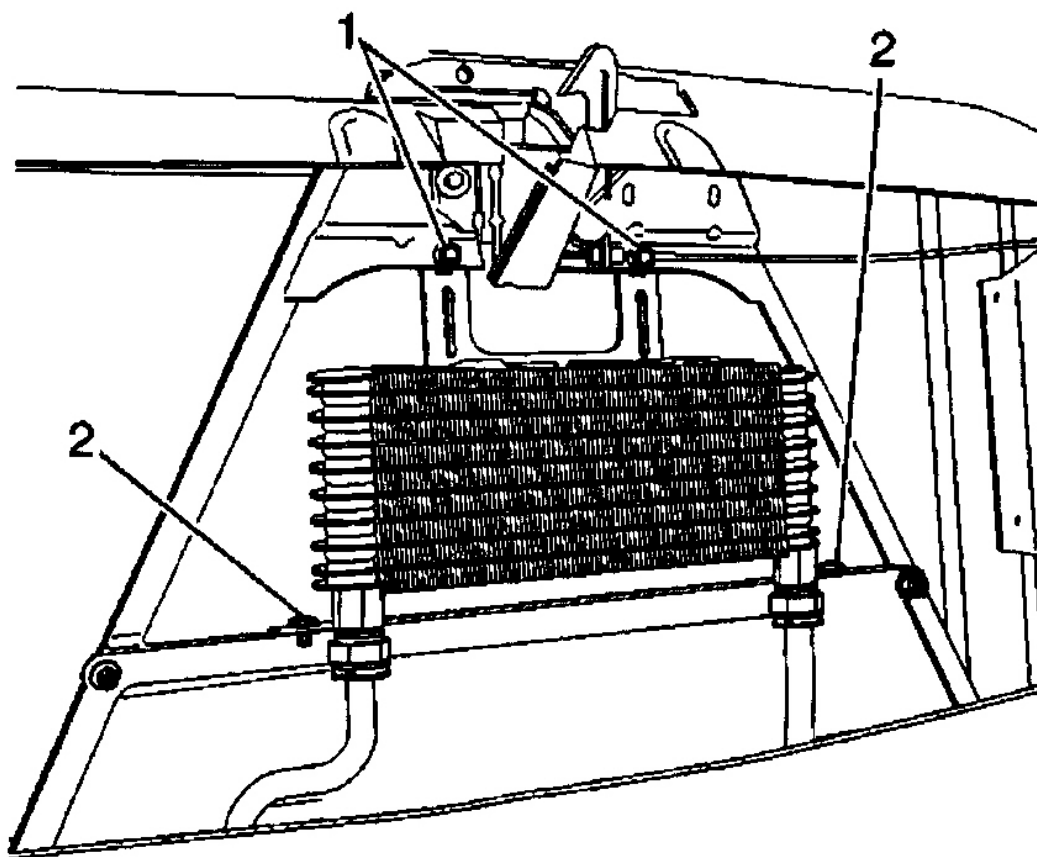
CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. Before disconnecting battery, see COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION.

WARNING: Before servicing any electrical component, the ignition key must be in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures. If a tool or equipment could easily come in contact with a live exposed electrical terminal, also disconnect the negative battery cable. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.

AUXILIARY OIL COOLER

Removal

1. Remove the front grill assembly.
2. Place a drain pan under the vehicle.
3. Disconnect the transmission oil cooler lines from the auxiliary cooler. See AUXILIARY OIL COOLER HOSE/PIPES & FITTINGS .
4. Remove the auxiliary oil cooler bolts (1) and push pins (2). See Fig. 15 .
5. Remove the auxiliary oil cooler from the vehicle.



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Fig. 15: Removing & Installing Auxiliary Oil Cooler
 Courtesy of GENERAL MOTORS CORP.

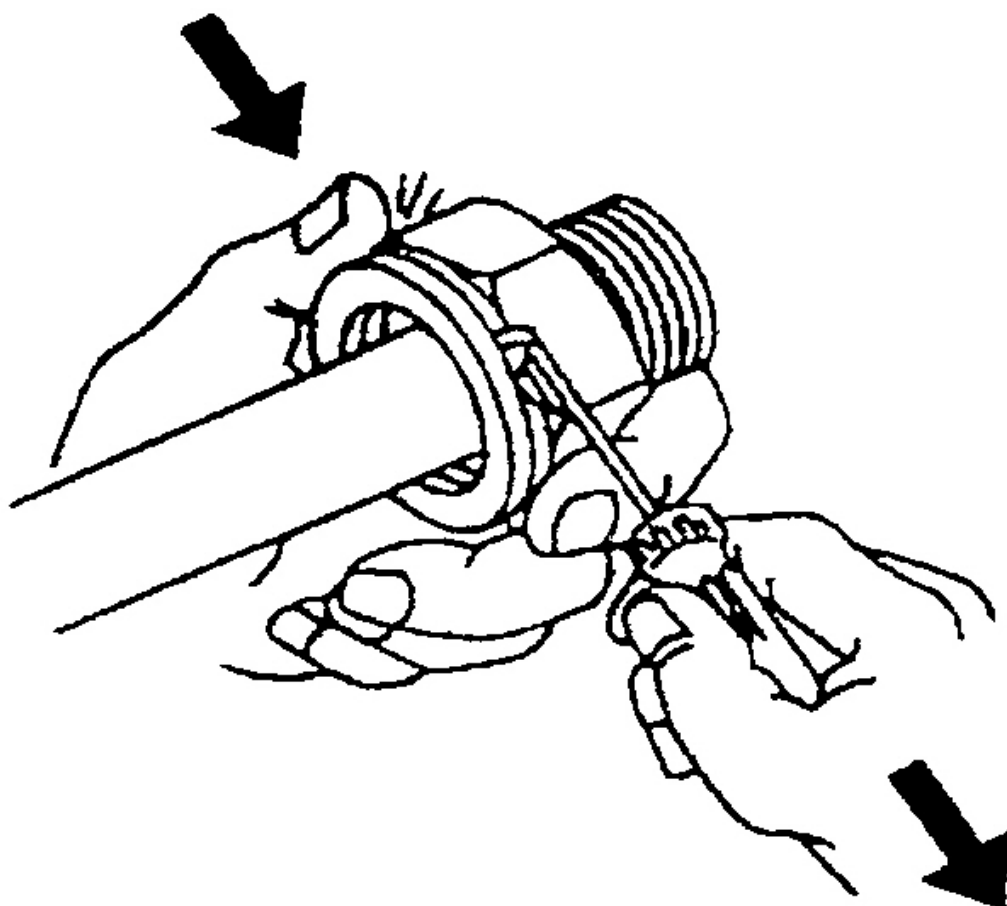
Installation

1. Install the auxiliary oil cooler to the vehicle.
2. Install the bolts (1) and the push pins (2) that retain the auxiliary oil cooler to the radiator brace. See **Fig. 15** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Connect the transmission oil cooler lines to the auxiliary cooler. See **AUXILIARY OIL COOLER HOSE/PIPES & FITTINGS** .
4. Install the front grill assembly.
5. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .

AUXILIARY OIL COOLER HOSE/PIPES & FITTINGS

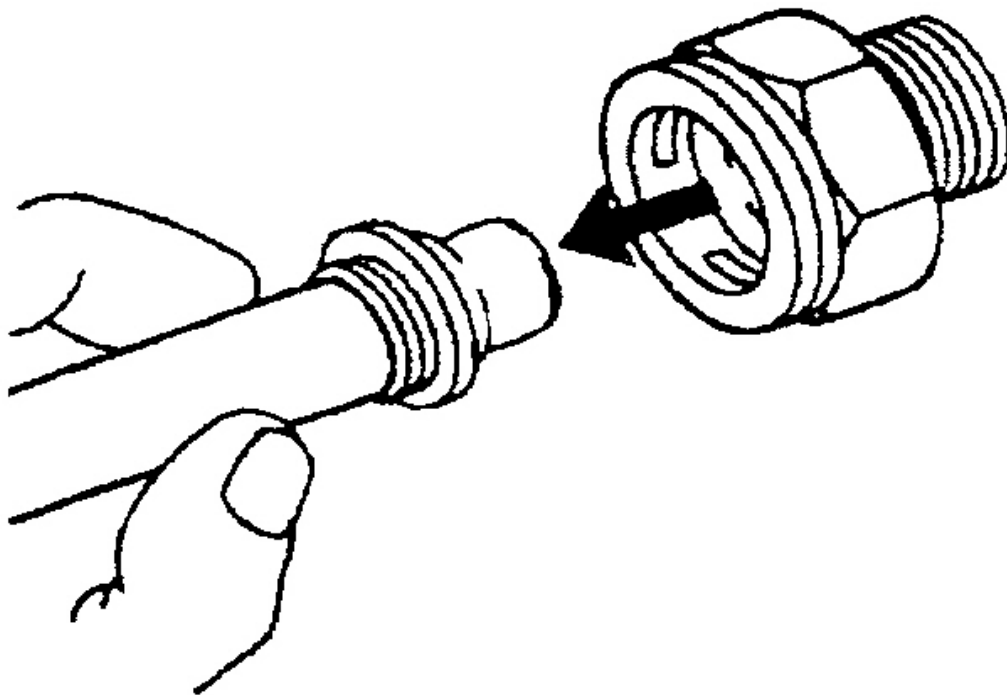
Removal

1. Raise and support the vehicle.
2. Pull the plastic cap back from the quick connect fitting.
3. Remove the cooling lines from the clips.
4. Remove the 2 retaining rings securing the 2 cooling lines to the transmission. See **Fig. 15** .
5. Using a bent tip screwdriver, pull on the open ends of the retaining ring in order to rotate the retaining ring around the quick connect fitting until the retaining ring is out of the fitting. See **Fig. 16** . Discard the retaining ring.
6. Pull the cooling line straight out from the quick connect fitting. See **Fig. 17** .
7. Repeat this procedure to remove all the remaining cooling lines from quick connect fittings.
8. For vehicles with and without auxiliary cooling, remove the cooling lines from the radiator. See **Fig. 18** .
9. Remove the oil cooling lines from the auxiliary oil cooler. See **Fig. 19** .



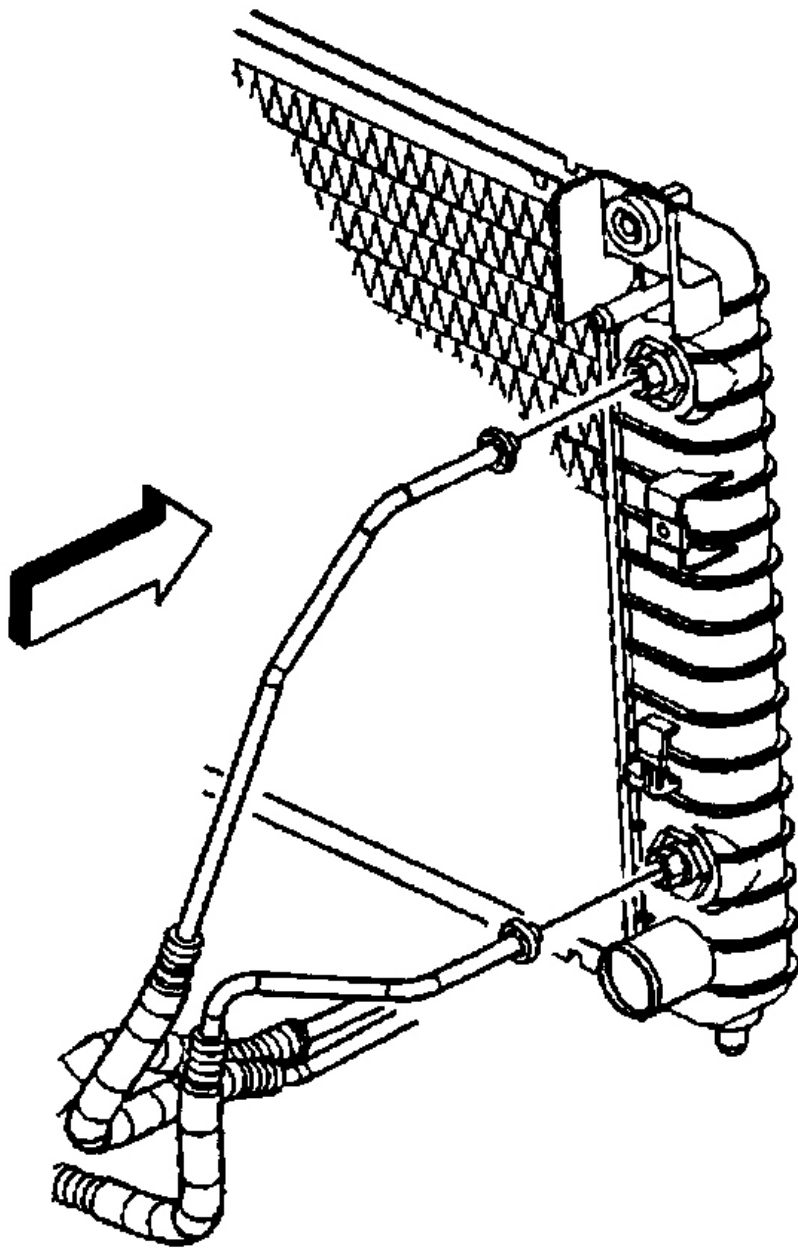
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Fig. 16: Removing Retaining Ring
Courtesy of GENERAL MOTORS CORP.



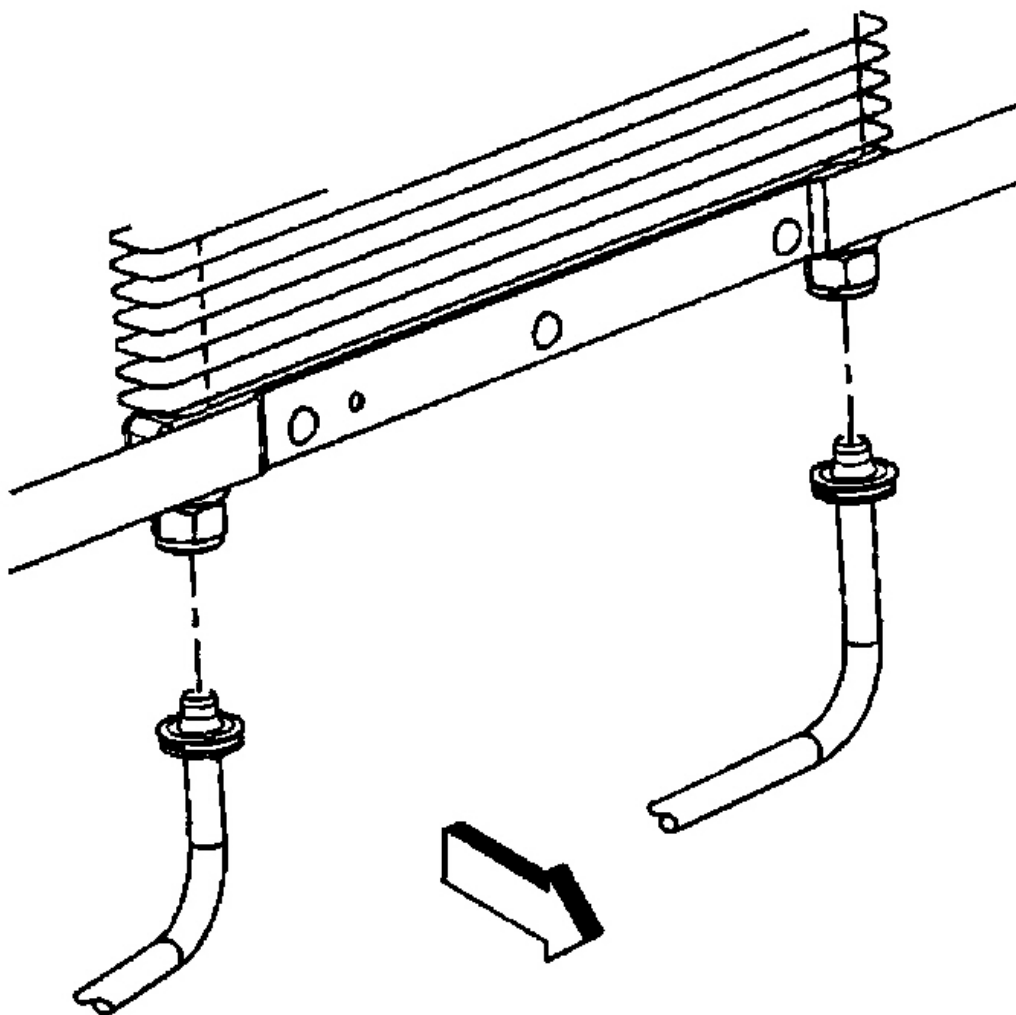
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Fig. 17: Removing & Installing Cooler Line From Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



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Fig. 18: Removing & Installing Fittings At Radiator
Courtesy of GENERAL MOTORS CORP.



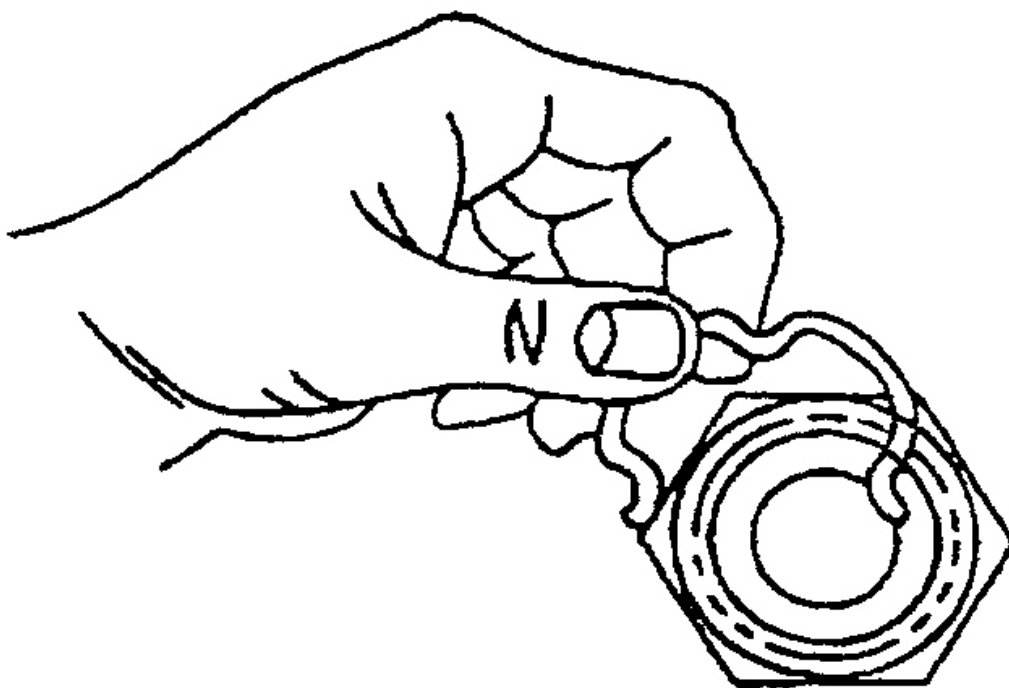
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Fig. 19: Disconnecting Connecting Fittings At Auxiliary Cooler
Courtesy of GENERAL MOTORS CORP.

Installation

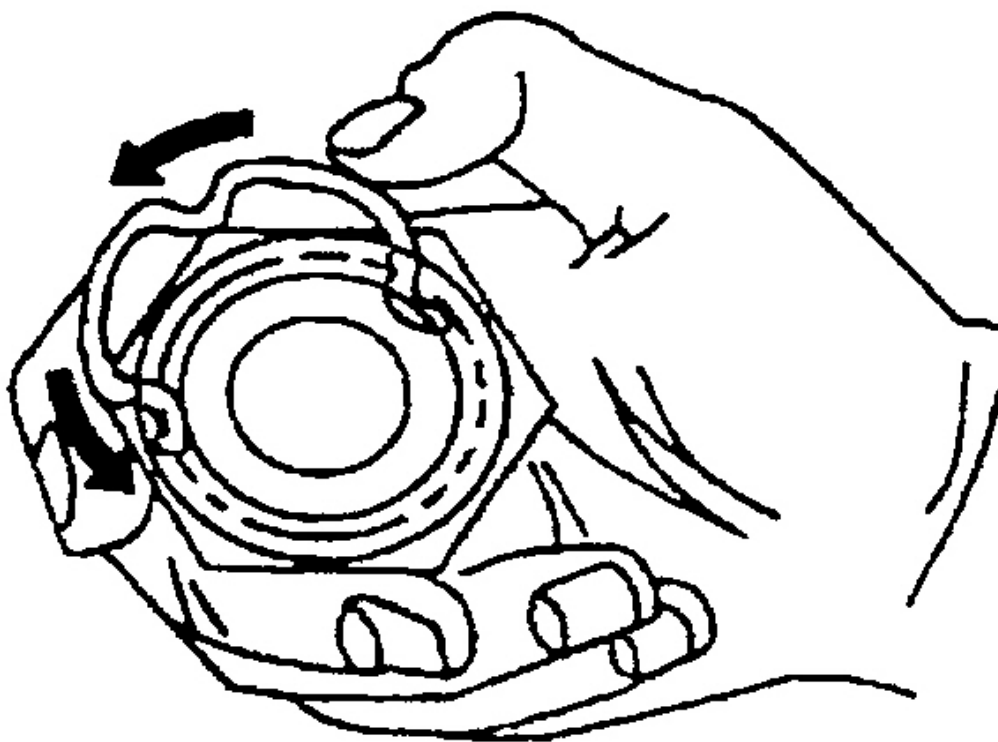
CAUTION: DO NOT reuse any of the existing oil lines or oil line fittings if there is excessive corrosion. DO NOT reuse any of the existing retaining rings that were removed from the existing quick connect fittings. All retaining rings being installed must be NEW. Ensure the following procedures are performed when installing the NEW retaining rings onto the fittings.

