ARTICLE BEGINNING

2000 AUTOMATIC TRANSMISSIONS
Hydra-Matic 4L60-E Electronic Controls

APPLICATION

AUTOMATIC TRANSMISSION APPLICATIONS

Application (Body/Series Code)	Engine Size
Cadillac Escalade	5.7L
Chevrolet	
Astro ("L" & "M")	4.3L
Blazer ("S" & "T")	4.3L
Camaro ("F")	3.8L & 5.7L
Chevy Express 1500/2500 ("G")	4.3L, 5.0L & 5.7L
Corvette ("Y")	5.7L
Pickup ("C" & "K")	5.7L
Silverado 1500 ("C" & "K")	4.3, 4.8L & 5.3L
Suburban 1500 ("C" & "K")	5.3L
S10 Pickup ("S" & "T")	2.2L & 4.3L
Tahoe ("C" & "K")	4.8L, 5.3L & 5.7L
GMC	
Envoy & Jimmy ("S" & "T")	4.3L
Pickup ("C" & "K")	5.7L
Safari ("L" & "M")	4.3L
Savana 1500/2500 ("G")	4.3L, 5.0L & 5.7L
Sierra 1500 ("C" & "K")	4.3, 4.8L & 5.3L
Sonoma ("S" & "T")	2.2L & 4.3L
Yukon ("C" & "K")	4.8L, 5.3L & 5.7L
Yukon XL ("C" & "K")	5.3L
Isuzu Hombre	2.2L & 4.3L
Oldsmobile Bravada ("T")	4.3L
Pontiac Firebird ("F")	3.8L & 5.7L

DESCRIPTION & OPERATION

INTRODUCTION

The Hydra-Matic 4L60-E transmission uses 2 electric shift solenoids to control transmission upshifts and downshifts. In addition, a pressure control (force motor) solenoid controls hydraulic line pressure, and a Torque Converter Clutch (TCC) solenoid controls TCC application. A TCC Pulse Width Modulated (PWM) solenoid is used to control fluid acting on converter clutch valve, which then controls TCC apply and release. A 3-2 control solenoid modulates hydraulic pressure for the 2-4 band and 3-4 clutch to improve 3-2 downshift. Solenoids are turned on and off by Powertrain Control Module (PCM) on passenger cars and trucks with 2.2L engine, or by Vehicle Control Module (VCM) on all other light trucks and vans.

PCM/VCM receives signals from various transmission sensors. Sensors include engine speed and throttle position, transmission speed, hydraulic pressure and transmission fluid temperature. PCM/VCM has on-board self-diagnostics to help identify any parts or circuits which may need further testing.

Shift solenoid holds hydraulic pressure (solenoid on) or releases hydraulic pressure (solenoid off). This action controls shift valves inside valve body. By switching one or both solenoids on or off, different combinations of clutches, sprags and bands are operated. See SHIFT SOLENOID OPERATION table under SOLENOIDS.

Line pressure control system compensates for normal wear of transmission components during upshifts in order to maintain optimal shift quality during life of transmission. PCM/VCM uses "adaptive learning" to maintain acceptable upshift times by adjusting line pressure. PCM/VCM compares actual "acceptable" shift time to calibrated desired shift time and calculates difference. An "acceptable" shift is considered valid if no inconsistent vehicle operations (A/C compressor cycling or extreme throttle changes) occurred during upshift. Line pressure is either increased or decreased depending on duration of time for upshift.

PCM/VCM

Passenger cars and light trucks with 2.2L, 4.8L and 5.3L engines are equipped with a Powertrain Control Module (PCM). All other light trucks and vans are equipped with a Vehicle Control Module (VCM). For PCM/VCM locations, see PCM/VCM LOCATIONS table.

PCM/VCM controls TCC, pressure control solenoid (hydraulic pressure), PWM solenoid and shift solenoids 1-2 and 2-3. In addition, PCM/VCM also controls ignition, fuel and emission devices related to engine.

PCM/VCM receives electronic input signals from sensors and switches. These signals help PCM/VCM determine when to operate various relays and solenoids related to engine and transmission components.

NOTE: PCM/VCM is also referred to as "control module" throughout this article.

PCM/VCM LOCATIONS

Application (1)	Location
"C" & "K" Series (Except Sierra & Silverado)	Left Side Of Engine Compartment, Near Electronic Brake Control Module (EBCM)
"C" & "K" Series (Sierra & Silverado)	Left Side Of Engine Compartment, Next To Battery
"F" Body	Right Side Of Engine Compartment, Rear

"G" Series	Of Wheelhouse In Engine Compartment, On Left Fenderwell, Below Relay Center
"L" & "M" Series	Left Side Of Engine Compartment, Next To Battery
"S" & "T" Series (2)	Right Side Of Engine Compartment
"Y" Body	Right Side Of Engine Compartment, Between Wheelwell & Dash Panel, Below Battery

(1) - For body/series identification, see TRANSMISSION APPLICATIONS table under APPLICATION.
(2) - Includes Isuzu Hombre.

LIMP-IN MODE

If sensor input signals are missing or inadequate for transmission operation, control module will output preset operating signals to transmission. This mode keeps vehicle operational and allows it to be driven with reduced transmission function and performance to a repair facility. Malfunction Indicator Light (MIL) may illuminate if malfunction occurs. Vehicle should not be driven for extended periods in limp-in mode.

SENSORS & SWITCHES

Introduction

The control module controls converter clutch lock-up, upshifts and downshifts based on transmission temperature, system voltage, throttle position, transmission oil pressure switches (5) and transmission input (engine) and output (transmission) speed sensors. See Fig. 1. System includes several other sensors and switches used for engine control (gasoline engines). For additional information and testing of engine components, see appropriate SELF-DIAGNOSTICS or SYSTEM & COMPONENT TESTING articles in ENGINE PERFORMANCE.

Transmission Fluid Pressure Manual Valve Position Switch

Transmission Fluid Pressure (TFP) manual valve position switch consists of 5 pressure switches and Transmission Fluid Temperature (TFT) sensor. Two pressure switches are normally closed and 3 are normally open. TFP manual valve position switch is mounted to valve body. See Fig. 1.

SOLENOIDS

Shift Solenoids 1-2 & 2-3

Transmission shifting is performed by 2 electric shift solenoids. Shift solenoids are operated in accordance with gear position. See SHIFT SOLENOID OPERATION table. Both solenoids are located on valve body. See Fig. 1. Ignition power is supplied to each solenoid by transmission fuse. Solenoid 1-2 controls hydraulic pressure to 1-2 shift valve. Solenoid 2-3 controls hydraulic pressure to 2-3 shift valve.

NOTE: The 3-4 shift valve is directly controlled by hydraulic circuits in valve body.

