2007 TRANSMISSION

Automatic Transmission - 5L40-E/5L50-E - Sky

SYMPTOMS - AUTOMATIC TRANSMISSION

Symptoms - Automatic Transmission

Diagnostic Category	Diagnostic Information
The following table consists of nine diagnostic categories that are located in the left hand column. Using this column, choose the appropriate category based on the operating conditions of the vehicle or transmission. After selecting a category, use the right hand column to locate the specific symptom diagnostics information.	
Fluid Diagnosis: This category contains the following topics: • Fluid condition - appearance, contaminants, smell, overheating • Line pressure - high or low • Fluid leaks	• Refer to **Transmission Fluid Checking**. • Refer to **Fluid Pressure High or Low**. • Refer to **Fluid Leak Diagnosis**. • Refer to **Automatic Transmission Overheating**.
Noise and Vibration Diagnosis: This category contains the following topics: • Ratcheting noise • Noise - drive gear, final drive, whine, growl, rattle, buzz, popping • Vibration	• Refer to **Noise and Vibration Analysis**. • Refer to **Buzz Noise or High Frequency Rattle Sound**. • Refer to **Popping Noise**. • Refer to **Whine Noise Varying with RPM or Fluid Pressure**. • Refer to **Noise in Random Ranges**.
Range Performance Diagnosis: This category contains the following topics: • Drives in Neutral • No Park • No Drive • Shift selector indicator does not match transmission gear range	• Refer to **No Drive in All Ranges**. • Refer to **Drives with Selector Lever in Position N**.
Shift Quality Feel Diagnosis: This category contains the following topics: • Harsh, soft or slipping shifts • Harsh, soft or delayed engagement • Shift shudder, Flare or tie-up • No engine braking	• Refer to **Harsh Shifts**. • Refer to **Harsh Shift 4 to 5, or 5 to 4**. • Refer to **Harsh Shift D to R**. • Refer to **Degraded 1-2 and 2-1 Shifts**. • Refer to **Degraded 2-3 and 3-2 Shifts**. • Refer to **Slips or Shudders in First Gear**. • Refer to **Degraded 4-5 Shift**.

	• Refer to **No Engine Braking in Second Gear**. • Refer to **No Engine Braking in First, Second, and Third Gear**. • Refer to **No Engine Braking in First Gear**. • Refer to **No Engine Braking**. • Refer to **No Engine Braking in First Gear**.
Shift Pattern: This category contains the following topics: • One forward gear only • Two forward gears only • Third gear only • Gear missing or slipping • No upshift or slipping • No downshifts • Non- First gear start	• Refer to **First and Second Gears Only**. • Refer to **First Gear Only**. • Refer to **First, Fourth, and Fifth Gears Only**. • Refer to **Second and Third Gears Only**. • Refer to **Fifth Gear Only**. • Refer to **No Reverse or Slips in Reverse**. • Refer to **Slips while Shifting**. • Refer to **No Second Gear**. • Refer to **No Third Gear**. • Refer to **No First Gear**. • Refer to **No Fourth Gear, or Slips in Fourth Gear**. • Refer to **No Fifth Gear**. • Refer to **Slips while Shifting**.
Shift Speed Diagnosis: This category consists of the following topic: Inaccurate or inconsistent shift points	Refer to **Inaccurate Shift Points**.
Torque Converter Diagnosis: This category contains the following topics: • Torque converter diagnosis • TCC does not apply • TCC does not release • TCC apply/release quality	• Refer to **Torque Converter Diagnosis**. • Refer to **No Engagement of Torque Converter Clutch**. • Refer to **Harsh Torque Converter Clutch Apply**.
Indicator ON or Message Center Displays Message: This category contains the following topics: • Change transmission fluid light ON • Service transmission light ON • Transmission hot idle engine light ON • Snow flake light ON	Refer to **Transmission Indicators and Messages** .

• Sport light ON	
If Symptom Not Found	• Refer to **Transmission Fluid Checking**. • Refer to **Road Test**. • Refer to **Line Pressure Check**.

TRANSMISSION FLUID CHECKING

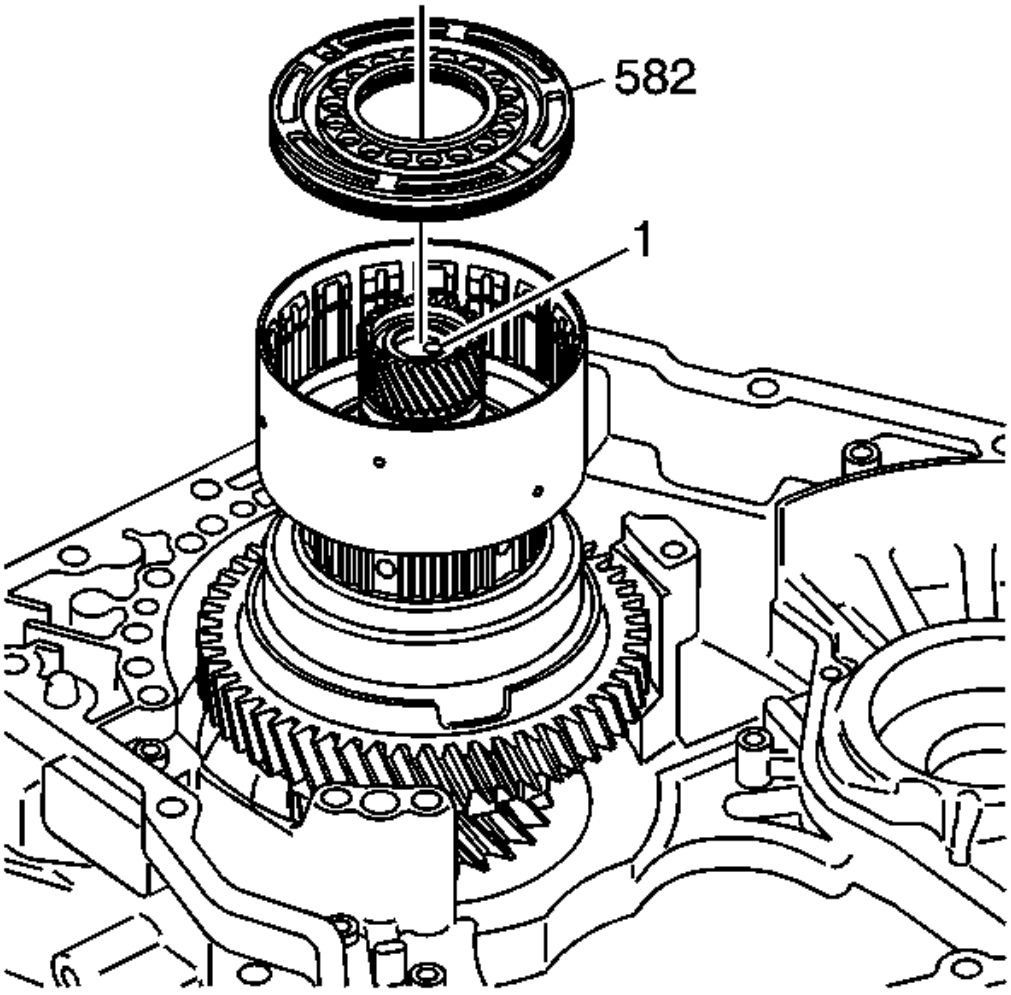

Fig. 1: Transmission Fluid Checking Procedure
Courtesy of GENERAL MOTORS CORP.

Transmission Fluid Checking

Step	Action	Value	Yes	No
1	**IMPORTANT:** **Transmission fluid level can only be accurately checked when the fluid temperature is between 30-50°C (86-122°F).** 1. Start the engine. 2. Depress the brake pedal and move the shift lever through the gear ranges, pausing a few seconds in each range. Return the shift lever to the PARK range. 3. Raise the vehicle on a hoist. The vehicle must be level with the engine running and the shift lever in the PARK range. Refer to **Lifting and Jacking the Vehicle** . **CAUTION:** **Refer to Checking Hot Transmission Fluid through Drain Plug Hole Caution .** 4. Remove the transmission fluid level hole plug (36). Location is model dependent. See the drawing above for locations. **IMPORTANT:** **The transmission fluid may darken with normal use and does not always indicate contamination or oxidation.** 5. Inspect the fluid color. If necessary, use a small screwdriver as a dipstick. Is the fluid color red or light brown with no burnt odor?	-	Go to **Step 4**	Go to **Step 2**
2	Does the fluid have a burnt odor or a dark brown color?	-	Go to **Step 8**	Go to **Step 3**
3	Does the fluid have a cloudy or milky appearance?	-	Go to **Step 7**	Go to **Step 8**
	Let the fluid temperature rise until it has reached the specified value. Inspect the	30-50°C (86-		

4	fluid level. The level should be even with the bottom of the threaded plug hole. Is the fluid level low?	122°F)	Go to **Step 5**	Go to **Step 11**
5	Add DEXRON®VI automatic transmission fluid in increments of 0.5 L (0.5 qt) until the fluid drains from the hole plug. Did you add more than 1.5 L (1.6 qt) to the transmission?	-	Go to **Step 6**	Go to **Step 11**
6	The transmission may have a leak. Refer to **Fluid Leak Diagnosis**. Was a transmission leak found?	-	Go to **Step 9**	Go to **Step 11**
7	The transmission fluid is contaminated with engine coolant. Repair or replace the transmission cooler in the radiator. Is the transmission cooler repair complete?	-	Go to **Step 9**	-
8	1. Drain the fluid by removing the transmission fluid pan drain plug (63). 2. Remove the transmission fluid pan. Refer to **Automatic Transmission Fluid and Filter Replacement** . **IMPORTANT:** **A very small amount of material in the bottom of the pan is a normal condition.** 3. Inspect the bottom pan for any excessive debris. Was excessive debris found?	-	Go to **Step 9**	Go to **Step 10**
	1. Repair the transmission, if required. **IMPORTANT:** **If the transmission is overhauled, it may be necessary to flush the transmission fluid cooler and pipes. Refer to Automatic Transmission Oil Cooler Flushing and Flow Test (J35944 A) or Automatic Transmission Oil Cooler Flushing and Flow Test (J 45096).**			

9	2. Add enough DEXRON®VI automatic transmission fluid to bring the fluid to the fluid level to the bottom of the threaded plug hole. 3. Start the engine. 4. Depress the brake pedal and move the shift lever through the gear ranges, pausing a few seconds in each range. Return the shift lever to the PARK range. 5. Raise the vehicle on a hoist. The vehicle must be level with the engine running and the shift lever in the PARK range. Refer to **Lifting and Jacking the Vehicle** . **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.** 6. Let the AT fluid temperature rise until it has reached the specified value. Remove the transmission plug. 7. If needed, add DEXRON®VI automatic transmission fluid in increments of 0.5 L (0.5 qt) until the fluid drains from the threaded hole plug. **NOTE:** **Refer to Fastener Notice .** **IMPORTANT:** **If the level hole plug (36) and O-ring (37) are not damaged, they**	30-50°C (86-122°F) 20 N.m (15 lb ft)		-

	should be reused. 8. Allow fluid to finish draining out of the plug hole. Inspect the level hole plug (36) and O-ring (37) for damage. Install the transmission hole plug (36) and tighten to the specified value. 9. Wipe any excess fluid from the transmission with a rag or shop towel. Is the repair complete?		System OK	
10	1. Change the fluid and fluid filter. Refer to **Automatic Transmission Fluid and Filter Replacement** . 2. Start the engine. 3. Depress the brake pedal and move the shift lever through the gear ranges, pausing a few seconds in each range. Return the shift lever to the PARK range. 4. Raise the vehicle on a hoist. The vehicle must be level with the engine running and the shift lever in the PARK range. Refer to **Lifting and Jacking the Vehicle** . **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.** 5. Let the AT fluid temperature rise until it has reached the specified value. Remove the transmission level hole plug (36).	30-50°C (86-122°F) 20 N.m (15 lb ft)		-

	6. If needed, add DEXRON®VI automatic transmission fluid in increments of 0.5 L (0.5 qt) until the fluid drains from the threaded hole plug. **NOTE:** **Refer to Fastener Notice .** **IMPORTANT:** **If the level hole plug (36) and O-ring (37) are not damaged, they should be reused.** 7. Allow fluid to finish draining out of the plug hole. Inspect the level hole plug (36) and O-ring (37) for damage. Install the transmission level hole plug (36) and tighten to the specified value. 8. Wipe any excess fluid from the transmission with a rag or shop towel. Is the repair complete?		System OK	
11	**NOTE:** **Refer to Fastener Notice .** **IMPORTANT:** **If the level hole plug (36) and O-ring (37) are not damaged, they should be reused.** 1. Let the AT fluid temperature rise until it has reached the specified value. Allow fluid to finish draining out of the hole plug. Inspect the level hole plug (36) and O-ring (37) for damage. Install the transmission level hole plug (36) and tighten to the specified value. 2. Wipe any excess fluid from the transmission with a shop towel or rag. Is the repair complete?	30-50°C (86-122°F) 20 N.m (15 lb ft)	System OK	-

LINE PRESSURE CHECK

Tools Required

- **J 21867** Pressure Gage
- **J 21867-L40** Pressure Gage Adapter

IMPORTANT: Before performing a line pressure check, verify that the pressure control (PC) solenoid valve is receiving the correct electrical signal from the PCM.

1. Install a scan tool.

CAUTION: Keep the brakes applied at all times in order to prevent unexpected vehicle motion. Personal injury may result if the vehicle moves unexpectedly.

2. Start the engine and set the parking brake.
3. Inspect for a stored Diagnostic Trouble Code (DTC).
4. Repair the vehicle, if necessary.
5. Check the fluid level. Refer to the **Transmission Fluid Checking**.
6. Check the manual linkage for proper adjustment.

CAUTION: Do not allow the line pressure gage hose to come into contact with the exhaust system. Transmission fluid is flammable, contact with the exhaust system may cause bodily injury or vehicle damage.

7. Turn the engine Off. Remove the transmission pressure test plug (40) and install **J 21867-L40** and **J 21867** .
8. Put the gear selector in PARK range and set the parking brake.
9. Start the engine and allow the engine to warm up at idle.

NOTE: The total test running time should not be longer than 2 minutes. Running the test longer than 2 minutes may damage the transaxle.

10. Access the PC solenoid valve control test on the scan tool.
11. Increase the PC solenoid actual current from 0 to 1 amps in 0.1 amp increments. Allow the pressure to stabilize for five seconds after each pressure change. Read the corresponding line pressure on the **J 21867** .
12. Refer to the **Line Pressure** specification table. Compare the data to the table.
13. If pressure readings differ greatly from the table, refer to **Fluid Pressure High or Low**.
14. Turn engine OFF. Remove the **J 21867** .
15. Inspect the pressure test plug (40) and O-ring (66) for damage.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: If the pressure test plug (40) and O-ring (66) are not damaged, they should be reused.

16. Install the transmission pressure test plug (40).

    Tighten: Tighten the transmission pressure test plug to 11 N.m (8 lb ft).

ROAD TEST

IMPORTANT: The Road Test Procedure should be performed only as part of the Symptom Diagnosis. Refer to Symptoms - Automatic Transmission.

The following test provides a method of evaluating the condition of the automatic transmission. The test is structured so that most driving conditions would be achieved. The test is divided into the following parts:

- Electrical Function Check
- Upshift Control and Torque Converter Clutch (TCC) Apply
- Part Throttle Detent Downshifts
- Full Throttle Detent Downshifts
- Manual Downshifts
- Coasting Downshifts
- Manual Gear Range Selection
  - REVERSE
  - Manual SECOND
  - Manual THIRD
  - Manual FOURTH

IMPORTANT: Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Before the road test, ensure the following:

- The engine is performing properly.
- Transmission fluid level is correct. Refer to the **Transmission Fluid Checking**.
- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.

- Observe all traffic regulations.
- View the scan tool data while conducting this test.

  Take along qualified help in order to operate the vehicle safely.

- Observe any unusual sounds or smells.

After the road test, inspect for the following:

- Transmission fluid level

  Refer to the **Transmission Fluid Checking**.

- Diagnostic Trouble Codes (DTCs) that may have set during the testing

  Refer to the applicable DTC.

- Scan tool data for any abnormal readings or data
- Fluid leaks

ELECTRICAL FUNCTION CHECK

Perform this check first, in order to ensure the electronic transmission components are connected and functioning properly. If these components are not checked, a simple electrical condition could be mis-diagnosed.

1. Connect the scan tool.
2. Ensure the gear selector is in PARK and set the parking brake.
3. Start the engine.
4. Verify that the following scan tool data can be obtained and is functioning properly.

   Refer to **Scan Tool Data List** for typical data values. Data that is questionable may indicate a concern.

   - Engine Speed
   - Transmission output speed
   - Vehicle speed
   - IMS Range
   - Transmission range (engine list)
   - Commanded gear
   - PC solenoid reference current
   - PC solenoid actual current
   - PC solenoid duty cycle
   - Engine coolant temperature

- Transmission fluid temperature
- Acceleration Pedal Position
- Ignition voltage
- 1-2 shift solenoid
- 2-3 shift solenoid
- 4-5 shift solenoid
- TCC solenoid duty cycle
- TCC slip speed

5. Monitor the brake switch signal with the Tech II. The scan tool should display:
   - Open when the brake pedal is released.
   - Closed when the brake pedal is depressed.
6. Check the garage shifts.
   1. Apply the brake pedal and ensure that the parking brake is set.
   2. Move the gear selector through the following ranges:
      1. PARK to REVERSE
      2. REVERSE to NEUTRAL
      3. NEUTRAL to DRIVE
   3. Pause 2 to 3 seconds in each gear position.
   4. Verify the gear engagements are immediate and not harsh.

IMPORTANT: Harsh engagement may be caused by any of the following conditions:

- **High idle speed**

  Compare engine idle speed to desired idle speed.

- **Commanded low PC solenoid current**

  Compare PC solenoid reference current to PC solenoid actual current.

- **A default condition caused by certain DTCs that result in maximum line pressure to prevent slippage**

IMPORTANT: Soft or delayed engagement may be caused by any of the following conditions:

- **Low idle speed**

  Compare engine idle speed to desired idle speed.

- **Low fluid level**

- **Commanded high PC solenoid current**

  Compare PC solenoid reference current to PC solenoid actual current.

- **Cold transmission fluid**

  Inspect for low transmission fluid temperature.

- **Selector linkage**

  Inspect the adjustment.

7. Monitor transmission range on the scan tool, engine list.
    1. Apply the brake pedal and ensure the parking brake is set.
    2. Move the gear selector through all ranges.
    3. Pause 2-3 seconds in each range.
    4. Return gear selector to PARK.
    5. Verify that all selector positions match the scan tool display.
8. Check accelerator pedal input.
    1. Apply the brake pedal and ensure that the parking brake is set.
    2. Ensure the gear selector is in PARK.
    3. Monitor accelerator pedal while increasing and decreasing engine speed with the throttle pedal. The scan tool accelerator pedal should increase and decrease with engine speed.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

UPSHIFT CONTROL AND TORQUE CONVERTER CLUTCH (TCC) APPLY

The TCM calculates the upshift points based primarily on two inputs: throttle angle and vehicle speed. When the TCM determines that conditions are met for a shift to occur, the TCM commands the shift by closing or opening the ground circuit for the appropriate solenoid.

Perform the following steps:

1. Refer to the **Shift Speed** table in this section and choose a throttle position of 12 percent, 25 percent or 50 percent. All throttle angles shown should be tested to cover the normal driving range.
2. Monitor the following scan tool parameters:
    - Throttle angle
    - Vehicle speed
    - Engine speed
    - Output shaft speed

- Commanded gear
- Slip speed
- Solenoid states

3. Place the gear selector in the OVERDRIVE position.
4. Accelerate the vehicle using the chosen throttle angle. Hold the throttle steady.
5. As the transmission upshifts, note the vehicle speed when the shift occurs for each gear change. There should be a noticeable shift feel or engine speed change within 1 to 2 seconds of the commanded gear change.
6. Compare the shift speeds to the Shift Speed table. Refer to **Shift Speed** . Shift speeds may vary slightly due to transmission fluid temperature or hydraulic delays in responding to electronic controls.
   - Note any harsh, soft or delayed shifts or slipping.
   - Note any noise or vibration.
7. Repeat steps 1- 6 to complete all throttle angles.

