

2000-01 AUTOMATIC TRANSMISSIONS

Servicing - Catera

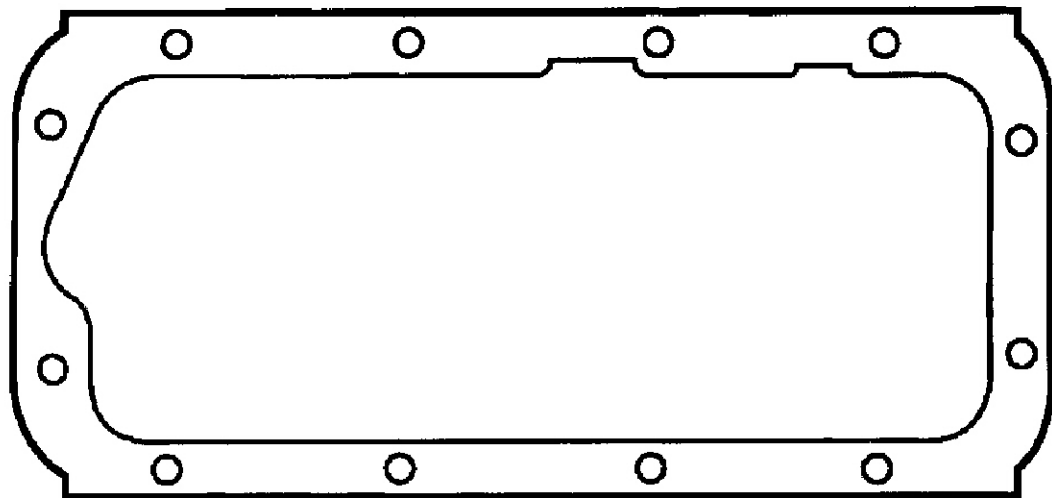
APPLICATION

TRANSMISSION APPLICATION

Application	Transmission Model (RPO Code)
Catera	4L30-E (ML4)

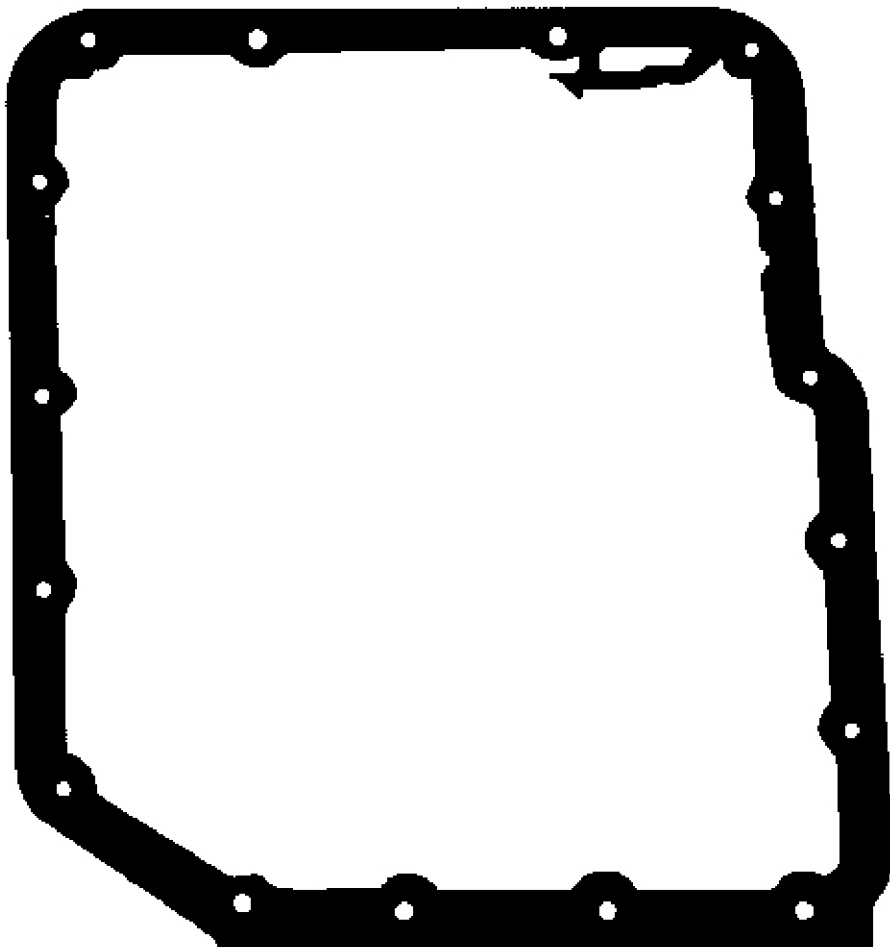
IDENTIFICATION

OIL PAN GASKET



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Fig. 1: Identifying Oil Pan Gasket (Hydra-Matic 4L30-E - Front)

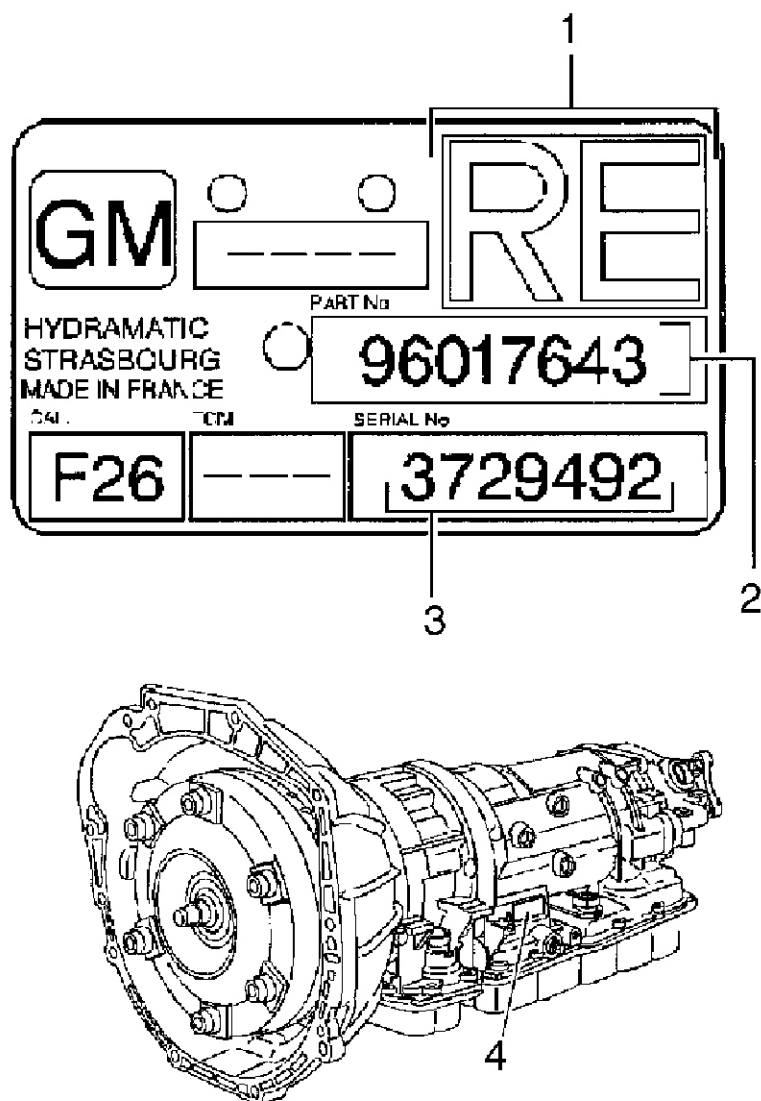


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Fig. 2: Identifying Oil Pan Gasket (Hydra-Matic 4L30-E - Rear)

TRANSMISSION

Transmission identification plate is located on driver's side of transmission. See **Fig. 3** .



1. Model
2. Part Number
3. Serial Number
4. Transmission Identification Plate Location

G00078075

Fig. 3: Locating Transmission Identification Plate
 Courtesy of GENERAL MOTORS CORP.

LUBRICATION

NOTE: The 4L30-E transmission is not equipped with a dipstick.

SERVICE INTERVALS

It is not necessary to check the transmission fluid level. A transmission fluid leak is the only reason for fluid loss. Transmission fluid should not be changed under normal operating conditions. Under continuous extreme operating conditions (trailer towing, heavy city traffic with ambient temperature more than 90°F (32°C) or delivery service), replace fluid and filter every 50,000 miles. If transmission is not used under any of these conditions, the fluid and filter do not require changing.

CHECKING FLUID LEVELS

CAUTION: The engine must be running when the transmission fluid fill plug is removed, or excessive fluid loss will occur. Transmission fluid may be hot. Since the actual fluid level is unknown, stand clear when removing the fill plug. Have a container ready to capture any lost fluid. Do not turn the engine off with the fill plug removed, as you can be injured by hot transmission fluid being expelled out of the oil fill opening.

NOTE: The transmission fluid checking procedure is an important part of any mechanical/hydraulic system diagnosis. The transmission fluid condition can be a reliable indicator of the presence of problems within the transmission.

1. Did you perform the diagnostic system check? If not, perform the diagnostic system check. See SELF-DIAGNOSTIC SYSTEM in appropriate DIAGNOSIS article in AUTOMATIC TRANSMISSIONS. If so, go to next step.

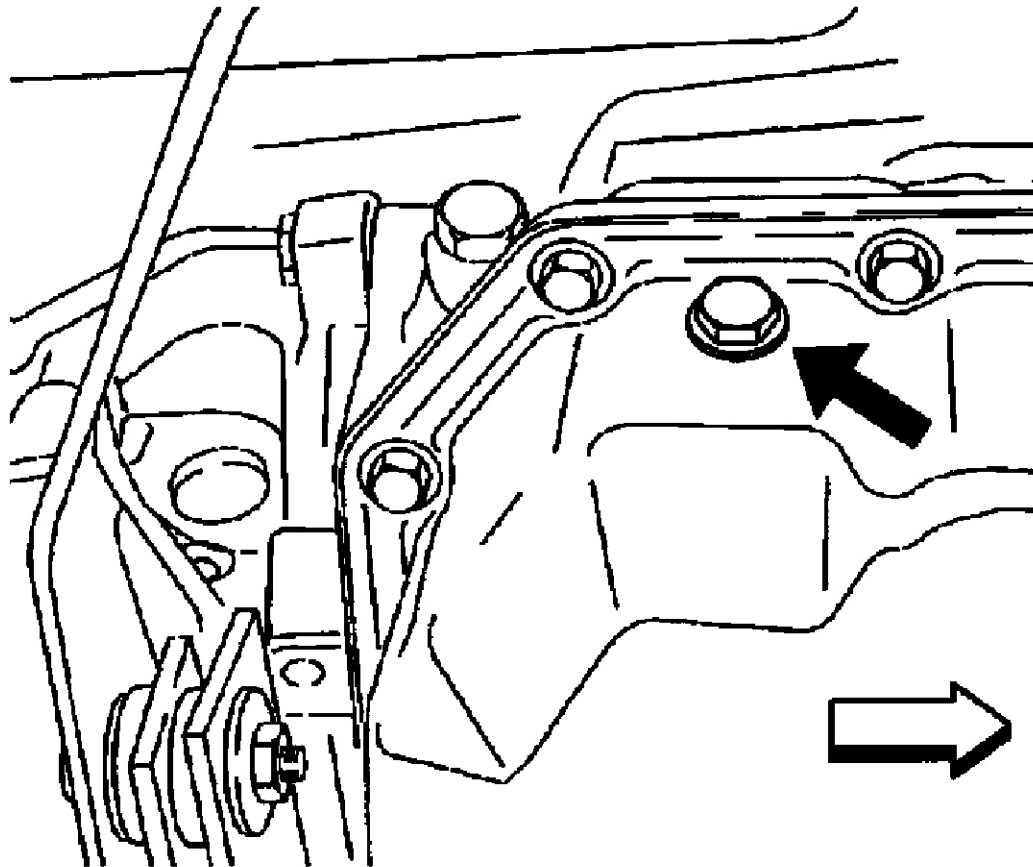
NOTE: The transmission fluid may darken with normal use and does not always indicate contamination or oxidation.

2. Warm the transmission to the operating temperature by driving the vehicle 15 miles, or by running the engine until the transmission fluid temperature has reached 113-185°F (45-85°C). Raise the vehicle on a hoist. The vehicle must be level when removing the transmission fluid fill plug. If a hoist is unavailable, the vehicle must be lifted at both ends and suitably supported. Start the engine. With the engine running and the transmission at the normal operating temperature, remove the transmission fluid fill plug. Check the fluid color. If necessary, use a small screwdriver as a dipstick. Is the fluid color clear Red or Light Brown with no burnt odor? If so, go to step 5 . If not, go to next step.
3. Does the fluid have a burnt odor or a dark brown color? If so, go to step 8 . If not, go to next step.
4. Does the fluid have a cloudy or milky appearance? If so, go to step 7 . If not, go to step 8 .
5. Check the fluid level. The fluid level should be even with the bottom of the threaded opening in the transmission oil pan. See **Fig. 4** . Is the fluid level low? If not, perform road test procedure. See PERFORMANCE TESTS in appropriate DIAGNOSIS article in AUTOMATIC TRANSMISSIONS. If so, go to next step.
6. With the engine running, add only enough DEXRON-III(R) ATF to bring the fluid level to the bottom of the threaded opening in the transmission oil pan. Check the transmission for any external leaks at transmission oil pans, gaskets and transmission oil cooler lines. Is the repair complete? If so, perform road test procedure. See PERFORMANCE TESTS in appropriate DIAGNOSIS article in AUTOMATIC TRANSMISSIONS.
7. Replace the transmission oil cooler. Is the repair complete? If so, go to step 9 .

NOTE: A very small amount of material in the bottom of the oil pan is a normal condition.

8. Drain the fluid. Check the bottom of the pan for any excessive debris. Was a problem found? If not, go to step 10 If so, go to next step.
9. Repair or replace the transmission if required. Flush transmission oil cooler and lines. See **OIL COOLER FLUSHING** . Add enough DEXRON-III(R) ATF to bring the fluid level to the bottom of the threaded opening in the transmission oil pan. Start the engine. Add enough DEXRON-III(R) ATF in order to bring the fluid level to the bottom of the threaded opening in the transmission oil pan. Is the repair complete? If so, perform road test procedure. See PERFORMANCE TESTS in appropriate DIAGNOSIS article in AUTOMATIC TRANSMISSIONS.
10. Change the fluid and the oil filter. Add enough DEXRON-III(R) ATF in order to bring the fluid level to the bottom of the threaded opening in the transmission oil pan. Start the engine. Add enough DEXRON-III(R) ATF in order to bring the fluid level to the bottom of the threaded opening in the transmission oil pan. Is the

repair complete? If so, perform road test procedure. See PERFORMANCE TESTS in appropriate DIAGNOSIS article in AUTOMATIC TRANSMISSIONS.



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Fig. 4: Locating Oil Pan Fill Plug
 Courtesy of GENERAL MOTORS CORP.

RECOMMENDED FLUIDS

Manufacturer recommends DEXRON-III(R) ATF. Fill transmission with appropriate quantity. See **FLUID CAPACITIES** .

