**DIAGNOSTIC TOOLS**

- **Rugged COM Cable**
  - PCS Part #: A-TCM4182
- **Transmission Diagnostic Device (TDD)**
  - PCS Part #: A-TDD5000

**PREVENTATIVE MAINTENANCE**

- Service interval is 1,000 hours / 12 months whichever comes first
- Filter and pan gasket should be replaced (PCS Part# TRN7090)
- Fluid must be DEXRON VI

**TRANSMISSION OVERVIEW**

The PCS 4LHD/4LHDX is a four-speed, longitudinal rear-wheel drive electronically controlled automatic overdrive transmission with torque converter clutch and advanced valve body features.

**GEAR**

<table>
<thead>
<tr>
<th>Gear</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio</td>
<td>3.059</td>
<td>1.625</td>
<td>1.000</td>
<td>0.696</td>
<td>2.29</td>
</tr>
</tbody>
</table>

*The GSE industry typically only uses 2 or 3 gears.*

**COOLER FITTINGS**

Two variants of case cooler interfaces exist within the fleet.

**VARIANT 1**
- Tapped -6ORB (9/16-18” w/O-Ring)
- Recommended Fitting
  - PCS Part #: TRN0212
  - -6ORB Male to -6JIC Male

**VARIANT 2**
- Tapped 1/4” NPS (Straight Pipe, 0.54-18”)
- Recommended Fitting
  - PCS Part #: TRN0215
  - 1/4” NPS Male to -6JIC Male

**PART NUMBER LOCATOR**

**TRANSMISSION**

- Last Four Digits of Trans Part #
- Complete Trans Part #
- Sequence #
- Julian Date (YYDDD)

**HARNESS**

- LOCATE LABEL
  - Located at the TCM breakout
- READ LABEL
  - PCS Part #
  - Description

**TCM**

- Model #
- Model #

**IDENTIFY GEN 2 OR GEN 3 VALVE BODY**

**GEN 2 (used for abuse protection)**

- ID Methods Below (Choose 1):
  - Remove pan, filter, and compare to image.
  - Measure solenoid resistance:
    - Trans Pin E to Pin R: 3-6Ω
    - Trans Pin E to Pin S: 3-6Ω
  - Use TDD to confirm reverse solenoid operation

**GEN 3 (used for abuse protection, inching, e-shift, and anti-collision)**

- ID Methods Below (Choose 1):
  - Remove pan, filter, and compare to image.
  - Measure solenoid resistance:
    - Trans Pin E to Pin R: 10-15Ω
    - Trans Pin E to Pin S: 10-15Ω
  - Use TDD to confirm reverse solenoid operation
PRE-RAMP CHECK LIST

KEY OFF PHYSICAL INSPECTION

Fastener Torque: Inspect all mounting bolts, torque converter bolts, flywheel bolts, and all other driveline hardware for proper torque.

Position Lever Check: Move the shift lever through all ranges and verify that the transmission shift arm is centered in the detent for each position.

KEY ON, ENGINE OFF SOFTWARE VERIFICATION

Connect: Connect to the TCM with the PCS TCM Diagnostic software. To download the software, please visit: www.GSEhelp.com.

Position Lever Verification: Move the shift lever through the ranges and verify the actual shift lever position matches the position shown in the software.

Throttle Position Sensor: Verify the throttle position reading is zero when the pedal is not pressed and 100% when fully depressed.

STATIONARY ENGINE RUNNING CHECKS

Fluid Level Check: Start the engine and check the fluid level is sufficient.

Engine RPM: Verify the engine RPM on the software matches the actual engine RPM.

DTC Check: Verify there are no diagnostic codes set.

TEST DRIVE (Operate the vehicle until trans is at operating temp)

Vehicle Speed: Move the vehicle and verify that the vehicle speed operates properly.

Shifting: Check proper transmission operation in all gears.

"Data log recommended. For help, view "How to Datalog.""

POST DRIVE CHECK

DTC Verification: Check for diagnostic codes.

Fluid Level Verification: Verify the fluid level is correct and no fluids are leaking from the vehicle.

HOW TO DATALOG

1. Open PCS TCM Diagnostic Software.
2. Connect to the TCM.
3. Click "Datalog" on the top menu.
4. Note the stored file location and click "Start Logging."
5. Operate the vehicle. When complete click, "Stop Logging."