SHIFT SOLENOID OPERATION

Gearshift Lever Position	1-2 Solenoid	2-3 Solenoid
"OD" (Overdrive)		
First Gear	On	On
Second Gear	Off	On
Third Gear	Off	Off
Overdrive	On	Off
"D" (Drive)		
First Gear	On	On
Second Gear	Off	On
Third Gear	Off	Off
"2" (Intermediate)		
First Gear	On	On
Second Gear (1)	Off	On
"1" (Low)		
First Gear	On	On
Second Gear	Off	On
"R" (Reverse)	On	On
"N" (Neutral)	On	On
"P" (Park)	On	On

(1) - Gear is only available at vehicle speeds greater than 30-35 MPH.

Pressure Control Solenoid

Transmission Adaptive Pressure (TAP) values may require resetting if one of the following repairs has been performed:

* Transmission overhaul or replacement.
* Repair or replacement of an apply or release component (band, clutch, piston and/or servo).
* Repair or replacement of a component or assembly which directly affects transmission line pressure.

To reset TAP values, see CLEARING & RESETTING TAP VALUES under DIAGNOSIS & TESTING.

Pressure control (force motor) solenoid has a spool valve and operates pressure regulator valve. See Fig. 1. Control module sends a frequency signal to pressure control solenoid to regulate hydraulic line pressure. Frequency signal (duty cycle) is measured with a dwell meter or lab scope. When duty cycle is zero, line pressure is at maximum, and pressure control solenoid draws zero amps. When duty cycle is 60 percent, line pressure is at minimum, and pressure control solenoid draws 1.1 amps at 4.5 volts.

TCC Solenoid

This solenoid is used to control TCC apply valve. Control module sends a frequency signal to TCC solenoid to gradually apply or release TCC. See Fig. 1.

3-2 Control Solenoid

Control module modulates current (duty cycle) to control 3-2 control solenoid. The 3-2 control solenoid is off in first gear. In all other gears, 3-2 control solenoid is 90 percent on. Hydraulic pressure is regulated to smoothly release 3-4 clutch and 2-4 band during 3-2 downshift.

TCC PWM Solenoid

TCC PWM solenoid is used to control fluid acting on converter clutch valve, which then controls TCC apply and release. See Fig. 1. TCC PWM solenoid is used to provide smooth engagement of torque converter clutch by operating with a duty cycle on time of less than 50 percent.

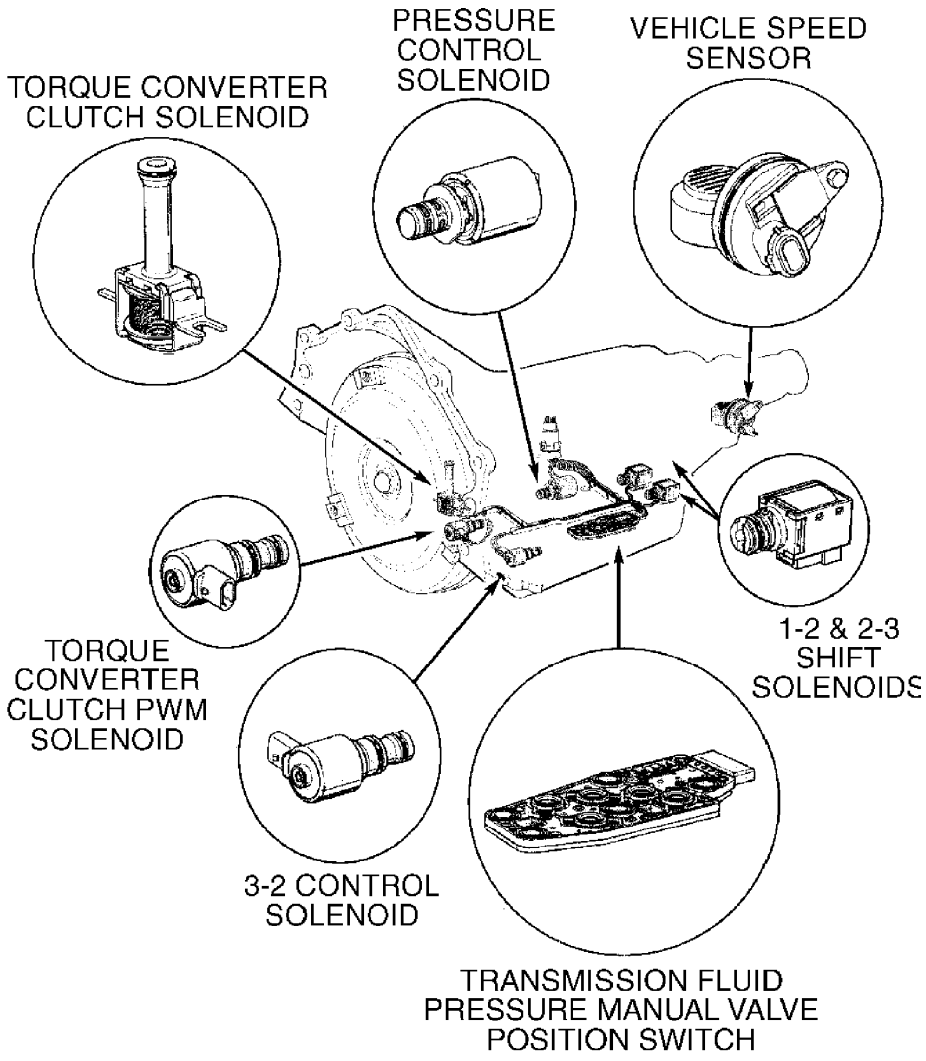

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Fig. 1: Locating Transmission Solenoids, Sensors & Switches
Courtesy of General Motors Corp.

SELF-DIAGNOSTIC SYSTEM

NOTE: Faulty engine sensors and actuators may cause transmission-related Diagnostic Trouble Codes (DTC) or driveability problems. Engine faults and related DTCs must be diagnosed and repaired before transmission DTCs are repaired. For additional information on diagnosing and repairing engine-related control module DTCs, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

The control module constantly monitors all electrical circuits. If control module detects circuit problems or out-of-range sensors, it will record a DTC. If problem continues for a predetermined time, Malfunction Indicator Light (MIL) on instrument cluster will illuminate.

If MIL remains illuminated, DTC(s) are currently being detected. If MIL is off, but control module had detected a circuit or sensor problem, DTC(s) will be stored in computer memory.

Stored DTCs may be retrieved from control module memory using a scan tool. DTCs cannot be retrieved by grounding 16-pin Data Link Connector (DLC).

Hard Failures

Most hard failures cause MIL to illuminate and remain on until malfunction is repaired. If MIL illuminates and remains on (light may flash) during vehicle operation, cause of malfunction must be determined.

If a sensor fails, control module utilizes a substitute value in its calculations to continue engine and/or transmission operation. In this condition, vehicle is functional, but will most likely display degraded driveability. See LIMP-IN MODE.

Intermittent Failures

Intermittent failures cause MIL to flicker or glow and turn off about 10 seconds after intermittent fault is no longer present. Corresponding DTC however, will be retained in computer memory. If related fault does not reoccur within 50 engine starts, DTC is erased from computer memory. Intermittent failures may be caused by sensor, connector or wiring-related problems.

TROUBLE SHOOTING

PRELIMINARY INSPECTION

NOTE: The preliminary inspection should be the starting point for any diagnosis. If performed carefully and thoroughly, it can often identify problems without requiring further diagnosis.