FLUID CAPACITIES

NOTE: Manufacturer does not specify a drain and refill capacity for this model.

TRANSMISSION FLUID CAPACITY ⁽¹⁾

Application	Overhaul - Qts. (L)
4L30-E	7.0 (6.4)

(1) Fluid capacities listed are approximate. Always fill to specified area on dipstick (if equipped). See **CHECKING FLUID LEVELS** .

DRAINING & REFILLING

Removal

1. Raise and support the vehicle. Place a drain pan under the transmission main case oil pan. Remove the front

and side transmission oil pan bolts only.

2. Loosen the rear transmission oil pan bolts approximately 4 turns. Lightly tap the transmission oil pan with a rubber mallet or pry to drain the fluid from the main case oil pan. Remove the transmission oil filter bolts. Remove the transmission oil filter.
3. Remove the transmission oil filter gasket. Place a drain pan under the transmission front oil pan. Remove the rear bolts from the transmission front oil pan. Remove the front bolts from the transmission front oil pan leaving one corner bolt in loosely.
4. Lightly tap oil pan with rubber mallet or pry to drain fluid. Clean the following components:
 - The transmission main case.
 - The transmission front adapter case.
 - The oil pan gasket surfaces with solvent.
 - The oil filter gasket surfaces.
 - All traces of gasket material must be removed.
 - Air dry.

Installation

1. Install the transmission oil filter gasket. Install the transmission oil filter. Install the transmission oil filter bolts. Tighten the transmission oil filter bolts to specification. See **TORQUE SPECIFICATIONS** .
2. Install the transmission front oil pan gasket. Install the transmission front oil pan. Install the front oil pan bolts. Tighten the front oil pan bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Install the transmission main case oil pan gasket. Install the transmission main case oil pan.
4. Install the transmission main case oil pan bolts. Tighten the main case oil pan bolts to specification. See **TORQUE SPECIFICATIONS** .
5. Refill the transmission with DEXRON-III(R) ATF. Fill the transmission (using and oil suction gun) to lower edge of oil pan fill plug opening. Tighten the oil pan fill plug to specification. See **TORQUE SPECIFICATIONS** .
6. Lower the vehicle. Inspect the transmission fluid level. See **CHECKING FLUID LEVELS** .

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.

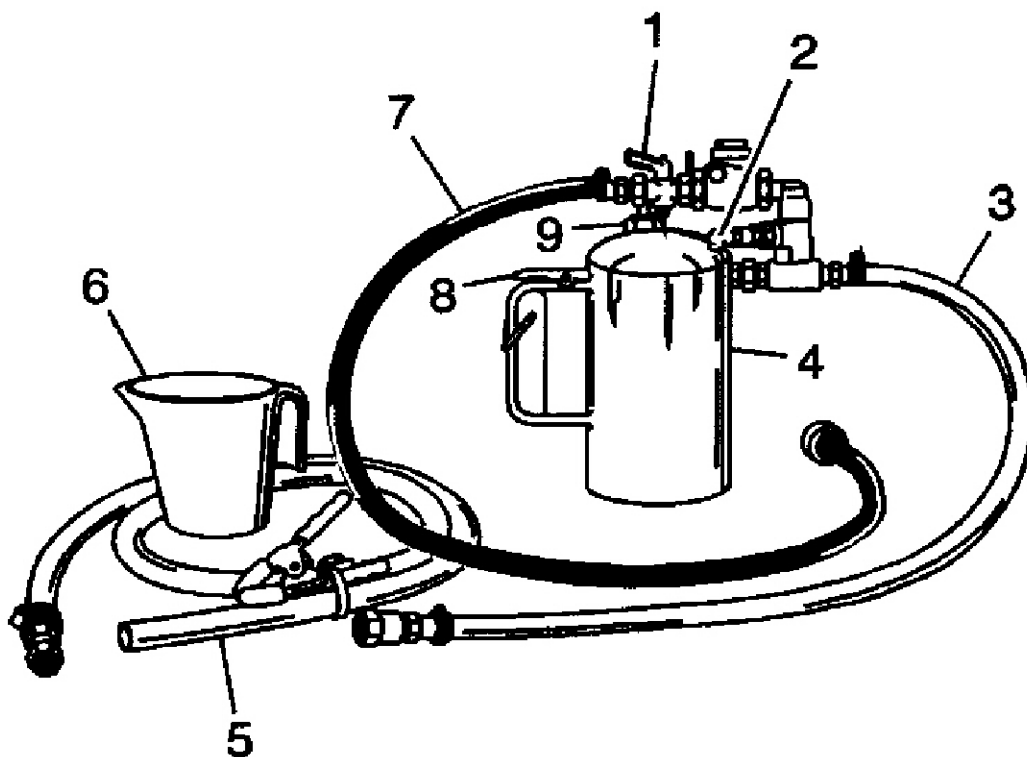
NOTE: GM studies indicate that plugged or restricted transmission oil coolers and pipes cause insufficient transmission lubrication and elevated operating temperatures which can lead to premature transmission wear-out. Many cases could have been prevented by following published procedures for transmission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

NOTE: Only GM Goodwrench DEXRON-III(R) ATF should be used when doing warranty

repair on GM transmissions. Tools required, Transmission Oil Cooler and Line Flusher (J-35944-A), Transmission Oil Cooler Flushing Fluid (J 35944-22), measuring cup, funnel, water supply (hot water recommended), water hose (at least 5/8" (16 mm) ID), shop air supply (with water/oil filters, regulator and pressure gauge), air chuck (with clip if available), oil drain container with lid, eye protection and rubber gloves.

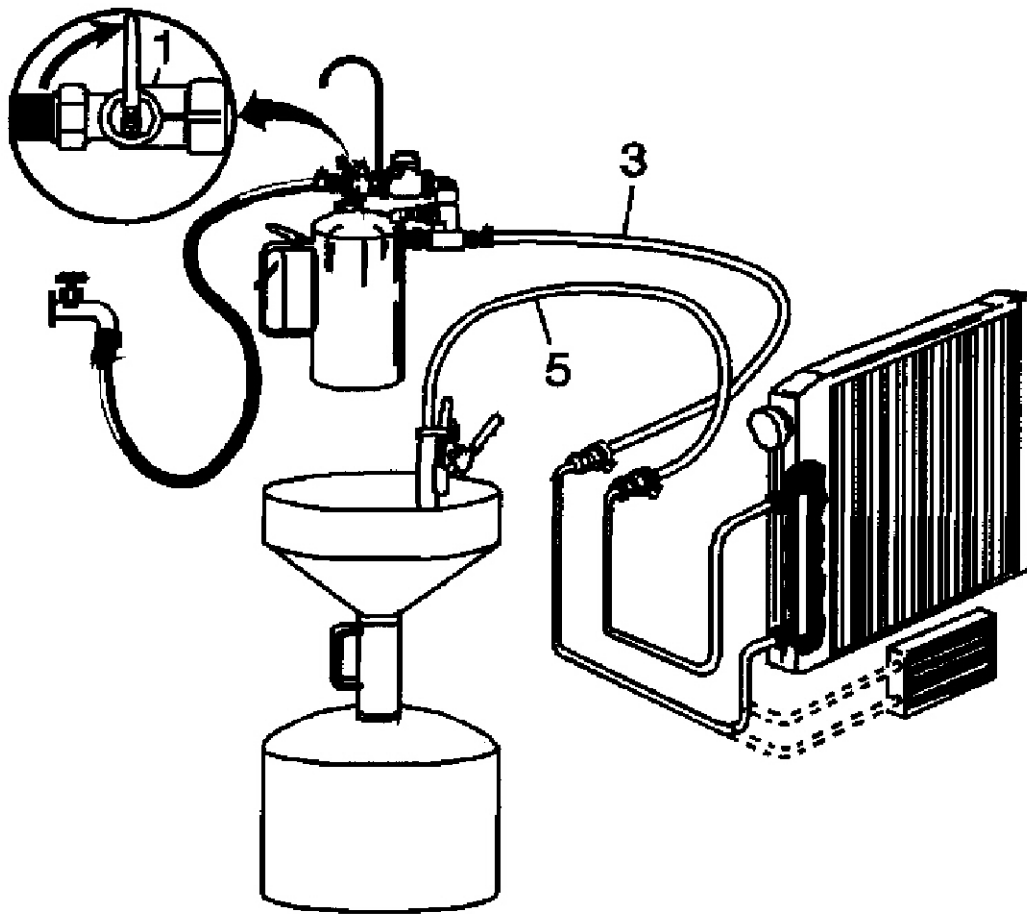
Preparation

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). See **Fig. 5**. Do not overfill. 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).
3. Connect the flusher discharge hose (5) to the oil cooler return pipe (top connector) (may require J-35944-600). Clip the discharge hose (5) onto the oil drain container. 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 oil cooler feed pipe (bottom connector) (may require J-35944-600). See **Fig. 6**.
4. With the water supply valve (1) on the (J 35944-A) in the off position, connect the water supply hose (7) from the flusher to the water supply at the faucet. See **Fig. 5** and **Fig. 6**. Turn ON the water supply at the faucet.



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Fig. 5: Identifying Flushing Equipment
 Courtesy of GENERAL MOTORS CORP.



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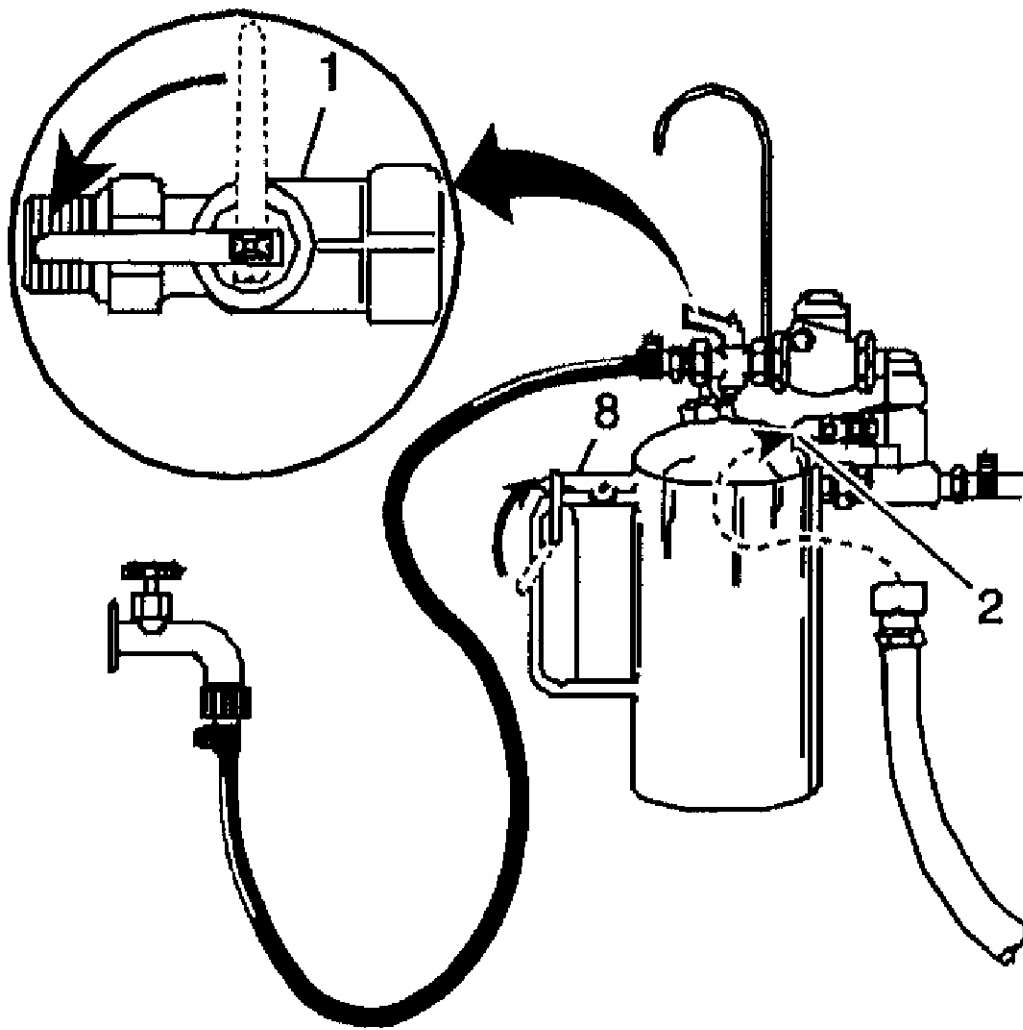
Fig. 6: Connecting Flushing Equipment
 Courtesy of GENERAL MOTORS CORP.

Initial Flush

1. 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. See **Fig. 7**. 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 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. 8**. 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. See **Fig. 5**. 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.

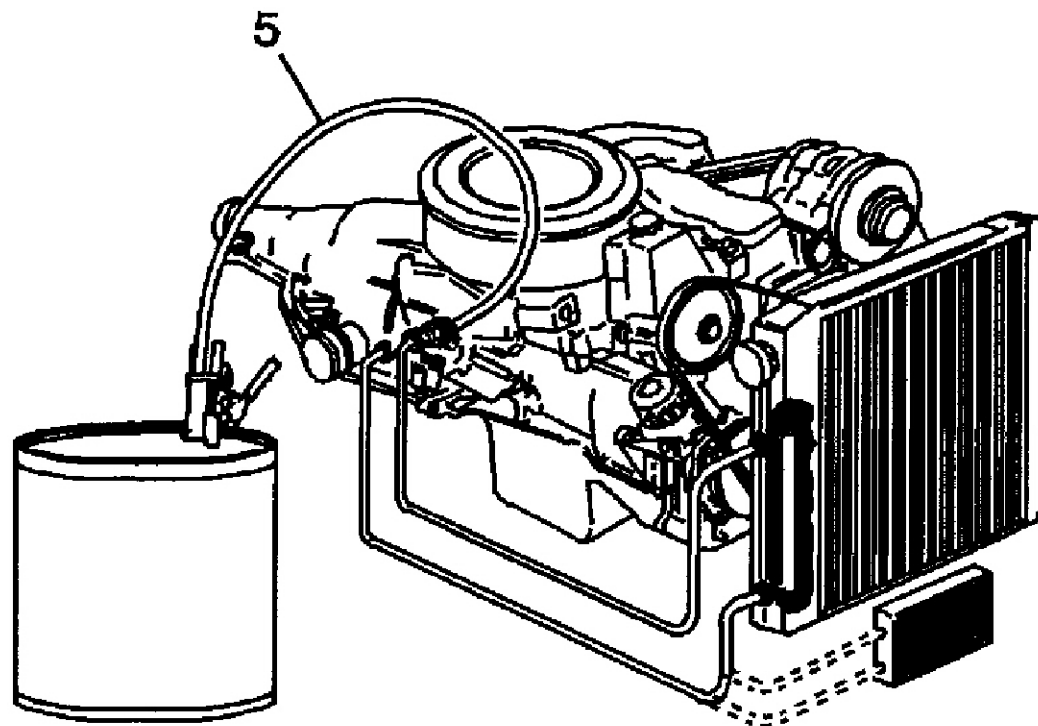
NOTE: Flushing for approximately 2 minutes in each cooler line direction will result in a total of about 8-10 gallons of waste fluid. This mixture of water and flushing fluid is to be captured in an appropriate container for proper disposal.

