TROUBLESHOOTING

SYMPTOMS - AUTOMATIC TRANSMISSION

Symptoms - Automatic Transmission

Diagnostic Category	Diagnostic Information
This table consists of nine diagnostic categories that are located in the left 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 column to locate the specific symptom diagnostic 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 Procedure** . • Refer to **Oil Pressure High or Low** . • Refer to **Fluid Leak Diagnosis** . • Refer to **Oil Out the Vent** .
Noise and Vibration Diagnosis: This category contains the following topics: • Reattaching noise • Noise - drive gear, final drive, whine, growl, rattle, buzz, popping • Vibration	• Refer to **Reattaching Noise** . • Refer to **Vibration in Reverse and Whining Noise in Park** . • Refer to **Popping Noise** . • Refer to **Whine Noise Varying with RPM or Fluid Pressure** . • Refer to **Buzz Noise or High Frequency Rattle Sound** . • Refer to **Noise in Random Ranges** .
Range Performance Diagnosis: This category contains the following topics: • Drives in Neutral • No Park • No Reverse • No Drive • No engine braking • Lack of Power or Hesitation	• Refer to **Drives in Neutral** . • Refer to **No Park** . • Refer to **No Reverse or Slips in Reverse** . • Refer to **No Drive in All Ranges** . • Refer to **No Drive in Drive Range** . • Refer to **No Overrun Braking - Manual 3-2-1** . • Refer to **Lack of Power or Hesitation** .
Shift Quality (Feel) Diagnosis: This category contains the following topic: • Harsh, soft or slipping shifts	• Refer to **Harsh Shifts** . • Refer to **Slipping or Harsh 1-2 Shift** . • Refer to **No 2-3 Shift or 2-3 Shift Slips,**

• Harsh, soft or delayed engagement • Shift shudder, flare or tie-up	**Rough or Hunting** . • Refer to **No 3-4 Shift, Slips or Rough 3-4 Shift** . • Refer to **Harsh Garage Shift** . • Refer to **Delay in Drive and Reverse** . • Refer to **3-2 Flare or Tie-Up** .
Shift Pattern: This category contains the following topics: • One forward gear only • Two forward gears only • Gear missing or slipping • No upshift or slipping upshift • No downshifts • Non-First gear start	• Refer to **First Gear Range Only - No Upshift** . • Refer to **Third Gear Only** . • Refer to **Second/Third Gear Only or First/Fourth Gears Only** . • Refer to **Slips in First Gear** . • Refer to **Slipping or Harsh 1-2 Shift** . • Refer to **No 2-3 Shift or 2-3 Shift Slips, Rough or Hunting** . • Refer to **No 3-4 Shift, Slips or Rough 3-4 Shift** . • Refer to **No Part Throttle or Delayed Downshifts** . • Refer to **Second Gear Start** .
Shift Speed Diagnosis: This category contains 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 Procedure** . • Refer to **No Torque Converter Clutch (TCC) Apply (300 RPM Slip)** . • Refer to **No Torque Converter Clutch (TCC) Release** .
Indicator On or Message Center Displays Message: This category contains the following topics: High Trans Temp light does illuminate	Refer to **DTC P0218** .
If Symptom Not Found	• Refer to **Transmission Fluid Checking Procedure** . • Refer to **Road Test Procedure** . • Refer to **Line Pressure Check Procedure** .

TRANSMISSION FLUID CHECKING PROCEDURE

Transmission Fluid Checking Procedure

Step	Action	Values	Yes	No
1	1. Start the engine and allow the engine to idle until the transmission fluid temperature has reached the value specified. 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** in General Information. **CAUTION:** **Refer to Checking Hot Transmission Fluid Through Drain Plug Hole Caution in Cautions and Notices.** 4. Remove the transmission plug. **IMPORTANT:** **The transmission fluid may darken with normal use and does not always indicate contamination or oxidation.** 5. 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?	30-50° C (86-122°F)	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**
4	Check the fluid level. The fluid level should be even with the bottom of the threaded plug hole. Is the fluid level low?	-	**Go to Step 5**	Go to **Step 11**
5	Add DEXRON III automatic transmission fluid in increments of 0.5 L until the fluid drains from the plug hole. Did you add more than 1.5 L 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 fluid 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**	-
	1. Drain the fluid by removing the bottom pan.			

8	**IMPORTANT:** **A very small amount of material in the bottom of the bottom pan is a normal condition.** 2. Check the bottom pan for any excessive debris. Was excessive debris found?	-	Go to **Step 9**	Go to **Step 10**
9	1. Repair the transmission if required, in some cases, overhaul may be required. 2. Flush the transmission oil cooler and pipes and check flow. Refer to **Automatic Transmission Oil Cooler Flushing and Flow Test (J 45096)** or **Automatic Transmission Oil Cooler Flushing and Flow Test (J 35944-A)** . 3. Add enough DEXRON III automatic transmission fluid to bring the fluid level to the bottom of the threaded plug hole. 4. If equipped, reset the oil life monitor to 100%. 5. Start the engine and allow the engine to idle until the transmission fluid temperature has reached the value specified. 6. 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. 7. 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** in General Information. **CAUTION:** **Refer to Checking Hot Transmission Fluid Through Drain Plug Hole Caution in Cautions and Notices.** 8. Remove the transmission plug. 9. If needed, add DEXRON III automatic transmission fluid in increments of 0.5 L until the fluid drains from the threaded plug hole. **NOTE:** **Refer to Fastener Notice in Cautions and Notices.** 10. Allow fluid to finish draining out of the plug hole. Install the plug and tighten to specified value. 11. Wipe any excess fluid from the transmission with a rag or shop towel.	30- 50° C (86-122°F) 30 N.m (22 lb ft)	Go to **Road**	

	Is repair complete?		**Test Procedure**	-
10	1. Change the fluid and the fluid filter. Refer to **Automatic Transmission Fluid/Filter Replacement** . 2. Start the engine and allow the engine to idle until the transmission fluid temperature has reached the value specified. 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** in General Information. **CAUTION:** **Refer to Checking Hot Transmission Fluid Through Drain Plug Hole Caution in Cautions and Notices.** 5. Remove the transmission plug. 6. If needed, add DEXRON III automatic transmission fluid in increments of 0.5 L until the fluid drains from the threaded plug hole. **NOTE:** **Refer to Fastener Notice in Cautions and Notices.** 7. Allow fluid to finish draining out of the plug hole. Install the plug and tighten to specified value. 8. Wipe any excess fluid from the transmission with a rag or shop towel. 9. If equipped, reset the oil life monitor to 100%. Is repair complete?	30 N.m (22 lb ft)	Go to **Road Test Procedure**	-
11	**NOTE:** **Refer to Fastener Notice in Cautions and Notices.** 1. Allow fluid to finish draining out of the plug hole. Install the plug and tighten to specified value. 2. Wipe any excess fluid from the transmission with a rag or shop towel. Is repair complete?	30 N.m (22 lb ft)	Go to **Road Test Procedure**	-

LINE PRESSURE CHECK PROCEDURE

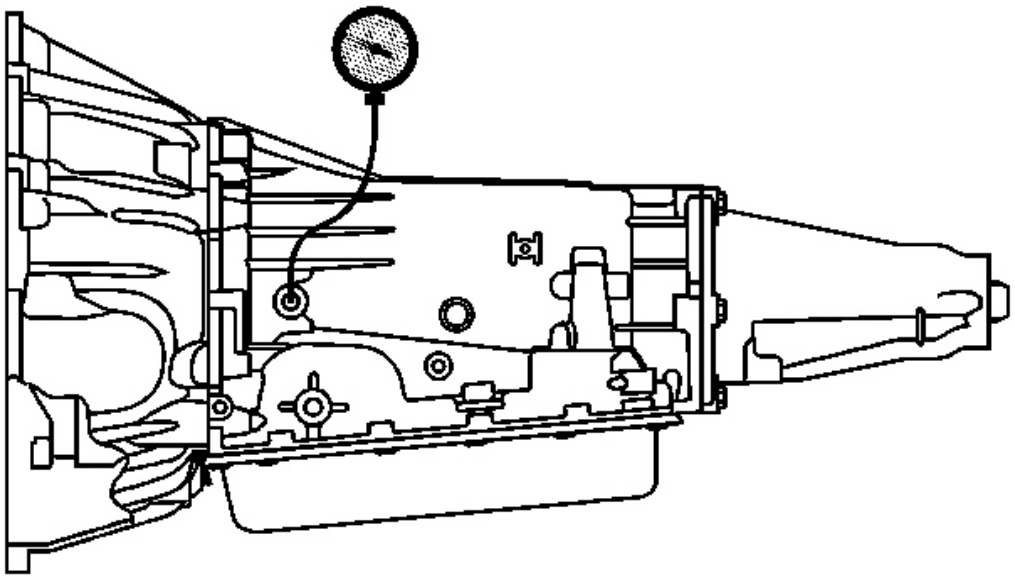

Fig. 1: J 21867 Pressure Gage
Courtesy of GENERAL MOTORS CORP.

Tools Required

J 21867 Pressure Gage

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

IMPORTANT: Before performing the line pressure check, verify that the transmission pressure control (PC) solenoid is operating correctly.

1. Install a scan tool.
2. Start the engine.
3. Inspect the transmission for the proper fluid levels. Refer to **Transmission Fluid Checking Procedure** .
4. Use the scan tool to inspect for any active or stored diagnostic trouble codes.
5. Inspect the manual linkage at the transmission for proper function.
6. Turn the engine OFF.

IMPORTANT: It may be necessary to remove or disconnect components in order to gain access to the transmission line pressure test port/plug.

7. Remove the pressure plug.
8. Install the **J 21867** .
9. Access the Scan Tool Output Control for the PC Solenoid.
10. Start the engine.

IMPORTANT: In order to achieve accurate line pressure readings, the following procedure must be performed at least three times in order to gather uniform pressure readings.
The scan tool is only able to control the PC solenoid in PARK and NEUTRAL with engine speeds below 1500 RPM. This protects the clutches from extreme high or low line pressures.

11. Begin commanding PC Solenoid at 1.0 amp and lower the amperage in one-tenth increments (0.01) until maximum line pressure is achieved.
12. Allow the pressure to stabilize between increments.
13. Compare your pressure readings to the Line Pressure table. Refer to **Line Pressure** .
14. If the pressure readings vary greatly from the line pressure table, refer to **Oil Pressure High or Low** .
15. Turn the engine OFF.
16. Remove the **J 21867** .

NOTE: Refer to Fastener Notice in Cautions and Notices.

17. Install the pressure plug.

Tighten: Tighten the pressure plug to 8-14 N.m (6-10 lb ft).

ROAD TEST PROCEDURE

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 FIRST
  - Manual SECOND
  - Manual THIRD

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 Procedure** .
- 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, check the following:

- Transmission fluid level. Refer to the **Transmission Fluid Checking Procedure** .
- 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.

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
   - TFP manual valve position switch
   - Transmission range, engine list
   - Commanded gear, current gear
   - PC solenoid reference current
   - PC solenoid actual current
   - PC solenoid duty cycle
   - Brake switch
   - Engine coolant temperature
   - Transmission fluid temperature
   - Throttle angle
   - Ignition voltage
   - 1-2 shift solenoid
   - 2-3 shift solenoid
   - TCC solenoid duty cycle
   - TCC slip speed
5. Monitor the brake switch signal while depressing and releasing the brake pedal. The scan tool should display:
   - Closed when the brake pedal is released.
   - Open 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. Check for low transmission fluid temperature.**

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 throttle angle input.
    1. Apply the brake pedal and ensure that the parking brake is set.
    2. Ensure the gear selector is in PARK.
    3. Monitor throttle angle while increasing and decreasing engine speed with the throttle pedal. The scan tool throttle angle 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 PCM calculates the upshift points based primarily on two inputs: throttle angle and vehicle speed. When the PCM determines that conditions are met for a shift to occur, the PCM 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 1-2 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 through 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. Instead, the pressure plate maintains a small amount of slippage, about 20 RPM, in SECOND, THIRD and FOURTH 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. Check for TCC apply in THIRD and FOURTH 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 Procedure** .
   - Refer to the **Shift Speed** table for the correct apply speeds.
   - Lightly tap and release the brake pedal. The TCC will release on most applications.

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 FOURTH gear.
3. Quickly increase throttle angle to greater than 50 percent.
4. Verify the following:
    - The TCC releases
    - The transmission downshifts immediately to THIRD gear

Full Throttle Detent Downshift

1. Place the gear selector in the OVERDRIVE position.
2. Accelerate the vehicle to speeds of 64-88 km/h (40-55 mph) in FOURTH gear.
3. Quickly increase throttle angle to 100 percent wide open throttle (WOT).
4. Verify the following:
    - The TCC releases
    - The transmission downshifts immediately to SECOND gear

Manual Downshifts

The shift solenoid valves do not control the initial downshift for the 4-3 or the 3-2 manual downshifts. The 4-3 and the 3-2 manual downshifts are hydraulic. The 2-1 manual downshift is electronic. The solenoid states should change during or shortly after a manual downshift is selected.

Manual 4-3 Downshift

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

Manual 4-1 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 FIRST.
4. Verify the following:
    - The TCC releases.
    - The transmission downshifts immediately to FIRST gear.
    - The engine slows the vehicle.

Coasting Downshifts

1. Place the gear selector in the OVERDRIVE position.
2. Accelerate the vehicle to FOURTH gear with the TCC applied.
3. Release the throttle and lightly apply the brakes.
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 First

1. With the vehicle stopped, move the gear selector to FIRST.
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 Second

1. With the vehicle stopped, move the gear selector to SECOND.
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 Third

1. With the vehicle stopped, move the gear selector to THIRD.
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 PROCEDURE

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 vehicle tends to have poor acceleration from a standstill. At speeds above 50-55 km/h (30-35 mph), the vehicle 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 vehicle 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
- A distorted clutch or housing surface due to long converter bolts
- 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.
- Plug wires - Look in each end. If there is red dust (ozone) or a black substance (carbon) present, then the wires are bad. Also look for a white discoloration of the wire. This indicates arcing during hard acceleration.
- Coil - Look for a black discoloration on the bottom of the 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.
- EGR valve - The valve may let in too much or too little unburnable exhaust gas and could cause the engine to run rich or lean.
- MAP/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.
- TP Sensor - The TCC apply and release depends on the TP Sensor in many engines. If the TP Sensor is out of specification, TCC may remain applied during initial engine loading.
- 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 or water.
- An internal failure occurs in the stator roller clutch.
- You notice excessive end play.
- Overheating produces heavy debris in the clutch or converter ballooning.
- 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.
- The threads in one or more of the converter bolt holds are damaged. Correct the condition with a new thread inset.
- 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 could be dented 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. Remove the transmission converter cover bolts and the cover.
5. Mark the relationship of the converter to the flywheel.
6. Remove the bolts attaching the converter to the flywheel.
7. Slide the torque converter away from the flywheel.
8. Rotate the flywheel and torque converter to inspect for defects or missing balance weights. Refer to **Engine Flywheel Cleaning and Inspection** in Engine Mechanical - 5.7L.
9. Lower the vehicle.
10. 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.
11. 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.

