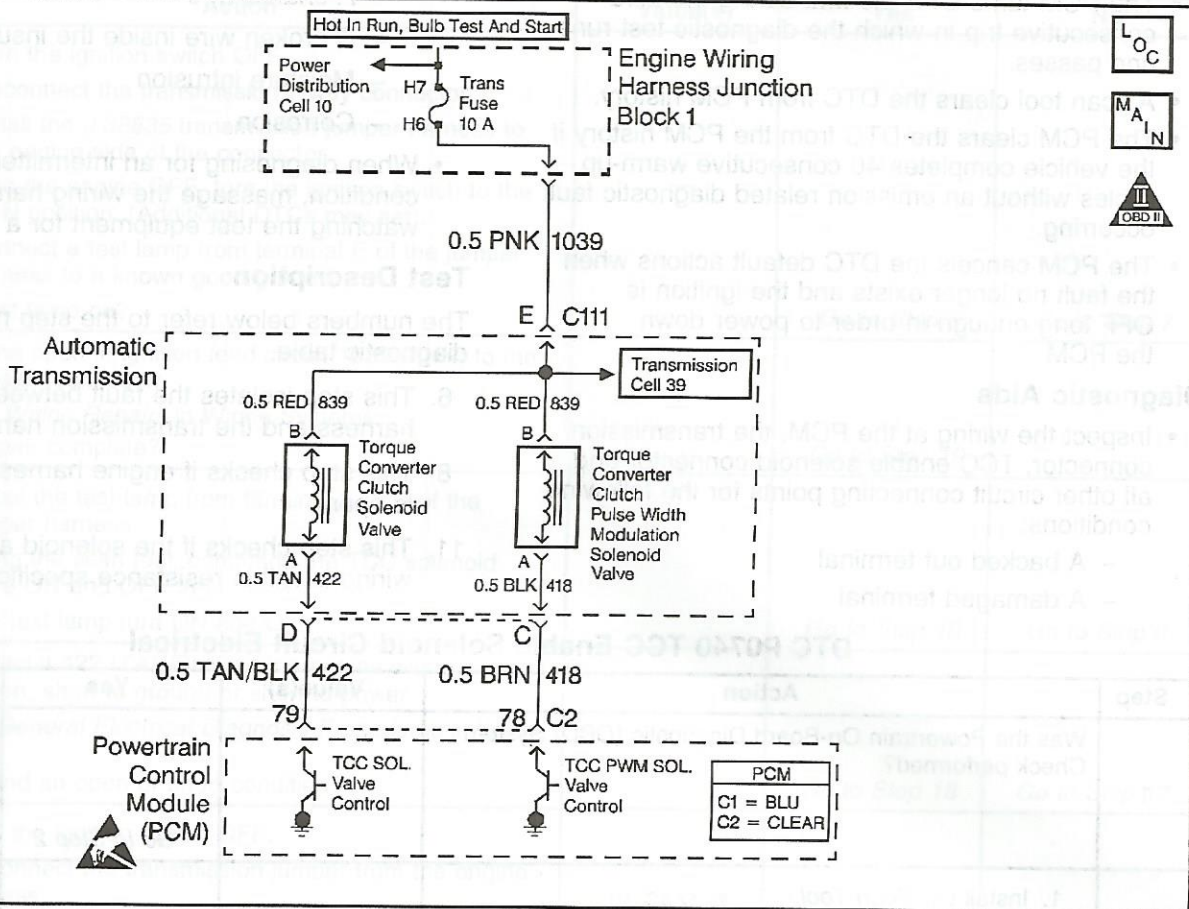


TCC Enable Solenoid Circuit Electrical



365240

Description

The torque converter clutch (TCC) solenoid valve is a normally OFF (normally OFF) valve which controls the torque converter clutch apply and release. The torque converter clutch pulse width modulation (TCC PWM) solenoid valve works with the TCC solenoid valve to regulate the clutch apply rate (feel). The PCM controls the duty cycle on the TCC PWM solenoid valve to regulate the feed pressure to the converter clutch regulator valve, which in turn, regulates the torque converter clutch apply pressure.

The TCC solenoid valve receives ignition voltage from the engine wiring harness on terminal 1039. The PCM controls the ground path on terminal 422 to turn the solenoid on and off. The PCM monitors the throttle position, vehicle speed and other parameters in order to determine when to energize the solenoid. When the solenoid is OFF, the PCM sends a high (ignition voltage) signal. When the solenoid is ON, the PCM will receive a zero voltage signal.