1. Install the transmission oil cooler lines to the vehicle.
2. Install a NEW retaining ring (E-clip) into the quick connect fitting using the following procedure:
 - A. Hook one of the open ends of the retaining ring in one of the slots in the quick connect fitting. See **Fig. 20** .
 - B. Rotate the retaining ring around the fitting until the retaining ring is positioned with all 3 ears through the 3 slots on the fitting. See **Fig. 21** .
 - C. DO NOT install the new retaining ring onto the fitting by pushing the retaining ring. See **Fig. 22** .
3. Ensure the 3 retaining ring ears are seen from inside the fitting and that the retaining ring moves freely in the fitting slots. See **Fig. 23** .
4. Install the NEW retaining ring (E-clip) into the remaining quick connect fittings.
5. Install the cooler line into the quick connect fitting.
6. Insert the cooler line end into the quick connect fitting until a click is either heard or felt. See **Fig. 24** .
7. Install the cooler lines to the vehicle. See **Fig. 17** .
8. DO NOT use the plastic cap on the cooler line in order to install the cooler line into the fitting. See **Fig. 25** .
9. Pull back sharply on the cooler line in order to ensure that the cooler line is fastened into the quick connect fitting.
10. Position (snap) the plastic cap onto the fitting. See **Fig. 26** . DO NOT manually depress the retaining ring when installing the plastic cap onto the quick connect fitting.
11. Ensure the plastic cap is fully seated against the fitting.
12. Ensure no gap is present between the cap and the fitting. See **Fig. 27** .
13. Ensure the Yellow identification band on the tube is hidden within the quick connect fitting. A hidden Yellow identification band indicates proper joint seating. See **Fig. 28** .
14. DO NOT install the cooler line end into the fitting incorrectly.
15. If you cannot position the plastic cap against the fitting, remove the retaining ring from the quick connect fitting. Check the retaining ring and the tube end in order to ensure neither is bent. Replace the cooler line or the retaining ring if necessary, and reinstall the cooler line per the installation procedure.
16. For vehicles without auxiliary cooling, install the cooling lines to the radiator.
17. For vehicles with auxiliary cooling, install the cooling lines to the radiator and the cooling lines to the auxiliary oil cooler.
18. On all vehicles, install the cooling lines to the transmission.
19. Install the cooling lines to the clips. Ensure all of the protective plastic caps are positioned over all of the quick connect fittings.
20. Lower the vehicle.
21. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .



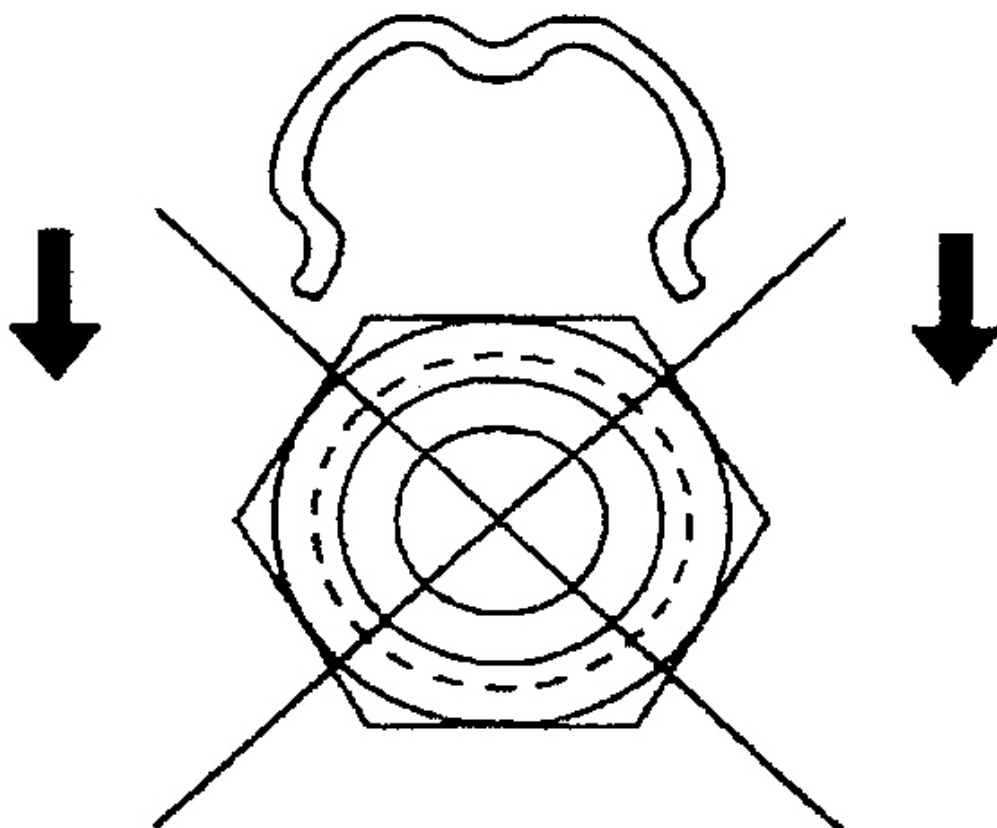
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Fig. 20: Starting Retaining Ring Onto Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



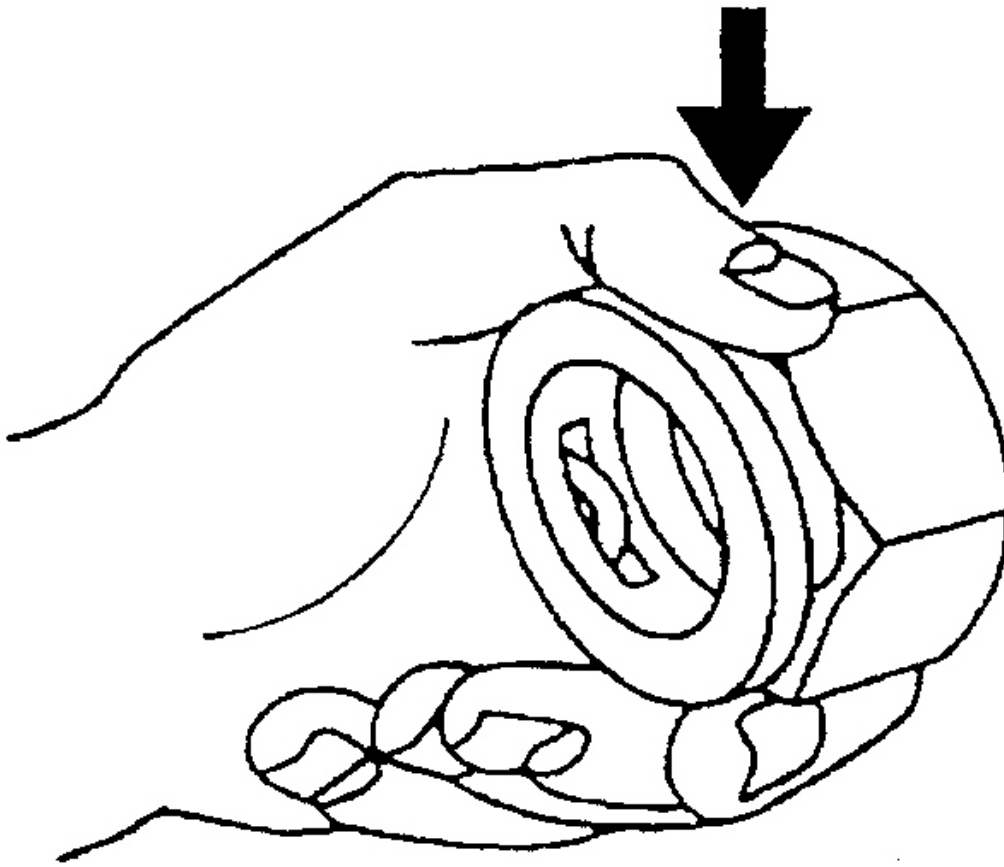
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Fig. 21: Installing Retaining Ring On Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



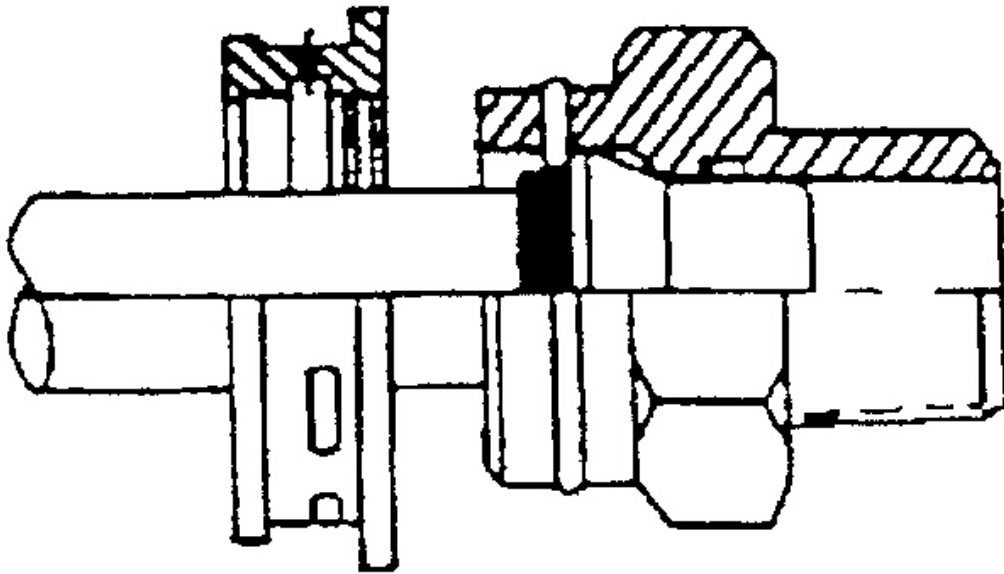
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Fig. 22: View Of Incorrect Method Of Installing Retainer
Courtesy of GENERAL MOTORS CORP.



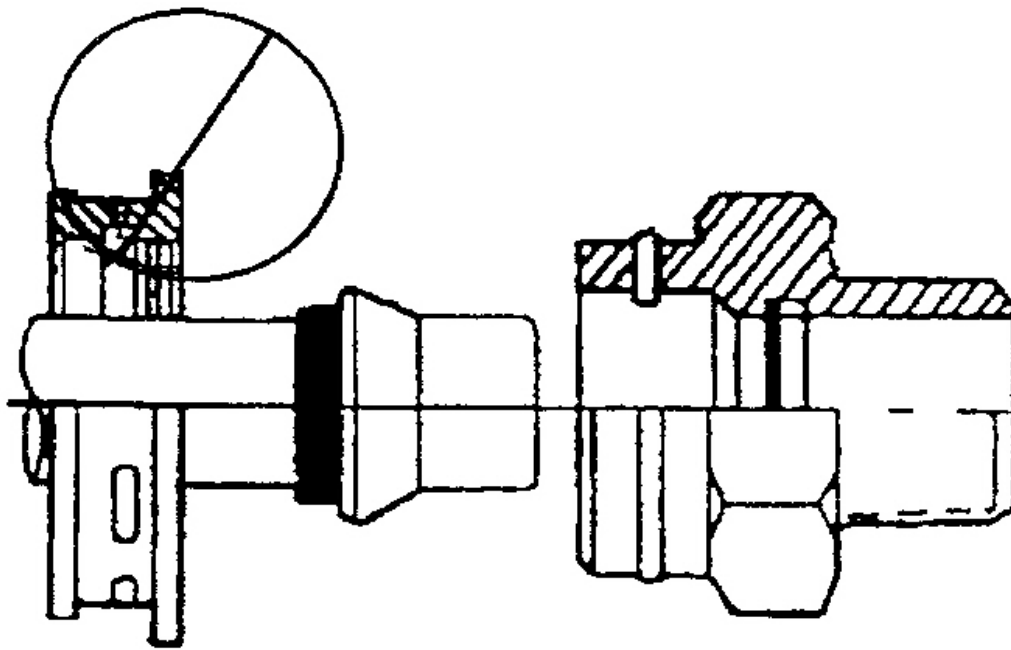
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Fig. 23: View Of Correctly Installed Retainer Ring
Courtesy of GENERAL MOTORS CORP.



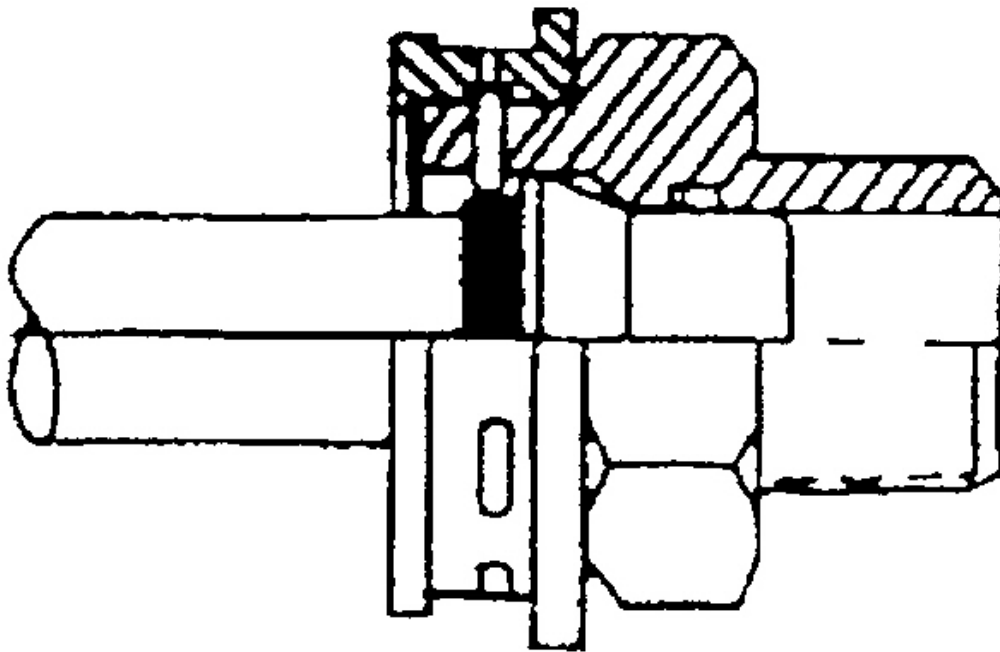
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Fig. 24: Installing Cooler Lines To Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



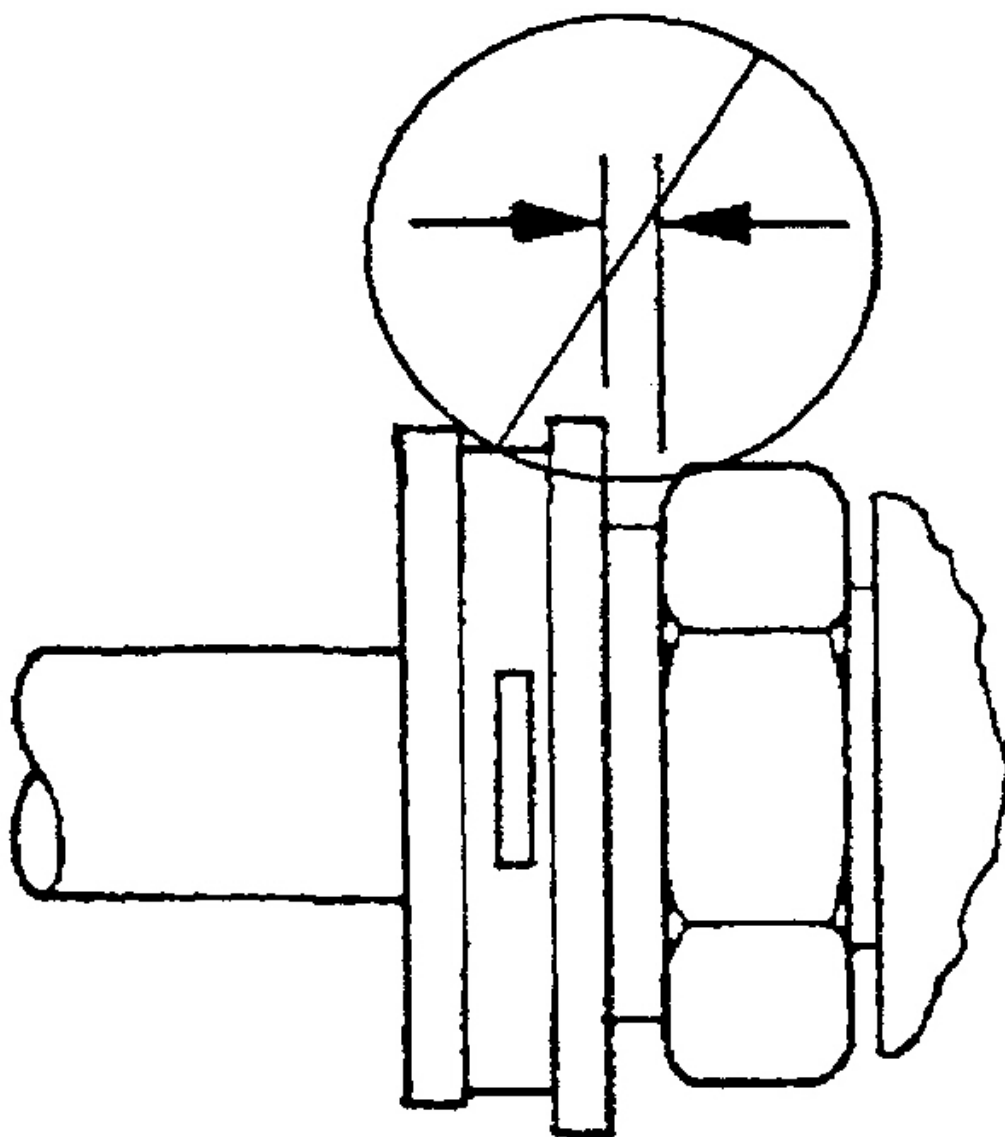
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Fig. 25: Incorrect Installation Method Using Plastic Cap
Courtesy of GENERAL MOTORS CORP.



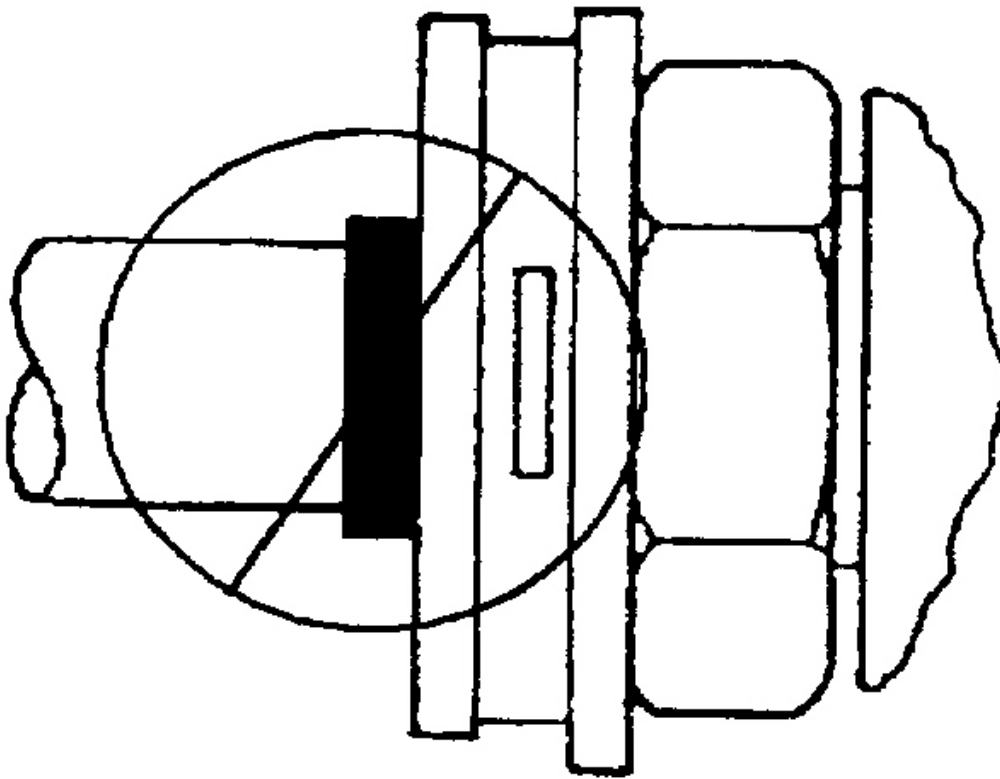
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Fig. 26: Installed View Of Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.



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Fig. 27: Checking For Improper Gap
Courtesy of GENERAL MOTORS CORP.



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Fig. 28: Checking For Identification Band
Courtesy of GENERAL MOTORS CORP.

CONTROL MAIN FILTER ATTACHMENT TUBE

NOTE: DO NOT drain the fluid if only the control main filter attachment tube is being replaced. Use a standard strap type filter wrench to remove or install the control main filter.

Removal

1. Remove filter (4) by rotating it in the counterclockwise direction. See **Fig. 2** .
2. Remove the magnet (2) from the filter attachment tube (1) in the converter housing or from the filter element. See **Fig. 2** .
3. Clean any metal debris from the magnet. Presence of any metal pieces larger than dust may indicate that transmission replacement or overhaul is required.

4. Remove the filter attachment tube (1) from the converter housing. See **Fig. 2** .

Installation

1. Install the filter attachment tube (1). See **Fig. 2** . Tighten the attachment tube to specification. See **TORQUE SPECIFICATIONS** .
2. Reinstall the magnet (2) onto the filter attachment tube (1).
3. Lubricate the gasket (3) on the control main filter with transmission fluid. See **Fig. 2** .
4. Install, by hand, the control main filter (4) until the gasket on the control main filter touches the converter housing.

NOTE: **Turning the control-main filter more than ONE FULL TURN after gasket contact will damage the filter and may cause fluid leakage.**

5. Turn the filter ONE FULL TURN ONLY after gasket contact.

NOTE: **Use only clean and approved transmission fluid.**

6. Check the transmission fluid level. See **CHECKING FLUID LEVEL & CONDITION** under LUBRICATION.

CONTROL VALVE BODY

NOTE: **Tools required: Wiring Harness Connector Remover (J-44257) and Internal Wiring Harness Installer (J-44247).**

Removal

1. Using the wiring harness connector remover, disconnect the external wiring harness from the main transmission connector. See **Fig. 29** .
2. Remove the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION.

