

2006 TRANSMISSION

Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

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 <u>Transmission Fluid Checking Procedure</u>. • Refer to <u>Line Pressure Check Procedure</u>. • Refer to <u>Engine Coolant/Water in Transmission</u>. • Refer to <u>Fluid Leak Diagnosis</u>. • Refer to <u>Transmission Overheats</u>. • Refer to <u>Automatic Transmission Fluid Leaks</u>.
Noise and Vibration Diagnosis: This category contains the following topics: • Noise - drive gear, final drive, whine, growl, hum, rattle, knock, clunk • Vibration	• Refer to <u>Noise and Vibration Analysis</u>. • Refer to <u>Vibration at Idle</u>. • Refer to <u>Vibration While Driving</u>. • Refer to <u>Hum or Rattle Noise at Idle</u>. • Refer to <u>Whine/Growl Noise That Changes with Vehicle Speed</u>.
Range Performance Diagnosis: This category contains the following topics: • No Park • No Reverse or slips • No Drive or slips • No engine braking • Range selector displays incorrect range	• Refer to <u>Range Selector Displays Incorrect Range</u>. • Refer to <u>Stall Speed Test</u>. • Refer to <u>Engagement Delay Test</u>. • Refer to <u>No Forward and Reverse</u>. • Refer to <u>Slips in Drive or No Drive</u>. • Refer to <u>Slips in Reverse or No Reverse</u>. • Refer to <u>Engine Stalls During</u>

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Reverse or Drive Engagement.

- Refer to Slips on Acceleration.
- Refer to Harsh Feel at Light Acceleration or Deceleration Without Causing an Upshift or Downshift.
- Refer to No Engine Braking in Fourth Gear.
- Refer to No Engine Braking in Third Gear.
- Refer to No Engine Braking in Second Gear.
- Refer to No Response to Movement of Shift Lever.
- Refer to Transmission Attempts to Move but Appears Locked Up.

Shift Quality Feel Diagnosis:

This category contains the following topics:

- Harsh shifts
- Soft shifts
- Harsh engagement
- Delayed engagement

- Refer to Harsh Park or Neutral to Drive Engagement.
- Refer to Harsh Park or Neutral to Reverse Engagement.
- Refer to Harsh Upshift.
- Refer to Harsh Shift on Coastdown.
- Refer to Harsh Forced Downshift.

Shift Pattern:

This category contains the following topics:

- No upshift
- No downshift

- Refer to No 1-2 Upshift.
- Refer to No 2-3 Upshift.
- Refer to No 3-4 Upshift.
- Refer to No 4-5 Upshift.
- Refer to No 5-4 Downshift.
- Refer to No 4-3 Downshift.
- Refer to No 3-2 Downshift.
- Refer to No 2-1 Downshift.

Shift Speed Diagnosis:

This category consists of the following topic:

Inaccurate or inconsistent shift points

- Refer to Engagement Time From Park or Neutral to Drive is Not Within Specifications.
- Refer to Engagement Time From Park or Neutral to Reverse is Not Within Specifications.

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

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 **Flexplate/Torque Converter Vibration Test**.
- Refer to **Torque Converter Clutch (TCC) Stuck On or Off**.

Symptom Can Not Be Duplicated or Symptom Not Found:

This category contains the following topics:

- Transmission fluid diagnosis
- Line pressure diagnosis
- Road testing

- Refer to **Transmission Fluid Checking Procedure**.
- Refer to **Line Pressure Check Procedure**.
- Refer to **Road Test Procedure**.

RANGE SELECTOR DISPLAYS INCORRECT RANGE

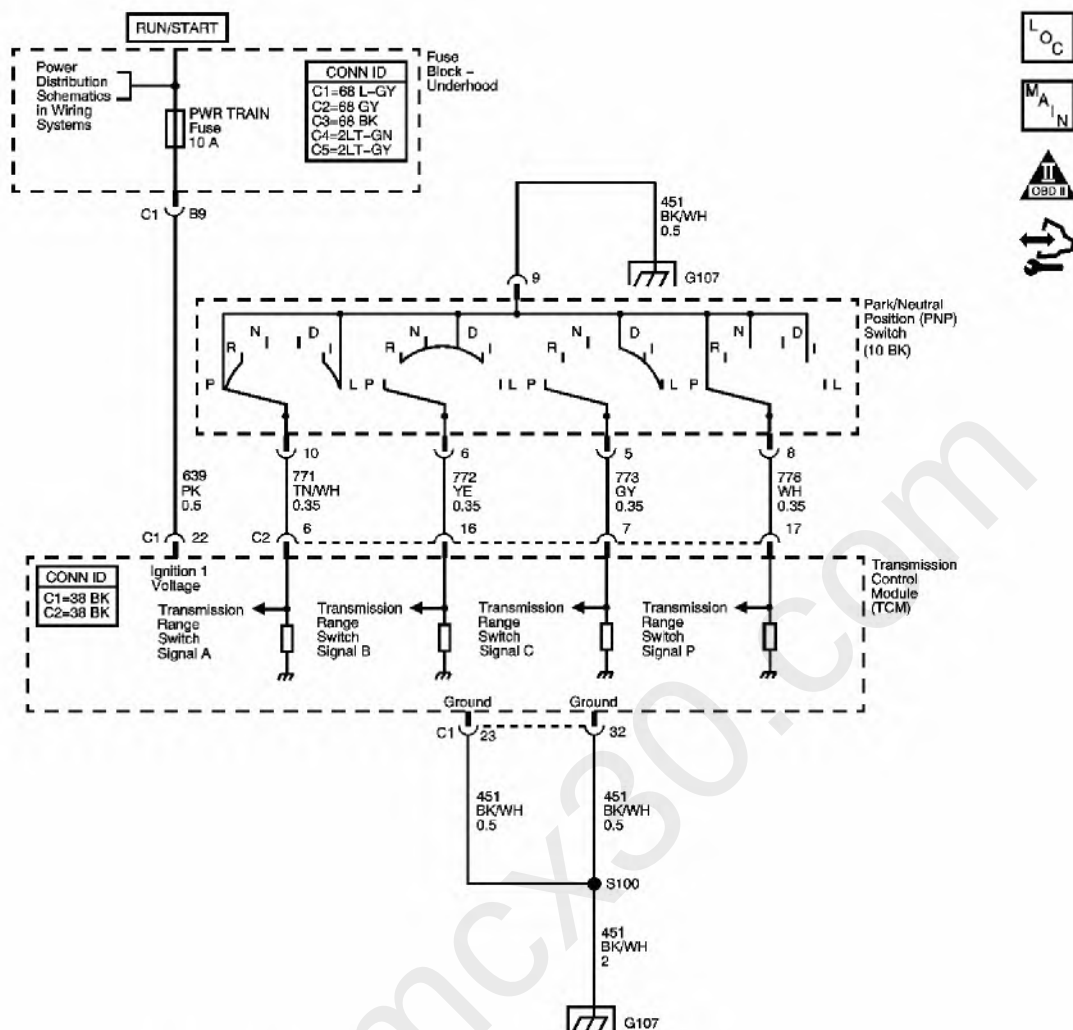


Fig. 1: Park/Neutral Position (PNP) Switch Circuit
Courtesy of GENERAL MOTORS CORP.

CIRCUIT DESCRIPTION

The TCM also communicates the park/neutral switch status to the BCM via serial data. The BCM uses this data to control the Electronic PRNDL display on the shifter. The BCM controls the LED's in the PRNDL display through 4 control circuits. The BCM has 8 DTCs for these 4 control circuits. These DTCs diagnose a shorted or an open for each circuit.

DIAGNOSTIC AIDS

Refer to **Transmission Range Switch Logic** for valid combinations of switch signal circuits A, B, C and P.

TEST DESCRIPTION

The numbers below refer to the step numbers on the diagnostic table.

4: By disconnecting the TR switch, the voltage path for all TR switch circuits would be removed and the TCM should recognize all circuits as open. The scan tool should display LOW for all range signals.

5: This step tests the TR switch wiring for an open or lack of ground from the TCM.

6: This step tests the TR switch wiring and the TCM by providing a voltage path through a fused jumper wire. When jumpered, the scan tool range signal A should change to HI.

7: This step tests the TR switch wiring and the TCM by providing a voltage path through a fused jumper wire. When jumpered, the scan tool range signal B should change to HI.

8: This step tests the TR switch wiring and the TCM by providing a voltage path through a fused jumper wire. When jumpered, the scan tool range signal C should change to HI.

Range Selector Displays Incorrect Range

Step	Action	Values	Yes	No
1	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Select TR Sw. on the scan tool. 4. With the scan tool, observe the TR Sw. display while selecting each transmission range: P, R, N, D, I and L. Does each selected transmission range match the scan tool TR Sw. display?	-	Go to Testing for Intermittent Conditions and Poor Connections in Wiring Systems	Go to Step 2
2	1. Inspect the TR switch for the following: • Damage • Loose or missing mounting hardware Refer to Transaxle Range Switch Replacement . • Proper adjustment Refer to Transaxle Range	-		

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	<u>Switch Adjustment</u> . 2. Inspect the shift cable for the following: • Damaged or stretched cable • Proper adjustment Refer to <u>Shift Control Replacement</u> .			
	Did you find and correct a condition?		Go to Step 15	Go to Step 3
3	With the scan tool, observe the TR Sw. A/B/C/P display. Does the scan tool TR Sw. A/B/C/P parameter indicate LOW for all range signal states?	-	Go to Step 12	Go to Step 4
4	1. Turn OFF the ignition. 2. Disconnect the TR switch 10-way connector. 3. Turn ON the ignition, with the engine OFF. Does the scan tool TR Sw. A/B/C/P parameter indicate LOW for all range signal states?	-	Go to Step 5	Go to Step 9
5	1. Using the digital multimeter (DMM) and the J 35616 GM terminal test kit, measure the voltage from terminal 10 of the TR switch 10-way connector to ground. 2. Measure the voltage from terminal 6 of the TR switch 10-way connector to B+. 3. Measure the voltage from terminal 5 of the TR switch 10-way connector to B+. 4. Measure the voltage from terminal 8 of the TR switch 10-way connector to B+. Does the voltage measure within the	10-12 V		Go to Step

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	specified range at all four terminals?		Go to Step 6	10
6	Connect a fused jumper wire from terminal 10 of the TR switch 10-way connector, signal A circuit, to B+ while monitoring the scan tool TR Sw. A/B/C/P parameter. When the signal A circuit is jumpered, do any other signal circuits indicate HI?	-	Go to Step 11	Go to Step 7
7	Connect a fused jumper wire from terminal 6 of the TR switch 10-way connector, signal B circuit, to B+ while monitoring the scan tool TR Sw. A/B/C/P parameter. When the signal B circuit is jumpered, do any other signal circuits indicate HI?	-	Go to Step 11	Go to Step 8
8	Connect a fused jumper wire from terminal 5 of the TR switch 10-way connector, signal C circuit, to B+ while monitoring the scan tool TR Sw. A/B/C/P parameter. When the signal C circuit is jumpered, do any other signal circuits indicate HI?	-	Go to Step 11	Go to Step 13
9	Test the signal circuit or circuits of the TR switch that did not indicate LOW for a short to voltage. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 15	Go to Step 14
10	Test the signal circuit or circuits of the TR switch that did not indicate proper voltage for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 15	Go to Step 14
11	Test the affected signal circuits of the TR switch for a shorted together condition. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 15	Go to Step 14
12	Test the voltage supply circuit of the TR switch for an open or short to ground. Refer to Circuit Testing and Wiring	-		

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	Repairs in Wiring Systems. Did you find and correct the condition?		Go to Step 15	Go to Step 13
13	Replace the TR switch. Refer to Transaxle Range Switch Replacement . Did you complete the replacement?	-	Go to Step 15	-
14	Replace the TCM. Refer to Control Module References in Computer/Integrating Systems for replacement, setup, and programming. Did you complete the replacement?	-	Go to Step 15	-
15	1. Turn ON the ignition, with the engine OFF. 2. With the scan tool, observe the TR Sw. display while selecting each transmission range: P, R, N, D, I and L. Does each selected transmission range match the scan tool TR Sw. display?	-	System OK	Go to Step 2

TRANSMISSION FLUID CHECKING PROCEDURE**DESCRIPTION**

Inspection of the transaxle fluid level, correct type of fluid, and the condition of the fluid for accurate operation of the transaxle.

PROCEDURE

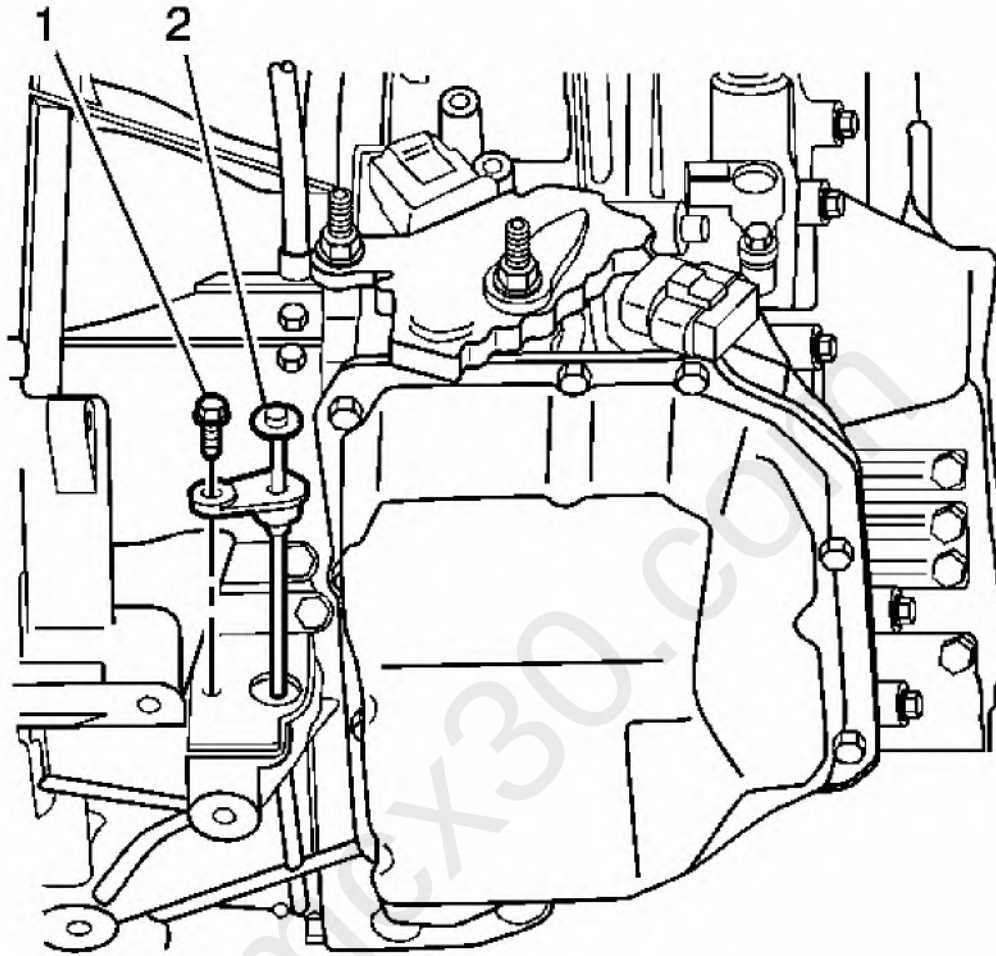


Fig. 2: View Of Transaxle Fluid Level Indicator & Bolt
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Routine inspection of the transaxle fluid is not required. Transaxle fluid inspection is only required if there is a symptom indicating a concern with the fluid.

1. Park the vehicle on a flat level surface.
2. Operate the vehicle in order for the transmission fluid temperature to reach the normal operating range.

Specification: Transaxle normal temperature: 60-70 degrees C (140-158 degrees F)

3. With the engine at idle, manual shift through all transaxle ranges and return to the PARK position. Leave the engine idling.

4. Clean any dirt or debris away from the area of the transaxle fluid level indicator.
5. Remove the transaxle fluid level indicator bolt (1) from the transaxle.
6. Remove the transaxle fluid level indicator (2).
7. Wipe away any transaxle fluid from the indicator.
8. Insert the indicator into the transaxle until fully seated.

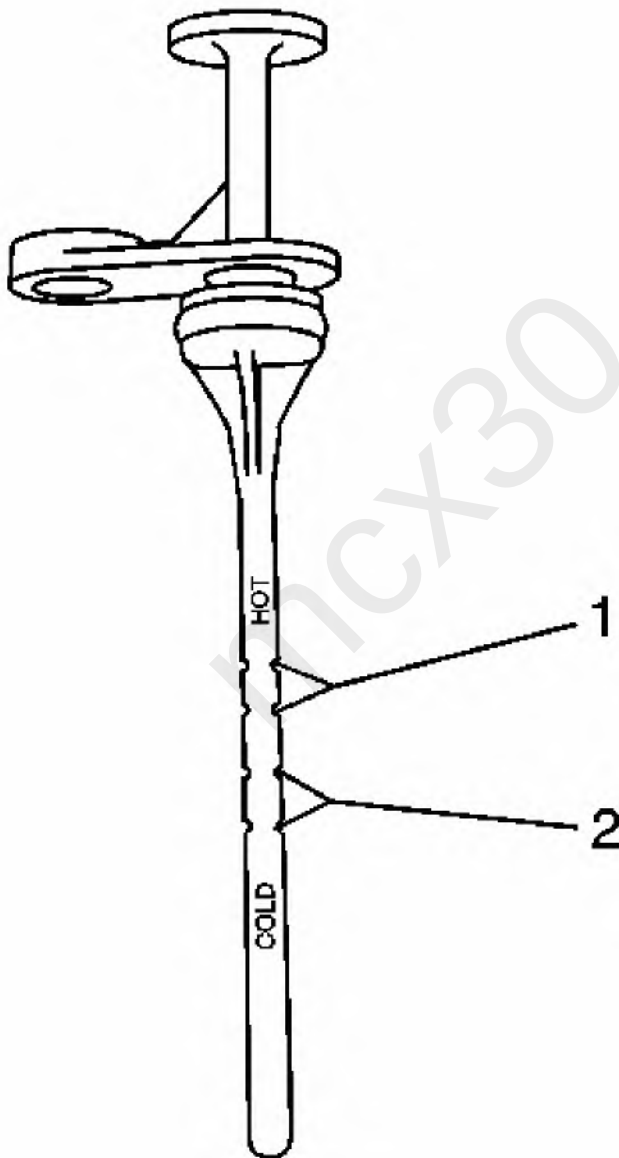


Fig. 3: View Of Transmission Fluid Levels
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Inspecting transaxle fluid level when not at normal temperature can give an incorrect measurement. The transaxle fluid expands when warm.