IMPORTANT: This transmission is equipped with an electronically controlled capacity clutch (ECCC). The pressure plate does not fully lock to the torque converter cover. The pressure plate maintains a small amount of slippage, approximately 20 RPM, in THIRD, FOURTH and FIFTH gears, depending on the vehicle application. ECCC was developed to reduce the possibility of noise, vibration or chuggle caused by TCC apply. Typical apply speeds are 49-52 km/h (30-32 mph) in THIRD gear and 65-73 km/h (40-45 mph) in FOURTH gear. Full lockup is available at highway speeds on some applications.

IMPORTANT: The TCC will not engage until the engine is in closed loop operation and the vehicle speed is as shown in the Shift Speed table. Refer to Shift Speed . The vehicle must be in a near-cruise condition, not accelerating or coasting, and on a level road surface.

8. Inspect for TCC apply in THIRD, FOURTH and FIFTH gear.
   - Note the TCC apply point. When the TCC applies there should be a noticeable drop in engine speed and a drop in slip speed to below 100 RPM. If the TCC apply can not be detected:
     - Check for DTCs.
     - Refer to **Torque Converter Diagnosis**.
   - Refer to the **Shift Speed** table for the correct apply speeds.

PART THROTTLE DETENT DOWNSHIFT

1. Place the gear selector in the OVERDRIVE position.
2. Accelerate the vehicle to 64-88 km/h (40-55 mph) in FIFTH gear.
3. Quickly increase throttle angle to greater than 50 percent.
4. Verify the following:

- The TCC releases
- The transmission downshifts immediately to FOURTH gear

5. Place the gear selector in the OVERDRIVE position.

FULL THROTTLE DETENT DOWNSHIFT

1. Accelerate the vehicle to speeds of 64-88 km/h (40-55 mph) in FIFTH gear.
2. Quickly increase throttle angle to 100 percent (WOT).
3. Verify the following:
   - The TCC releases
   - The transmission downshifts immediately to THIRD gear

MANUAL DOWNSHIFTS

The shift solenoid valves control the initial downshift for the 5-4, 4-3, 3-2 manual downshifts. The solenoid states should change during or shortly after a manual downshift is selected.

Manual 5-4 Downshift

1. Place the gear selector in the OVERDRIVE position.
2. Accelerate the vehicle to 64-88 km/h (40-55 mph) in FIFTH gear.
3. Release the throttle while moving the gear selector to FOURTH.
4. Verify the following:
   - The TCC releases
   - The transmission downshifts immediately to FOURTH gear
   - The engine slows the vehicle

Manual 5-3 Downshift

1. Place the gear selector in the OVERDRIVE position.
2. Accelerate the vehicle to 64-72 km/h (40-45 mph).
3. Release the throttle while moving the gear selector to THIRD.
4. Verify the following:
   - The TCC releases.
   - The transmission downshifts immediately to THIRD gear.
   - The engine slows the vehicle.

Manual 5-2 Downshift

1. Place the gear selector in the OVERDRIVE position.
2. Accelerate the vehicle to 48 km/h (30 mph).
3. Release the throttle while moving the gear selector to SECOND.

4. Verify the following:
    - The TCC releases.
    - The transmission downshifts immediately to SECOND gear.
    - The engine slows the vehicle.

COASTING DOWNSHIFTS

1. Place the gear selector in the OVERDRIVE position.
2. Accelerate the vehicle to FIFTH gear with the TCC applied.
3. Release the throttle.
4. Verify the following:
    - The TCC releases
    - Downshifts occur at speeds shown in the Shift Speed table. Refer to **Shift Speed** .

MANUAL GEAR RANGE SELECTION

The shift solenoids control the upshifts in the manual gear ranges.

Perform the following tests using 10-15 percent throttle angle.

Reverse

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise, or vibration.

Manual Second

1. With the vehicle stopped, move the gear selector to SECOND.
2. Accelerate the vehicle to 32 km/h (20 mph).
3. Verify the following:
    - No upshifts occur.
    - The TCC does not apply.
    - There is no noticeable slip, noise, or vibration.

Manual Third

1. With the vehicle stopped, move the gear selector to THIRD.
2. Accelerate the vehicle to 57 km/h (35 mph).
3. Verify the following:
    - The 1-2 shift occurs.
    - The 2-3 shift does not occur.

- There is no noticeable slip, noise or vibration.

Manual Fourth

1. With the vehicle stopped, move the gear selector to FOURTH.
2. Accelerate the vehicle to 64 km/h (40 mph).
3. Verify the following:
   - The 1-2 shift occurs
   - The 2-3 shift occurs
   - There is no noticeable slip, noise or vibration

TORQUE CONVERTER DIAGNOSIS

The Torque Converter Clutch (TCC) is applied by fluid pressure, which is controlled by a PWM solenoid valve. This solenoid valve is located inside of the automatic transmission assembly. The solenoid valve is controlled through a combination of computer controlled switches and sensors.

TORQUE CONVERTER STATOR

The torque converter stator roller clutch can have two different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up at all times.

POOR ACCELERATION AT LOW SPEED

If the stator is freewheeling at all times, the car tends to have poor acceleration from a standstill. At speeds above 50-55 km/h (30-35 mph), the car may act normally. For poor acceleration, you should first determine that the exhaust system is not blocked, and the transmission is in First gear when starting out.

If the engine freely accelerates to high RPM in NEUTRAL, you can assume that the engine and the exhaust system are normal. Check for poor performance in DRIVE and REVERSE to help determine if the stator is freewheeling at all times.

POOR ACCELERATION AT HIGH SPEED

If the stator is locked up at all times, performance is normal when accelerating from a standstill. Engine RPM and car speed are limited or restricted at high speeds. Visual examination of the converter may reveal a blue color from overheating.

If the converter has been removed, you can check the stator roller clutch by inserting a finger into the splined inner race of the roller clutch and trying to turn the race in both directions. You should be able to freely turn the inner race clockwise, but you should have difficulty in moving the inner race counterclockwise or you may be unable to move the race at all.

NOISE

IMPORTANT: Do not confuse this noise with pump whine noise, which is usually noticeable in PARK, NEUTRAL and all other gear ranges. Pump whine will vary with line pressure.

You may notice a torque converter whine when the vehicle is stopped and the transmission is in DRIVE or REVERSE. This noise will increase as you increase the engine RPM. The noise will stop when the vehicle is moving or when you apply the torque converter clutch, because both halves of the converter are turning at the same speed.

Perform a stall test to make sure the noise is actually coming from the converter:

1. Place your foot on the brake.
2. Put the gear selector in DRIVE.

NOTE: You may damage the transmission if you depress the accelerator for more than 6 seconds.

3. Depress the accelerator to approximately 1,200 RPM for no more than six seconds.

A torque converter noise will increase under this load.

TORQUE CONVERTER CLUTCH SHUDDER

The key to diagnosing Torque Converter Clutch (TCC) shudder is to note when it happens and under what conditions.

TCC shudder which is caused by the transmission should only occur during the apply or the release of the converter clutch. Shudder should never occur after the TCC plate is fully applied.

IF SHUDDER OCCURS DURING TCC APPLY OR RELEASE

If the shudder occurs while the TCC is applying, the problem can be within the transmission or the torque converter. Something is causing one of the following conditions to occur:

- Something is not allowing the clutch to become fully engaged.
- Something is not allowing the clutch to release.
- The clutch is releasing and applying at the same time.

One of the following conditions may be causing the problem to occur:

- Leaking turbine shaft seals
- A restricted release orifice
- Defective friction material on the TCC plate

IF SHUDDER OCCURS AFTER TCC HAS APPLIED

If shudder occurs after the TCC has applied, most of the time there is nothing wrong with the transmission.

The TCC is not likely to slip after the TCC has been applied. Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC apply when going up a hill or accelerating. This is due to the mechanical coupling between the engine and the transmission.

Once TCC is applied, there is no torque converter fluid coupling assistance. Engine or driveline vibrations could be unnoticeable before TCC engagement.

Inspect the following components in order to avoid misdiagnosis of TCC shudder. An inspection will also avoid the unnecessary disassembly of a transmission or the unnecessary replacement of a torque converter.

- Spark plugs

  Inspect for cracks, high resistance or a broken insulator.

- Cylinder coil

  Look for a black discoloration on the bottom of each cylinder coil. This indicates arcing while the engine is misfiring.

- Fuel injector

  The filter may be plugged.

- Vacuum leak

  The engine will not get a correct amount of fuel. The mixture may run rich or lean depending on where the leak occurs.

- MAF sensor

  Like a vacuum leak, the engine will not get the correct amount of fuel for proper engine operation.

- Carbon on the intake valves

  Carbon restricts the proper flow of air/fuel mixture into the cylinders.

- Flat cam

  Valves do not open enough to let the proper fuel/air mixture into the cylinders.

- Oxygen sensor

  This sensor may command the engine too rich or too lean for too long.

- Fuel pressure

  This may be too low.

- Engine mounts

  Vibration of the mounts can be multiplied by TCC engagement.

- Axle joints

  Check for vibration.

- Cylinder balance

  Bad piston rings or poorly sealing valves can cause low power in a cylinder.

- Fuel contamination

  This causes poor engine performance.

Replace the torque converter if any of the following conditions exist:

- External leaks appear in the hub weld area.
- The converter hub is scored or damaged.
- The converter pilot is broken, damaged, or fits poorly into the crankshaft.
- You discover steel particles after flushing the cooler and the cooler lines.
- The pump is damaged, or you discover steel particles in the converter.
- The vehicle has TCC shudder and/or no TCC apply. Replace the torque converter only after all hydraulic and electrical diagnoses have been made. The converter clutch material may be glazed.
- The converter has an imbalance which cannot be corrected. Refer to **Flexplate/Torque Converter Vibration Test**.
- The converter is contaminated with engine coolant which contains antifreeze.
- An internal failure occurs in the stator roller clutch.
- You notice excessive end play.
- Overheating produces heavy debris in the clutch.
- You discover steel particles or clutch lining material in the fluid filter or on the magnet, when no internal parts in the unit are worn or damaged. This condition indicates that lining material came from the converter.

Do not replace the torque converter if you discover any of the following symptoms:

- The oil has an odor or the oil is discolored, even though metal or clutch facing particles are not present.
- Transmission failure did not display evidence of damaged or worn internal parts, steel particles or clutch plate lining material in the unit and inside the fluid filter.

- The vehicle has been exposed to high mileage only. An exception may exist where the lining of the torque converter clutch dampener plate has seen excess wear by vehicles operated in heavy and/or constant traffic, such as taxi, delivery, or police use.

FLEXPLATE/TORQUE CONVERTER VIBRATION TEST

ISOLATING VIBRATION

NOTE: Some engine/transaxle combinations cannot be balanced in this manner due to restricted access or limited clearances between the torque converter bolts and the engine. Ensure that the bolts do not bottom out in the lug nuts or the torque converter cover which could dent and cause internal damage.

To isolate and correct a flywheel or torque converter vibration, separate the torque converter from the flywheel to determine if vibration is in the engine or transmission.

1. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.
2. Turn the engine OFF.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
4. Mark the relationship of the converter to the flywheel.
5. Remove the bolts attaching the converter to the flywheel. Refer to **Fastener Tightening Specifications** .
6. Slide the torque converter away from the flywheel.
7. Rotate the flywheel and torque converter to inspect for defects or missing balance weights. Refer to Engine Flywheel Cleaning and Inspection in Engine Controls 3.6L.
8. Lower the vehicle.
9. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration. Refer to **Diagnostic Starting Point - Vibration Diagnosis and Correction** in Vibration Diagnosis and Correction.
10. Turn the engine OFF.

INDEXING TORQUE CONVERTER

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flywheel balance.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Rotate the torque converter one bolt position.

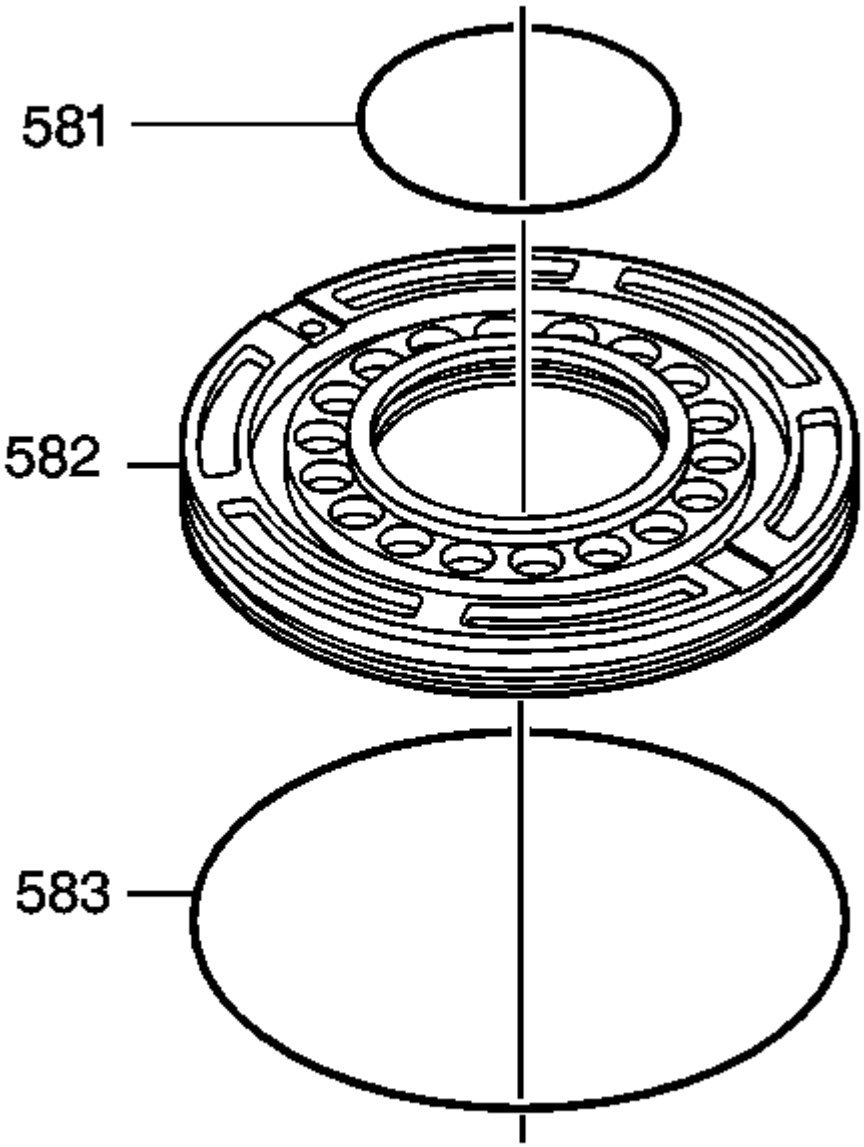

Fig. 2: View Of Torque Converter Hub In Engine Crankshaft
Courtesy of GENERAL MOTORS CORP.

3. Align the torque converter hub (2) in the engine crankshaft (3) and install the torque converter to flywheel bolts. Refer to **Fastener Tightening Specifications** .
4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration. Refer

to **Noise and Vibration Analysis**.

Repeat this procedure until you obtain the best possible balance.

NOISE AND VIBRATION ANALYSIS

A noise or vibration that is noticeable when the vehicle is in motion MAY NOT be the result of the transmission.

If noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is less noticeable as RPM increases, the cause may be from poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.
- Inspect the tires for the following conditions:
  - Uneven wear
  - Imbalance
  - Mixed sizes
  - Mixed radial and bias ply
- Inspect the suspension components for the following conditions:
  - Alignment wear or damage
  - Loose fasteners
  - Driveline damage or wear
- Inspect the engine and transmission mounts for damage and loose bolts.
- Inspect the transmission case mounting holes for the following conditions:
  - Missing bolts, nuts, and studs
  - Stripped threads
  - Cracks
- Inspect the flywheel for the following conditions:
  - Missing or loose bolts
  - Cracks
  - Imbalance
- Inspect the torque converter for the following conditions:
  - Missing or loose bolts or lugs
  - Missing or loose balance weights
  - Imbalance caused by heat distortion or fluid contamination

BUZZ NOISE OR HIGH FREQUENCY RATTLE SOUND

Buzz Noise or High Frequency Rattle Sound

Checks	Action
DEFINITION: A buzz or high frequency rattle	

• Trace Cooler Pipes • Check for binding or contact at the Radiator, other than at the Cooler Pipe connectors	Verify a pressure buzz by watching for a needle vibration of the pressure gage. A road test may be necessary. Refer to **Road Test**.

WHINE NOISE VARYING WITH RPM OR FLUID PRESSURE

Whine Noise Varying with RPM or Fluid Pressure

Checks	Action
DEFINITION: In all ranges, a whine which may be sensitive to RPM load, or which ceases when the TCC engages, or which is sensitive to the oil pressure	
Torque Converter (1)	Verify that the noise is internal to the torque converter by placing your left foot on the brake with the gear or selector in Drive. Momentarily stall the engine. Torque Converter noise increases under load.
Oil Pump System	Pump whine noise, which is usually noticeable in Park, Neutral and all other gear ranges. Pump whine will vary with line pressure.

POPPING NOISE

Popping Noise

Checks	Action
DEFINITION: A popping noise, similar to popcorn popping	
Oil Pump System	• Check fluid level. • Inspect for pump cavitation, indicated by bubbles in fluid. • Inspect the transmission fluid filter for a leaky seam. • Inspect the transmission fluid filter seal for improper positioning or for a cut seal.

NOISE IN RANDOM RANGES

Noise in Random Ranges

Checks	Action
DEFINITION: Noise only in certain gear ranges	
Refer to **Range Reference** . Determine the power flow and the applicable components that may be causing this noise.	

CLUTCH PLATE DIAGNOSIS

COMPOSITION PLATES

Dry the plates and inspect the plates for the following conditions:

- Pitting
- Flaking
- Wear
- Glazing
- Cracking
- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

STEEL PLATES

Wipe the plates dry and inspect the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

CAUSES OF BURNED CLUTCH PLATES

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch plates
- Engine coolant in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- Damaged fluid passage sleeves
- Low line pressure
- Valve body conditions
    - The valve body face is not flat.
    - Porosity is between channels.
    - The valve bushing clips are improperly installed.
    - The checkballs are misplaced.
- The Teflon® seal rings are worn or damaged.
- Low transmission fluid level

ENGINE COOLANT/WATER IN TRANSMISSION

If antifreeze or water has entered the transmission, perform the following:

1. Disassemble the transmission.
2. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
3. Replace the composition-faced clutch plate assemblies. The facing material may separate from the steel center portion.

4. Replace all of the washers.
5. Replace the torque converter.
6. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
7. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.

FLUID LEAK DIAGNOSIS

NOTE: The transmission fluid level must be checked before fluid leak diagnosis is performed to prevent damage to the transmission.

Check transmission fluid lever. Refer to **Transmission Fluid Checking**.

GENERAL METHOD

1. Verify that the leak is transmission fluid.
2. Thoroughly clean the suspected leak area.
3. Operate the vehicle for 24 km (15 mi), or until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut OFF the engine.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

POWDER METHOD

1. Thoroughly clean the suspected leak area with solvent.
2. Apply an aerosol type powder, such as foot powder, to the suspected leak area.
3. Operate the vehicle for 24 km (15 mi), or until normal operating temperatures are reached.
4. Shut OFF the engine.
5. Inspect the suspected leak area.
6. Trace the leak path through the powder in order to find the source of the leak.
7. Make the necessary repairs.

DYE AND BLACK LIGHT METHOD

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Install the dye. Refer to **Transmission Fluid Checking**.
3. Detect the leak with the black light.
4. Make the necessary repairs.