3. Flush the oil cooler and pipes with water and solution for 2 minutes. During this flush, attach the shop air supply of 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.
4. Release the trigger (8) and turn the flusher water supply valve (1) to the off position.



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Fig. 7: Flushing Oil Cooling System
Courtesy of GENERAL MOTORS CORP.



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Fig. 8: 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. Repeat steps 2 and 3 of the INITIAL FLUSH procedure. Release the trigger (8) of the flusher and allow water only to rinse the oil cooler and pipes for one minute. See **Fig. 7**.
2. Turn the flusher water supply valve (1) to the off position and turn off the water supply at the faucet. 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 (5). See **Fig. 8**.

TRANSMISSION & OIL COOLER FLOW CHECK**Flow Check**

1. Disconnect both hoses from the oil cooler pipes. Connect the oil cooler feed pipe (front connector) to the transmission and the return pipe (rear connector) to the discharge hose (5). See **Fig. 8**. Clip the discharge hose (5) onto the empty oil drain container.
2. Confirm the transmission is filled with ATF. See **CHECKING FLUID LEVELS**.
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. 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 feed flow is insufficient, inspect the transmission. If feed flow is sufficient, 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

Disconnect the water supply hose (7) from the flusher and bleed any remaining air pressure from the flusher tank (4). See **Fig. 5** . Remove the fill cap (9) from the flusher and return any unused flushing solution to its container. Rinse the (J 35944-A) with water. Do not store the flusher with flushing solution in it. After every 3rd use, clean the flusher as described in the instructions included with the tool. 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. For servicing of these components, see appropriate component under **ADJUSTMENTS** and/or **REMOVAL & INSTALLATION** . For additional information on servicing electrical components, see appropriate **DIAGNOSIS** article in **AUTOMATIC TRANSMISSIONS**.

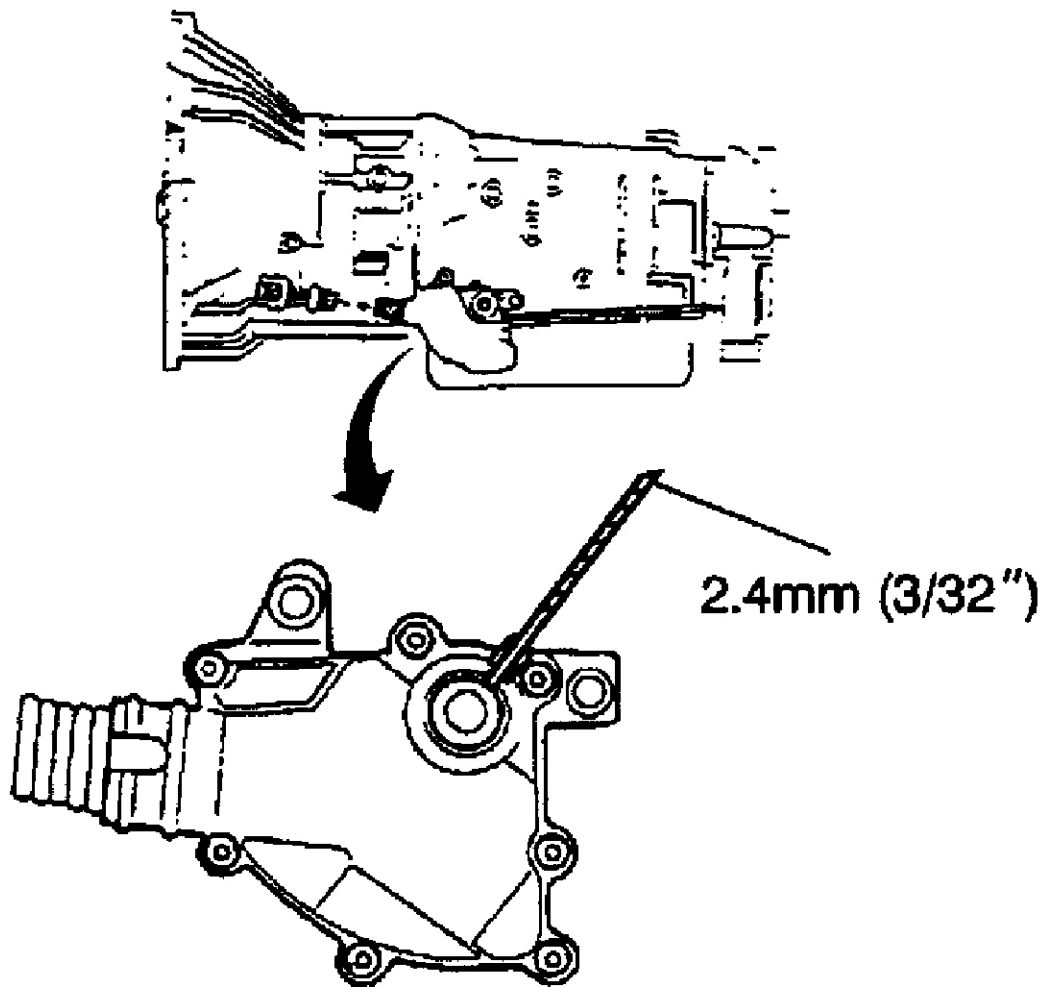
ADJUSTMENTS

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: Park/Neutral Position (PNP) switch may also be referred to as manual shaft shift position switch. Adjust switch so engine starts with transmission in Park or Neutral only.

1. Apply the parking brake. Position the selector to Neutral. Raise and support the vehicle. Remove the manual shaft shift position switch shield. Remove the nut from the range selector lever. Disconnect the shift position switch electrical connector.
2. Connect ohmmeter between switch terminals "E" and "H" (Red/Black wires). Loosen manual shaft shift position switch bolts. Rotate switch slightly in both directions to determine range of continuity (about 5 degrees). See **Fig. 9** .
3. Position manual shaft shift position switch in middle of contact range. Tighten manual shaft shift position switch bolts to 106 INCH lbs. (12 N.m). Remove the multimeter. Install the shift position switch wire harness connector. Use a plastic tie strap if the connector clip is broken. Install the range selector lever. Tighten selector lever nut to 71 INCH lbs. (8 N.m). Install the shift position switch shield. Lower the vehicle.

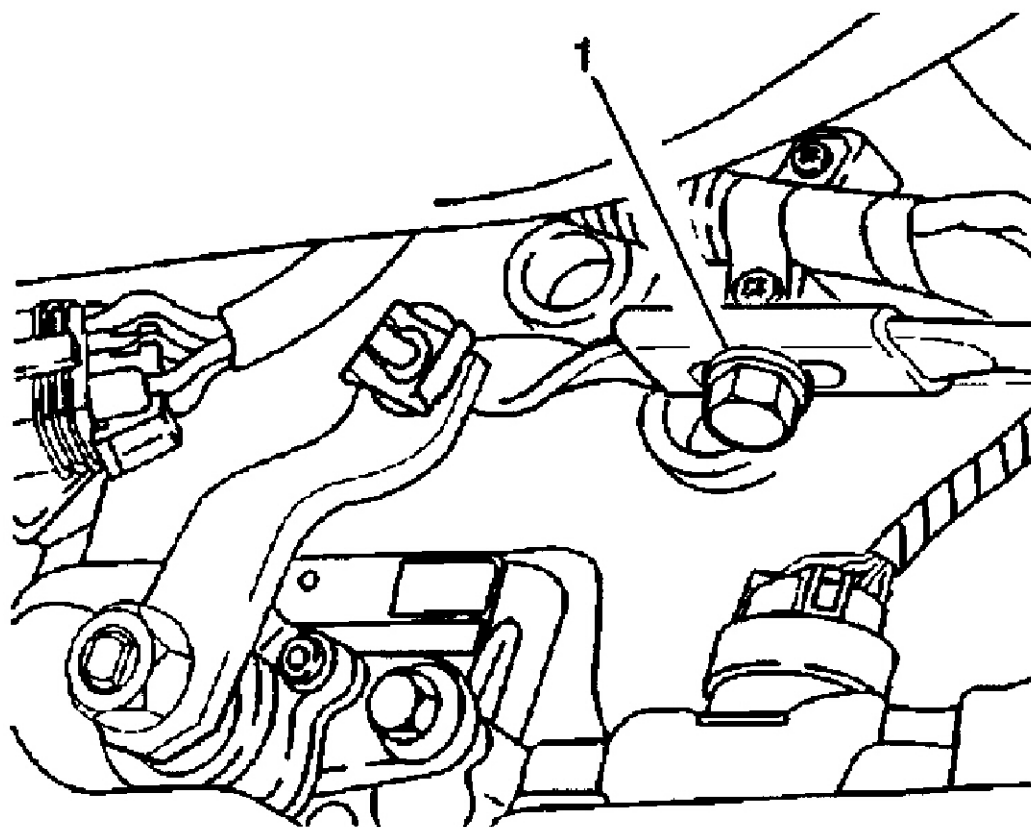


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Fig. 9: Adjusting Manual Shift Shaft Switch
Courtesy of GENERAL MOTORS CORP.

SHIFT CONTROL LINKAGE ROD

1. Position the shift lever in Park. Raise and support the vehicle. Loosen the adjustment bolt (1) to allow the adjuster to slide freely. See **Fig. 10**.
2. Hold the selector lever on transmission against the rear stop to eliminate any play. Tighten the shift control linkage adjustment bolt to specification. See **TORQUE SPECIFICATIONS**. Lower the vehicle.
3. Inspect the operation of starting system with shift lever in each position. The engine should only crank when the lever is in Park or Neutral position.



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Fig. 10: Identifying Adjustment Bolt
Courtesy of GENERAL MOTORS CORP.

REMOVAL & INSTALLATION

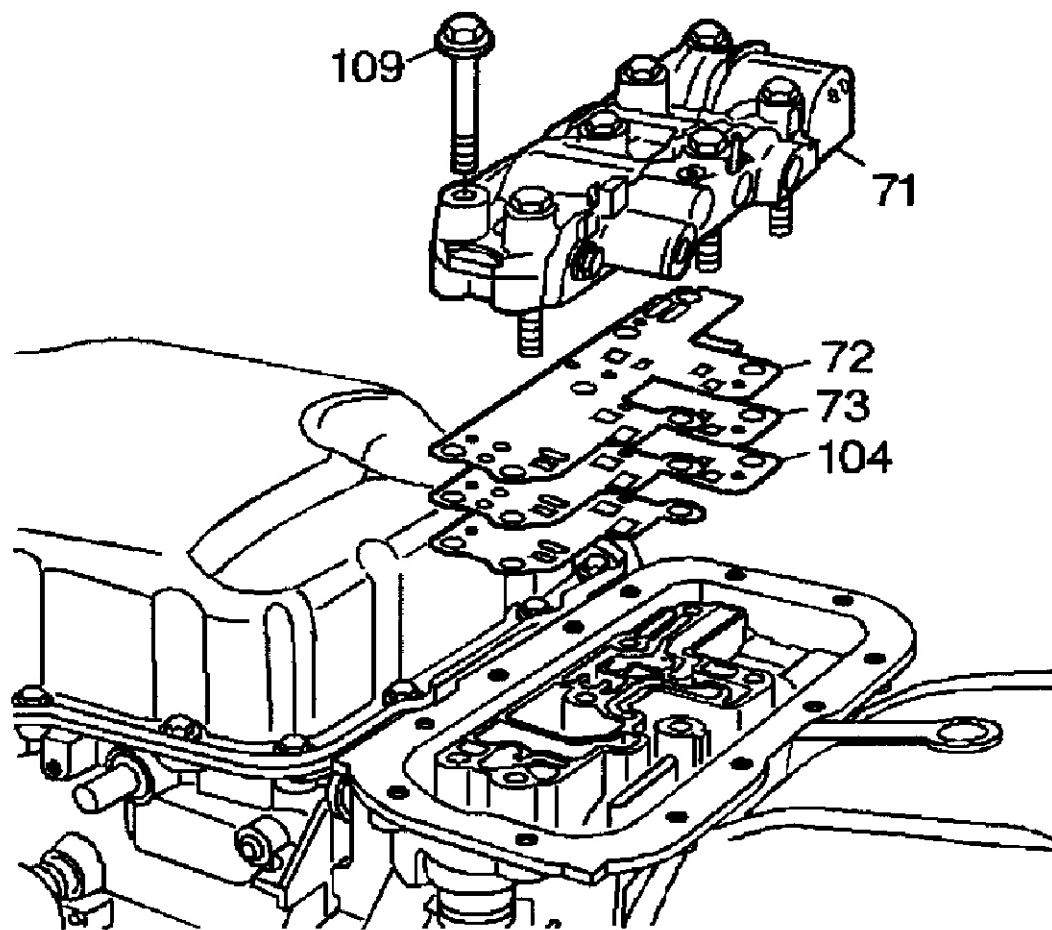
WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. Do not use electrical 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. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

NOTE: 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.

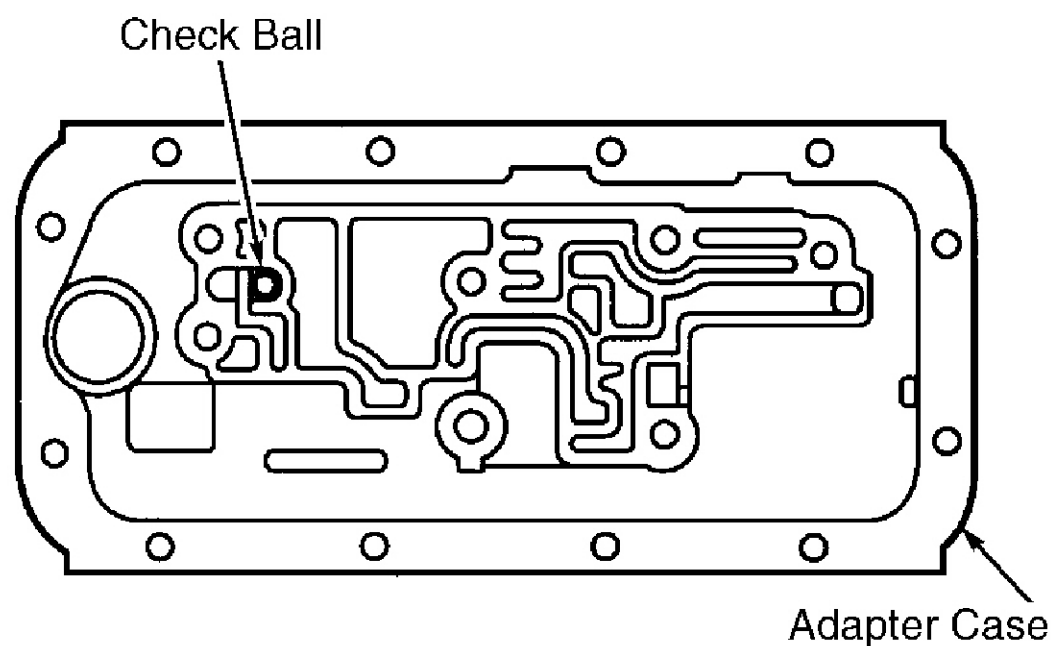
ADAPTER CASE CONTROL VALVE ASSEMBLY**Removal**

Remove the transmission oil pan and oil filter. See **DRAINING & REFILLING** under LUBRICATION. Remove the adapter case control valve assembly bolts (109). See **Fig. 11** . Remove the control valve assembly (71). Remove the spacer plate (73) and gasket (72). Remove the spacer plate to case gasket (104). Remove the ball check valve (85). See **Fig. 12** .