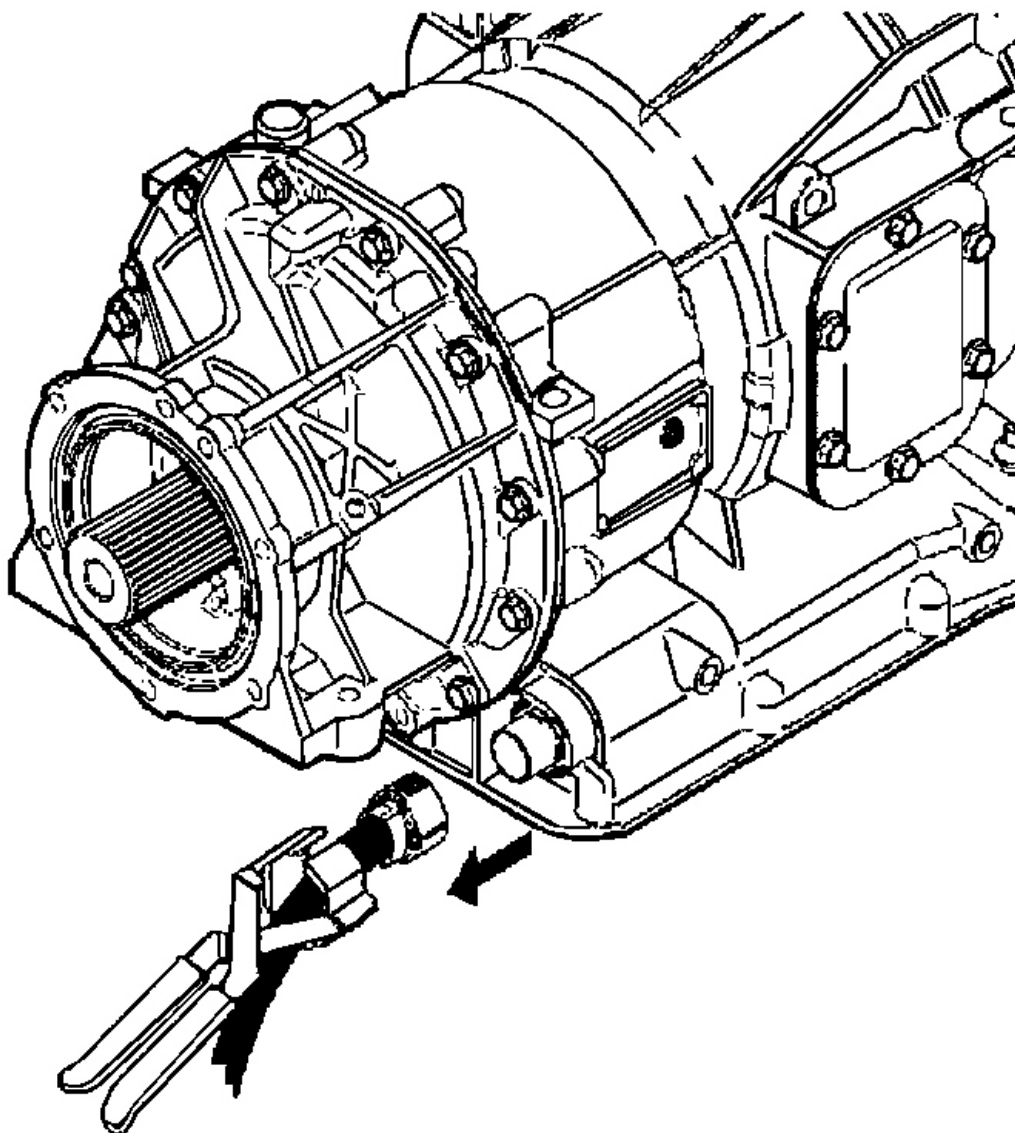
NOTE: **The transmission main connector is actually one end of the internal harness that protrudes through the main housing.**

3. Place a 1 3/16" (30 mm) or 12-point deep socket or box end (2) over the connector (1).
4. Push inward on the socket or wrench to release the retainer "feet" that attach the connector (1) to the main housing. See **Fig. 30** .
5. Remove the wrench. Push inward on the electrical connector to separate it from the main housing. This allows the internal wiring harness to remain with the control valve assembly as it is removed.
6. Remove the 2 detent spring bolts (3). Remove the detent spring assembly (2). See **Fig. 31** .

NOTE: **As the control valve assembly is removed, be careful not to lose the**

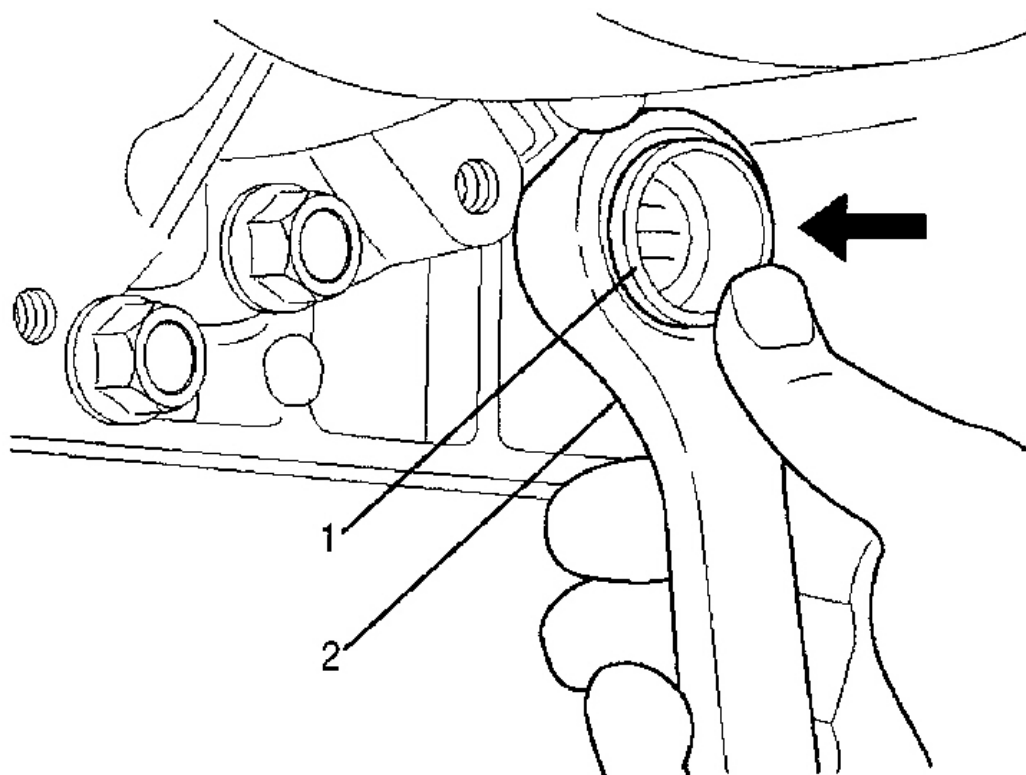
manual selector valve pin or allow the manual selector valve to slide out of the control valve assembly.

7. Remove 14 bolts at locations marked (1). See **Fig. 32** . Support the control valve assembly (about 10 pounds) and remove the last bolt marked (1).
8. Lower the control valve assembly (1) to clear the dowel pins (2) in the main housing. See **Fig. 33** .
9. Move the control valve assembly (4) sideways to disengage pin (1) in the manual selector valve (2) from the slot in detent lever (3). See **Fig. 34** . Remove the control valve assembly (4).



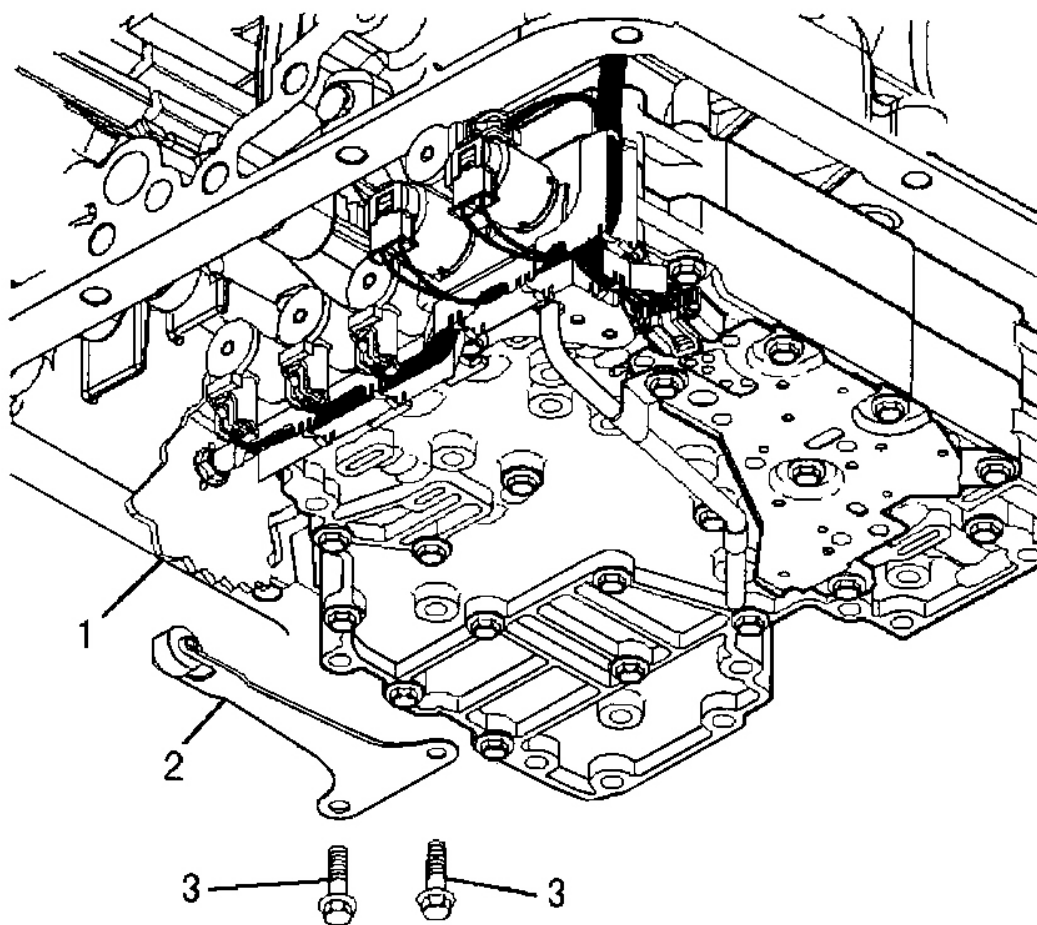
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Fig. 29: Disconnecting External Wiring Harness
Courtesy of GENERAL MOTORS CORP.



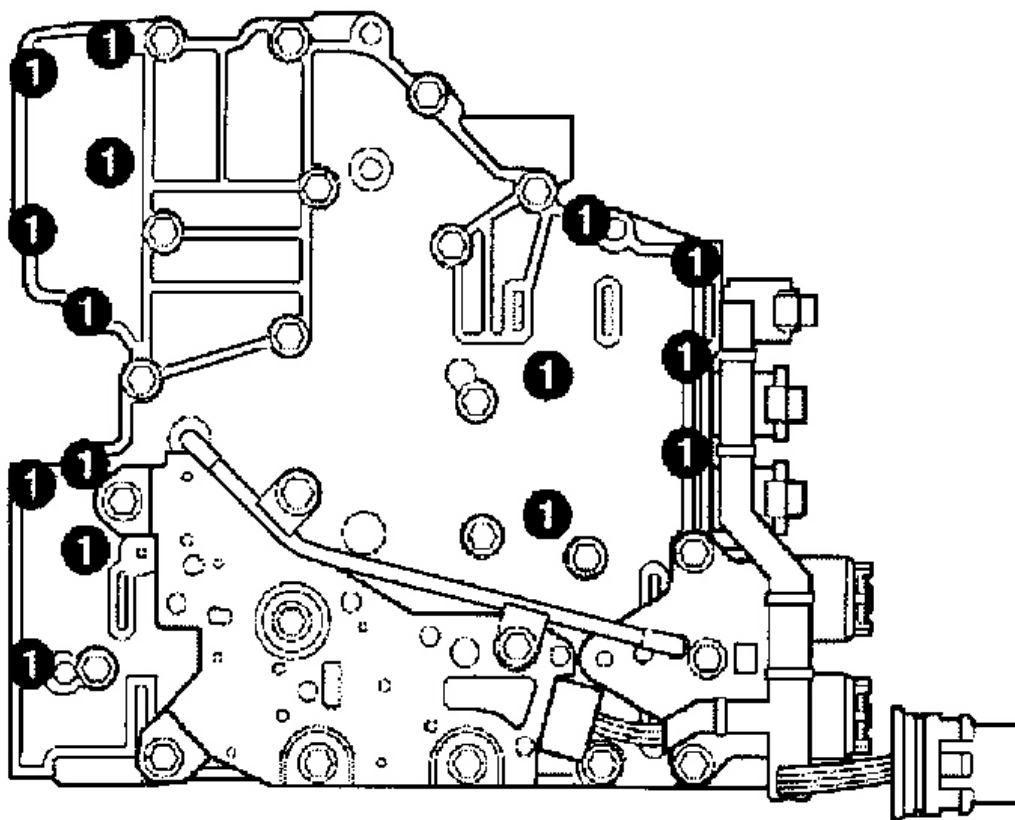
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Fig. 30: Releasing Retainer At Connector
Courtesy of GENERAL MOTORS CORP.



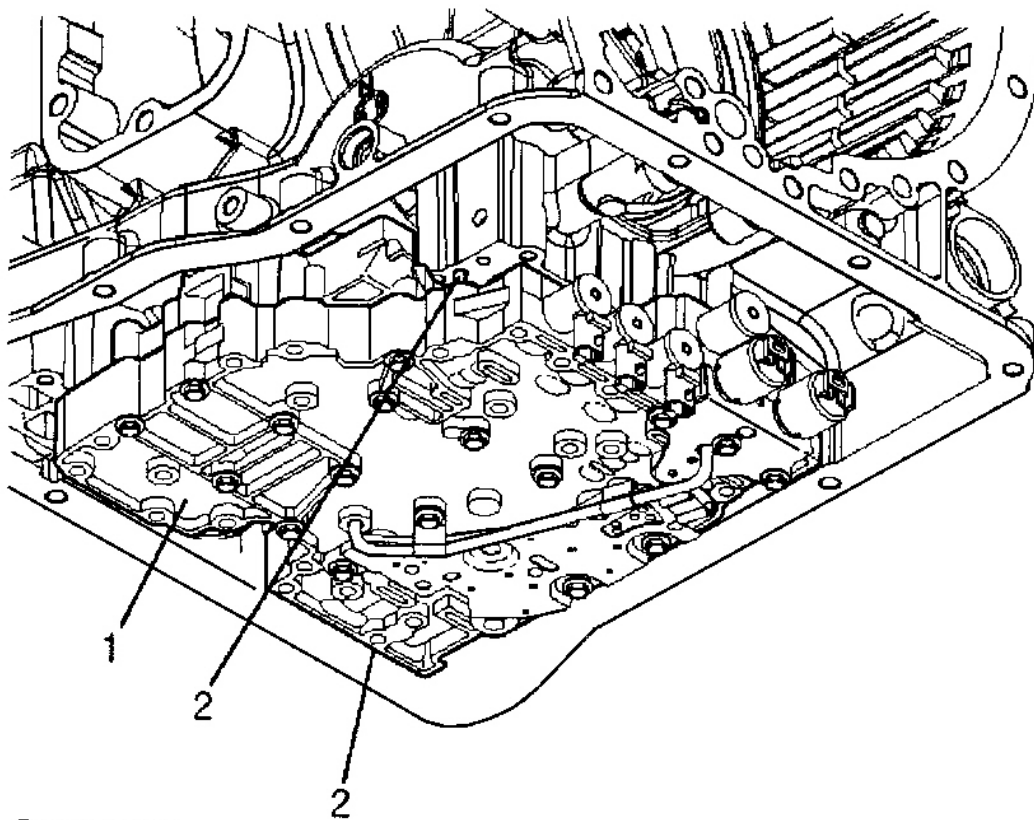
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Fig. 31: Removing & Installing Detent Spring
Courtesy of GENERAL MOTORS CORP.



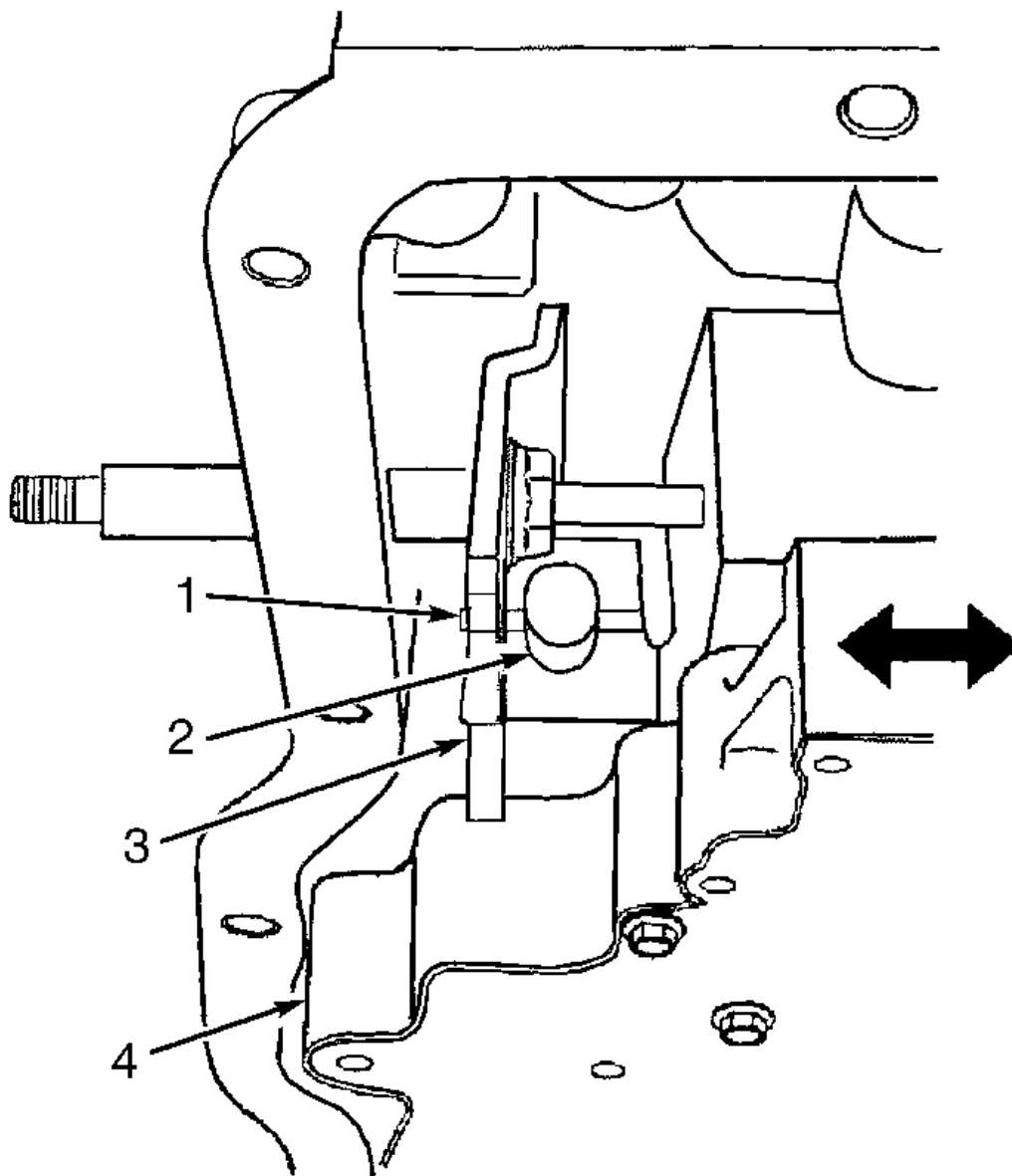
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Fig. 32: Removing & Installing Control Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.



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Fig. 33: Lowering Control Valve Body From Dowel Pins
Courtesy of GENERAL MOTORS CORP.



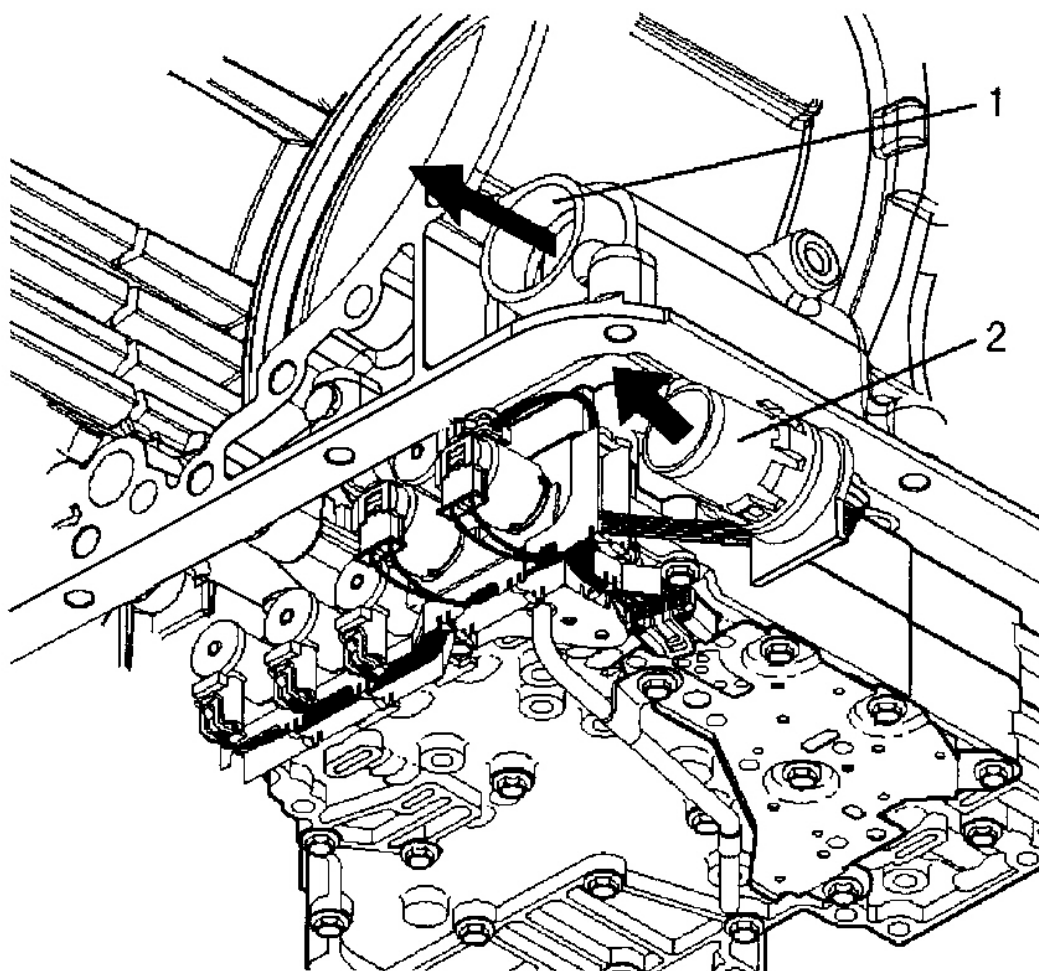
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Fig. 34: Moving Control Valve To Disengage & Engage Pin
Courtesy of GENERAL MOTORS CORP.