When the PCM detects a continuous open or short in the TCC solenoid valve circuit, then DTC P0740 is set. DTC P0740 is a type B DTC.

Conditions for Running the DTC

- System voltage is 10–18 volts.
- The engine speed is greater than 500 RPM for 5 seconds.
- Not in fuel shut off.

Conditions for Setting the DTC

DTC P0740 sets if one of the following conditions exists for 5 seconds:

Condition 1

The PCM commands the solenoid ON, and the voltage signal to the PCM remains high (B+).

Condition 2

The PCM commands the solenoid OFF, and the voltage signal to the PCM remains low (0 volts).

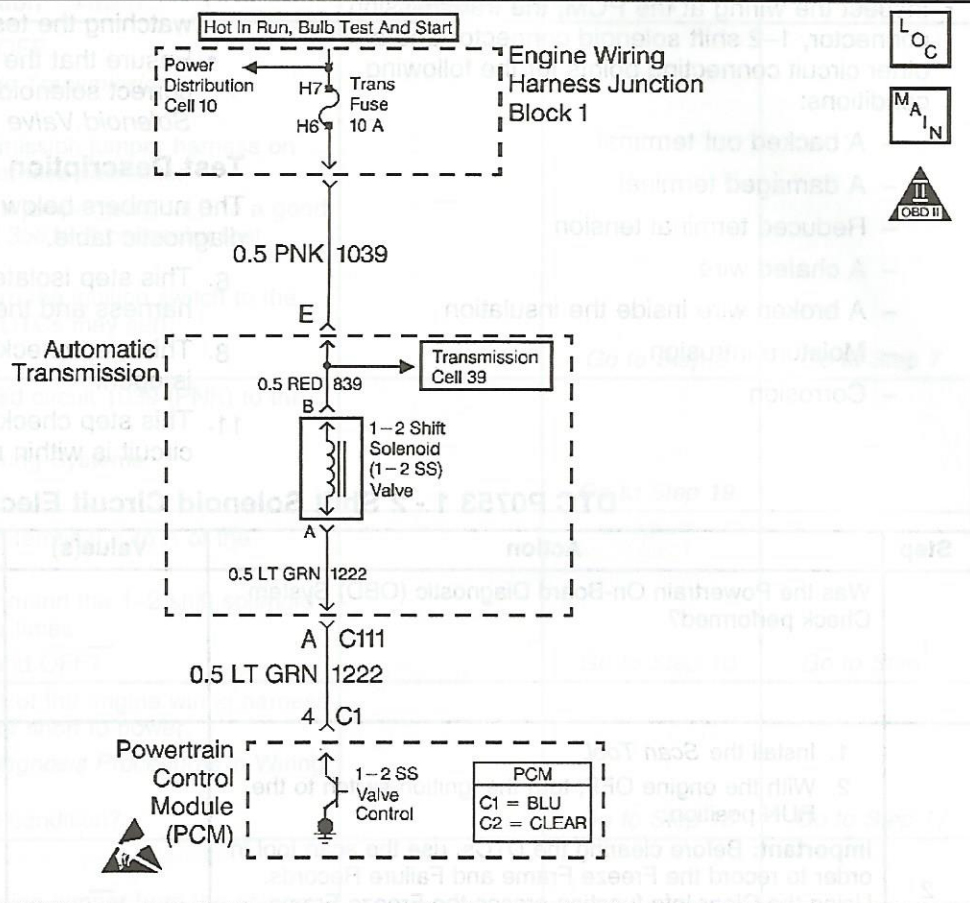
Action Taken When the DTC Sets

- The PCM inhibits TCC.
- The PCM inhibits 4th gear, if the transmission is in hot mode.
- The PCM illuminates the malfunction indicator lamp (MIL) during the second consecutive trip in which the conditions for setting the DTC are met.