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Fig. 11: Removing & Installing Adapter Case Control Valve Body
Courtesy of GENERAL MOTORS CORP.



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Fig. 12: Identifying Check Ball Location In Adapter Case
Courtesy of GENERAL MOTORS CORP.

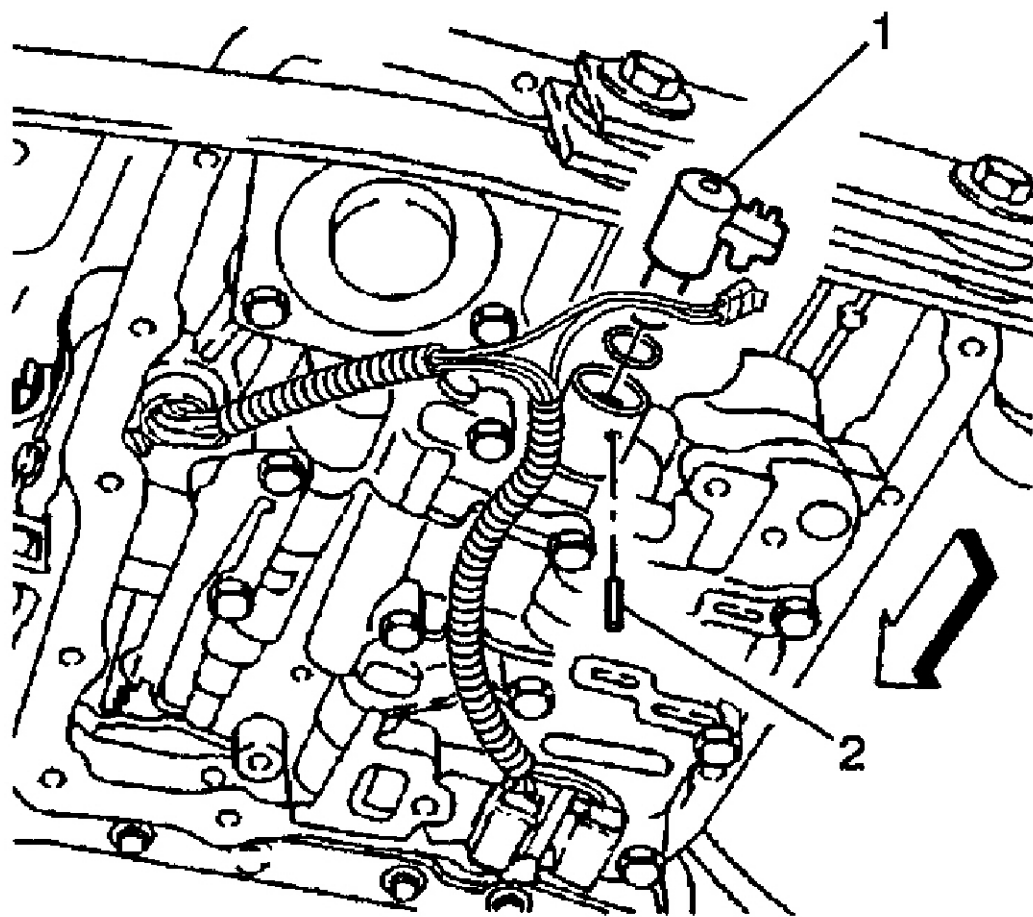
Installation

Install the adapter case check ball (85) into the case passage. See **Fig. 12**. Install the spacer plate to case gasket (104). See **Fig. 11**. Install the spacer plate (73). Install the spacer plate to control valve assembly gasket (72). Install the control valve assembly (71). Install the control valve assembly bolts (109). Tighten the control valve assembly bolts to specification. See **TORQUE SPECIFICATIONS**. Install the transmission oil filter and the transmission oil pan. See **DRAINING & REFILLING** under LUBRICATION.

BAND CONTROL SOLENOID

Removal

1. Remove the transmission oil pan and oil filter. See **DRAINING & REFILLING** under LUBRICATION.
2. Disconnect the electrical harness connector from the solenoid valve.
3. Remove the retaining pin (2). See **Fig. 13**. Use pliers to pull the pin out.
4. Remove the solenoid (1). Remove the solenoid valve and the wave washer.



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Fig. 13: Removing & Installing Band Control Solenoid
 Courtesy of GENERAL MOTORS CORP.

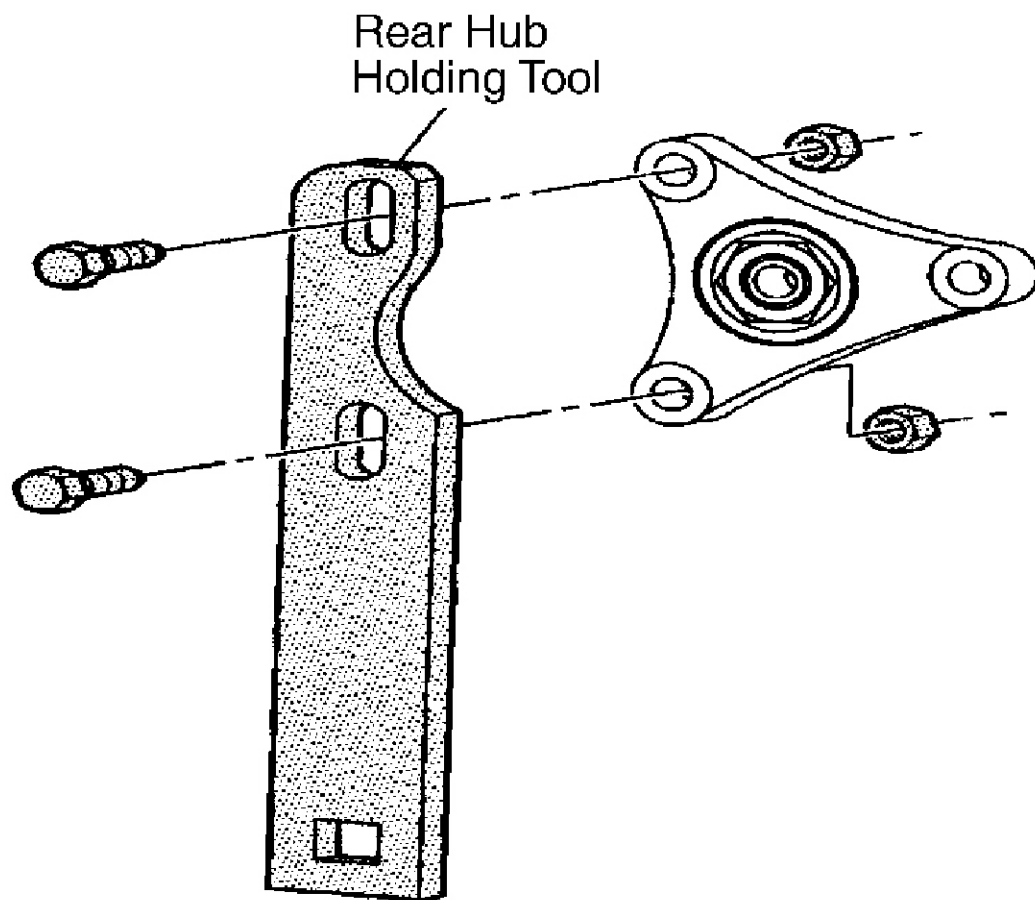
Installation

1. Install the solenoid valve (1) and the wave washer. See **Fig. 13** .
2. Install the retaining pin (2). Use a soft mallet to drive the pin in.
3. Connect the electrical harness connector to the solenoid valve.
4. Install the transmission oil filter and the transmission oil pan. See **DRAINING & REFILLING** under LUBRICATION.

DRIVE FLANGE

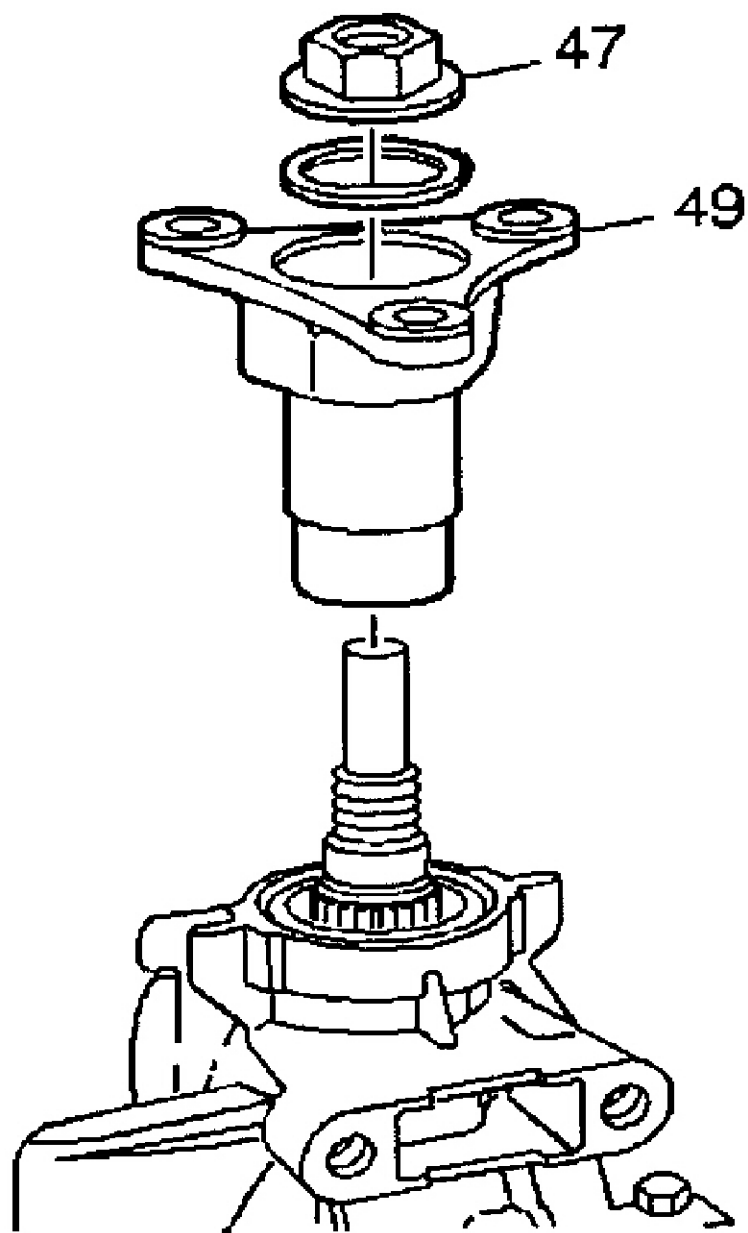
Removal

1. Raise and support the vehicle. Remove the propeller shaft coupling bolts.
2. Remove the propeller shaft coupling from drive flange. Use a screwdriver to pry propeller shaft coupling away from drive flange. Install the Rear Hub Holding Tool (J 42066) to the drive flange. See **Fig. 14** . While holding the rear hub holding tool, remove the flange nut.
3. Discard the flange nut. Remove the drive flange (49) from transmission output shaft. See **Fig. 15** . Use the Slide Hammer (J 6125-1B) and the Axle Boot Remover (J 23129) to remove the transmission case extension seal (50). See **Fig. 16** .



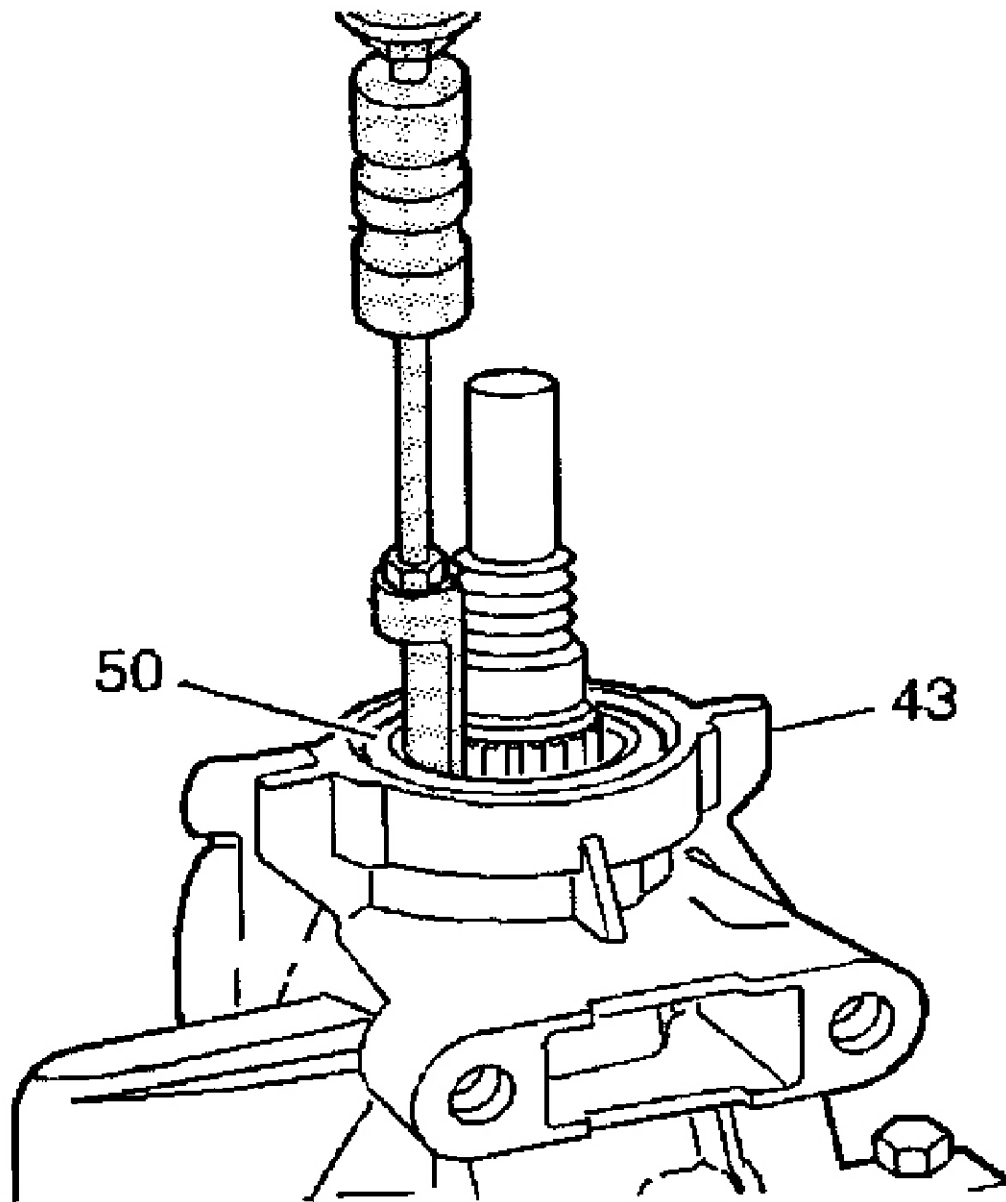
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Fig. 14: Identifying Rear Hub Holding Tool
Courtesy of GENERAL MOTORS CORP.