Installation

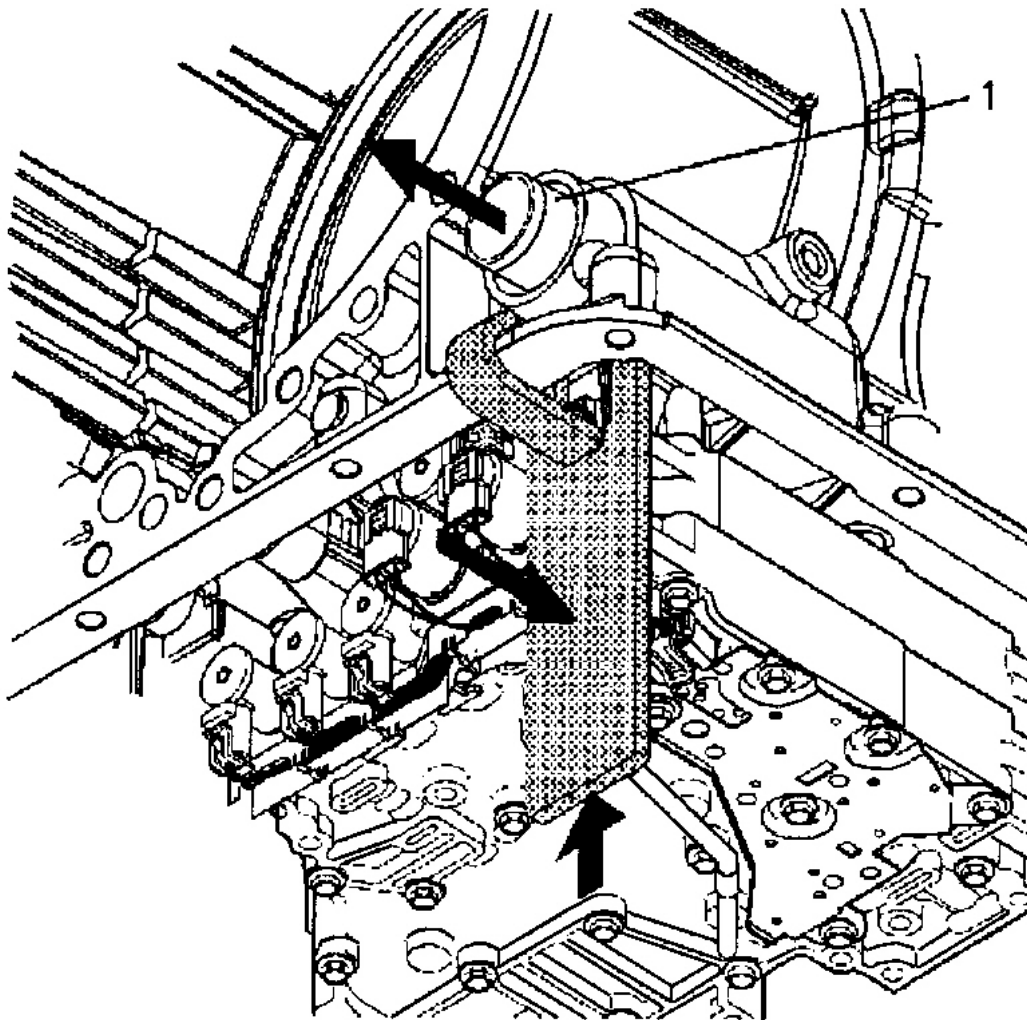
1. Move the control valve assembly (4) into position under the main housing. Engage the pin (1) in the manual selector valve (2) into the slot in the detent lever (3). See **Fig. 34** .

2. Align the control valve assembly (1) with the dowel pins (2) in the main housing. See **Fig. 33** . Seat the control valve assembly against the main housing and hold it in position.
3. Install one bolt marked (1) to hold the control valve assembly in place.
4. Reinstall the remaining 14 bolts marked (1) that fasten the control valve assembly to the main housing. See **Fig. 32** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
5. Push the main transmission connector (2) outward through the hole (1) in the main housing until the retaining "feet" on the connector are nearing the locked position. See **Fig. 35** .
6. Use the internal wiring harness installer to complete the seating of the retaining "feet" that lock the connector (1) into the main housing. See **Fig. 36** .
7. Install the detent spring assembly (2) onto the control valve assembly. Confirm the roller of the detent spring assembly rests on the detent lever (1).
8. Install 2 detent spring bolts (3). Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
9. Install the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION.
10. Connect the external wiring harness to the main transmission connector.



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Fig. 35: Installing Main Transmission Connector
Courtesy of GENERAL MOTORS CORP.



G00096120

Fig. 36: Seating Main Transmission Connector To Housing
Courtesy of GENERAL MOTORS CORP.

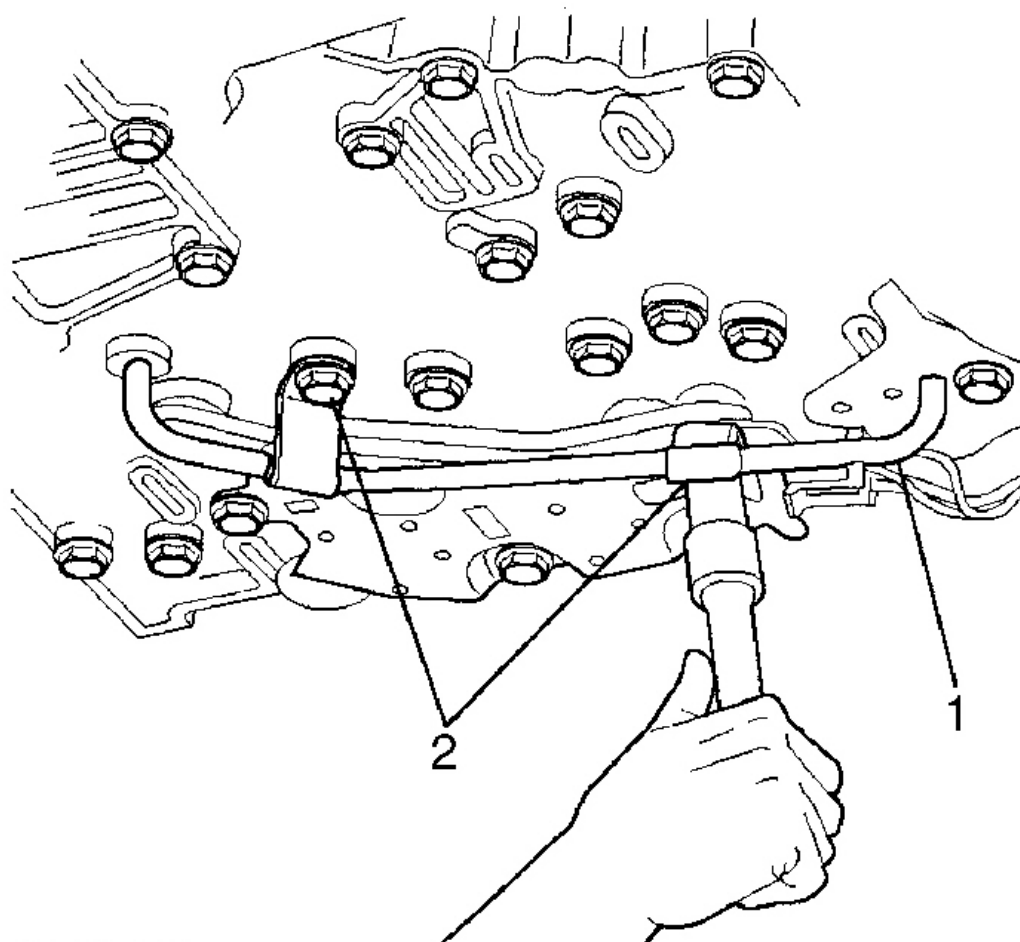
CONTROL VALVE SOLENOIDS

Removal

1. Remove the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION.
2. Disconnect the internal wiring harness from the solenoid being changed.
3. Remove the 2 bolts (2) that fasten reverse signal tube (1) to the control valve assembly. Remove the reverse signal tube. See **Fig. 37** .

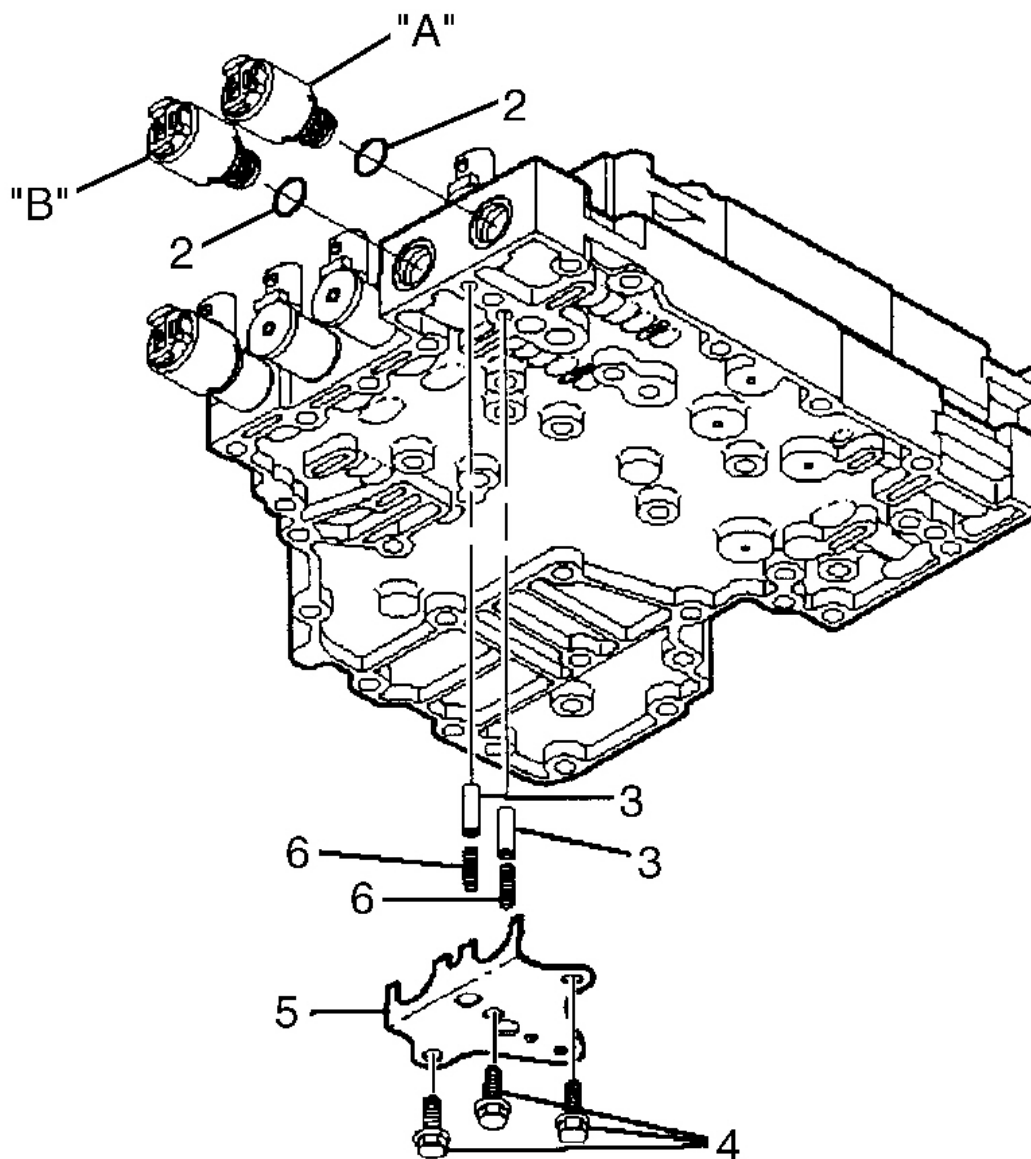
NOTE: When the A/B solenoid bracket (5) is removed, there are 2 sets of accumulators (3) and springs (6) which may fall from their bores. See Fig. 38 . Ensure to catch them so they are not damaged. The A/B solenoid bracket (5) **MUST** not be modified. Ensure the angle between the 2 bracket surfaces is 90 degrees or less. Replace the bracket if the angle is more than 90 degrees.

4. To remove "A" or "B" solenoid, remove 3 bolts (4) and the A/B solenoid bracket (5). Remove accumulators (3) and springs (6) if they do not fall out when bracket (5) is removed.
5. Note the position of the solenoid connector and pull the solenoid (1) or (8) out of the bore in the control valve assembly. The "O" ring on the solenoid provides the resistance felt during removal.
6. Remove the solenoid retainer (1) for the "C", "D", "E", or "F" solenoids. Note the position of the solenoid connector and pull the solenoid (3) out of the bore in the control valve assembly. The "O" rings (2) provide the resistance felt during removal. See Fig. 39 .



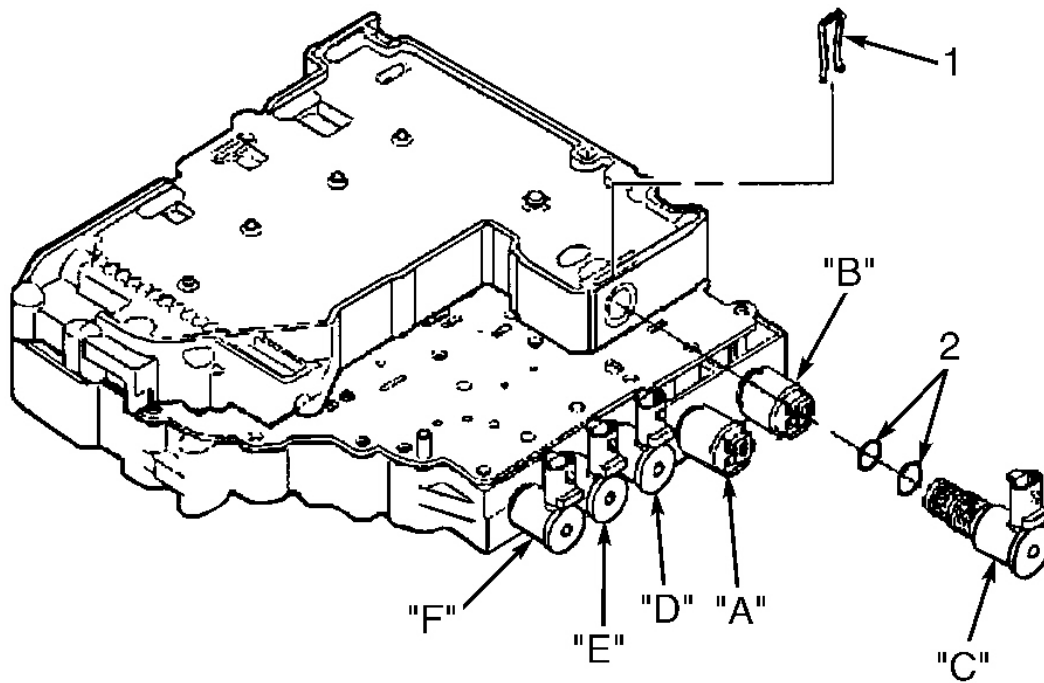
G00092197

Fig. 37: Removing & Installing Reverse Signal Tube
Courtesy of GENERAL MOTORS CORP.



G00096132

Fig. 38: Removing & Installing A/B Solenoid Bracket
Courtesy of GENERAL MOTORS CORP.



G00096131

Fig. 39: Identifying Control Valve Solenoids
 Courtesy of GENERAL MOTORS CORP.

Installation

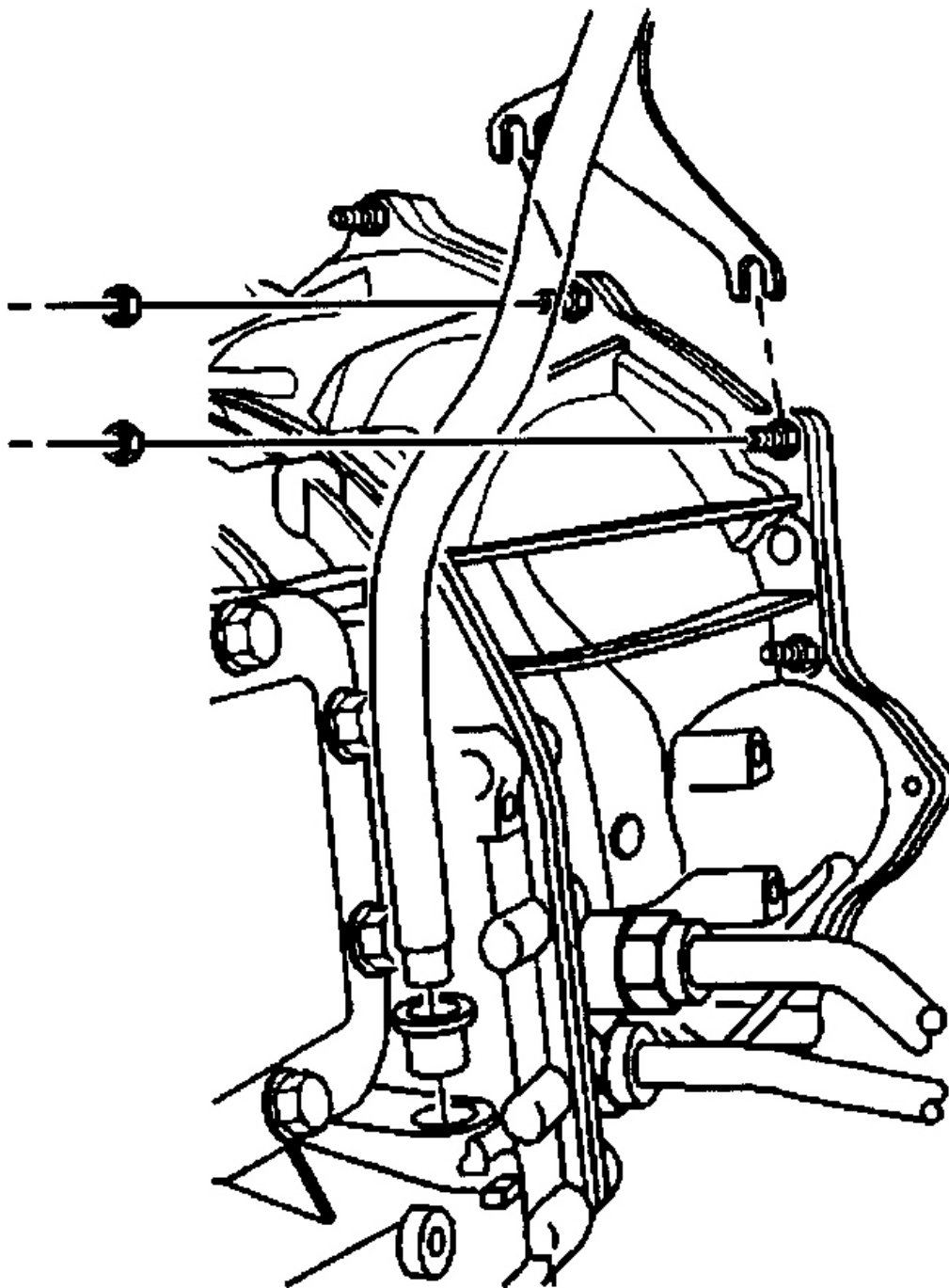
1. Obtain the new solenoid. Lubricate new "O" rings (2) with clean transmission fluid. Install the "O" rings and push the new solenoids into the control valve body bore with the wiring harness connector in the correct position.
2. Reinstall the 2 accumulators (3) and springs (6) before installing the A/B solenoid bracket (5). The valve (3) goes in the bore first with the hollow end facing outward, followed by the spring (6) which goes inside the hollow portion of the valve. See **Fig. 38** .
3. Install the solenoid retainers (1) for the "C", "D", "E", and "F" solenoids. See **Fig. 39** .
4. Reinstall the solenoid retaining bracket (5). Install 3 bolts (4) and tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
5. Install the reverse signal tube. Install the 2 bolts (2) that fasten reverse signal tube (1) to the control valve assembly. See **Fig. 37** . Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
6. Reconnect the internal wiring harness to the solenoid.
7. Install the oil pan and suction filter. Fill transmission with appropriate fluid to proper level. See **LUBRICATION** .

FILLER TUBE & SEAL

NOTE: If the vehicle is equipped with a diesel engine, the transmission must be removed to service the fill tube and/or seal.

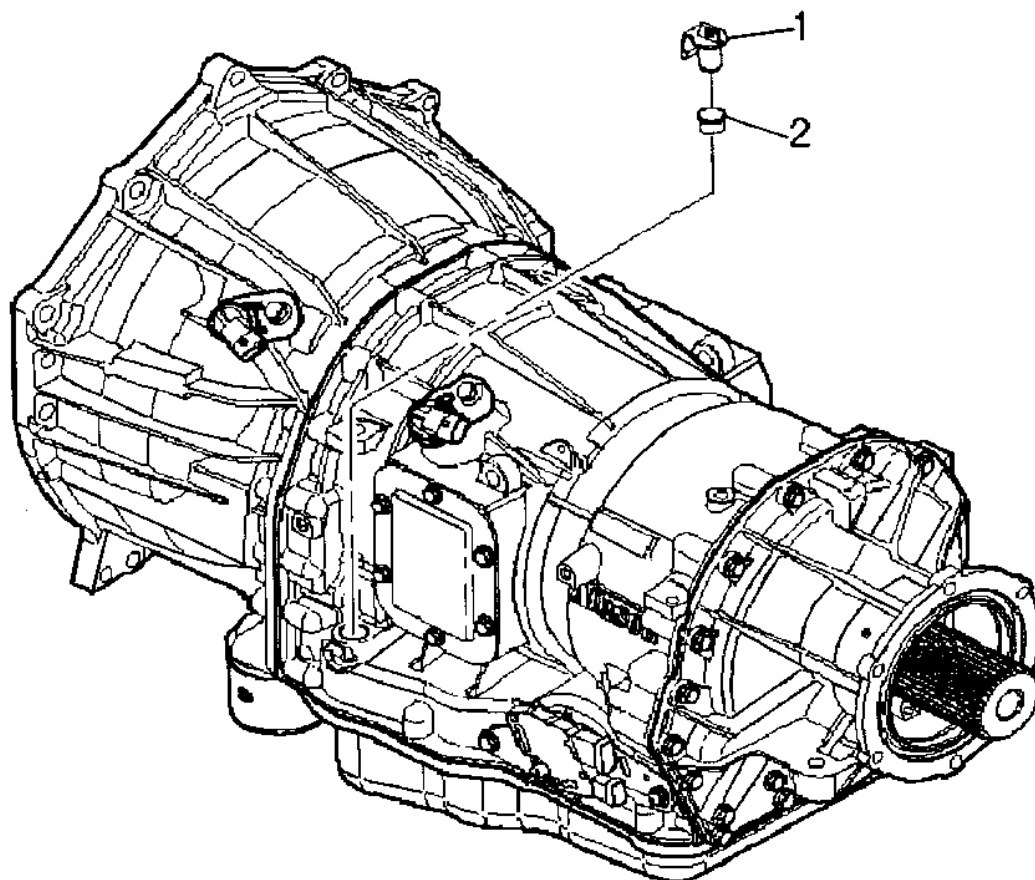
Removal

1. The transmission case has provisions that enable the fill tube to be installed on either the right or left side of the transmission. If servicing the plug and/or seal opposite the fill tube, go to step 8 .
2. Remove the transmission fluid level indicator.
3. Raise and suitably support the vehicle.
4. Remove the nuts attaching the fill tube to the transmission. See **Fig. 40** .
5. Place a drain pan under the transmission to catch any dripping fluid.
6. Loosen the fill tube from the transmission.
7. Remove the fill tube and seal from the vehicle.
8. Remove the fill tube plug (1). See **Fig. 41** .
9. Remove the fill tube plug seal (2).