CONTROLLER AREA NETWORK (CAN)

- Most CAN GSE applications use J1939.
- High speed, two wire communication protocol used for communication between control modules. Typically ECM to TCM for sharing engine RPM, throttle position, and other signals.
- Twisted wire, two 120-ohm terminating resistors
- CAN H (pin 7 of bulkhead)
- CAN L (pin 1 of bulkhead)
- Measuring resistance between CAN H and CAN L must be 60Ω.

LINE PRESSURE TAP

Line pressure tap (1/8" NPT) available for diagnostics.

1. Remove pressure plug.
2. Install appropriately rated pressure gauge for transmission line pressure measurement. Pressures could exceed 300 PSI.
3. Command current using PCS software.
4. Start the Engine.
5. Perform test in Neutral at 1200 RPM between 100 - 200°F (38 - 93°C).

<table>
<thead>
<tr>
<th>AMP</th>
<th>PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>170-193</td>
</tr>
<tr>
<td>0.5</td>
<td>135-166</td>
</tr>
<tr>
<td>1</td>
<td>54-80</td>
</tr>
<tr>
<td>0</td>
<td>198-227</td>
</tr>
<tr>
<td>0.5</td>
<td>154-193</td>
</tr>
<tr>
<td>1</td>
<td>53-85</td>
</tr>
</tbody>
</table>

**WARNING:** Only perform this test in Neutral with the brakes applied and engine speeds below 1500 RPM. Failure to do so may result in extremely high pressures (in excess of 300 PSI) that could damage the transmission or the gauge and result in serious injury.

COOLER AND COOLER LINES

- Cooler and cooler lines must be flushed free and clear of debris.
- Cooler fitting information on page 1.

TRANSMISSION VENT

Vent must be clear of exhaust and heat sources.

(PCS Part#: TRN7006-REV2)

TRANSMISSION CONNECTOR

Transmission connector must have arrow out.

TORQUE CONVERTER PULL-UP

1. Align and install the bellhousing/transmission to the engine. Before tightening the bellhousing fasteners, check to be sure converter rotates freely.
2. Torque bellhousing fasteners to spec. Push the torque converter back into the transmission as far as possible.
3. Measure the gap between the flexplate mounting surface and the torque converter mounting pads.

Gap distance must be between .060” (1.5mm) and .187” (4.7mm). Do not proceed and contact PCS if gap is out of range.

*Pre-ramp checklist must be completed after transmission replacement.
**1. CHECK FLUID LEVEL AND CONDITION**

**CHECK FLUID CONDITION**
- Fluid color: Fluid should be red in color. Burnt smelling fluid (dark color) most likely indicates internal abnormal transmission operation.

**CHECK FLUID LEVEL**
- **LEVEL CHECK PROCEDURE**
  - Engine at idle
  - Move lever through the ranges to fill all transmission cavities
  - “Proper” level is very transmission temperature dependent

**CONTAMINATED FLUID**
- Fluid that has a cloudy or milky appearance is possibly contaminated with water from engine coolant or an external source.
  - Transmission Vent
  - Radiator
  - Fluid Storage Container

**CHECK FLUID LEVEL**
- **LEVEL CHECK PROCEDURE**
  - Engine at idle
  - Move lever through the ranges to fill all transmission cavities
  - “Proper” level is very transmission temperature dependent

**DIPSTICK INDICATORS**
- **COLD:** 80-90°F (26-32°C)
- **HOT:** 180-200°F (82-93°C)

**NOTES**
- Software will calculate proper level based on temp
- Too low - no pressure, intermittent pressure
- Too high - expands with heat, could overflow

**2. CHECK FOR CODES**

**PCS SOFTWARE INTERFACE VIA LAPTOP**
- Transmission controller is accessed via a serial data interface and a laptop.
- Clicking on the code number will open a code description window.
- If the software doesn’t connect and there is power to the unit, try a different TCM.

**CHECK TRANS INDICATOR**
- If vehicle is equipped with a check trans indicator, full description of light operation can be found on page 5.