DTC P0740 TCC Enable Solenoid Circuit Electrical (cont'd)

Step	Action	Value(s)	Yes	No
	<ol style="list-style-type: none"> 1. Turn the ignition switch OFF. 2. Disconnect the transmission 7-way connector. 3. Install the <i>J 38835</i> transmission jumper harness to the engine side of the connector. 4. With the engine OFF, turn the ignition switch to the RUN position. (Additional DTCs may set). 5. Connect a test lamp from terminal E of the jumper harness to a known good ground. Is the test lamp on?	—	Go to Step 8	Go to Step 7
	Repair the open in ignition feed circuit 1039 (PNK) to the transmission connector. Refer to <i>Wiring Repairs</i> in Wiring Systems. Is the repair complete?	—	Go to Step 19	—
	<ol style="list-style-type: none"> 1. Install the test lamp from terminal E to D of the jumper harness. 2. Using the scan tool, command the TCC solenoid valve ON and OFF three times. Does the test lamp turn ON and OFF?	—	Go to Step 10	Go to Step 9
	Inspect circuit 422 (TAN/BLK) of the engine wiring harness for an open, short to ground or short to power. Refer to <i>General Electrical Diagnosis Procedures</i> in Wiring Systems. Did you find an open or short condition?	—	Go to Step 18	Go to Step 17
	<ol style="list-style-type: none"> 1. Turn the ignition switch OFF. 2. Disconnect the transmission jumper from the engine harness. 3. Connect the transmission jumper to the <i>Automatic Transmission</i> 7-way connector on the transmission. 4. Connect a <i>J 39200</i> digital multimeter (DMM) from terminal E to terminal D of the jumper. Is the measured resistance within the specified range?	19–24 Ω @ 20°C (68°F) 24–31 Ω @ 88°C (190°F)	Go to Step 11	Go to Step 12
	Connect DMM from jumper terminal D to A, B, C, F and the transmission case. Are all resistances greater than the specified value?	100 Ω	Go to Step 16	Go to Step 15
	Is the resistance greater than the specified value?	31 Ω	Go to Step 13	Go to Step 14
	Inspect the transmission harness circuit 839 (RED) and circuit 422 (TAN) for an open. Refer to <i>General Electrical Diagnosis Procedures</i> in Wiring Systems. Was a condition found?	—	Go to Step 15	Go to Step 16
	Disconnect wiring harness from the TCC solenoid. Connect DMM from jumper terminal D to terminal E. Is resistance greater than the specified value?	100 Ω	Go to Step 16	Go to Step 15
	Replace the automatic transmission wiring harness. Refer to <i>Solenoids and Wiring Harness Replacement</i> . Is the replacement complete?	—	Go to Step 19	—
	Replace the TCC solenoid valve. Refer to <i>Torque Converter Clutch Solenoid Replacement</i> . Is the replacement complete?	—	Go to Step 19	—
	Replace the PCM. Refer to <i>PCM Replacement/Programming</i> in Engine			

1753 1 - 2 Shift Solenoid Circuit Electrical



365243

Description

The 1-2 shift solenoid valve (1 - 2 SS Valve) controls transmission fluid pressure on the 1 - 2 shift. Circuit 1039 provides ignition voltage to the solenoid. The powertrain control module (PCM) controls the solenoid ON and OFF by closing and opening the ground, and monitors voltage levels. When the 1 - 2 SS valve is commanded ON, the PCM provides a low voltage. When the 1 - 2 SS Valve is commanded OFF, the PCM detects a high voltage. DTC 1753 sets if the received voltage is outside the normal limits, indicating an open or short. DTC 1753 is a type B DTC.

Conditions for Running the DTC

Engine voltage is 10-18 volts.
Engine speed is greater than 500 RPM.
Engine fuel shut off.

Conditions for Setting the DTC

DTC 1753 sets if one of the following conditions is met for 5 seconds:

Step 1: The PCM commands the solenoid ON and the voltage across the solenoid is high (B+).
Step 2: The PCM commands the solenoid OFF and the voltage across the solenoid is high (B+).