1) Check transmission fluid level and condition. Inspect all wiring harnesses and connections leading to transmission. Verify brake

system is operational and not dragging.

2) Check all vacuum hoses for correct routing, restrictions, cuts or other damage. Inspect difficult-to-see vacuum hoses beneath air cleaner assembly and other engine components.

3) Inspect all engine compartment wiring for proper connections. Check wires for pinched or chafed spots, as well as contact with sharp edges or exhaust manifolds.

4) Repair any problems as necessary. If no problems are found during preliminary inspection, begin diagnosis of transmission electronic control system. See DIAGNOSIS & TESTING.

DIAGNOSIS & TESTING

INTRODUCTION

NOTE: To test electronic control of transmission solenoids, sensors and pressure switch assembly without using self-diagnostics, see COMPONENT TESTS.

NOTE: DTCs are recorded at various operating times. Some DTCs require operation of affected sensor or switch for 5 seconds; others may require operation for 5 minutes or longer at normal operating temperature, road speed and load. Therefore, some DTCs may not set in a service bay operational mode and may require road testing in order to duplicate condition under which DTC will set.

Diagnostic Flow

Diagnosis of computerized engine control system should be performed in the following order:

1) Ensure all engine systems not related to computer system are operating properly. DO NOT proceed with testing unless all other problems have been repaired. On-Board Diagnostic (OBD) system check must be performed before using specific DTC testing procedure. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

2) If DTCs were displayed, determine whether DTCs are hard or intermittent. Hard DTCs will cause MIL to illuminate continuously while engine is running. See HARD OR INTERMITTENT DTC DETERMINATION. For diagnosing hard DTCs, proceed to appropriate DTC test. See DIAGNOSTIC TROUBLE CODE INDEX table under ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. For diagnosing intermittent DTCs, see appropriate TROUBLE SHOOTING - NO CODES article in ENGINE PERFORMANCE.

3) If no DTCs are present and vehicle is in limp-in mode, check fused power supply circuit to transmission solenoids. A non-transmission related component system failure may cause this circuit fuse to fail. Fuses such as ERLS or SHIFT SOL fuse supply power to non-transmission related components (A/C clutch, EGR, EVAP or ABS system) which may have caused fuse to fail.

4) If no DTCs are present and a driveability problem exists, see TROUBLE SHOOTING - NO CODES article in ENGINE PERFORMANCE. Doing so will help identify proper system or component to check in appropriate SYSTEM & COMPONENT TESTING article in ENGINE PERFORMANCE.

5) After necessary repairs, clear DTCs. Verify vehicle will

enter "closed loop" operation and ensure DTC does not return.

ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

Introduction
The OBD system check determines:

* If Malfunction Indicator Light (MIL) is operational.
* If control module is operating and can recognize a fault.
* If any DTCs are stored.

OBD system check is the starting point for utilizing the self-diagnostic system for determining computer-related problems. Use of scan tool is required to perform OBD system check. Perform this test prior to performing any diagnostic procedures in DTC tests. For scan tool data values, refer to scan tool manufacturer's instruction manual. After performing necessary tests as described in OBD system check, and no DTCs are indicated and driveability problems still exist, see appropriate TROUBLE SHOOTING - NO CODES article in ENGINE PERFORMANCE.

Diagnostic Procedure
1) Connect scan tool. Turn ignition on, engine off. If scan tool powers up, go to next step. If scan tool does not power up, see DATA LINK CONNECTOR DIAGNOSIS.
2) If MIL is illuminated, go to next step. If MIL is not illuminate, see NO MALFUNCTION INDICATOR LIGHT.
3) Using scan tool, attempt to communicate with control module. If scan tool communicates with control module, go to next step. If scan tool does not communicate with control module, see DATA LINK CONNECTOR DIAGNOSIS.
4) Using scan tool, observe DTC status for MIL REQUEST, FAIL THIS IGN, LAST TEST FAIL and HISTORY. If any DTCs are stored, save freeze frame and failure records information using scan tool CAPTURE INFO feature. Diagnose DTCs. See DIAGNOSTIC TROUBLE CODE INDEX table. If no DTCs are stored, see appropriate TROUBLE SHOOTING - NO CODES article in ENGINE PERFORMANCE.

NOTE: Only transmission-related DTCs are listed. For engine-related DTC definitions, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE. These DTCs pertain to engine performance and must be repaired first, as engine performance and related component signals will affect transmission operation and diagnosis.

DIAGNOSTIC TROUBLE CODE INDEX

DTC (1)	Description
B2722	Trans Preference Switch Circuit - Low Input
P0218	Transmission Fluid Overtemperature
P0502	VSS Circuit - Low Input
P0503	VSS Circuit - Intermittent
P0711	TFT Sensor Circuit - Range/Performance

P0712	TFT Sensor Circuit - Low Input
P0713	TFT Sensor Circuit - High Input
P0719	Brake Switch Circuit - Low Input
P0724	Brake Switch Circuit - High Input
P0740	TCC Enable Solenoid Circuit - Electrical Malfunction
P0742	TCC System - Stuck On
P0748	PC Solenoid Circuit - Electrical Malfunction
P0751 (2)	1-2 Shift Solenoid Valve Performance - No 1st Or 4th Gear
P0751 (3)	1-2 Shift Solenoid Valve Performance
P0752 (2)	1-2 Shift Solenoid Valve Performance - No 2nd Or 3rd Gear
P0753	1-2 Shift Solenoid Circuit - Electrical Malfunction
P0756 (2)	2-3 Shift Solenoid Valve Performance - No 1st Or 2nd Gear
P0756 (3)	2-3 Shift Solenoid Valve Performance
P0757 (2)	2-3 Shift Solenoid Valve Performance - No 3rd Or 4th Gear
P0758	2-3 Shift Solenoid Circuit - Electrical Malfunction
P0785	3-2 Shift Solenoid Circuit - Electrical Malfunction
P1810	TFP Manual Valve Position Switch - Circuit Malfunction
P1860	TCC PWM Solenoid Circuit - Electrical Malfunction
P1870	Transmission Component Slipping
P1875 (4)	4WD Low Switch Circuit - Electrical Malfunction

(1) - For diagnostic procedures, see DIAGNOSTIC TESTS.
(2) - 3.8L only.
(3) - Except 3.8L.
(4) - Applies to 4WD pickups only.

DATA LINK CONNECTOR DIAGNOSIS

If scan tool does not display control module data, see DATA LINK CONNECTOR DIAGNOSIS OR NO SCAN TOOL DATA under SELF-DIAGNOSTIC SYSTEM in appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

NO MALFUNCTION INDICATOR LIGHT

If MIL does not illuminate, see MIL INOPERATIVE or MIL CIRCUIT CHECK under SELF-DIAGNOSTIC SYSTEM in appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

HARD OR INTERMITTENT DTC DETERMINATION

NOTE: DTCs are recorded at various operating times. Some DTCs require operation of a sensor or switch for 5 seconds; others

require operation for 5 minutes or more at normal operating temperature, vehicle speed and load. Therefore, some DTCs may not set in a service bay operational mode and may require road testing the vehicle in order to duplicate conditions under which DTC will set.