**NOTE:** DTC’s may be visible on factory installed dash displays or with a J1939 code reader.

**3. CHECK THE BASICS**

Without power, the trans behavior depends on the valve body.
- GEN 2: 1 forward gear, reverse, min pressure, trans slips when loaded
- GEN 3: No forward, no reverse

**TCM CONNECTOR**
- Arrow facing out.
- Verify switched ignition on pin E (10A fuse).

**SHIFT LINKAGE:** Ensure cable fits transmission detent.

**4. CHECK THE SIGNALS**

Having the transmission harness schematic is strongly recommended for reference during this step. It can be obtained from:

www.GSEhelp.com

Connect to the TCM using the software and verify the following items:

1. Shift lever matches reported lever position.
2. Throttle position matches the reported TPS. Must be 0% at idle and 100% at full throttle. Abuse protection typically set at 15%
3. Engine RPM matches reported engine RPM. Abuse protection typically set at 1500 RPM.
4. Other abuse protection inputs such as seat switch, shift inhibit, etc. This is vehicle specific. Use the Abuse Protection monitor screen in the software.
5. Vehicle speed in the software should be zero when the vehicle is stopped and increases as the vehicle speeds up. Vehicle speed is not going to be accurate - this is intentional for calibration purposes.

**5. DIRECTLY CONTROL THE TRANSMISSION**

To directly control the transmission, turn to page 4, “Transmission Diagnostic Device (TDD) Quick Reference.”
**CONNECT TDD TO TRANSMISSION AND POWER**

Step 1. Connect handheld to harness.
Step 2. Connect to transmission with arrow facing out. Reference Figure 1.
Step 3. Connect to battery.
   Step 3.1 - Turn all toggle switches to the off position (↑). For switch functions, Reference Figure 2.
   Step 3.2 - Connect the red clamp to the battery’s positive terminal.
   Step 3.3 - Connect the black clamp to the battery’s negative terminal.
   Step 3.4 - Verify the power LED is on. If it is not on, check the battery connections and the 10A fuse.
Step 4. With operator on seat, brakes fully pressed, start engine. The vehicle will move suddenly when commanded by the TDD.

**NOTE:** Gen 3 valve body vehicles will move independent of shift lever position in all tests.

---

**GEN 2 REVERSE CLUTCH SOLENOID TEST**
Turning the solenoid ON prevents reverse (abuse protection reverse lockout).

<table>
<thead>
<tr>
<th>REV</th>
<th>FWD</th>
<th>LINE</th>
<th>TCC</th>
<th>SSA</th>
<th>SSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

**Step 1.** Move shift lever into Reverse with REV OFF. The vehicle should move in Reverse.
**Step 2.** Move shift lever into Neutral.
**Step 3.** Turn REV ON.
**Step 4.** Move shift lever into Reverse. Vehicle should not move.

---

**GEN 3 REVERSE CLUTCH SOLENOID TEST**
Turning the solenoid OFF prevents reverse (abuse protection reverse lockout).

<table>
<thead>
<tr>
<th>REV</th>
<th>FWD</th>
<th>LINE</th>
<th>TCC</th>
<th>SSA</th>
<th>SSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

**Step 1.** Move shift lever into Reverse with REV OFF. The vehicle should not move in Reverse.
**Step 2.** Move shift lever into Neutral.
**Step 3.** Turn REV ON.
**Step 4.** Move shift lever into Reverse. Vehicle should move.

---

**FORWARD CLUTCH SOLENOID TEST**
Turning the solenoid ON enables forward (abuse protection forward lockout, when OFF).

<table>
<thead>
<tr>
<th>REV</th>
<th>FWD</th>
<th>LINE</th>
<th>TCC</th>
<th>SSA</th>
<th>SSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

**Step 1.** Move shift lever into Drive with FWD ON. Vehicle should move forward in 1st gear.
**Step 2.** Move shift lever into Neutral.
**Step 3.** Turn FWD OFF.
**Step 4.** Move shift lever into Drive. Vehicle should not move.

---

**SHIFT SOLENOID A&B TEST**
The shift solenoids select the gear of the transmission.

<table>
<thead>
<tr>
<th>REV</th>
<th>FWD</th>
<th>LINE</th>
<th>TCC</th>
<th>SSA</th>
<th>SSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

**Step 1.** Move shift lever into Drive. The vehicle should move in 1st gear.
**Step 2.** At an appropriate speed, move the shift solenoids to switch gears. Reference the table below.

<table>
<thead>
<tr>
<th>GEAR</th>
<th>SSA</th>
<th>SSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

---

**TCC SOLENOID TEST**
Turning the solenoid ON locks the converter clutch.

<table>
<thead>
<tr>
<th>REV</th>
<th>FWD</th>
<th>LINE</th>
<th>TCC</th>
<th>SSA</th>
<th>SSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

**Step 1.** Move the shift lever into Drive while firmly applying the brakes.
**Step 2.** Turn the TCC ON. The engine should stall.