Action Taken When the DTC Sets

- The PCM inhibits commanded 3-2 downshifts if the vehicle speed is greater than 48 km/h (30 mph).
- The PCM illuminates the malfunction indicator lamp (MIL) during the second consecutive trip in which the conditions for setting the DTC are met.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL during the third consecutive trip in which the diagnostic test runs and passes.
- A scan tool clears the DTC from PCM history.
- The PCM clears the DTC from the PCM history if the vehicle completes 40 consecutive warm-up cycles without an emission related diagnostic fault occurring.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Step	Action	Values	System OK	Go to
5	Replace the 1 - 2 shift solenoid. Refer to 1 - 2 Shift Solenoid Replacement.	—	—	Go to Step 6
6	Perform the following in order to verify the repair: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • The traction control is not active. • The transmission fluid temperature is 20–130°C (68–266°F) • The engine speed is more than 500 RPM for 5 seconds. • The vehicle is not in fuel shut off. • The gear range is D4. • The vehicle speed is more than 8 km/h (5 mph). • All the conditions in the following pass cases must be met: Case 1 - The PCM commands a 1 - 2 shift. - The throttle position is 18 - 55% and constant within + or - 3%. - The vehicle speed is 8–64 km/h (5–40 mph). - Within 2 seconds, the engine speed in 2nd gear must be 130 RPM less than the last speed in 1st gear. Case 2 - The PCM commands a 2 - 3 shift. - The throttle position is 10–55% and constant within + or - 10%. - The vehicle speed is 32–89 km/h (20–55 mph). - Within 2.5 seconds, the engine speed in 3rd gear must be 130 RPM less than the last engine speed in 2nd gear. Case 3 - The PCM commands a 3 - 4 shift. - The throttle position is 5–40% and constant within + or - 7%. - The vehicle speed is 56–121 km/h (35–75 mph). - Within 1.0 second, the engine speed in 4th gear must be 250 RPM less than the last engine speed in 3rd gear. Case 4 - The PCM commands 4th gear. - The TCC is commanded ON. - The throttle position is 2–30%. - The speed ratio is 0.68–0.82. - The TCC slip speed is 0 - 50 RPM for more than 3 seconds. 4. Select Specific DTC. 5. Enter DTC P0751. Has the test run and passed?	—	System OK	Go to Step 6

Circuit Description

The 2 - 3 shift solenoid valve (2 - 3 SS valve) controls the transmission fluid pressure on the 2 - 3 shift valve. A fused circuit 1039 provides ignition voltage to the solenoid. The powertrain control module (PCM) commands the solenoid ON or OFF by closing or opening the ground, and monitors voltage levels. When the 2 - 3 SS valve is commanded ON, the PCM receives low voltage. When the 2 - 3 SS valve is commanded OFF, the PCM receives high voltage. DTC P0758 sets if the received voltage is outside the calibration limits, indicating an open or short. DTC P0758 is a type A DTC.

Conditions for Running the DTC

- System voltage is 10-18 volts.
- The engine speed is greater than 500 RPM for 5 seconds.
- Not in fuel shut off.

Conditions for Setting the DTC

DTC P0758 sets if either of the following occurs continuously for 5 seconds:

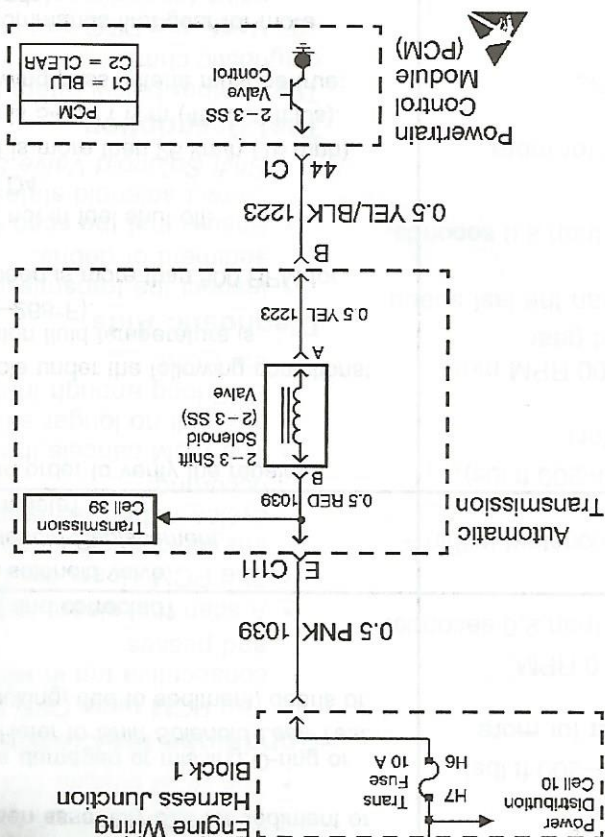
- The PCM commands the solenoid ON and the voltage signal to the PCM remains high (B+).
- The PCM commands the solenoid OFF and the voltage signal to the PCM remains low (0 volts).

Action Taken When the DTC Sets

- The PCM illuminates the malfunction lamp (MIL).
- The PCM commands 3rd gear only.
- The PCM inhibits TCC operation.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL during consecutive trip in which the diagnosis and passes.
- A scan tool clears the DTC from PCM.
- The PCM clears the DTC from the PCM when the vehicle completes 40 consecutive cycles without an emission related occurrence.
- The PCM cancels the DTC default OFF long enough in order to power the PCM.