FIND THE CAUSE OF THE LEAK

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

Seals

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

POSSIBLE POINTS OF FLUID LEAKS

Transmission Oil Pan

- Incorrectly tightened fluid pan bolts
- Improperly installed or damaged fluid pan gasket
- Damaged fluid pan or mounting face
- Incorrect fluid pan gasket
- Fluid Drain Plug

Case Leak

- Fluid Fill Plug

- Extension Housing
- Wiring harness O-ring seal
- Damaged manual shaft seal
- Loose or damaged fluid cooler line seals fittings
- Worn or damaged propeller shaft flange seal
- Loose line pressure test plug
- Porous casting
- Fluid fill plug

Leak at the Torque Converter End

- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the transmission case or the oil pump

Leak at the Vent

- Overfilled system
- Water or coolant in the fluid. The fluid will appear milky
- Transmission case porous
- Plugged vent
- Drain-back holes plugged
- Mispositioned oil pump to case gasket, if equipped

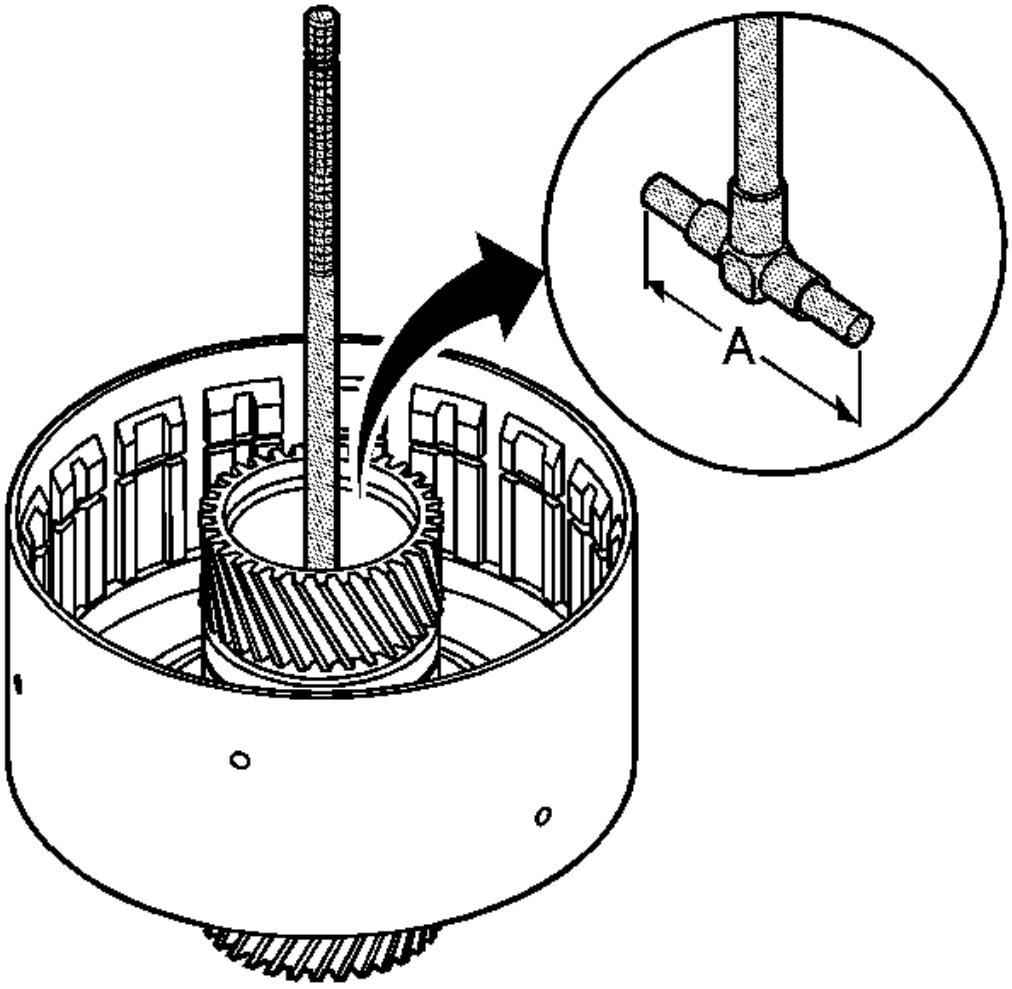

Fig. 3: Leak Inspection Points
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Torque Converter Assembly
2	Fluid Cooler Pipe Connectors
4	Torque Converter Housing Fluid Seal Assembly
24	Automatic Transmission Case Assembly
25	Case Extension Gasket
29	Prop Shaft Flange Seal
36	Transmission Level Hole Plug
40	Transmission Pressure Test Plug

56	Automatic Transmission Wiring Harness O-ring Seal
60	Automatic Transmission Fluid Pan Gasket
63	Automatic Transmission Fluid Drain Plug
229	Torque Converter Housing Seal
243	Transmission Vent Assembly
605	Manual Shift Shaft Seal
614	Cup Plug

CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas. You can usually repair these leaks with the transmission in the vehicle.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

CAUTION: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. While the transmission case is still hot, apply the epoxy. You can use a clean, dry soldering acid brush to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before starting the engine.
5. Repeat the fluid leak diagnosis procedures.

SHIFT SOLENOID LEAK TEST

Tools Required

- **J 44246** Solenoid Testing Kit
- **J 35616** GM Terminal Test Kit

Leak Test Procedure

IMPORTANT:
- **This procedure tests On/Off type solenoid valves.**
- **Visually inspect the physical condition of the solenoid before testing. Inspect the O-rings before and after the test to be sure that they are not cut or damaged.**

1. Remove the shift solenoid valve from the control valve body or the TCC solenoid valve from the transmission case. Refer to **1-2 Shift Solenoid Valve Replacement** , **2-3 Shift Solenoid Valve Replacement** , **4-5 Shift Solenoid Valve Replacement** , **Torque Converter Clutch Solenoid**

Replacement , and **Transmission Internal Electrical Harness Replacement** .

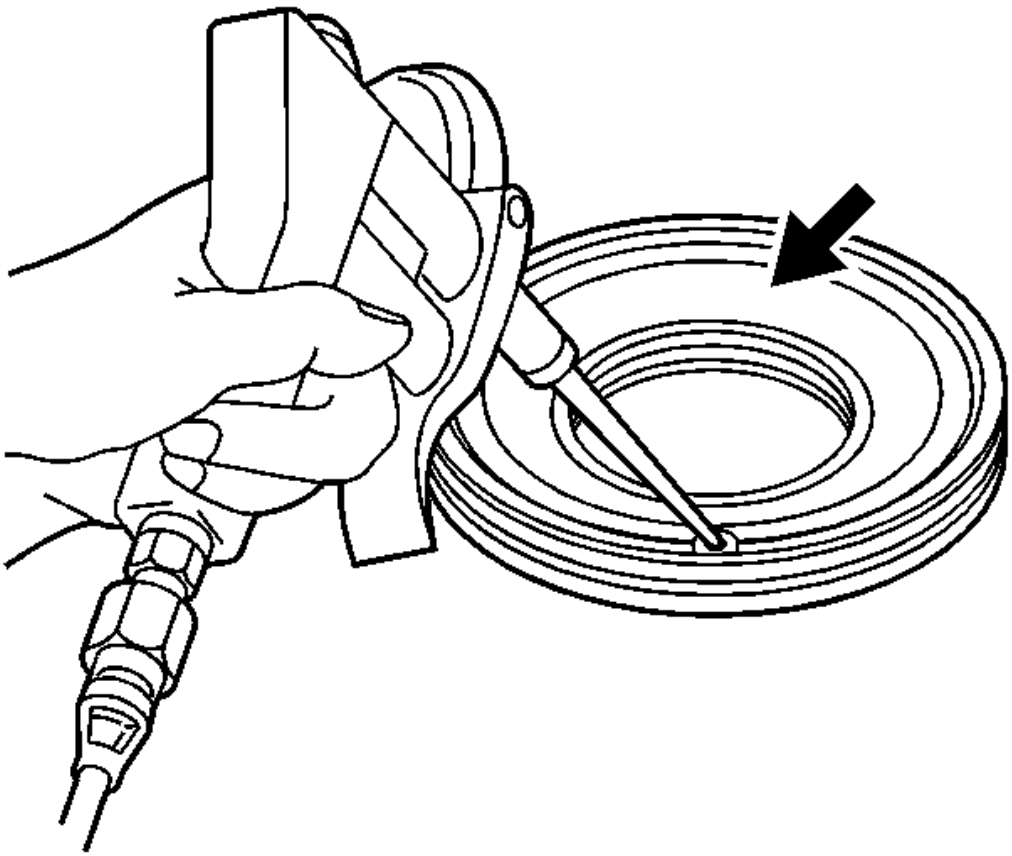

Fig. 4: Installing Shift Solenoid Into Bore #5
Courtesy of GENERAL MOTORS CORP.

2. Install the TCC solenoid valve, the 1-2 shift solenoid valve, the 2-3 shift solenoid valve or the 4-5 shift solenoid into bore number 5 of the **J 44246** .

   Install the factory retainer clip to retain the solenoid.

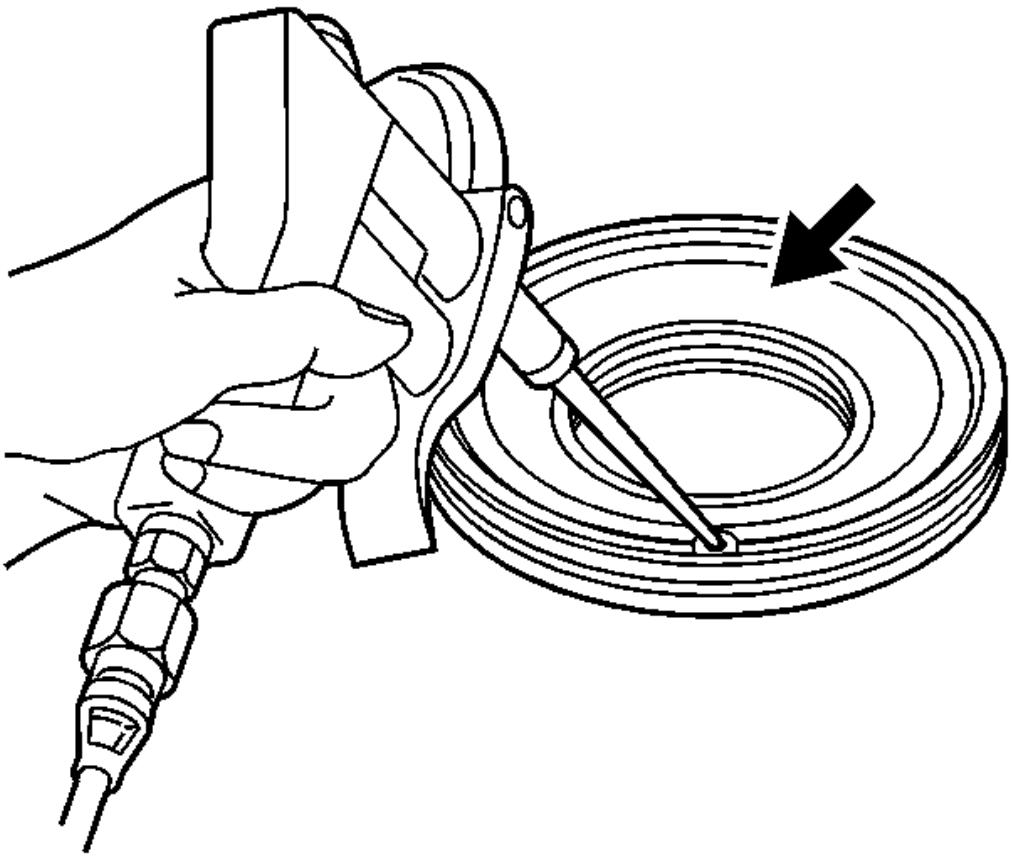

Fig. 5: Connecting Solenoid Testing Harness
Courtesy of GENERAL MOTORS CORP.

3. Connect the solenoid testing harness supplied with the **J 44246** to the solenoid.

IMPORTANT: Do not use air pressure in excess of 120 psi. Excessive pressure will not allow the solenoid ball check valve to seat properly. Recommended air pressure is 50 psi.

4. Apply compressed air to the **J 44246** .
5. Connect the solenoid testing harness to the, 12 volt, positive and negative (-) battery terminals.
6. Observe if the solenoid is operating electrically. An audible clicking noise can be heard when connecting or disconnecting power.

IMPORTANT:

- **All solenoids need to be energized to seal.**

- **A small amount of air leakage is normal +/- 21 kPa (+/- 3 psi).**

7. Observe the air flow through the solenoid. The flow will completely or nearly completely stop. Replace the solenoid if there continues to be an obvious air leak when the solenoid is energized.

IMPORTANT: Inspect the O-rings after the test to be sure that they are not cut or damaged.

8. Install the shift solenoid valve into the control valve body or the TCC solenoid valve into the transmission case. Refer to **1-2 Shift Solenoid Valve Replacement** , **2-3 Shift Solenoid Valve Replacement** , **4-5 Shift Solenoid Valve Replacement** , **Torque Converter Clutch Solenoid Replacement** , and **Transmission Internal Electrical Harness Replacement** .

AUTOMATIC TRANSMISSION OIL COOLER FLUSHING AND FLOW TEST (J35944 A)

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 repeat repair cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flow checking and flushing the auxiliary transmission oil cooler, if equipped.

IMPORTANT: Use the J 35944-A or equivalent to flush the transmission oil cooler and the oil cooler pipes whenever the transaxle is removed for the following repairs:

- **Torque converter**
- **Oil pump**
- **Oil pump drive shaft**
- **Drive sprocket support**
- **Transaxle overhaul complete**
- **Transaxle assembly replacement**

IMPORTANT: Use the J 35944-A or equivalent to flush the transmission oil cooler and the oil cooler pipes whenever the transmission is removed for the following repairs:

- **Torque converter**
- **Oil pump**
- **Turbine shaft**
- **Transmission overhaul complete**
- **Transmission assembly replacement**

Only GM Goodwrench DEXRON®III automatic transmission fluid should be used when doing a repair on a GM transmission.

Time allowance for performing the cooler flow checking and flushing procedure has been included in the appropriate labor time guide operations since the 1987 model year. The service procedure steps for oil cooler flushing are as follows:

Cooler Flow Check and Flushing Steps

1. Tools Required
2. Preparation
3. Back Flush
4. Forward Flush
5. Flow Check
6. Clean-up

Tools Required

- **J 35944-A** Transmission Oil Cooler and Line Flusher
- **J 35944-22** Transmission Oil Cooler Flushing Fluid
- Measuring cup
- Funnel
- Water supply - hot water recommended
- Water hose, at least 16 mm (5/8 in) ID
- Shop air supply with water/oil filters, regulator and pressure gage
- Air chuck with clip, if available
- Oil drain container
- Pail with lid - 19 L (5 gallon)
- Eye protection
- Rubber gloves

PREPARATION

1. During the installation of the repaired or replacement transmission, do not connect the oil cooler pipes.

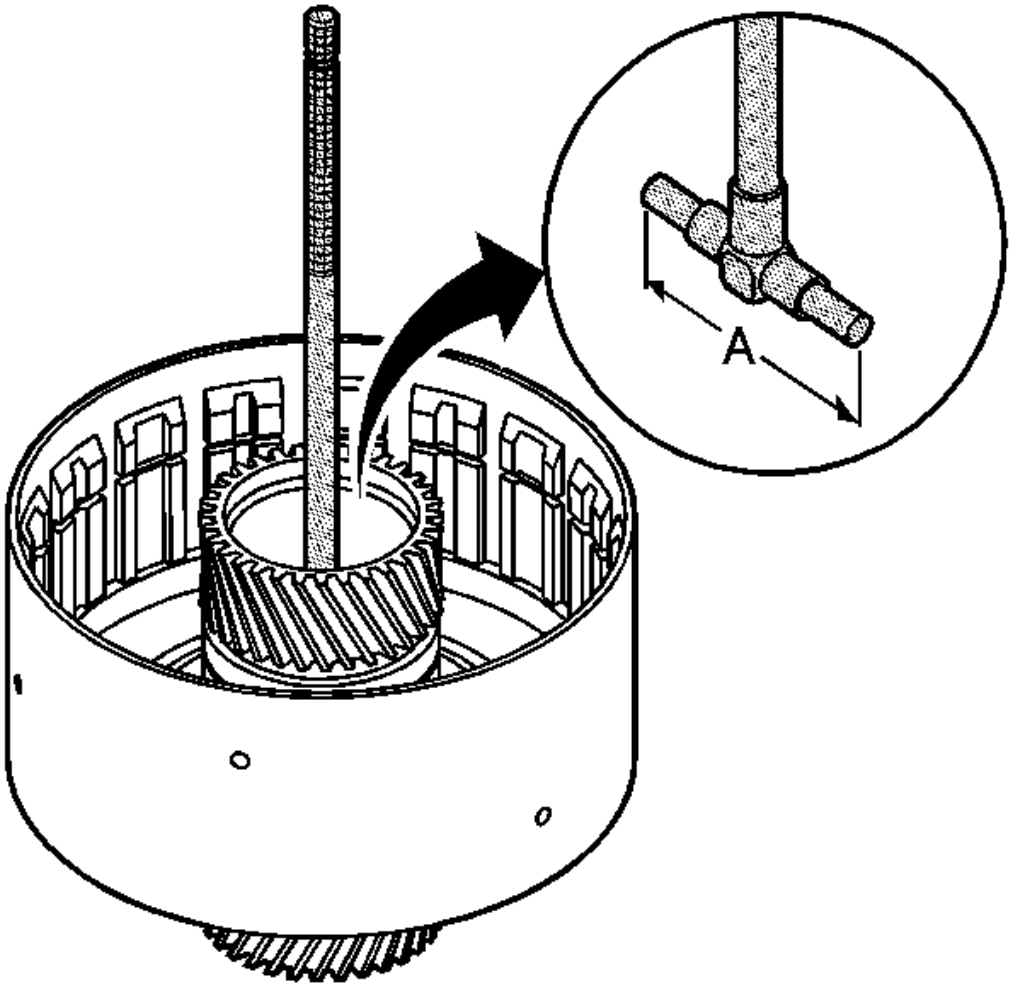

Fig. 6: Identifying Flusher Tank & Components
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not use solutions that contain alcohol or glycol. Use of solutions that contain alcohol or glycol may damage the oil cooler line flusher, oil cooler components and/or transmission components.

IMPORTANT: The 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 GM, use of other non-approved fluids for cooler flushing can have an adverse reaction to the seals inside the transmission.

2. Remove the fill cap (9) on the **J 35944-A** and fill the flusher tank (4) with 0.6 L (20-21 oz) of **J 35944-22** , using the measuring cup (6). Do not overfill.
3. Install the fill cap (9) on the **J 35944-A** and pressurize the flusher tank (4) to 550-700 kPa (80-100 psi), using the shop air supply at the tank air valve (2).
4. With the water supply valve (1) on the **J 35944-A** in the OFF position, connect the water supply hose from the **J 35944-A** to the water supply at the faucet.
5. Turn ON the water supply at the faucet.