9. Remove the indicator and inspect the level and the condition of the oil on the indicator:
 - Transmission fluid level at normal operating temperature (1)
 - Transmission fluid level if cold (2)
10. If the fluid level is incorrect inspect for the following conditions:
 - Fluid below level, inspect for a leak. Refer to **Fluid Leak Diagnosis** or **Automatic Transmission Fluid Leaks**.
 - Fluid above level, inspect for contamination of the fluid.

IMPORTANT: The transaxle uses T-IV fluid, GM P/N 88900925 (Canadian P/N 22689186). The fluid is normally red in color. The oil may darken in color with more miles on a vehicle.

11. Inspect the condition of the fluid for the following conditions:
 - Excessively dirty with particles in the fluid
 - If there are no driveability concerns, replace the fluid. Refer to **Transaxle Fluid Replacement**.
 - If driveability concerns are present disassemble and inspect for a cause.
 - Burnt smell
 - Inspect for the correct fluid. Refer to **Fluid Capacity Specifications**.
 - Inspect for conditions that may of cause overheating of the transmission fluid. Refer to **Transmission Overheats**.
 - If there are no driveability concerns, replace the fluid. Refer to **Transaxle Fluid Replacement**.
 - If driveability concerns are present disassemble and inspect for cause.
 - Inspect the transmission oil cooler system for functioning properly. Refer to **Automatic Transmission Oil Cooler Flushing and Flow Test**.
 - Black in color
 - Disassemble the transaxle and inspect for components that may have over heated.
 - Inspect the transmission oil cooler system for functioning properly. Refer to **Automatic Transmission Oil Cooler Flushing and Flow Test**.
 - Milky or white tint in color from coolant or water
 - Inspect for failure of the transaxle oil cooler. Refer to **Engine Coolant/Water in Transmission**.
 - Inspect for missing or improperly routed vent hose.

- Inspect for missing fill plug.

12. Install the fluid level indicator.

NOTE: Refer to Fastener Notice in Cautions and Notices.

13. Install the fluid indicator bolt.

Tighten: Tighten the fluid indicator bolt to 10 N.m (89 lb in).

LINE PRESSURE CHECK PROCEDURE

Tools Required

- J-21867-50 Transmission Line Pressure Adapter. See Special Tools .
- J 21867 Pressure Gage. See Special Tools .

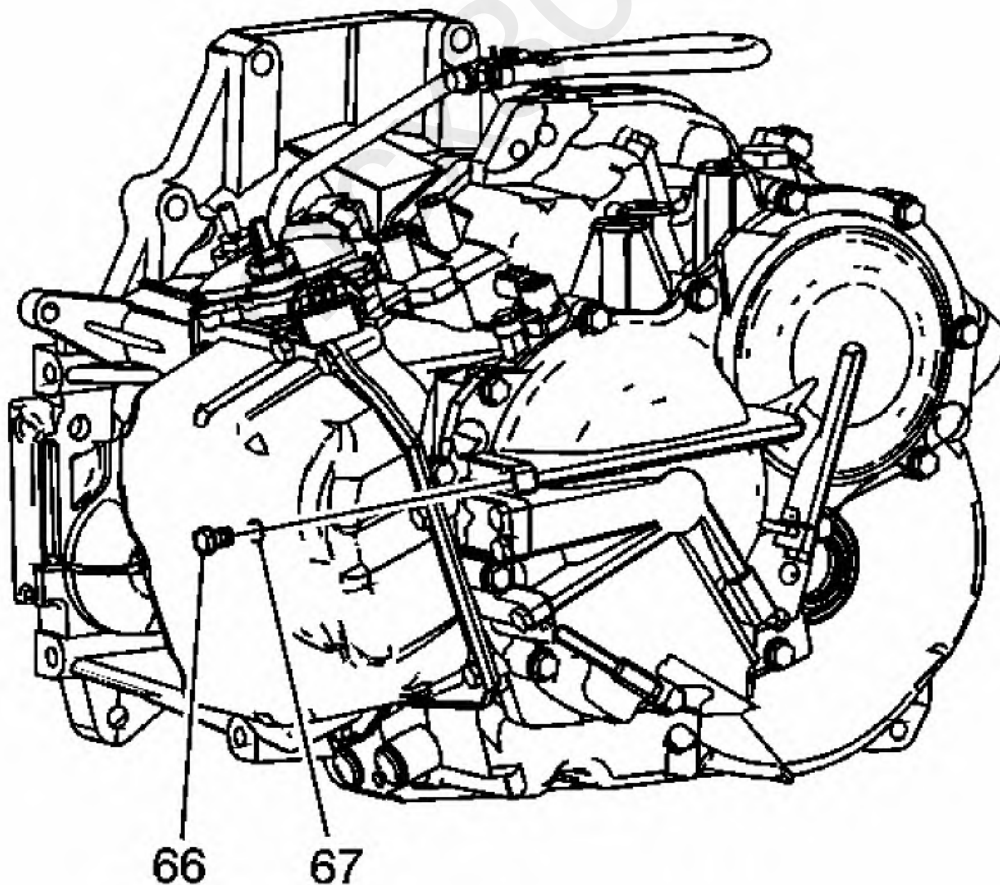


Fig. 4: View Of Automatic Transmission Fluid Pressure Test Hole Plug
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the left front splash shield. Refer to **Splash Shield Replacement - Engine** in Body Front End.
3. Remove the automatic transmission fluid pressure test hole plug (66) and O-ring seal (67).

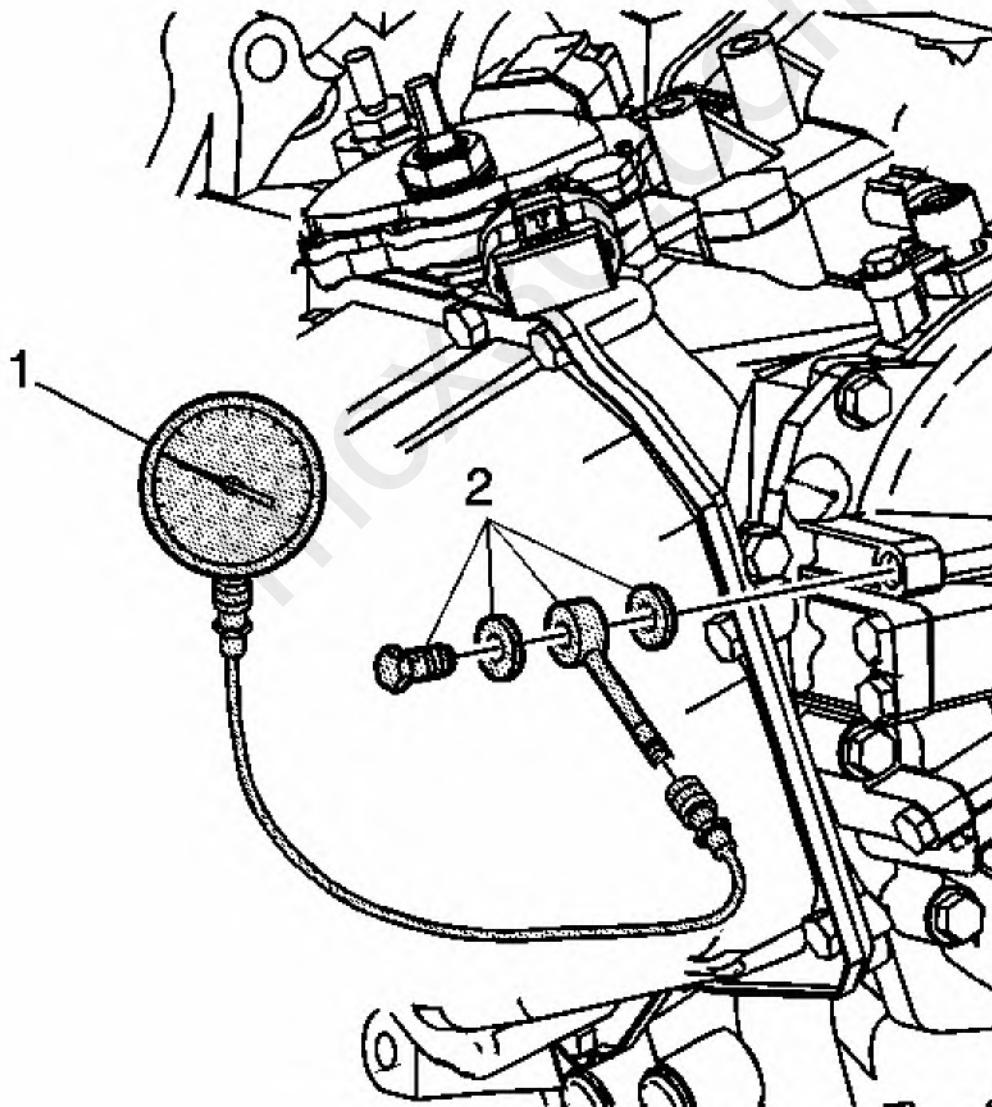


Fig. 5: Installing J-21867-50 & J 21867
Courtesy of GENERAL MOTORS CORP.

4. Install the **J-21867-50** (2) with a sealing washer on each side of the adapter into the test hole. See **Special Tools** .
5. Install the quick connect fitting of the **J-21867-50** on the hose of **J 21867** . See **Special Tools** .
6. Connect the **J 21867** (1) to the **J-21867-50** (2). See **Special Tools** .
7. Fully apply the parking brake.
8. Connect a scan tool for engine RPMs.
9. Start the engine and allow the engine to warm up at idle.
10. Firmly apply the brake and shift into REVERSE (R).
11. Allow the engine to idle and record the line pressure.

Specifications: 500-610 kPa (73-89 psi)

IMPORTANT: Do not perform the 2600 RPM test longer than 5 seconds.

12. Increase the engine speed to 2600 RPM and record the line pressure.

Specifications: 1710-1980 kPa (248-287 psi)

13. Allow the transmission fluid to cool at idle in PARK (P) for at least one minute.
14. Firmly apply the brake and shift into DRIVE (D).
15. Allow the engine to idle and record the line pressure.

Specifications: 330-390 kPa (48-57 psi)

IMPORTANT: Do not perform the 2600 RPM test longer than 5 seconds.

16. Increase the engine speed to 2600 RPM and record the line pressure.

Specifications: 1280-1418 kPa (186-206 psi)

17. If the line pressure reading is not within specifications refer to the Line Test Results table.

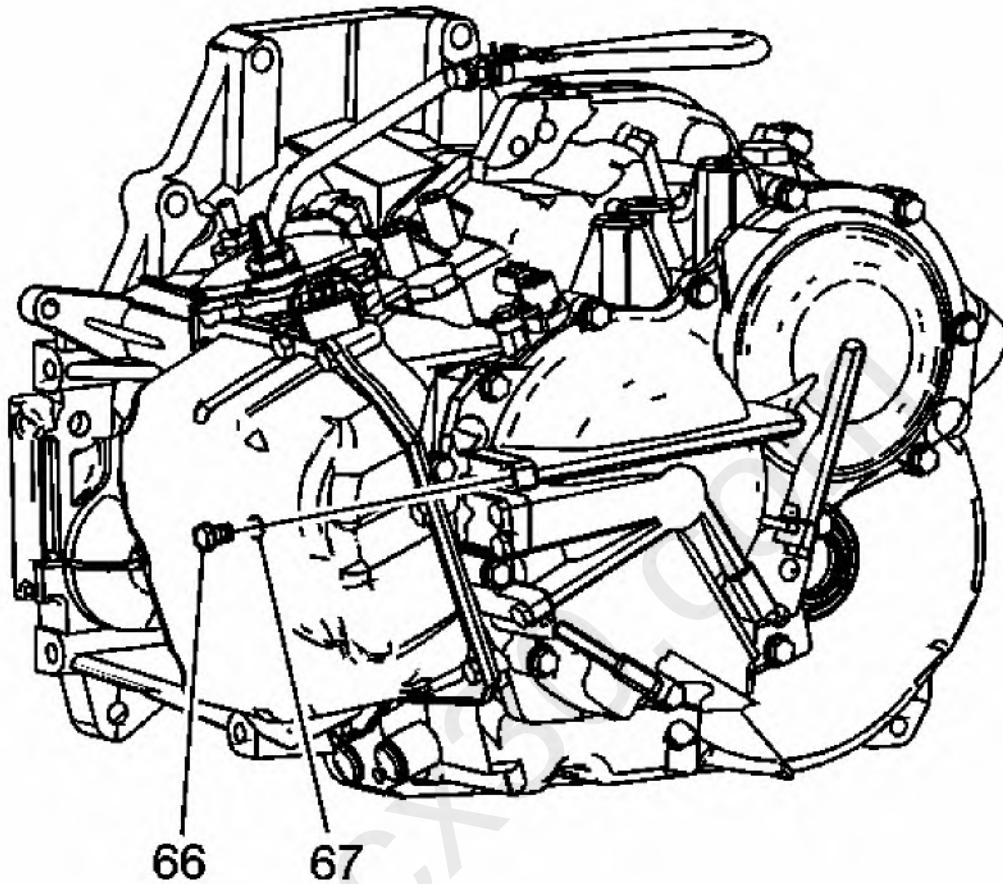


Fig. 6: View Of Automatic Transmission Fluid Pressure Test Hole Plug
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

18. Remove the tools and install the automatic transmission fluid pressure test hole plug (66) and a new O-ring (67).

Tighten: Tighten the test hole plug to 7 N.m (62 lb in).

19. Install the left front splash shield. Refer to in Body Front End.

Line Test Results

Result	Possible Cause
HIGHER than specification in BOTH	• Line pressure control solenoid valve assembly - SLT (316) concern

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

DRIVE AND REVERSE	• Primary regulator valve (395) concern
LOWER than specification in BOTH DRIVE AND REVERSE	• Line pressure control solenoid valve assembly - SLT (316) concern • Primary regulator valve (395) concern • Fluid pump assembly (2) concern • 1-2 reverse clutch (603) concern
LOWER than specification in DRIVE ONLY	• Low system line pressure • 1-2 reverse clutch (603) slipping • DRIVE hydraulic circuit concern/failure • Forward clutch (565) concern
LOWER than specifications in REVERSE ONLY	• REVERSE hydraulic circuit concern/failure • Direct clutch (562) concern • Low and reverse clutch (511) concern

TRANSMISSION ADAPTIVE LEARN PROCEDURE

Perform the transmission adaptive learn procedure after any of the following service procedures:

- Transmission Control Module (TCM) replacement
- TCM calibration change
- Control valve body replacement
- Transaxle overhaul
- Transaxle replacement

IMPORTANT: Perform all steps of the adaptive learn procedure. Repeat the steps as many times as indicated. Engine flare during shifting or harsh shifts will occur if not done correctly. When performing the up/down shifting during 2-3 and 3-4 up-shifts, small shift flare may occur the first or second time depending on transaxle internal tolerances.

1. Drive the vehicle to warm the transaxle fluid until 65-110°C (150-230°F). The adaptive learn procedure will not work unless transaxle fluid is the correct temperature.
2. Reset the transaxle adaptive learns using a scan tool. Go to the Transmission Special Functions then Trans. Output Controls menu and select Reset Transmission Adapts.
3. Perform the following steps for the garage shifts adaptive learn.

1. Apply the parking brake and the foot brake.
 2. Shift from NEUTRAL to REVERSE and keep in REVERSE for 3 seconds.
 3. Shift from REVERSE to NEUTRAL.
 4. Repeat the above two steps five times.
 5. Shift from NEUTRAL to DRIVE and keep in DRIVE for 3 seconds.
 6. Shift from DRIVE to NEUTRAL.
 7. Repeat the above two steps five times.
4. Perform the following steps for the Up/Down shifting adaptive learn.
1. Drive the vehicle in DRIVE with light (15-20 percent) throttle until above 50 km/h (31 mph) in 4th gear.
 2. Decelerate and apply the brakes until vehicle comes to a stop. Brake the vehicle so that it takes at least 14 seconds.
 3. Repeat the above steps five times.

IMPORTANT: Depending on vehicle model, the shift indicator positions are labeled P R N D I L and some the positions are labeled P R N D L4 L2. The transaxle operation is same with either label.

I = Intermediate and L4 = Low four

L = Low and L2 = Low two

5. Perform the following steps for 2-1 Manual down shift adaptive learn.
1. Drive the vehicle in I or L4 until over 25 km/h (16 mph) in 2nd with any throttle position.
 2. Decelerate, shift from I or L4 to L or L2 manually and stop the vehicle.
 3. Repeat the above two steps ten times.

IMPORTANT: If shift quality does not improve, ensure the TCM has the correct transmission calibration.

6. Confirm shift quality.

ROAD TEST PROCEDURE

CONDITIONS

Verify that the automatic transmission fluid is between 50-80°C (120-176°F).