Diagnostic Aids

Inspect the wiring at the PCM, the transmission selector, 2-3 shift solenoid connector and all circuit connecting points for the following conditions:

- A backed out terminal
- A damaged terminal
- Reduced terminal tension
- A chafed wire
- A broken wire inside the insulation
- Moisture intrusion
- Corrosion

- When diagnosing for an intermittent short or open condition, massage the wiring harness while watching the test equipment for a change.
- Ensure that the scan tool commanded gear has correct solenoid states and ratio. Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

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

- 6. This step isolates the fault between the engine harness and the transmission harness.
- 8. This step checks if the engine harness circuit 1223 is open.
- 11. This step checks if the solenoid and transmission circuit is within resistance specifications.

DTC P0758 2 - 3 Shift Solenoid Circuit Electrical

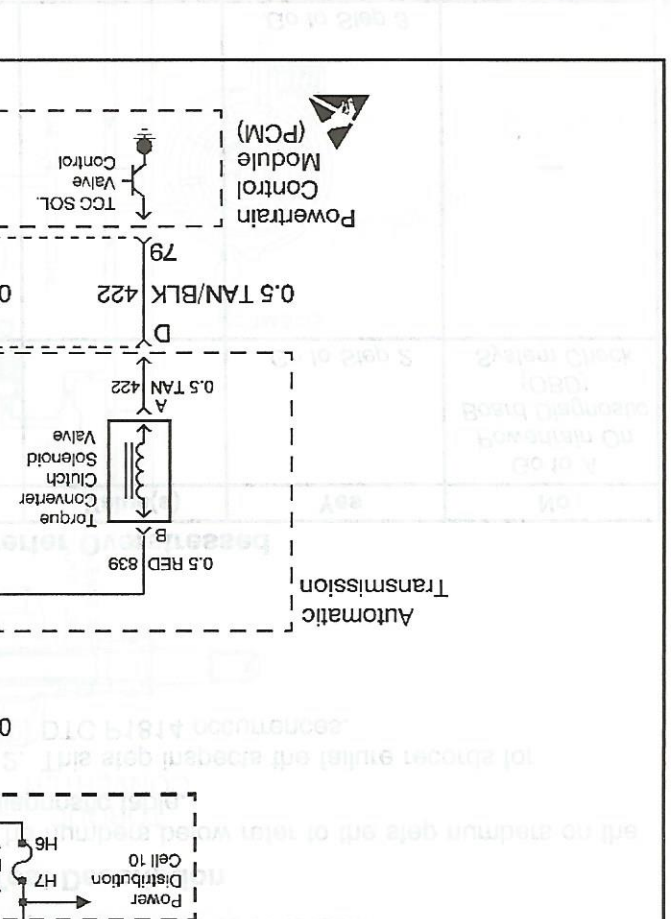
Action	Value(s)	Yes	No
Were you sent here from the Powertrain On-Board Diagnostic (OBD) System Check?	—	Go to Step 2	Go to A Powertrain On Board Diagnostic (OBD) System Check
1. Install the <i>Scan Tool</i> . 2. With the engine OFF, turn the ignition switch to the RUN position. Important: Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records. Using the Clear Info function erases the Freeze Frame and Failure Records from the PCM. 3. Record the Freeze Frame and Failure Records. 4. Clear the DTC. Are DTCs P0740, P0753 or P1860 set also?	—	Go to Step 3	Go to Step 6
1. Remove the Trans fuse. 2. Inspect the fuse for an open. Refer to <i>Wiring Repairs</i> in <i>Wiring Systems</i> . Was a condition found and corrected?	—	Go to Step 4	Go to Step 5
Inspect for open or short to ground in engine harness circuit 1039 (PNK). Refer to <i>General Electrical Diagnosis Procedures</i> in <i>Wiring Systems</i> . Was a condition found?	—	Go to Step 18	Go to Step 5
Inspect for open or short to ground in transmission harness circuit 839 (RED). Refer to <i>General Electrical Diagnosis Procedures</i> in <i>Wiring Systems</i> . Was a condition found?	—	Go to Step 18	—

Circuit Description

The torque converter clutch (TCC) solenoid valve is an ON/OFF (normally OFF) valve which controls the converter clutch pulse width modulation (TCC PWM) solenoid valve works with the TCC solenoid valve to control the clutch apply rate (feel). The PCM controls the duty cycle on the TCC PWM solenoid valve to regulate the feed pressure to the converter clutch regulator valve, which in turn, regulates the converter clutch apply pressure.