BACK FLUSH

1. Inspect the transmission oil cooler pipes for kinks or damage. Repair as necessary.

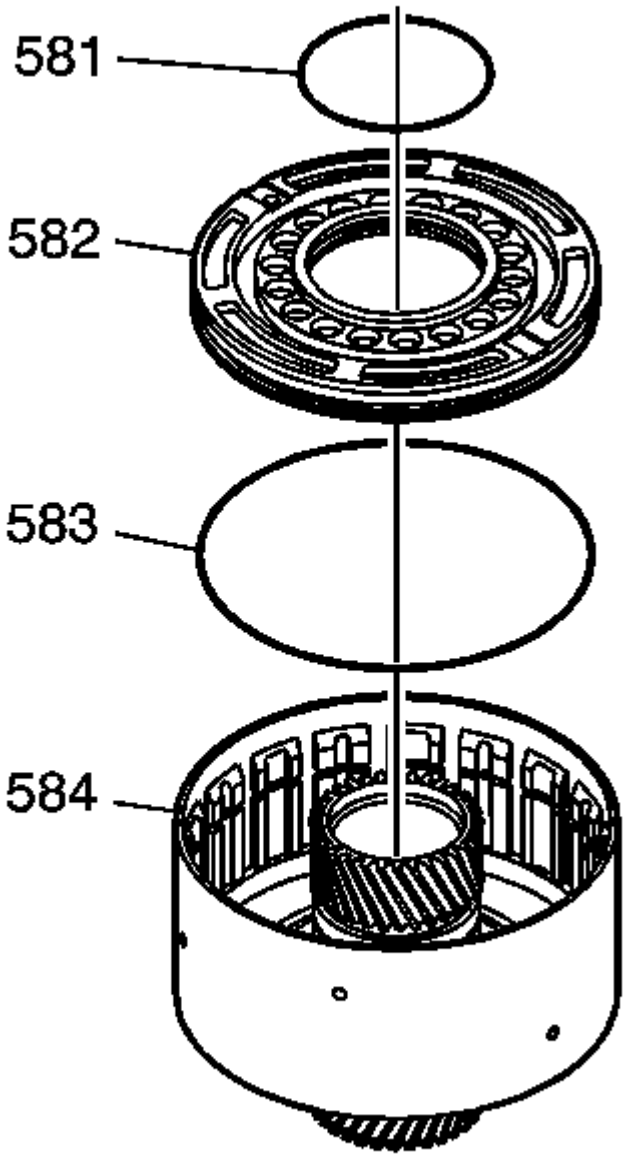

Fig. 7: Connecting J 35944 To Oil Cooler
Courtesy of GENERAL MOTORS CORP.

2. Connect the **J 35944-A** to the oil cooler feed top connector.
3. Clip the discharge hose (2) onto the oil drain container.
4. Attach the **J 35944-A** to the undercarriage of the vehicle with the hook provided and connect the flushing system feed supply hose (1) from the **J 35944-A** to the bottom connector oil cooler return pipe.

5. Turn the **J 35944-A** water supply valve (3) 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 **J 35944-A** water supply valve (3) to the OFF position and clip the discharge hose onto a 19 liter (5 gallon) pail with a lid, to avoid splashback.

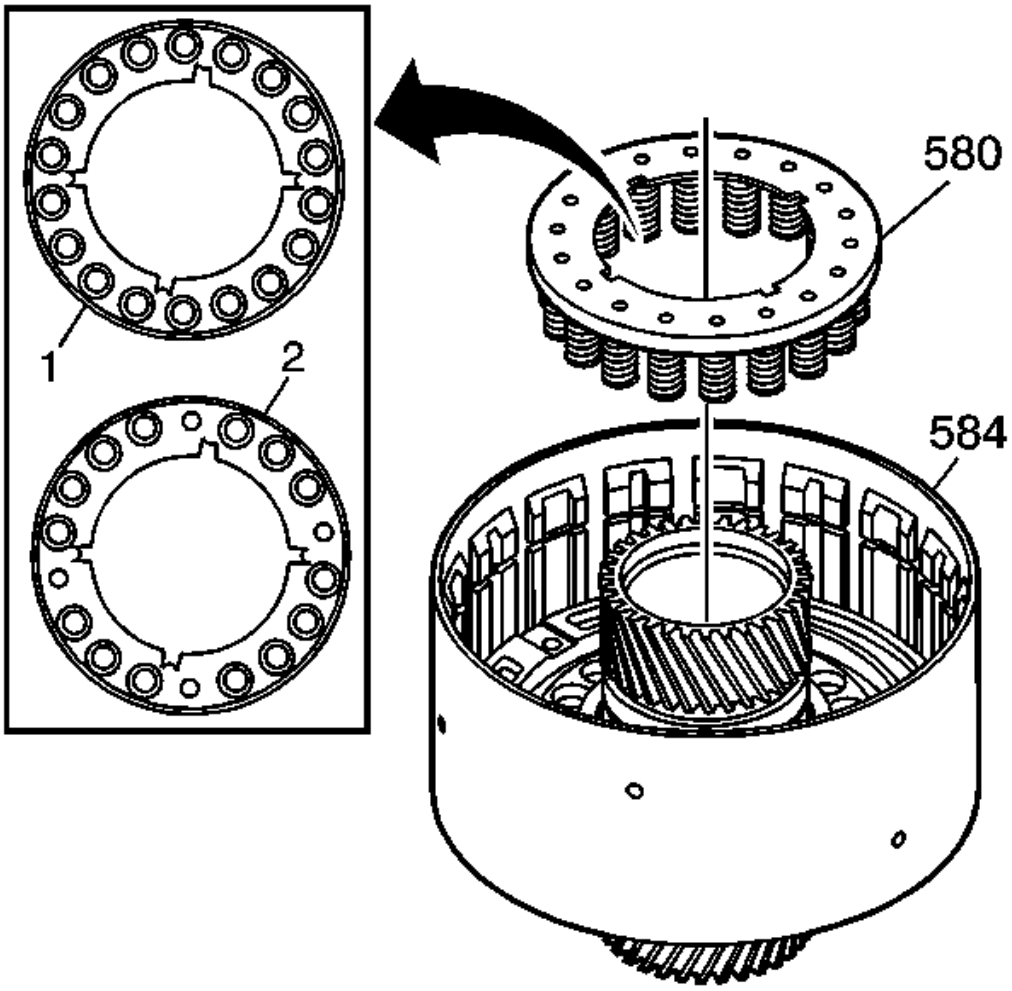

Fig. 8: J 35944-A Water Supply Valve ON/OFF Positions
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: 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 **J 35944-A** water supply valve (3) to the ON position and depress the trigger (1) to mix cooler flushing solution into the water flow. Use the clip provided on the handle to hold the trigger (1) down. 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 825 kPa (120 psi) to the flushing system feed air valve (2) located on the **J 35944-A** , for 3-5 seconds at the end of every 15-20 second interval to create a surging action.
9. Release the trigger (1) and turn the **J 35944-A** water supply valve (3) to the OFF position.

FORWARD FLUSH

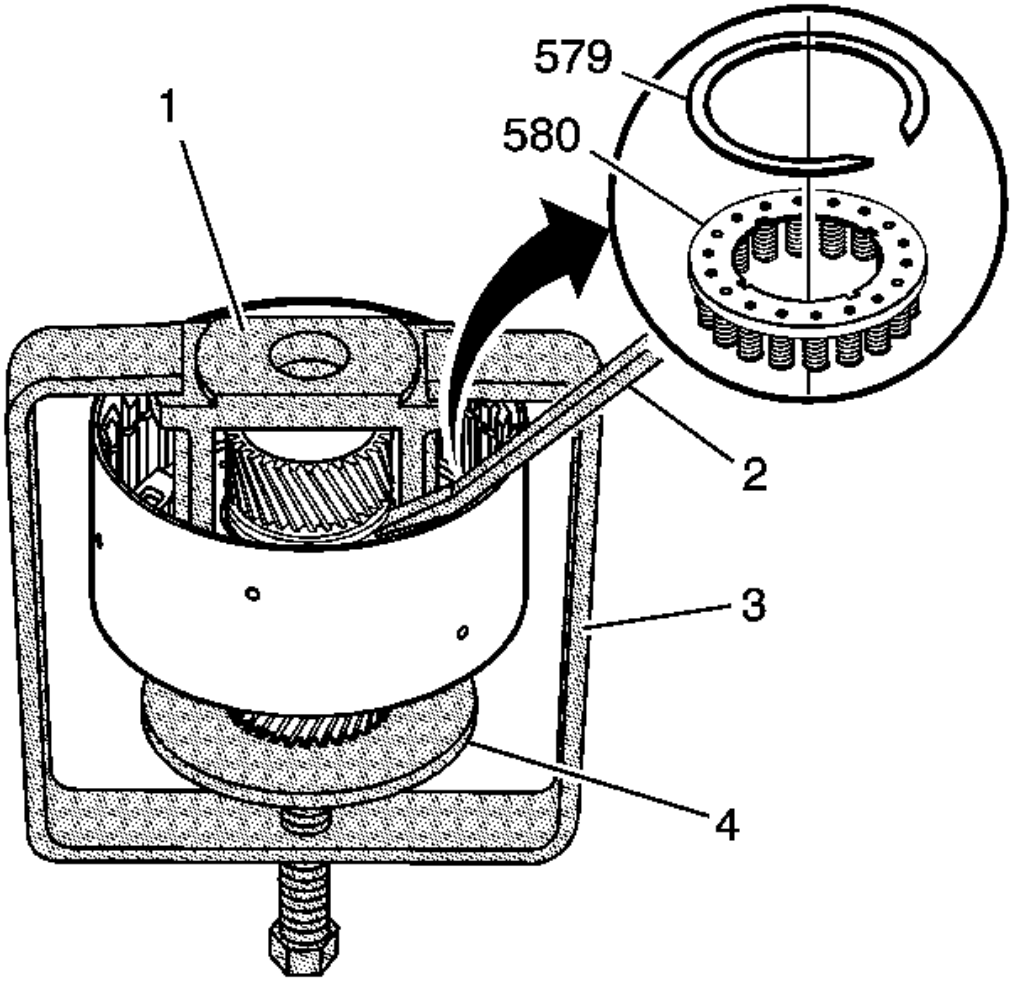

Fig. 9: Connecting J 35944 To Oil Cooler
Courtesy of GENERAL MOTORS CORP.

1. Disconnect both hoses (1 and 2) 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.
2. Repeat Step 6 and 7 of the Back Flush.

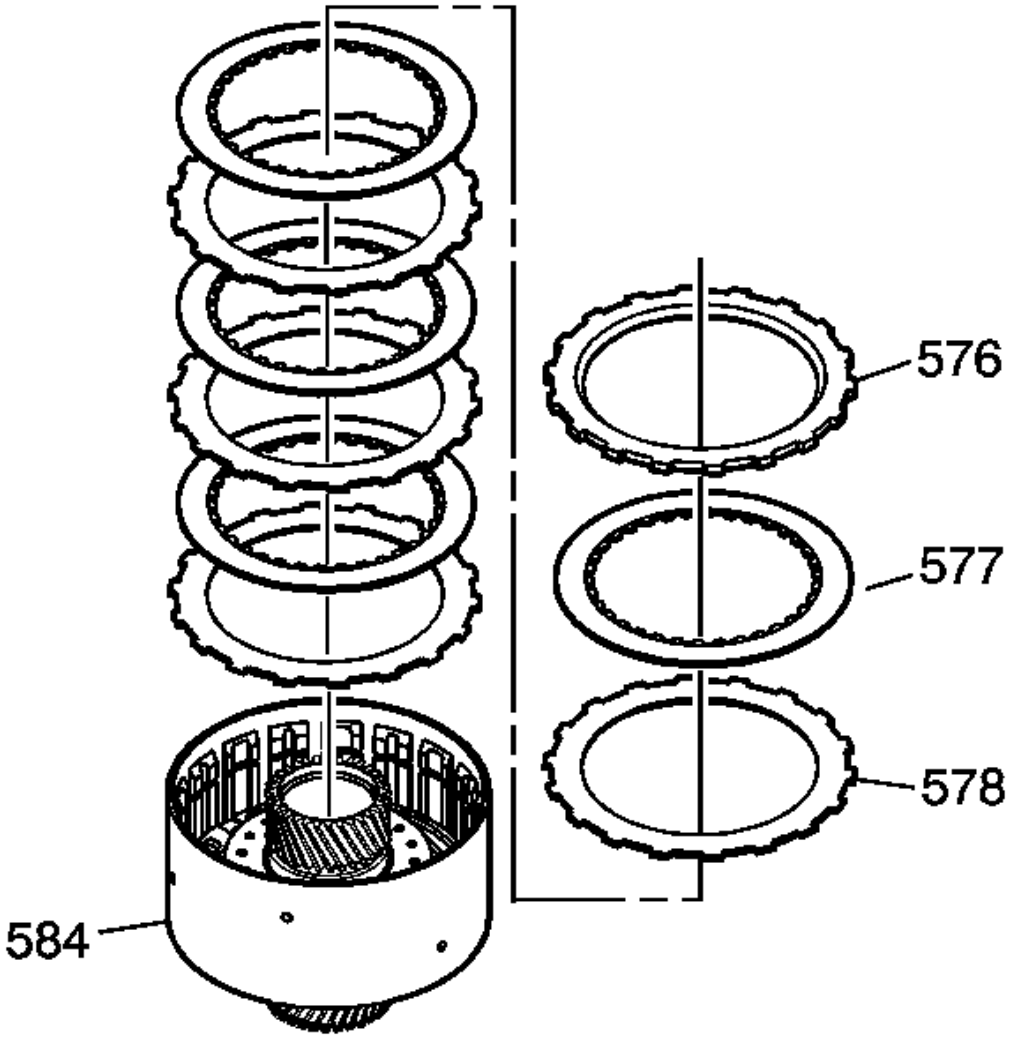

Fig. 10: J 35944-A Water Supply Valve ON/OFF Positions
Courtesy of GENERAL MOTORS CORP.

3. Release the trigger (1) of the **J 35944-A** and allow water only to rinse the oil cooler and pipes for 1

minute.

4. Turn the **J 35944-A** water supply valve (3) 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 **J 35944-A** and blow out the water from the oil cooler and pipes. Continue, until no water comes out of the discharge hose.

FLOW TEST

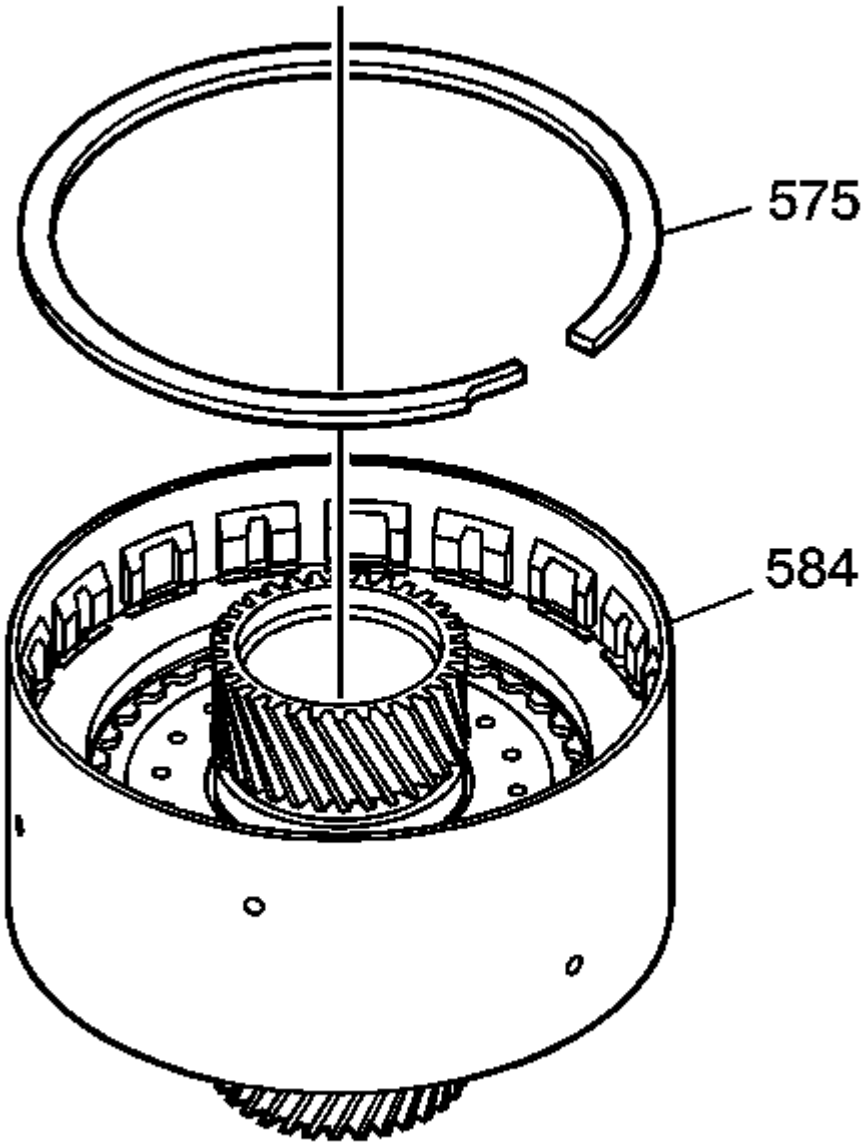

Fig. 11: Clipping The Discharge Hose To An Empty Oil Container
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: 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, top connector, to the

transmission for normal flow.

2. Clip the discharge hose (1) to an empty oil container.
3. Confirm the transmission is filled with automatic transmission fluid. Refer to **Fluid Capacity Specifications** for the correct automatic transmission 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 1.9 L (2 quarts) must be discharged during this 30 second run time.
5. If the fluid flow meets or exceeds 1.9 L (2 quarts) in 30 seconds, connect the oil cooler feed pipe to the front connector on the transmission.
6. If fluid flow is less than 1.9 L (2 qt) in 30 seconds, perform the following diagnosis:
    1. Disconnect the **J 35944-A** discharge hose (1) from the oil cooler return pipe.
    2. Disconnect the oil cooler feed pipe at the radiator.
    3. Connect the **J 35944-A** discharge hose (1) to the oil cooler feed pipe, radiator end.
    4. Clip the discharge hose (1) onto the oil drain container.
    5. 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 1.9 L (2 qt) must be discharged during this 30 second run time.
7. If the amount of transmission fluid flow remains less than 1.9 L (2 qt) in 30 seconds, inspect the oil cooler feed pipe, top connector, for restrictions or damage. If no condition is found with the feed pipe, inspect the transmission.

CLEAN-UP

1. Disconnect the water supply hose from the **J 35944-A** and bleed any remaining air pressure from the flusher tank.
2. Remove the fill cap from the **J 35944-A** and return any unused flushing solution to its container. Rinse the **J 35944-A** with water. Do not store the **J 35944-A** with flushing solution in it.
3. After every third use, clean the **J 35944-A** as described in the instructions included with the tool.
4. Dispose of any waste water/solution and transmission fluid in accordance with local regulations.

AUTOMATIC TRANSMISSION OIL COOLER FLUSHING AND FLOW TEST (J 45096)

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 failure. Many repeat repair cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flow checking and flushing the auxiliary transmission oil cooler, if equipped.

IMPORTANT: Use the J 45096 , or equivalent, to flush and flow test the transmission oil cooler and the oil cooler pipes after the transaxle is removed for repairs.

Only GM Goodwrench DEXRON®VI automatic transmission fluid (ATF) should be used when doing a repair

on a GM transmission.