PURPOSE

A complete road test is done in order to accomplish one of the following:

- Verify that a customer concern actually exists
- Diagnose a symptom malfunction accurately
- Confirm that the automatic transmission is functioning properly after a repair is completed

PROCEDURE

PARK Range Test

1. Park the vehicle on a grade of greater than 5 degrees.
2. With the gear selector in the PARK position, release the service and parking brakes if applied. There should be little or no initial movement in the vehicle. This procedure is done to verify that the park pawl (702) is properly engaged with the front differential transfer drive gear assembly (14).

DRIVE Range Test

1. Road test the vehicle in order to verify that the automatic transmission assembly has the correct up-shift, down-shift, kick-down and torque converter clutch (TCC) lock up operation at the shift points as listed in the **Shift Speed** table.
2. Decelerate the vehicle in order to verify correct engine brake operation.
3. Verify that there is no abnormal shock, noise, slip, and/or harshness during the course of normal operation.

TORQUE CONVERTER DIAGNOSIS PROCEDURE

The torque converter clutch (TCC) is applied by fluid pressure, which is controlled by the pressure control solenoid valve. The pressure control solenoid valve is located inside of the automatic transmission assembly. The pressure control solenoid valve is controlled through a combination of computer controlled switches and sensors.

TORQUE CONVERTER STATOR

The torque converter stator roller clutch can have 2 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 restricted, 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 torque converter may reveal a blue color from overheating.

If the torque 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 6 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:

- 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 the 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 improper gap, cracks, high resistance or a broken insulator.

- Ignition coil

Look for a white discoloration or bulls eye marks on the coil. This indicates arcing while the engine is misfiring.

- Fuel injector

There may be an intermittent internal electrical short.

- Engine mounts

Vibration from loose or weak mounts can be multiplied by TCC engagement.

- Axle joints

Check for proper installation, wear and/or damage.

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 ATF is contaminated with engine coolant.
- An internal failure occurs in the stator roller clutch.
- Overheating produced heavy debris from clutch material.
- 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 fluid has an odor or the fluid 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

DRIVE PLATE (FLEXPLATE) DEFLECTION

Inspect the drive/flexplate assembly in order to verify that the deflection/lateral runout is within specification as listed. If lateral runout is greater than the maximum allowed specification, replace the drive/flexplate assembly.

Specification: Lateral runout of the drive/flexplate assembly must be less than 0.2 mm (0.008 in).

NOTE: When installing the TCC to the drive/flexplate, make sure to use specified TCC mount bolts. DO NOT use longer bolts. Using longer bolts will result in deformation of the TCC cover and damage to the TCC lock up clutch lining. TCC lock up malfunction will eventually occur, resulting in a need to replace the TCC assembly.

IMPORTANT: If abnormal wear or witness marks are present on the torque converter clutch (TCC) sleeve, or on the fluid pump assembly, replace the TCC and the automatic transmission fluid pump assembly.

STALL SPEED TEST

PURPOSE/DESCRIPTION OF TEST

A stall test is performed to inspect the overall performance of the automatic transmission and engine assembly by measuring the stall speed in both the DRIVE and REVERSE gear ranges.

CONDITIONS

- Verify that the automatic transmission fluid (ATF) temperature is between 50-80°C (120-176°F).
- All additional electrical loads are OFF.

NOTE: Do not continuously run the test procedure for longer than 5 seconds because of the extreme increase in the automatic transmission fluid (ATF) temperature. Also, be sure to keep the interval between stall tests to more than 1 minute in order to prevent damage to the automatic transmission internal components.

PROCEDURE

1. Chock all 4 wheels and fully apply the parking brake in order to prevent any vehicle movement during testing.

2. Apply firm pressure to the service brake pedal with the left foot in order to apply the service brakes.
3. Move the automatic transmission manual gearshift selector from the PARK position to the DRIVE position.
4. Evenly press the accelerator pedal to the wide-open throttle (WOT) position with the right foot.
5. Record the maximum engine RPM noted within 5 seconds of achieving the WOT position, and then return to the closed throttle position. Return the gear selector to the PARK position.
6. Wait 1 minute before proceeding to the next portion of the test procedure.
7. Move the automatic transmission manual gearshift selector from the PARK position to the REVERSE position.
8. Evenly press the accelerator pedal to the wide-open throttle (WOT) position with the right foot.
9. Record the maximum engine RPM noted within 5 seconds of achieving the WOT position, and then return to the closed throttle position. Return the gear selector to the PARK position.

Specifications: 2,450-2,750 RPM

Stall Test Results

Result	Possible Cause
Observed RPM is LOWER than the specification in BOTH DRIVE AND REVERSE ranges	• Base engine concern • Torque converter clutch (TCC) internal one-way clutch failure
Observed RPM is HIGHER than the specification in DRIVE ONLY	• Line pressure is below specifications • Forward clutch (565) concern • Front internal gear and low clutch sprag assembly (25) concern
Observed RPM is HIGHER than the specification in REVERSE ONLY	• Line pressure is below specifications • Direct clutch (562) slipping • Low and reverse clutch (511) slipping
Observed RPM is HIGHER than the specification in BOTH DRIVE AND REVERSE ranges	• Line pressure is below specifications • 1-2 reverse clutch (603) slipping • Internal fluid leak concern in each of the selected ranges

ENGAGEMENT DELAY TEST

PURPOSE/DESCRIPTION OF TEST

Engagement delay is the time delay in seconds that it takes 1 to feel the slight engagement of the automatic transmission assembly into gear. The engagement delay test starts when the automatic transmission gearshift selector is moved from the PARK to the REVERSE or DRIVE positions. This test can also be performed by starting in the NEUTRAL position and then shifting to the DRIVE or REVERSE positions. Engagement delay times can be used to diagnose the hydraulic system and internal clutch conditions/concerns.

CONDITIONS

- Verify that the automatic transmission fluid (ATF) temperature is between 50-80°C (120-176°F).
- All additional electrical loads are OFF.
- The engine is at, and maintains, a base idle.

PROCEDURE

1. Chock all 4 wheels and fully apply the parking brake in order to prevent any vehicle movement during testing.

IMPORTANT:

- Perform each test 3 times and take the average value.
- Maintain a time interval of greater than 1 minute between engagement delay tests. The 1 minute delay allows release of clutch fluid pressure.
- After servicing any of the following, clear the adapt learn data and perform adapt learn procedure. Poor transaxle performance will occur without completing the adapt learn. Refer to Transmission Adaptive Functions .
 - Control valve body replacement
 - TCM replacement
 - TCM calibration change
 - Transaxle replacement
- The adapt learn procedure requires repeat shifting the transaxle from Neutral to Drive to Neutral 5 times. Then repeat shifting from Neutral to Reverse to Neutral 5 times. While in Drive or Reverse, hold in that range for a minimum of 3 seconds.

2. Begin the test by using a time recording device, starting the device at the moment when the automatic transmission gearshift selector is moved from either the PARK or the

NEUTRAL position to either the REVERSE or the DRIVE position.

3. The time recording device is stopped at the exact moment that the automatic transmission is felt to have engaged into the selected gear.

Specifications:

- PARK or NEUTRAL to DRIVE position: Less than 0.7 seconds
- PARK or NEUTRAL to REVERSE position: Less than 1.2 seconds

Engagement Delay Test Results

Result	Possible Cause
Engagement time is LONGER than the specification time for PARK or NEUTRAL to DRIVE engagement	• Line pressure is below specification • Forward clutch (565) slipping • Second clutch sprag (503) concern
Engagement time is LONGER than the specification time for PARK or NEUTRAL to REVERSE engagement	• Line pressure is below specification • Direct clutch (562) slipping • Low and reverse clutch (511) slipping • 1-2 reverse clutch (603) slipping

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

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 automatic transmission fluid type
- Incorrect usage of clutch plates
- Engine coolant in the automatic 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 ball check valves are misplaced.
 - The accumulator check valve assemblies are misplaced.

ENGINE COOLANT/WATER IN TRANSMISSION

NOTE: **The engine coolant or water will deteriorate the seals and the glue that bonds the clutch material to the pressure plate. Both conditions may cause damage to the transmission.**

If engine coolant 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

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

Check transmission fluid level. Refer to **Transmission Fluid Checking Procedure**.

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 Procedure**.
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

Control Valve Body Cover (29)

- Incorrectly tightened control valve body cover bolts
- Improperly installed or damaged control valve body cover sealant
- Damaged control valve body cover or mounting face

Case Leak

- Lube Fill Plug (70)
- Wiring connector O-ring seal (46)
- Damaged manual shift shaft seal assembly (713)
- Loose or damaged fluid cooler pipe fitting seals (87)
- Loose fluid pressure test hole plug (66)
- Porous casting

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 fluid pump

Leak at the Vent

- Overfilled system
- Water or coolant in the fluid. The fluid will appear milky
- Transmission case porous
- Plugged vent (815)
- Drain-back holes plugged

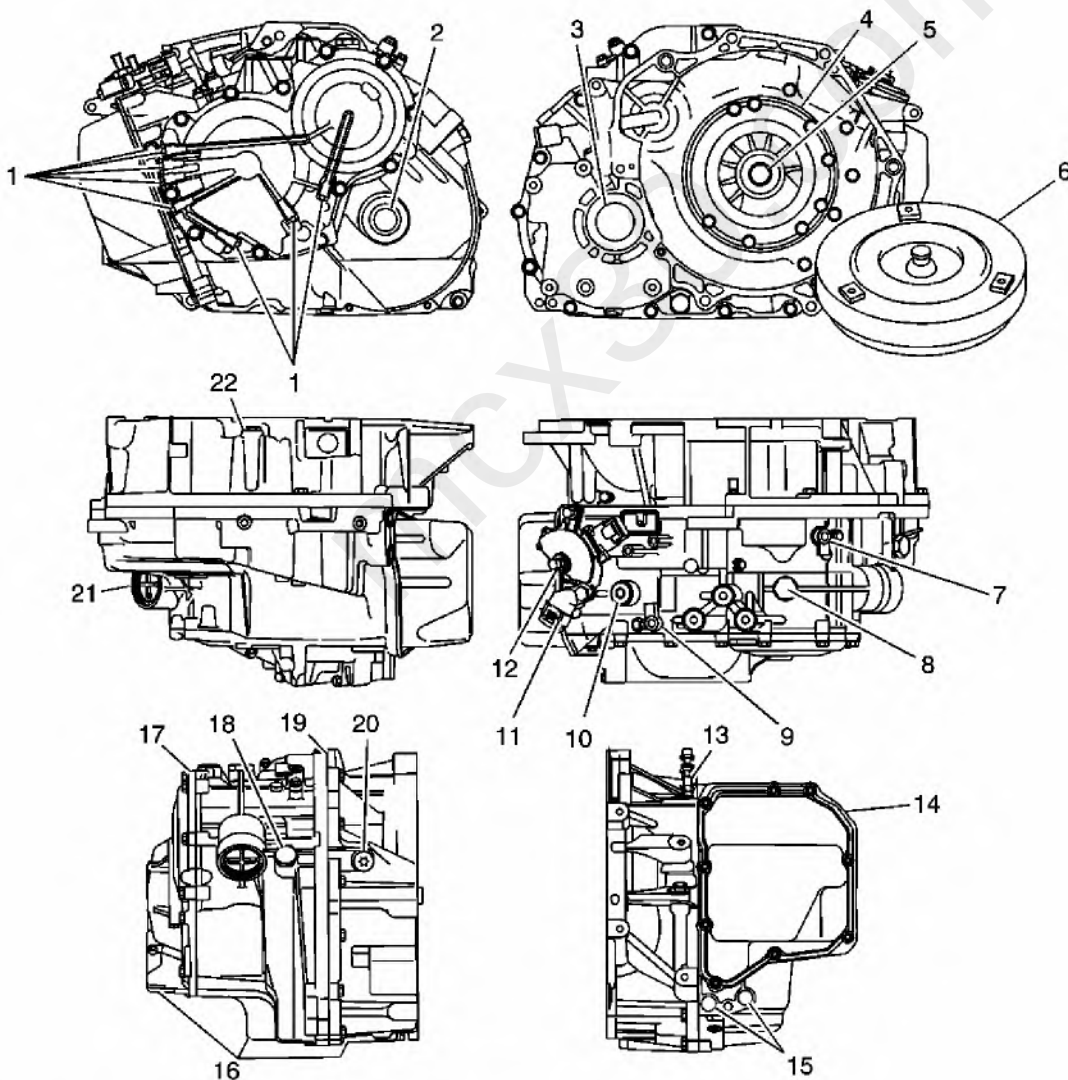


Fig. 7: Possible Fluid Leaks
Courtesy of GENERAL MOTORS CORP.

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2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Callouts For Fig. 77

Callout	Component Name
1	Automatic Transmission Fluid Pressure Test Hole Plugs
1	Automatic Transmission Fluid Pressure Test Hole Plugs
2	Front Wheel Drive Oil Shaft Seal
3	Front Differential Carrier Seal Assembly
4	Automatic Transmission Fluid Pump O-ring Seal
5	Automatic Transmission Fluid Pump Body Seal Assembly
6	Torque Converter Assembly
7	Automatic Transmission Output Speed Sensor O-ring Seal
8	3rd Gear Band Anchor Bolt/Screw
9	Automatic Transmission Input Speed Sensor O-ring Seal
10	Lube Fill Plug
11	Automatic Transmission Wiring Harness Assembly
12	Manual Shift Shaft Seal Assembly
13	Automatic Transmission Vent Assembly
14	Control Valve Body Cover
15	Transmission Fluid Cooler Pipe Fitting Seal
16	Automatic Transmission Case, Automatic Transmission Case Cover Assembly or Torque Converter Housing Assembly - Porosity
17	Automatic Transmission Case Cover Assembly to Automatic Transmission Case
18	Automatic Transmission Case Plug O-ring Seal
19	Torque Converter Housing Assembly to Automatic Transmission Case
20	Automatic Transmission Case Plug O-ring Seal
21	3rd Gear Band Servo Piston and Cover O-ring Seal
22	Transmission Fluid Drain 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 3 hours before starting the engine.
5. Repeat the fluid leak diagnosis procedures.

AUTOMATIC TRANSMISSION OIL COOLER FLUSHING AND FLOW TEST

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 or replacement. See Special Tools . Use only GM Goodwrench DEXRON III or VI automatic transmission fluid in the J 45096 . See Special Tools . The AF33-5 uses T-IV automatic transmission fluid. The residual DEXRON III or VI left in the oil cooler after flushing, remove carefully by blowing out with compressed air. Time allowance for performing the cooler flow checking and flushing procedure is included in the appropriate labor time guide operations. 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. See **Special Tools** .
- **J 45096-30** Transmission Cooler Flush Adapter
- Shop air supply with water/oil filters, regulator and pressure gage - minimum 90 psi
- Eye protection
- Rubber gloves

MACHINE SET-UP

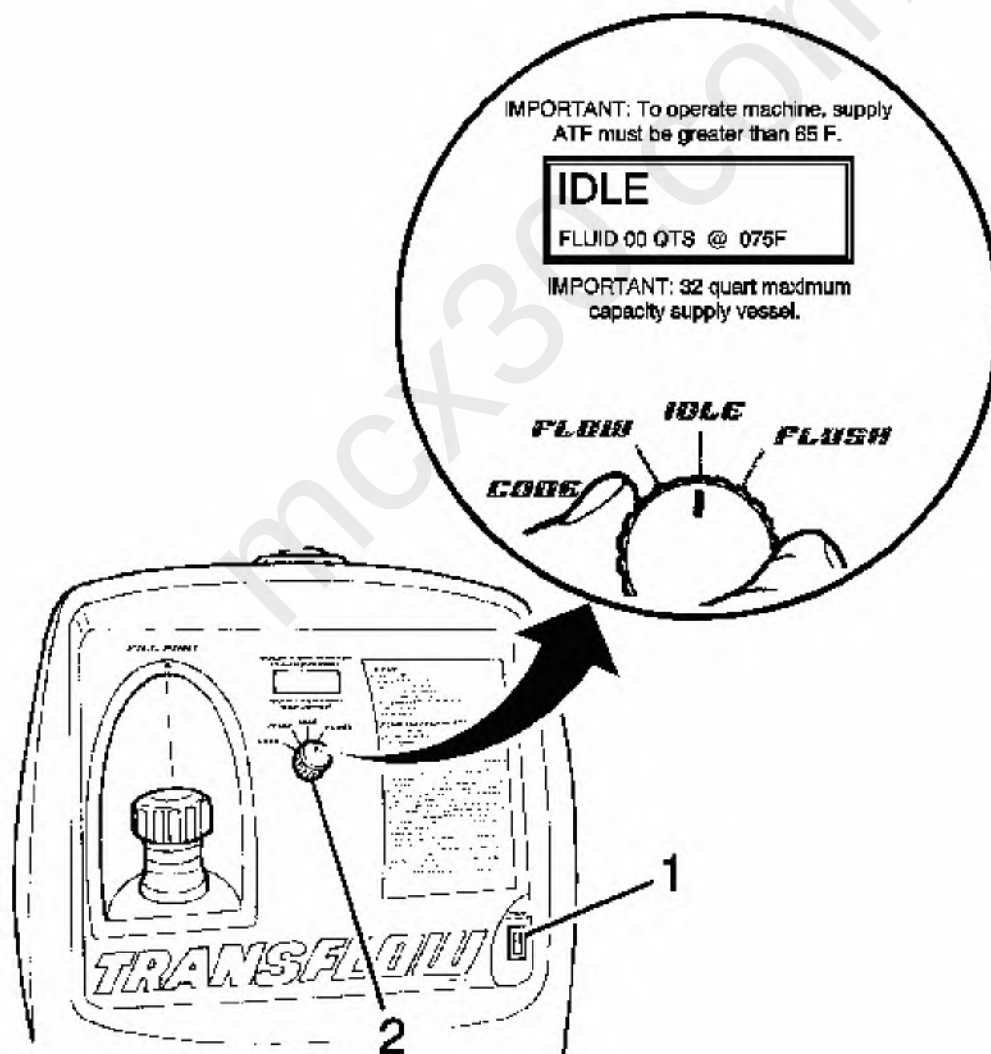


Fig. 8: View Of Main Power Switch & Main Function Switch
Courtesy of GENERAL MOTORS CORP.