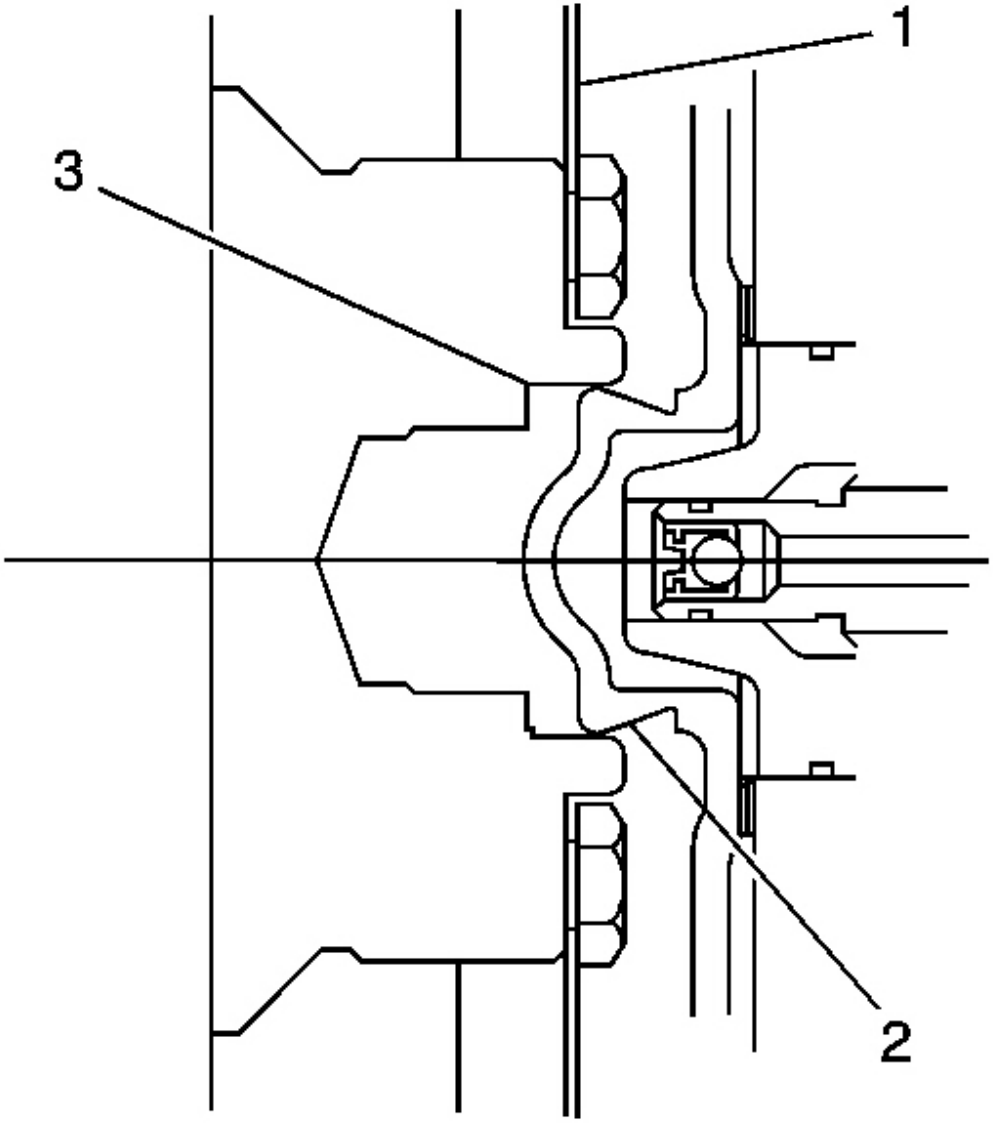

Fig. 2: Aligning The Torque Converter Hub In The Engine Crankshaft
Courtesy of GENERAL MOTORS CORP.

3. Align the torque converter hub (2) in the engine crankshaft (3) and install the torque converter to flywheel bolts.
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.

6. Install the transmission converter cover bolts and the cover.

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 and wear
  - 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

CLUTCH PLATE DIAGNOSIS

Composition Plates

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

- Pitting
- Flaking
- Delamination - splitting or separation of bonded clutch material
- 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 check 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 or apply plates
- Engine coolant or water in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- 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(R) seal rings are worn or damaged.

ENGINE COOLANT/WATER IN TRANSMISSION

NOTE: The antifreeze or water will deteriorate the seals, gaskets and the glue that bonds the clutch material to the pressure plate. Both conditions may cause damage to the 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 nylon parts (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

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. Detect the leak with the black light.
3. 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 oil pan bolts
- Improperly installed or damaged oil pan gasket
- Damaged oil pan or mounting face
- Incorrect oil pan gasket

Case Leak

- Damaged or missing fill tube seal
- Mislocated fill tube bracket

- Damaged vehicle speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler connector fittings
- Worn or damaged propeller shaft oil seal
- Loose line pressure pipe plug
- Porous casting warped torque converter housing

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 Pipe or the Fluid Fill Tube

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

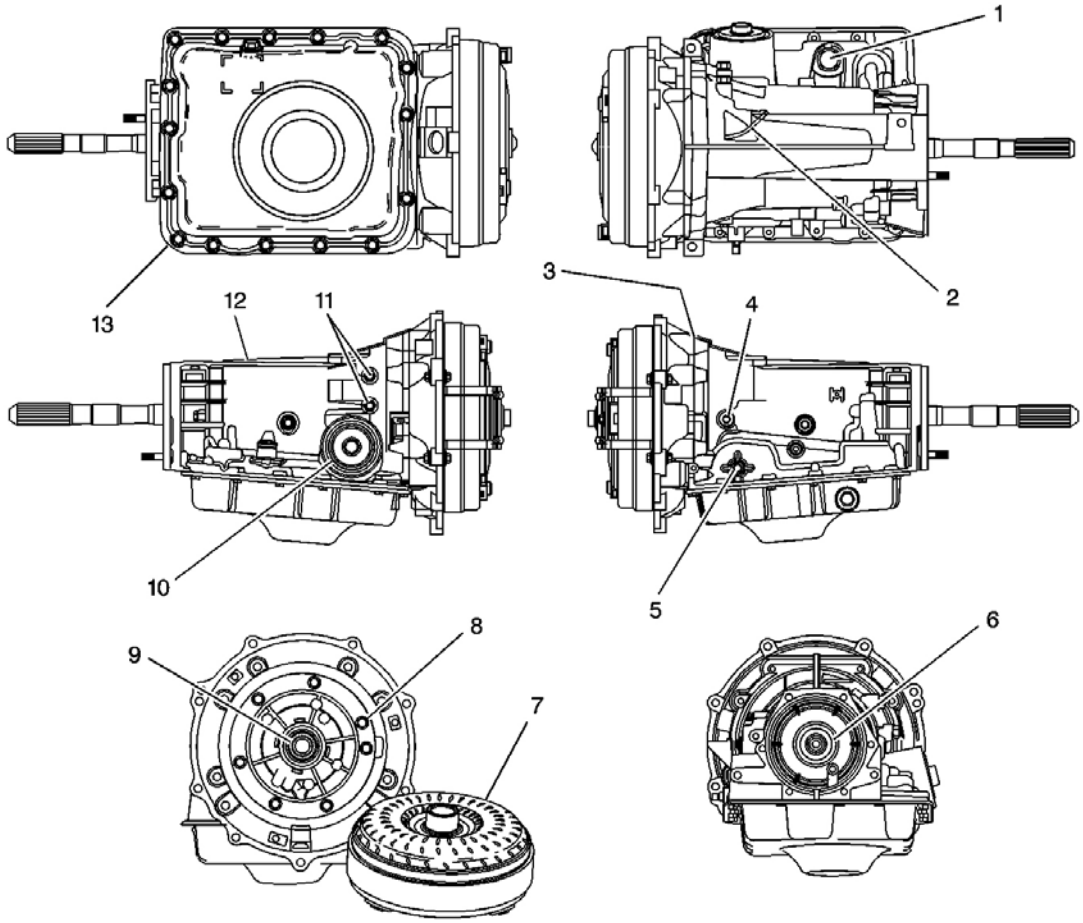

Fig. 3: Leak Inspection Points
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 44

Callout	Component Name
1	Wiring Harness Pass-through Connector O-Ring Seal
2	Transmission Vent Assembly
3	Converter Housing to Case Joint (Pump to Case Oil Seal)
4	Line Pressure Plug
5	Manual Shaft Seal
6	Case Rear Oil Seal Assembly
7	Torque Converter Assembly
8	Pump to Case Oil Seal
9	Pump Oil Seal Assembly
10	2-4 Servo Cover O-Ring Seal
11	Oil Cooler Pipe Connectors

12	Transmission Case
13	Transmission Oil Pan Gasket

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 35616** GM Terminal Test Kit
- **J 44246** Solenoid Testing 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 torque converter clutch (TCC) solenoid valve from the transmission case. Refer to **Control and Shift Solenoids Replacement** or **Torque Converter Clutch Pulse Width Modulation (TCC PWM) Solenoid, TCC Solenoid, and Wiring Harness** .

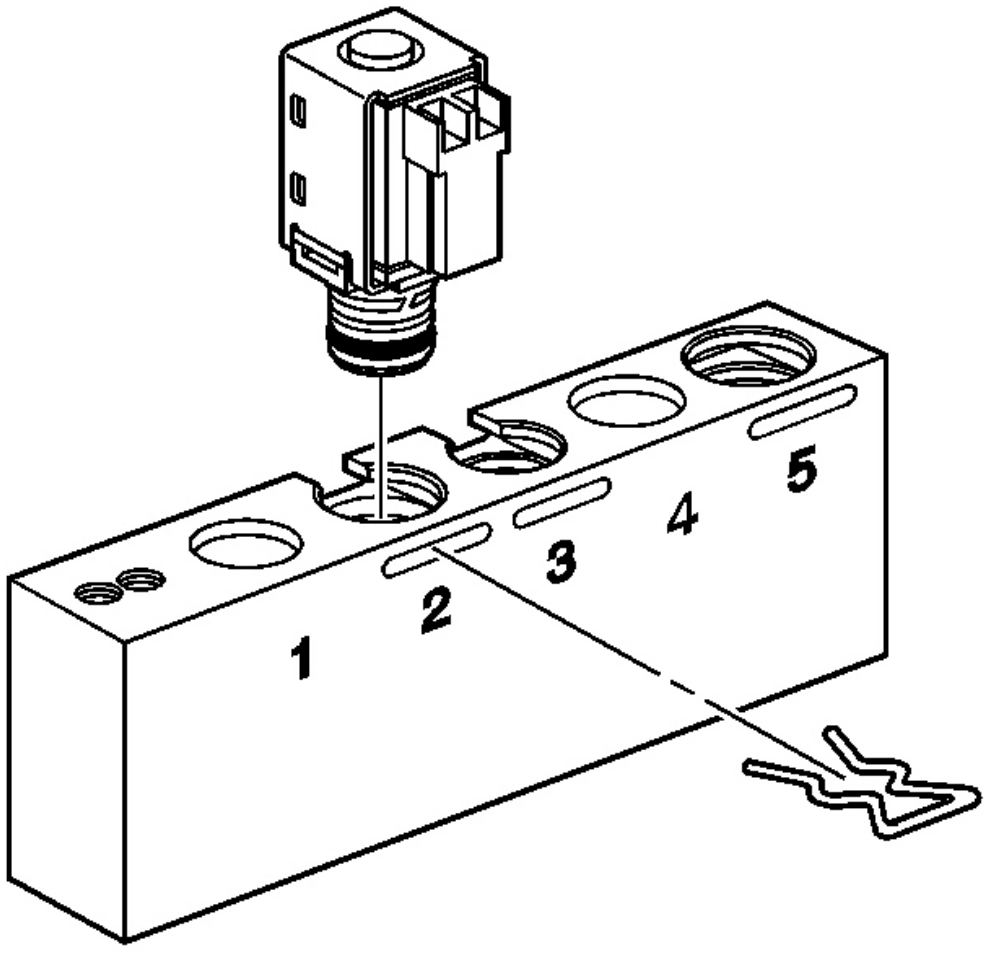

Fig. 4: Installing Valve Into J 44246
Courtesy of GENERAL MOTORS CORP.

2. Install the TCC solenoid valve, the 1-2 shift solenoid valve or the 2-3 shift solenoid valve into bore number 2 of the **J 44246** and install the factory retainer clip to retain the solenoid.

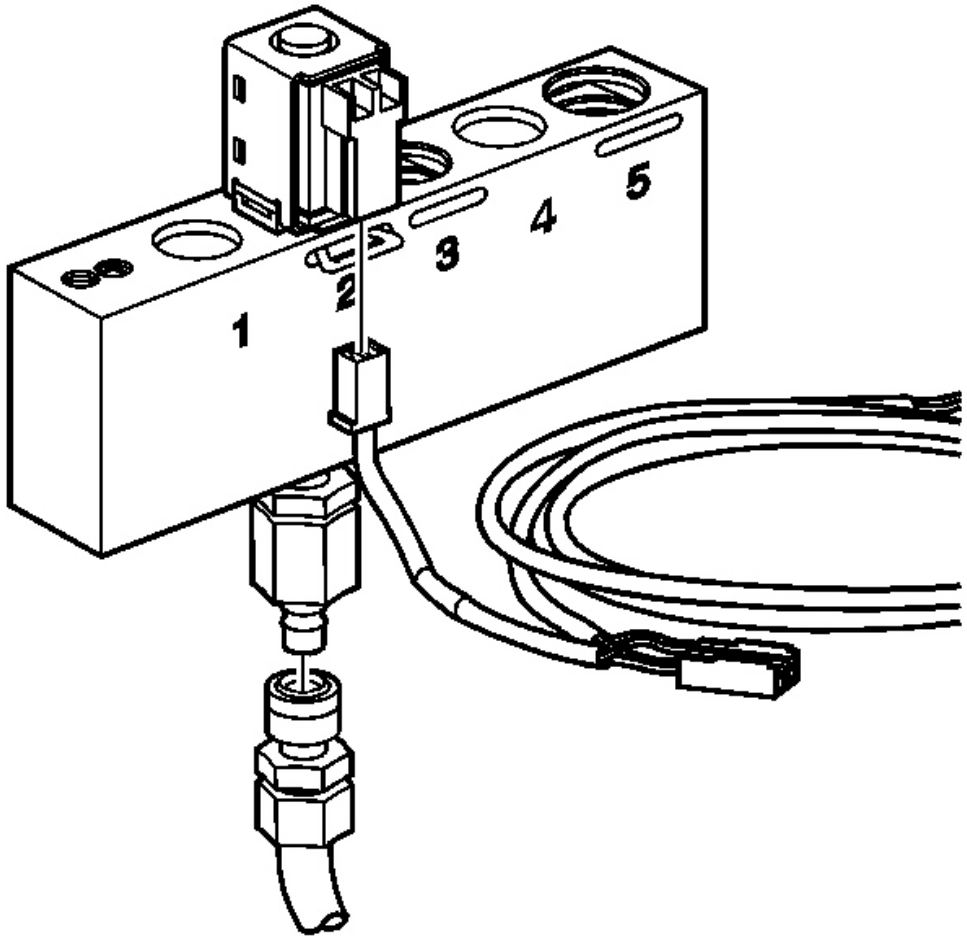

Fig. 5: Connecting The Solenoid Testing Harness To The Solenoid
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The supplied solenoid testing harness will not power the 4L60-E TCC On/Off solenoid. To energize this solenoid, apply battery, 12-volt, positive (+) and negative (-) to the TCC On/Off solenoid wiring harness using connector test adapter kit J 35616 . Use terminal E, Red, Power, and terminal T, Black, Ground. Refer to the Automatic Transmission Inline 20-Way Connector End View .