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Fig. 15: Removing & Installing Drive Flange
Courtesy of GENERAL MOTORS CORP.

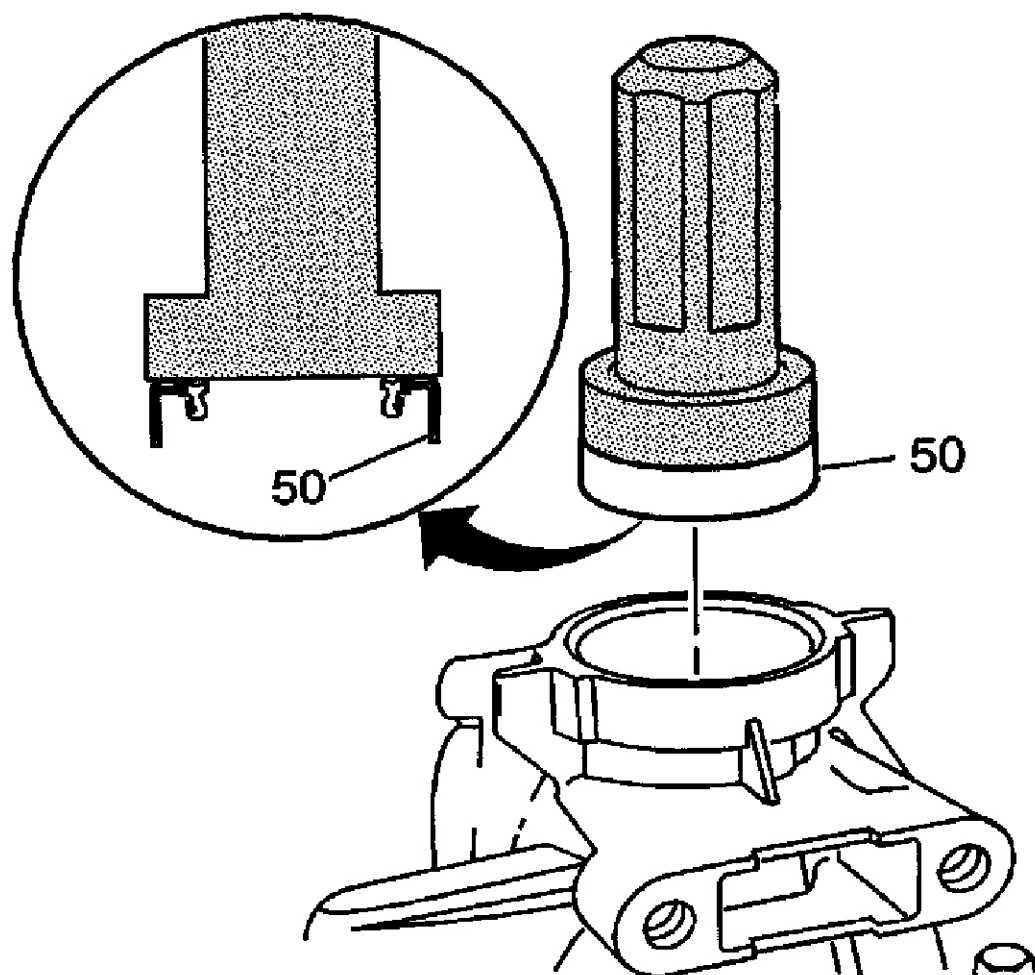


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Fig. 16: Removing Transmission Extension Case Seal
Courtesy of GENERAL MOTORS CORP.

Installation

1. Using the Getrag Axle Output Shaft Seal Installer (J 36797), install the new transmission case extension seal (50). See **Fig. 17** . Install the drive flange (49). Install the rear hub holding tool to the drive flange. See **Fig. 15** .
2. Install the washer and the new flange nut. While holding the rear hub holding tool, tighten the drive flange nut to specification. See **TORQUE SPECIFICATIONS** .
3. Install the propeller shaft coupling to drive flange. Install the propeller shaft coupling bolts. Tighten the propeller shaft coupling bolts to specification. See **TORQUE SPECIFICATIONS** . Lower the vehicle.



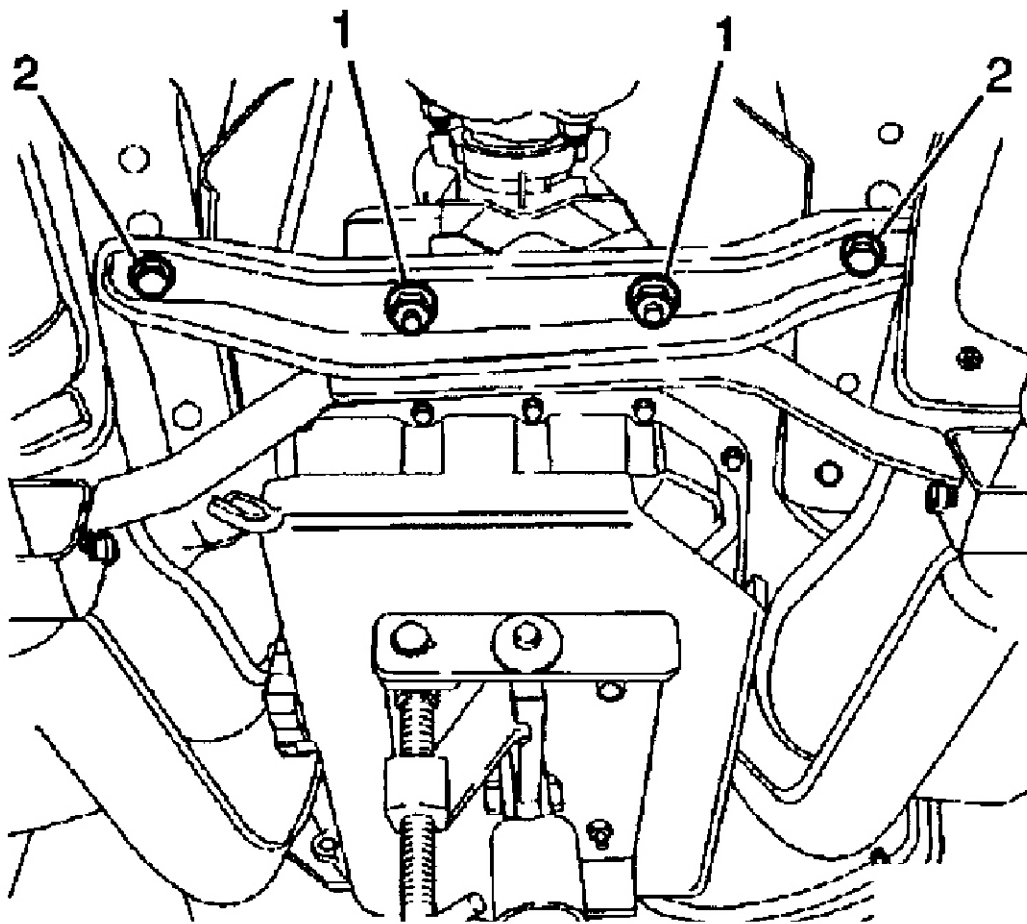
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Fig. 17: Installing Transmission Case Extension Seal
Courtesy of GENERAL MOTORS CORP.

EXTENSION HOUSING

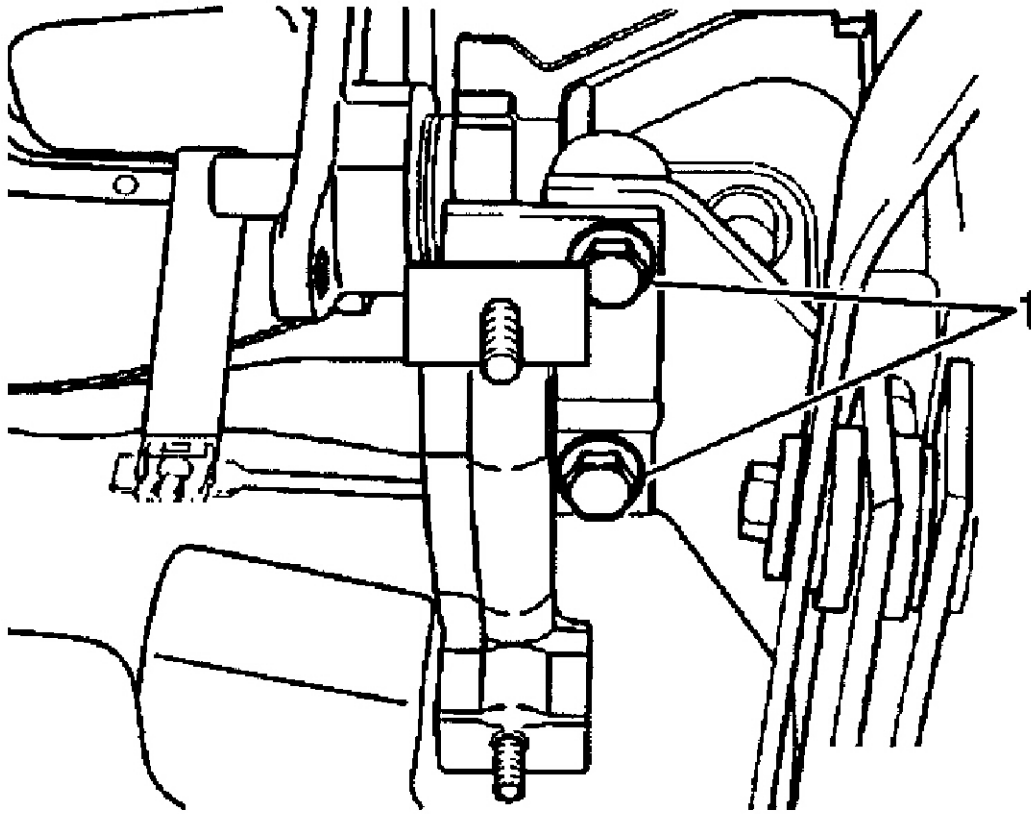
Removal

1. Remove the drive flange. See **DRIVE FLANGE** .
2. Remove the catalytic converter support bracket bolts and bracket. See **Fig. 18** .
3. Remove the transmission mount. See **Fig. 19** . Remove the vehicle speed sensor. See **VEHICLE SPEED SENSOR** .
4. Remove rear oxygen sensor harness clips (112) from the case extension. See **Fig. 20** .
5. Remove the transmission case extension bolts (52).
6. Remove the transmission case extension (43).
7. Remove the transmission case extension gasket (42).



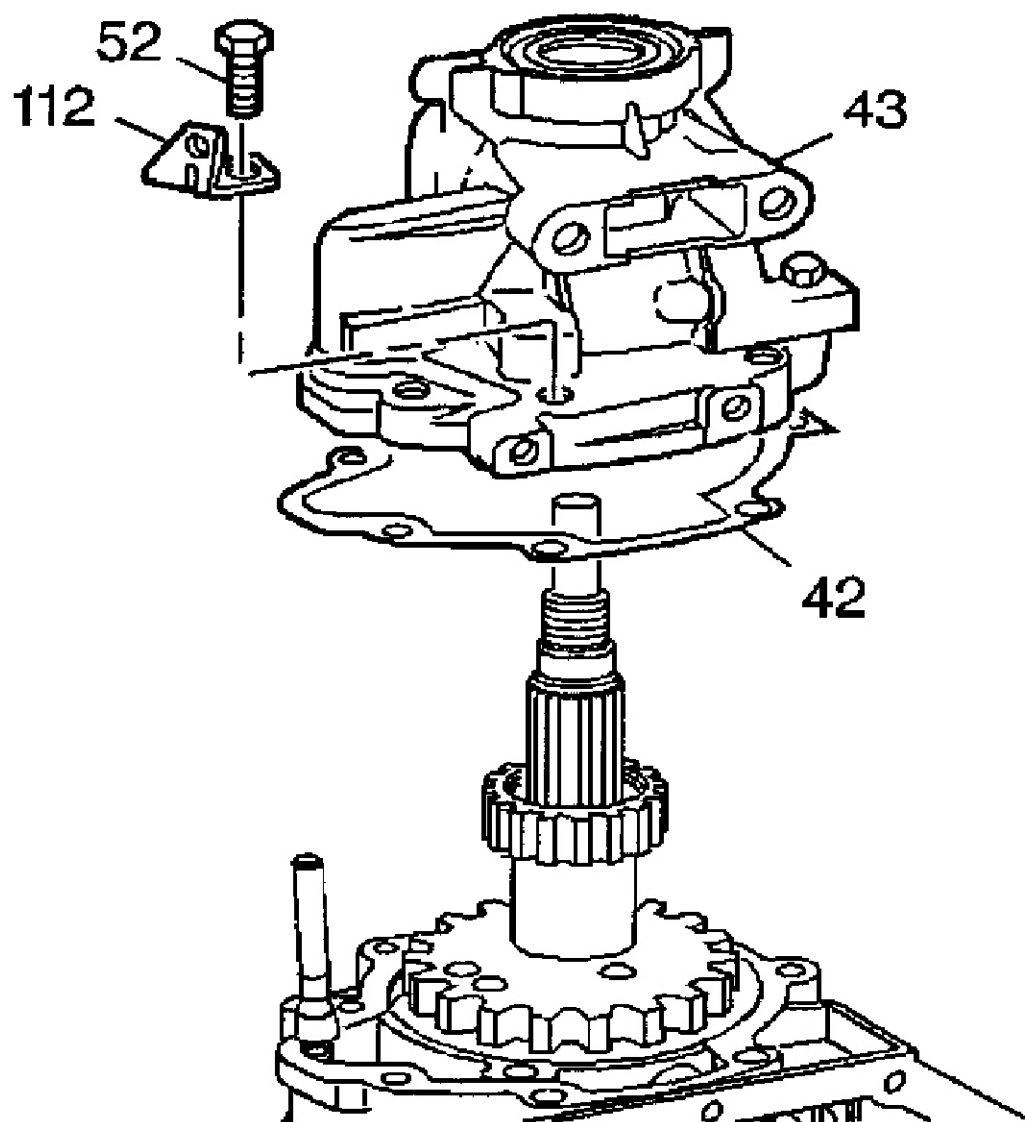
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Fig. 18: Removing & Installing Transmission Crossmember
Courtesy of GENERAL MOTORS CORP.



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Fig. 19: Removing & Installing Transmission Mount
Courtesy of GENERAL MOTORS CORP.