---

**TRANSMISSION TEMPERATURE SENSOR**

<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
<th>Min Ω</th>
<th>Typ Ω</th>
<th>Max Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40</td>
<td>-40</td>
<td>90636</td>
<td>100707</td>
<td>110778</td>
</tr>
<tr>
<td>32</td>
<td>0</td>
<td>8481</td>
<td>9423</td>
<td>10365</td>
</tr>
<tr>
<td>86</td>
<td>30</td>
<td>2013</td>
<td>2237</td>
<td>2461</td>
</tr>
<tr>
<td>122</td>
<td>50</td>
<td>876</td>
<td>973</td>
<td>1070</td>
</tr>
<tr>
<td>158</td>
<td>70</td>
<td>420</td>
<td>467</td>
<td>514</td>
</tr>
<tr>
<td>212</td>
<td>100</td>
<td>159</td>
<td>177</td>
<td>195</td>
</tr>
<tr>
<td>302</td>
<td>150</td>
<td>42.5</td>
<td>47.2</td>
<td>51.9</td>
</tr>
</tbody>
</table>

*Only for shift cable applications.*
Diagnostic trouble codes (DTC’s) can be read using the PCS diagnostic software or the check transmission light installed on the dash.

If a DTC is active and the engine is running, the check transmission light will be on solid to indicate there is an active code. When the ignition is turned on, but the engine is not running, the light will flash a pattern so the DTC can be read. The flashing will indicate both active and stored codes.

The codes consist of two numbers. The first number is flashed at one second intervals, then a one second pause and the second number is flashed at 350ms. There is a three second pause in between trouble codes.