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

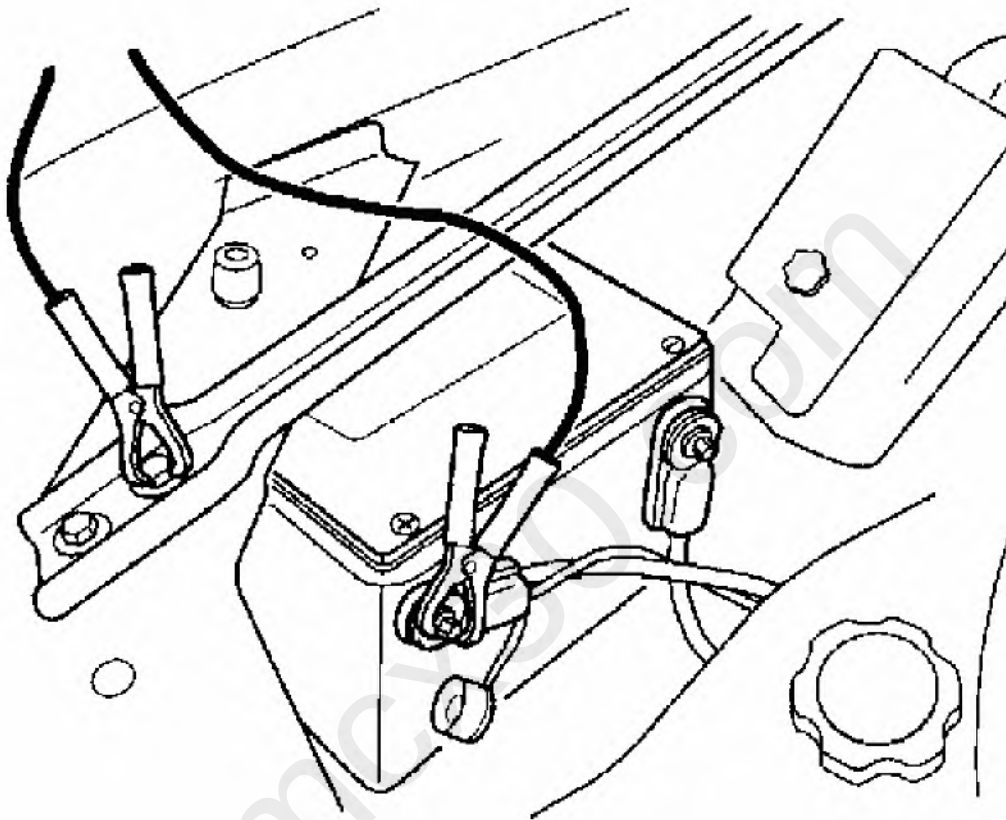


Fig. 9: Connecting To 12V DC Power Source
Courtesy of GENERAL MOTORS CORP.

3. Connect **J 45096** to the vehicle 12V 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. See **Special Tools**.
4. Turn the main power switch to the ON position.

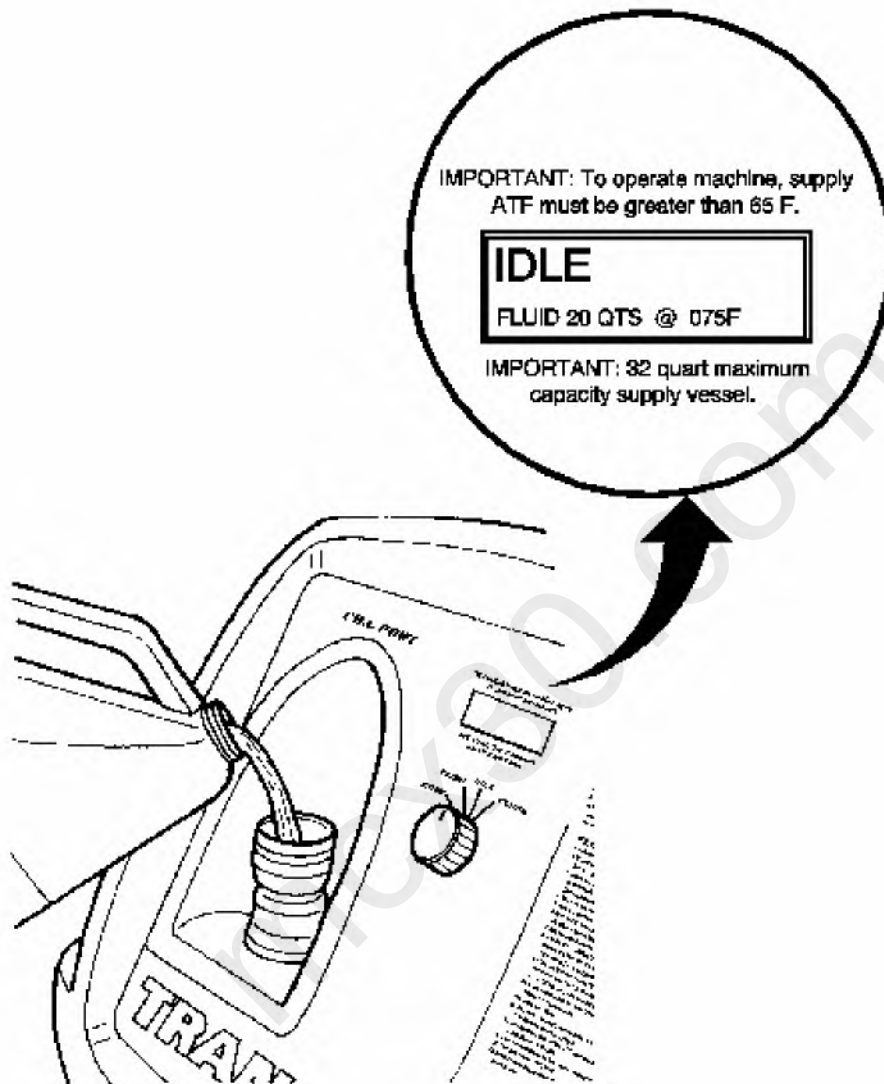


Fig. 10: Filling Supply Tank With Transmission Fluid
Courtesy of GENERAL MOTORS CORP.

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®III/Mercon®, or equivalent, through the fill port.
6. Reinstall and tighten the fill cap.

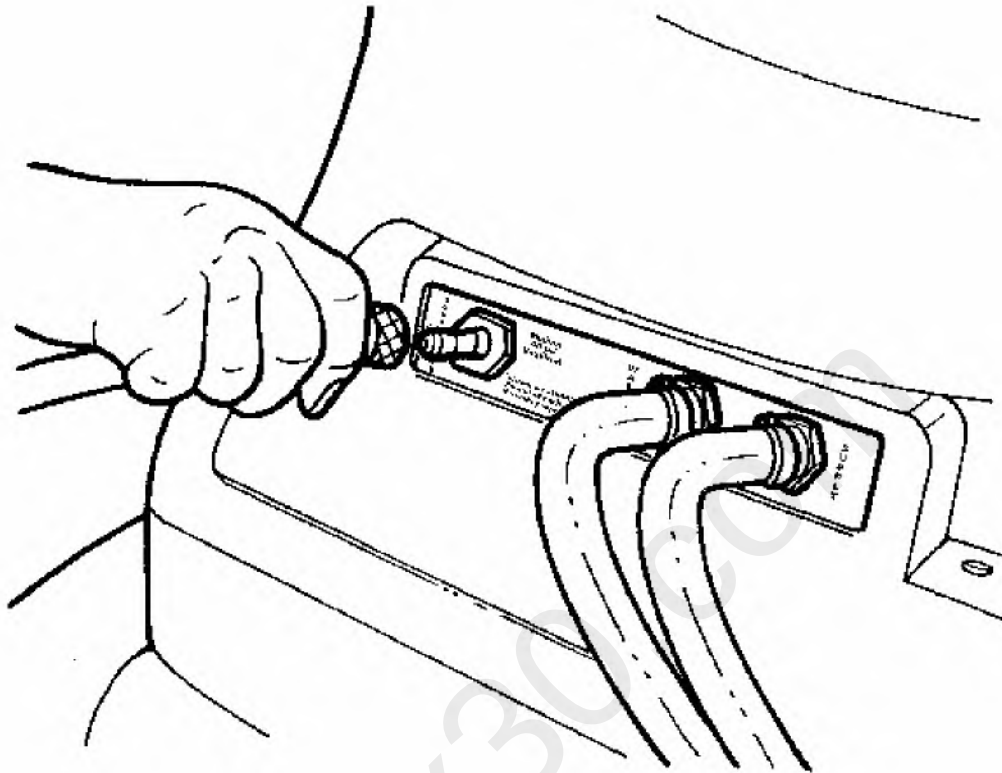


Fig. 11: Applying Shop Air Supply Hose To Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

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

DETERMINE MINIMUM FLOW RATE

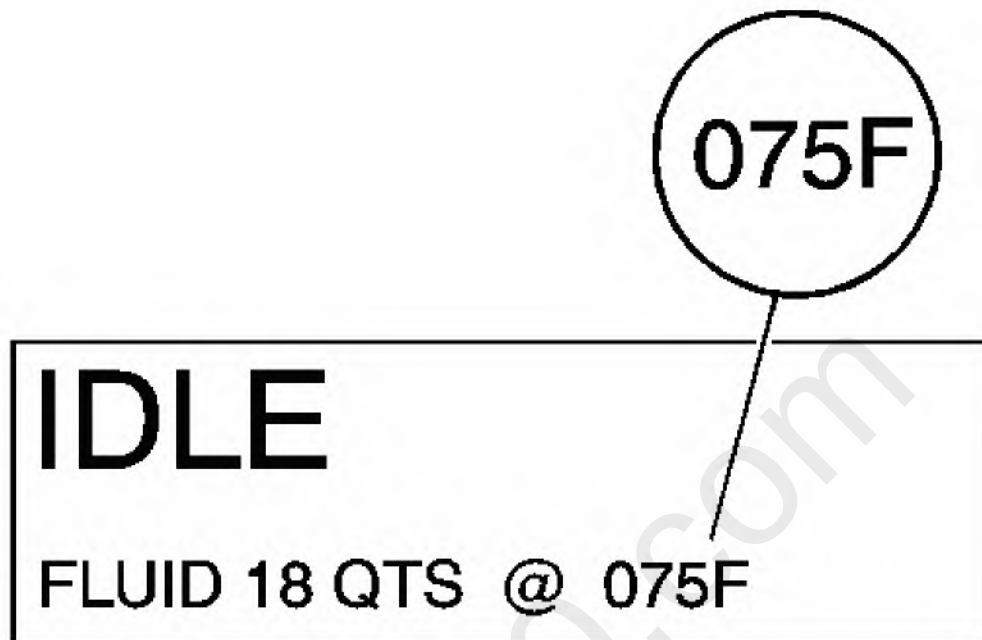


Fig. 12: Identifying Machine Display Of Automatic Transmission Fluid Temperature

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.

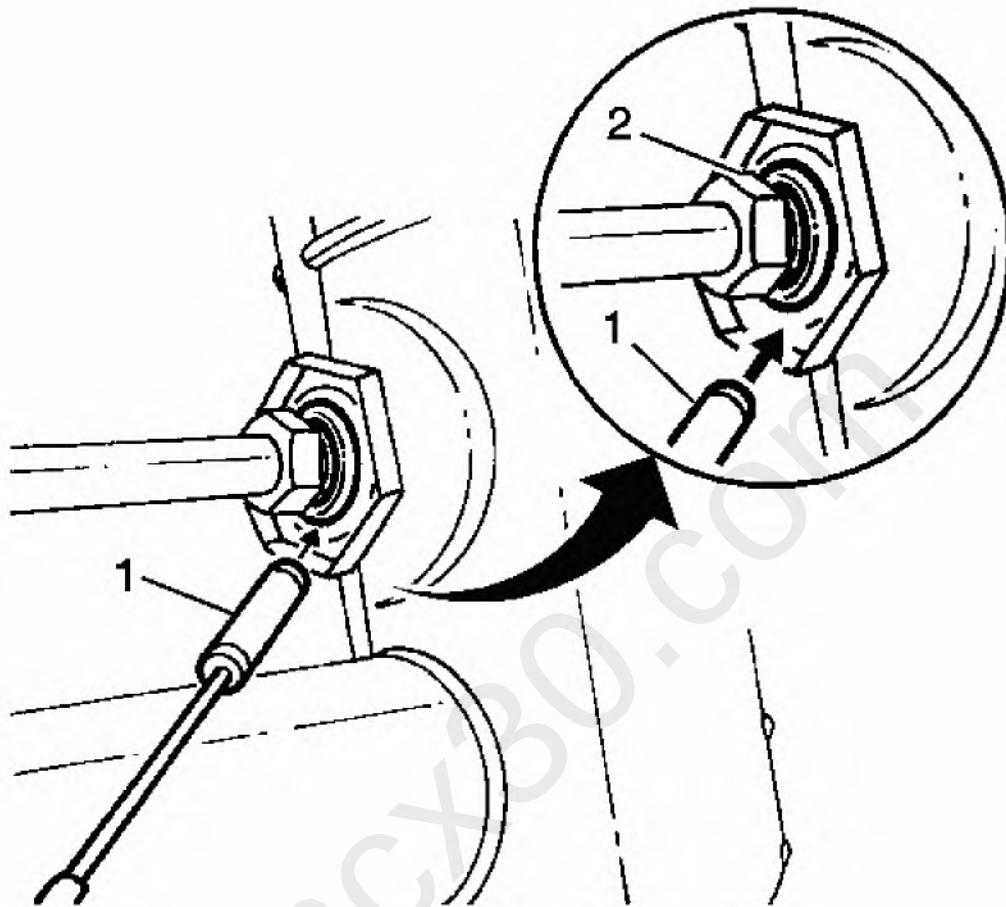


Fig. 13: Identifying Transmission Oil Cooler Metal Composition
Courtesy of GENERAL MOTORS CORP.

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.

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

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

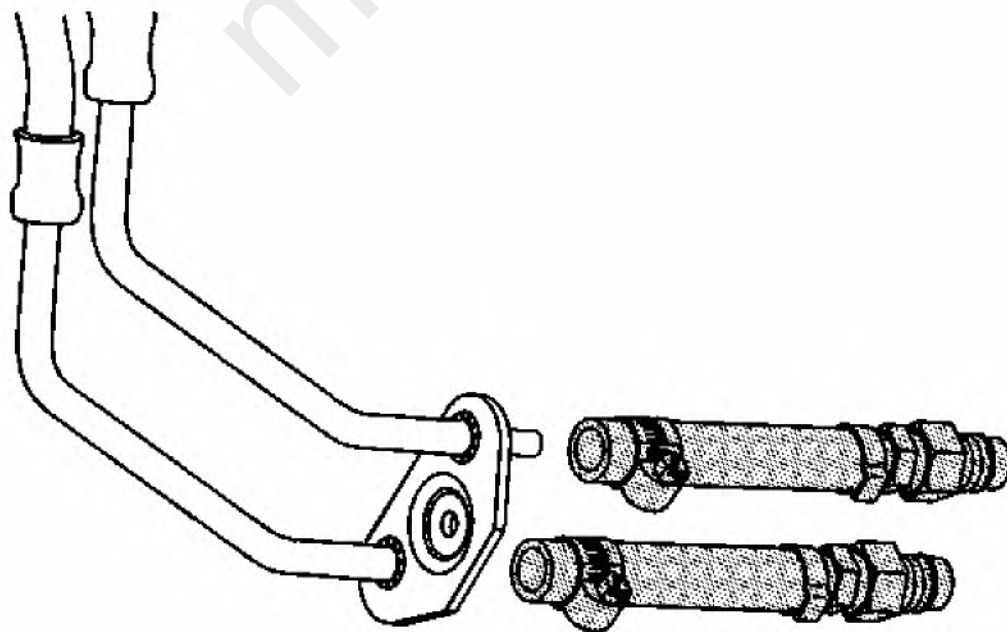


Fig. 14: View Of Oil Cooler Lines, J 35944-440 & J 45096 Adapters
Courtesy of GENERAL MOTORS CORP.