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

Installation

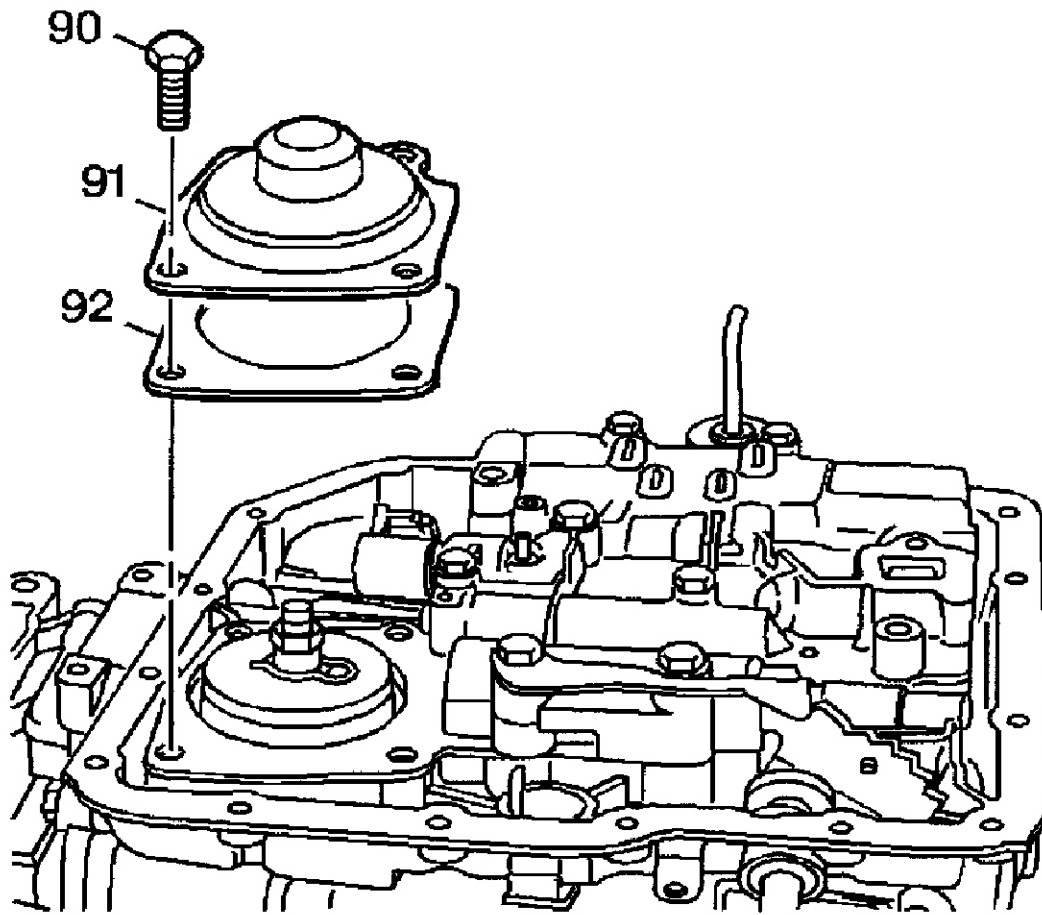
1. Install the new transmission case extension gasket (42). See **Fig. 20** .
2. Install the transmission case extension (43). Install the transmission case extension bolts (52) and tighten to specification. See **TORQUE SPECIFICATIONS** .
3. Install the rear oxygen sensor harness clips (112) to the case extension. Install the vehicle speed sensor. See **VEHICLE SPEED SENSOR** .
4. Install the catalytic converter support bracket. Install the catalytic converter support bracket bolts. Install the drive flange. See **DRIVE FLANGE** .
5. Inspect and adjust the transmission fluid level. See **CHECKING FLUID LEVELS** under LUBRICATION.

MAIN CASE CONTROL VALVE BODY

Removal

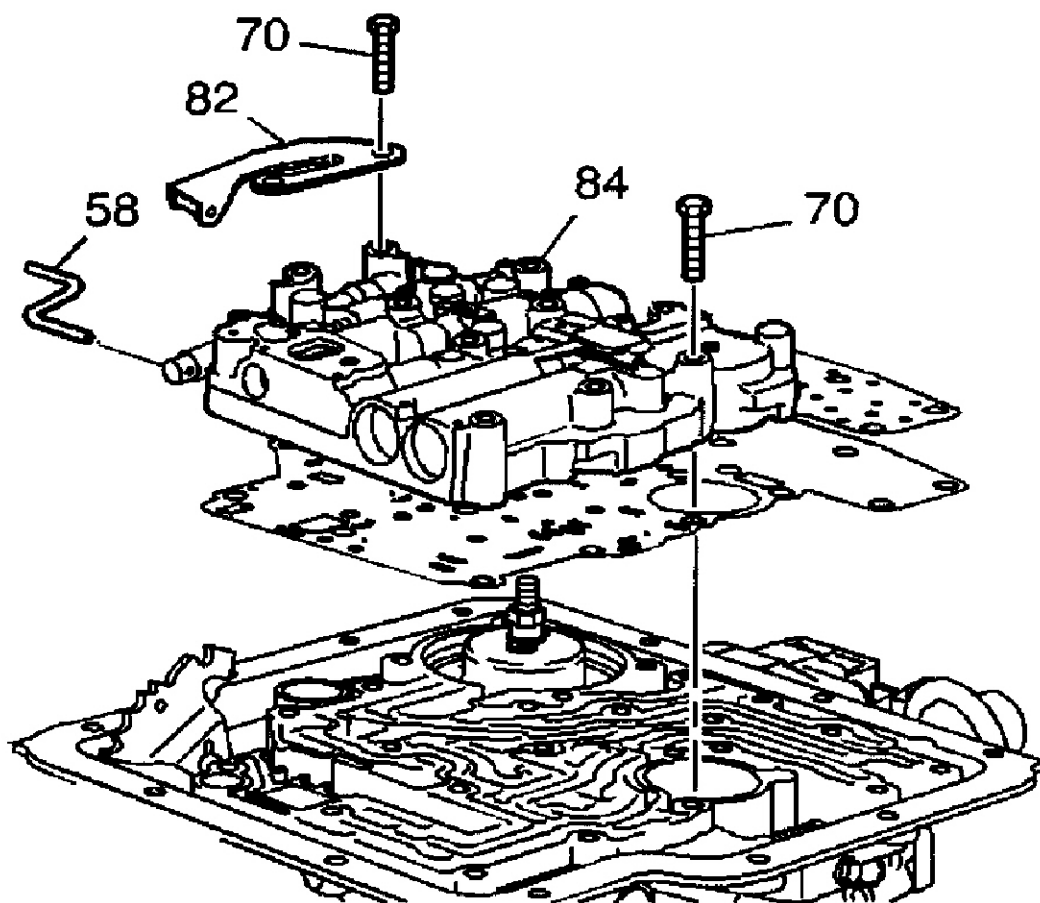
1. Remove the servo piston cover bolts (90). See **Fig. 21** . Remove the servo piston cover (91) and gasket (92). Remove the manual detent roller and spring assembly bolts (70). See **Fig. 22** .

2. Remove the manual detent roller and spring assembly (82). Remove the control valve assembly bolts (70). Remove the control valve assembly (84).
3. Note the position of the manual valve link, (the long end into the manual valve, the short end into the detent lever). Remove the manual valve link (58). Remove the ball check valves (85) from the transmission case passage. See **Fig. 23** .



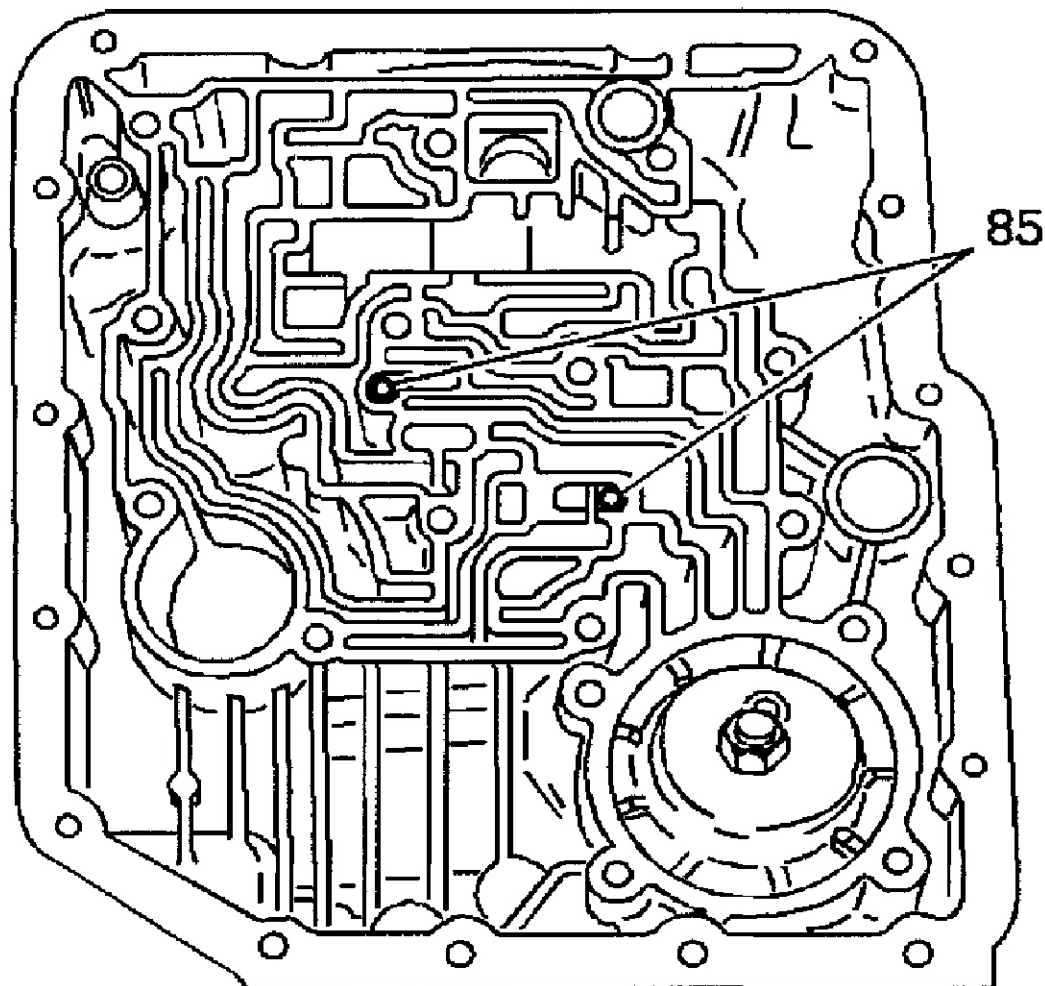
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Fig. 21: Removing & Installing Servo Piston Cover
Courtesy of GENERAL MOTORS CORP.



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Fig. 22: Removing & Installing Main Case Control Valve Body
Courtesy of GENERAL MOTORS CORP.

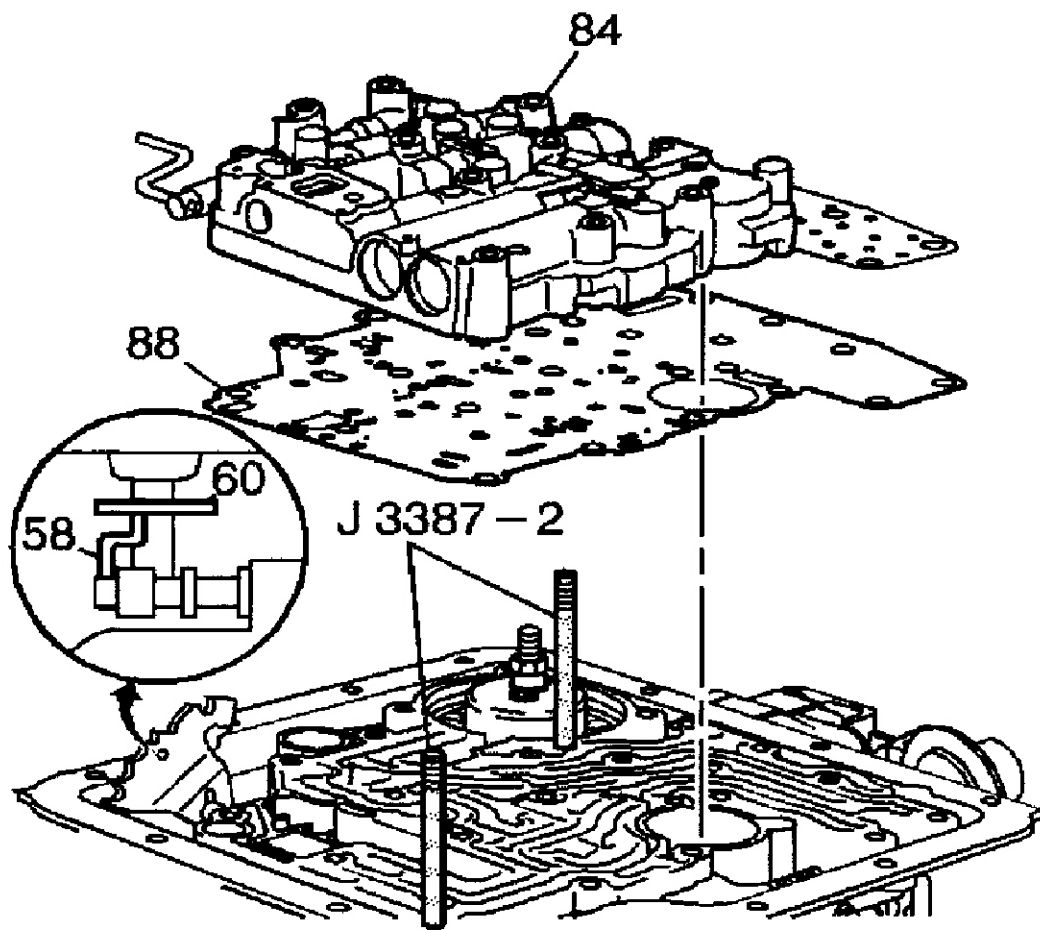


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Fig. 23: Locating Ball Check Valves
Courtesy of GENERAL MOTORS CORP.