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

IMPORTANT: Do not use air pressure in excess of 827.4 kPa (120 psi). Excessive pressure will not allow the solenoid ball check valve to seat properly. Recommended air pressure is 344.75 kPa (50 psi).

4. Apply compressed air to the **J 44246** .
5. Air should flow through the solenoid. If air does not flow through the solenoid, replace the solenoid. Refer to **Control and Shift Solenoids Replacement** .
6. Connect the solenoid testing harness to the 12-volt positive (+) and negative (-) battery terminals.
7. 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).**

8. 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.

9. Install the shift solenoid valve into the control valve body or the TCC solenoid valve into the transmission case. Refer to **Control and Shift Solenoids Replacement** or **Torque Converter Clutch Pulse Width Modulation (TCC PWM) Solenoid, TCC Solenoid, and Wiring Harness** .

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(R)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 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 35944-200** Cooler Flushing Adapter
- **J 45096** Transmission Oil Cooling System Flush and Flow Test Tool
- Shop air supply with water/oil filters, regulator and pressure gage - minimum 90 psi
- Eye protection
- Rubber gloves

Machine Set-up

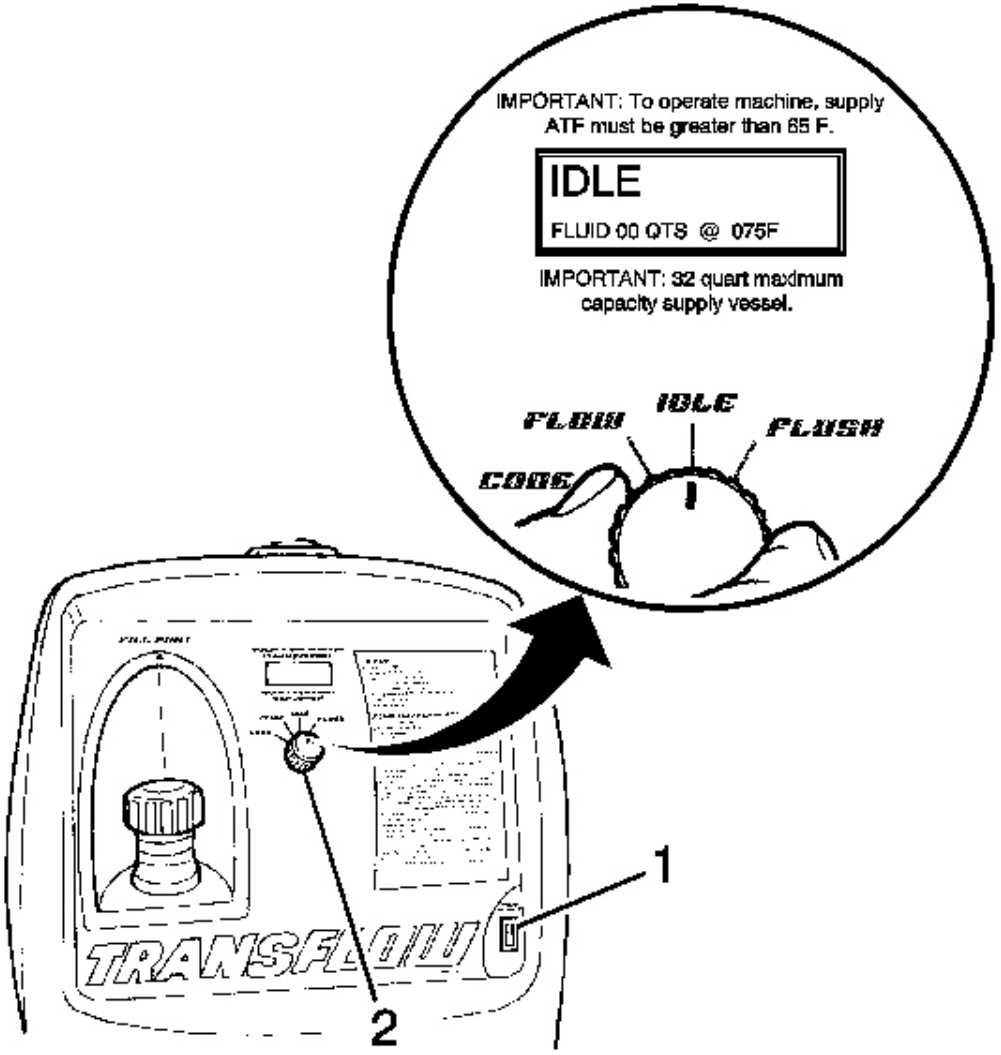

Fig. 6: Turning The Main Function Switch To The IDLE Position
Courtesy of GENERAL MOTORS CORP.

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

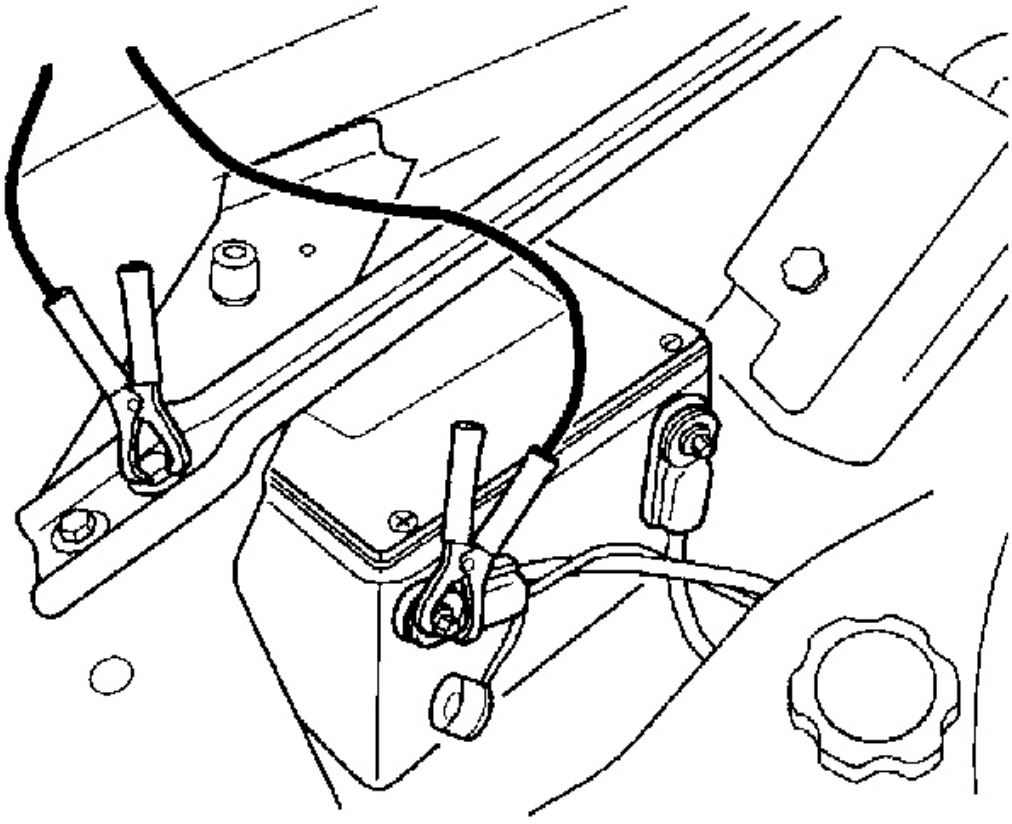

Fig. 7: Connecting J 45096 To The Vehicle 12-Volt DC Power Source
Courtesy of GENERAL MOTORS CORP.

3. Connect **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.

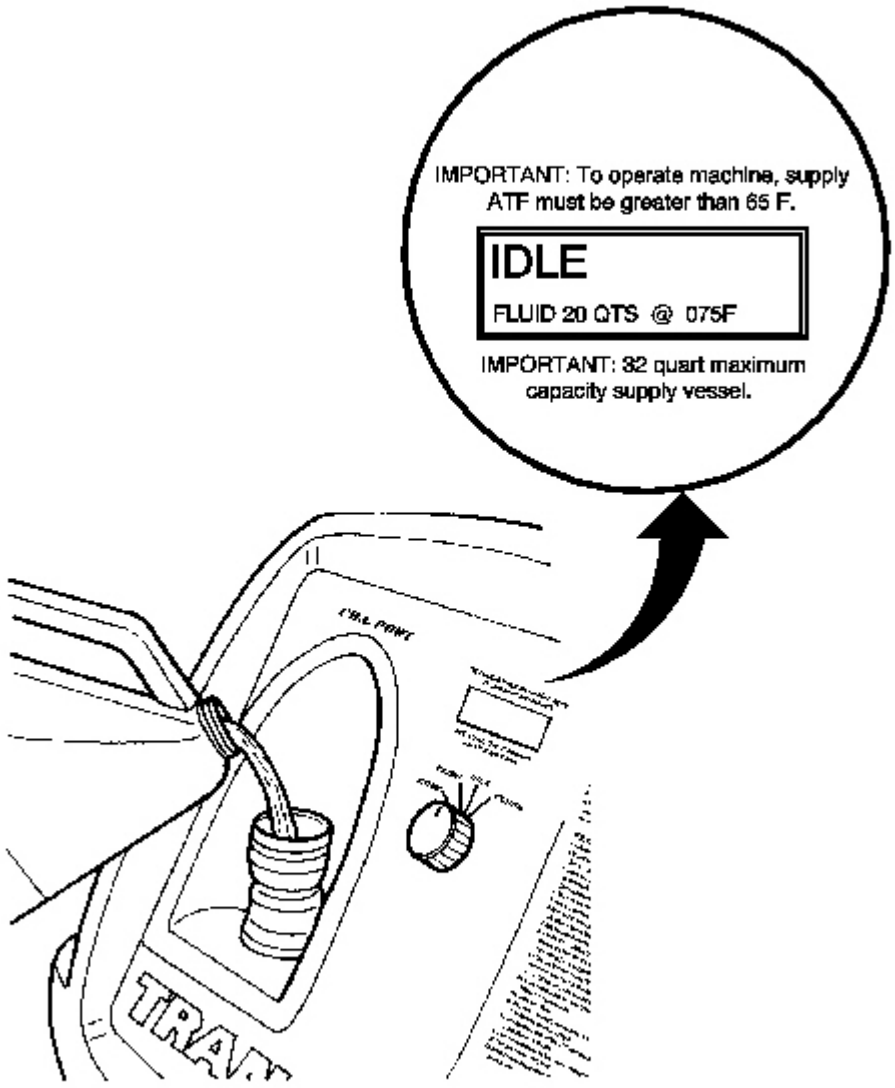

Fig. 8: Filling The Supply Tank With DexronIII/Mercon
Courtesy of GENERAL MOTORS CORP.

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(R)III/Mercon(R), or equivalent, through the fill port.

6. Install and tighten the fill cap.

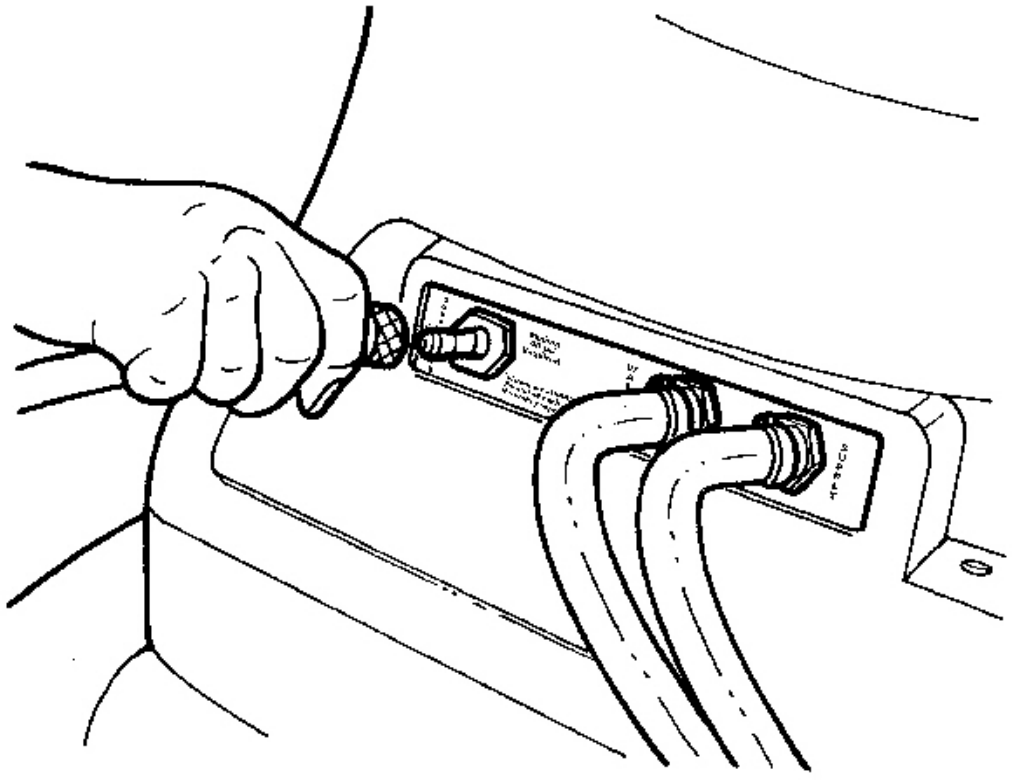

Fig. 9: Connecting A Shop Air Supply Hose To The Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

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

Determine Minimum Flow Rate

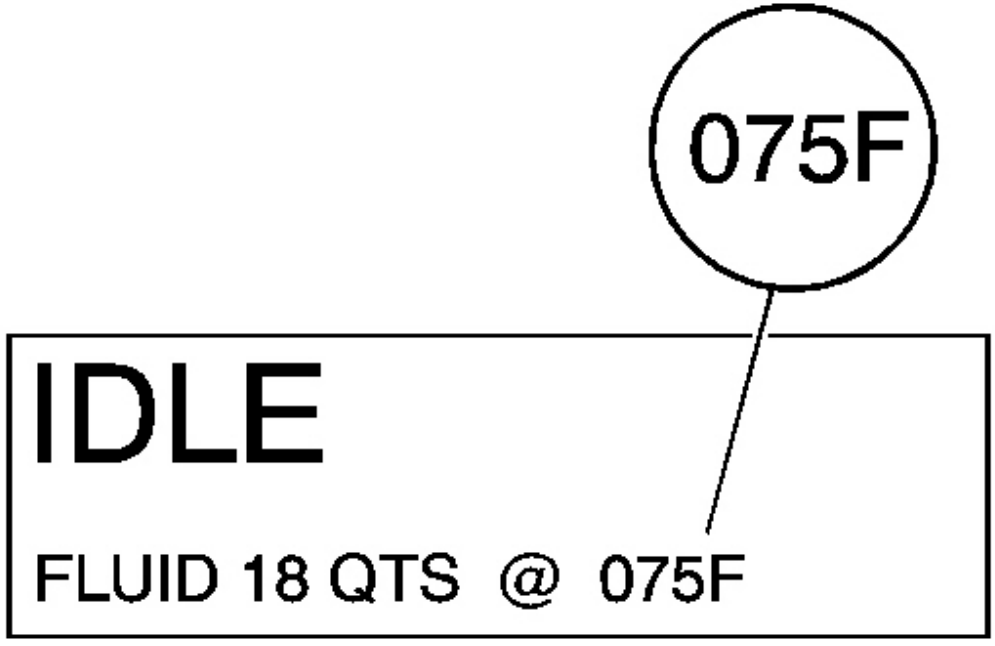

Fig. 10: Identifying The Temperature Of The Automatic Transmission Fluid
Courtesy of GENERAL MOTORS CORP.