1. Install both of the **J 45096-30** onto the oil cooler lines.

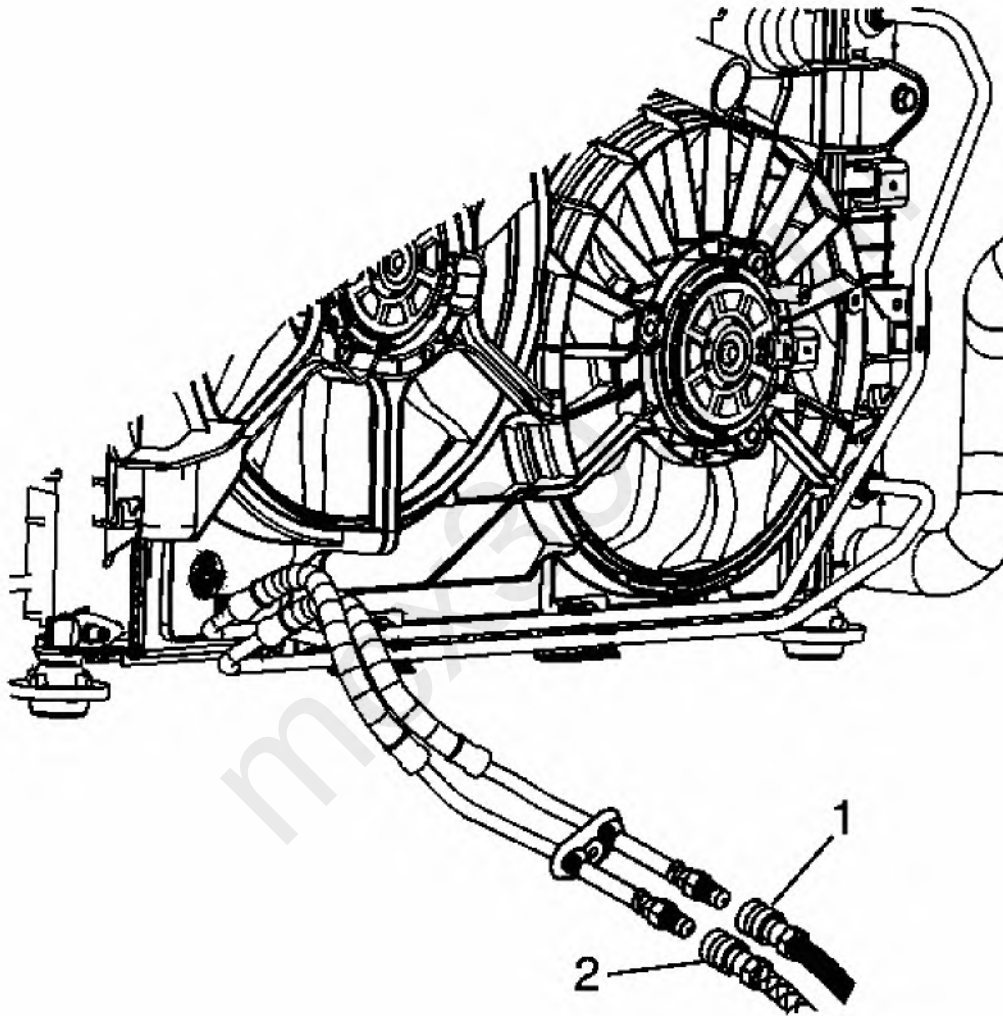


Fig. 15: Connecting Black Supply Hose & Clear Waste Hose To Adapters
Courtesy of GENERAL MOTORS CORP.

2. Connect the black supply hose (1) to the adapter connected to the return line, bottom hose of the transmission oil cooler.
3. Connect the clear waste hose (2) to the adapter connected to the supply line, top hose from the transmission oil cooler.

The above connections are the reverse flow or back-flush direction.

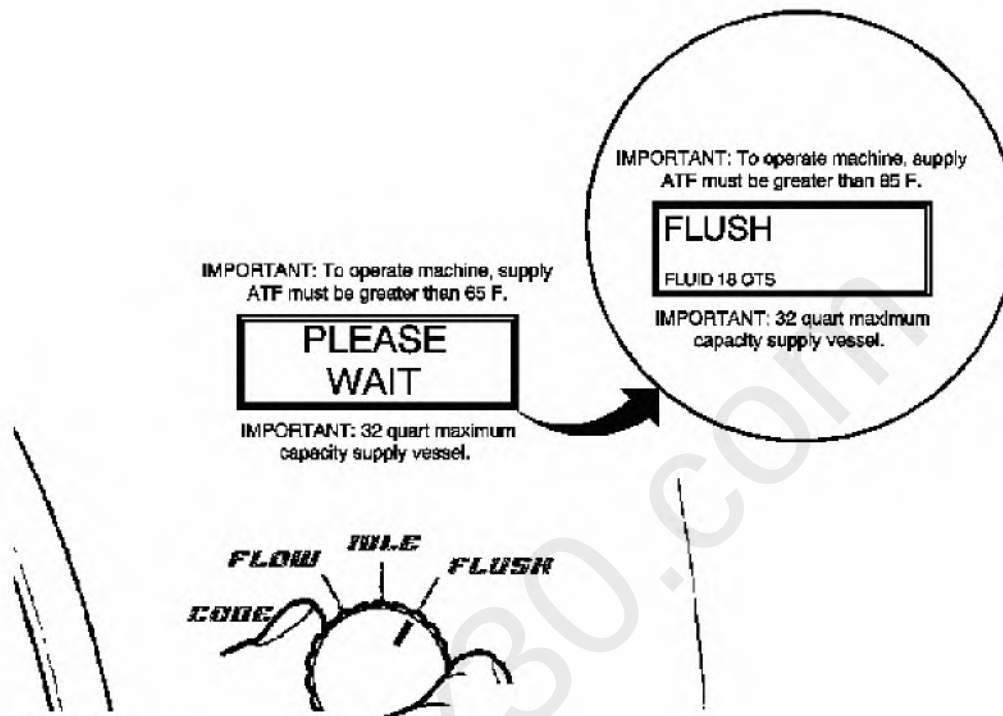


Fig. 16: Setting Main Function Switch To FLUSH Position
Courtesy of GENERAL MOTORS CORP.

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

IMPORTANT: To operate machine, supply
ATF must be greater than 65 F.

IDLE

FLUID 16 QTS @ 075F

IMPORTANT: 32 quart maximum
capacity supply vessel.

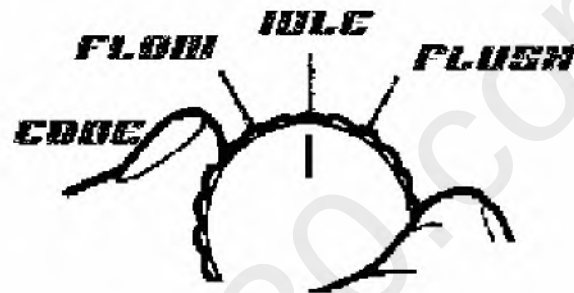


Fig. 17: Setting Main Function Switch To IDLE Position
Courtesy of GENERAL MOTORS CORP.

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

FORWARD FLUSH

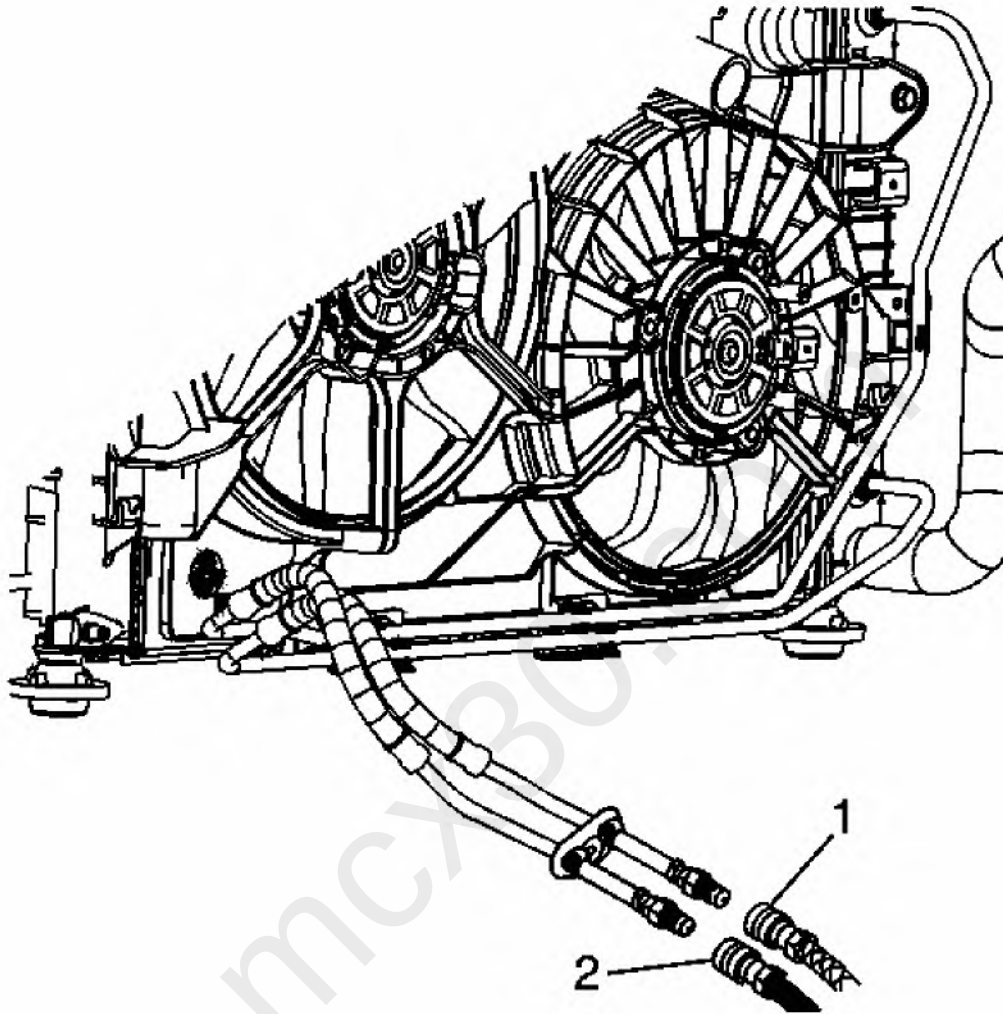


Fig. 18: Switching Black Hose & Clear Hose Connections
Courtesy of GENERAL MOTORS CORP.

1. Disconnect the **J 45096** at the hose couplings at the adapters and switch the hoses. See **Special Tools** . The black hose (2) to the oil cooler supply hose and the clear hose (1) to the oil cooler return hose.

The above connections are now in the normal flow direction.

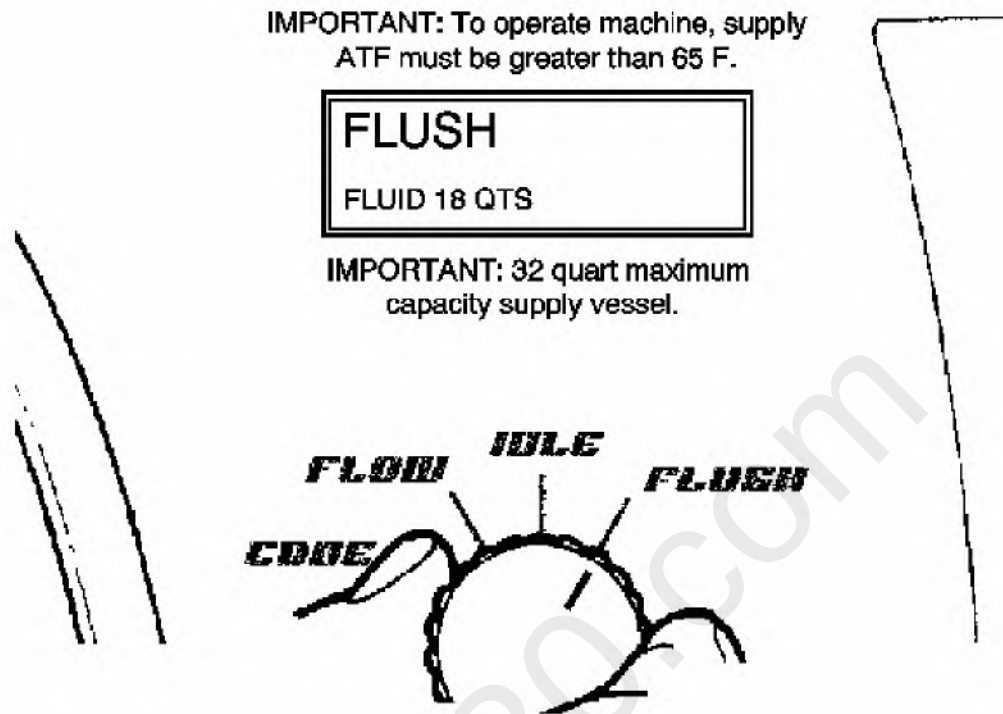


Fig. 19: Setting Main Function Switch To FLUSH Position
Courtesy of GENERAL MOTORS CORP.

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

FLOW TEST

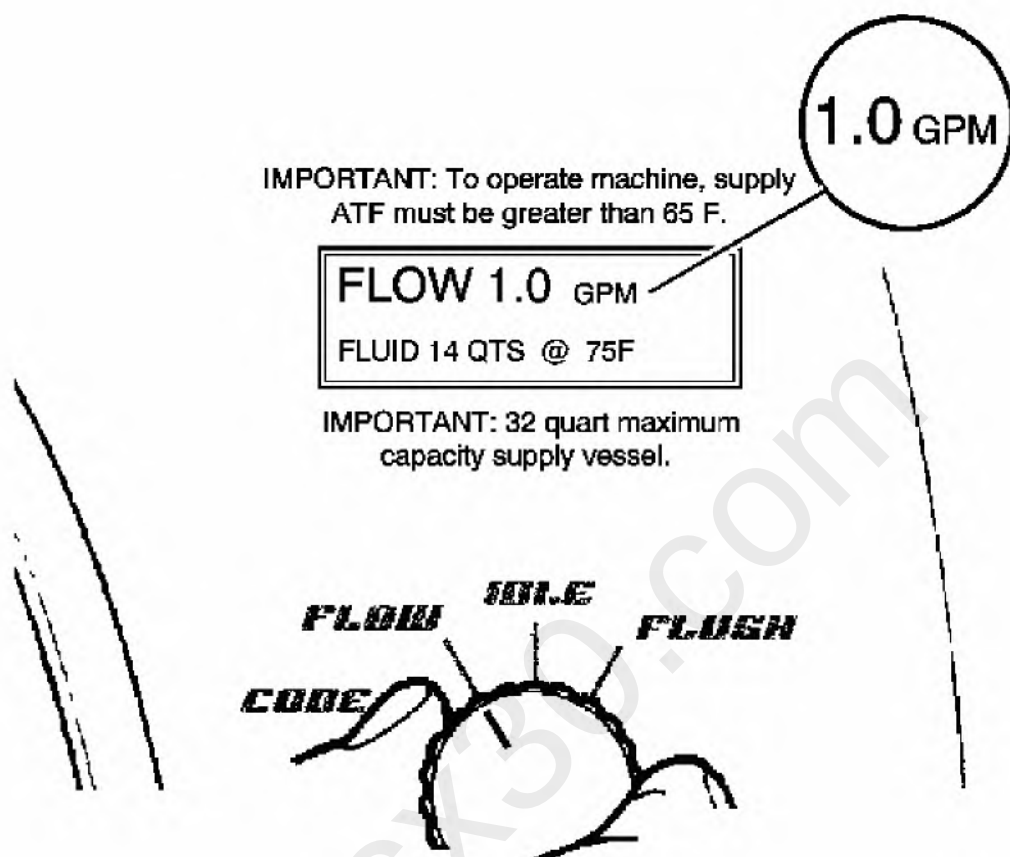


Fig. 20: Setting Main Function Switch To FLOW Position
Courtesy of GENERAL MOTORS CORP.

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

IMPORTANT: To operate machine, supply ATF must be greater than 65 F.

FLOW 1.0 @ 75F CYCLE 6

A10DFB2

IMPORTANT: 32 quart maximum capacity supply vessel.

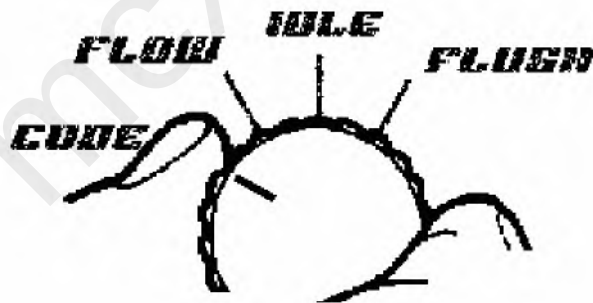


Fig. 21: Setting Main Function Switch To CODE Position
Courtesy of GENERAL MOTORS CORP.

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

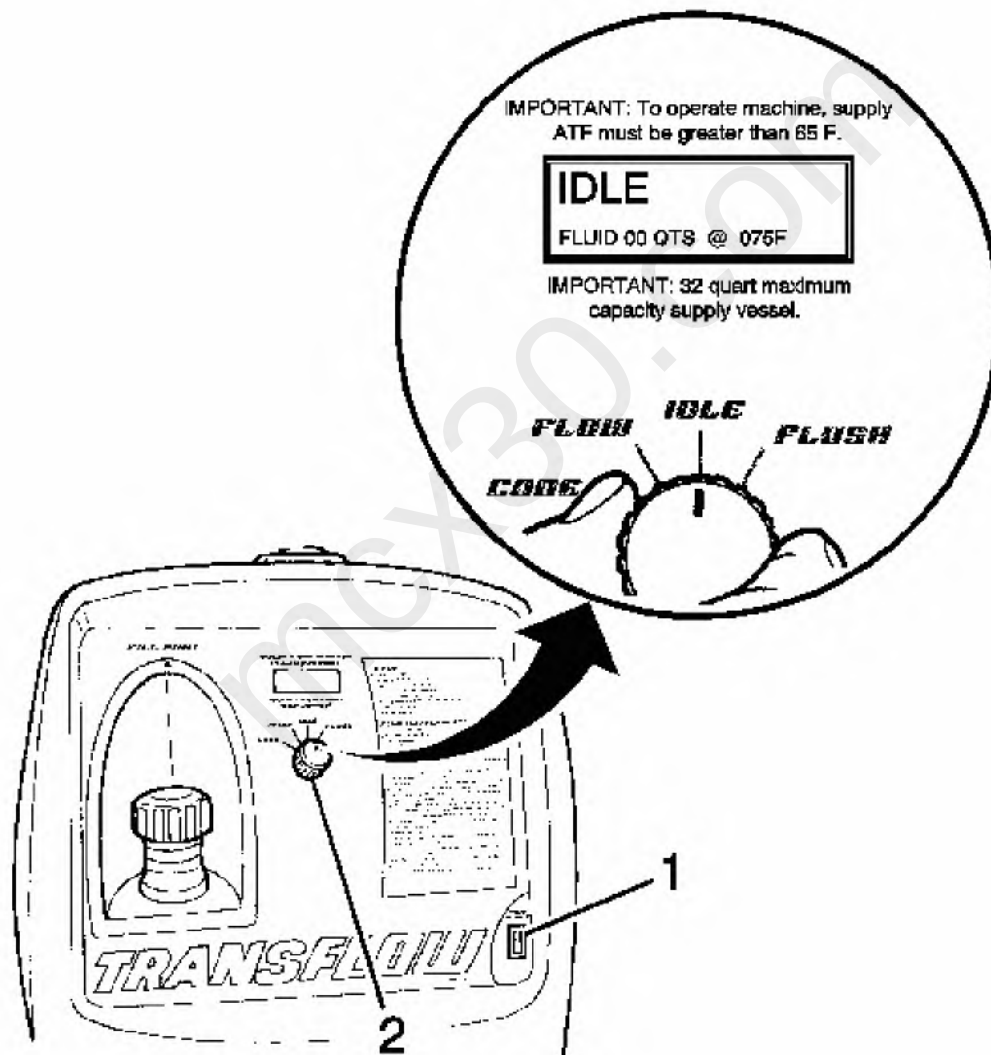


Fig. 22: View Of Main Power Switch & Main Function Switch
Courtesy of GENERAL MOTORS CORP.