Time allowance for performing the cooler flow checking and flushing procedure has been included in the appropriate labor time guide operations since the 1987 model year. The service procedure steps for oil cooler flushing and flow testing are as follows:

COOLER FLOW CHECK AND FLUSHING STEPS

1. Machine Set-up
2. Determine Minimum Flow Rate
3. Back Flush
4. Forward Flush
5. Flow Test
6. Code Recording Procedure
7. Clean-up

Tools Required

- **J 45096** Transmission Oil Cooling System Flush and Flow Test Tool
- **J 45806** Cooler Flushing Adapter
- Shop air supply with water/oil filters, regulator and pressure gage - minimum 90 psi
- Eye protection
- Rubber gloves

MACHINE SET-UP

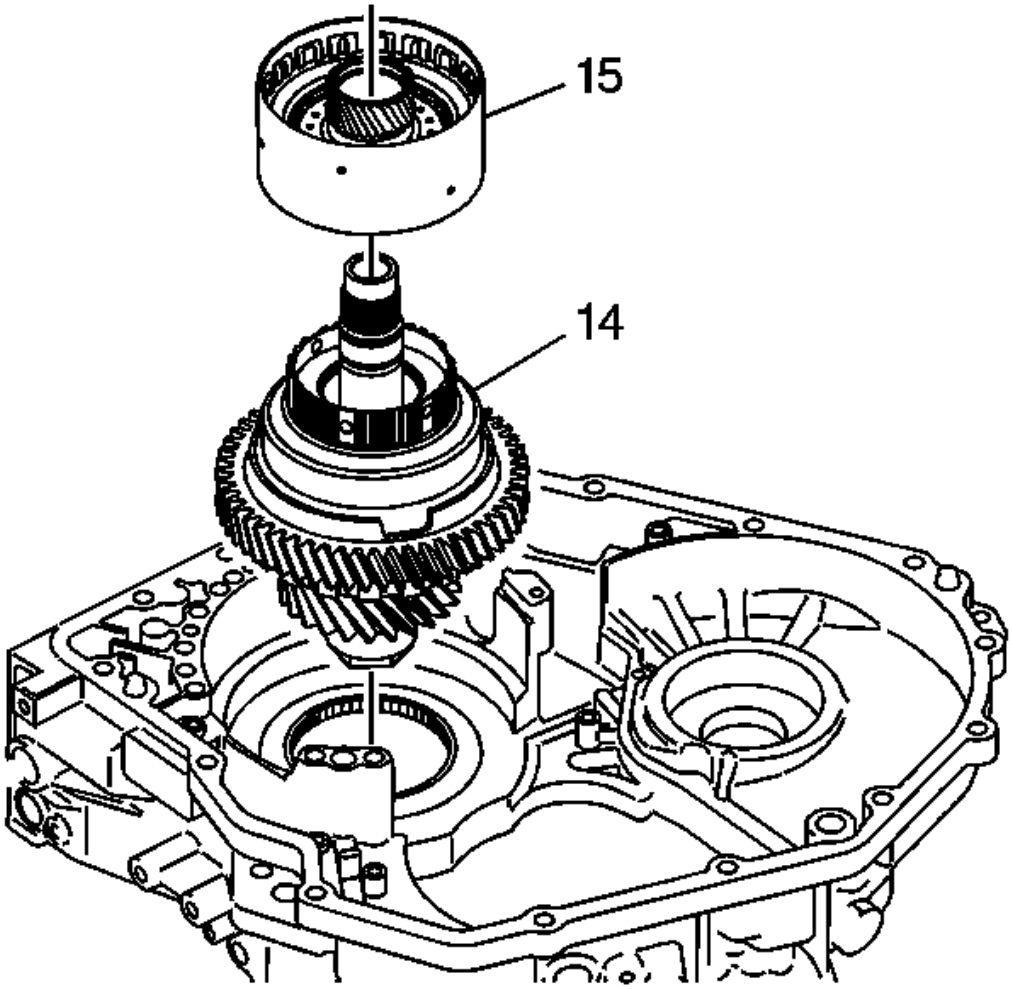

Fig. 12: View Of Main Power Switch & Main Function Switch
Courtesy of GENERAL MOTORS CORP.

1. Verify that the main power switch (1) is in the OFF position.
2. Place the main function switch (2) in the IDLE position.

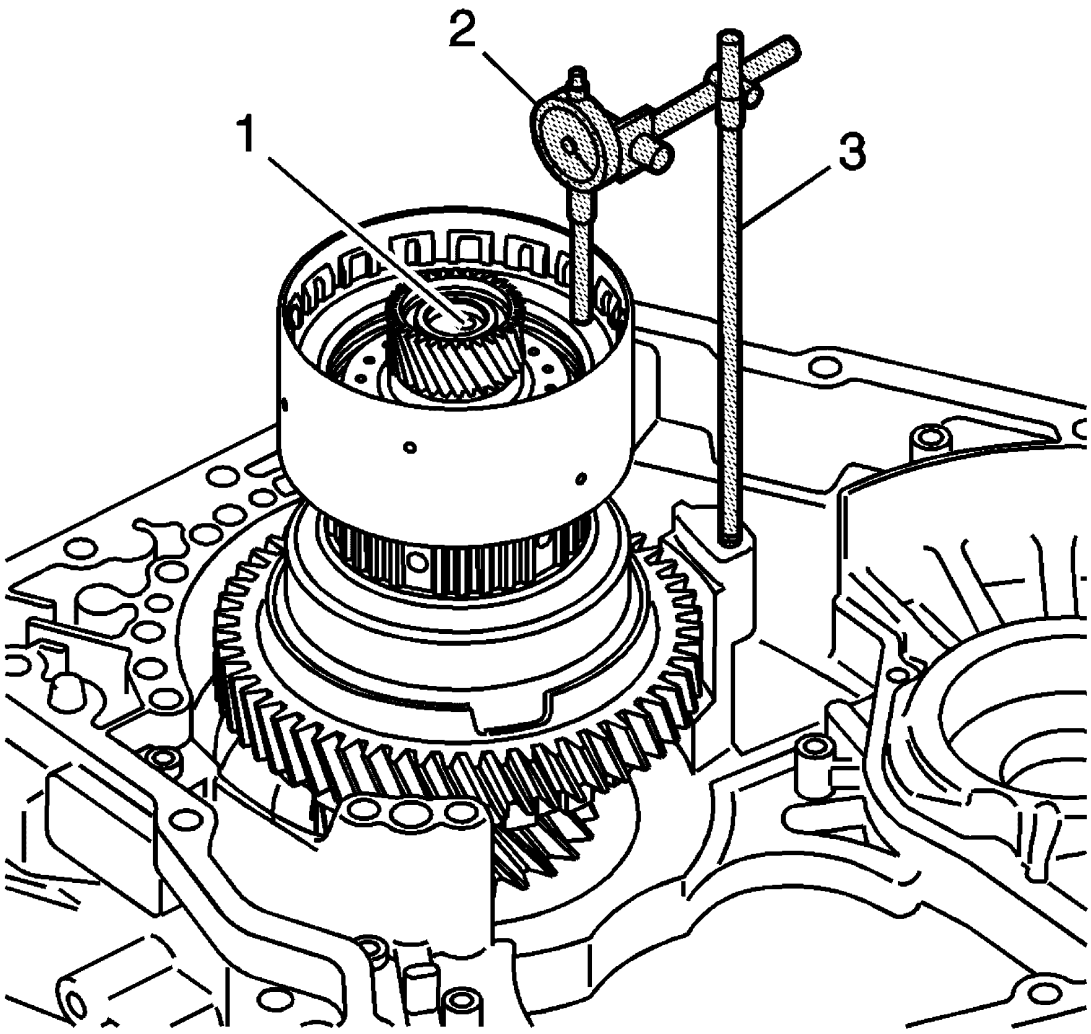

Fig. 13: Connecting To 12V DC Power Source
Courtesy of GENERAL MOTORS CORP.

3. Connect the **J 45096** to the vehicle 12-volt DC power source by connecting the red battery clip to the positive, +, battery post on the vehicle and connect the negative lead to a known good chassis ground.
4. Turn the main power switch to the ON position.

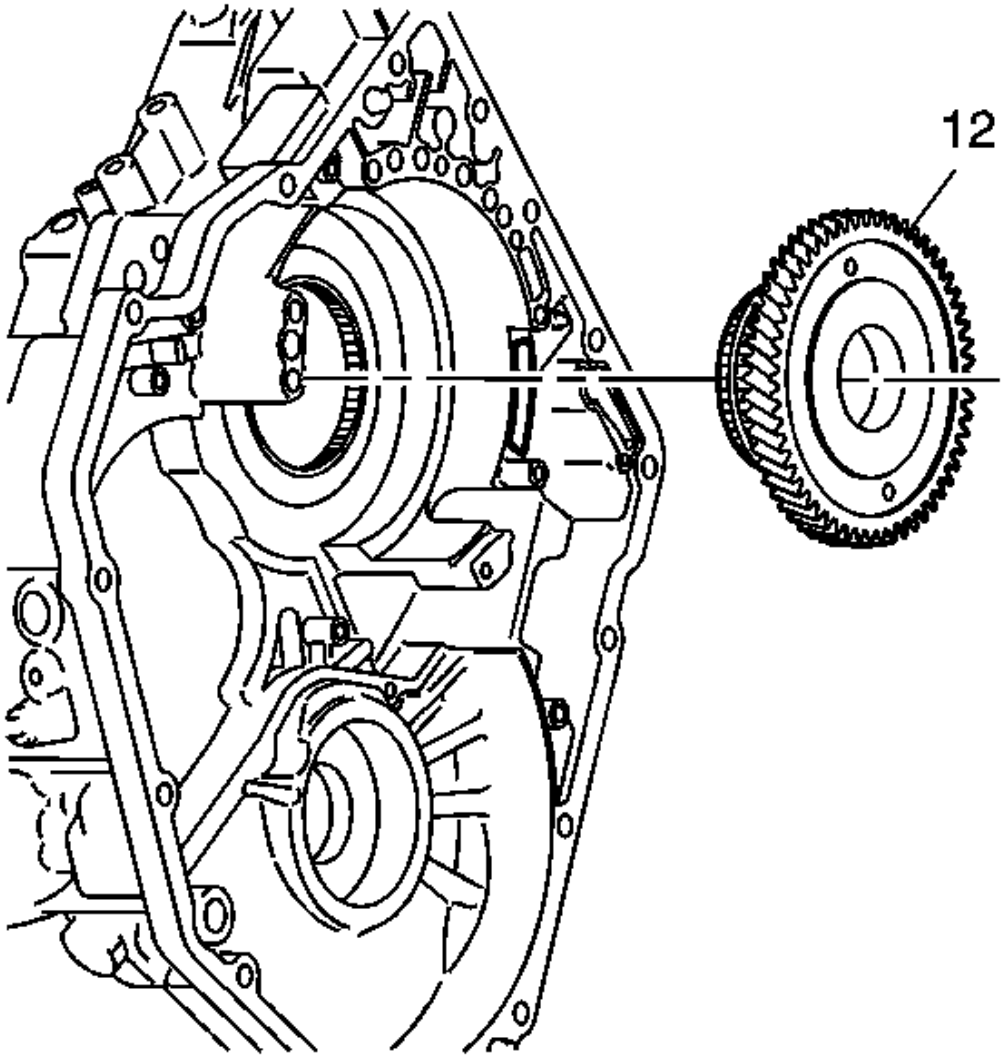

Fig. 14: Filling Supply Tank With Transmission Fluid
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not overfill the supply vessel. Damage to the unit may result. To verify the fluid level, view the LCD screen display while filling the unit, to ensure the fluid level does not exceed 30 L (32 qt).

5. Fill the supply tank with DEXRON®VI/Mercon®, or equivalent, through the fill port.
6. Reinstall and tighten the fill cap.

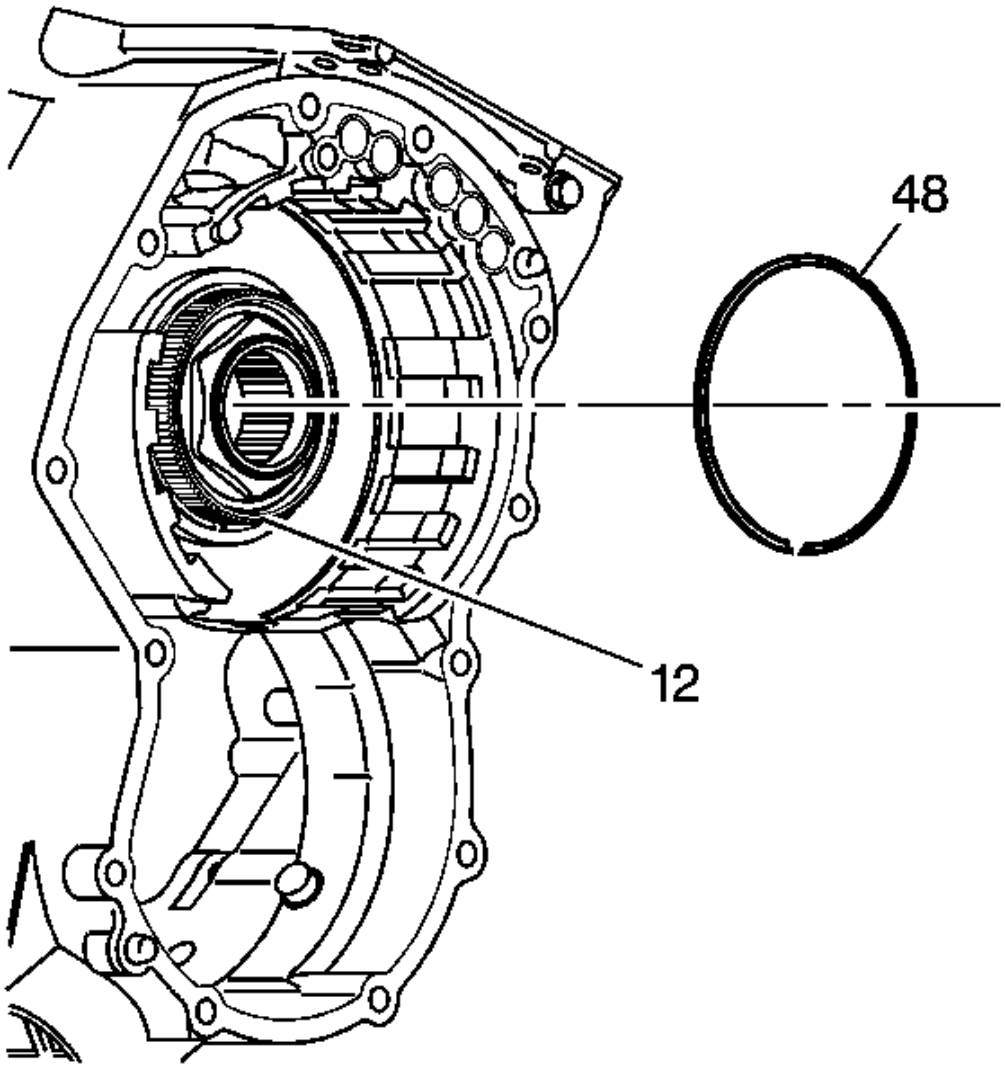

Fig. 15: Applying Shop Air Supply Hose To Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

7. Connect a shop air supply hose to the quick-disconnect on the rear panel marked SUPPLY AIR.

DETERMINE MINIMUM FLOW RATE

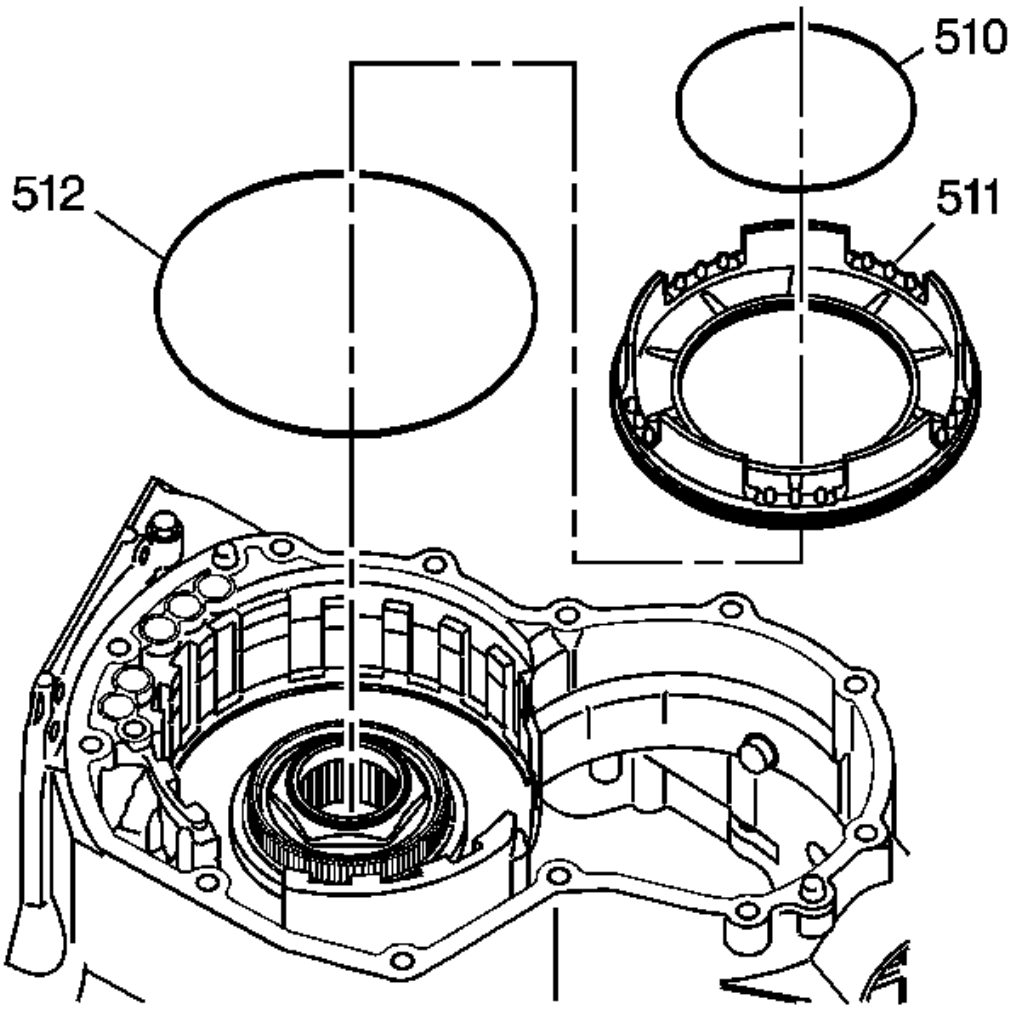

Fig. 16: Identifying Machine Display Of Automatic Transmission Fluid Temperature
Courtesy of GENERAL MOTORS CORP.

1. From the machine display, identify the temperature of the ATF that is stored in the supply vessel of **J 45096** .

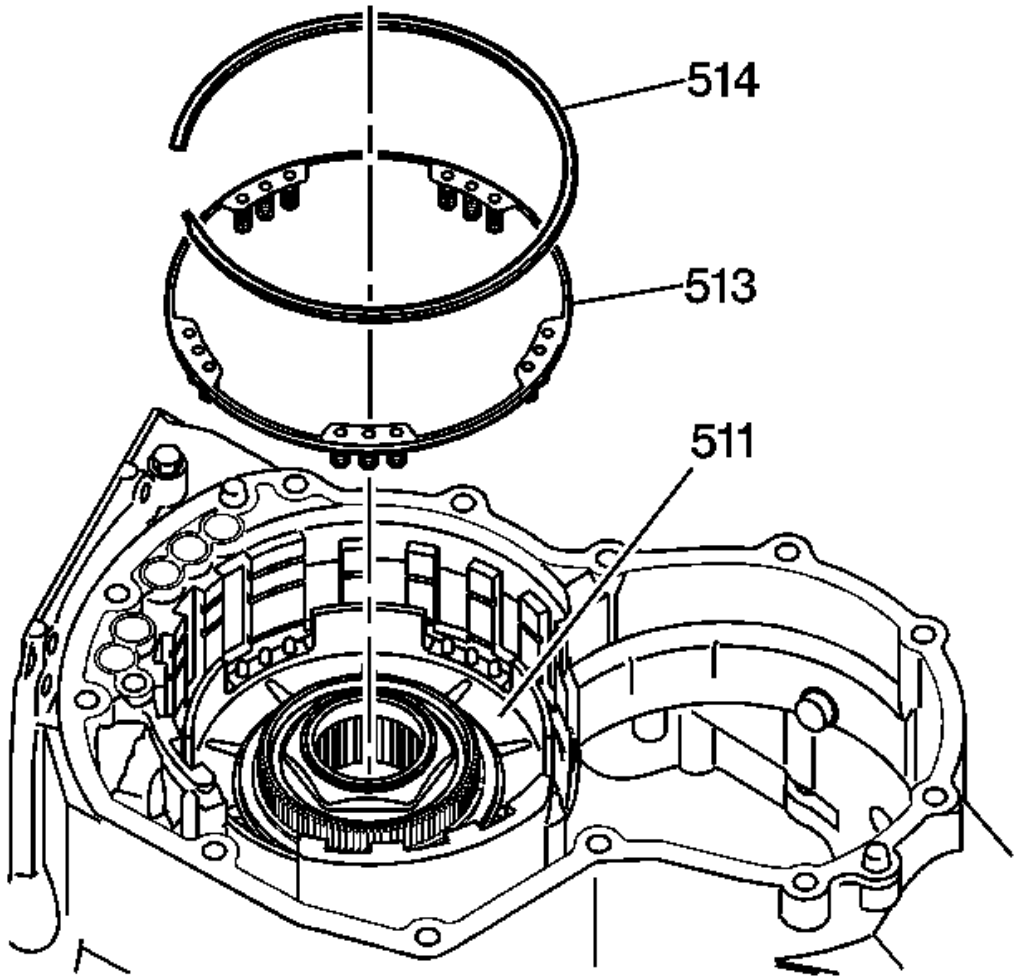

Fig. 17: Identifying Transmission Oil Cooler Metal Composition
Courtesy of GENERAL MOTORS CORP.