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

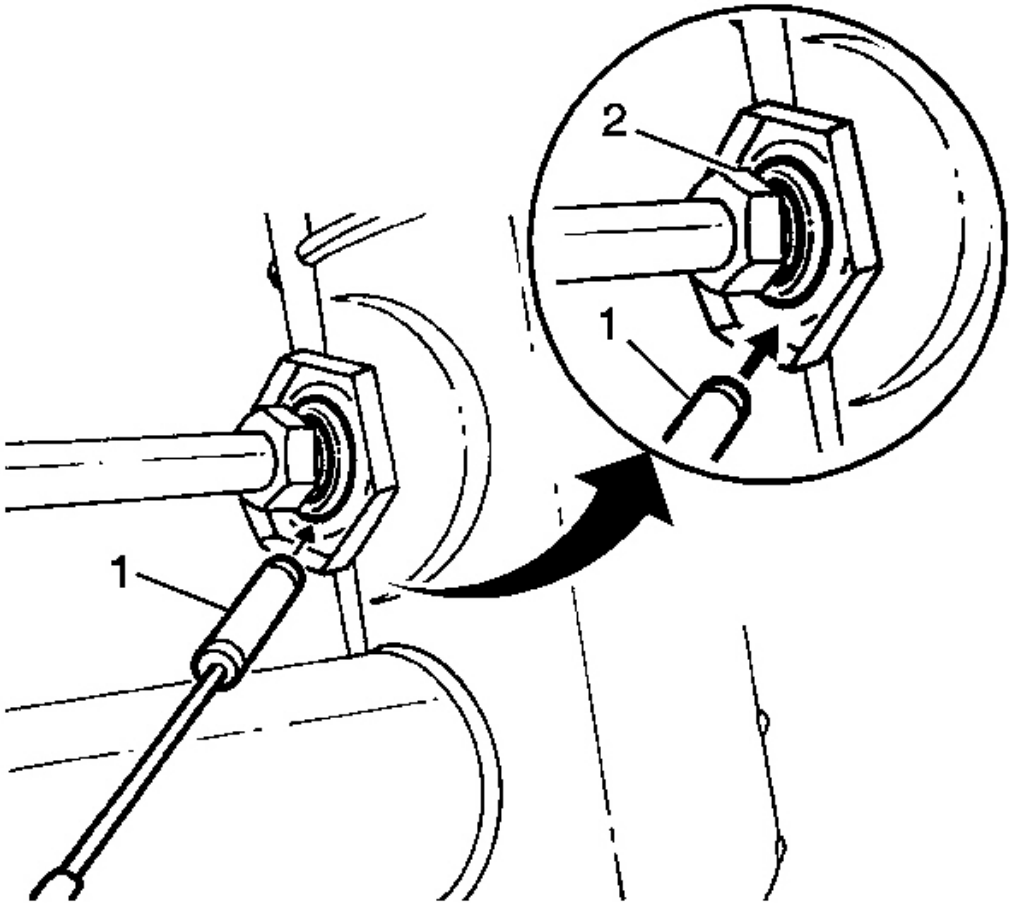

Fig. 11: Determining Whether The Transmission Oil Cooler Is Steel Or Aluminum
Courtesy of GENERAL MOTORS CORP.

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: 24°C (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

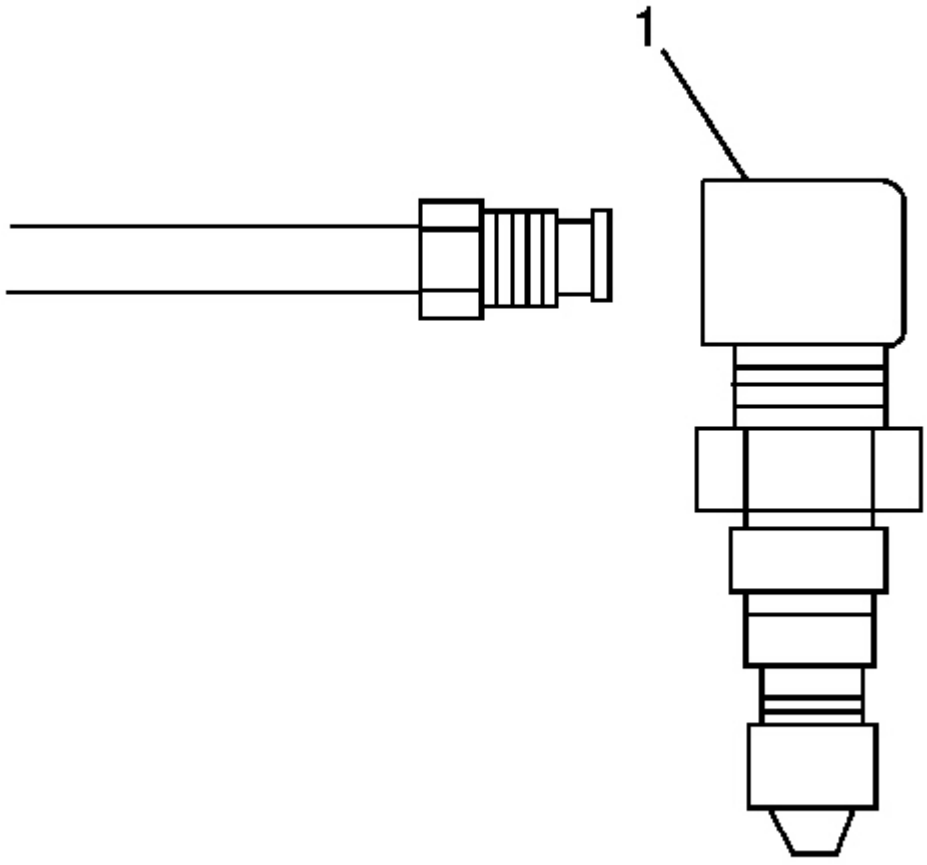

Fig. 12: Connecting The J 45096 Adapters To The Vehicle's Transmission Oil Cooler Supply And Return Lines
Courtesy of GENERAL MOTORS CORP.

1. Connect the **J 45096** adapters (1) to the vehicle's transmission oil cooler supply and return lines at the transmission, may require **J 35944-200** .

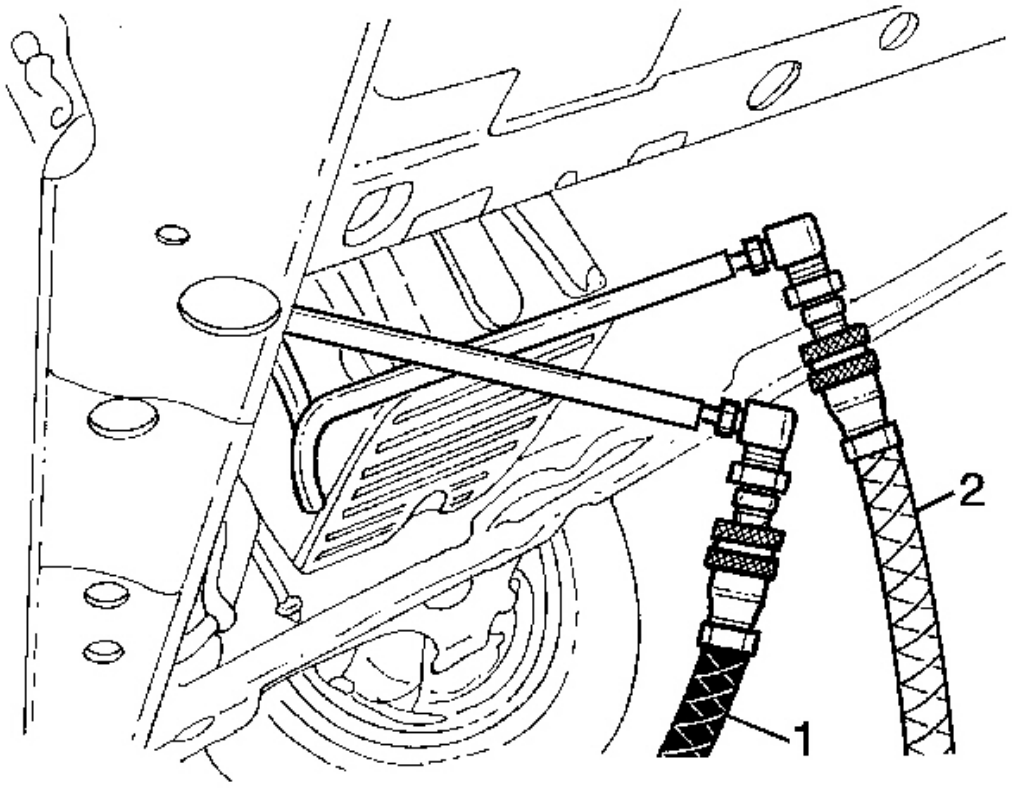

Fig. 13: Connecting Black Supply Hose And Clear Waste Hose
Courtesy of GENERAL MOTORS CORP.

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.

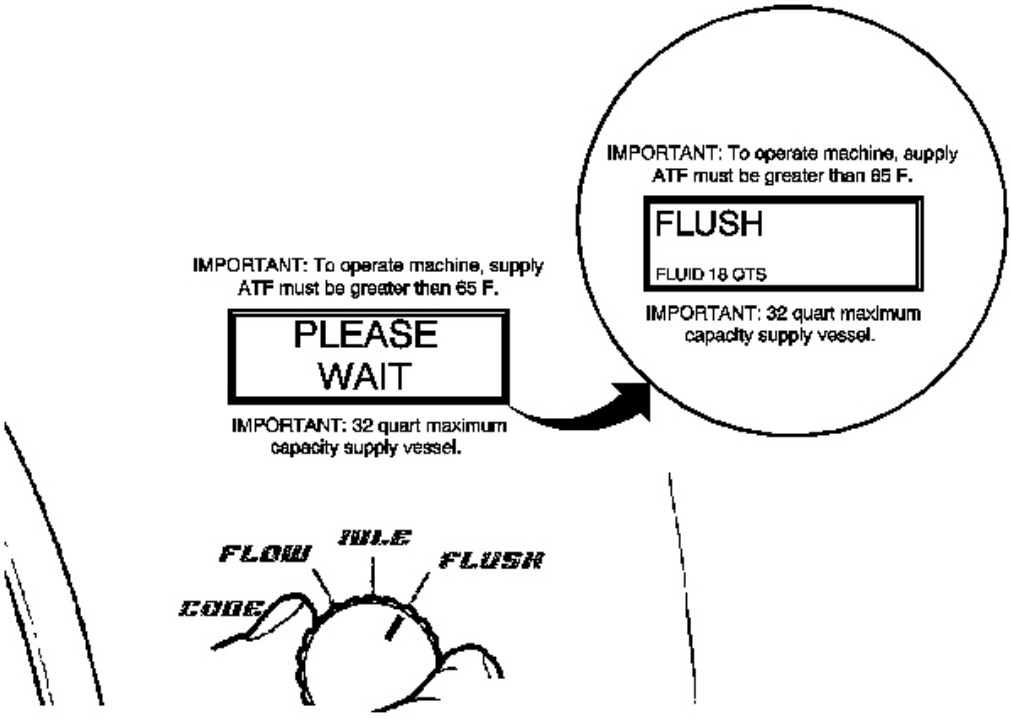

Fig. 14: Turning The Main Function Switch To The FLUSH Position
Courtesy of GENERAL MOTORS CORP.

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

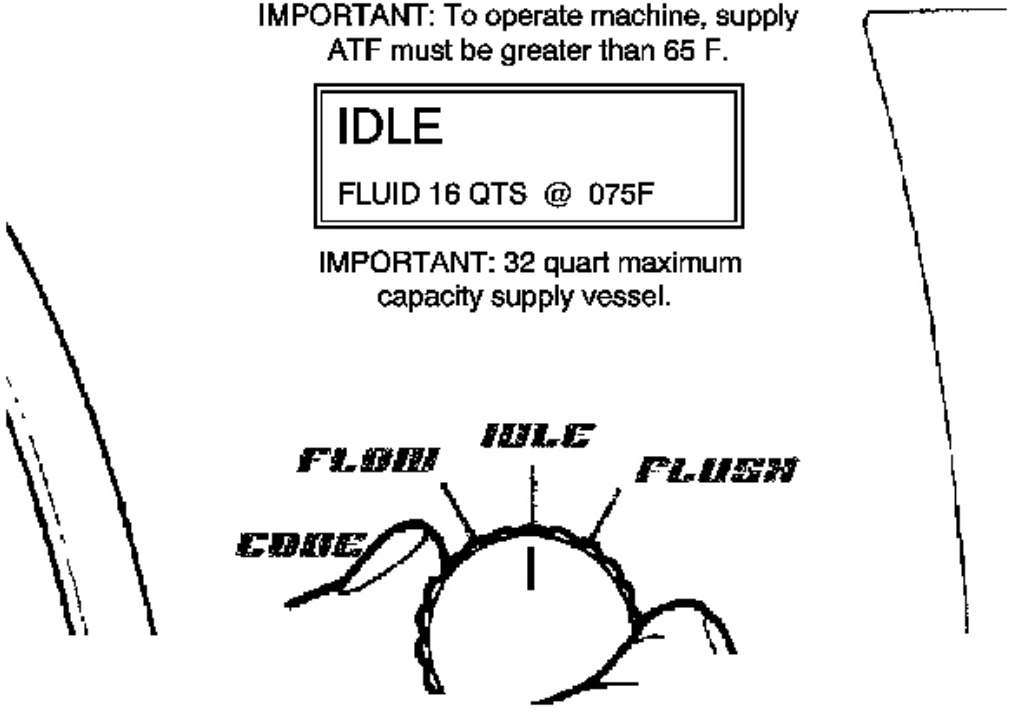

Fig. 15: Turning The Main Function Switch To The IDLE Position
Courtesy of GENERAL MOTORS CORP.