During any diagnostic procedure, determine if DTC(s) are hard failure or intermittent failure DTCs. Diagnostic procedures will not always help analyze intermittent DTCs. To determine hard and intermittent DTCs, perform the following:

1) Enter diagnostic mode. Read and record all stored DTCs. Exit diagnostic mode and clear DTCs. See CLEARING DIAGNOSTIC TROUBLE CODES.
2) Apply parking brake and place transmission in Neutral or Park. Block drive wheels and start engine. MIL should turn off. Allow engine to reach normal operating temperature and continue to run for 2 minutes and note MIL.
3) If MIL illuminates, enter diagnostic mode. Read and record DTCs. This will reveal hard failure DTCs. Oxygen sensor-related DTCs may require a road test to reset hard failures after DTCs were cleared. If MIL does not illuminate, all stored DTCs were intermittent failures.

CLEARING DIAGNOSTIC TROUBLE CODES

DTCs can be cleared using scan tool. If scan tool is not available, turn ignition switch to OFF position. Remove control module fuse from fuse block for 30 seconds. Replace fuse. If fuse cannot be located, disconnect control module pigtail at battery for 30 seconds. DTCs may also be cleared by disconnecting negative battery cable. However, this may result in loss of other on-board memory data, such as preset radio tuning. After power to control module is removed, poor driveability may occur until control module "relearns" operating parameters.

DTCs are also cleared under the following conditions: Control module will turn off MIL after 3 consecutive ignition cycles without a failure reported. Control module will cancel DTC default actions when fault no longer exists and ignition is cycled off long enough to power down control module. DTC is cleared when vehicle has achieved 40 warm-up cycles without a failure reported.

CLEARING & RESETTING TAP VALUES

Using scan tool, clear and reset TAP values following scan tool manufacturer's instructions. Start engine and allow it to reach normal operating temperature with transmission in Park. Ensure all accessories are off. Apply brakes and shift transmission into Drive. Allow engine to idle for 2 minutes. Perform road test for 5-7 miles. Operate vehicle under normal conditions. Avoid extreme acceleration. Once road test is complete, allow engine to return to idle. Place transmission in PARK. Allow engine to idle for one minute, and then turn engine off.

CONNECTOR IDENTIFICATION

NOTE: Harness connectors shown do not apply to every vehicle. Some connectors are model specific, depending upon equipment application. For connector identification, refer to appropriate illustrations. See Figs. 2-20.

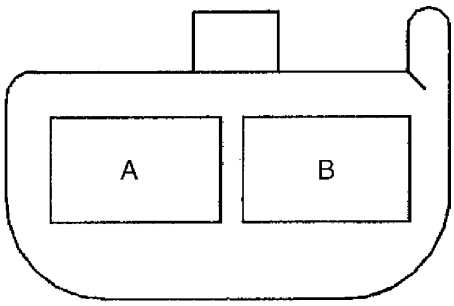

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Fig. 2: Identifying Park Lock Solenoid Harness Connector Terminals (Male - "S" & "T" Series W/Floor Shift)
Courtesy of General Motors Corp.

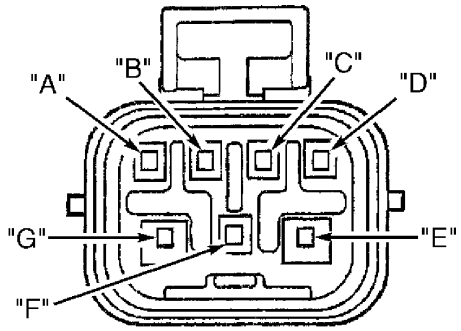

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Fig. 3: Identifying PNP Switch & Backup Light Switch Harness Connector C1 Terminals (Female - "S" & "T" Series)
Courtesy of General Motors Corp.

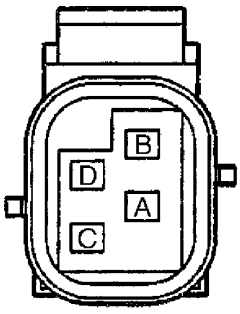

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Fig. 4: Identifying PNP Switch & Backup Light Switch Harness Connector C2 Terminals (Female - "S" & "T" Series)
Courtesy of General Motors Corp.

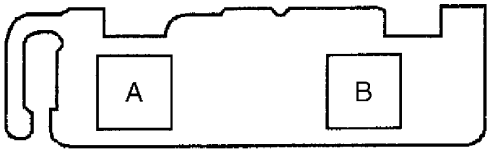

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Fig. 5: Identifying Pressure Control Solenoid Valve Harness Connector Terminals (Female)
Courtesy of General Motors Corp.

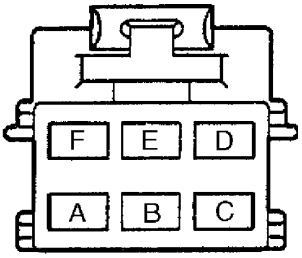

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Fig. 6: Identifying Shift Lock Controller & Shift Lock Solenoid Harness Connector Terminals (Female - "S" & "T" Series W/Floor Shift)
Courtesy of General Motors Corp.

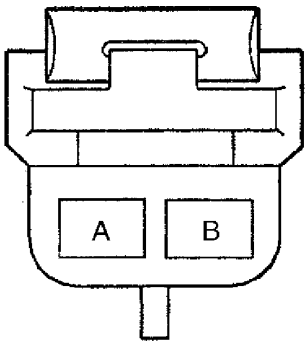

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Fig. 7: Identifying Shift Lock Solenoid Harness Connector Terminals ("F" Body, & "C", "G", "K", "L" & "M" Series)
Courtesy of General Motors Corp.

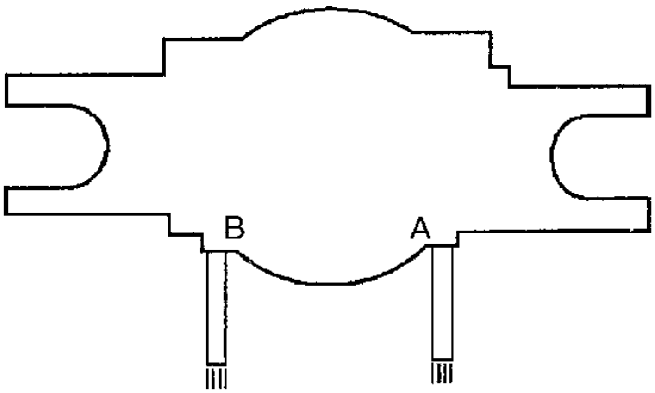

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Fig. 8: Identifying TCC Solenoid Valve Harness Connector Terminals (Harness Side)

Courtesy of General Motors Corp.