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.
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.

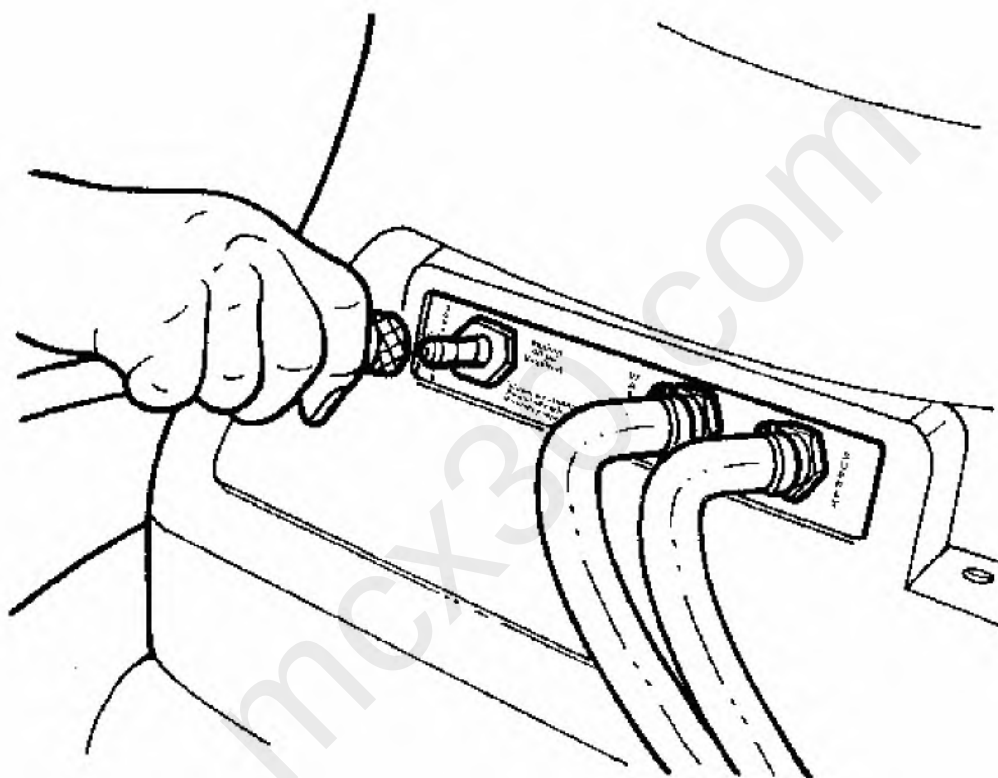


Fig. 23: Applying Shop Air Supply Hose To Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the air supply hose from **J 45096** . See **Special Tools** .
5. Dispose of the waste ATF in accordance with all applicable federal, state, and local requirements.
6. Clean the residual DEXRON III from the transmission oil cooler, using compressed air to blow out the transmission oil cooler.

TRANSMISSION OVERHEATS

Transmission Overheats

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Condition	Action
DEFINITION: Transmission overheats	
Low fluid level	Inspect for leaks and repair as necessary.
Incorrect fluid	Replace the fluid with the correct fluid
Fluid Filter (42) is restricted	• Diagnose the cause for the filter restriction and repair as needed. • Replace the fluid filter (42) and fluid.
Restricted Oil Cooler Lines	• Inspect for bent or kinked pipes • Inspect for pinched or kinked hoses • Inspect for cracks or signs of hose overheating that may cause delamination of the hose • Replace faulty oil cooler lines
Internal oil cooler restriction	Replace radiator assembly and fluid.
Case Assembly oil inlet filter/screen	Remove the inlet cooler line seal from the case assembly. Inspect for foreign material trapped by the case inlet filter/screen. Clean the passage to remove the foreign material from the case inlet screen. If unable to remove the foreign material, the screen will have to be removed from the case assembly and cleared manually outside of the case assembly.

NO FORWARD AND REVERSE**No Forward and Reverse**

Condition	Action
DEFINITION: No forward and reverse	
No fluid or fluid level low	Inspect fluid level and color. Perform a fluid level inspection and make sure that the fluid does not smell burnt, and shows no sign of coolant cross contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct fluid and retest.
Torque Converter Assembly (1)	• Torque converter (1) not physically connected to the engine flexplate due to mounting bolts not installed or physical damage to torque converter mounting lugs due to mounting bolts being too short in length. Perform an inspection of the torque converter mounting bolts to verify that they are physically present and if so, are they correct in length and size.

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	• Seizure or breaking of the torque converter sleeve or fluid pump assembly (2) internal bushing, due to misalignment of the torque converter (1) pilot pin to the engine crankshaft rear center pilot hole. Inspect the torque converter sleeve and fluid pump bushing for signs of damage. If damage is present, inspect crankshaft pilot hole and correct as necessary before installing a new torque converter assembly (1). • Torque converter (1) to flexplate mounting bolts length are too long, thus causing internal damage to the torque converter (1) (projection into the front cover) which in turn peels off the internal friction material from the torque converter apply plate. Replace the torque converter assembly (1) and install the correct torque converter to flexplate mounting bolts. • Torque converter (1) internal lock-up friction material peeled off the apply plate due to an attempted thread repair on one or more of the converter mounting lug pads. Re-tapping of the mounting lug pad threads causes projection of the front cover, which in turn peels off the lock-up clutch friction material. Replace the torque converter assembly (1) and the torque converter to flexplate mounting bolts if necessary.
Physical damage to Fluid Pump Assembly, (2) due to improper Torque Converter (1) installation.	Inspect the fluid pump drive gear (205) for damage. Replace the fluid pump assembly (2) if there is damage to the gears.
External Control Valve Body Assembly (39)	
Line Pressure Control Solenoid Valve Assembly (SLT) (316)	Verify that the line pressure control solenoid valve assembly (SLT) (316) responds electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly, inspect the O-ring seal, and bore for signs of damage and/or missing seal. If the valve responded electrically and there are no bore or seal concerns, replace the line pressure control solenoid valve assembly due to possible internal mechanical concerns and retest. If a concern is still present after replacing the line pressure control solenoid valve (316), then replace the control valve body assembly (39).

SLIPS IN DRIVE OR NO DRIVE

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Slips in Drive or No Drive

Condition	Action
DEFINITION: Slips in drive or no drive	
Fluid Level Low and/or Contaminated or unit filled with the wrong type of fluid	Inspect fluid level and color. Perform a fluid level inspection and make sure that the fluid does not smell burnt, and shows no sign of coolant cross contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct fluid and retest.
Low System Line Pressure	
Fluid	Low fluid level, perform fluid level check and correct as needed.
Fluid Pump (2)	Internal fluid pump (2) concern, diagnose fluid pump assembly and repair or replace assembly as necessary.
Torque Converter (1)	Internal concern, diagnose the cause of the concern and repair as necessary. Replace the torque converter assembly.
Fluid Filter (42)	Fluid filter (42) restricted. Diagnose the cause of the restriction and repair as necessary and replace the filter assembly.
Internal Transmission Concerns	Internal fluid leak, perform system air checks and repair as necessary.
External Control Valve Body Assembly (39)	
Line Pressure Control Solenoid Valve Assembly (SLT) (316)	Verify that the line pressure control solenoid valve assembly (SLT) (316) responds electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly, inspect the O-ring seal, and bore for signs of damage and or missing seal. If the valve responded electrically and there are no bore or seal concerns, replace the line pressure control solenoid valve assembly due to possible internal mechanical concerns and retest. If a concern is still present after replacing the line pressure control solenoid valve (316), replace the control valve body assembly (39).
Internal Control Valve Body Assembly (39)	
• Primary Regulator Valve (395) • Check Valve (360) • Manual Valve (337) • Line Pressure Control	Remove the control valve body assembly to inspect the items listed. Inspect internal bores and valves for signs of wear and/or damage, including internal contamination. If unable to verify a repairable concern, replace the complete valve body assembly.

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

(SLT) Accumulator Piston (433)	
Clutch - Mechanical/Hydraulic	
1-2 Reverse (B5) Clutch Assembly	Remove the transmission case cover and 1-2 reverse clutch assembly (B5) (19). Inspect all 1-2 reverse (B5) clutch components and operation. Repair as necessary.
Forward (C1) Clutch	Remove the transmission case cover and 1-2 reverse clutch assembly (B5) (19) and the forward and direct clutch assembly (23). Inspect all forward clutch (C1) components and operation. Repair as necessary.
Front Internal Gear and Low Clutch Sprag (F2) Assembly (25)	Remove the transmission case cover and 1-2 reverse clutch assembly (B5) (19), the forward and direct clutch assembly (23), the front carrier sun gear assembly (24), and the front internal gear and low clutch sprag assembly (25). Inspect all components and operation. Repair as necessary.

SLIPS IN REVERSE OR NO REVERSE**Slips in Reverse or No Reverse**

Condition	Action
DEFINITION: Slips in reverse or no reverse	
Fluid Level Low and/or Contaminated or unit filled with the wrong type of fluid	Inspect fluid level and color. Perform a fluid level inspection and make sure that the fluid does not smell burnt, and shows no sign of coolant cross contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct fluid and retest.
Torque Converter (1)	Internal concern, diagnose the cause of the concern and correct as necessary. Replace the torque converter assembly.
Low System Line Pressure	
Fluid	Low fluid level, perform fluid level check and correct as needed.
Fluid Pump (2)	Internal fluid pump (2) concern, diagnose fluid pump assembly and repair or replace assembly as necessary.
Torque Converter (1)	Internal concern, diagnose the cause of the concern and repair as necessary. Replace the torque converter assembly.
Fluid Filter (42)	Fluid filter (42) restricted. Diagnose the cause of the restriction and repair as necessary and replace the filter assembly.

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Internal Transmission Concerns	Internal fluid leak, perform system air checks and repair as necessary.
External Control Valve Body Assembly (39)	
• Line Pressure Control Solenoid Valve Assembly (SLT) (316) • Reverse, 1st Shift Solenoid Valve Assembly (S1) (310) • 2-3, 3-4 Shift Solenoid Valve Assembly (S2) (308)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly as needed, and inspect the solenoids O-ring seals, and bores for signs of damage and/or missing seals. If the valves responded electrically and there are no bore or seal concerns, replace assembly as required due to a possible internal mechanical concern and retest. If after replacing the valve assembly in question, a concern is still present, replace the complete control valve body assembly (39).
Internal Control Valve Body Assembly (39)	
• Primary Regulator Valve (395) • Check Valve (360) • Manual Valve (337) • M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • Line Pressure Control (SLT) Accumulator Piston (433)	Remove the control valve body assembly to inspect the items listed. Inspect internal bores and valves for signs of wear and/or damage, including internal contamination. If unable to verify a repairable concern, replace the complete valve body assembly.
Clutch - Mechanical/Hydraulic	
Forward (C1) Clutch	Remove the transmission case cover and 1-2 reverse clutch assembly (B5) (19) and the forward and direct clutch assembly (23). Inspect all forward clutch (C1) components and operation. Repair as necessary.
Low and Reverse Clutch Piston Assembly (27)	Remove the transmission case cover and 1-2 reverse clutch assembly (B5) (19), the forward and direct clutch assembly (23), the front internal gear and low clutch sprag (F2) assembly (25), and the low and reverse clutch plates and disc assembly (B3) (26). Inspect the low and reverse clutch piston (27) and related components for proper operation. Repair as necessary.
1-2 Reverse (B5) Clutch Assembly	Remove the transmission case cover and 1-2 reverse clutch assembly (B5) (19). Inspect all 1-2 reverse (B5) clutch components and operation. Repair as necessary.

ENGAGEMENT TIME FROM PARK OR NEUTRAL TO DRIVE IS NOT WITHIN SPECIFICATIONS

Engagement Time From Park or Neutral to Drive is Not Within Specifications

Condition	Action
DEFINITION: Engagement time from PARK or NEUTRAL to DRIVE is NOT within specifications	
Automatic transmission fluid (ATF) level low, contaminated, or unit is contaminated with engine coolant	Inspect the ATF level and color. Perform Transmission Fluid Checking Procedure and make sure that the fluid does not smell burnt, and shows no sign of engine coolant cross contamination. If cross contamination is present, perform a system flush. Refer to Automatic Transmission Oil Cooler Flushing and Flow Test . Retest to verify the repair.
Transmission is filled with the wrong type of automatic transmission fluid (ATF)	If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct ATF and retest.
Automatic Transmission Input Speed Sensor (73)	Inspect the automatic transmission input speed sensor (73) for loose electrical connection and/or signs of physical damage that could cause erratic output. The magnetic end of the sensor should be free of any metal shavings/particles, including heavy friction material build-up. If metal or heavy friction material is found, diagnose the cause and repair as needed. Perform a complete ATF flush on the transmission and oil cooler assembly. Refer to Automatic Transmission Oil Cooler Flushing and Flow Test .
Internal Automatic Transmission Control Valve Body Assembly (39)	
Forward Clutch Control Valve (354)	Remove the automatic transmission control valve body assembly (39) to inspect the forward clutch control valve (354). Inspect the internal bore and the valve for signs of wear and/or damage, including internal contamination. If unable to verify a repairable concern, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
Forward Clutch Assembly (550-553)	Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19), and the forward and direct clutch assembly (23) to inspect all forward clutch components and operation. Repair or replace as needed.

ENGAGEMENT TIME FROM PARK OR NEUTRAL TO REVERSE IS NOT

WITHIN SPECIFICATIONS

Engagement Time From Park or Neutral to Reverse is Not Within Specifications

Condition	Action
DEFINITION: Engagement time from PARK or NEUTRAL to REVERSE is NOT within specifications	
Automatic transmission fluid (ATF) level low, contaminated, or unit is contaminated with engine coolant	Inspect the ATF level and color. Perform Transmission Fluid Checking Procedure and make sure that the fluid does not smell burnt, and shows no sign of engine coolant cross contamination. If cross contamination is present, perform a system flush. Refer to Automatic Transmission Oil Cooler Flushing and Flow Test . Retest to verify the repair.
Transmission is filled with the wrong type of automatic transmission fluid (ATF)	If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct ATF and retest.
Automatic Transmission Input Speed Sensor (73)	Inspect the automatic transmission input speed sensor (73) for loose electrical connection and/or signs of physical damage that could cause erratic output. The magnetic end of the sensor should be free of any metal shavings/particles, including heavy friction material build-up. If metal or heavy friction material is found, diagnose the cause and repair as needed. Perform a complete ATF flush on the transmission and oil cooler assembly. Refer to Automatic Transmission Oil Cooler Flushing and Flow Test .
External Automatic Transmission Control Valve Body Assembly (39)	
Reverse Shift Solenoid Valve Assembly (S5) (305)	Verify that the solenoid responds electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly and inspect the solenoid O-ring seals and the solenoid bore for signs of damage and/or missing seals. If the valve responded electrically and there are no bore or seal concerns, replace the assembly as required due to a possible internal mechanical concern and retest. If after reverse shift solenoid valve assembly replacement a concern is still present, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
Shift Pressure Relay Valve (424)	Remove the automatic transmission control valve body assembly (39) to inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Shift Pressure Control Valve (430)	damage, including internal contamination. If unable to verify a repairable condition, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
- Direct Clutch Assembly (562) - Low and Reverse Clutch Plates and Disc Assembly (26)	Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19), the forward and direct clutch assembly (23), the front internal gear and low clutch sprag assembly (25), and the low and reverse clutch plates and disc assembly (26). Inspect all related components for proper operation. Repair or replace as needed.

ENGINE STALLS DURING REVERSE OR DRIVE ENGAGEMENT

Engine Stalls During Reverse or Drive Engagement

Condition	Action
DEFINITION: Engine stalls during reverse or drive engagement	
External Control Valve Body Assembly (39)	
3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303) - Reverse, 1st Shift Solenoid Valve Assembly (S1) (310) - TCC Lock Up Pressure Control Solenoid Valve Assembly (SLU) (339)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly as needed, and inspect the solenoids O-ring seals, and bores for signs of damage and/or missing seals. If the valves responded electrically and there are no bore or seal concerns, replace assembly as required due to a possible internal mechanical concern and retest. If after replacing the valve assembly in question, a concern is still present, replace the complete control valve body assembly (39).
Internal Control Valve Body Assembly (39)	
- U1 Shift Valve (386) - Lock up Relay Valve (415) - Shift Pressure Relay Valve (424)	Remove the control valve body assembly to inspect the items listed. Inspect internal bores and valves for signs of wear and/or damage, including internal contamination. If unable to verify a repairable concern, replace the complete valve body assembly.