**EXAMPLE:**
Code 24 consists of two slow flashes followed by four quick flashes.

---

### Table: Diagnostic Trouble Codes (DTC’s)

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
<th>FAIL CONDITIONS</th>
<th>ACTION TAKEN</th>
<th>ACTIVE TO STORED CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CAN Com. Lost</td>
<td>Code 1 is the same as <strong>code 23</strong>. It is reported as code 1 or code U0001 on some software versions. See <strong>Code 23</strong> below for a full description.</td>
<td>Max line pressure. Shift points fixed at 35% throttle.</td>
<td>Throttle position below 4.9 volts for more than 1 second.</td>
</tr>
<tr>
<td>21</td>
<td>Throttle Position High</td>
<td>Throttle Position High Throttle position voltage has been above 4.9 Volts for more than 1 second.</td>
<td>Max line pressure. Shift points fixed at 35% throttle.</td>
<td>Throttle position below 4.9 volts for more than 1 second.</td>
</tr>
<tr>
<td>22</td>
<td>Throttle Position Low</td>
<td>TPS voltage is less than 0.20 volts for more than 1 second.</td>
<td>Max line pressure. Shift points fixed at 35% throttle.</td>
<td>Throttle position above 0.20 volts for more than 1 second.</td>
</tr>
<tr>
<td>23</td>
<td>CAN Com. Lost</td>
<td>No CAN communications for greater than 5 seconds. <strong>Note:</strong> Reported as code 1 or U0001 in some software versions.</td>
<td>Max line pressure. Shift points fixed at 35% TPS. Inhibit 4thTCC.</td>
<td>Valid CAN message received.</td>
</tr>
<tr>
<td>24</td>
<td>Output Speed Sensor</td>
<td>No Code 21, 22, 23. Sets when not in Park or Neutral, Engine RPM greater than 3000, Input shaft speed greater than 10%, Output speed less than 200. All conditions met for 3 seconds.</td>
<td>Calculate output shaft speed from input shaft speed and commanded gear. Max line pressure.</td>
<td>Key Cycle</td>
</tr>
<tr>
<td>28</td>
<td>Lever Position Error</td>
<td>Sets when TCM receives an illegal combination from lever position sensor for 2 seconds.</td>
<td>Max pressure. Assume Overdrive 4 is selected. Inhibit 4thTCC.</td>
<td>Key Cycle</td>
</tr>
<tr>
<td>37</td>
<td>Brake Switch Stuck Off</td>
<td>Sets when Brake is not pressed, Vehicle speed is below 5 MPH for greater than 6 seconds, then Vehicle speed is greater than 20 MPH for greater than 6 seconds, for a total of 7 times.</td>
<td>Inhibit TCC</td>
<td>Key Cycle or when Brake Pedal is pressed</td>
</tr>
<tr>
<td>38</td>
<td>Brake Switch Stuck On</td>
<td>Sets when Brake is pressed, Vehicle speed is below 5 MPH for greater than 6 seconds, then Vehicle speed is greater than 20 MPH for greater than 6 seconds, for a total of 7 times.</td>
<td>Inhibit TCC</td>
<td>Key Cycle or When Brake Pedal is pressed</td>
</tr>
<tr>
<td>39</td>
<td>TCC Stuck OFF</td>
<td>TCC slip is greater than 65 RPM for 3 seconds when TCC is commanded on in 2nd or 3rd.</td>
<td>Inhibit TCC/4th gear</td>
<td>Key Cycle</td>
</tr>
<tr>
<td>51</td>
<td>TCM</td>
<td>Sets when Internal memory writes/read fail, COP stops operating or processor executes an illegal Opcode.</td>
<td>Key Cycle</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>System Voltage High Long</td>
<td>Sets when system voltage is greater than 16 volts for 30 minutes.</td>
<td>Key Cycle or when system voltage drops below 15V.</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>System Voltage High</td>
<td>Sets when system voltage is greater than 19.5 volts for 5 seconds.</td>
<td>Key Cycle or when system voltage drops below 18V.</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Trans Temp High TFT Circuit Low</td>
<td>Sets when Transmission Temperature Is above 151°C (304°F).</td>
<td>Inhibit 4thTCC</td>
<td>When trans temp drops below 148°C for 5 seconds.</td>
</tr>
<tr>
<td>59</td>
<td>Trans Temp Low TFT Circuit High</td>
<td>Transmission Temperature Is Below -37°C (-34°F) for 1 second.</td>
<td>Inhibit 4th/TCC</td>
<td>When trans temp goes above -35°C for 5 seconds.</td>
</tr>
<tr>
<td>68</td>
<td>Component Slipping/TCC/4th Clutch Slipping</td>
<td>No DTC 23, 28, 71, 74. Throttle Position is greater than 25%, Engine speed is 200 rpm or more than input speed for 6 seconds when in 4th gear and TCC engaged.</td>
<td>Max line pressure, Inhibit 4th</td>
<td>Key Cycle</td>
</tr>
<tr>
<td>69</td>
<td>TCC Stuck On</td>
<td>No DTC 21, 22, 23, 71, 74 Sets when TCC slip is between -25 and 25 rpm, TCC solenoid is commanded off, TPS is greater than 25% for 4 seconds.</td>
<td>TCC Commanded on, Max Line Pressure</td>
<td>Key Cycle</td>
</tr>
<tr>
<td>71</td>
<td>Engine Speed Circuit Low</td>
<td>Sets when Engine speed is less than 50 RPM, transmission range is R, D4, D3, D1 for 2 seconds.</td>
<td>Inhibit 4th and TCC</td>
<td>When Engine RPM goes above 300 RPM</td>
</tr>
</tbody>
</table>