2. Determine whether the transmission oil cooler is steel or aluminum by using a magnet (1) at the cooler flange (2) at the radiator.
3. Refer to the table below. Using the temperature from step 1, locate on either the Steel MINIMUM Flow Rate table or the Aluminum MINIMUM Flow Rate table the minimum flow rate in gallons per minutes (GPM). Record the minimum flow rate in GPMs and the supply fluid temperature for further reference.

Example:

- Fluid temperature: 75°F
- Cooler type: Steel

The MINIMUM flow rate for this example would be 0.8 GPM.

4. Inspect transmission oil cooler lines for damage or kinks that could cause restricted oil flow. Repair as needed and refer to the appropriate GM service manual procedures.

Minimum Flow Rate in Gallons Per Minute (GPM)

Temperature Range	Steel	Aluminum
65 - 66°F	0.6 gpm	0.5 gpm
67 - 70°F	0.7 gpm	0.6 gpm
71 - 75°F	0.8 gpm	0.7 gpm
76 - 80°F	0.9 gpm	0.8 gpm
81 - 84°F	1.0 gpm	0.9 gpm
85 - 89°F	1.1 gpm	1.0 gpm
90 - 94°F	1.2 gpm	1.1 gpm
95 - 98°F	1.3 gpm	1.2 gpm
99 - 103°F	1.4 gpm	1.3 gpm
104 - 108°F	1.5 gpm	1.4 gpm
109 - 112°F	1.6 gpm	1.5 gpm
113 - 117°F	1.7 gpm	1.6 gpm
118 - 120°F	1.8 gpm	1.7 gpm

BACK FLUSH PROCEDURE

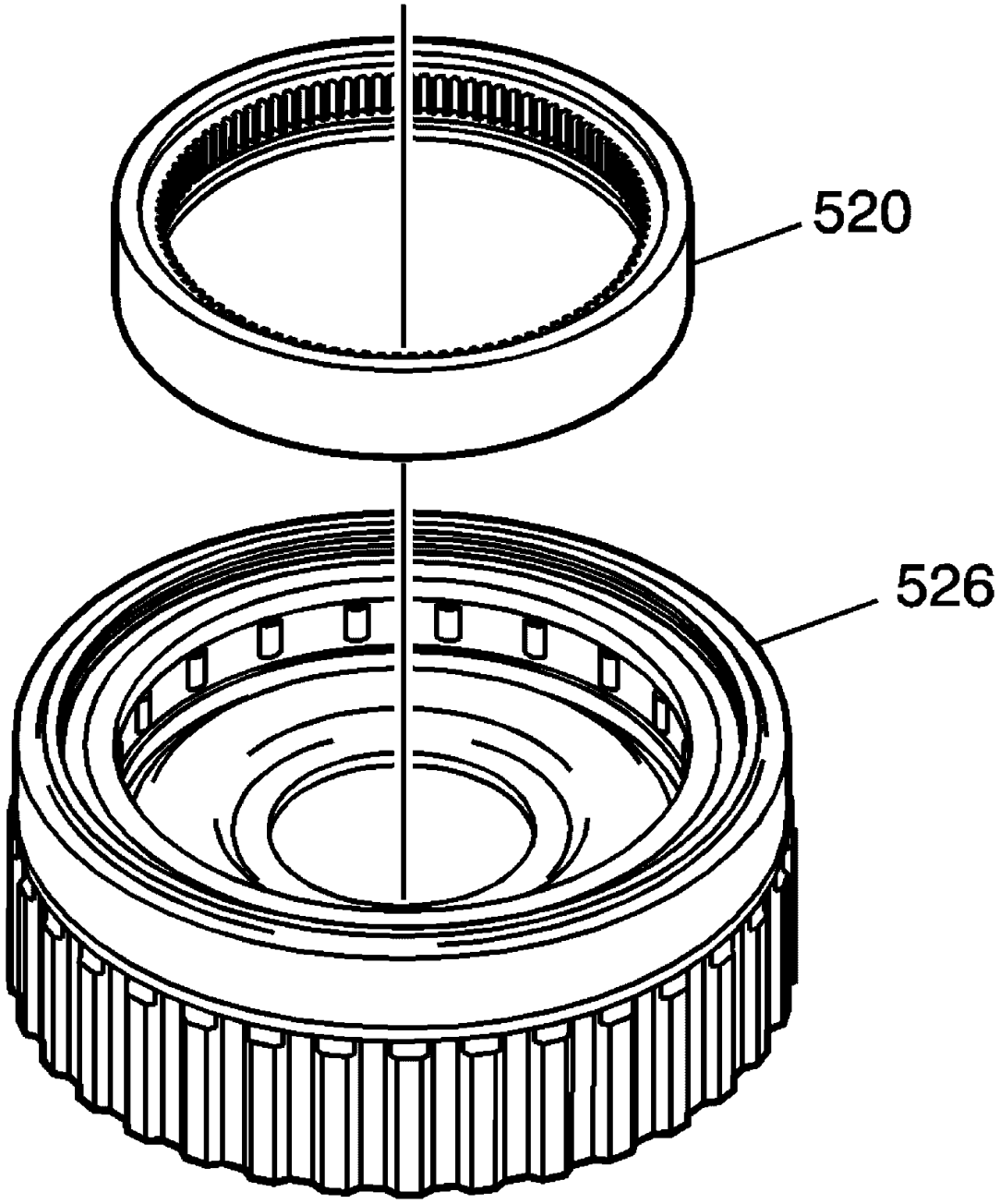

Fig. 18: View Of J 45096 & J 35944-440
Courtesy of GENERAL MOTORS CORP.

1. Connect the **J 45096** adapters (1) to the vehicle's transmission oil cooler supply and return lines at the transmission using **J 45806** (2).

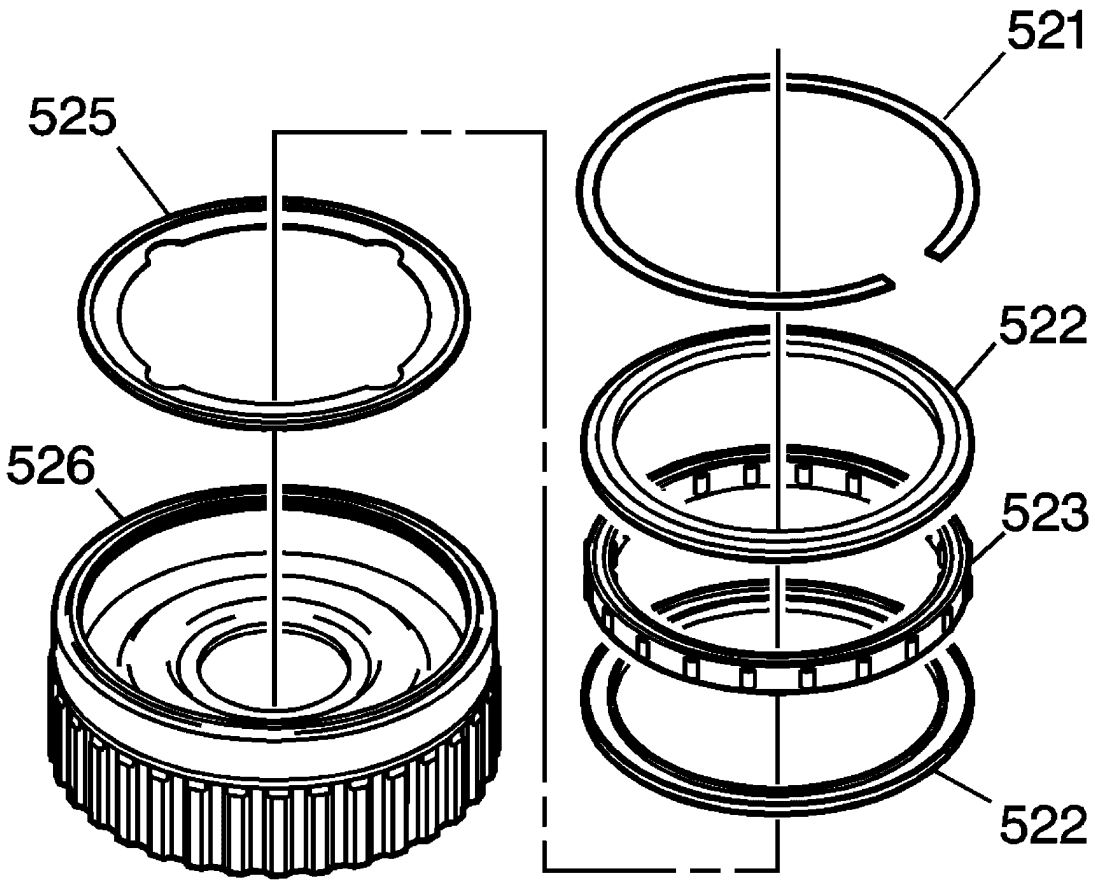

Fig. 19: Identifying Black Supply Hose And Clear Waste Hose
Courtesy of GENERAL MOTORS CORP.

2. Connect the black supply hose (1) to the return line, top connector of the transmission, and the clear waste hose (2) to the feed line, bottom connector of the transmission, to the vehicle cooler lines. This is the reverse flow - backflush direction.

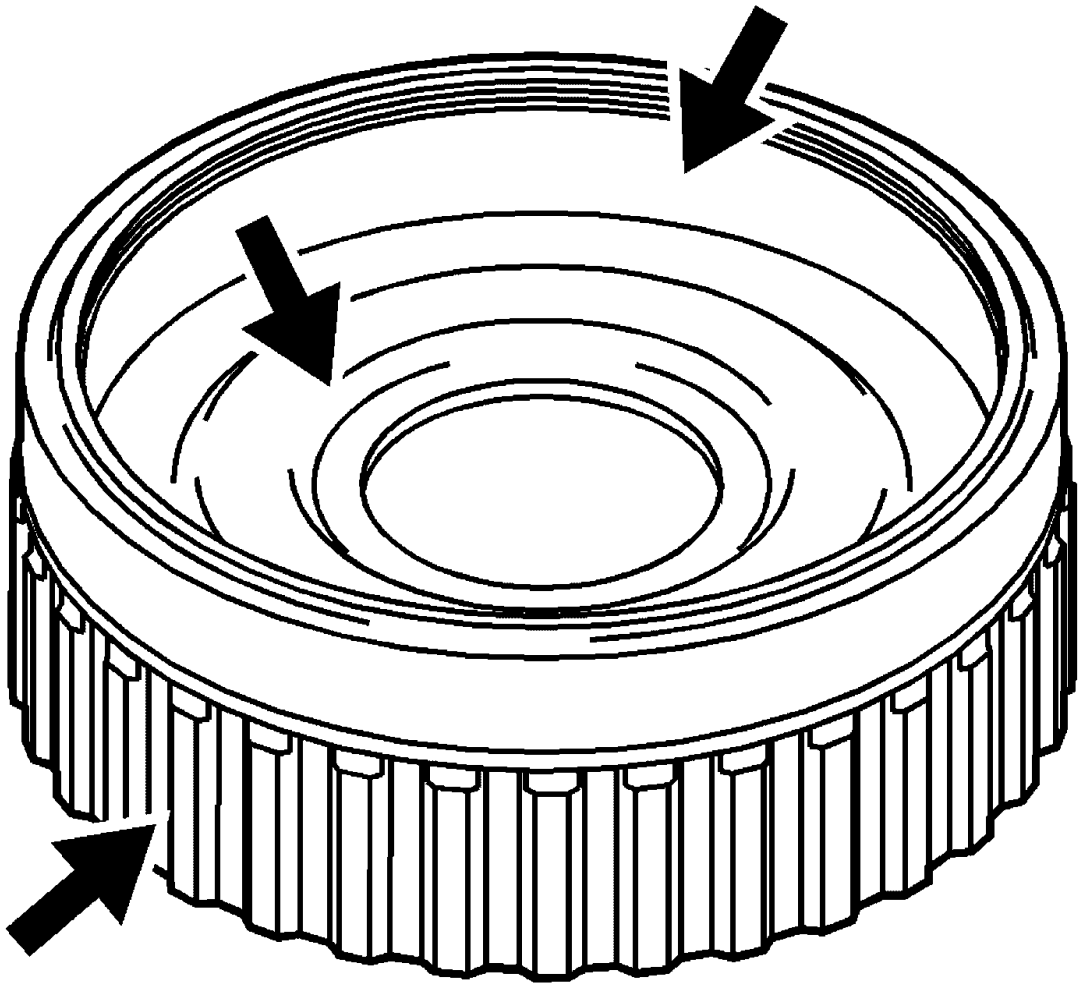

Fig. 20: Setting Main Function Switch To FLUSH Position
Courtesy of GENERAL MOTORS CORP.

3. Turn the main function switch to the FLUSH position. Allow the machine to operate for 30 seconds.

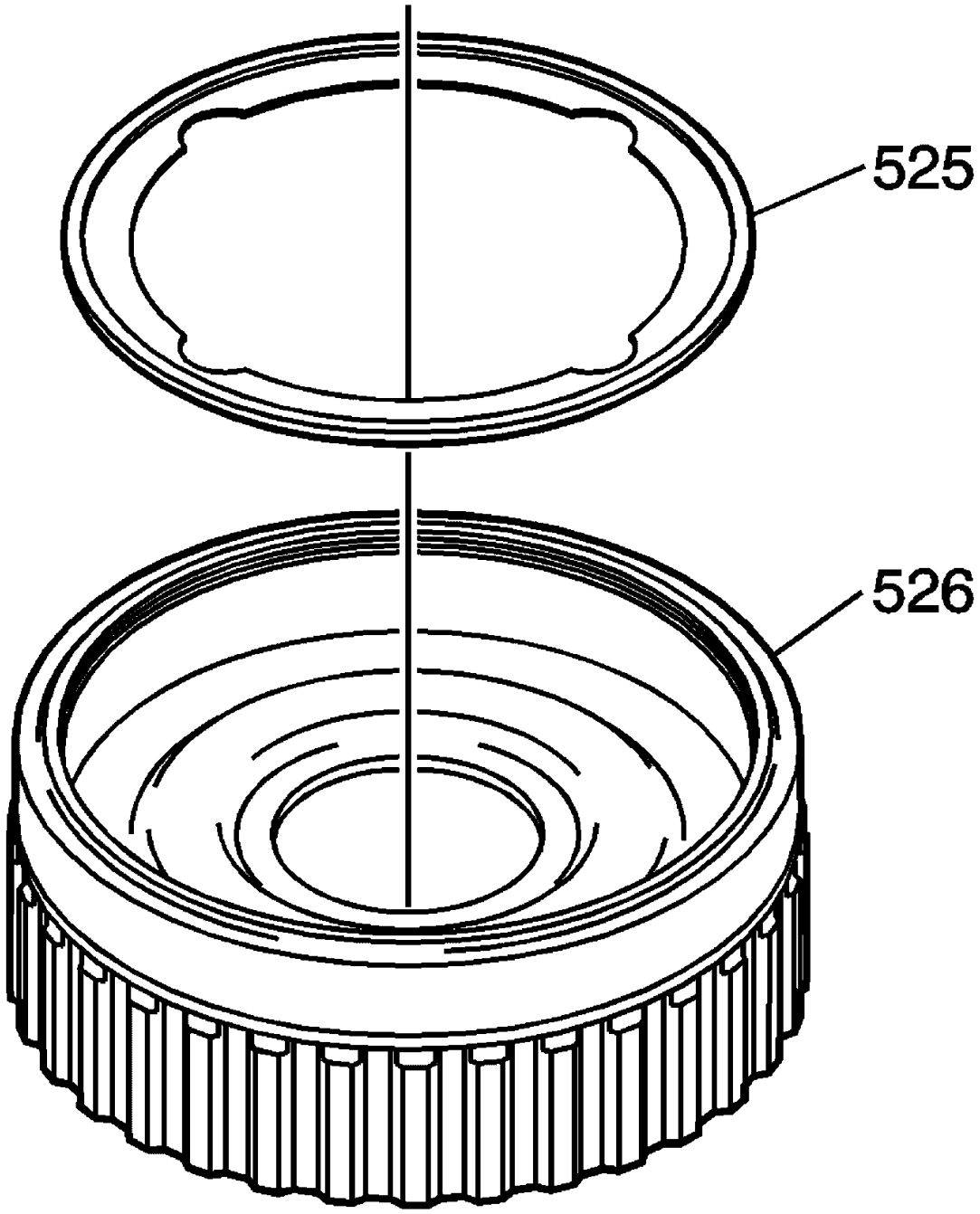

Fig. 21: Setting Main Function Switch To IDLE Position
Courtesy of GENERAL MOTORS CORP.

4. Turn the main function switch to the IDLE position and allow the supply vessel pressure to dissipate.

FORWARD FLUSH

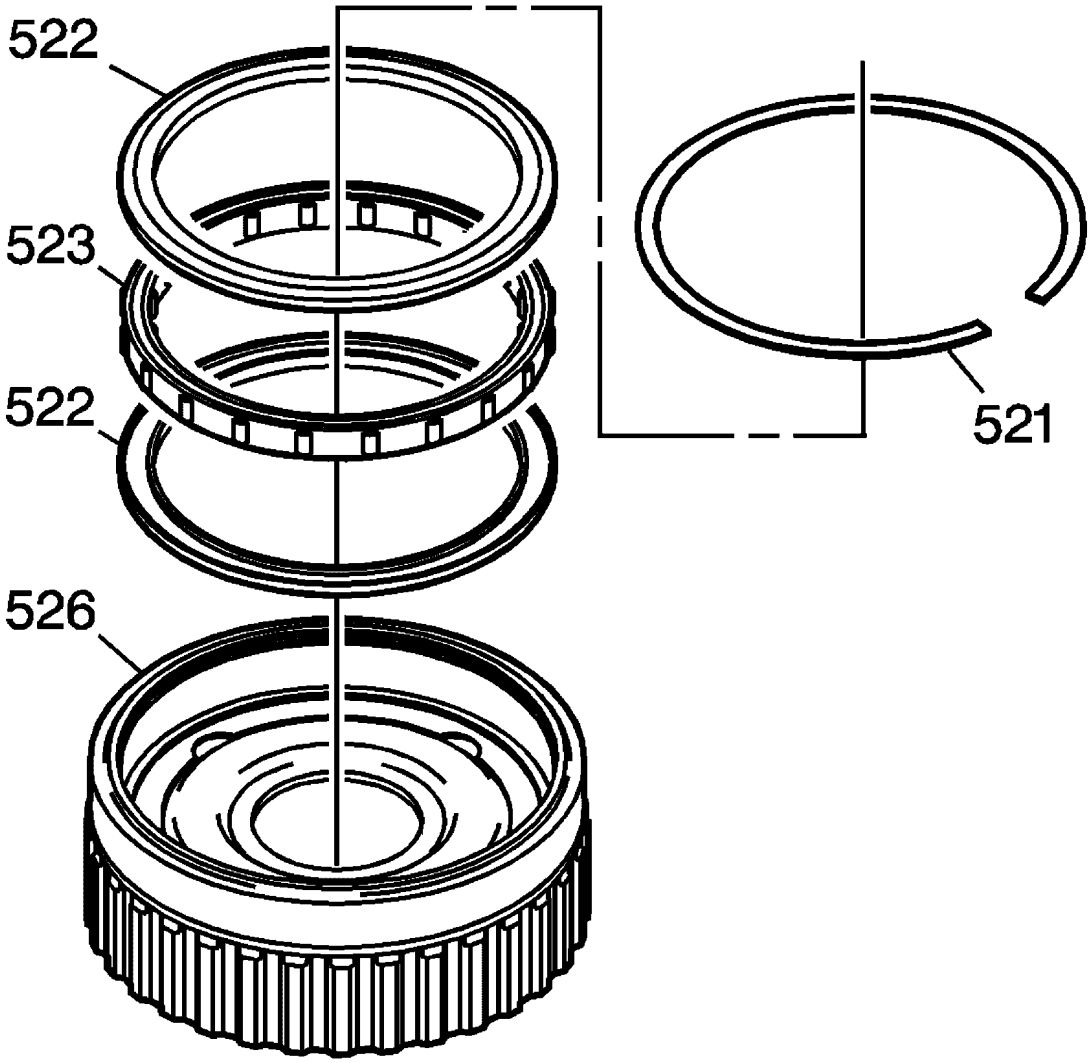

Fig. 22: Identifying Black Supply Hose And Clear Waste Hose
Courtesy of GENERAL MOTORS CORP.