G00096133

Fig. 40: Disconnecting & Connecting Filler Tube Bracket



G00096134

Fig. 41: Removing & Installing Filler Tube Seal & Plug
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install a new fill tube plug seal (2) into the main housing. See **Fig. 41** .
2. Align the tab on the fill tube plug (1) with the tang on the main housing.
3. Install the fill tube plug (1). Press the plug into the seal (2) until the tab on the fill tube plug locks into place in the notch on the main housing. See **Fig. 40** .
4. Install the NEW fill tube seal to the transmission.
5. Install the fill tube to the transmission. Ensure the fill tube bracket is positioned properly on the studs. See **Fig. 40** .
6. Install the fill tube bracket nuts to the studs. See **Fig. 40** . Tighten the fill tube bracket nuts to

specification. See **TORQUE SPECIFICATIONS** .

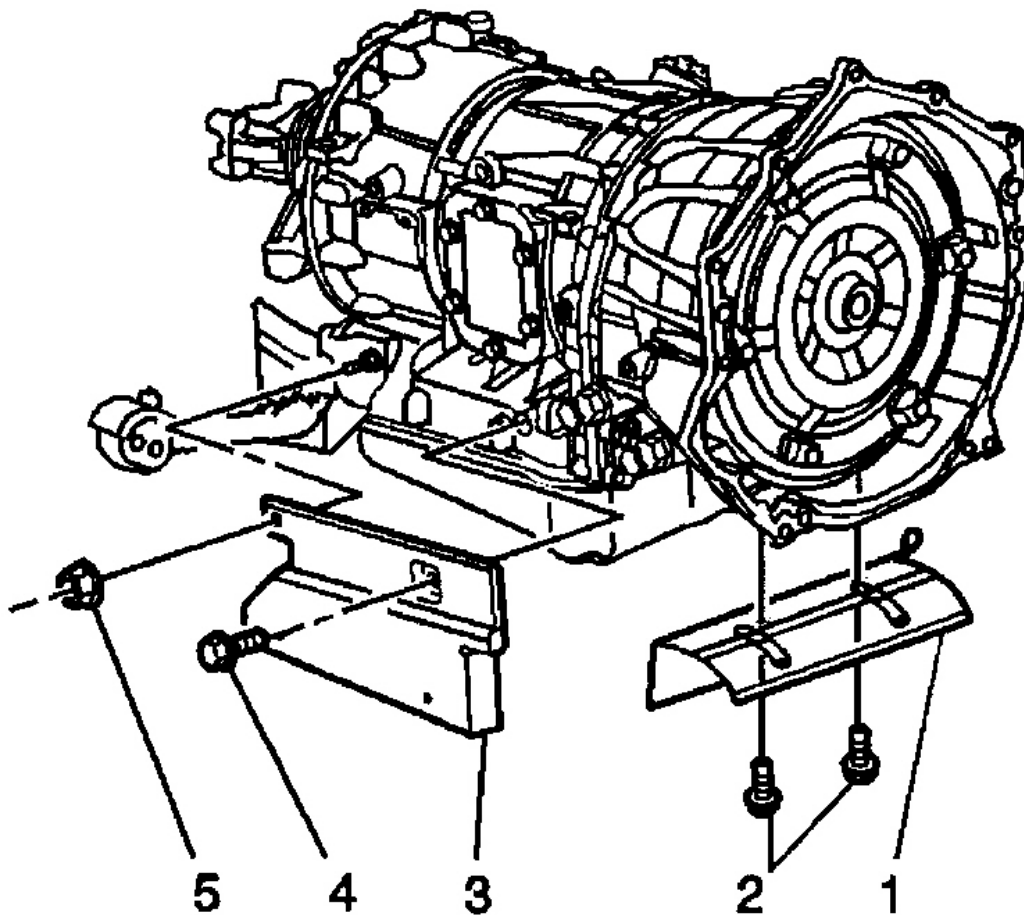
7. Lower the vehicle.

8. Fill the transmission with appropriate fluid to proper level. See **LUBRICATION** .

HEAT SHIELD

Removal

1. Raise and suitably support the vehicle.
2. Remove the bolts (2) from the front heat shield (1). See **Fig. 42** .
3. Remove the front heat shield (1) from the transmission.
4. Remove the bolt (4) and the nut (5) from the side heat shield (3).
5. Remove the side heat shield (3) from the transmission.



G00096139

Fig. 42: Removing & Installing Heat Shields
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the side heat shield (3) to the transmission. See **Fig. 42** .
2. Install the bolt (4) and the nut (5) to the side heat shield (3). Tighten the bolt (4) and the nut (5) to specification. See **TORQUE SPECIFICATIONS** .
3. Install the front heat shield (1) to the transmission.
4. Install the bolts (2) to the front heat shield (1). Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
5. Lower the vehicle.

INTERNAL FILTER

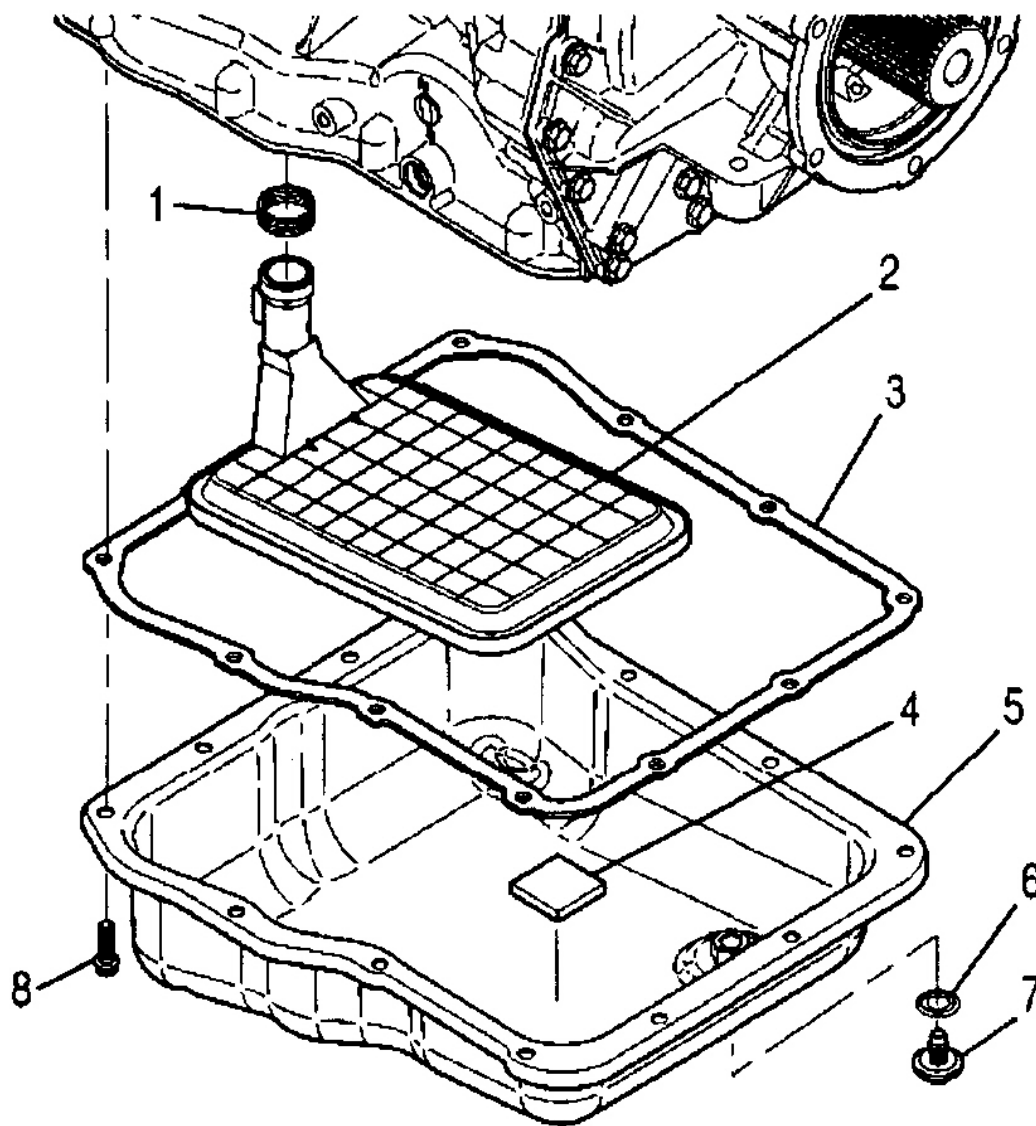
Removal

NOTE: It would be helpful to record the amount of transmission fluid lost during this procedure. Fluid in good condition, drained into a clean container, may be reused.

1. Raise and support the vehicle. Remove drain plug (7) and drain plug seal (6) from oil pan (5). See **Fig. 43**.
2. Allow the fluid to drain into a suitable container. Inspect the drained fluid. See **CHECKING FLUID LEVEL & CONDITION** under LUBRICATION.
3. Remove the 12 oil pan bolts (8). Hold the oil pan in position as the last bolt is removed.
4. Remove oil pan (5) and gasket (3).
5. Inspect magnet (4). See **Fig. 43**. Excessive metallic particles or large metallic particles may indicate need for overhaul or replacement of the transmission.

NOTE: DO NOT remove the suction filter or seal if only replacing the oil pan or oil pan gasket.

6. Remove suction filter (2) by pulling straight down where the suction tube is seated in the main housing.
7. Remove suction seal (1) from the filter or from the seal bore in the main housing. Discard the old seal. Discard the filter, if it is being replaced.



G00092186

Fig. 43: Removing & Installing Oil Pan
 Courtesy of GENERAL MOTORS CORP.

Installation

1. Remove all gasket material from the main housing. Remove any scratches from the main housing that would cause a split line leak.
2. Place a new seal (1) on the tube of suction filter (2), if it was removed. Ensure the seal locates against the shoulder on the suction filter tube.

3. Push the filter (2) and seal (1) into the seal bore in the main housing. Position the suction filter properly. See **Fig. 43** .
4. Install 2 headless guide studs (M8 x 1.25) into opposite corners of the oil pan mounting face on the main housing.
5. Place a gasket (3) on the oil pan and align the bolt holes. See **Fig. 43** .
6. Slide the gasket (3) and oil pan (5) over the guide bolts and hold them in place while installing 2 bolts (8) to hold the parts in place.
7. Install the remainder of the 12 oil pan bolts (2 will replace the guide studs). Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
8. Reinstall drain plug (7) and drain plug seal (6) and tighten to specification. See **Fig. 43** . See **TORQUE SPECIFICATIONS** .
9. Lower the vehicle.
10. Fill transmission with appropriate fluid to proper level. See **RECOMMENDED FLUIDS** and **FLUID CAPACITIES** under LUBRICATION.

MANUAL DETENT SPRING & ROLLER

Removal

Remove the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION. Remove the 2 detent spring bolts (3). Remove the detent spring assembly (2). See **Fig. 31** .

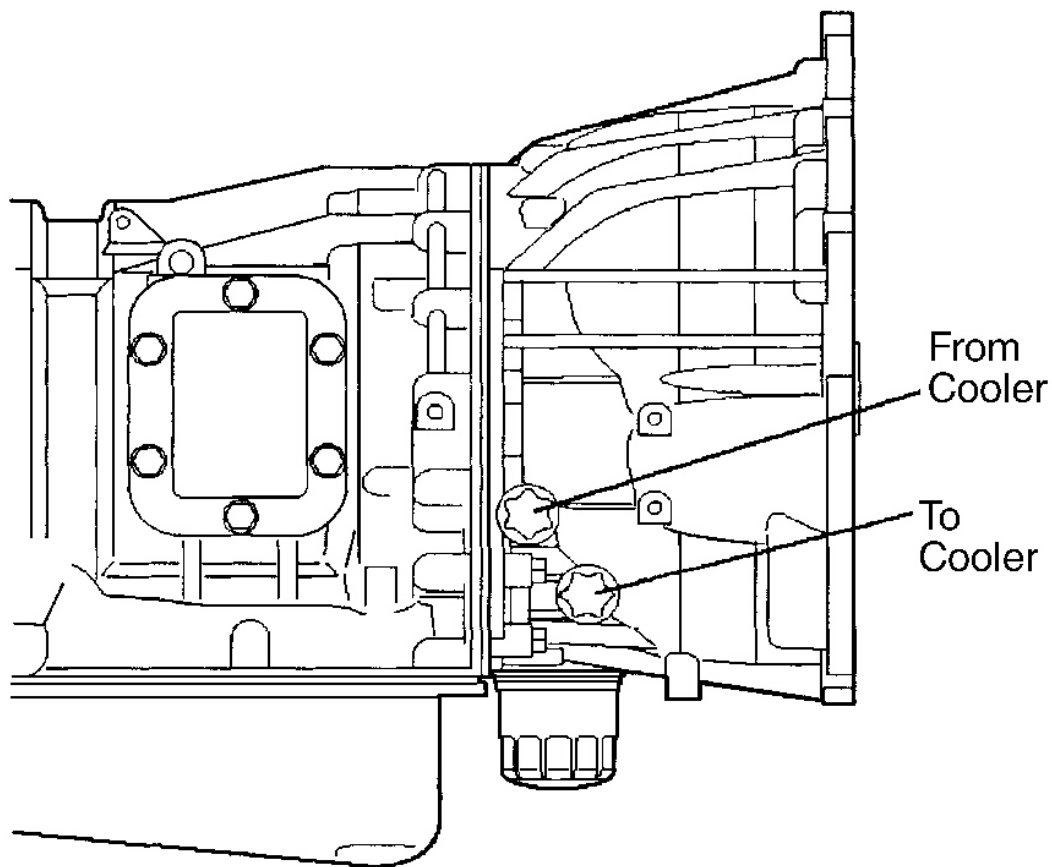
Installation

Install the detent spring assembly (2) onto the control valve assembly. Confirm the roller of the detent spring assembly rests on the detent lever (1). See **Fig. 31** . Install 2 detent spring bolts (3). Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** . Install the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION.

OIL COOLER FITTING

Removal

Disconnect the hose from the hydraulic connector assembly being replaced. Remove the hydraulic connector assembly. See **Fig. 44** .



G00096130

Fig. 44: Removing & Installing Oil Cooler Fitting
Courtesy of GENERAL MOTORS CORP.

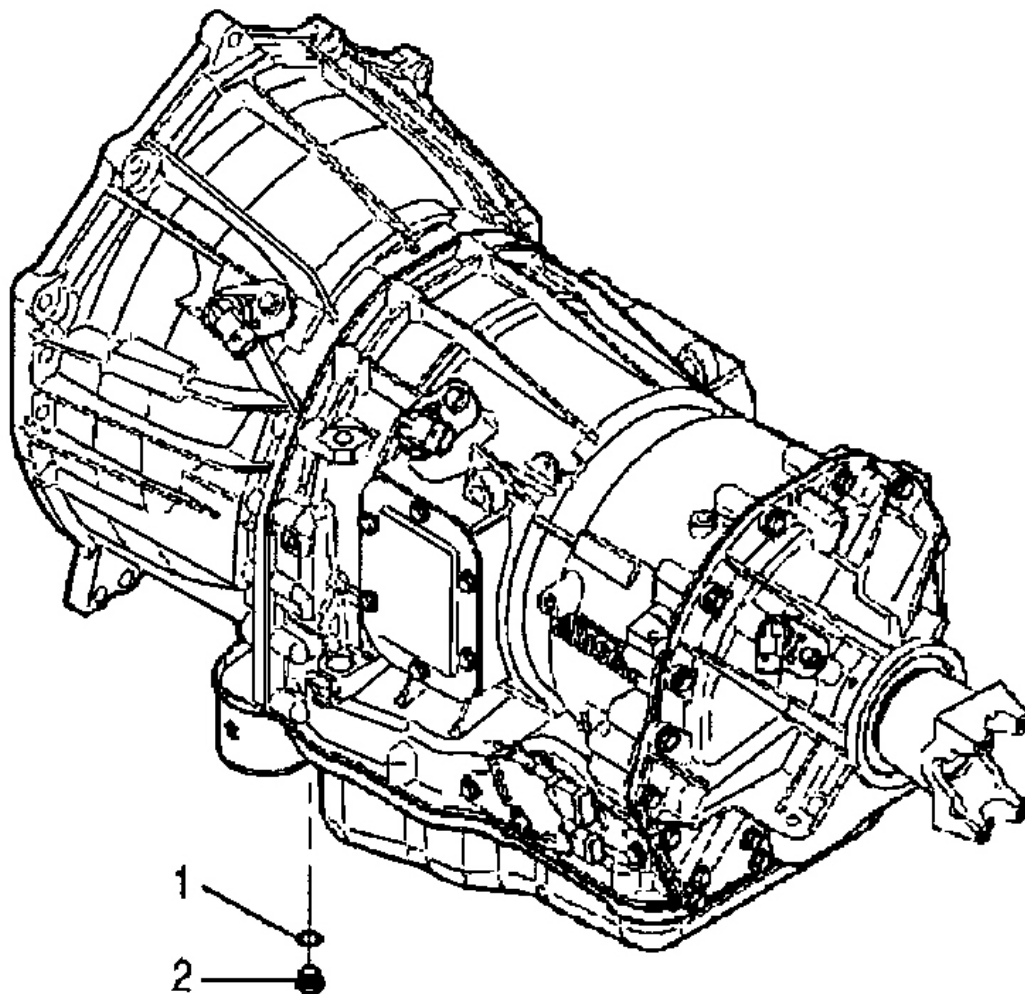
Installation

Install a new hydraulic connector assembly. See **Fig. 44** . Tighten to specification. See **TORQUE SPECIFICATIONS** . Connect the hose to the hydraulic connector(s).

OIL PRESSURE TEST PLUG

Removal

Remove the pressure tap plug (2) and "O" ring (1) that is located on the bottom of the converter housing near the control main filter. See **Fig. 45** . Remove the "O" ring from the plug and discard it.



G00096136

Fig. 45: Removing & Installing Oil Pressure Test Plug
Courtesy of GENERAL MOTORS CORP.

Installation

Install a new "O" ring (1) on the pressure tap plug (2). See **Fig. 45** . Install the plug and "O" ring into the converter housing. Tighten the plug to specification. See **TORQUE SPECIFICATIONS** .

PARK/NEUTRAL POSITION SWITCH

Removal

1. Disconnect the external wiring harness from the PNP switch.
2. Disconnect the shift linkage/cable from the shift lever (2) on the selector shaft (4). See **Fig. 7** .
3. Use wrench (1) to prevent the shift lever (2) from rotating. Remove nut (3) from the end of the selector shaft (4). See **Fig. 7** . Carefully remove the shift lever (2) from selector shaft (4).
4. Remove the 2 bolts (6). Remove the PNP switch (5) by sliding it outward over the selector shaft (4).

NOTE: If the park/neutral position switch did not easily slide off the selector shaft, use a file to remove any burrs or raised metal where the selector lever was seated against the shoulder of the selector shaft.

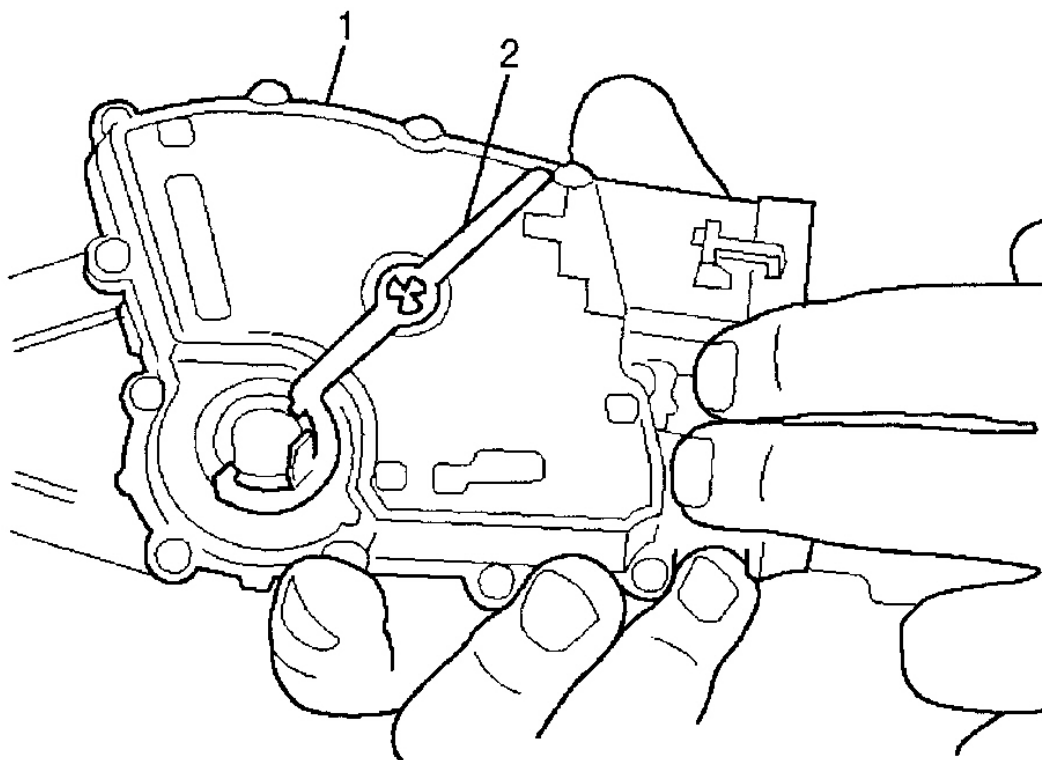
Installation

NOTE: If replacing the PNP switch, use the following procedure. If reinstalling old switch, use adjustment procedure. See **PARK/NEUTRAL POSITION SWITCH** under **ADJUSTMENTS**.