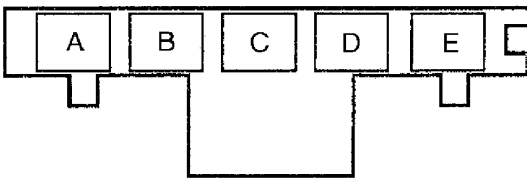

Fig. 9: Identifying TFP Manual Valve Position Switch Harness Connector Terminals (Female)
Courtesy of General Motors Corp.

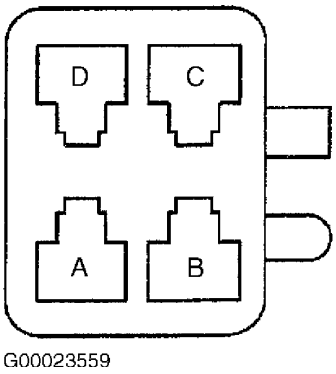

Fig. 10: Identifying Tow/Haul Switch Harness Connector Terminals (Female - "S" & "T" Series, Except Envoy)
Courtesy of General Motors Corp.

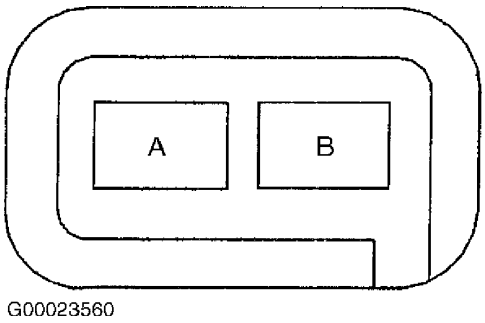

Fig. 11: Identifying Tow/Haul Switch Harness Connector Terminals (Male - Envoy, & "C", "K", "L" & "M" Series)
Courtesy of General Motors Corp.

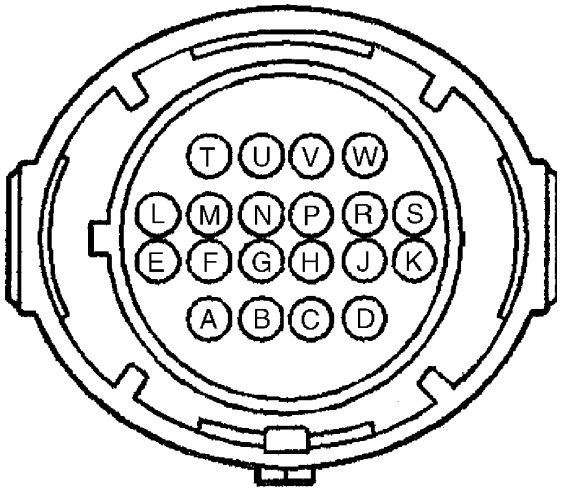

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Fig. 12: Identifying Transmission 20-Pin In-Line Harness Connector Terminals (Female)
Courtesy of General Motors Corp.

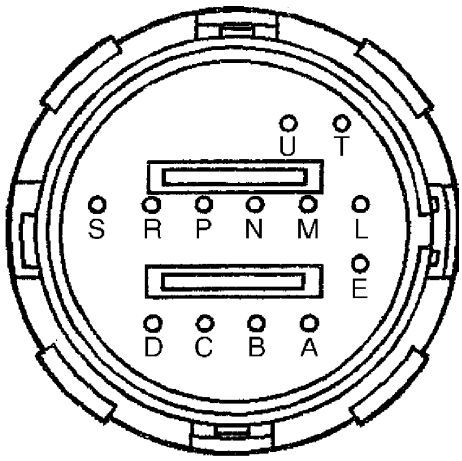

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Fig. 13: Identifying Transmission 20-Pin In-Line Harness Connector Terminals (Male)
Courtesy of General Motors Corp.

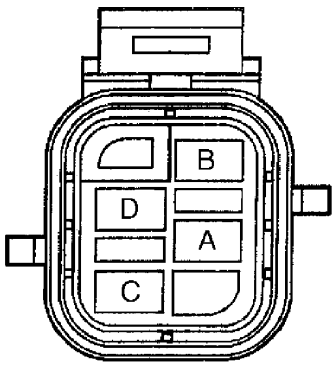

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Fig. 14: Identifying TR Switch Harness Connector Terminals (Female)
Courtesy of General Motors Corp.

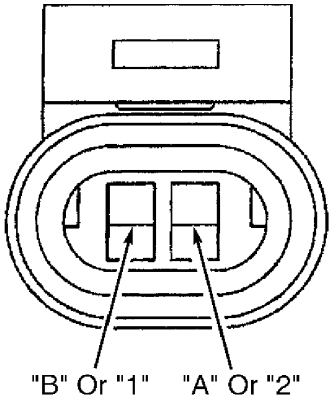


Fig. 15: Identifying VSS Harness Connector Terminals (Female)
Courtesy of General Motors Corp.

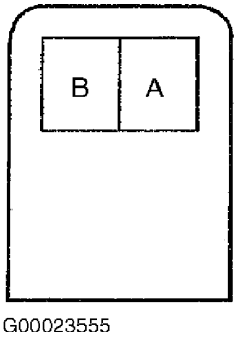


Fig. 16: Identifying 1-2 & 2-3 Shift Solenoid Valve, & TCC PWM Solenoid Valve Harness Connector Terminals (Female)
Courtesy of General Motors Corp.

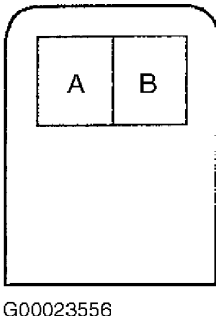
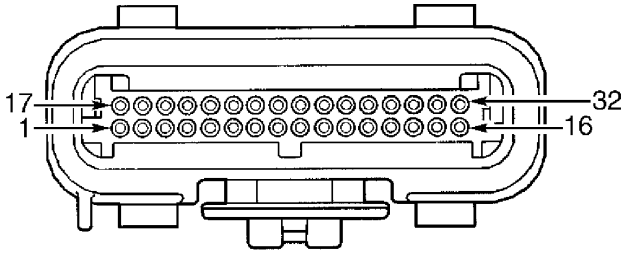
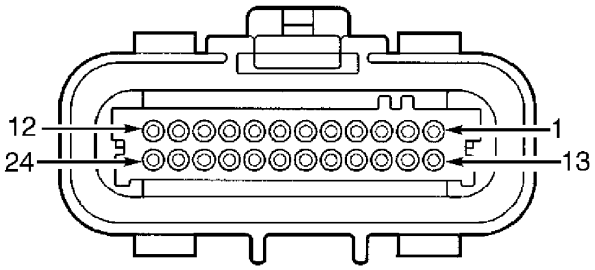


Fig. 17: Identifying 3-2 Shift Solenoid Valve Harness Connector Terminals (Female)
Courtesy of General Motors Corp.