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

Forward Flush

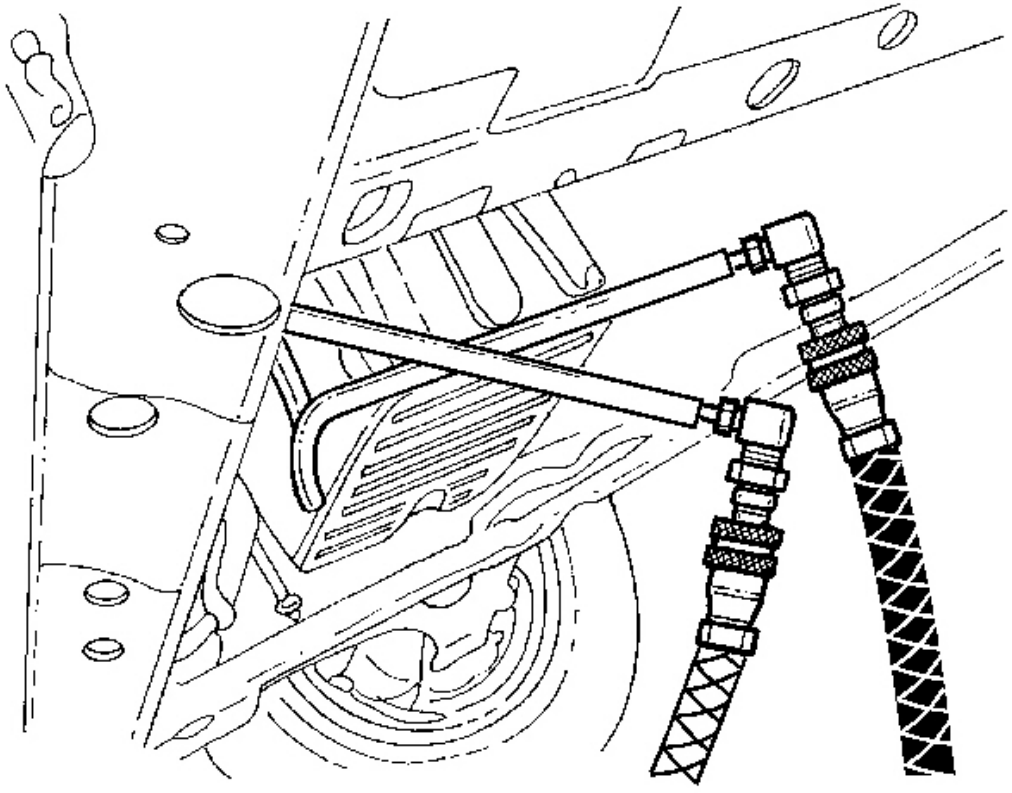

Fig. 16: Disconnecting The Supply And Waste Hoses From The Vehicle Cooler Lines
Courtesy of GENERAL MOTORS CORP.

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

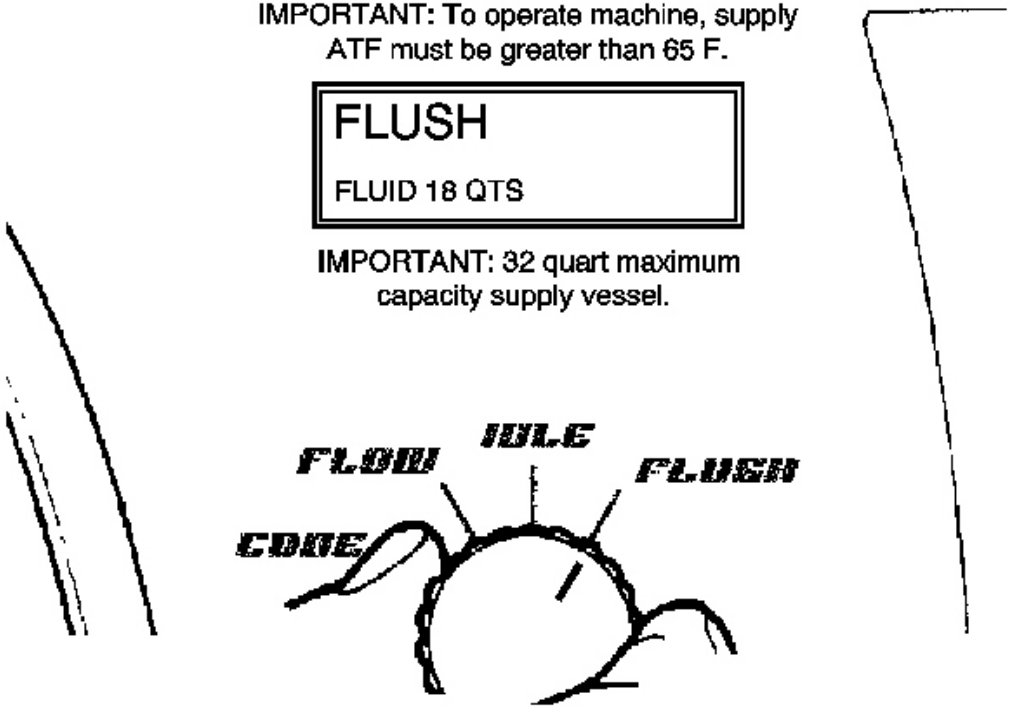

Fig. 17: Turning The Main Function Switch To The FLUSH Position
Courtesy of GENERAL MOTORS CORP.

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

Flow Test

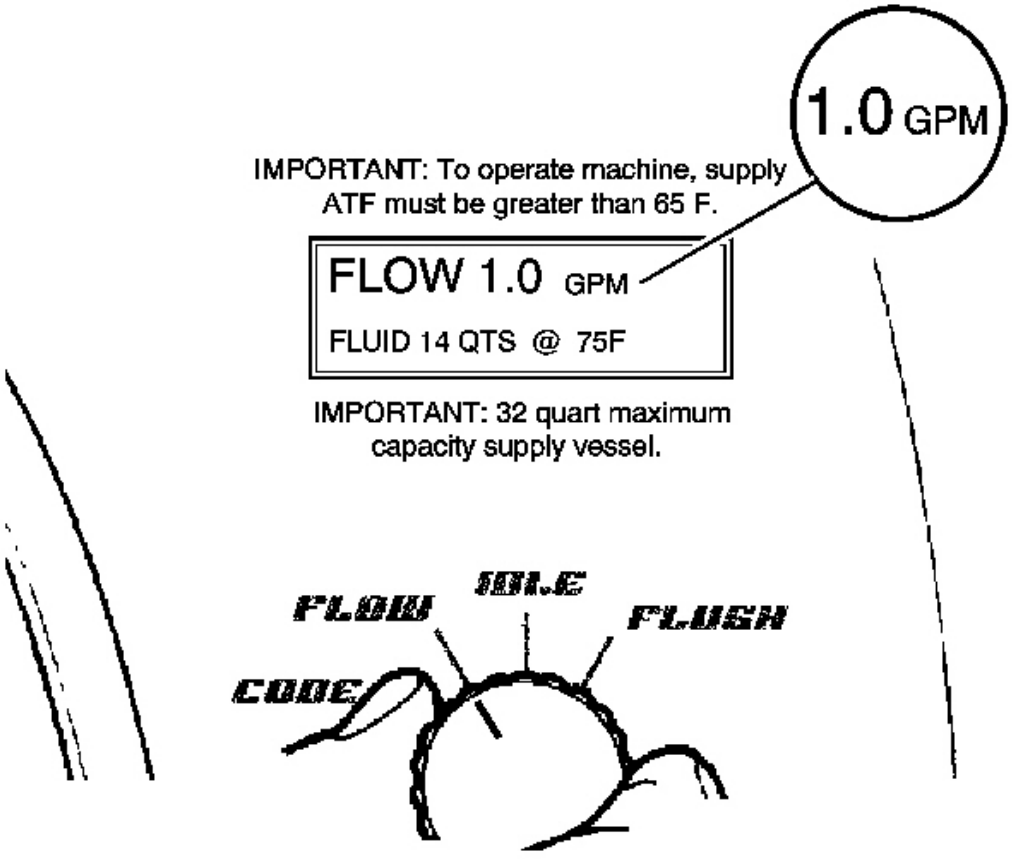

Fig. 18: Turning The Main Function Switch To The FLOW Position
Courtesy of GENERAL MOTORS CORP.

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 the Code Recording Procedure.

1. Replace the transmission oil cooler.
2. Connect the supply and waste hoses to the cooler lines in the normal flow direction. Perform the Flow Test.
3. Perform the Code Recording Procedure.

Code Recording Procedure

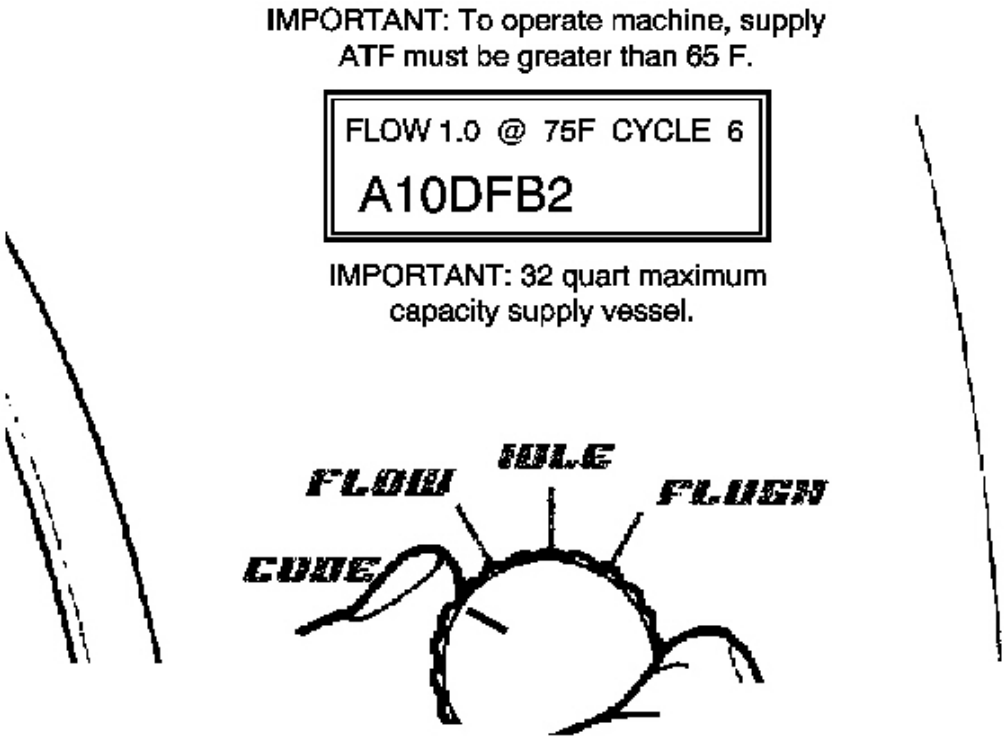

Fig. 19: Turning The Main Function Switch To The CODE Position
Courtesy of GENERAL MOTORS CORP.

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

IMPORTANT:

- **If power is interrupted prior to the recording of the 7-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 the repair order.

Clean-Up

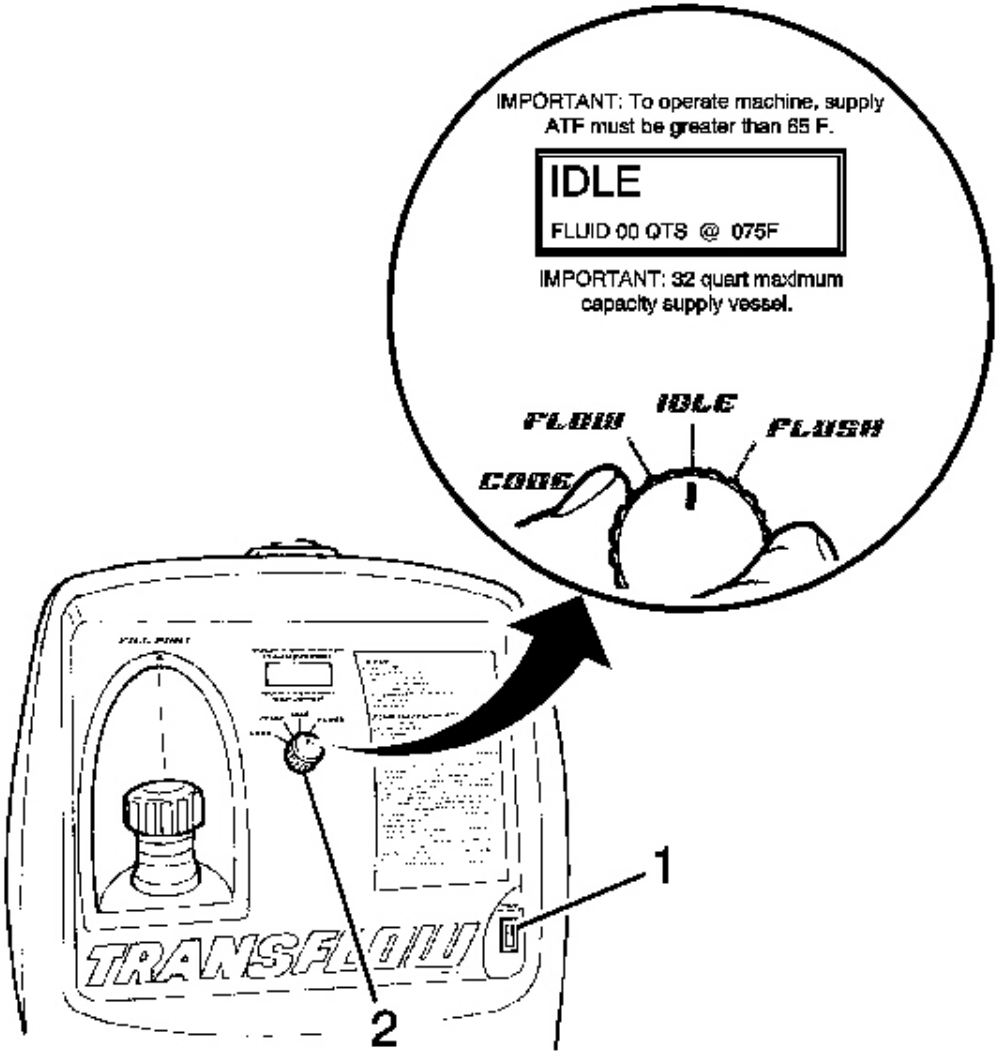

Fig. 20: Turning The Main Function Switch To The IDLE Position
Courtesy of GENERAL MOTORS CORP.