1. Ensure the neutral assurance bracket (2) is in the proper position on PNP switch (1). See **Fig. 46** .
2. Ensure the selector shaft is in the Neutral position as follows:
 - A. Place a wrench on the selector shaft flats and rotate the shaft to its furthest clockwise position.
 - B. Rotate the selector shaft counter clockwise 2 detents.
3. Align the PNP switch (5) with the main housing so the neutral assurance bracket is facing outward.
4. While maintaining the correct PNP switch to selector shaft alignment, slide the new PNP switch (5) over the selector shaft (4).
5. While holding the neutral assurance bracket in engagement with the PNP switch, install the 2 bolts (6) so the PNP switch may be rotated with slight effort. See **Fig. 46** . Tighten the 2 bolts to specification. See **TORQUE SPECIFICATIONS** .
6. Remove and discard the neutral assurance bracket.
7. Install splash shield (1), concave side toward PNP switch (3), over selector shaft (2).

NOTE: **DO NOT drive the selector lever onto the selector shaft. DO NOT use an impact wrench in order to tighten the selector lever nut. Hold the lever with a wrench while tightening the nut. DO NOT drive the selector lever onto the selector shaft. Do not use an impact wrench in order to tighten the selector lever nut. Hold the lever with a wrench while tightening the nut. Failure to follow these instructions may result in transmission damage.**

8. Reinstall shift lever (2). Install nut (3), by hand, on the end of selector shaft (4). See **Fig. 7** . Use a wrench (1) to keep the shift lever from rotating. Tighten shift lever nut to specification. See **TORQUE SPECIFICATIONS** .
9. Reconnect the shift selector linkage/cable to the shift lever (2).
10. Connect the external wiring harness to the PNP switch.



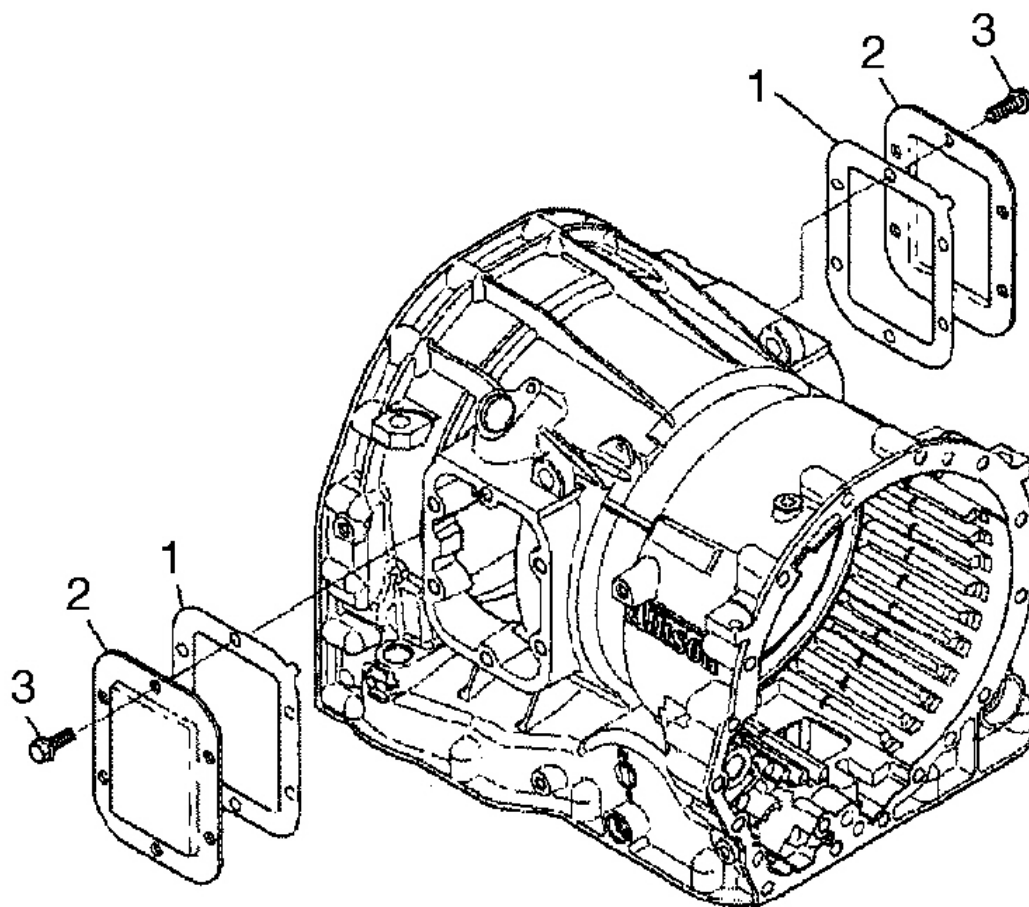
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Fig. 46: Removing & Installing Park/Neutral Position Switch
Courtesy of GENERAL MOTORS CORP.

POWER TAKE-OFF COVER

Removal & Installation

Remove 6 bolts (3). Remove the PTO cover (2) and gasket (1). See **Fig. 47** . Discard the used gasket. Ensure the PTO gasket face on the main housing is free of all foreign material, nicks and scratches. To install, place the new PTO cover gasket (1) on the cover (2). Start the top center bolt (3) first. See **Fig. 47** . Install the other 5 bolts and tighten all bolts to specification. See **TORQUE SPECIFICATIONS** .



G00096111

Fig. 47: Removing & Installing Power Take-Off Cover
 Courtesy of GENERAL MOTORS CORP.

PRESSURE SWITCH MANIFOLD

Removal

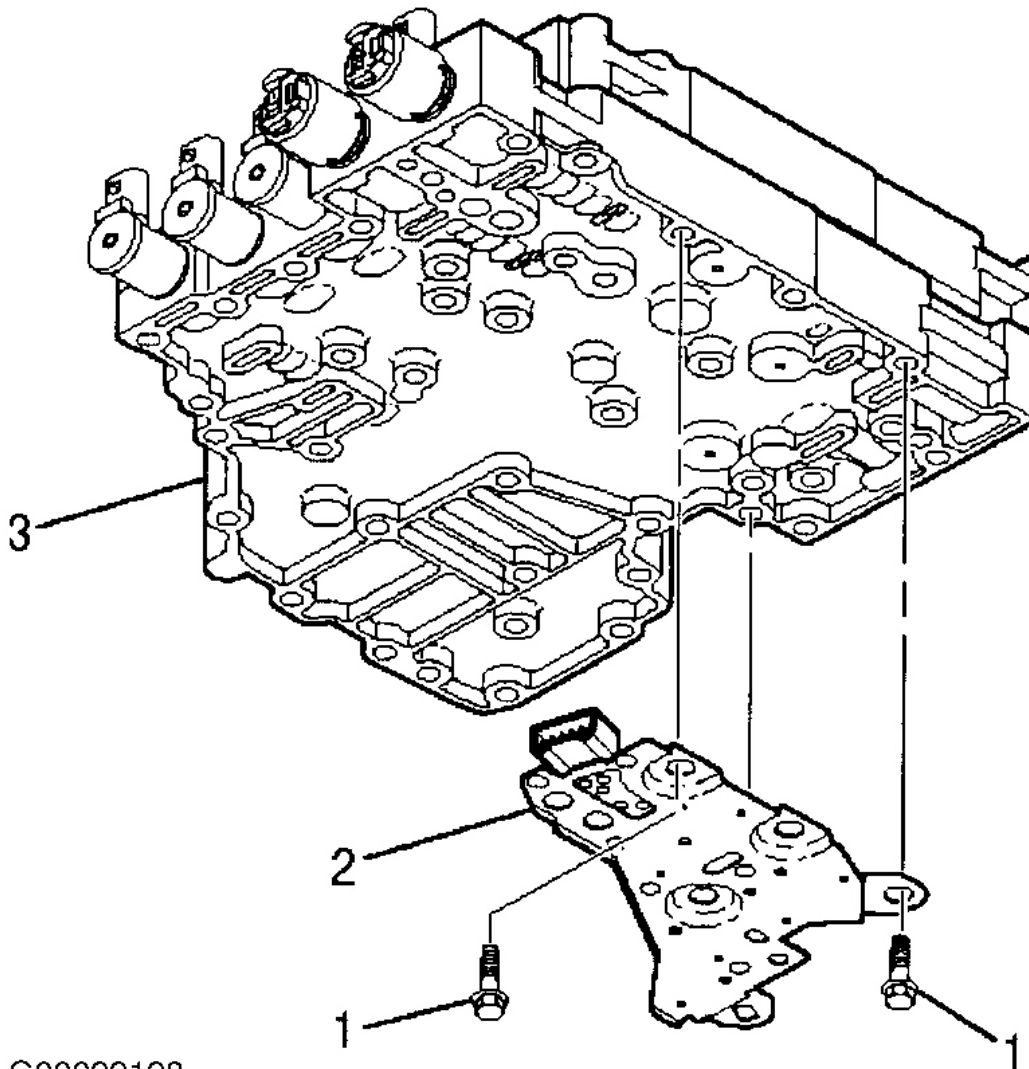
NOTE: Individual pressure switches cannot be replaced. When any pressure switch needs replacement, the entire assembly must be replaced.

1. Remove the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION.
2. Remove the 2 bolts (2). Remove the reverse signal tube (1). See **Fig. 37**.

WARNING: Before servicing any electrical component, the ignition key must be

in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures. If a tool or equipment could easily come in contact with a live exposed electrical terminal, also disconnect the negative battery cable. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.

3. Disconnect the internal wiring harness connector from the pressure switch assembly (2).
4. Remove 5 bolts (1). Remove the pressure switch assembly (2). See **Fig. 48** .



G00092198

Fig. 48: Removing & Installing Pressure Switch Manifold Assembly

Courtesy of GENERAL MOTORS CORP.

Installation

1. Place the new pressure switch manifold assembly (2) in position and install one bolt (1) in a recessed location to hold it into position. See **Fig. 48** .
2. Start the remaining 4 bolts (1) in recessed locations and tighten the bolts by hand. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Connect the internal wiring harness connector to the pressure switch assembly.
4. Install the reverse signal tube (1). Install 2 bolts (2). Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
5. Install the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION.

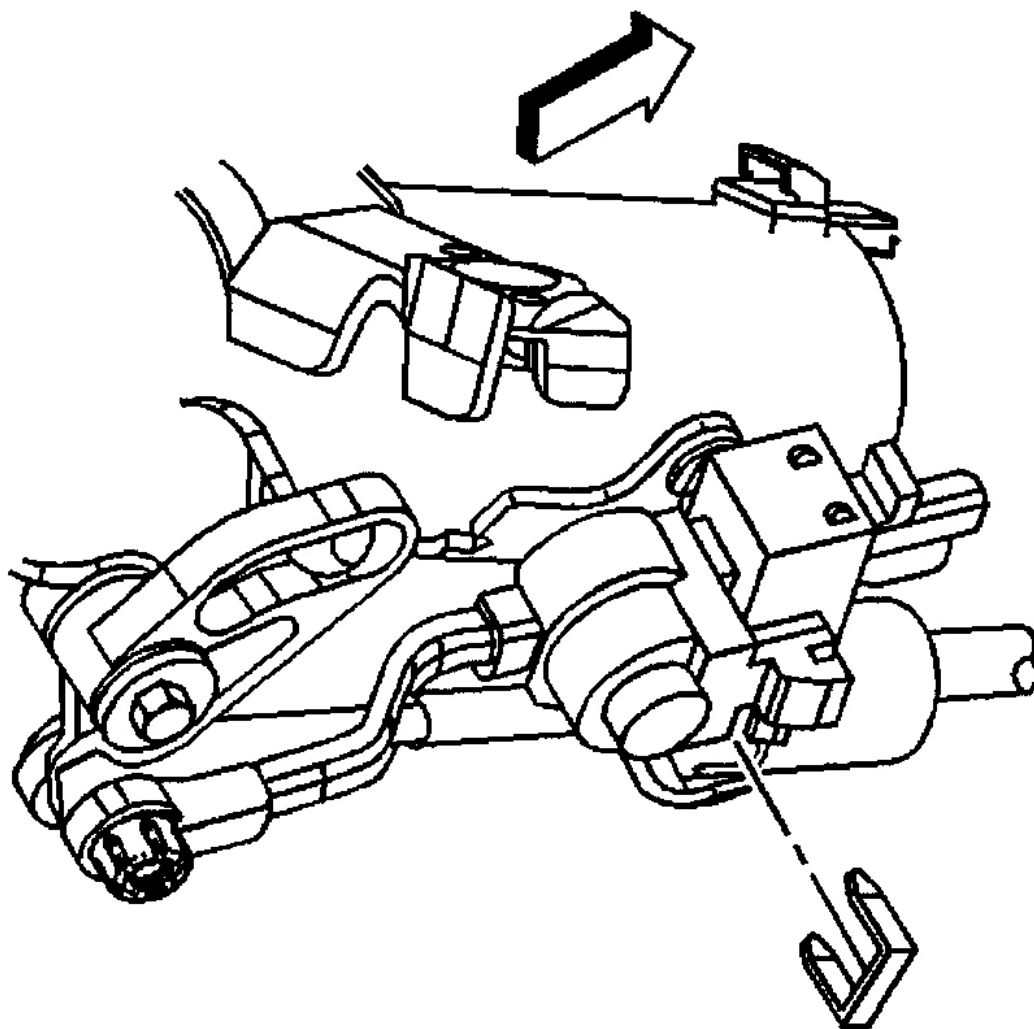
SHIFT CABLE

Removal

1. Position the shift lever into the Park position.
2. Remove the instrument panel knee bolster.
3. Remove the retainer securing the cable to the steering column. See **Fig. 49** .
4. Remove the cable end from the steering column ball stud. See **Fig. 50** .
5. Depress the tangs and remove the cable from the steering column bracket.
6. Remove the bolt securing the cable support to the brace. See **Fig. 51** .

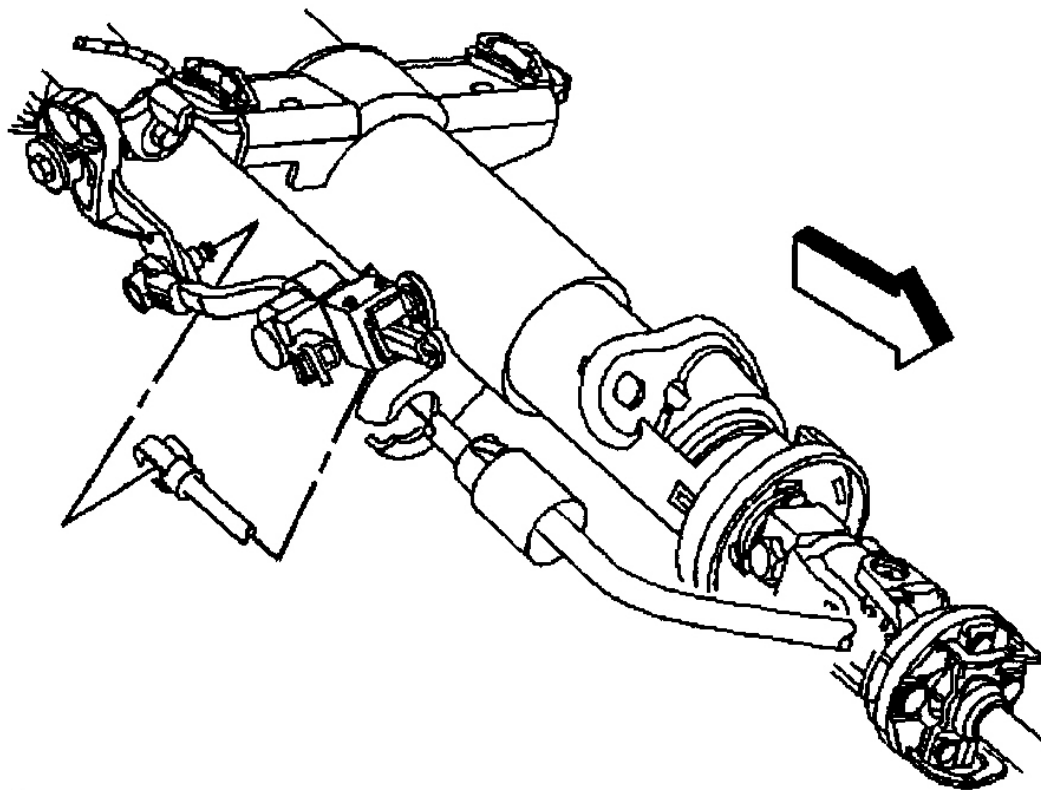
NOTE: **Avoid unnecessary twisting/bending of the selector cable when removing the cable from the support.**

7. Remove the range selector cable from the support. See **Fig. 52** .
8. Raise and suitably support the vehicle.
9. Ensure the transmission manual shaft is positioned in mechanical Park.
10. Remove the range selector cable end (2) from the transmission range selector lever ball stud (1). See **Fig. 53** .
11. Remove the retainer securing the cable to the bracket. See **Fig. 54** .
12. Depress the tangs and remove the cable from the transmission bracket.
13. Remove the cable clips from the floor panel reinforcement. See **Fig. 55** .
14. Remove the cable clips (2) from the transfer case, if equipped. See **Fig. 56** .
15. Lower the vehicle.
16. Pull back the carpet and insulation around the driver's area.
17. Remove the cable grommet from the floor panel. See **Fig. 57** .
18. Remove the cable from the hole in the floor panel.



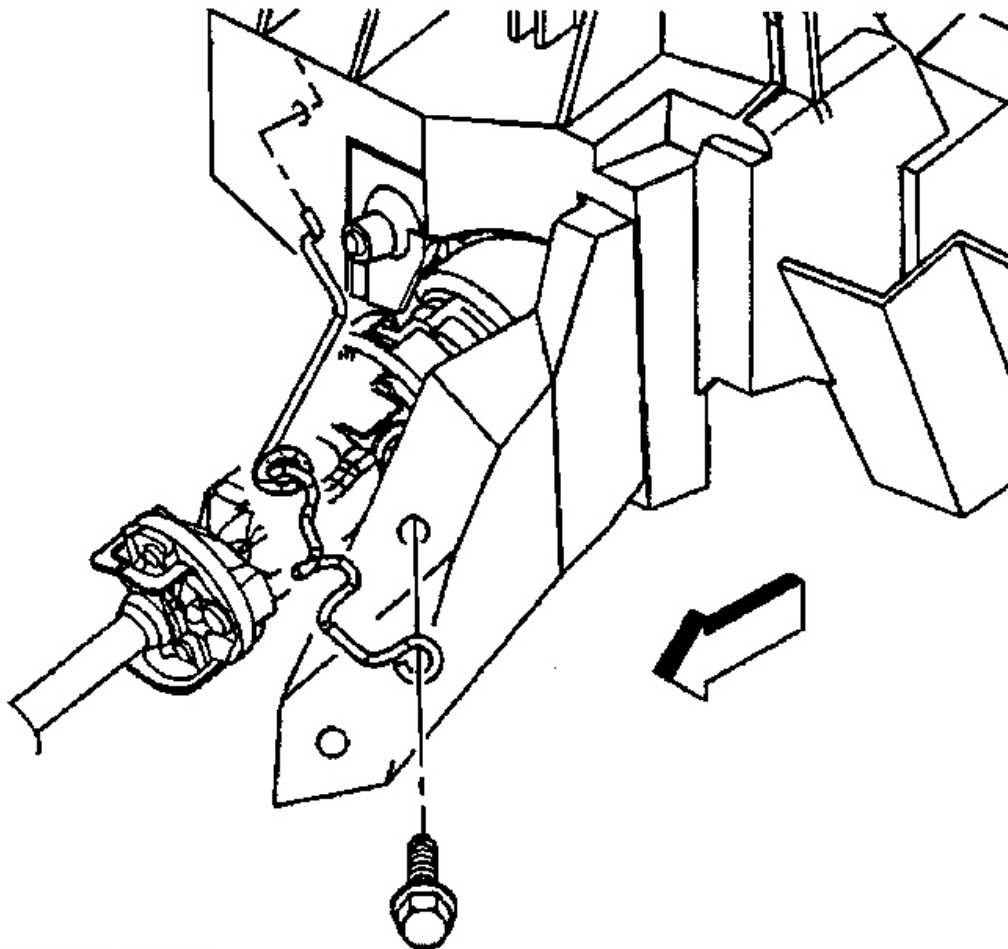
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Fig. 49: Removing Retainer Securing Cable To Steering Column
Courtesy of GENERAL MOTORS CORP.