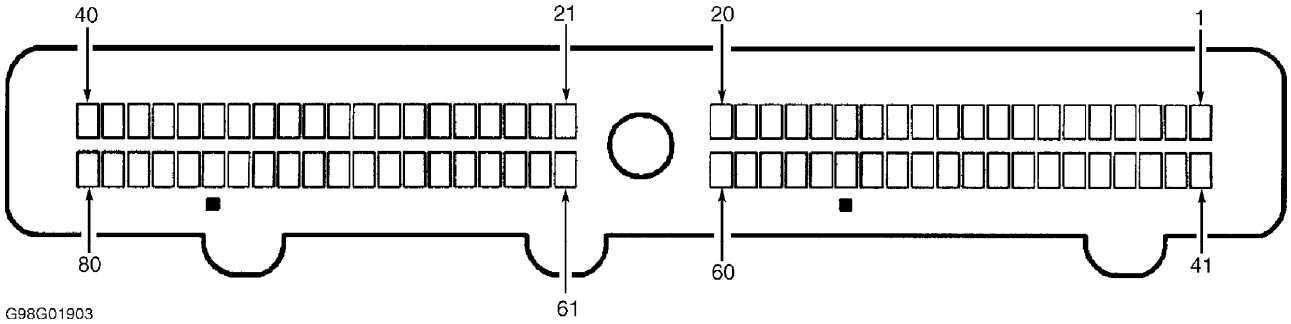
CONNECTOR C1, C2 & C3



CONNECTOR C4

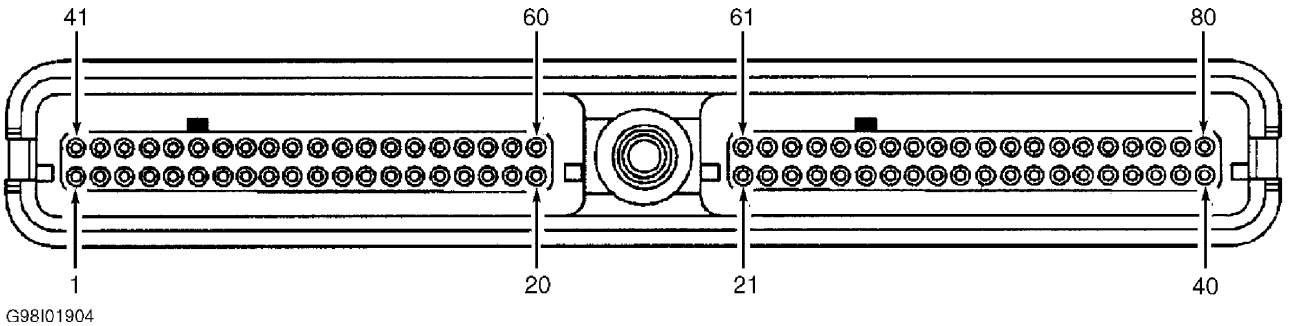
G99A54395

Fig. 18: Identifying VCM Harness Connector Terminals (VCM Equipped Vehicles - C1/Blue, C2/Red, C3/Clear & C4/Black)
Courtesy of General Motors Corp.



G98G01903

Fig. 19: Identifying PCM 80-Pin Harness Connector Terminals (PCM Equipped Vehicles W/2.2L - C1/Blue & C2/Black)
Courtesy of General Motors Corp.



G98I01904

Fig. 20: Identifying PCM 80-Pin Harness Connector Terminals (PCM Equipped Vehicles WO/2.2L - C1/Blue & C2/Clear Or Red)
Courtesy of General Motors Corp.

SUMMARY

If no hard DTCs are present, and driveability symptoms or intermittent DTCs exist, diagnose system by verifying electronic control system circuit operation. This may be accomplished by using scan tool to compare actual circuit data values to typical manufacturer specified data values. Refer to scan tool manufacturer's instruction manual.

DIAGNOSTIC TESTS

NOTE: Not all DTCs are applicable to all models.

INTRODUCTION

The following diagnostic tests are DTC and model specific. Always perform OBD system check prior to performing any diagnostic procedure. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. For harness connector terminal identification, see CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. For circuit identification, see WIRING DIAGRAMS.

Diagnostic aids, located at end of each diagnostic test, are additional tips used to help diagnose DTCs when diagnostic procedures do not identify a problem.

Control module harness connector colors and terminal identification vary with vehicle application. When using diagnostic tests, see appropriate wiring diagram to determine which connector(s) to disconnect during test procedure. Locate component being tested and trace specified circuit to determine control module harness connector and terminal related to that component.

DTC B2722: TRANS PREFERENCE SWITCH CIRCUIT - LOW INPUT

Circuit Description

The Body Control Module (BCM) monitors signal circuit of tow/haul switch in order to determine when switch is activated, requesting a trailering or hauling shift pattern.

Conditions For Running DTC B2722

DTC will run under the following conditions:

* Battery voltage must be 9-16 volts.
* Ignition switch is in ON position.
* Tow/haul switch is activated.

Conditions For Setting DTC P0218

DTC will set under the following conditions:

* Tow/haul switch signal circuit is shorted to ground for about 3 minutes.
* Tow/haul switch is activated (stuck) for about 3 minutes.

Action Taken By Control Module

Control module performs the following action if DTC is set:

* Tow/haul mode is inoperative.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, monitor transmission preference parameter in BCM INPUTS 2 data list. If scan tool displays OFF, go to next step. If scan tool does not display OFF, go to step 4).

3) Activate tow/haul switch. Using scan tool, monitor transmission preference parameter. If scan tool indicates ON, see DIAGNOSTIC AIDS. If scan tool does not indicate ON, go to next step.

4) Turn ignition off. Disconnect tow/haul switch harness connector. Turn ignition on, engine off. Using scan tool, monitor transmission preference parameter. If scan tool displays OFF, go to step 7). If scan tool does not display OFF, go to next step.

5) Check tow/haul switch signal circuit (Light/Blue wire) for short to ground. Repair as necessary. After repairs, go to step 10). If circuit is okay, go to next step.

6) Check for faulty BCM harness connections. Repair as necessary. After repairs, go to step 10). If connections are okay, go to step 8).

7) Check for faulty tow/haul switch harness connections. Repair as necessary. After repairs, go to step 10). If connections are okay, go to step 9).

8) Replace BCM. See appropriate BODY CONTROL MODULES article in ACCESSORIES & EQUIPMENT. After repairs, go to step 10).

9) Replace tow/haul switch. After repairs, go to next step.

10) Using scan tool, clear DTCs. Operate vehicle under conditions required to run DTC. Check for DTCs. If DTC B2722 does not return, system is okay. If DTC B2722 returns, go to step 2).

Diagnostic Aids

Inspect wiring for poor connections at related components. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for moisture and corrosion. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0218: TRANSMISSION FLUID OVERTEMPERATURE

NOTE: Transmission Fluid Pressure (TFP) manual valve position switch assembly may also be referred to as Pressure Switch Assembly (PSA).

Circuit Description

Flow of transmission fluid begins in bottom pan and is drawn through filter, control valve body, transmission case and into oil pump assembly. Oil pump assembly pressurizes fluid and directs it to

pressure regulator valve, where it becomes the main supply of fluid to various components and hydraulic circuits in transmission. Hot fluid exiting torque converter flows through converter clutch apply valve and into transmission cooler lines to oil cooler and auxiliary cooler, if equipped. From cooler, fluid returns to cool and lubricate front of transmission. In forward drive ranges, "D4" fluid from manual valve is routed through an orificed cup plug in rear of transmission case to feed rear lube fluid circuit. DTC P0218 is set if control module detects a high transmission fluid temperature for extended periods of time.