1. Disconnect the supply and waste hoses from the vehicle cooler lines. Reverse the supply and waste hoses to provide a normal flow direction.

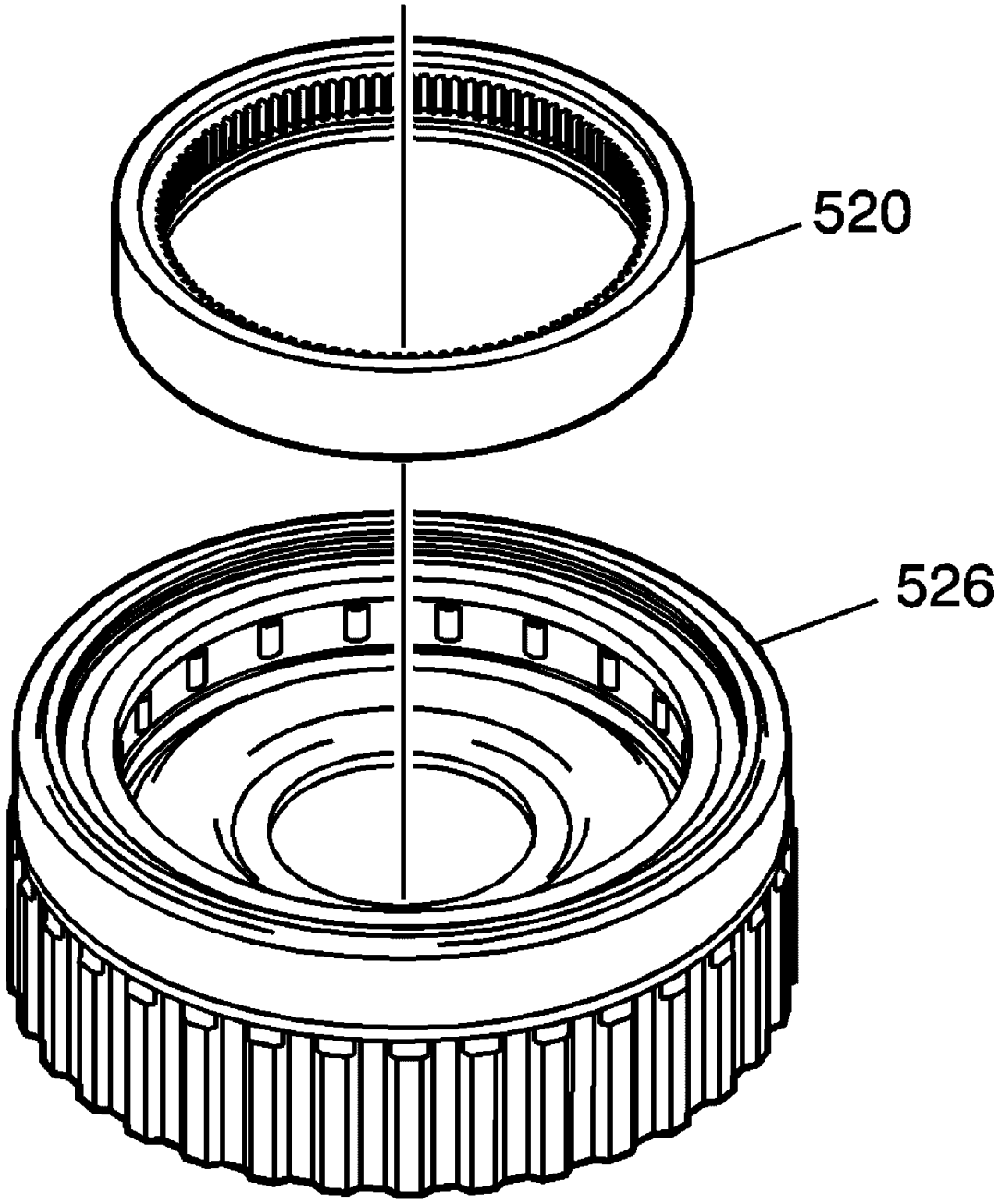

Fig. 23: Setting Main Function Switch To FLUSH Position
Courtesy of GENERAL MOTORS CORP.

2. Turn the main function switch to the FLUSH position and allow machine to operate for 30 seconds.

FLOW TEST

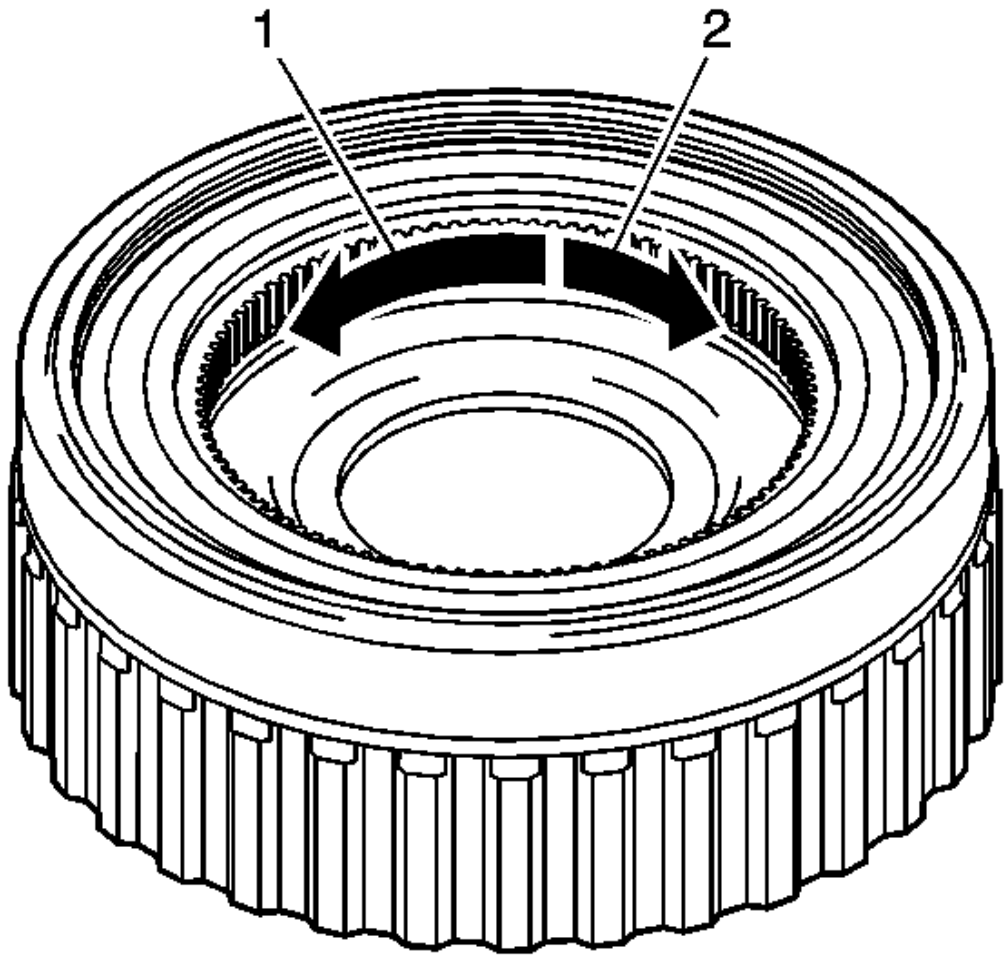

Fig. 24: Setting Main Function Switch To FLOW Position
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the flow rate is less than 0.5 gpm, the LCD displays an error message. Refer to the Troubleshooting section of the operation manual.

1. Turn the main function switch to the FLOW position and allow the oil to flow for 15 seconds. Observe and note the flow rate; this is the TESTED flow rate.
2. Compare the TESTED flow rate to the MINIMUM flow rate information previously recorded.
    - If the TESTED flow rate is equal to or greater than the MINIMUM flow rate recorded, the oil cooling system is functioning properly. Perform Code Recording Procedure.
    - If the TESTED flow rate is less than the MINIMUM flow rate previously recorded, repeat the back

flush and forward flush procedures.

3. If the TESTED flow rate is less than the MINIMUM flow rate after the second test, perform Code Recording Procedure.
    1. Replace the transmission oil cooler.
    2. Reconnect supply and waste hoses to the cooler lines in the normal flow direction. Perform Flow Test.
    3. Perform Code Recording Procedure.

CODE RECORDING PROCEDURE

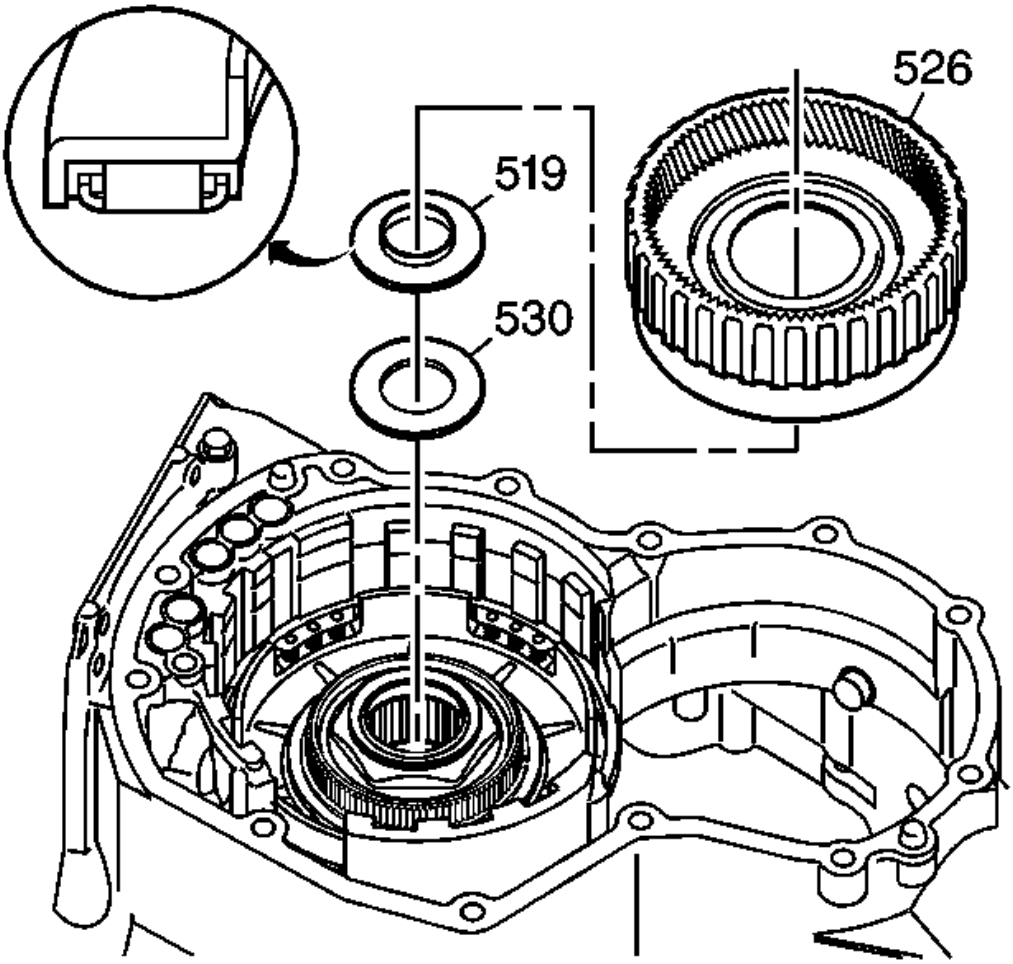

Fig. 25: Setting Main Function Switch To CODE Position
Courtesy of GENERAL MOTORS CORP.

1. Turn the main function switch to the CODE position.

IMPORTANT:

- **If power is interrupted prior to the recording of the seven-character code, the code will be lost and the flow rate test will need to be repeated.**
- **The flow test must run for a minimum of 8-10 seconds and be above 0.5 gpm for a code to be generated.**

2. Record TESTED flow rate, temperature, cycle and seven-character flow code information on repair order.

CLEAN-UP

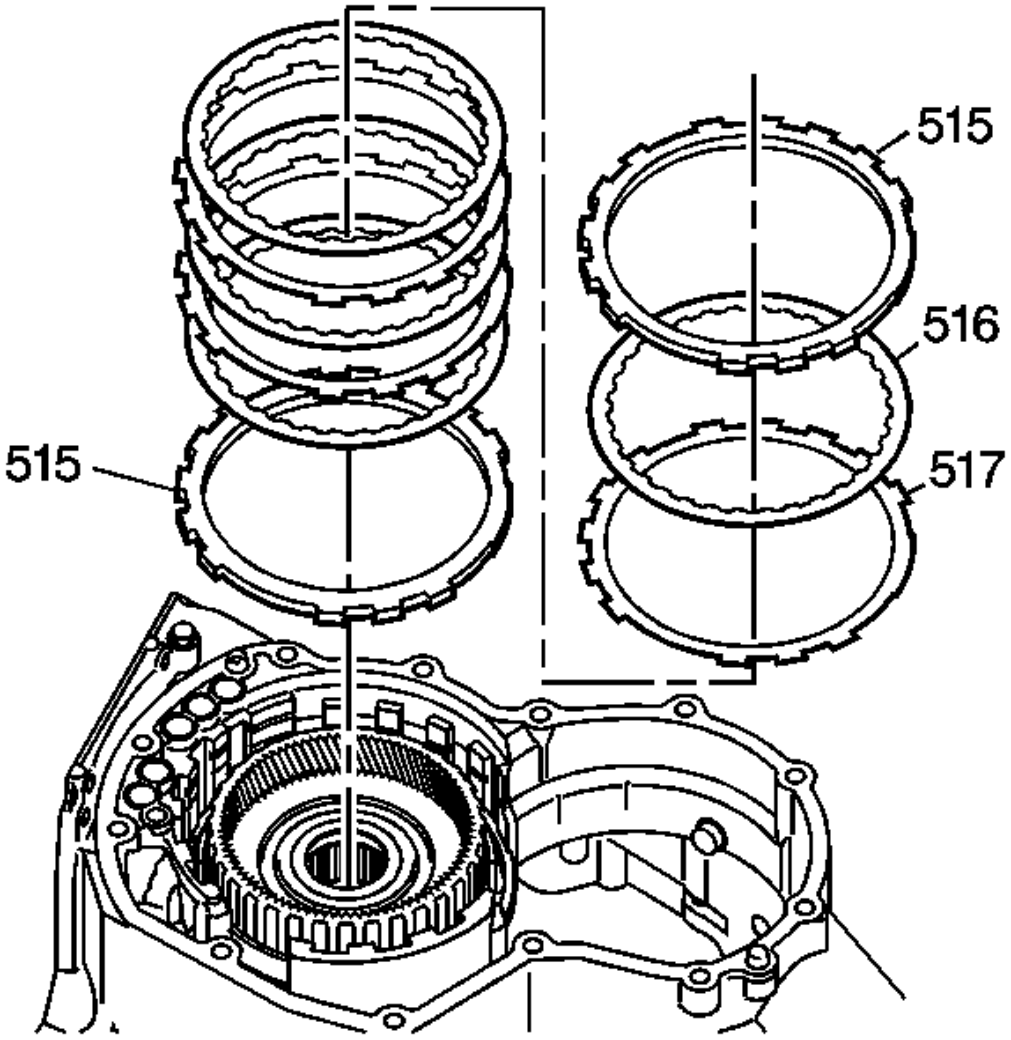

Fig. 26: View Of Main Power Switch & Main Function Switch
Courtesy of GENERAL MOTORS CORP.

1. Turn the main function switch (2) to the IDLE position and allow the supply vessel pressure to dissipate.
2. Turn the main power switch (1) to the OFF position.
3. Disconnect the supply and waste hoses and the 12-volt power source from the vehicle.

Note: A small amount of water may drain from the bottom of the unit when the air supply is disconnected. This is a normal operation of the built-in water separator.

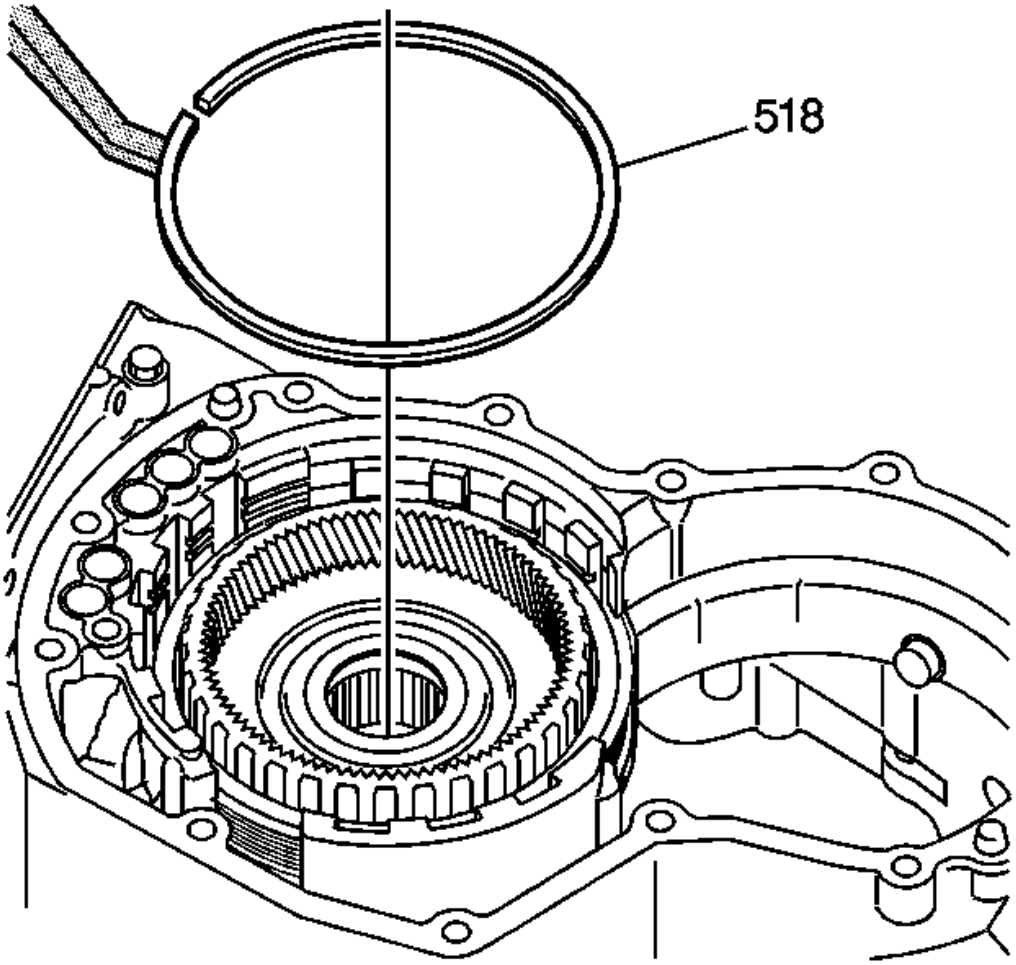

Fig. 27: Applying Shop Air Supply Hose To Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the air supply hose from **J 45096** .
5. Dispose of the waste ATF in accordance with all applicable federal, state, and local requirements.