SLIPS ON ACCELERATION

Slips On Acceleration

Condition	Action
DEFINITION: Slips on acceleration	

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Fluid Level Low and/or Contaminated or unit filled with the wrong type of fluid	Inspect fluid level and color. Perform a fluid level inspection and make sure that the fluid does not smell burnt, and shows no sign of coolant cross contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct fluid and retest.
Low System Line Pressure	
Fluid	Low fluid level, perform fluid level check and correct as needed.
Fluid Pump (2)	Internal fluid pump (2) concern, diagnose fluid pump assembly and repair or replace assembly as necessary.
Torque Converter (1)	Internal concern, diagnose the cause of the concern and repair as necessary. Replace the torque converter assembly.
Fluid Filter (42)	Fluid filter (42) restricted. Diagnose the cause of the restriction and repair as necessary and replace the filter assembly.
Internal Transmission Concerns	Internal fluid leak, perform system air checks and repair as necessary.
External Control Valve Body Assembly (39)	
- Line Pressure Control Solenoid Valve Assembly (SLT) (316) - TCC Lock Up Pressure Control Solenoid Valve Assembly (SLU) (339) - Reverse, 1st Shift Solenoid Valve Assembly (S1) (310) 2-3, 3-4 Shift Solenoid Valve Assembly (S2) (308) - Reverse Shift Solenoid Valve Assembly (S5) (305)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly as needed, and inspect the solenoids O-ring seals, and bores for signs of damage and/or missing seals. If the valves responded electrically and there are no bore or seal concerns, replace assembly as required due to a possible internal mechanical concern and retest. If after replacing the valve assembly in question, a concern is still present, replace the complete control valve body assembly (39).
Internal Control Valve Body Assembly (39)	
- M2 Shift Valve (426) - Neutral Relay Valve (356)	

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

- Shift Pressure Relay Valve (424)
- Shift Pressure Control Valve (430)
- Forward Clutch (C1) Accumulator Piston (612)
- Line Pressure Control (SLT) Accumulator Piston (433)

Remove the control valve body assembly to inspect the items listed. Inspect internal bores and valves for signs of wear and/or damage, including internal contamination. If unable to verify a repairable concern, replace the complete valve body assembly.

HARSH FEEL AT LIGHT ACCELERATION OR DECELERATION WITHOUT CAUSING AN UPSHIFT OR DOWNSHIFT

Harsh Feel During Acceleration or Deceleration

Condition	Action
DEFINITION: Harsh feel without causing an upshift or downshift. Concern is most noticeable with light acceleration or deceleration.	
Engine and or Transaxle mounts	Inspect the engine and or transaxle for loose, damaged or missing mounts. Repair as necessary.
Base Engine	Inspect the engine for any base level concerns. Repair as necessary.
Drive Axles	Inspect both drive axles for proper installation and/or damage. Repair as necessary.

NO 1-2 UPSHIFT

No 1-2 Upshift

Checks	Actions
DEFINITION: No first gear to second gear upshift	
External Automatic Transmission Control Valve Body Assembly (39)	
• Reverse, 1st Shift Solenoid Valve Assembly (S1) (310) • 2--3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly,

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

• 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303)	replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • U2 Shift Valve (392)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
• Second Clutch Assembly (209-220) • 2nd Coast Clutch and 2nd Clutch Hub and 2nd Clutch Sprag Assembly (11)	Remove the torque converter assembly (1) and the fluid pump assembly (2) in order to inspect the second clutch assembly (209-220) and the 2nd coast clutch and 2nd clutch hub and 2nd clutch sprag assembly (11). Inspect all related components for proper operation. Repair or replace as necessary.

NO 2-3 UPSHIFT

No 2-3 Upshift

Checks	Actions
DEFINITION: No second gear to third gear upshift	
External Automatic Transmission Control Valve Body Assembly (39)	
• 2--3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • U2 Shift Valve (392)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
• 4-5 Clutch Assembly (15) • 3rd Gear Band Assembly (16)	• Inspect the 3rd gear band servo piston assembly (57) for signs of internal binding, internal contamination, and/or missing parts. If the servo assembly was found to be binding in the transmission case bore, it is possible that there is damage to the 3rd gear band assembly (16). The 3rd gear band assembly (16) should be physically inspected to verify proper operation. • Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19), and the 1-2 reverse carrier gear assembly (18) in order to inspect the 3rd gear brake band assembly (16). Inspect all related components for proper operation. Repair or replace as necessary.

NO 3-4 UPSHIFT

No 3-4 Upshift

Checks	Actions
DEFINITION: No third gear to fourth gear upshift	
External Automatic Transmission Control Valve Body Assembly (39)	
• 2--3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • U2 Shift Valve (392)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Clutch - Mechanical/Hydraulic

3rd Gear Band Assembly (16)	Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19), and the 1-2 reverse carrier gear assembly (18) in order to inspect the 3rd gear brake band assembly (16). Inspect all related components for proper operation. Repair or replace as necessary.
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NO 4-5 UPSHIFT

No 4-5 Upshift

Checks	Actions
DEFINITION: No fourth gear to fifth gear upshift	
External Automatic Transmission Control Valve Body Assembly (39)	
• 2--3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • Reverse Shift Solenoid Valve Assembly (S5) (305)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • U2 Shift Valve (392) • Shift Pressure Relay Valve (424)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
Direct Clutch Assembly (554-563)	Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19), and the forward and direct clutch assembly (23) in order to inspect all direct clutch components and operation. Repair or replace as necessary.

NO 5-4 DOWNSHIFT

No 5-4 Downshift

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2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Checks	Actions
DEFINITION: No fifth gear to fourth gear downshift	
External Automatic Transmission Control Valve Body Assembly (39)	
• 2--3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • Reverse Shift Solenoid Valve Assembly (S5) (305)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • U2 Shift Valve (392) • Shift Pressure Relay Valve (424)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
2nd Coast Clutch and 2nd Clutch Hub and 2nd Clutch Sprag Assembly (11)	Remove the torque converter assembly (1) the fluid pump assembly (2), and the 2nd Coast Clutch and 2nd Clutch Hub and 2nd Clutch Sprag Assembly (11). Inspect all related components for proper operation. Repair or replace as necessary.

NO 4-3 DOWNSHIFT**No 4-3 Downshift**

Checks	Actions
DEFINITION: No fourth gear to third gear downshift	
External Automatic Transmission Control Valve Body Assembly (39)	
• 2--3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Assembly (S3) (300) • 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303)	no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • U2 Shift Valve (392)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
4-5 Clutch Assembly (15)	Inspect the 3rd gear band servo piston assembly (57) for signs of internal binding, internal contamination, and/or missing parts. If the servo assembly was found to be binding in the transmission case bore, it is possible that there is damage to the 3rd gear band assembly (16). The 3rd gear band assembly (16) should be physically inspected to verify proper operation.

NO 3-2 DOWNSHIFT

No 3-2 Downshift

Checks	Actions
DEFINITION: No third gear to second gear downshift	
External Automatic Transmission Control Valve Body Assembly (39)	
• 2--3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303) • Line Pressure Control Solenoid Valve Assembly (SLT) (316)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Internal Automatic Transmission Control Valve Body Assembly (39)

- | | |
|---|--|
| <ul style="list-style-type: none">• M1 Shift Valve (389)• M2 Shift Valve (426)• U1 Shift Valve (386)• U2 Shift Valve (392) | Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39). |
|---|--|

Clutch - Mechanical/Hydraulic

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|----------------------------------|--|
| 1-2 Reverse Clutch Assembly (19) | Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19). Inspect all 1-2 reverse clutch components for proper operation. Repair or replace as necessary. |
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NO 2-1 DOWNSHIFT

No 2-1 Downshift

Checks	Actions
DEFINITION: No second gear to first gear downshift	
External Automatic Transmission Control Valve Body Assembly (39)	
• Reverse, 1st Shift Solenoid Valve Assembly (S1) (310) • 2--3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • U2 Shift Valve (392)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
Front Internal Gear and Low Clutch Sprag	Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19), the forward and direct

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Assembly (25)	clutch assembly (23), and the front carrier sun gear assembly (24) to gain access to the front internal gear and low clutch sprag assembly (25). Disassemble the front internal gear and low clutch sprag assembly (25) in order to inspect and clean. Repair or replace components as necessary to correct the condition.
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TORQUE CONVERTER CLUTCH (TCC) STUCK ON OR OFF

Torque Converter Clutch (TCC) Stuck ON or OFF

Condition	Action
DEFINITION: Torque converter clutch (TCC) stuck ON or OFF	
Torque Converter Assembly (1)	Perform an electrical performance test. If no concern was verified electrically, inspect the torque converter assembly (1) for signs of internal damage caused by an external issue such as mount bolts too long in length or thread repair. Replace the torque converter assembly (1) making sure that the correct flexplate mounting bolts are used.
External Control Valve Body Assembly (39)	
1-2,2-3, Reverse Shift solenoid Valve Assembly (S3) (300) 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303) - TCC Lock Up Pressure Control Solenoid Valve Assembly (SLU) (339)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly as needed, and inspect the solenoids O-ring seals, and bores for signs of damage and/or missing seals. If the valves responded electrically and there are no bore or seal concerns, replace assembly as required due to a possible internal mechanical concern and retest. If after replacing the valve assembly in question, a concern is still present, replace the complete control valve body assembly (39).
Internal Control Valve Body Assembly (39)	
- Secondary Regulator Valve (436) - U2 Shift Valve (392) - Solenoid Relay Valve (378) - Lock Up Relay Valve (415) - Lock Up Control Valve (454)	Remove the control valve body assembly to inspect the items listed. Inspect internal bores and valves for signs of wear and/or damage, including internal contamination. If unable to verify a repairable concern, replace the complete valve body assembly.

NO ENGINE BRAKING IN FOURTH GEAR

No Engine Braking in Fourth Gear

Checks	Actions
DEFINITION: No engine braking in fourth gear	
External Automatic Transmission Control Valve Body Assembly (39)	
Reverse Shift Solenoid Valve Assembly (S5) (305)	Verify that the solenoid responds electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly as needed, and inspect the solenoid O-ring seals, and the solenoid bore for signs of damage and/or missing seals. If the solenoid valve responded electrically and there are no bore or seal concerns, replace the solenoid valve assembly as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • Shift Pressure Relay Valve (424) • Shift Pressure Control Valve (430)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
2nd Coast Clutch Assembly (221-230)	Remove the torque converter assembly (1) and the automatic transmission fluid pump, 2nd coast clutch, 2nd clutch assembly (2) in order to gain access to the 2nd coast clutch assembly (221-230). Disassemble the 2nd coast clutch assembly and inspect. Repair or replace components as necessary to correct the condition.

NO ENGINE BRAKING IN THIRD GEAR

No Engine Braking in Third Gear

Checks	Actions
DEFINITION: No engine braking in third gear	
External Automatic Transmission Control Valve Body Assembly (39)	
Reverse Shift Solenoid Valve Assembly (S5) (305)	Verify that the solenoid responds electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	assembly as needed, and inspect the solenoid O-ring seals, and the solenoid bore for signs of damage and/or missing seals. If the solenoid valve responded electrically and there are no bore or seal concerns, replace the solenoid valve assembly as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • Shift Pressure Relay Valve (424) • Shift Pressure Control Valve (430)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
• 2nd Coast Clutch Assembly (221-230) • 3rd Gear Band Assembly (16)	• Remove the torque converter assembly (1) and the automatic transmission fluid pump, 2nd coast clutch, 2nd clutch assembly (2) in order to gain access to the 2nd coast clutch assembly (221-230). Disassemble the 2nd coast clutch assembly and inspect. Repair or replace components as necessary to correct the condition. • Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19), and the 1-2 reverse carrier gear assembly (18) in order to inspect the 3rd gear brake band assembly (16). Inspect all related components for proper operation. Repair or replace as necessary.

NO ENGINE BRAKING IN SECOND GEAR

No Engine Braking in Second Gear

Checks	Actions
DEFINITION: No engine braking in second gear	
External Automatic Transmission Control Valve Body Assembly (39)	
Reverse Shift Solenoid Valve Assembly (S5) (305)	Verify that the solenoid responds electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assembly as needed, and inspect the solenoid O-ring seals, and the solenoid bore for signs of damage and/or missing

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	seals. If the solenoid valve responded electrically and there are no bore or seal concerns, replace the solenoid valve assembly as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • Shift Pressure Relay Valve (424) • Shift Pressure Control Valve (430)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
Clutch - Mechanical/Hydraulic	
• 2nd Coast Clutch Assembly (221-230) • 1-2 Reverse Clutch Assembly (19)	• Remove the torque converter assembly (1) and the automatic transmission fluid pump, 2nd coast clutch, 2nd clutch assembly (2) in order to gain access to the 2nd coast clutch assembly (221-230). Disassemble the 2nd coast clutch assembly and inspect. Repair or replace components as necessary to correct the condition. • Remove the automatic transmission case cover and 1-2 reverse clutch assembly (19). Inspect all 1-2 reverse clutch components for proper operation. Repair or replace as necessary.

NO RESPONSE TO MOVEMENT OF SHIFT LEVER

No Response to Movement of Shift Lever

Condition	Action
DEFINITION: No response to movement of shift lever	
Gear Selector Assembly	Gear selector assembly mechanically broken or not connected to cable assembly
Gear Selector Cable	• Cable not connected to the gear selector assembly or to the manual shift shaft and detent lever assembly (710) • Cable broken internally
Manual Shift Shaft and Detent Lever Assembly (710)	• Not installed • Shaft broken

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Manual Shift Shaft and Detent Lever Spring and Roller Assembly (711)	• Not installed • Mechanically broken, or mounting bolts (712, 715) not installed or loose
Manual Valve Link (336)	• Not installed • Not connected to the manual shift shaft assembly (710)

TRANSMISSION ATTEMPTS TO MOVE BUT APPEARS LOCKED UP

Transmission Attempts to Move but Appears Locked Up

Condition	Action
DEFINITION: Transmission attempts to move but appears locked up	
Parking Pawl Actuator Rod (709)	• Not installed • Not installed correctly inside transmission assembly

VIBRATION AT IDLE

Vibration at Idle

Condition	Action
DEFINITION: Vibration at base idle.	
Engine and or Transaxle mounts	Inspect the engine and or transaxle for loose, damaged or missing mounts. Repair as necessary.
Exhaust System	Inspect the complete exhaust system for proper installation and/or damage.
Drivetrain "grounded out" to or on the vehicle chassis	Inspect the complete drive-train for signs of physical contact. Correct as necessary.
Drive Axles	Inspect both drive axles for proper installation and/or damage. Repair as necessary.
Engine Flexplate	Inspect the flexplate for damage, excessive run-out. Correct as necessary.
Base Engine	Inspect the engine for any base level concerns. Repair as necessary.

VIBRATION WHILE DRIVING

Vibration While Driving

Condition	Action
DEFINITION: Vibration while driving.	
• Lack of automatic transmission fluid	

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

(ATF) • Burnt ATF • Incorrect ATF • ATF contaminated with engine coolant	Perform an ATF fluid inspection and correct as necessary. Refer to Transmission Fluid Checking Procedure .
Engine and/or Transaxle mounts	Inspect the engine and/or transaxle for loose, damaged or missing mounts. Repair as necessary.
Drivetrain "grounded out" to the vehicle chassis	Inspect the complete drivetrain for signs of physical contact. Correct as necessary.
Drive Axles	Inspect both drive axles for proper installation and/or damage. Repair as necessary.
Exhaust System	Inspect the complete exhaust system for proper installation and/or damage.
Tires	Inspect all four tires for signs of cupping or irregular wear pattern.
Engine Flexplate	Inspect the flexplate for damage, excessive run-out. Correct as necessary.
Base Engine	Inspect the engine for any base level concerns. Repair as necessary.
Internal transaxle concern	Remove the transaxle assembly and disassemble. Repair as necessary.

HUM OR RATTLE NOISE AT IDLE

Hum or Rattle Noise at Idle

Condition	Action
DEFINITION: Hum or rattle noise at idle.	
Oil cooler pipes	Inspect for proper routing and/or signs of grounding out.
Base Engine	Inspect the engine for any base level concerns. Repair as necessary.

WHINE/GROWL NOISE THAT CHANGES WITH VEHICLE SPEED

Whine or Growl Noise That Changes With Vehicle Speed

Condition	Action
DEFINITION: whine or growl noise that changes with vehicle speed.	
• Lack of automatic transmission fluid (ATF) • Burnt ATF	Perform an ATF fluid inspection and correct as necessary. Refer to Transmission Fluid Checking

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

- Incorrect ATF
- ATF contaminated with engine coolant

Procedure.

AUTOMATIC TRANSMISSION FLUID LEAKS

Automatic Transmission Fluid Leaks

Condition	Action
Automatic transmission fluid (ATF) leaks from automatic transmission vent assembly (815)	
Transmission unit overfilled with automatic transmission fluid (ATF).	Perform a fluid fill level inspection and if needed, drain ATF as needed to obtain the correct fill level.
ATF fill level is high due to engine coolant contamination	ATF level is high due to contamination resulting from mixing with engine coolant. Verify that the ATF is the correct color and does not smell burnt. If ATF is contaminated with engine coolant refer to contaminated ATF concern and correct as needed.
• Automatic transmission vent assembly (815) is not installed, damaged or restricted • Vent hose (814) not secure, not installed, restricted or damaged • Vent pipe (812) not secure, not installed, restricted or damaged • Vent hose clips (813) not installed	Inspect and correct as needed. Verify that the unit has the correct ATF level after repair(s) are completed.
Fluid leak from between the engine and transmission assembly area	
• Engine rear main seal concern • Engine oil pan and or gasket concern • Engine intake manifold or gasket concern • Engine valve cover	Add fluorescent oil dye to both the engine oil and the ATF. Inspect with a leak detection lamp - black light - to aid in pinpointing the exact area of concern. Correct as needed.