The TCC PWM solenoid valve receives ignition voltage from circuit 1039. The PCM uses throttle position, vehicle speed, and other inputs in order to determine when to energize the solenoid. The PCM controls the ground path on circuit 418 to vary the duty cycle from 0 to 100%. At 0% duty cycle, the converter clutch pressure is at minimum. At 100% duty cycle, the converter clutch apply pressure is at maximum.

When the PCM detects a continuous open or short in the TCC PWM solenoid valve circuit, then DTC P1860 sets. DTC P1860 is a type B DTC.



Conditions for Running the DTC

- System voltage is 10–18 volts.
- The engine speed is more than 500 RPM.
- The engine speed is less than 500 RPM.
- Not in fuel shut off.
- TCC PWM duty cycle is less than 10%.
- TCC PWM duty cycle is less than 90%.

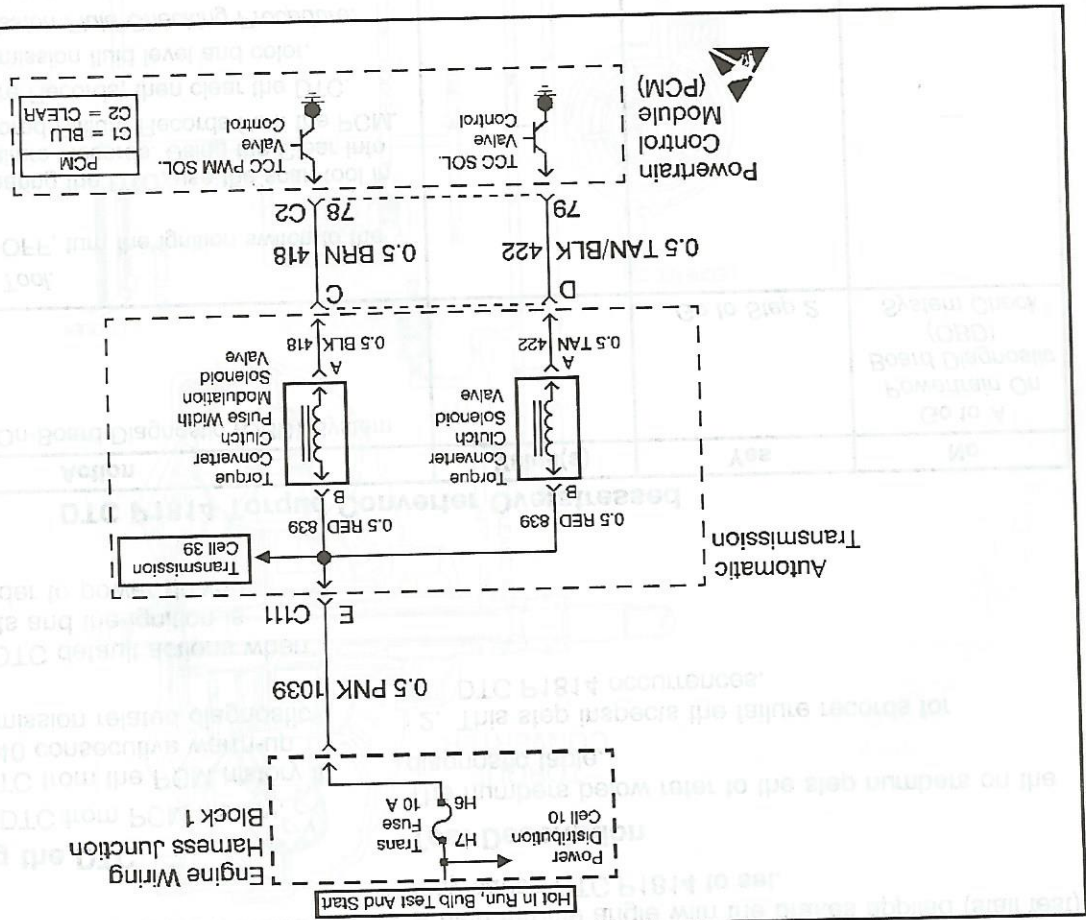
Conditions for Setting the DTC

DTC P1860 sets when the PCM commands signal voltage on circuit 418 outside the call limits for 5 seconds.

Action Taken When the DTC Sets

- The PCM inhibits TCC operation.
- The PCM inhibits 4th gear if the transmission is in 4th gear.
- The PCM illuminates the malfunction indicator lamp (MIL) during the second consecutive trip in which the conditions for setting the DTC are met.