Conditions For Running DTC P0218
DTC will run under the following conditions:

* DTCs P0711, P0712 or P0713 are not present.
* Ignition is on for 5 seconds.

Conditions For Setting DTC P0218
DTC will set under the following condition:

* Transmission fluid temperature is greater than 266øF (130øC) for 10 minutes.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Does not illuminate MIL.
* Freezes shift adapts from being updated.
* DTC P0218 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Ensure transmission fluid level is correct. Fill if necessary. See AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. If transmission fluid level is okay, go to next step.
3) Check engine and transmission cooling system for restrictions, blockage or debris. Check transmission cooler lines for damage and check oil cooler flow. If a problem is found, repair as necessary. After repairs, go to step 6). If no problem is found, go to next step.
4) Check transmission line pressure. See PERFORMANCE TESTS in HYDRA-MATIC 4L60-E OVERHAUL article. If a problem is found, repair as necessary. After repairs, go to step 6). If no problem is found, go to next step.
5) Check torque converter stator. See PERFORMANCE TESTS in HYDRA-MATIC 4L60-E OVERHAUL article. If a problem is found, repair as necessary. After repairs, go to next step. If no problem is found, see DIAGNOSTIC AIDS.
6) Using scan tool, clear DTCs. Start engine and allow it to

reach normal operating temperature. Using scan tool, monitor engine run time and transmission fluid temperature parameters while test driving vehicle for at least 10 minutes. Ensure fluid temperature stabilizes and is less than 264øF (129øC). Check for DTCs. If DTC P0218 does not return, system is okay. If DTC P0218 returns, repeat step 1).

Diagnostic Aids

DTC P0218 may set 10 minutes after DTC P0711 has set. If DTC P0711 has set, repair before proceeding with DTC P0218. DTC P0218 will most likely be eliminated once DTC P0711 is repaired.

TFT displayed on scan tool should increase steadily to normal operating temperature, and then stabilize. Verify driver habits such as trailer towing in "D4". Towing should be performed in "D3".

DTC P0502: VSS CIRCUIT - LOW INPUT

Circuit Description

Vehicle speed is signaled to control module by Vehicle Speed Sensor (VSS). Sensor is a Permanent Magnet (PM) generator mounted to transmission case extension. PM generator produces an AC voltage as speed sensor rotor teeth pass sensor's magnetic field. Control module converts AC voltage into a digital signal. Control module uses vehicle speed to determine shift timing and TCC apply and release. DTC P0502 is set if control module detects a low vehicle output speed when vehicle has high engine speed in drive range.

Conditions For Running DTC P0502

DTC will run under the following conditions:

* DTCs P0101, P0102, P0103, P0107, P0108, P0122, P0123 and P1810 are not present.
* Transmission is not in Park or Neutral.
* Throttle angle is greater than 12 percent (3.8L) or greater than 15 percent (5.7L).
* Engine vacuum is 0-31 In. Hg. (0-105 kPa).
* Engine speed is greater than 3000 RPM.
* Engine torque is 40-400 ft. lbs. (3.8L) or 30-400 ft. lbs. (5.7L).

Conditions For Setting DTC P0502

DTC will set under the following condition:

* Transmission output speed is less than 150 RPM for 2.5 seconds.

Action Taken By Control Module

Control module performs the following actions if DTC is set:

* Illuminates MIL.
* Commands 2nd gear only.
* Commands maximum line pressure.
* Inhibits TCC engagement.

* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0502 is recorded in history.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Connect scan tool. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Raise and support rear axle assembly. Start engine. Disable traction control system (if equipped). Place transmission in any drive range. Monitor output speed sensor parameter on scan tool with wheels rotating. If output speed increases with wheel speed, see DIAGNOSTIC AIDS. If output speed does not increase with wheel speed, go to next step.

3) Turn ignition off. Disconnect appropriate control module harness connector connected to VSS. See WIRING DIAGRAMS. Measure resistance between VSS terminals at appropriate control module harness connector. If resistance is 1377-3355 ohms (Camaro, Firebird and 2WD pickups) or 976-2354 ohms (Corvette and 4WD pickups), go to next step. If resistance is not as specified, go to step 7).

4) Place transmission in Neutral. Using DVOM, select AC volt scale. Hold one wheel from rotating. Rotate other wheel by hand, ensuring drive shaft rotates. If voltage is greater than .5 volt AC, go to next step. If voltage is not greater than .5 volt AC, go to step 12).

5) Measure resistance between ground and VSS input circuit at control module harness connector. If resistance is greater than 50 k/ohms, go to next step. If resistance is not greater than 50 k/ohms, go to step 9).

6) Reconnect control module harness connector. Disconnect VSS harness connector. Turn ignition on, engine off. Check VSS input and ground circuits for short to voltage. Repair as necessary. After repairs, go to step 15). If circuits are okay, go to step 14).

7) Disconnect VSS harness connector. Measure resistance of VSS. If resistance is 1377-3355 ohms (Camaro, Firebird and 2WD pickups) or 976-2354 ohms (Corvette and 4WD pickups), go to next step. If resistance is not as specified, go to step 13).

8) If resistance measured in step 3) was greater than 3355 ohms (Camaro, Firebird and 2WD pickups) or greater than 2354 ohms (Corvette and 4WD pickups), go to step 10). If resistance is not greater than specified value, go to step 11).

9) Check VSS input and ground circuits for short to ground. Repair as necessary. After repairs, go to step 15).

10) Check for open in VSS input and ground circuits. Repair as necessary. After repairs, go to step 15).

11) Check VSS input and ground circuits for short together. Repair as necessary. After repairs, go to step 15).

12) Remove VSS assembly. Check output shaft speed sensor rotor for damage or misalignment. Check case extension bushing for wear. Repair as necessary. After repairs, go to step 15). If no problem is found, go to next step.

13) Replace VSS assembly. After repairs, go to step 15).
14) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.
15) Using scan tool, clear DTCs. Test drive vehicle. Ensure transmission output speed is greater than 250 RPM for 2 seconds. Check for DTCs. If DTC P0502 does not return, system is okay. If DTC P0502 returns, repeat step 1).

Diagnostic Aids
DTC P0502 sets when no vehicle speed is detected at start-off. Check for Electromagnetic Interferences (EMI) induced on VSS circuits caused by misrouted wiring harness too close to spark plug wires. Check wiring for poor connections at control module connector and transmission 20-pin connector. Check for bent, backed out or broken terminals, or misaligned connectors. Inspect for damaged VSS or for damaged output speed sensor rotor teeth. Check for moisture and corrosion. Ensure VSS is aligned correctly and secured to transmission case properly. An incorrect calibration may set DTC P0502. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0503: VSS CIRCUIT - INTERMITTENT

Circuit Description
Vehicle speed is signaled to control module by Vehicle Speed Sensor (VSS). Sensor is a Permanent Magnet (PM) generator mounted to transmission case extension. PM generator produces an AC voltage as speed sensor rotor teeth pass sensor's magnetic field. Control module converts AC voltage into a digital signal. Control module uses vehicle speed to determine shift timing and TCC apply and release. DTC P0503 is set if control module detects a large drop in vehicle speed.