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

concern • Transmission torque converter (1) weld or seam issue • Transmission fluid pump body seal (200) worn and or damaged or not installed • Transmission fluid pump O-ring seal (206) not installed or damaged during installation	
Torque converter housing assembly (10)	
Front differential carrier seal assembly (800)	Inspect the front differential carrier seal assembly (800) for not being installed, worn and or damaged. Correct as needed.
Front differential carrier seal (800) to torque converter housing (10) internal bore concern	Inspect the front differential carrier seal (800) to torque converter housing (10) internal bore for signs of physical damage and or oversize bore. If unable to repair, replace the torque converter housing assembly (801).
Manual shaft detent lever assembly (710) to automatic transmission case assembly (17)	
Manual shift shaft seal assembly (713)	Inspect the manual shift shaft seal assembly (713) for signs for physical damage or improper installation or not being installed. Correct as needed.
Automatic transmission case assembly (17) manual shift shaft bore	Inspect automatic transmission case assembly (17) internal bore for proper finish and size. If damaged, replace the automatic transmission case assembly (17)
Input speed sensor (71) and/or output speed sensor (62) assembly to automatic transmission case assembly (17)	
Sensor O-ring seal (63) or (71) not installed or sealing surface damaged	Inspect sensor O-ring sealing surface and replace if damaged or in question.
Automatic transmission case assembly (17) speed sensor internal bore	Inspect automatic transmission case assembly (17) internal bore for proper finish and size. If damaged, replace the automatic transmission case assembly (17)
Torque converter housing assembly (10) to transmission case assembly (17)	
Lack of sealant	Add fluorescent oil dye to the ATF. Inspect with a leak detection lamp - black light - to aid in pinpointing the exact area of concern. Correct as needed.
Torque converter housing	Inspect the torque converter housing assembly (801)

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

assembly (801)	sealing surface. If the sealing surface is not repairable, replace the torque converter housing assembly (801).
Transmission case assembly (17) sealing surface damaged	Inspect the transmission case assembly (17) sealing surface. If the sealing surface is not repairable, replace the transmission case assembly (17).
Mounting bolts not torqued to the correct specification, cross-threaded or missing.	Verify that there are no damaged thread issues, coat the fastener threads with threadlocker 242 and torque to specification.
Control valve body cover (29) to automatic transmission case assembly (17)	
Lack of sealant	Add fluorescent oil dye to the ATF. Inspect with a leak detection lamp - black light - to aid in pinpointing the exact area of concern. Correct as needed.
Control valve body cover (29) sealing surface damaged	Inspect the control valve body cover (29) sealing surface. If the sealing surface is not repairable, replace the control valve body cover (29).
Transmission case assembly (17) sealing surface damaged	Inspect the transmission case assembly (17) sealing surface. If the sealing surface is not repairable, replace the transmission case assembly (17).
Mounting bolts not torqued to the correct specification, cross-threaded or missing.	Verify that there are no damaged thread issues, coat the fastener threads with threadlocker 242 and torque to specification.
Automatic transmission case cover and 1-2 reverse clutch assembly (19) to automatic transmission case assembly (17)	
Lack of sealant	Add fluorescent oil dye to the ATF. Inspect with a leak detection lamp - black light - to aid in pinpointing the exact area of concern. Correct as needed.
Automatic transmission case cover and 1-2 reverse clutch assembly (19) sealing surface damaged	Inspect the automatic transmission case cover and 1-2 reverse clutch assembly (19) sealing surface. If the sealing surface is not repairable, replace the automatic transmission case cover and 1-2 reverse clutch assembly (19).
Transmission case assembly (17) sealing surface damaged	Inspect the transmission case assembly (17) sealing surface. If the sealing surface is not repairable, replace the transmission case assembly (17).
Mounting bolts not torqued to the correct specification, cross-threaded or missing.	Verify that there are no damaged thread issues, coat the fastener threads with threadlocker 242 and torque to specification.
Fluid leaks from a casting	
Torque converter housing assembly (10)	Porous casting or signs of physical damage, including sealing surfaces. Repair as necessary. If unable to perform
Automatic transmission case assembly (17)	

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Automatic transmission case cover and 1-2 reverse clutch assembly (19)	an external case repair, then replace housing assembly as necessary.
Fluid leak from top of automatic transmission case area, near wiring harness	
Transmission wiring harness pass-through connector O-ring seal (46)	Remove the control valve body cover (29) in order to inspect the transmission wiring harness pass-through connector O-ring seal (46). Make sure the seal is installed and that there are no signs of damage.
Automatic transmission case assembly (17) wiring harness bore concern	Inspect the transmission case assembly (17) wiring harness pass-through connector internal bore for signs of damage or being oversize. Correct as needed.
Fluid leak from the oil cooler line area	
Oil Cooler Line Seals (87)	• Oil cooler lines not fully seated into seals • Oil cooler line retainer mounting bolts not torqued to the correct specification, cross-threaded or missing. • Internal bore concern, damaged or oversize within the transmission case assembly (17) oil cooler line seal bore.

HARSH PARK OR NEUTRAL TO DRIVE ENGAGEMENT

Harsh Park or Neutral to Drive Engagement

Checks	Actions
DEFINITION: Harsh PARK or NEUTRAL to DRIVE engagement	
Fluid level low and/or contaminated, or unit filled with the wrong type of automatic transmission fluid (ATF)	Inspect the ATF level and color. Perform Transmission Fluid Checking Procedure and make sure that the fluid does not smell burnt, and shows no sign of coolant cross-contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct ATF and retest.
Calibration	Using a scan tool, verify that the current calibration level downloaded into the transmission control module (TCM) is correct for this platform, including that the correct TCM is being used for the platform. Refer to the appropriate service information to verify that both engine and transmission calibrations are the most current up-to-date level.
Adaptive learn function	Perform adaptive learn procedure on the transmission in order for the TCM to calibrate line pressure for accurate shifts.

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Automatic Transmission Input Speed Sensor Assembly (73)	Inspect the automatic transmission input speed sensor assembly (73) for loose electrical connection and/or signs of physical damage that could cause erratic output. The magnetic end of the sensor should be free of any metal shavings/particles, including heavy friction material build-up. If metal or heavy friction material is found, diagnose the cause and repair as necessary.
External Automatic Transmission Control Valve Body Assembly (39)	
• Reverse, 1st Shift Solenoid Valve Assembly (S1) (310) • 2-3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • Line Pressure Control Solenoid Valve Assembly (SLT) (316) • Automatic Transmission Fluid Temperature Sensor (36) - part of the Automatic Transmission Wiring Harness Assembly (33)	• Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39). • Using a scan tool, verify that the transmission fluid temperature is correct. If the transmission fluid temperature is NOT correct, diagnose and correct as necessary.
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 shift Valve (426) • Neutral Relay Valve (356) • Ball Check Valve (355) • Solenoid Modulator Valve (346)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).

HARSH PARK OR NEUTRAL TO REVERSE ENGAGEMENT

Harsh Park or Neutral to Reverse Engagement

Checks	Actions
DEFINITION: Harsh PARK or NEUTRAL to REVERSE engagement	
Fluid level low and/or	Inspect the ATF level and color. Perform Transmission

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

contaminated, or unit filled with the wrong type of automatic transmission fluid (ATF)	Fluid Checking Procedure and make sure that the fluid does not smell burnt, and shows no sign of coolant cross-contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct ATF and retest.
Calibration	Using a scan tool, verify that the current calibration level downloaded into the transmission control module (TCM) is correct for this platform, including that the correct TCM is being used for the platform. Refer to the appropriate service information to verify that both engine and transmission calibrations are the most current up-to-date level.
Adaptive learn function	Perform adaptive learn procedure on the transmission in order for the TCM to calibrate line pressure for accurate shifts.
Automatic Transmission Input Speed Sensor Assembly (73)	Inspect the automatic transmission input speed sensor assembly (73) for loose electrical connection and/or signs of physical damage that could cause erratic output. The magnetic end of the sensor should be free of any metal shavings/particles, including heavy friction material build-up. If metal or heavy friction material is found, diagnose the cause and repair as necessary.
Automatic Transmission Fluid Temperature Sensor (36) - part of the Automatic Transmission Wiring Harness Assembly (33)	Using a scan tool, verify that the transmission fluid temperature is correct. If the transmission fluid temperature is NOT correct, diagnose and correct as necessary.
External Automatic Transmission Control Valve Body Assembly (39)	
- Reverse Shift Solenoid Valve Assembly (S5) (305) - Shift Pressure Control Solenoid Valve Assembly (SLS) (340)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
Shift Pressure Relay	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Valve (424) • Ball Check Valve (355) • Solenoid Modulator Valve (346) • Shift Pressure Control Valve (430) • Forward Clutch Control Valve (354) • Line Pressure Control (SLT) Accumulator Piston (433)	internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).
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HARSH UPSHIFT

Harsh Upshift

Checks	Actions
DEFINITION: Harsh upshifts	
Customer Driving Habits	Road test the vehicle in an attempt to duplicate the concern. If unable to duplicate the concern, scan the system to verify that there is no other concern present, perform a bulletin search, and verify the calibration level.
Fluid level low and/or contaminated, or unit filled with the wrong type of automatic transmission fluid (ATF)	Inspect the ATF level and color. Perform Transmission Fluid Checking Procedure and make sure that the fluid does not smell burnt, and shows no sign of coolant cross-contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct ATF and retest.
Calibration	Using a scan tool, verify that the current calibration level downloaded into the transmission control module (TCM) is correct for this platform, including that the correct TCM is being used for the platform. Refer to the appropriate service information to verify that both engine and transmission calibrations are the most current up-to-date level.
Adaptive learn function	Perform adaptive learn procedure on the transmission in order for the TCM to calibrate line pressure for accurate shifts.
Automatic Transmission Input Speed Sensor Assembly (73)	Inspect the automatic transmission input speed sensor assembly (73) for loose electrical connection and/or signs of physical damage that could cause erratic output. The

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	magnetic end of the sensor should be free of any metal shavings/particles, including heavy friction material build-up. If metal or heavy friction material is found, diagnose the cause and repair as necessary.
Automatic Transmission Fluid Temperature Sensor (36) - part of the Automatic Transmission Wiring Harness Assembly (33)	Using a scan tool, verify that the transmission fluid temperature is correct. If the transmission fluid temperature is NOT correct, diagnose and correct as necessary.
External Automatic Transmission Control Valve Body Assembly (39)	
• 2-3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303) • Reverse Shift Solenoid Valve Assembly (S5) (305) • Line Pressure Control Solenoid Valve Assembly (SLT) (316) • Shift Pressure Control Solenoid Valve Assembly (SLS) (340) • TCC Lock Up Pressure Control Solenoid Valve Assembly (SLU) (339)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386) • U2 Shift Valve (392)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

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|--|--|
| <ul style="list-style-type: none">• Solenoid Relay Valve (378)• 4-5 Clutch (B4) Release Valve (385)• Shift Pressure Relay Valve (424)• Ball Check Valve (355)• Solenoid Modulator Valve (346)• Shift Pressure Control Valve (430)• 2nd Coast Clutch (B1) Control Valve (359)• 2nd Clutch (B2) Control Valve (446)• 3rd Gear (B4) Control Valve (423)• 1-2 Reverse Clutch (B5) Control Valve (411) | automatic transmission control valve body assembly (39). |
|--|--|

HARSH SHIFT ON COASTDOWN

Harsh Shift on Coastdown

Checks	Actions
DEFINITION: Harsh shift on coastdown	
Fluid level low and/or contaminated, or unit filled with the wrong type of automatic transmission fluid (ATF)	Inspect the ATF level and color. Perform Transmission Fluid Checking Procedure and make sure that the fluid does not smell burnt, and shows no sign of coolant cross-contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct ATF and retest.
Calibration	Using a scan tool, verify that the current calibration level downloaded into the transmission control module (TCM) is correct for this platform, including that the correct TCM is being used for the platform. Refer to the appropriate service information to verify that both engine and transmission calibrations are the most current up-to-date level.
Automatic Transmission	Inspect the automatic transmission input speed sensor

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

Input Speed Sensor Assembly (73)	assembly (73) for loose electrical connection and/or signs of physical damage that could cause erratic output. The magnetic end of the sensor should be free of any metal shavings/particles, including heavy friction material build-up. If metal or heavy friction material is found, diagnose the cause and repair as necessary.
Automatic Transmission Fluid Temperature Sensor (36) - part of the Automatic Transmission Wiring Harness Assembly (33)	Using a scan tool, verify that the transmission fluid temperature is correct. If the transmission fluid temperature is NOT correct, diagnose and correct as necessary.
External Automatic Transmission Control Valve Body Assembly (39)	
• 2-3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303) • Reverse Shift Solenoid Valve Assembly (S5) (305) • Line Pressure Control Solenoid Valve Assembly (SLT) (316) • Shift Pressure Control Solenoid Valve Assembly (SLS) (340) • TCC Lock Up Pressure Control Solenoid Valve Assembly (SLU) (339)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389) • M2 Shift Valve (426) • U1 Shift Valve (386)	Remove the automatic transmission control valve body assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

- U2 Shift Valve (392)
- Solenoid Relay Valve (378)
- 4-5 Clutch (B4) Release Valve (385)
- Shift Pressure Relay Valve (424)
- Ball Check Valve (355)
- Solenoid Modulator Valve (346)
- Shift Pressure Control Valve (430)
- 2nd Coast Clutch (B1) Control Valve (359)
- 2nd Clutch (B2) Control Valve (446)
- 3rd Gear (B4) Control Valve (423)

damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).

HARSH FORCED DOWNSHIFT

Harsh Forced Downshift

Checks	Actions
DEFINITION: Harsh forced downshifts	
Customer Driving Habits	Road test the vehicle in an attempt to duplicate the concern. If unable to duplicate the concern, scan the system to verify that there is no other concern present, perform a bulletin search, and verify the calibration level.
Fluid level low and/or contaminated, or unit filled with the wrong type of automatic transmission fluid (ATF)	Inspect the ATF level and color. Perform Transmission Fluid Checking Procedure and make sure that the fluid does not smell burnt, and shows no sign of coolant cross-contamination. If unable to determine if the transmission has the correct type of fluid, drain the unit and refill with the correct ATF and retest.
Calibration	Using a scan tool, verify that the current calibration level downloaded into the transmission control module (TCM) is correct for this platform, including that the correct TCM is being used for the platform. Refer to the appropriate service information to verify that both engine and transmission calibrations are the most current up-to-date

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

	level.
Automatic Transmission Input Speed Sensor Assembly (73)	Inspect the automatic transmission input speed sensor assembly (73) for loose electrical connection and/or signs of physical damage that could cause erratic output. The magnetic end of the sensor should be free of any metal shavings/particles, including heavy friction material build-up. If metal or heavy friction material is found, diagnose the cause and repair as necessary.
Automatic Transmission Fluid Temperature Sensor (36) - part of the Automatic Transmission Wiring Harness Assembly (33)	Using a scan tool, verify that the transmission fluid temperature is correct. If the transmission fluid temperature is NOT correct, diagnose and correct as necessary.
External Automatic Transmission Control Valve Body Assembly (39)	
• 2-3, 3-4 Shift Solenoid Valve Assembly (S2) (308) • 1-2, 2-3, Reverse Shift Solenoid Valve Assembly (S3) (300) • 3-4, 4-5 Shift Solenoid Valve Assembly (S4) (303) • Reverse Shift Solenoid Valve Assembly (S5) (305) • Line Pressure Control Solenoid Valve Assembly (SLT) (316) • Shift Pressure Control Solenoid Valve Assembly (SLS) (340) • TCC Lock Up Pressure Control Solenoid Valve Assembly (SLU) (339)	Verify that all solenoids respond electrically. If there is no response, perform an electrical diagnosis. If there are no electrical concerns, remove the solenoid valve assemblies as needed, and inspect the solenoid O-ring seals, and the solenoid bores for signs of damage and/or missing seals. If the solenoid valves responded electrically and there are no bore or seal concerns, replace the solenoid valve assemblies as necessary due to possible internal mechanical concerns and retest. If a condition is still present after replacing the solenoid valve assembly, replace the complete automatic transmission control valve body assembly (39).
Internal Automatic Transmission Control Valve Body Assembly (39)	
• M1 Shift Valve (389)	Remove the automatic transmission control valve body

2006 Chevrolet Equinox LT

2006 TRANSMISSION Automatic Transaxle - AF33-5 - Troubleshooting - Equinox & Torrent

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| <ul style="list-style-type: none">• M2 Shift Valve (426)• U1 Shift Valve (386)• U2 Shift Valve (392)• Solenoid Relay Valve (378)• 4-5 Clutch (B4) Release Valve (385)• Shift Pressure Relay Valve (424)• Ball Check Valve (355)• Shift Pressure Control Valve (430)• 2nd Coast Clutch (B1) Control Valve (359)• 2nd Clutch (B2) Control Valve (446)• 3rd Gear (B4) Control Valve (423) | <p>assembly (39) and inspect the items listed. Inspect the internal bores and the valves for signs of wear and/or damage, including internal contamination. If unable to verify any repairable concerns, replace the complete automatic transmission control valve body assembly (39).</p> |
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