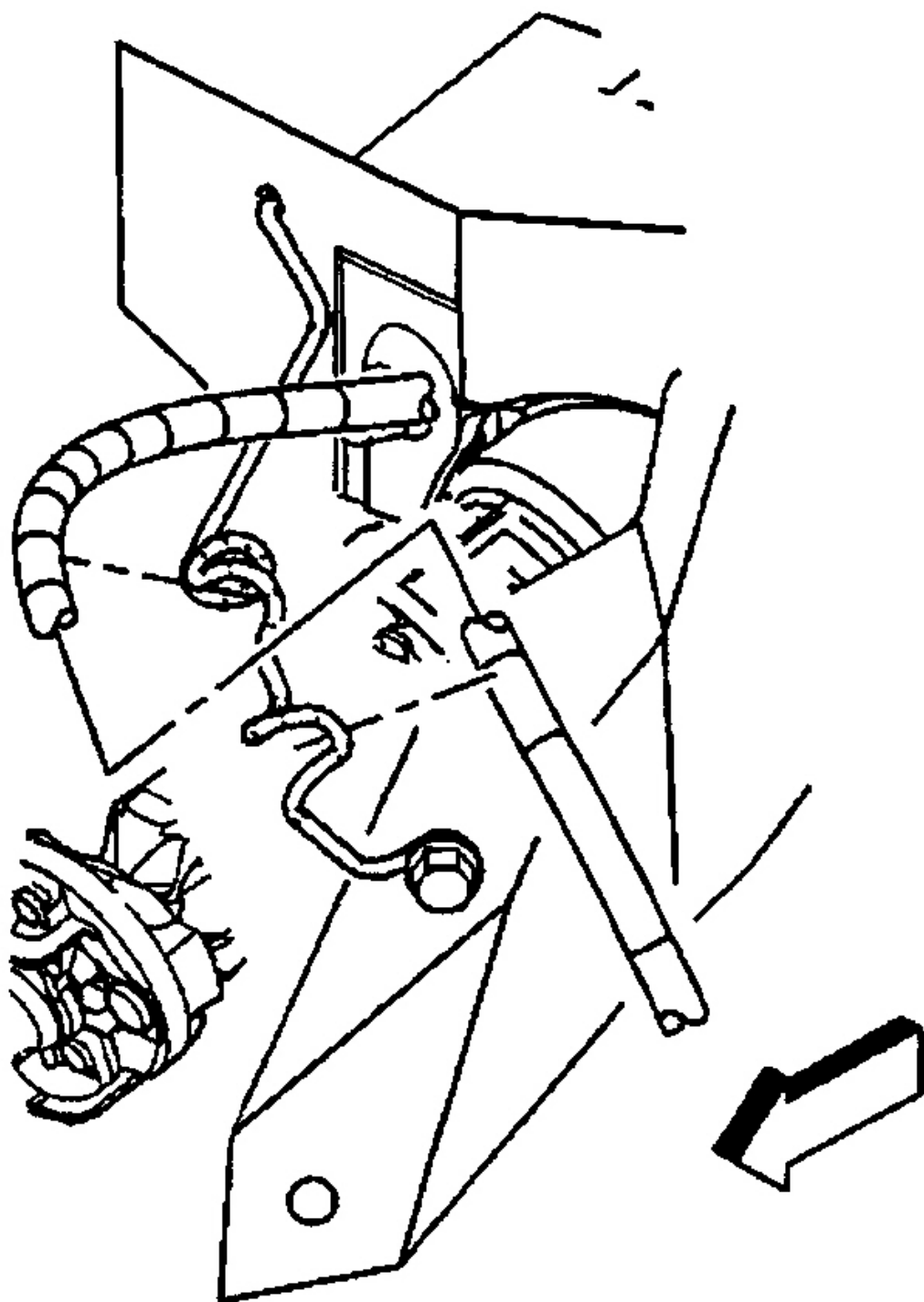
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Fig. 50: Removing Cable From Steering Column Ball Stud
Courtesy of GENERAL MOTORS CORP.



G00096126

Fig. 51: Removing & Installing Cable Support
Courtesy of GENERAL MOTORS CORP.



G00096127

Fig. 52: Removing & Installing Shift Cable At Support
Courtesy of GENERAL MOTORS CORP.

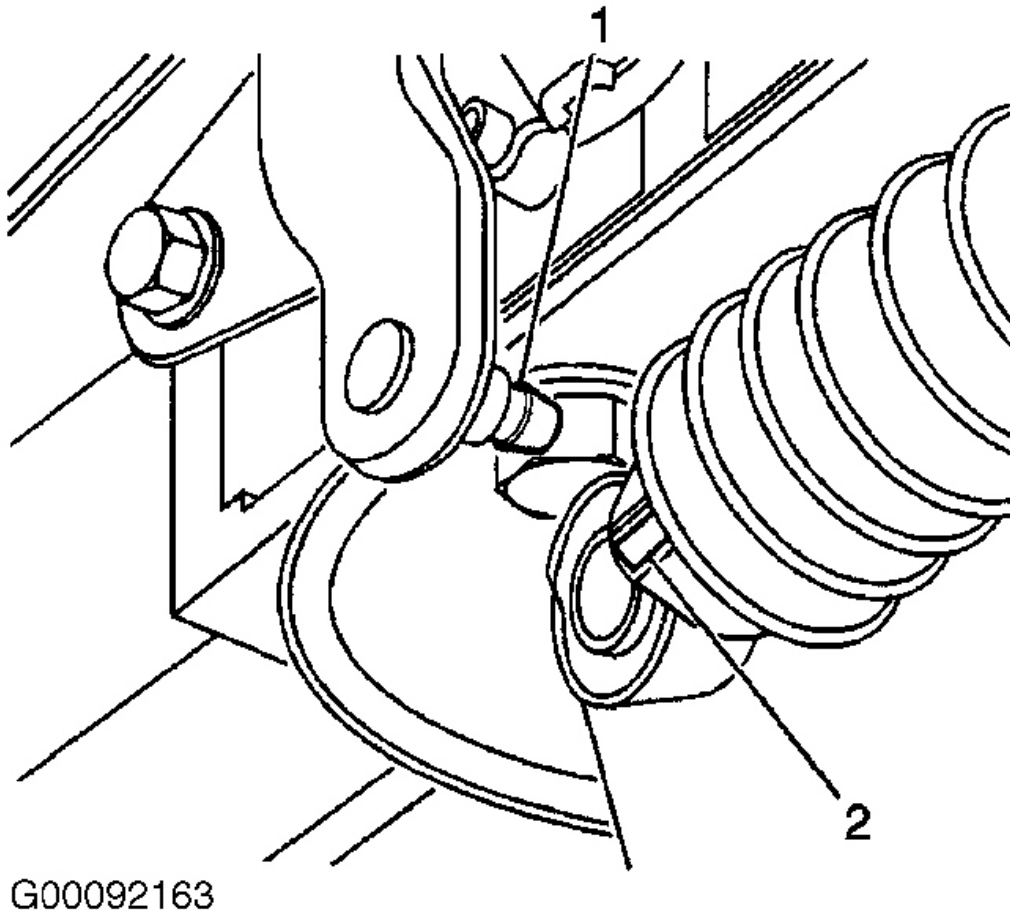
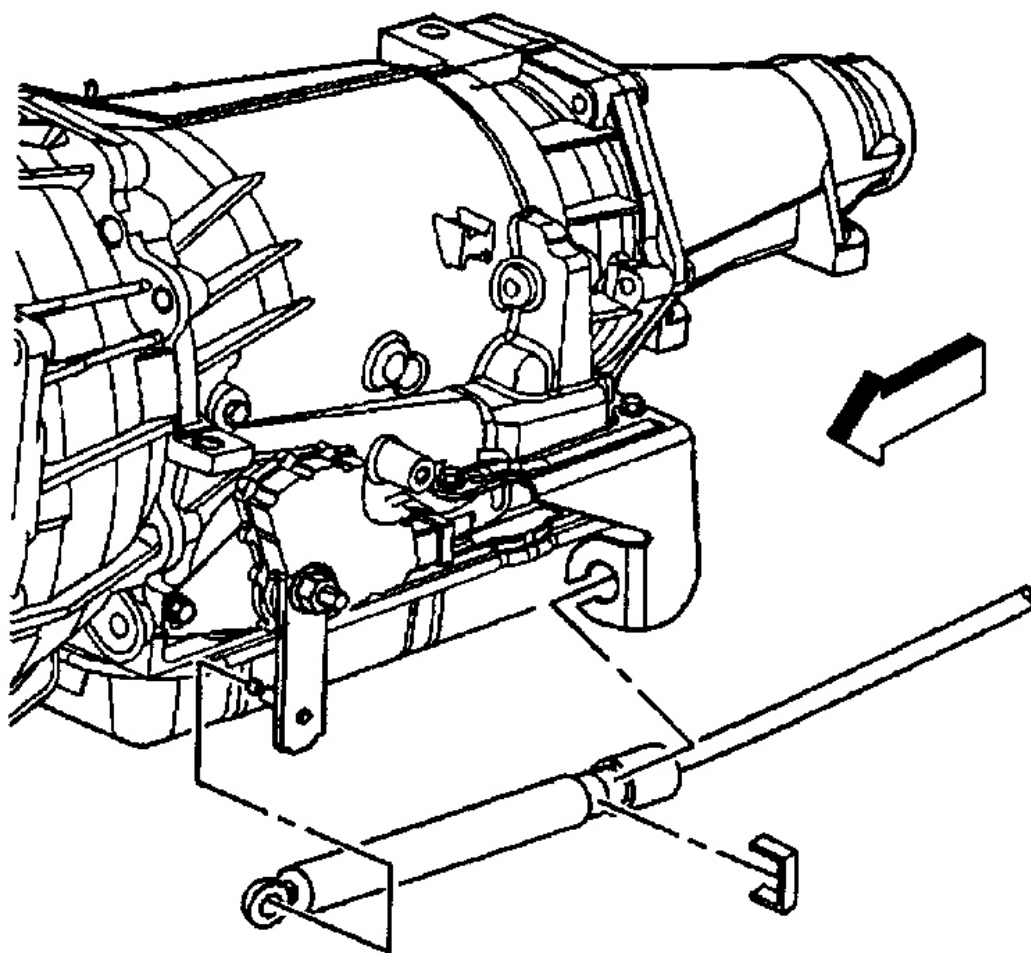
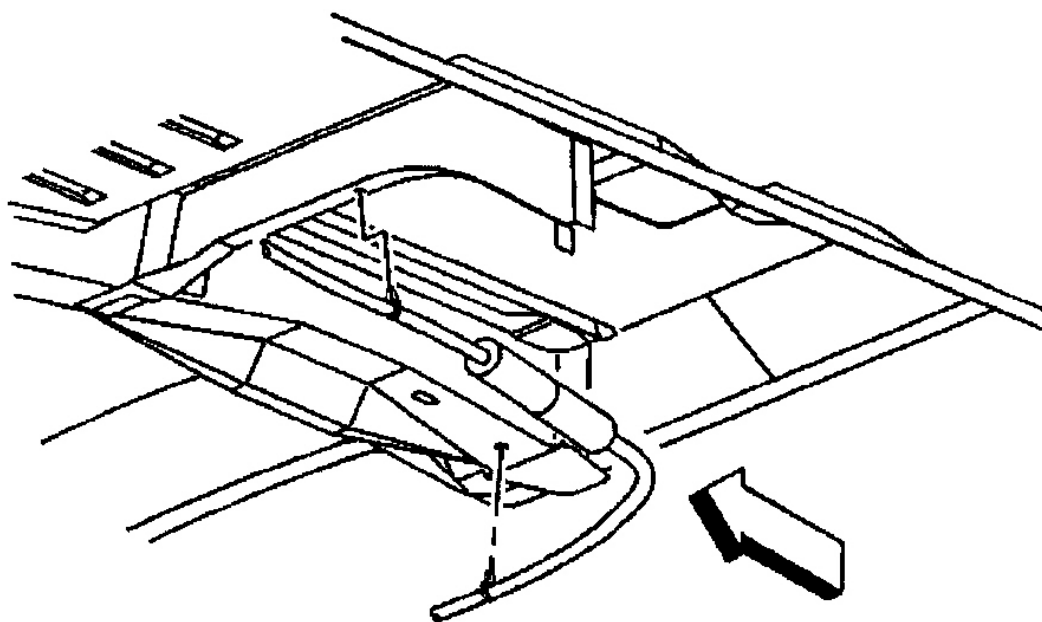


Fig. 53: Removing & Installing Shift Cable At Transmission Lever
Courtesy of GENERAL MOTORS CORP.



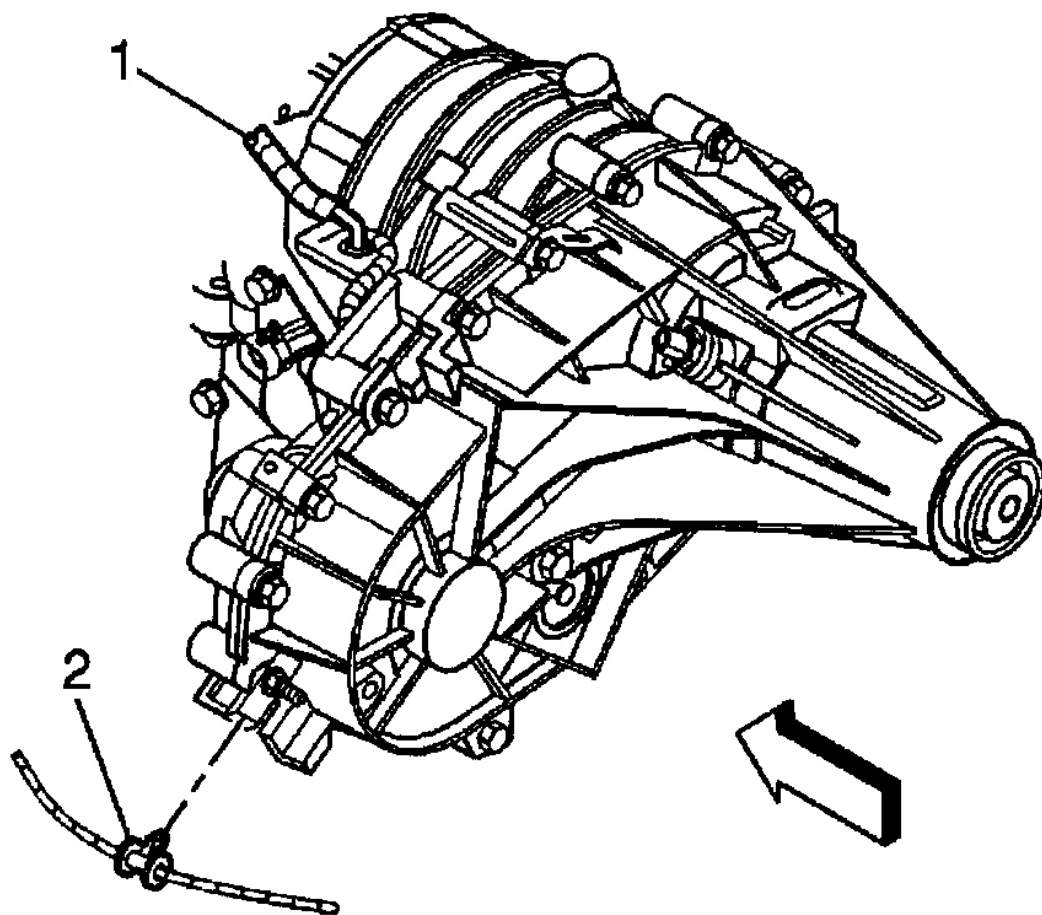
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Fig. 54: Removing & Installing Shift Cable At Transmission
Courtesy of GENERAL MOTORS CORP.



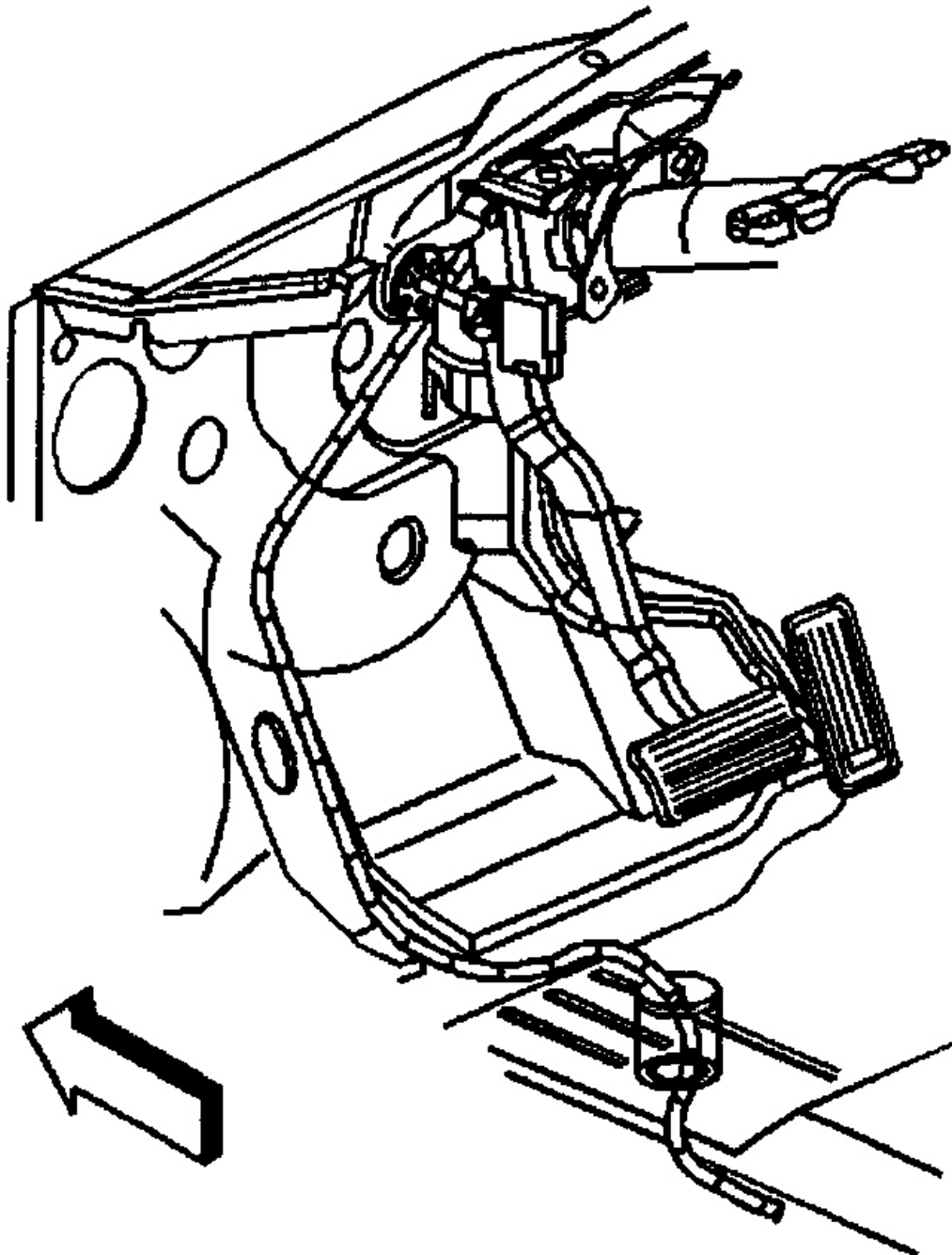
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Fig. 55: Removing Floor Panel Reinforcement Clips
Courtesy of GENERAL MOTORS CORP.



G00203004

Fig. 56: Removing Cable Clips From Transfer Case
Courtesy of GENERAL MOTORS CORP.



G00202987

Fig. 57: Removing Cable Grommet From Floor Panel
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install the cable to the hole in the floor panel. See **Fig. 57** .
2. Install the cable grommet to the floor panel.
3. Position the carpet and insulation around the driver's area.
4. Raise the vehicle.
5. Install the cable clips (2) to the transfer case, if equipped. See **Fig. 56** .
6. Install the cable clips to the floor panel reinforcement. See **Fig. 55** .
7. Ensure the transmission manual shaft is positioned in mechanical Park.
8. Install the cable to the transmission bracket. See **Fig. 54** .
9. Install the retainer securing the cable to the bracket.
10. Install the range selector cable end (2) to the transmission range selector lever ball stud (1). See **Fig. 53** .
11. Lower the vehicle.

NOTE: **Avoid unnecessary twisting/bending of the range selector cable when removing the cable from the support.**

12. Install the range selector cable to the support. See **Fig. 52** .
13. Install the bolt securing the cable support to the brace. See **Fig. 51** . Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .
14. Install the cable to the steering column bracket. See **Fig. 50** .
15. Install the cable end to the steering column ball stud.
16. Install the retainer securing the cable to the steering column. See **Fig. 49** .
17. Install the instrument panel knee bolster.
18. If all of the gear positions cannot be achieved, adjust the cable. See **SHIFT CABLE** under ADJUSTMENTS.

SELECTOR SHAFT & DETENT LEVER

Removal

1. Remove the control valve assembly from the transmission. See **CONTROL VALVE BODY** .
2. Remove the PNP switch. See **PARK/NEUTRAL POSITION SWITCH** .
3. Loosen nut (1) on the selector shaft (5) that retains the detent lever (4) to the selector shaft. See **Fig. 58** .

NOTE: **DO NOT mar the main housing surface around the spring pin when removing the spring pin. An unmarred surface is required to maintain the seal between the control valve assembly and the main housing.**

4. Place a protective plate on the main housing surface around the spring pin (3). Place a drill bit inside spring pin (3) to prevent cutting or collapsing the pin when removing the pin. Remove the spring pin (3) from the main housing.

5. Slide the selector shaft (5) through the detent lever (4) and through the selector shaft seal.
6. Rotate the detent lever to disengage the park pawl apply assembly (2). Remove the detent lever (4) and nut (1).

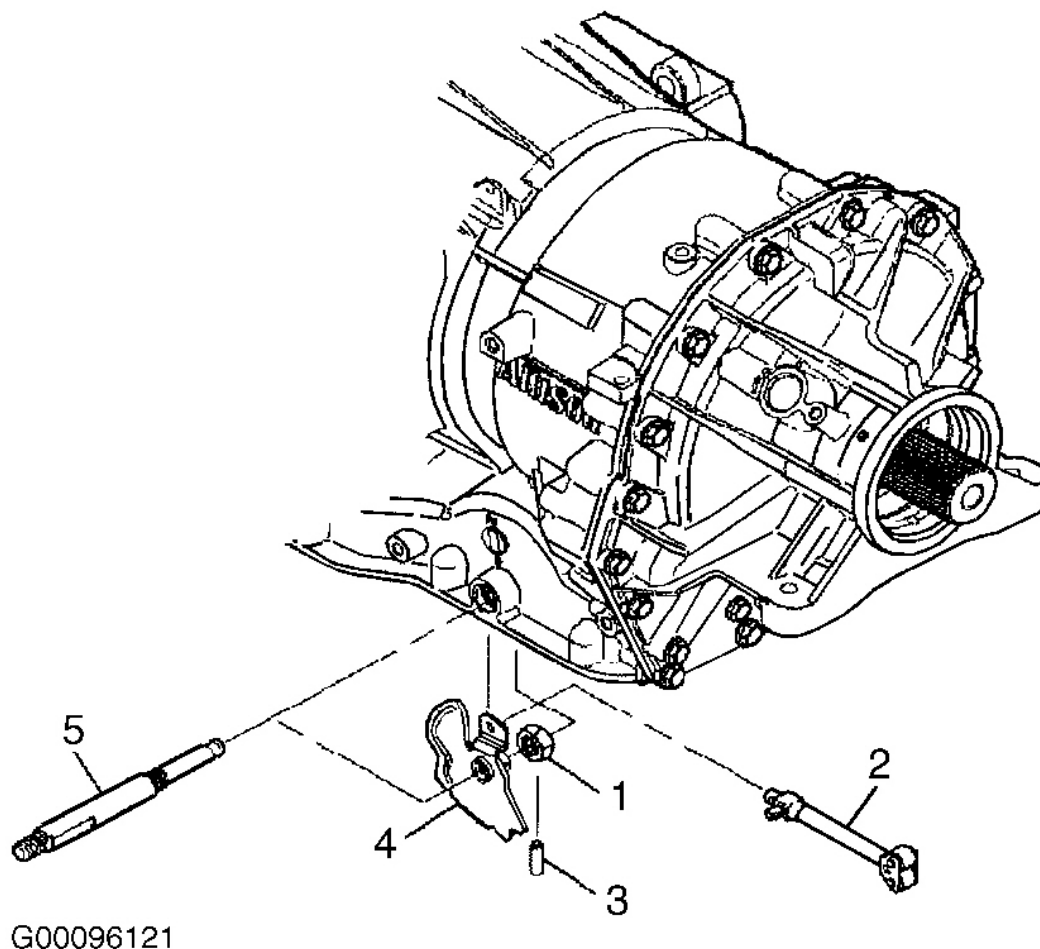


Fig. 58: Removing & Installing Selector Shaft & Detent Lever
Courtesy of GENERAL MOTORS CORP.