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

2. Turn the main power switch to the OFF position.

IMPORTANT: 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.

3. Disconnect the supply and waste hoses and the 12-volt power source from the vehicle.

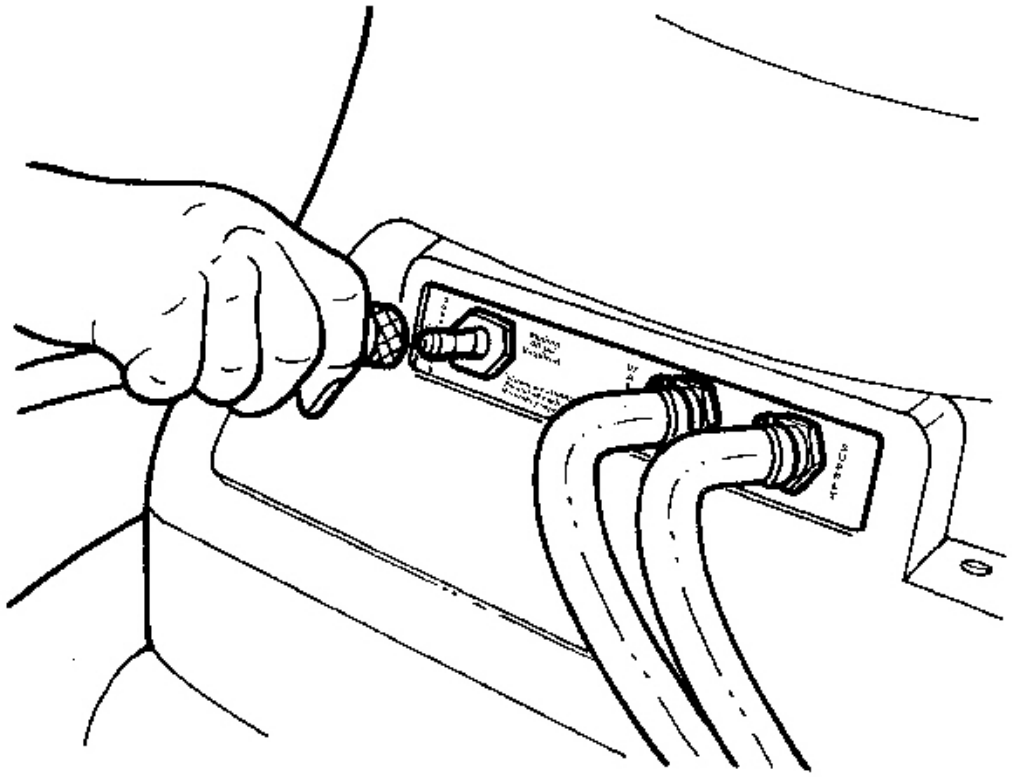

Fig. 21: Connecting A Shop Air Supply Hose To The Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

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.

AUTOMATIC TRANSMISSION OIL COOLER FLUSHING AND FLOW TEST (J 35944-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(R)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 Flusher
- **J 35944-22** Transmission Oil Cooler Flushing Fluid
- **J 35944-600** Transmission Cooler Flush Adapter
- 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.

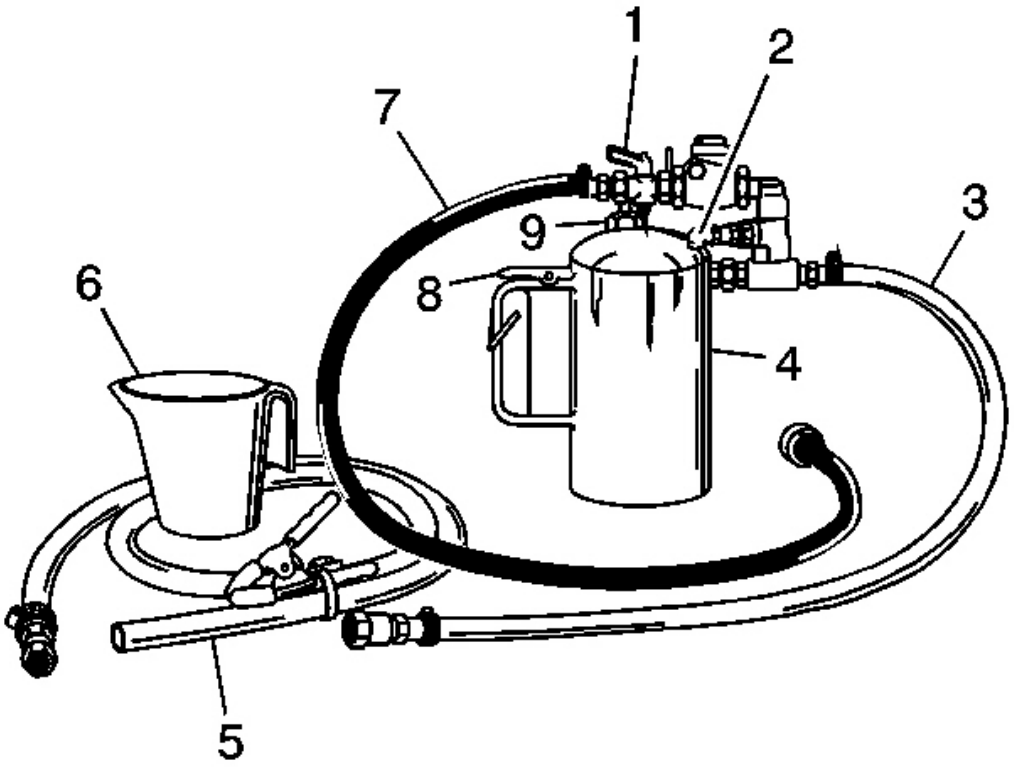

Fig. 22: J 35944 Flusher Tank
Courtesy of GENERAL MOTORS CORP.

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.

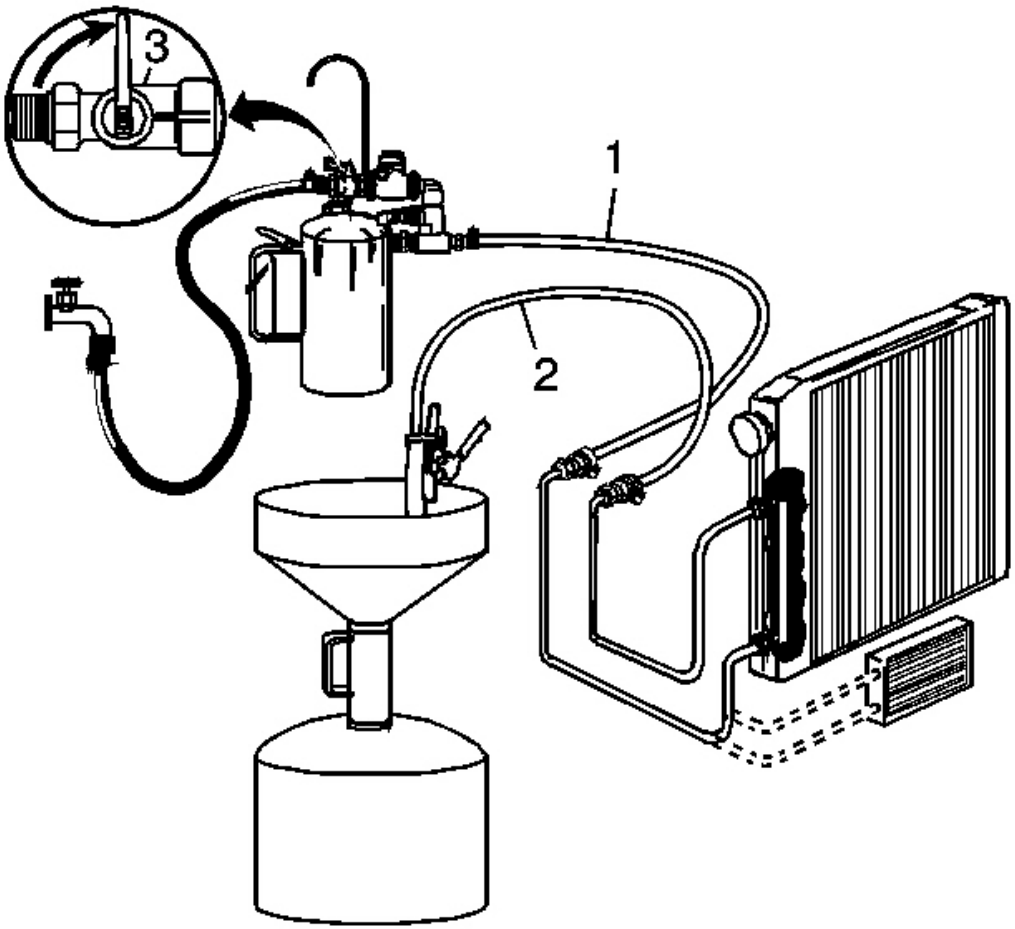

Fig. 23: Flushing The Oil Cooler & Lines
Courtesy of GENERAL MOTORS CORP.

2. Connect the **J 35944-A** to the oil cooler feed bottom connector. Use the **J 35944-600** , if required.
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 top connector oil cooler return pipe. Use the **J 35944-600** , if required.
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.

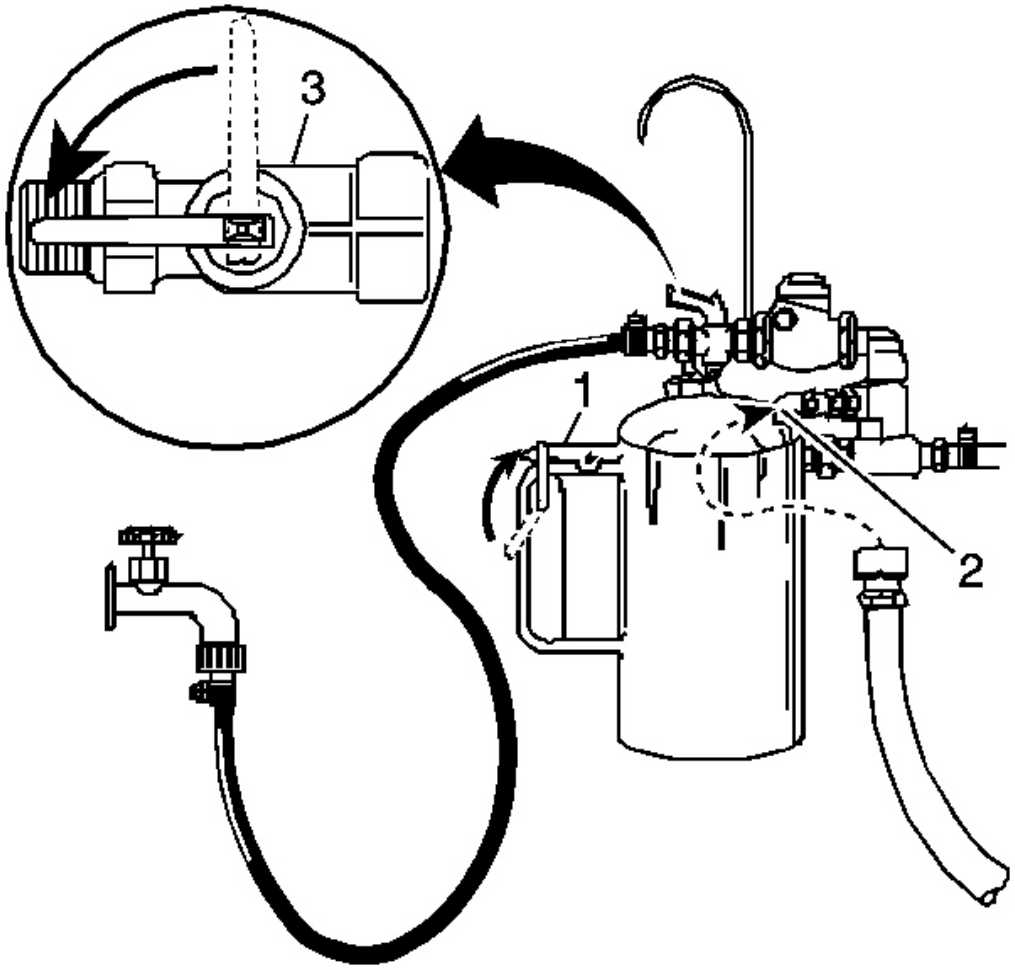

Fig. 24: Turning The J 35944-A Water Supply Valve To The ON Position

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

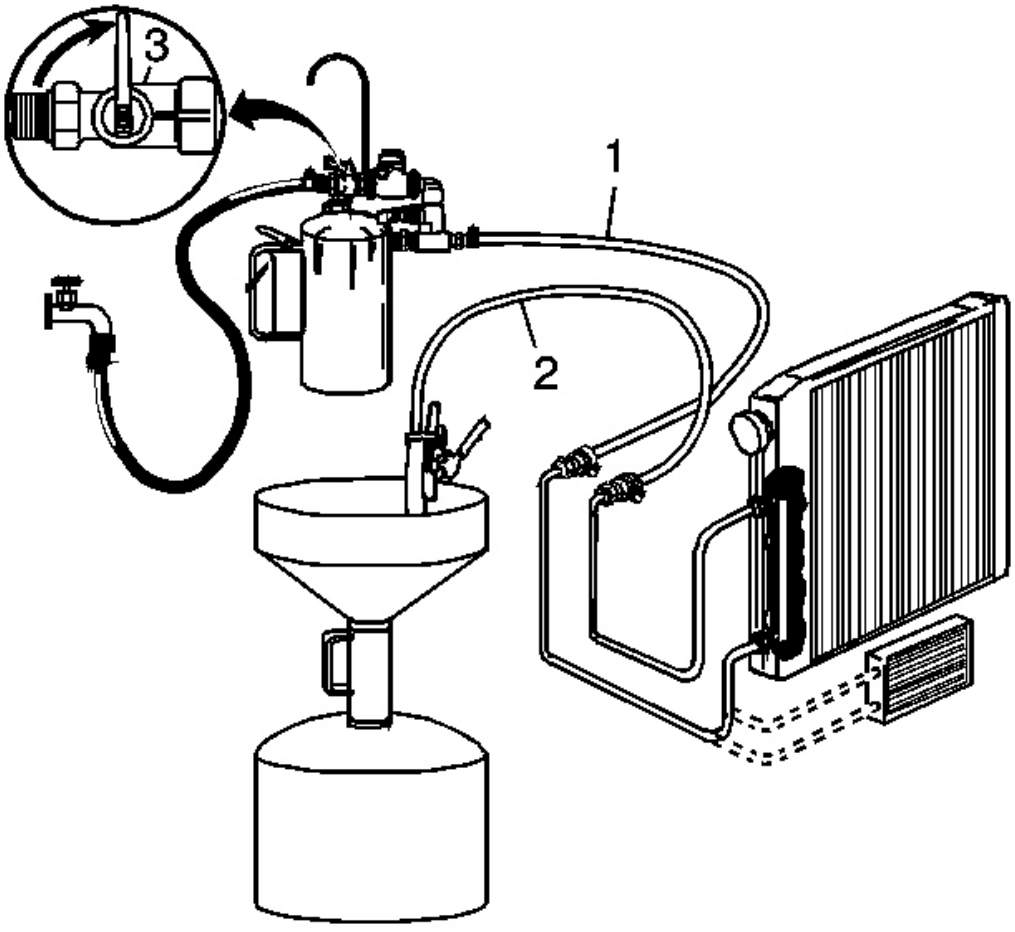

Fig. 25: Flushing The Oil Cooler & Lines
Courtesy of GENERAL MOTORS CORP.