**NOTE:** J1939 codes, if available, can be found in the column “CODE” below the GM 2-digit code.
<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
<th>FAIL CONDITIONS</th>
<th>ACTION TAKEN</th>
<th>ACTIVE TO STORED CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>Intermittent Output Shaft Speed</td>
<td>No DTC 21, 22, 23, 28, 71, 74. Sets when Engine RPM is greater than 300 rpm, range is D4, D3, D2, or D1, Throttle position is greater than 25% and Output shaft speed changes more than 500 rpm in one measurement period.</td>
<td>Max line pressure. Calculate TOSS from TISS and commanded Gear.</td>
<td>Key Cycle</td>
</tr>
<tr>
<td>73</td>
<td>Pressure Control Circuit</td>
<td>Force motor current is more than 0.16 Amps different than commanded current for 2 seconds.</td>
<td>Max line pressure.</td>
<td>Key Cycle</td>
</tr>
<tr>
<td>74</td>
<td>Input Speed Sensor Circuit</td>
<td>No DTC 28. Sets when Range is not park or neutral, engine speed greater than 300 RPM, Output speed greater than 200 RPM, Input speed less than 50 RPM, for 2 seconds.</td>
<td>Max line pressure. Inhibit 4th/ TCC.</td>
<td>When Input RPM goes above 75 RPM for 2 seconds.</td>
</tr>
</tbody>
</table>
| 75     | System Voltage Low           | Sets when the ignition is on, voltage is less than the following conditions:  
-40°F (-40°C) = 7.3V  
194°F (90°C) = 10.3V  
302°F (150°C) = 11.7V  
Engine Speed is greater than 300 rpm for 4 seconds. | 2nd Gear with Max pressure. Inhibit TCC. | |
| 79     | Transmission Fluid Overtemp  | No DTC 58 sets when transmission fluid temperature is greater than 270°F (132°C), for 5 minutes. | None. | When temp falls below 266°F (130°C) for 5 seconds |
| 81     | Shift Solenoid B (SSB) Circuit Fault | Battery Voltage above 10V TCM detects an open circuit, short to battery, short to ground, or over-current condition on the shift solenoid B circuit for 2 seconds. | 2nd or 3rd gears only. Max Line Pressure. | When Fault condition removed for 2 seconds. |
| 82     | Shift Solenoid A (SSA) Circuit Fault | Battery Voltage above 10V TCM detects an open circuit, short to battery, short to ground, or over-current condition on the shift solenoid A circuit for 2 seconds. | 2nd and 3rd gears only or 1st and 4th gear only. Max line pressure. | When Fault condition removed for 2 seconds. |
| 83     | TCC Solenoid Circuit Fault   | Battery Voltage above 10V. TCM detects an open circuit, short to battery, short to ground, or over-current condition on the TCC solenoid circuit. | Inhibit TCC. Inhibit 4th when in Hot mode. | When Fault condition removed for 2 seconds. |
| 84     | Accelerator Pedal Performance | Measured throttle voltage difference exceeds allowable tolerance. | Assume 0% throttle. | Key Cycle |
| 85     | Undefined Ratio Error        | No DTC 21, 22, 23, 24, 28, 71, 72 sets when RPM is greater than 300 RPM, TPS is greater than 25%, VSS is greater than 7 MPH, ratio falls out of range for 6 seconds. | 2nd gear with Max line pressure. Inhibit TCC. | Key Cycle |
| 86     | Low Ratio Error (Shift Solenoid B (SSB) Stuck On) | No DTC 21, 22, 23, 24, 28, 71, 72, 74, 85 sets when RPM is greater than 300 RPM, TPS is greater than 25%, VSS is greater than 7 MPH, transmission ratio matches 4th when 1st is commanded or 3rd gear when 2nd gear is commanded, for 6 seconds. | 2nd gear with Max line pressure. Inhibit TCC. | Key Cycle |
| 87     | High Ratio Error (Shift Solenoid B (SSB) Stuck Off) | No DTC 21, 22, 23, 24, 28, 71, 72, 74, 85 sets when RPM is greater than 300 RPM, TPS is greater than 25%, VSS is greater than 7 MPH, transmission ratio matches 1st when 4th is commanded or 2nd gear when 3rd gear is commanded, for 6 seconds. | 2nd gear with Max line pressure. Inhibit TCC. | Key Cycle |
| 91     | Non-Idle Inch                | TPS greater than 15% or RPM greater than 800 RPM during inching. | Transmission locked | Key Cycle |
| 92     | Movement Not Commanded       | Output shaft movement detected when not commanded. | Transmission locked | Key Cycle |
| 93     | Inching Past Target          | Output shaft movement detected past desired stopping point. | Transmission locked | Key Cycle |
| 94     | Forward Clutch Solenoid Circuit Fault | Forward clutch current is more than 0.16 Amps different than commanded current for 2 seconds. | Trans commanded to neutral; however an electrical failure of the clutch solenoid could result in unpredictable vehicle movement. | Key Cycle |
| 95     | Reverse Clutch Solenoid Circuit Fault | Reverse clutch current is more than 0.16 Amps different than commanded current for 2 seconds. | Trans commanded to neutral; however an electrical failure of the clutch solenoid could result in unpredictable vehicle movement. | Key Cycle |
| 98     | Anti-collision System Fault  | No communication with anti-collision module or anti-collision DTC. | Disable anti-collision system | Invalid communication received or anti-collision fault cleared. |

**NOTE:** J1939 codes, if available, can be found in the column "CODE" below the GM 2-digit code.