Installation

1. Place the new detent lever (4) in position in the main housing. Rotate the detent lever to engage the park pawl apply assembly (2). Reinstall the selector shaft (5) through the selector shaft seal and through the detent lever (4). See **Fig. 58** .
2. Place the nut (1) in position over the selector shaft. Push the selector shaft (5) into its final position in the main housing. Reinstall the spring pin (3) into the main housing that retains the selector shaft.

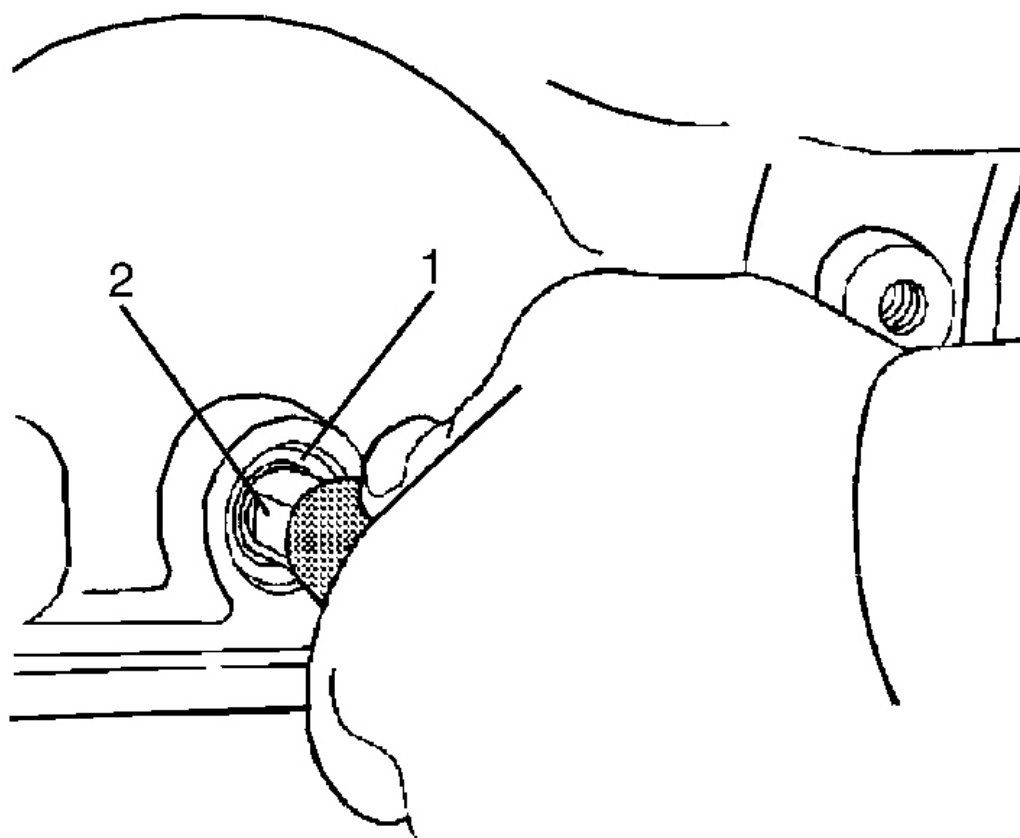
3. Install pin to 0.33-0.35" (8.5-9.0 mm) above main housing surface. Hand tighten nut (1). Tighten the nut (1) to specification. See **TORQUE SPECIFICATIONS** .
4. Install the PNP switch. See **PARK/NEUTRAL POSITION SWITCH** .
5. Install the control valve assembly. See **CONTROL VALVE BODY** .

SELECTOR SHAFT SEAL

Removal

NOTE: **Tools required: Selector Shaft Seal Remover (J-43911), and Selector Shaft Seal Installer (J-43909).**

1. Remove the PNP Switch. See **PARK/NEUTRAL POSITION SWITCH** .
2. Ensure the jackscrew for the selector shaft seal remover is backed off and will not interfere with installation of the removal tool. Slide the seal remover tool over the selector shaft (2) with the threaded end of the tool towards the seal. See **Fig. 59** .
3. Rotate the removal tool so the threads on the end of the tool engage the steel shell (1) of the seal. Use a wrench to ensure the removal tool is firmly attached to the seal shell.
4. Rotate the jackscrew in the clockwise direction to remove the seal from the bore. Discard the seal that was removed.

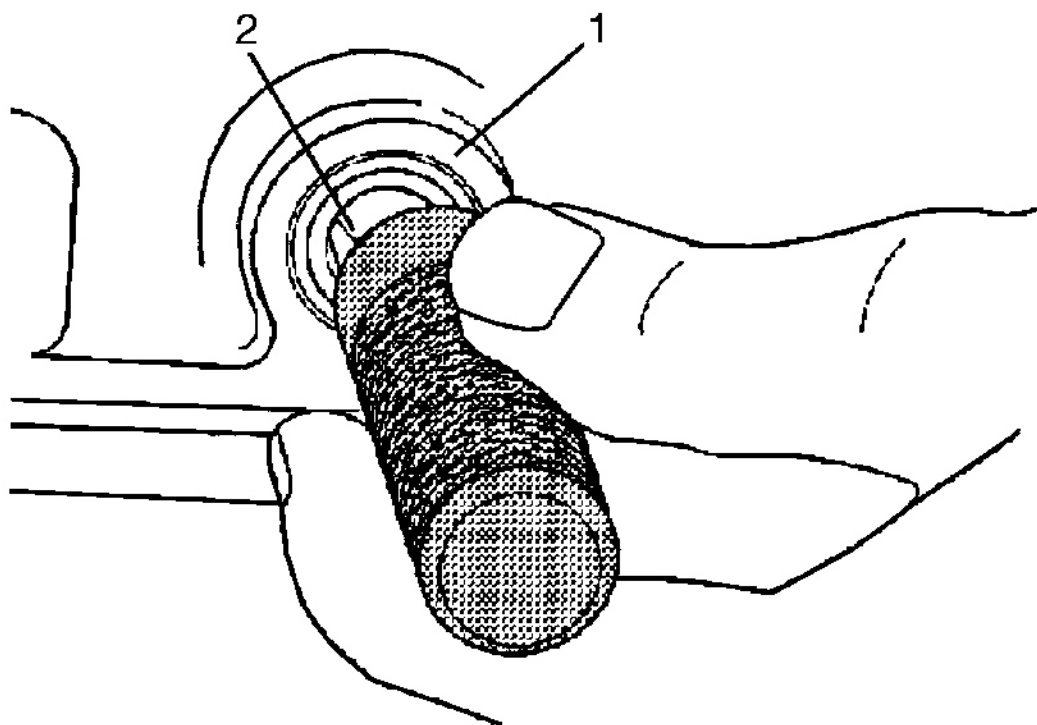


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Fig. 59: Removing Selector Shaft Seal
Courtesy of GENERAL MOTORS CORP.

Installation

1. Carefully slide a new selector shaft seal (1) over the selector shaft (2) with the wide face of the steel case facing outward. Position the seal so it is starting to enter the seal bore.
2. Obtain the selector shaft seal installer and remove the inner sleeve so the tool will slide over the selector shaft. See **Fig. 60** .
3. Slide the selector shaft seal installer into position so the end of the tool contacts the seal being installed.
4. Use a mallet to strike the selector shaft seal installer and drive the new seal into the seal bore until it is seated at the bottom of the bore.
5. Install the PNP Switch. See **PARK/NEUTRAL POSITION SWITCH** .



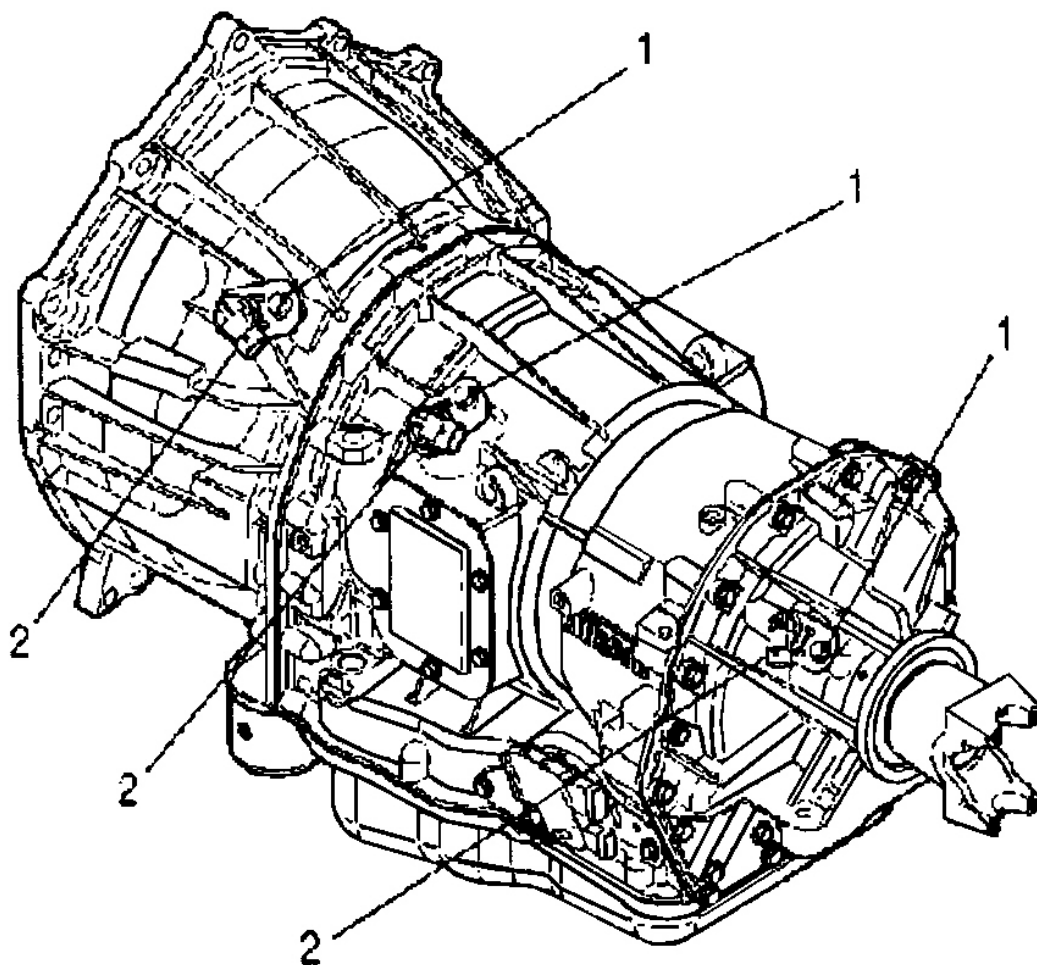
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Fig. 60: Installing Selector Shaft Seal
Courtesy of GENERAL MOTORS CORP.

SPEED SENSORS

Removal

1. Ensure the vehicle ignition is turned OFF.
2. Disconnect the external wiring harness from the speed sensor.
3. Remove the bolt (1) from the speed sensor and carefully remove the speed sensor (2). See **Fig. 61** .



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Fig. 61: Removing & Installing Vehicle Speed Sensors
 Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: DO NOT rotate the sensor in its retaining bracket. Changing the sensor/bracket orientation may cause improper operation.

1. Install a new "O" ring (3) on the speed sensor (2). Lubricate the "O" ring with clean transmission fluid. See **Fig. 61**.
2. Install the new speed sensor (2) into the speed sensor bore. Align the hole in the retaining bracket with the bolt hole in the speed sensor boss.
3. Install the speed sensor bolt and tighten to specification. See **TORQUE SPECIFICATIONS**.

4. Reconnect the external wiring harness to the speed sensor.

WIRING HARNESS

NOTE: **Tools required: Wiring Harness Connector Remover (J-44257), and Internal Wiring Harness Installer (J-44247).**

Removal

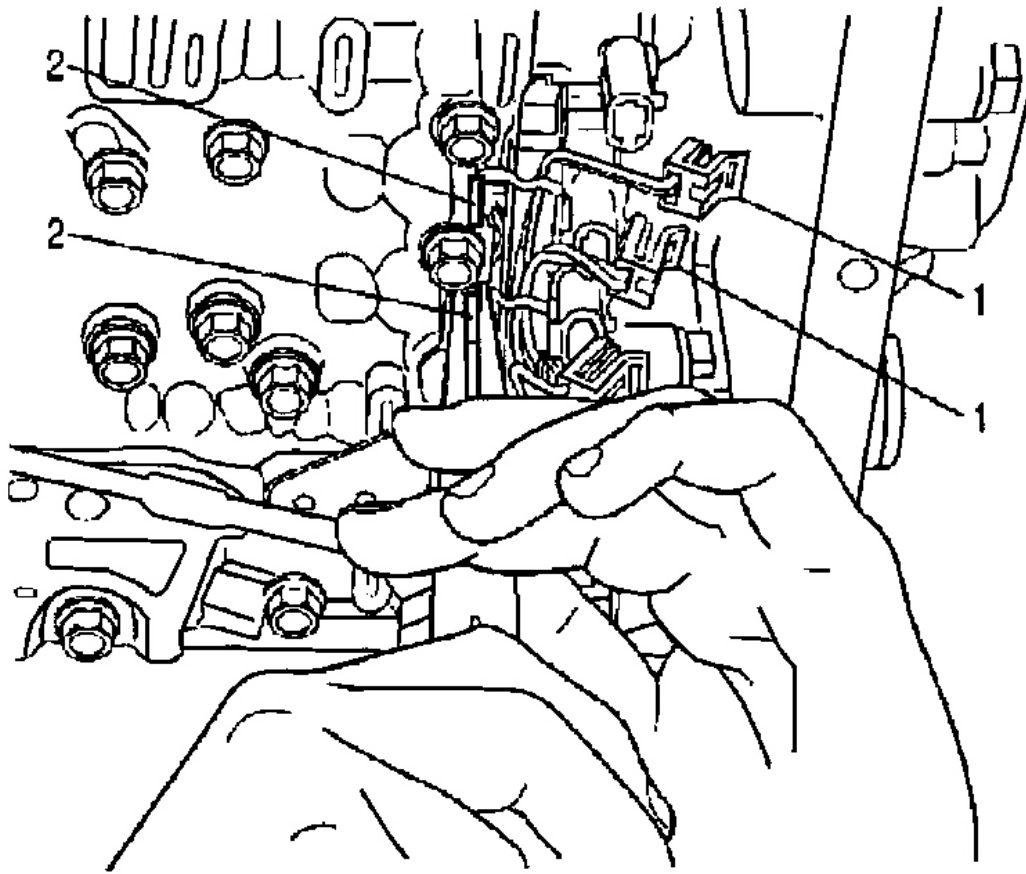
1. Remove the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION.
2. Disconnect the external wiring harness from the main transmission connector. Use the wiring harness connector remover, if connector is not easily accessible. See **Fig. 29** .

NOTE: **The main transmission connector is actually one end of the internal wiring harness that protrudes through the main housing.**

3. Place a 1 3/16" or (30 mm) 12-point deep socket or box end wrench (2) over the main transmission connector (1). See **Fig. 30** .
4. Push inward on the socket or wrench to release the retaining "feet" that attach the connector (1) to the main housing.
5. Remove the wrench. Push inward on the electrical connector to separate it from the main housing.
6. Disconnect the internal wiring harness connectors (1) from solenoids "A" through "F" and from the pressure switch assembly. See **Fig. 62** .

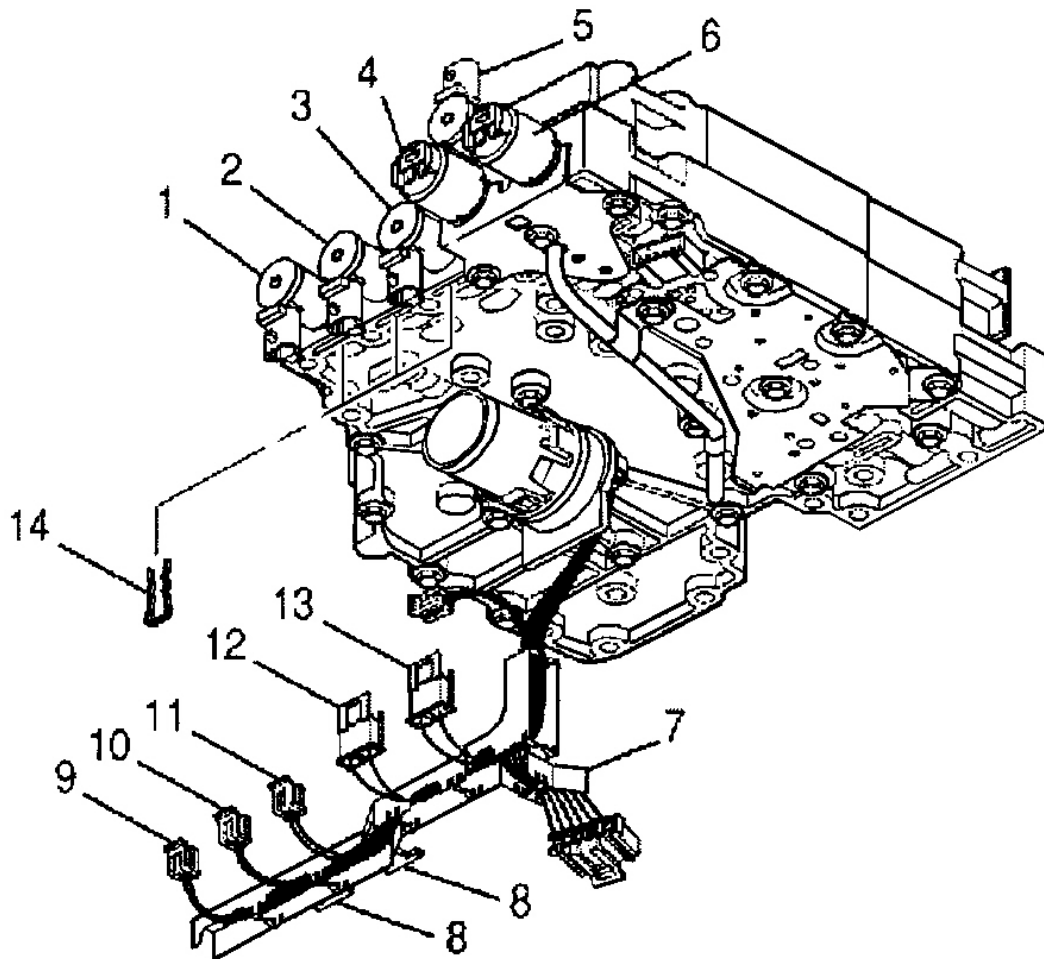
NOTE: **The solenoid retainers for "E" and "D" solenoids also retain tabs on the wiring harness "U" channel. The solenoids will remain in position even after the solenoid retainers are removed.**

7. Remove the solenoid retainers (2) for solenoids "E" and "D".
8. Remove the internal wiring harness from the transmission. See **Fig. 63** .



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Fig. 62: Disconnecting & Connecting Wiring Harness At Solenoids
Courtesy of GENERAL MOTORS CORP.



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Fig. 63: Exposed View Of Wiring Harness
Courtesy of GENERAL MOTORS CORP.

Installation

1. Align the tabs (8) on the new wiring harness "U" channel with the solenoid retainer slots for solenoids "E" (3) and "D" (2) on the control valve assembly. Install the solenoid retainers (14) for the "E" (3) and "D" (4) solenoids. See Fig. 63 .

NOTE: The internal wiring harness connectors (7) and (9-13) should be in the correct position for installation because of their pre-assembled position in the "U" channel.

2. Attach the internal wiring harness connectors to their respective solenoids "A" through "F" and to the

pressure switch assembly as follows:

- Connector No. 13 - Solenoid No. 6. See **Fig. 63** .
 - Connector No. 12 - Solenoid No. 4.
 - Connector No. 7 - Solenoid No. 5.
 - Connector No. 10 - Solenoid No. 2.
 - Connector No. 11 - Solenoid No. 3.
 - Connector No. 9 - Solenoid No. 1.
3. Push the main transmission connector (2) outward through hole (1) in the main housing until the retaining "feet" on the connector are near the locked position. **Fig. 35** .
 4. Use the internal wiring harness installer to seat the retaining "feet" on transmission connector (1). See **Fig. 36** .
 5. Install the oil pan and suction filter. See **INTERNAL FILTER** under LUBRICATION.
 6. Connect the external wiring harness to the main transmission connector.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Filler Tube Nut	13 (18)
Heat Shield Bolt	13 (18)
Heat Shield Nut	18 (24)
Oil Cooler Fitting	18 (24)
Oil Filter Tube Bolt	22 (30)
Oil Pan Bolt	20 (27)
Oil Pan Drain Plug	26 (35)
PNP Switch Bolt	20 (27)
PTO Cover Bolt	32 (43)
Shift Lever Nut	18 (24)
INCH Lbs. (N.m)	
Auxiliary Oil Cooler Bolt	108 (12)
Cable Support Bolt	89 (10)
Control Solenoid Bolt	108 (12)
Control Valve Body Bolt	108 (12)
Detent Spring Bolt	108 (12)
Manual Detent Spring Bolt	97 (11)
Oil Pressure Test Plug	108 (12)
Pressure Switch Manifold	108 (12)
Reverse Signal Tube Bolt	108 (12)
Vehicle Speed Sensor Bolt	108 (12)