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.

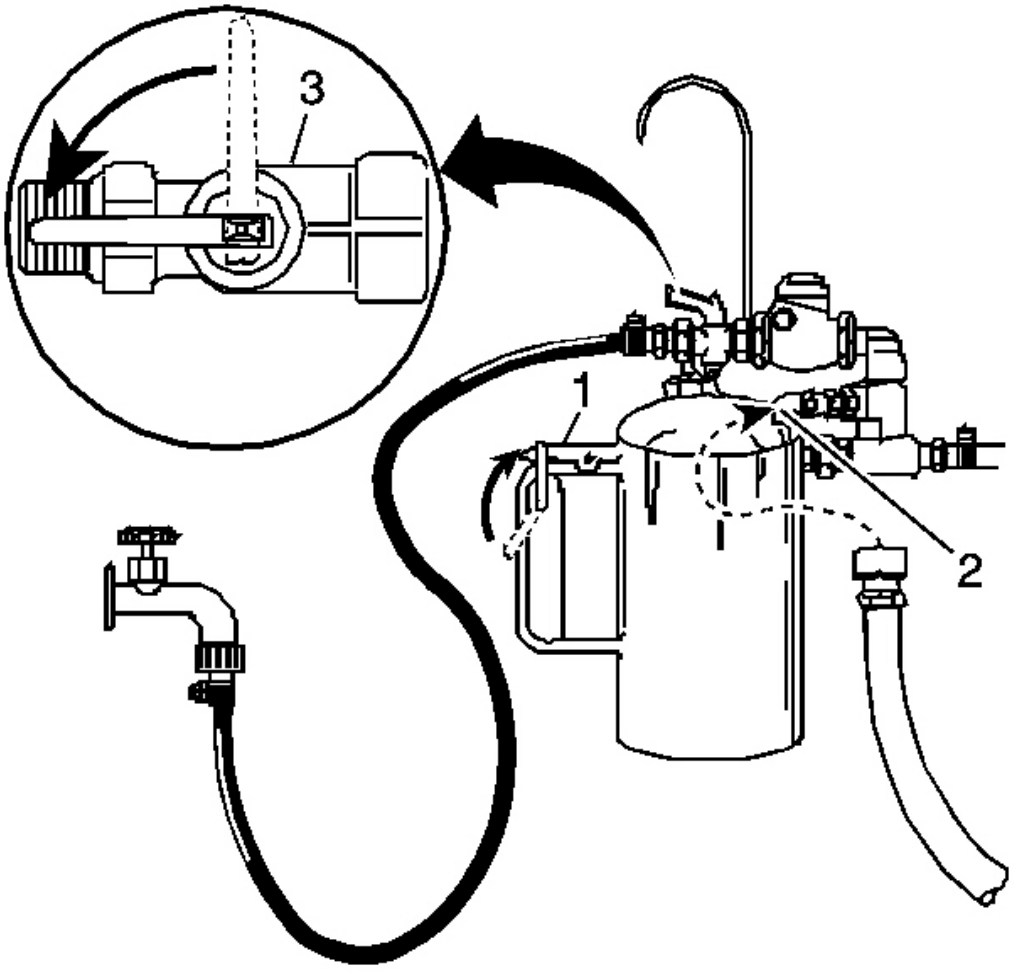

Fig. 26: Turning The J 35944-A Water Supply Valve To The ON Position
Courtesy of GENERAL MOTORS CORP.

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

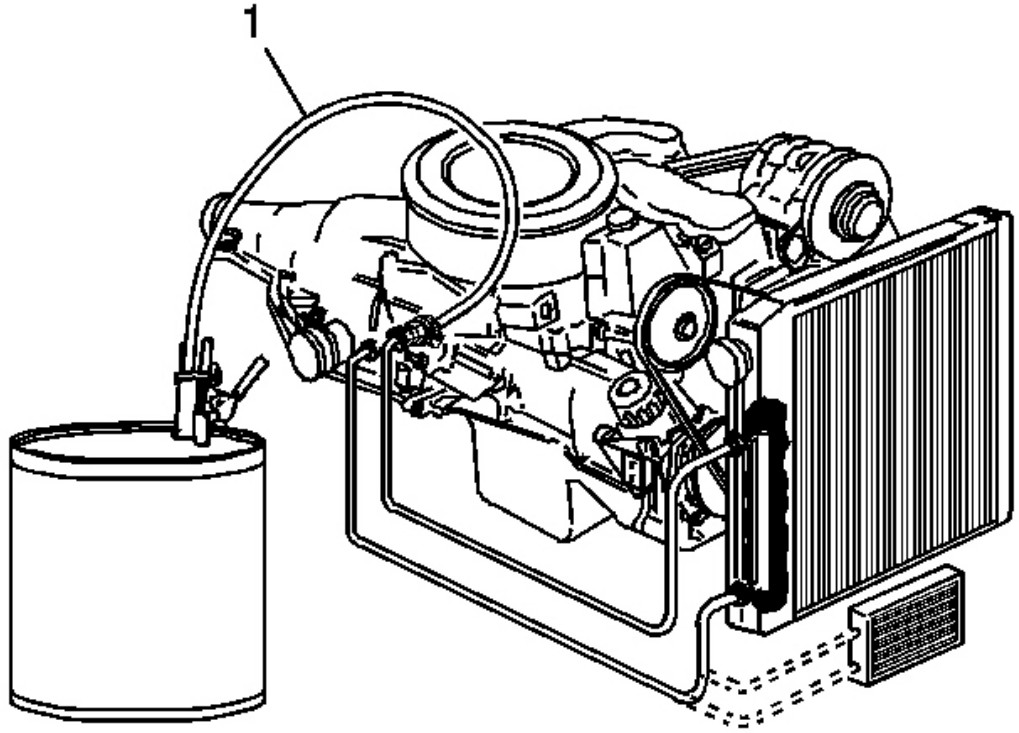

Fig. 27: Clipping The Discharge Hose To An Empty Oil Container
Courtesy of GENERAL MOTORS CORP.

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, bottom 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 bottom 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, bottom connector, for restrictions or damage. If no condition is found with the feed pipe, bottom connector, 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.

TRANSMISSION OVERHEATS

Transmission Overheats

Checks	Causes
TCC Circuit	Blockage during apply or release
Pump Cover (215)	Cross channel leakage
Pressure Regulator Valve (216)	The valve is stuck in a high demand position
Oil Cooler	The cooler or the cooler lines are blocked
Oil Pan Gasket (73)	The gasket is damaged
Turbine Shaft O-ring (618)	The O-ring is damaged
Turbine Shaft Seals (619)	The seals are damaged
Stator Shaft Bushings (234/241)	The bushing is worn or damaged
Fluid	The fluid level is low
Radiator	Air flow is restricted or internal blockage

OIL PRESSURE HIGH OR LOW

Oil Pressure High or Low

Checks	Causes
Oil Pump Assembly (4)	• Pressure regulator valve stuck • Pressure regulator valve spring • Rotor guide omitted or misassembled

	• Rotor cracked or broken • Reverse boost valve or sleeve stuck, damaged or incorrectly assembled • Orifice hole in pressure regulator valve plugged • Sticking slide or excessive rotor clearance • Pressure relief ball not seated or damaged • Porosity in pump cover or body • Wrong pump cover • Pump faces not flat • Excessive rotor clearance
Oil Filter (72)	• Intake pipe restricted by casting flash • Cracks in filter body or intake pipe • O-ring seal missing, cut or damaged • Wrong grease used on rebuild
Control Valve Body (60)	• Manual valve scored or damaged • Spacer plate or gaskets incorrect, misassembled or damaged • Face not flat • 2-3 Shift valve stuck • Checkballs omitted or misassembled
Pressure Control Solenoid (377)	Damage to electrical terminals
Transmission Fluid Pressure Manual Valve Position Switch (69)	• Contamination • Damaged seals
Case (103)	Case to control valve body face not flat
System Voltage	• 12 volts not supplied to transmission • Electrical short (pinched solenoid wire) • Solenoid not grounded

HARSH SHIFTS

Harsh Shifts

Checks	Causes
Throttle Position Sensor	Open or shorted circuit
Vehicle Speed Sensor (36)	Open or shorted circuit
Automatic Transmission Fluid Pressure (TFP) (69)	• Contamination • Damaged seals
Trans Fluid Temperature Sensor (Part of 69)	Open or shorted circuit
Engine Coolant Temperature Sensor	Open or shorted circuit

Pressure Control Solenoid (377)	• Damage to electrical terminals • Contamination

INACCURATE SHIFT POINTS

Inaccurate Shift Points

Checks	Causes
Oil Pump Assembly (4)	• Stuck pressure regulator valve • Sticking pump slide
Valve Body Assembly (60)	Spacer plate or gaskets misassembled, damaged or incorrect

Case (103)	• Porous or damaged valve body pad
	• 2-4 Servo Assembly
	  ○ 2-4 accumulator porosity
	  ○ Damaged servo piston seals
	  ○ Apply pin damaged or improper length
	• 2-4 Band Assembly
	  ○ Burned
	  ○ Anchor pin not engaged

Throttle Position Sensor	• Disconnected • Damage
Vehicle Speed Sensor (36)	• Disconnected • Damaged • Bolt not tightened
4WD Low Switch	• Disconnected • Damaged

FIRST GEAR RANGE ONLY - NO UPSHIFT

1st Gear Range Only - No Upshift

Checks	Causes
Control Valve Body (60)	• The 1-2 Shift valve is sticking • The spacer plate or gaskets are mispositioned or damaged
Case (103)	The case to valve body face is damaged or is not flat
Shift Solenoid Valves (366/368)	• Stuck or damaged • Faulty electrical connection
2-4 Servo Assembly (13-28)	• The apply passage case is restricted or blocked • Nicks or burrs on the servo pin or on the pin bore in the case

	• Fourth servo piston is installed backwards
2-4 Band Assembly (602)	• The 2-4 band is worn or damaged • The band anchor pin is not engaged

SLIPS IN FIRST GEAR

Slips in 1st Gear

Checks	Causes
Forward Clutch Assembly (646-651)	• Clutch plates worn • Porosity or damage in forward clutch piston • Forward clutch piston inner and outer seals missing, cut or damaged • Damaged forward clutch housing • Forward clutch housing retainer and ball assembly not sealing or damaged
Forward Clutch Accumulator (353-358)	• Piston seal missing, cut or damaged • Piston out of its bore • Porosity in the piston or valve body • Stuck abuse valve
Input Housing and Shaft Assembly (621)	Turbine shaft seals missing, cut or damaged
Valve Body (60)	• 1-2 Accumulator valve stuck • Face not flat, damaged lands or interconnected passages • Spacer plate or gaskets incorrect, mispositioned or damaged
Low Roller Clutch (678)	• Damage to lugs to inner ramps • Rollers not free moving • Inadequate spring tension • Damage to inner splines • Lube passage plugged
Torque Converter (1)	Stator roller clutch not holding
1-2 Accumulator Assembly (55-57, 104)	• Porosity in piston or 1-2 Accumulator cover and pin assembly • Damaged ring grooves on piston • Piston seal missing, cut or damaged • Valve body to spacer plate gasket at 1-2 Accumulator cover, missing or damaged • Leak between piston and pin • Broken 1-2 Accumulator spring
Line Pressure	Refer to **Oil Pressure High or Low** .

2-4 Servo Assembly (13-28)	4th Servo piston in backward

SLIPPING OR HARSH 1-2 SHIFT

Slipping or Rough 1-2 Shift

Checks	Causes
Valve Body Assembly (60)	• Mislocated valve body to spacer plate checkball or checkballs. • 1-2 Shift valve train stuck due to sediment • Gaskets or spacer plate incorrect, mispositioned or damaged • 1-2 Accumulator valve stuck or damaged • Face not flat • 4-3 sequence valve stuck or damaged • #1 or #8 checkball missing or mis-located • 1-2 accumulator valve bushing rotated 180°
2-4 Servo Assembly (13-28)	• Apply pin too long or too short • 2nd servo apply piston seal missing, cut or damaged • Restricted or missing oil passages • Servo bore in case damaged
2nd Accumulator (55-57, 104)	• Porosity in 1-2 accumulator cover or piston • Piston seal or groove damaged • Nicks or burrs in 1-2 accumulator housing • Missing or restricted oil passage • 1-2 accumulator piston spring not seated • Rough finish in 1-2 accumulator bore in case • A cracked 1-2 accumulator piston - allowing fluid to leak by
2-4 Band (602)	Worn or mispositioned
Oil Pump Assembly (4) or Case (103)	Faces not flat

NO 2-3 SHIFT OR 2-3 SHIFT SLIPS, ROUGH OR HUNTING

No 2-3 Shift or 2-3 Shift slipping, Rough or Hunting

Checks	Causes
Oil Pump (4)	Stator shaft bushings scored or off location
Valve Body Assembly (60)	• 2-3 Shift valve train stuck • Gaskets or spacer plate incorrect, mispositioned or damaged • 2-3 Accumulator valve stuck

	• Face not flat • Chips in servo feed oil, orifice #7 in spacer plate • Mislocated valve body to spacer plate checkball or checkballs
Input Housing Assembly (620-621, 646-655)	• 3-4 clutch or forward clutch plates worn • Excessive clutch plate travel • Cut or damaged 3-4 clutch or forward clutch piston seals • Porosity in input clutch housing or piston • 3-4 clutch piston checkball stuck, damaged or not sealing • Restricted apply passages • Forward clutch piston retainer and ball assembly not seating • Sealing balls loose or missing • Input housing (621) cracked or broken
Case (103)	3rd accumulator retainer and ball assembly not seating
2-4 Servo Assembly (13-28)	2nd apply piston seals missing, cut or damaged

SECOND/THIRD GEAR ONLY OR FIRST/FOURTH GEARS ONLY

Second/Third Gears Only or First/Fourth Gears Only

Checks	Causes
1-2 Shift Solenoid Valve (367A)	• Sediment is in the valves • The electrical connection is faulty • Damaged seal

NO FIRST OR SECOND GEAR/NO THIRD OR FOURTH GEAR

No 1st or 2nd/No 3rd or 4th

Checks	Causes
2-3 Shift Solenoid Valve (367B)	• Sediment is in the valves • The electrical connection is faulty • Damaged seal

NO SECOND GEAR, NO FOURTH GEAR, AND NO REVERSE GEAR

No Second Gear, No Fourth Gear and No Reverse Gear

Checks	Causes
Reaction Sun Shell (670)	Broken spline on reaction sun shell/replace shell.