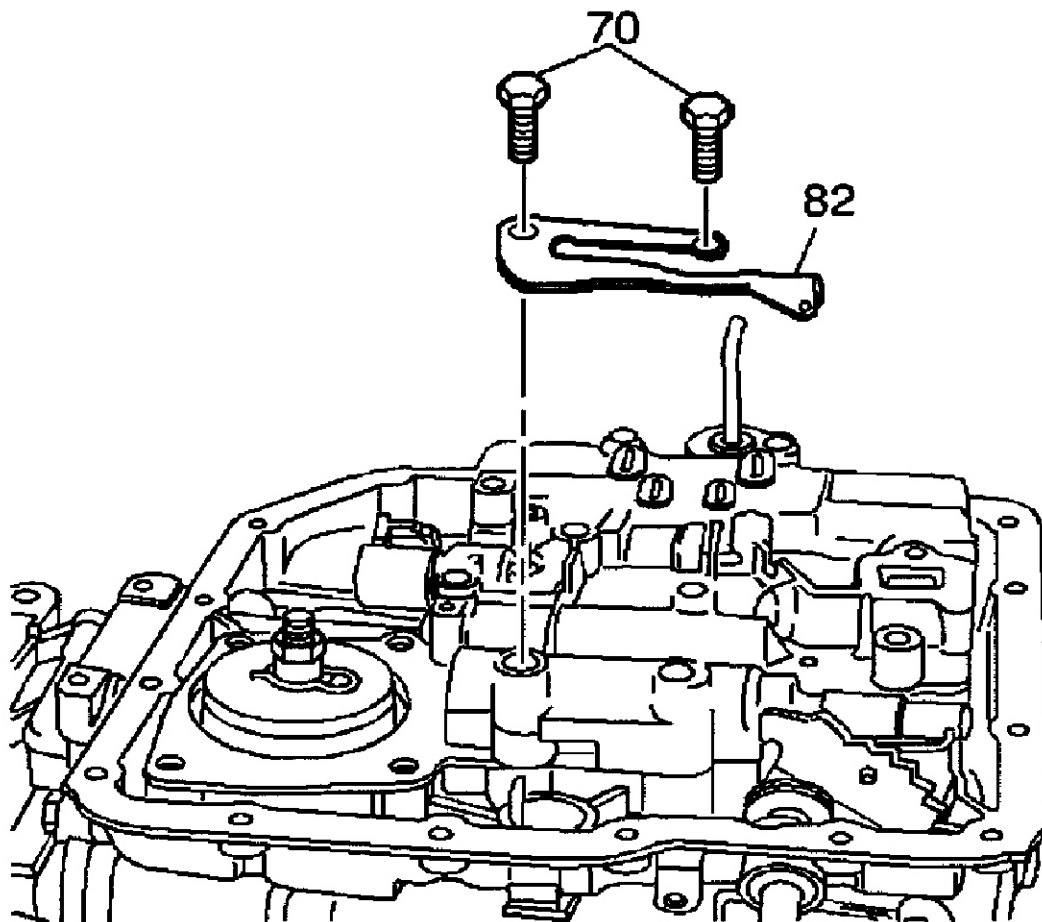
Installation

1. Install the 2 check balls (85) into the case fluid passages. See **Fig. 23** . Install Alignment Pins (J 3387-2) into the transmission case. See **Fig. 24** . Install the spacer plate to case gasket (88). Note the position of the manual valve link (the long end into the manual valve, the short end into the detent lever). Install the control valve assembly (84) onto the transmission case. Connect the manual valve link (58) to the detent lever (60). Remove alignment pints.
2. Install the detent roller assembly (82). See **Fig. 25** . Install the detent roller assembly bolts (70). Tighten the bolts finger tight only. 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.
3. Install the control valve assembly bolts (70). Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** . Install the forward band servo cover gasket (92). Install the forward band servo cover (91). Install the forward band servo cover bolts (90). Tighten the cover bolts to specification.



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Fig. 24: Identifying Alignment Pins
Courtesy of GENERAL MOTORS CORP.



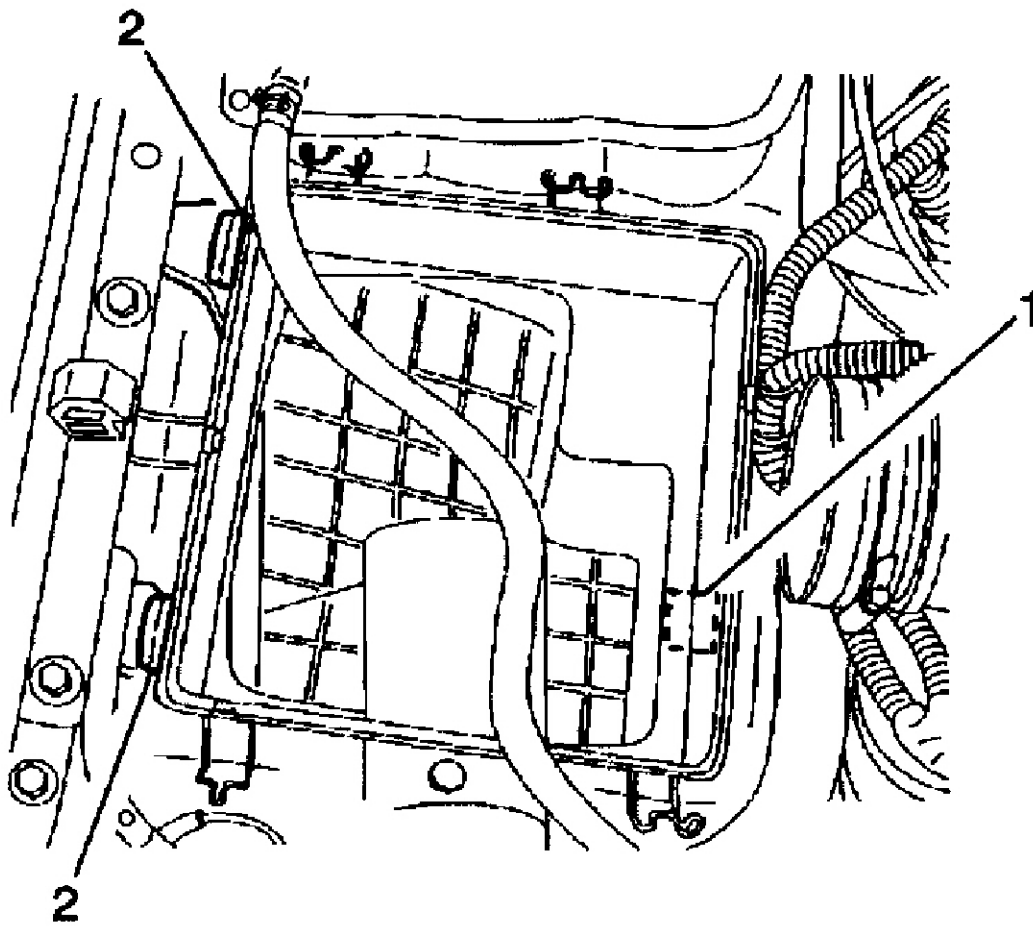
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Fig. 25: Installing Detent Roller Assembly
 Courtesy of GENERAL MOTORS CORP.

OIL COOLER PIPES

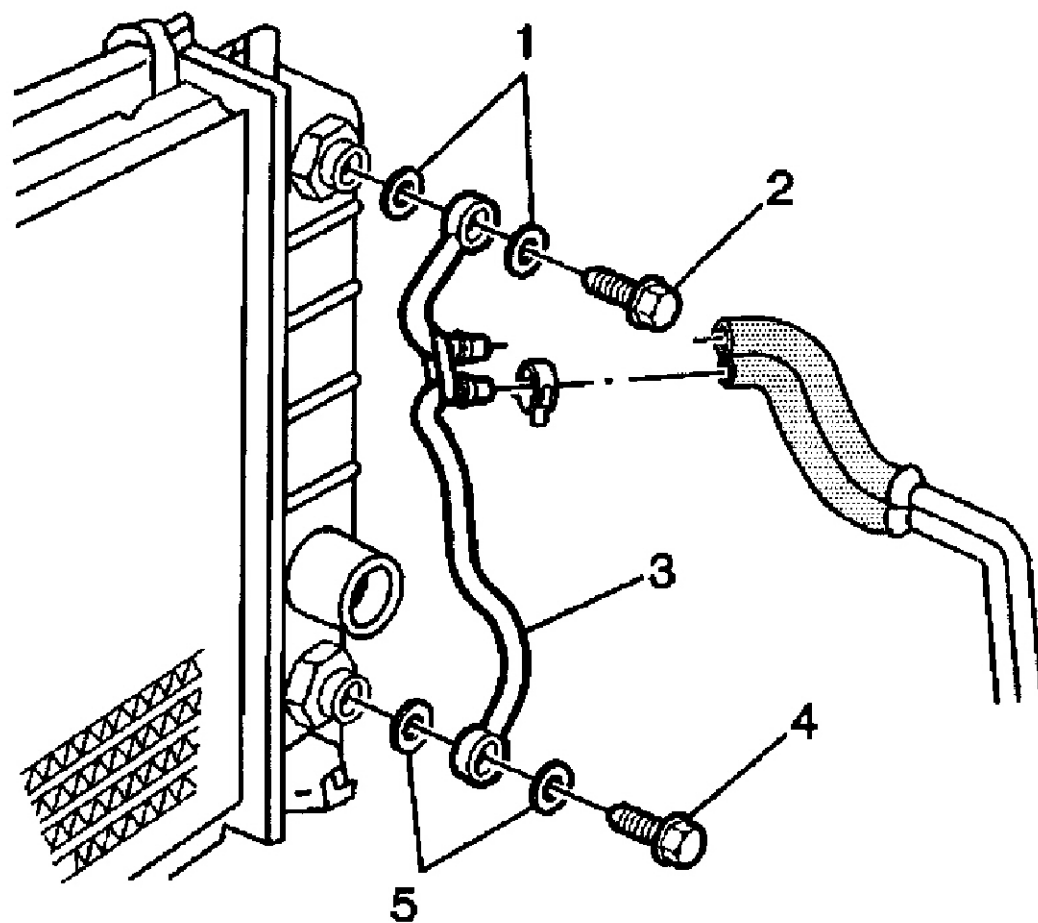
Removal

1. Remove the air filter housing. Remove the cover. Remove the element. Unseat from the grommets (1, 2). See **Fig. 26**.
2. Remove the generator cooling duct. Remove the center inlet and outlet pipe hoses from oil cooler pipe. Squeeze the clamps. Slide the clamps away from the connection.
3. Disconnect the hoses from pipe. Remove the upper pipe fitting and seals (1, 5) from radiator. See **Fig. 27**. Discard seals. Raise and support the vehicle. Remove the lower pipe fitting and seals from radiator. Discard seals. Remove the front oil cooler pipe (3) from vehicle.



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Fig. 26: Locating Air Cleaner Housing Grommets
Courtesy of GENERAL MOTORS CORP.



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Fig. 27: Identifying Front Oil Cooler Pipe
 Courtesy of GENERAL MOTORS CORP.

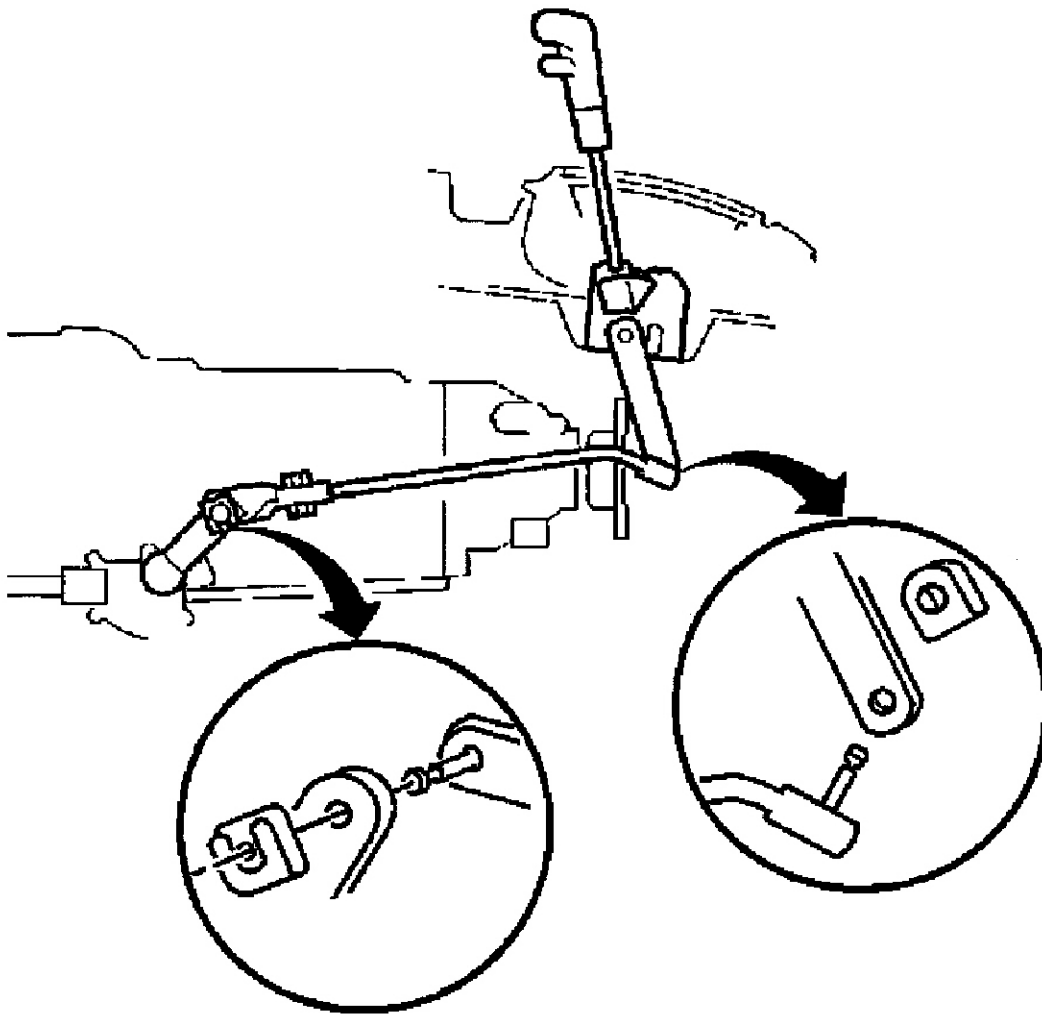
Installation

1. Install the lower pipe fitting and new seals to radiator. See **Fig. 27** . Tighten the lower pipe fitting bolt (4) to specification. See **TORQUE SPECIFICATIONS** . Install the front oil pipe (3) to vehicle. Lower the vehicle.
2. Install the upper pipe fitting and new seals to radiator. Install the upper pipe fitting bolt (2). Tighten the upper pipe fitting to specification. See **TORQUE SPECIFICATIONS** . Install the center oil cooler pipe hoses to pipe.
3. Install the hoses to pipes. Squeeze the clamps. Slide the clamps into position. Install the generator cooling duct. Install the air filter housing. Seat the housing to the grommets (1, 2). Install the element. Install the cover. Inspect the transmission fluid level.

SHIFT CONTROL LINKAGE

Removal

Position the shift lever in Neutral. Raise and support vehicle. Remove the shift control linkage retaining clips. See **Fig. 28** . Remove the shift control linkage.



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Fig. 28: Removing & Installing Shift Rod Linkage
Courtesy of GENERAL MOTORS CORP.