DTC P1860 TCC PWM Solenoid Circuit Electrical



Circuit Description

The torque converter clutch (TCC) solenoid valve is an ON/OFF (normally OFF) valve which controls the converter clutch pulse width modulation (TCC PWM) solenoid valve works with the TCC solenoid valve to control the clutch apply rate (feet). The PCM controls the duty cycle on the TCC PWM solenoid valve to regulate the feed pressure to the converter clutch regulator valve, which in turn, regulates the converter clutch apply pressure.

The TCC PWM solenoid valve receives ignition voltage from circuit 1039. The PCM uses throttle position, vehicle speed, and other inputs in order to determine when to energize the solenoid. The PCM controls the ground path on circuit 418 to vary the duty cycle from 0 to 100%. At 0% duty cycle, the converter clutch apply pressure is at minimum. At 100% duty cycle, the converter clutch apply pressure is at maximum.

When the PCM detects a continuous open or short in the TCC PWM solenoid valve circuit, then DTC P1860 sets. DTC P1860 is a type B DTC.

Conditions for Running the DTC

- System voltage is 10-18 volts.
- The engine speed is more than 500 RPM
- Not in fuel shut off.
- TCC PWM duty cycle is less than 10% than 90%.

Conditions for Setting the DTC

- The PCM commands DTC P1860 sets when the PCM detects signal voltage on circuit 418 outside the call limits for 5 seconds.

Action Taken When the DTC Sets

- The PCM inhibits TCC operation.
- The PCM inhibits 4th gear if the transmission is in the hot mode.
- The PCM illuminates the malfunction indicator lamp (MIL) during the second consecutive trip in which the conditions for setting the DTC are met.

If the fluid flow was insufficient, check flow from the transmission by disconnecting the feed line at the cooler and observing the flow for another 30 seconds.

Check for the following conditions:

Insufficient Flow — Inspect the transmission for causes.

Sufficient Flow — Inspect the cooler pipes, fittings and repeat the cooler flushing procedure. If the flow is still insufficient, replace the cooler.

Remove the discharge hose and reconnect the cooler pipes.

Check the fluid level.

Modulator Diagnosis

Modulator System (4T60-E)

The vacuum modulator system on the Hydra-Matic transaxle controls shift feel (may be soft or firm) by sensing the changes in the engine load, indicated by the engine vacuum. The modulator does this by controlling the main line vacuum boost. The vacuum modulator system may be used for firm or slipping shift conditions.

Modulator Diagnosis

The Hydra-Matic 4T60-E transaxle requires a vacuum of 13–17 inch Hg of engine vacuum at hot engine idle. This vacuum should be checked at the modulator with the engine in Drive for proper operation. An incorrect vacuum supply to the modulator or a malfunctioning modulator may cause some or all of the listed symptoms.

Cause harsh upshifts.

Cause harsh downshifts.

Cause harsh Park to Reverse engagement.

Cause harsh Neutral to Drive engagement.

Cause soft upshifts.

Cause soft downshifts.

Cause harsh light throttle upshifts.

Cause firm light throttle upshifts.

Cause second gear shifts.

Cause slips in the Low position.

Cause slips in the Drive position.

Cause slips in the Reverse position.

Cause harsh 3 - 2 coastdown shifts.

Cause rough 4 - 3 manual downshifts.

Cause rough 3 - 2 manual downshifts.

Cause slipping in the Drive position.

Cause slipping in the Reverse position.

Cause pressure regulator valve

causes a buzz.

Cause engine burning transaxle fluid.

The following may cause an incorrect engine vacuum signal at the modulator:

- A pinched vacuum line.
- A cut vacuum line.
- A plugged vacuum line.
- A disconnected vacuum line.

Also, the engine mechanical and the operating conditions related to the following may result in incorrect engine vacuum or poor transaxle performance:

- The fuel.
- The ignition.
- The exhaust.
- The emission systems.

Disconnect the vacuum supply line at the modulator and install a vacuum gage to the line to check for the proper vacuum. Locate the cause and correct as required if there is less than 44–57 kPa (13–17 inch Hg) of vacuum at hot engine idle with the transaxle in Drive. The gage reading must respond quickly (only 1/10th of a second delay) to the throttle movement because the vacuum is supplied through a 0.031 inch orifice in order to stabilize the line pressure when shifting the transaxle between forward and reverse ranges.