SLIPS OR SHUDDERS IN FIRST GEAR

Slips or Shudders in First Gear

Checks	Causes
DEFINITION: A large engine RPM increase is noted in first gear, Drive range, with little or no vehicle forward speed increase. Second, third, and fourth gear operations are normal. Shifts into first gear are soft or do not occur. First gear ratio is 2.921:1	

Forward Clutch	• Clutch plates worn • Porosity in the piston • Piston seal damaged • Forward clutch housing ball check valve not sealing or damaged • Input shaft fluid seals damaged or missing
Control Valve Body Accumulator Assembly	• Face not flat • Spacer plate or gaskets mispositioned or damaged
Input Sun Gear Shaft	Broken shaft
Forward Sprag Clutch Assembly	Sprags not holding
Low Clutch Sprag Assembly	Sprags not holding
Torque Converter Assembly	Stator roller clutch not holding
Line Pressure	Refer to **Fluid Pressure High or Low**.

NO DRIVE IN ALL RANGES

No Drive in All Ranges

Check	Causes
DEFINITION: A large engine RPM increase is noted, with no vehicle forward speed increase, during the following conditions: The engine is running. The transmission is in Drive range. The vehicle is stopped or moving slowly. The vehicle brakes are not applied. The throttle is opened 25 percent or greater.	
Forward Clutch Assembly	• Damaged or worn clutch plates • Damaged or cut piston • Damaged or stuck ball check valve
Forward Clutch Sprag	• Damaged sprag • Worn or pitted inner race
Fluid Pump	• Damaged vanes • Missing slide spring • Fluid pump screen assembly plugged or damaged • Fluid pump rotor guide omitted or misassembled • Fluid pump rotor cracked or broken • Porosity in fluid pump • Fluid pump surfaces not flat

	• Excessive fluid pump rotor clearance
Low Clutch Sprag	• Damaged sprag • Worn or pitted inner race
Input and Reaction Carrier	Damaged or worn gears

NO FIRST GEAR

No 1st Gear

Check	Causes
DEFINITION: A large engine RPM increase is noted in first gear, Drive range, with little or no vehicle forward speed increase. Second, third, and fourth gear operation are normal. Shifts into first gear are soft or do not occur.	
Control Valve Body Accumulator Assembly	• 1-2 shift control valve stuck released • 1-2 shift valve stuck released • 1-2 SS valve stuck ON
Forward and Low Clutch Sprag	• Damaged sprag • Worn or pitted inner race
Forward Clutch Assembly	Damaged

FIRST GEAR ONLY

First Gear Only

Check	Causes
DEFINITION: The transmission only provides first gear in Drive range. The vehicle accelerates from a stop in first gear and does not upshift.	
Control Valve Body Accumulator Assembly	• 1-2 shift control valve stuck applied • 1-2 shift valve stuck applied
Control Valve Body Accumulator Assembly	The spacer plate or gasket are mispositioned or damaged
Shift Solenoid Valve	• Stuck or damaged • Faulty electrical connection

NO SECOND GEAR

No Second Gear

Check	Causes
DEFINITION: A large engine RPM increase is noted in second gear, Drive range, with little or no vehicle forward speed increase. First, third, and fourth gear operation are normal. Shifts into second gear are soft or do not occur.	
Second Clutch	• Damaged piston

	• Damaged or worn clutch plates
Second Coast Clutch	• Damaged piston • Damaged or worn clutch plates
Second Clutch Sprag	• Damaged sprag • Worn or pitted inner race
Second Clutch Fluid Passage Sleeve	Leaking

FIRST AND SECOND GEARS ONLY

First and Second Gears Only

Check	Causes
DEFINITION: The transmission only provides first and second gear in Drive range.	
Control Valve Body Accumulator Assembly	• 2-3 SS valve stuck • 2-3 shift valve stuck applied • Spacer plate or gaskets are mispositioned or damaged

FIRST, FOURTH, AND FIFTH GEARS ONLY

First, Fourth, and Fifth Gears Only

Check	Causes
DEFINITION: The transmission provides first, fourth and fifth gear in Drive range.	
Control Valve Body Accumulator Assembly	• 1-2 SS valve stuck off • Spacer plate or gaskets are mispositioned or damaged

SECOND AND THIRD GEARS ONLY

Second and Third Gears Only

Check	Causes
DEFINITION: The transmission only provides second and third gear in Drive range. The shift pattern as the vehicle accelerates from a stop is 2-2-3-3.	
Control Valve Body Accumulator Assembly	• 1-2 SS valve stuck applied • Spacer plate or gaskets are mispositioned or damaged
Winter Mode active	Shorted switch or circuit

NO THIRD GEAR

No Third Gear

Check	Causes
DEFINITION: A large engine RPM increase is noted in third gear, Drive range, with no vehicle forward speed increase. First, second, and fourth gear operation are normal. Shifts into third gear are soft or do not occur.	
Intermediate Clutch Sprag	• Damaged sprag • Worn or pitted inner race
Intermediate Clutch	• Damaged piston • Damaged or worn clutch plates
Intermediate Fluid Passage Sleeve	Leaking

NO FOURTH GEAR, OR SLIPS IN FOURTH GEAR

No Fourth Gear, or Slips in Fourth Gear

Check	Causes
DEFINITION: A large engine RPM is noted in fourth gear or no vehicle forward speed increase. Shifts into fourth gear are soft or do not occur.	
Control Valve Body Accumulator Assembly	• 3-4 shift valve stuck applied • 3-4 shift control valve stuck applied
Direct and Reverse Clutch	• Damaged or worn piston (406) • Damaged or worn clutch plates • Damaged ball check valve (405)

FIFTH GEAR ONLY

Fifth Gear Only

Check	Causes
DEFINITION: The transmission only provides fifth gear in Drive range. The vehicle accelerates from a stop in fifth gear.	
Control Valve Body Accumulator Assembly	Feed limit valve or spring stuck in the exhaust position
Wiring Harness	Improper electrical connection to shift solenoids
Inspect for active transmission DTCs	Transmission DTC default action active

HARSH SHIFT 4 TO 5, OR 5 TO 4

Harsh Shift 4 to 5, or 5 to 4

Check	Causes
DEFINITION: One of the two following conditions occurs during a 4th to 5th and 5th to 4th gear steady throttle upshift, or a 4th to 5th gear coast, or a light to moderate throttle detent downshift: Harsh shift feel - an unacceptable quick gear change occurs.	
Overdrive Clutch and Coast Clutch	• Damaged or cut piston

	• Damaged or worn clutch plates
Fluid Pump Assembly	• Pressure regulator valve stuck • Pressure regulator valve spring • Line boost valve spring • Line boost valve or bushing stuck, damaged or incorrectly assembled • Fluid pump screen assembly plugged or damaged • Fluid pump rotor guide omitted or misassembled • Fluid pump rotor cracked or broken • Porosity in fluid pump • Fluid pump surfaces not flat • Excessive fluid pump rotor clearance • Pump slide seal out of location • Pump vanes damaged • Pump slide spring damaged
Pressure Control Solenoid	Damaged

HARSH SHIFT D TO R

Harsh Shift D to R

Check	Causes
DEFINITION: Gear engagement that is harsh when the engine is idling in Park or Neutral, and the gear selector is moved to Drive or Reverse range.	
Forward Clutch	• . Damaged or worn piston (436) • . Damaged or worn clutch plates (449) • . Damaged or stuck ball check valve (434)
Reverse Clutch	• . Damaged or worn piston (404) • . Damaged or worn clutch plates (418/417) • . Damaged or stuck ball check valve (403)
Fluid Pump Assembly	Refer to **Harsh Shift 4 to 5, or 5 to 4**.
PC Solenoid	Damaged

HARSH SHIFTS

Harsh Shifts

Check	Causes
DEFINITION: Harsh shift feel - an unacceptable quick gear change occurs.	

Pressure Control Solenoid	• Damaged O-rings • Contamination
Output Speed Sensor	Open or grounded circuit
Input Speed Sensor	Open or grounded circuit
Throttle Position	Open or grounded circuit
Forward Clutch Assembly	• Damaged or worn clutch plates • Damaged or cut piston • Damaged or stuck ball check valve
Control Valve Body Accumulator Assembly	• Accumulator piston stuck • Stuck or missing ball check valves
Fluid Pump	• Pressure regulator valve stuck • Pressure regulator valve spring • Line boost valve spring • Line boost valve or bushing stuck, damaged or incorrectly assembled • Fluid pump screen assembly plugged or damaged • Fluid pump rotor guide omitted or misassembled • Fluid pump rotor cracked or broken • Porosity in fluid pump • Fluid pump surfaces not flat • Excessive fluid pump rotor clearance • Pump slide seal out of location • Pump vanes damaged • Pump slide spring damaged
Inspect for active transmission DTCs	Transmission DTC default action active

HARSH TORQUE CONVERTER CLUTCH APPLY

Harsh Torque Converter Clutch Apply

Check	Causes
DEFINITION: A unacceptable quick TCC apply or release occurs in third, fourth or fifth gear, overdrive, Drive or Manual third range, with the throttle held steady.	
Control Valve Body & Accumulator Assembly	Stuck TCC regulator apply valve
TCC Solenoid Valve	Stuck ON

NO ENGINE BRAKING IN FIRST, SECOND, AND THIRD GEAR

No Engine Braking in First, Second, and Third Gear

Check	Causes
DEFINITION: A large engine RPM increase and forward vehicle speed decrease do not immediately occur when the transmission is shifted from Overdrive or fourth gear in Drive range to either first or second gear, manual second.	
Control Valve Body Accumulator Assembly	• 3-4 shift valve stuck released • Missing or stuck low pressure control valve • 4-5 shift valve and/or 4-5 control shift valve stuck released • 1-2 shift valve stuck released • 2-3 shift valve and/or 2-3 control shift stuck released

NO ENGINE BRAKING IN FIRST GEAR

No Engine Braking in First Gear

Check	Causes
DEFINITION: A large engine RPM increase and forward vehicle speed decrease do not immediately occur when the transmission is shifted from Overdrive or fourth gear in Drive or manual third range to first.	
Low and Reverse Clutch	• Damaged or cut piston • Damaged or worn clutch plates
Control Valve Body Accumulator Assembly	• 3-4 shift control valve stuck • 3-4 shift valve stuck - 1st, 2nd or 3rd gear • Low pressure control valve - 1st, 2nd or 3rd gears • 4-5 SS valve stuck off - 1st, 2nd, or 3rd gears • 4-5 shift valve stuck applied - 1st, 2nd, 3rd gears • 3-4 shift valve and/or 3-4 control shift valve stuck released • Low pressure control valve stuck released • 4-5 shift valve and/or 4-5 control shift valve stuck released • 1-2 shift valve stuck released

NO ENGINE BRAKING IN SECOND GEAR

No Engine Braking in Second Gear

Check	Causes
DEFINITION: A large engine RPM increase and forward vehicle speed decrease do not immediately occur when the transmission is shifted from third to fourth gear in Drive or Manual Third range to either	

second gear, Manual Second.	
Coast Clutch	• Damaged or cut piston • Damaged or worn clutch plates • Damaged or stuck ball check valve • 3-4 shift valve and/or 3-4 control shift valve stuck released • Low pressure control valve stuck released • 4-5 shift valve and/or 4-5 control shift valve stuck released • 1-2 shift valve stuck applied • 2-3 shift and/or 2-3 control shift stuck released

NO ENGINE BRAKING IN THIRD GEAR

No Engine Braking in Third Gear

Check	Causes
DEFINITION: A large engine RPM increase and forward vehicle speed decrease in third gear do not immediately occur when the transmission is shifted from overdrive or fourth gear in Drive or Manual Third range to third gear range.	
Overdrive Clutch	• Damaged or cut piston • Damaged or worn clutch plates
Control Valve Body Accumulator Assembly	• 3-4 shift valve and/or 3-4 control shift valve stuck released • Low pressure control valve stuck released • 4-5 shift valve and/or 4-5 control shift valve stuck released • 1-2 shift valve stuck applied • 2-3 shift and/or 2-3 control shift stuck applied

INACCURATE SHIFT POINTS

Inaccurate Shift Points

Check	Causes
DEFINITION: An upshift or a downshift, or TCC apply, that occurs at a speed outside of the calibrated range. Refer to **Shift Speed** .	
Fluid Pump Assembly	• Stuck pressure regulator valve • Sticking pump slide
Control Valve Body Accumulator Assembly	Spacer plate and gasket misaligned or damaged
Throttle Position Sensor	Disconnected or damaged

Input Speed Sensor	• Disconnected or damaged • Bolt not torqued properly
Output Speed Sensor	• Disconnected or damaged • Bolt not torqued properly
Shift Solenoids	Leaking
Sport Mode active	Shorted switch or circuit

NO FIFTH GEAR

No Fifth Gear

Check	Causes
DEFINITION: A large engine RPM increase is noted in fifth gear, Drive range, with little or no vehicle forward speed increase. First, second, third gear and fourth operation are normal. Shifts into fifth gear are soft or do not occur.	
Control Valve Body Accumulator Assembly	• 4-5 SS valve stuck On • 4-5 shift valve stuck applied • 4-5 shift control valve stuck applied
Overdrive Clutch	• Damaged or cut piston • Damaged or worn clutch plates

NO REVERSE OR SLIPS IN REVERSE

No Reverse or Slips in Reverse

Check	Causes
DEFINITION: A large engine RPM increase is noted with little or no vehicle rearward speed increase during the following conditions: • The engine is running. • The transmission is in Reverse range. • The vehicle is stopped or moving slowly. • The vehicle brakes are not applied. • The throttle is opened 25 percent or greater.	
Direct and Reverse Clutch Assembly	• Damaged reverse clutch housing ball check valve • Damaged or cut piston • Damaged or worn clutch plates
Control Valve Body Accumulator Assembly	• Reverse lockout valve stuck • TCC PWM solenoid valve leaking
Selector Lever	Adjustment

SLIPS WHILE SHIFTING

Slips while Shifting

Checks	Causes
DEFINITION: A large engine RPM increase is noted in fifth, fourth, third, second or first in Drive range, with little or no vehicle forward speed increase. Shifts into fifth, fourth, third, second or first gear are soft or do not occur.	
Control Valve Body Accumulator Assembly	• Accumulator piston seals • Porosity in the accumulator piston housings • Stuck or missing ball check valves
Pressure Control Solenoid	Damaged
Fluid Pump	Damaged

DEGRADED 1-2 AND 2-1 SHIFTS

Degraded 1-2 and 2-1 Shifts

Check	Causes
DEFINITION: One of the two following conditions occurs during a first to second gear steady throttle upshift, or a second to first gear coast, or a light to moderate throttle detent downshift: • Harsh shift feel An unacceptable quick gear change occurs. • Soft shift feel An unacceptable long gear change occurs.	
Second Clutch	• Damaged piston, 1-2, 2-1 shift • Damaged or worn clutch plates, 1-2, 2-1 shift
Pressure Control Solenoid	Damaged
Fluid Pump	Damaged

DEGRADED 2-3 AND 3-2 SHIFTS

Degraded 2-3 and 3-2 Shifts

Check	Causes
DEFINITION: One of the two following conditions occurs during a second to third gear steady throttle upshift, or a third to second coast, or a light to moderate throttle detent downshift: • Harsh shift feel An unacceptable quick gear change occurs.	

• Soft shift feel An unacceptable long gear change occurs.	
Intermediate Clutch	• Damaged piston, 2-3, 3-2 shift • Damaged or worn clutch plates, 2-3, 3-2 shift
Pressure Control Solenoid	Damaged
Fluid Pump	Damaged

DEGRADED 4-5 SHIFT

Degraded 4-5 Shift

Check	Causes
DEFINITION: One of the two following conditions occurs during a fourth to fifth gear steady throttle upshift, or a fifth to fourth coast, or a light to moderate throttle detent downshift: • Harsh shift feel An unacceptable quick gear change occurs. • Soft shift feel An unacceptable long gear change occurs.	
Coast Clutch	• Damaged or cut piston • Damaged or worn clutch plates • Damaged or stuck ball check valve
Intermediate Clutch	• Damaged piston, 2-3, 3-2 shift • Damaged or worn clutch plates, 2-3, 3-2 shift
Overdrive Clutch	• Damaged or worn clutch plates • Damaged or worn piston
Pressure Control Solenoid	Damaged
Fluid Pump	Damaged

DRIVES WITH SELECTOR LEVER IN POSITION N

Drives with Selector Lever in Position N

Check	Causes
DEFINITION: Vehicle moves forward while in Neutral.	
Forward Clutch and Coast Clutch Assembly	• Damaged or worn clutch plates • Damaged or cut piston • Damaged or stuck ball check valve
Selector Lever	Adjustment

NO ENGAGEMENT OF TORQUE CONVERTER CLUTCH

No Engagement of Torque Converter Clutch

Check	Causes
DEFINITION: A large difference in RPM is noted between the engine speed and the transmission input turbine speed in third or fourth gear, Drive or Manual Third range when the torque converter clutch (TCC) is commanded ON by the transmission control module (TCM).	
Control Valve Body and Accumulator Assembly	• TCC regulator apply valve stuck released • TCC regulator apply valve spring broken
Torque Converter Housing	Transmission fluid pump cover damaged or misaligned
Torque Converter Clutch Pulse Width Modulation (TCC PWM) Solenoid Assembly	• Stuck Off • Internal damage • Damaged or cut O-ring • Screen damaged • Electrical connector damage
Fluid Pump	• Stuck, binding TCC control valve • TCC enable valve • Stick or binding TCC enable valve spring • Misaligned gasket
Turbine Shaft	Damaged or cut O-ring
Inspect for active transmission DTCs	Transmission DTC default action active

FLUID PRESSURE HIGH OR LOW

Fluid Pressure High or Low

Check	Causes
DEFINITION: Transmission main line pressure that is determined to be high or low. Refer to **Line Pressure Check**.	
Fluid Pump Assembly	• Pressure regulator valve stuck • Pressure regulator valve spring • Line boost valve spring • Line boost valve or bushing stuck, damaged or incorrectly assembled • Pressure relief ball not seated or damaged • Pressure relief ball spring • Pump slide seal out of location • Fluid pump screen assembly plugged or damaged • Fluid pump rotor guide omitted or

	misassembled • Fluid pump rotor cracked or broken • Porosity in fluid pump • Fluid pump surfaces not flat • Excessive fluid pump rotor clearance
Fluid Filter	• Intake pipe restricted. • Cracks in fluid filter • Fluid filter seal missing, cut or damaged
Control Valve Body Accumulator Assembly	• Manual valve scored or damaged • Spacer plate or gaskets misassemble or damaged • Control valve top channel plate not flat • Control valve bottom channel plate not flat • Feed limit valve or spring stuck in the exhaust position
Pressure Control Solenoid Assembly	• Contaminated • O-rings cut or damaged • Electrical connection
System Voltage	• 12 Volts not supplied to transmission • Electrical short - pinched solenoid wire • Solenoid not grounded
Clutch Accumulator	Leaking
Inspect for active transmission DTCs	Transmission DTC default action active

NO ENGINE BRAKING

No Engine Braking

Check	Causes
DEFINITION: A large engine RPM increase and forward vehicle speed decrease do not immediately occur when the transmission is shifted from overdrive or fourth gear in Drive or manual third range to either first, second gear, or third gear, manual second.	
Coast Clutch	• Damaged or cut piston • Damaged or worn clutch plates • Damaged or stuck ball check valve
Overdrive Clutch	• Damaged or cut piston • Damaged or worn clutch plates

AUTOMATIC TRANSMISSION OVERHEATING

Automatic Transmission Overheating

Checks	Causes
Fluid Pump Assembly	• Pressure regulator valve stuck • Pressure regulator valve spring • Line boost valve spring • Line boost valve or bushing stuck, damaged or incorrectly assembled • Pressure relief ball not seated or damaged • Pressure relief ball spring • Fluid pump screen assembly plugged or damaged • Fluid pump rotor guide omitted or misassembled • Fluid pump rotor cracked or broken • Porosity in fluid pump • Fluid pump surfaces not flat • Excessive fluid pump rotor clearance
Pressure Control Solenoid Assembly	• Contaminated • O-Rings cut or damaged • Electrical connection
Inspect for active transmission DTCs	Transmission DTC default action active