Installation

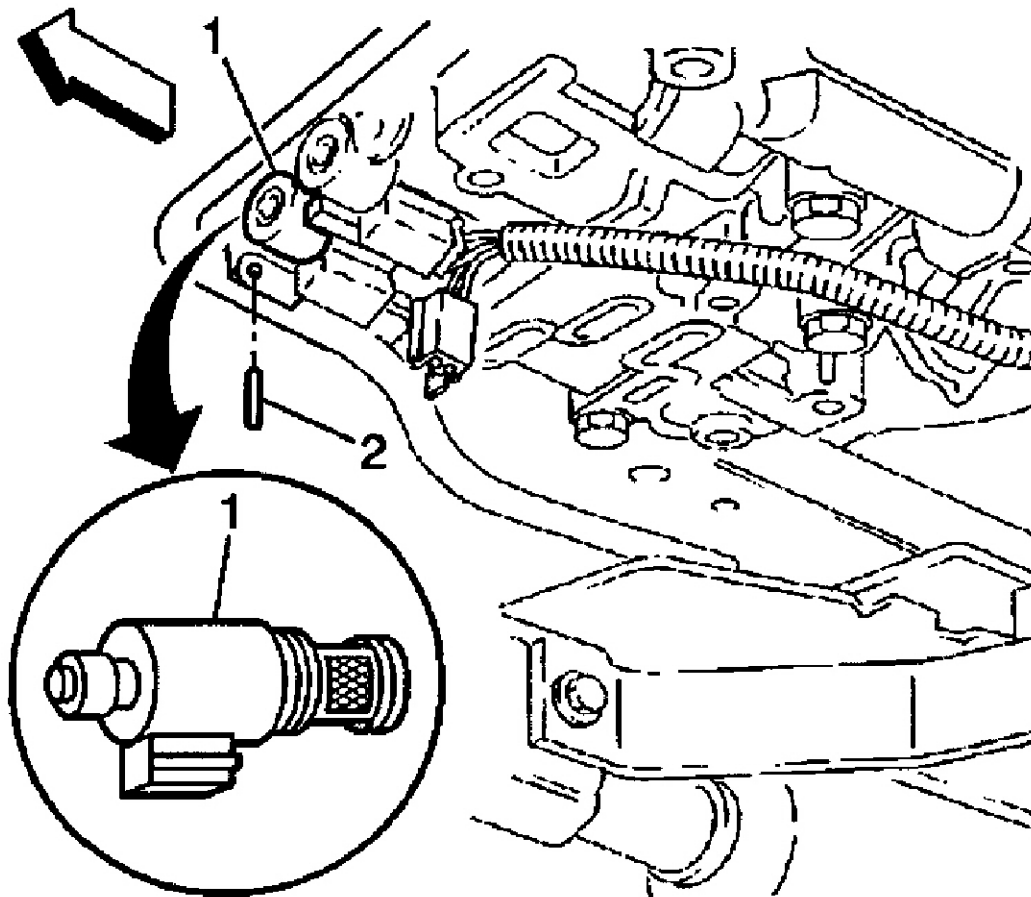
Install the shift control linkage. Install the shift control linkage retaining clips. See **Fig. 28** . Adjust the shift linkage. See **SHIFT CONTROL LINKAGE ROD** under ADJUSTMENTS. Lower the vehicle.

SHIFT CONTROL SOLENOIDS

NOTE: This procedure is for removal and installation of the 1-2/3-4 and 2-3 shift solenoids.

Removal

1. Remove the transmission oil pan and filter. See **DRAINING & REFILLING** under LUBRICATION.
2. Disconnect the electrical harness connector from solenoid valve.
3. Remove the retaining pin (2). See **Fig. 29** . Use pliers to pull pin out. Remove the solenoid valve (1).



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Fig. 29: Removing & Installing Shift Solenoids
 Courtesy of GENERAL MOTORS CORP.

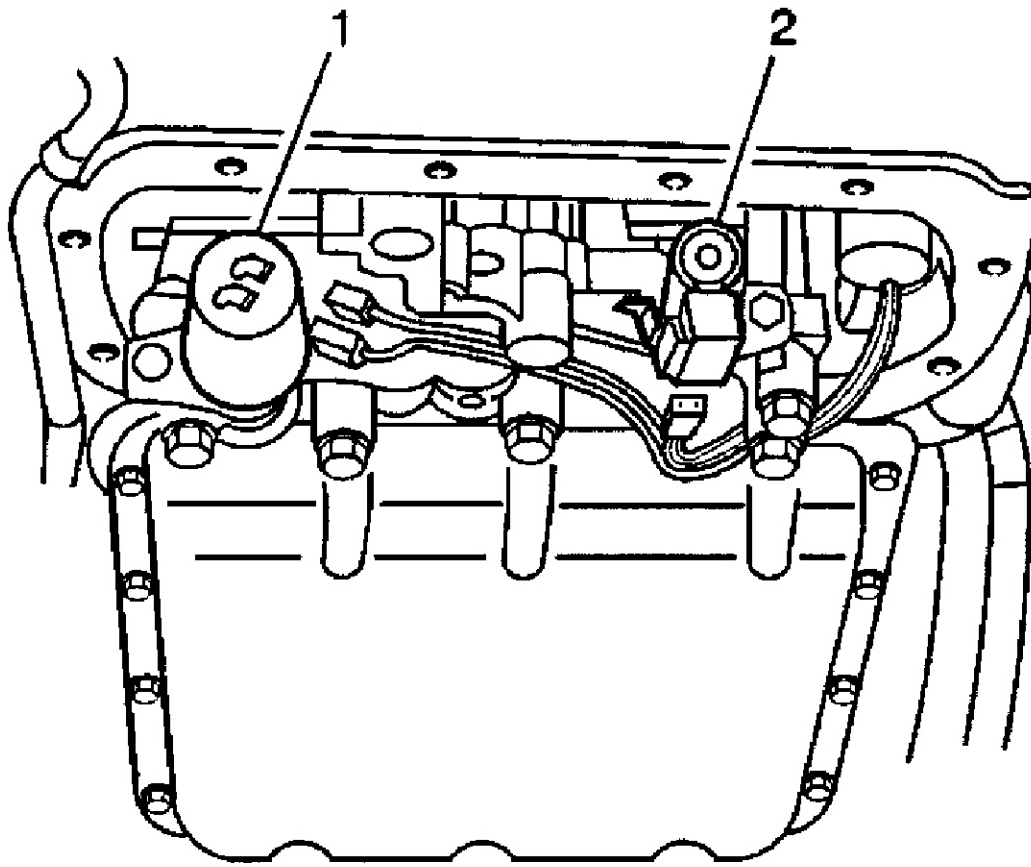
Installation

1. Install the solenoid valve (1). See **Fig. 29** . Install the retaining pin (2). Use a soft mallet to drive the retaining pin in.
2. Connect the electrical harness connector to the solenoid valve.
3. Install the transmission filter and the transmission oil pan. See **DRAINING & REFILLING** under LUBRICATION.

TORQUE CONVERTER CLUTCH & PRESSURE CONTROL SOLENOIDS

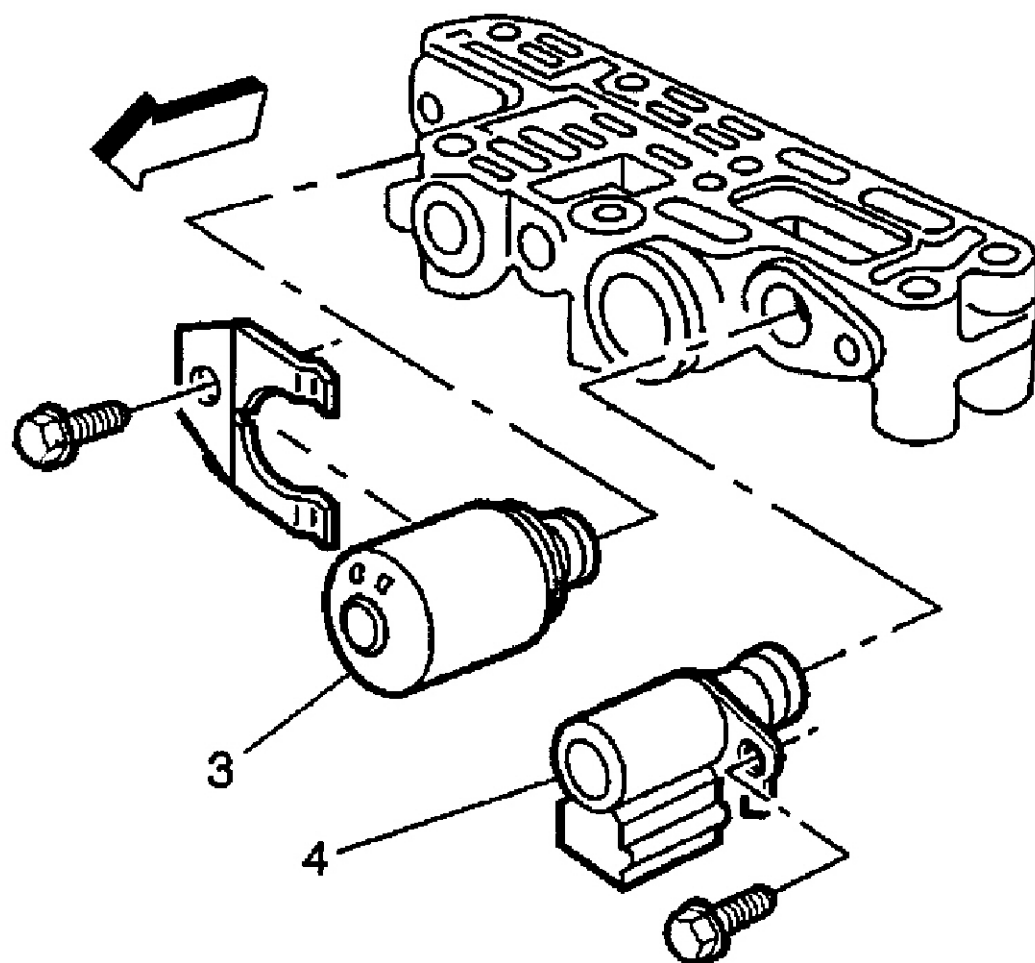
Removal

1. Remove the front transmission oil pan. See **DRAINING & REFILLING** under LUBRICATION. Disconnect the electrical connectors from the solenoid valves (1, 2). See **Fig. 30** .
2. Remove the solenoid valve retainer bolts and the retainer. Remove the pressure control solenoid valve (3). See **Fig. 31** .
3. Remove the torque converter clutch solenoid valve (4).



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Fig. 30: Identifying Solenoid Valves
Courtesy of GENERAL MOTORS CORP.



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Fig. 31: Removing & Installing Solenoid Valves
 Courtesy of GENERAL MOTORS CORP.

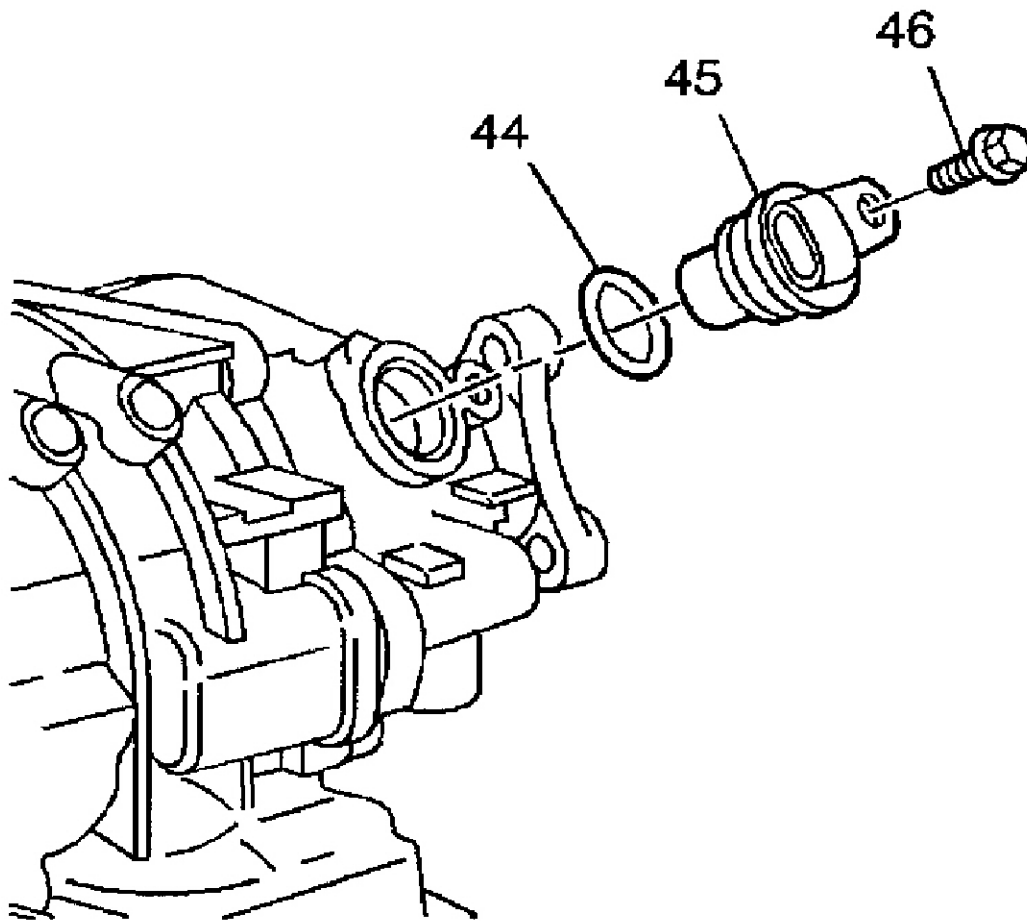
Installation

1. Install the torque converter clutch solenoid valve (4). See **Fig. 31** . Install the pressure control solenoid valve (3). Install the solenoid valve retainer and the bolts. Tighten both of the solenoid valve retainer bolts to specification. See **TORQUE SPECIFICATIONS** .
2. Connect the electrical connectors to the solenoid valves (1, 2). See **Fig. 30** . Install the front transmission oil pan. See **DRAINING & REFILLING** under LUBRICATION.

VEHICLE SPEED SENSOR

Removal

Raise and support the vehicle. Disconnect the vehicle speed sensor electrical harness connector. Remove the vehicle speed sensor bolt (46). Remove the vehicle speed sensor (45) and the seal (44). See **Fig. 32** . Use hand pressure to rotate the sensor back and forth while pulling outward. Do not pry on the sensor.



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Fig. 32: Removing & Installing Vehicle Speed Sensor
 Courtesy of GENERAL MOTORS CORP.

Installation

Install the seal (44) to the speed sensor (45). Install the vehicle speed sensor to the transmission. Install the speed sensor attaching bolt (46). See **Fig. 32** . Tighten the vehicle speed sensor bolt to specification. See **TORQUE SPECIFICATIONS** . Connect the vehicle speed sensor electrical harness connector. Lower the vehicle.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Control Valve Assembly Bolt	15 (20)
Forward Band Servo Cover Bolt	18 (24)
Lower Pipe Fitting Bolt	18 (24)
Oil Pan Fill Plug	33 (45)
Upper Pipe Fitting	24 (18)
INCH Lbs. (N.m)	
Front Oil Pan Bolt	97 (11)
Shift Control Linkage Adjustment Bolt	71 (8)
Transmission Main Case Oil Pan Bolt	97 (11)
Vehicle Speed Sensor Bolt	80 (9)

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