Remove the modulator and remove the modulator valve if there is enough engine vacuum available to the modulator. Inspect the valve for nicks. Inspect the valve for scoring. Connect a hand-operated vacuum pump to the modulator. Pump the device until 51–68 kPa (15–20 inch Hg) of vacuum is reached while observing the modulator plunger. The modulator plunger should be drawn in as the vacuum pump is operated. The vacuum should not bleed down for at least 30 seconds after reaching 51–68 kPa (15–20 inch Hg). Perform the next test if the modulator checks okay.

If the following conditions are met then the shift problem is not vacuum related:

- The vacuum signal is within the specifications.
- The modulator is functioning properly.
- The modulator valve is undamaged.

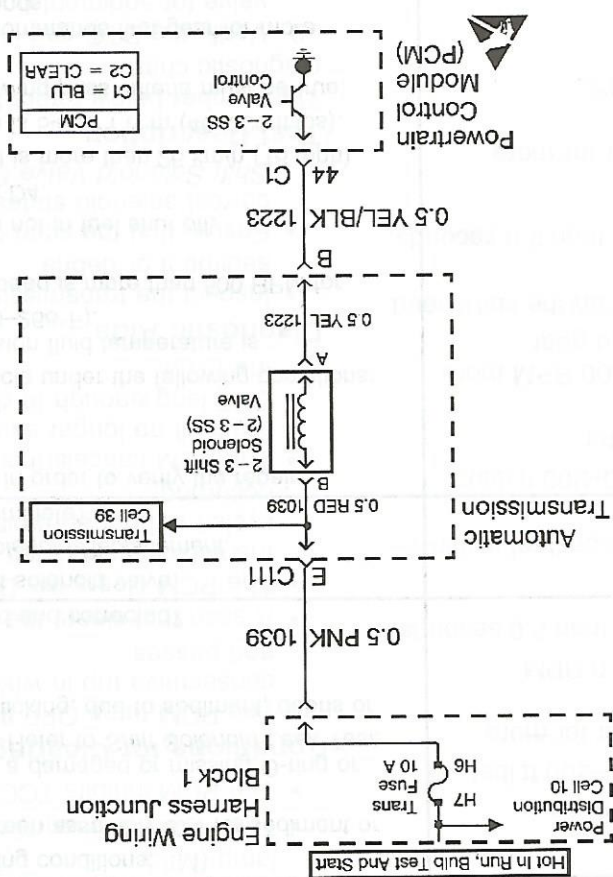
Perform the oil pressure check outlined in the Hydra-Matic 4T60-E diagnosis section if the above conditions are met. Refer to the appropriate diagnosis if the pressures are out of specifications.

Vacuum Diaphragm Check Procedure

Perform the following steps to inspect the vacuum diaphragm:

1. Turn the modulator so that the vacuum connector faces down.
2. Replace the modulator if any of the following liquid drains out:
 - If transaxle fluid drains out.
 - If water condensate drains out.
 - If gasoline drains out.

DTC P0758 2 - 3 Shift Solenoid Circuit Electrical



Circuit Description

The 2 - 3 shift solenoid valve (2 - 3 SS valve) controls the transmission fluid pressure on the 2 - 3 shift valve. A fused circuit 1039 provides ignition voltage to the solenoid. The powertrain control module (PCM) commands the solenoid ON or OFF by closing or opening the ground, and monitors voltage levels. When the 2 - 3 SS valve is commanded ON, the PCM receives low voltage. When the 2 - 3 SS valve is commanded OFF, the PCM receives high voltage. DTC P0758 sets if the received voltage is outside the calibration limits, indicating an open or short. DTC P0758 is a type A DTC.

Conditions for Running the DTC

- System voltage is 10-18 volts.
- The engine speed is greater than 500 RPM for 5 seconds.
- Not in fuel shut off.

Conditions for Setting the DTC

DTC P0758 sets if either of the following occurs continuously for 5 seconds:

- The PCM commands the solenoid ON and the voltage signal to the PCM remains high (B+).
- The PCM commands the solenoid OFF and the voltage signal to the PCM remains low (0 volts).

Action Taken When the DTC Sets

- The PCM illuminates the malfunction lamp (MIL).
- The PCM commands 3rd gear only.
- The PCM inhibits TCC operation.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL during consecutive trip in which the diagnosis and passes.
- A scan tool clears the DTC from PCM.
- The PCM clears the DTC from the vehicle completes 40 consecutive cycles without an emission related occurring.
- The PCM cancels the DTC default after the fault no longer exists and the ignition is OFF long enough in order to power the PCM.