THIRD GEAR ONLY

Third Gear Only

Checks	Causes
System Voltage	• 12 volts not supplied to transmission • Electrical short (pinched solenoid wire) • Solenoid not grounded

3-2 FLARE OR TIE-UP

3-2 Flare or Tie-Up

Checks	Causes
3-2 Shift Solenoid Valve Assembly (394)	• Shorted or damaged • Contamination • Damaged Seal • Check ball not seating

NO 3-4 SHIFT, SLIPS OR ROUGH 3-4 SHIFT

No 3-4 Shift/Slipping or Rough 3-4 Shift

Checks	Causes
Oil Pump Assembly (4)	• Pump cover retainer and ball assembly omitted or damaged • Faces not flat

Valve Body Assembly (60)	• Valves stuck
	  ○ 2-3 Shift valve train
	  ○ Accumulator valve
	  ○ 1-2 Shift valve train
	  ○ 3-2 Shift solenoid valve assembly
	• Spacer plate or gaskets incorrect, mispositioned or damaged

2-4 Servo Assembly (13-28)	• Incorrect band apply pin • Missing or damaged servo seals • Porosity in piston, cover or case • Damaged piston seal grooves • Plugged or missing orifice cup plug
Case (103)	• 3rd Accumulator retainer and ball assembly leaking • Porosity in 3-4 accumulator piston or bore • 3-4 Accumulator piston seal or seal grooves damaged • Plugged or missing orifice cup plug

	• Restricted oil passage
Input Housing Assembly (621)	Refer to **No 2-3 Shift or 2-3 Shift Slips, Rough or Hunting** .
2-4 Band Assembly (602)	Worn or misassembled

NO REVERSE OR SLIPS IN REVERSE

No Reverse or Slips in Reverse

Checks	Causes
Input Housing Assembly (602)	• 3-4 Apply ring stuck in applied position • Forward clutch not releasing • Turbine shaft seals missing, cut or damaged
Manual Valve Link (89)	Disconnected
Valve Body Assembly (60)	• 2-3 Shift valve stuck • Manual linkage not adjusted • Spacer plate and gaskets incorrect, mispositioned or damaged • Lo overrun valve stuck • Orificed cup plug restricted, missing or damaged
Reverse Input Clutch Assembly (605-614)	• Clutch plate worn • Reverse input housing and drum assembly cracked at weld • Clutch plate retaining ring out of groove • Return spring assembly retaining ring out of groove • Seals cut or damaged • Restricted apply passage • Porosity in piston • Belleville plate installed incorrectly • Excessive clutch plate travel • Oversized housing
Lo and Reverse Clutch (694-696)	• Clutch plates worn • Porosity in piston • Seals damaged • Return spring assembly retaining ring mispositioned • Restricted apply passage
Reaction Sun Shell (670)	Broken spline on reaction sun shell/replace shell

NO PART THROTTLE OR DELAYED DOWNSHIFTS

No Part Throttle or Delayed Downshifts

Checks	Causes
Input Housing Assembly (621)	• 3-4 Apply ring stuck in applied position • Forward clutch not releasing • Turbine shaft seals missing, cut or damaged
Manual Valve Link (89)	Disconnected
Valve Body Assembly (60)	• 2-3 Shift valve stuck • Manual linkage not adjusted • Spacer plate and gaskets incorrect, mispositioned or damaged • Lo overrun valve stuck • Orificed cup plug restricted, missing or damaged
Reverse Input Clutch Assembly (606-614)	• Clutch plate worn • Reverse input housing and drum assembly cracked at weld • Clutch plate retaining ring out of groove • Return spring assembly retaining ring out of groove • Seals cut or damaged • Restricted apply passage • Porosity in piston • Belleville plate installed incorrectly • Excessive clutch plate travel • Oversized housing
Lo and Reverse Clutch (694-696)	• Clutch plates worn • Porosity in piston • Seals damaged • Return spring assembly retaining ring mispositioned • Restricted apply passage

HARSH GARAGE SHIFT

Harsh Garage Shift

Checks	Causes
Valve Body Assembly (60)	• Orifice cup plug missing • Checkball missing

NO OVERRUN BRAKING - MANUAL 3-2-1

No Overrun Braking - Manual 3-2-1

Checks	Causes
External Linkage	Not adjusted properly
Valve Body Assembly (60)	• 4-3 Sequence valve stuck • Checkball mispositioned • Spacer plate and gaskets incorrect, damaged or mispositioned
Overrun and Forward Clutch Assembly (644-651)	• Turbine shaft oil passages plugged or not drilled • Turbine shaft seal rings damaged • Turbine shaft sealing balls loose or missing • Porosity in forward or overrun clutch piston • Overrun piston seals cut or damaged • Overrun piston checkball not sealing

NO TORQUE CONVERTER CLUTCH (TCC) APPLY (300 RPM SLIP)

No Torque Converter Clutch (TCC) Apply

Checks	Causes
Valve Body Assembly (60)	• Regulator apply valve side loading • Stuck converter clutch valve • TCC apply valve stuck closed (debris in bore) • TCC/PWM solenoid broken/cracked • Turbine shaft O-ring omitted • TCC/PWM solenoid leaking
Input Housing and Turbine Shaft Assembly (621)	• Turbine shaft hole not drilled to full depth • Scratched turbine shaft journals • Turbine shaft O-ring omitted/damaged • Turbine shaft retainer and ball assembly restricted or damaged
Electrical	• 12 volts not supplied to transmission • Outside electrical connector damaged • Inside electrical connector damaged • Wire harness damaged • TCC solenoid damaged • Electrical short (pinched wire) • TCC solenoid not grounded
Torque Converter Clutch (1)	Internal damage (blue or distorted)
Oil Pump Assembly (4)	• TCC spring cocked • Orifice cup plug restricted or damaged

	• Pump to case gasket mispositioned • Converter clutch valve retaining ring mispositioned • Converter clutch valve stuck or assembled backward
Transmission Fluid Pressure Manual Valve Position Switch (69)	• Contamination • Damaged seals
Solenoid Screen (367A/367B)	Blocked
TCC Solenoid Valve (Part of 66)	Internal damage
Engine Speed Sensor	Internal damage
Engine Coolant Temperature Sensor	Internal damage
Automatic Transmission Fluid Temperature Sensor (Part of 69)	Internal damage
Brake Switch	Internal damage
PCM	Internal damage
TCC PWM Solenoid (Part of 66)	Internal damage

TORQUE CONVERTER CLUTCH (TCC) SHUDDER

No Torque Converter Clutch Shudder

Checks	Causes
Miscellaneous	• Low oil presure • Engine not tuned properly • Contaminated transmission oil
Oil Filter (72)	• Crack in filter body • Flash restricting filter neck • O-ring seal (71) cut or damaged
Torque Converter Assembly (1)	• Internal damage • Broken weld or missing weight
Oil Pump Assembly (4)	• Converter clutch valve (224) stuck • Restricted oil passage
Input Housing and Shaft Assembly (621)	• Turbin shaft O-ring (618) cut or damaged • Turbin shaft retainer and ball assembly (617) restricted or damaged

NO TORQUE CONVERTER CLUTCH (TCC) RELEASE

No TCC Release

Checks	Causes

TCC Solenoid Valve (Part of 66)	• External ground • Clogged exhaust orifice
Converter (1)	Internal damage
Valve Body Assembly (60)	The converter clutch apply valve is stuck in the apply position
Oil Pump Assembly (4)	The converter clutch valve is stuck
PCM	External ground

TORQUE CONVERTER CLUTCH (TCC) SLIP - 100 RPM SLIP

TCC Slip (100 RPM)

Checks	Causes
Valve Body Assembly (60)	• TCC/PWM solenoid leaks • Regulator apply valve or converter clutch shift valve sticking or side loading
Oil Pump Assembly (4)	• Stator shaft bushings worn, due to scratched turbine shaft journal (replace bushings and input housing assembly) • TCC apply valve is stuck open • TCC solenoid leaking
Input Housing and Turbine Shaft Assembly (621)	• Scratched journal on turbine shaft • Turbine shaft O-ring cut • Turbine shaft hole not drilled to full depth

TORQUE CONVERTER CLUTCH (TCC) SLIP WITH STALL/STUMBLE

TCC Slip with Stall/Stumble

Checks	Causes
TCC Apply Valve (Part of 66)	Stuck open

TORQUE CONVERTER CLUTCH (TCC) INTERMITTENT - OK COLD/SLIPS HOT

Intermittent TCC OK Cold/Slips Hot

Checks	Causes
TCC PWM Solenoid (396)	Leaks
Regulator Apply Valve (216)	Sticking valve
Converter Clutch Shift Valve (224)	Sticking valve

NO FOURTH GEAR, OR SLIPS IN FOURTH GEAR

No 4th or Slipping 4th

Checks	Causes
Checkball #2, 4,	Valve body checkball in wrong location or an additional checkball is installed. Refer to

8 or 12	Control Valve Body Installation in Transmission Unit Repair article-4L60-E.
Orificed Cup Plug (240)	Not fully pressed into pump cover. Refer to Oil Pump Stator Shaft Bushing Replacement in Transmission Unit Repair article-4L60-E.

SLIP/FLARE IN ANY GEAR

Slip/Flare in any Gear

Checks	Causes
Pump Slide Inner/Outer Spring (206/207)	Omitted

NO THIRD GEAR

No 3rd

Checks	Causes
Orificed Cup Plug (698)	Missing or blown out

DRIVES IN NEUTRAL

Drives in Neutral

Checks	Causes
Forward Clutch (446-451)	The clutch does not release
Manual Valve Link (89)	Disconnected
Case (103)	• The face is not flat • Internal leakage exists

SECOND GEAR START

Second Gear Start

Checks	Causes
Signal Noise on VSS Circuit	Chassis vibrations, incorrect harness routing, owner installed electronic components.
Diagnostic Trouble Code (DTC)	• Electrical or mechanical 1-2 Shift Solenoid Valve (367) malfunction. • Sediment in the valve body may cause improper TFP operation.
Leaking AFL Circuit	Spacer plate (48), spacer plate gaskets (47 or 52), control valve body (60), mispositioned, damaged or poor sealing/mating surface exist.
Blocked or restricted Valve Body Spacer Plate (48) Spacer Plate to Case Gasket (47) or Spacer Plate to Valve Body Gasket (52)	Trapped sediment or metal particles.
Stuck 1-2 Shift Valve (366)	• Trapped sediment or metal particles.

	• Binding shift valve or worn valve body bore.
TFP manual valve position switch (69)	TFP manual valve position switch (69) erratic operation.

NO PARK

No Park

Checks	Causes
Parking Lock Actuator Linkage (85-90)	• Actuator rod assembly bent or damaged • Actuator rod spring binding or improperly crimped • Actuator rod not attached to inside detent lever • Parking lock bracket damaged or not torqued properly • Inside detent lever not torqued properly • Parking pawl binding or damaged

OIL OUT THE VENT

Oil Out the Vent

Checks	Causes
Oil Pump (4)	Chamber in pump body rotor pocket
Miscellaneous	Fluid level-overfilled

VIBRATION IN REVERSE AND WHINING NOISE IN PARK

Vibration in Reverse and Whining Noise in Park

Checks	Causes
Oil Pump (4)	Chamber in pump body rotor pocket
Miscellaneous	Fluid level-overfilled

REATTACHING NOISE

Reattaching Noise

Checks	Causes
Parking Brake Pawl (50-81)	The parking pawl return spring is weak, damaged, or misassembled

POPPING NOISE

Popping Noise

Checks	Action
DEFINITION: A popping noise, similar to popcorn popping	
Oil Pump	• Check fluid level.

System	• 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.

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	Verify that the noise is internal to the oil pump during a preliminary oil pressure check. An increase in line pressure will vary an oil pump noise.

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 Procedure** .

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.	

NO DRIVE IN ALL RANGES

No Drive in All Ranges

Checks	Causes
Low Transmission Fluid Level	Transmission or cooler line leak
Oil Pump (4)	Damaged oil pump rotor (212)
Torque Converter (1)	• Damaged pump drive

	• The converter to flex plate bolts are missing

NO DRIVE IN DRIVE RANGE

No Drive in Drive Range

Checks	Causes
Torque Converter (1)	• The stator roller clutch is not holding • The converter is not bolted to the flex plate

SHIFT LEVER INDICATES WRONG GEAR

Shift Lever Indicates Wrong Gear

Checks	Causes
Manual Valve (340)	Not engaged to detent lever
Detent Roller Pin (63)	Missing or damaged
Detent Roller (63)	Broken or disconnected
Detent Spring (63)	Broken or disconnected
Manual Valve Link (89)	Loose or missing
Manual Shaft (84)	Flats not parallel
Indicator Linkage	Misadjusted

NO GEAR SELECTION

No Gear Selection

Checks	Causes
Detent Lever (63)	Nut loose or missing
Manual Valve (84)	Stuck
Spacer Plate/Gaskets (47, 48, 52)	Blocked holes
Control Valve Body to Case (60/103)	Blocked channels

ENGINE STARTS IN GEAR

Engine Starts in Gear

Checks	Causes
Manual Valve (24)	Not engaged to detent lever
Transmission Range Switch	Not working or mispositioned

DELAY IN DRIVE AND REVERSE

Delay in Drive and Reverse

Checks	Causes
Forward Clutch Piston (630)	Cut or damaged piston seals

Low and Reverse Clutch Piston (695)	Cut or damaged inner, outer or center clutch seals
Reverse Input Clutch Piston Assembly (607)	Cut or damaged inner or outer clutch seals
Pump Cover (215)	Cut or damaged oil seal rings - stator shaft

LACK OF POWER OR HESITATION

Lack of Power or Hesitation

Checks	Causes
Automatic Transmission Fluid Pressure (TFP) Manual Valve Position Switch (69)	Incorrect TFP signal logic for current gear position. Refer to **Transmission Fluid Pressure (TFP) Manual Valve Position Switch Logic** .