Conditions For Running DTC P0503
DTC will run under the following conditions:

* DTC P1810 is not present.
* Time since last gear range change is greater than 6 seconds.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel shut off mode.
* Transmission output speed increase does not exceed 250 RPM (3.8L) or 600 RPM (all others) within 6 seconds.

Conditions For Setting DTC P0503
DTC will set under the following condition:

* Transmission output speed decrease is greater than 1300 RPM for 3 seconds when not in Park or Neutral.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL.

* Commands a soft shift to 2nd gear.
* Commands maximum line pressure.
* Inhibits TCC engagement.
* Inhibits 4th gear in hot mode.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0503 is recorded in history.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Connect scan tool. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Raise and support rear axle assembly. Start engine. Disable traction control system (if equipped). Place transmission in "D3" range. Monitor output speed sensor parameter on scan tool with wheels rotating about 2000 RPM. If output speed on scan tool display decreases or fluctuates more than 1300 RPM, go to next step. If output speed does not decreases or fluctuate more than 1300 RPM, see DIAGNOSTIC AIDS.

3) Turn ignition off. Disconnect appropriate control module harness connector connected to VSS. See WIRING DIAGRAMS. Measure resistance between VSS terminals at appropriate control module harness connector. If resistance is 1377-3355 ohms (Camaro, Firebird and 2WD pickups) or 976-2354 ohms (Corvette and 4WD pickups), go to next step. If resistance is not as specified, go to step 7).

4) Place transmission in Neutral. Using DVOM, select AC volt scale. Hold one wheel from rotating. Rotate other wheel by hand, ensuring drive shaft rotates. If voltage is greater than .5 volt AC, go to next step. If voltage is not greater than .5 volt AC, go to step 12).

5) Measure resistance between ground and VSS input circuit at control module harness connector. If resistance is greater than 50 k/ohms, go to next step. If resistance is not greater than 50 k/ohms, go to step 9).

6) Reconnect control module harness connector. Disconnect VSS harness connector. Turn ignition on, engine off. Check VSS input and ground circuits for short to voltage. Repair as necessary. After repairs, go to step 15). If circuits are okay, go to step 14).

7) Disconnect VSS harness connector. Measure resistance of VSS. If resistance is 1377-3355 ohms (Camaro, Firebird and 2WD pickups) or 976-2354 ohms (Corvette and 4WD pickups), go to next step. If resistance is not as specified, go to step 13).

8) If resistance measured in step 3) was greater than 3355 ohms (Camaro, Firebird and 2WD pickups) or 2354 ohms (Corvette and 4WD pickups), go to step 10). If resistance is not greater than specified, go to step 11).

9) Check VSS input and ground circuits for short to ground. Repair as necessary. After repairs, go to step 15).

10) Check for open in VSS input and ground circuits. Repair as necessary. After repairs, go to step 15).

11) Check VSS input and ground circuits for short together.

Repair as necessary. After repairs, go to step 15).

12) Remove VSS assembly. Check output shaft speed sensor rotor for damage or misalignment. Check case extension bushing for wear. Repair as necessary. After repairs, go to step 15). If no problem is found, go to next step.

13) Replace VSS assembly. After repairs, go to step 15).

14) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

15) Using scan tool, clear DTCs. Test drive vehicle. Ensure transmission output speed drop is less than 500 RPM for 3 seconds, and output speed is greater than 600 RPM for 3 seconds. Check for DTCs. If DTC P0503 does not return, system is okay. If DTC P0503 returns, repeat step 1).

Diagnostic Aids

An incorrect VSS calibration may set DTC P0503. Check for Electromagnetic Interference (EMI) induced on VSS circuits caused by misrouted wires too close to spark plug wires. Ensure VSS is secured to transmission case extension and correctly aligned. Check for damaged VSS or rotor teeth. Inspect wiring for poor connections at control module and at transmission 20-pin connector. Check for bent, backed out or broken terminals or misaligned connectors. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0711: TFT SENSOR CIRCUIT - RANGE/PERFORMANCE

Circuit Description

Transmission Fluid Temperature (TFT) sensor is a negative coefficient thermistor within TFP manual valve position switch. TFT sensor controls signal voltage from control module. The control module supplies a 5-volt reference signal to sensor. When transmission fluid temperature is cold, sensor resistance is high, and control module detects high signal voltage. As transmission fluid temperature increases, sensor resistance decreases and detected voltage decreases. DTC P0711 is set if control module detects a large change in transmission fluid temperature or if control module detects a TFT value which remains constant for a period of time in which a measurable amount of change is expected for 2 consecutive ignition cycles.

Conditions For Running DTC P0711

DTC will run under the following conditions:

* DTCs P0502, P0503 or P1870 are not present.
* System voltage is 8-19 volts.
* Engine is running for more than 7 minutes.
* Vehicle speed is greater than 5 MPH for 7 minutes or more within a single ignition cycle.
* Transmission fluid temperature at start-up is -40-70 øF (-40-21øC).

* Transmission fluid temperature is -36-304 øF (-38-151øC).
* Engine coolant temperature is greater than 158øF (70øC) and has changed by at least 90øF (50øC) since start-up.
* TCC slip speed is greater than 120 RPM for 7 minutes or more within a single ignition cycle.

Conditions For Setting DTC P0711
DTC will set under one of the following conditions:

* Transmission fluid temperature does not change more than 2.7øF (1.5øC) for 7 minutes since start-up.
* Transmission fluid temperature changes more than 36øF (20øC) in .2 seconds 14 times or more within 7 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Does not illuminate MIL.
* Freezes shift adapts from being updated.
* Determines and uses a default transmission fluid temperature based on certain operating criteria.
* Records operating conditions when conditions for running DTC are met.
* DTC P0711 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Check transmission fluid level. Fill if necessary. See appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. Go to next step.
3) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Monitor TFT parameter while test driving vehicle. If TFT does not change more than 2.7øF (1.5øC) in 7 minutes since start-up, or TFT changes more than 36øF (20øC) in .2 second, 14 times within 7 seconds, go to next step. If neither of these conditions occurred, cause is intermittent. See DIAGNOSTIC AIDS.
4) If scan tool displays a condition in which TFT does not change by more than 2.7øF (1.5øC) in 7 minutes since start-up, go to step 6). If scan tool does not display a condition in which TFT does not change by more than 2.7øF (1.5øC) in 7 minutes since start-up, go to next step.
5) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Install appropriate jumper harness on engine side of in-line harness connector. Connect test light between terminals "L" and "M". See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. Turn ignition on, engine off. While monitoring scan tool, wiggle engine wiring harness from appropriate control module harness connector to transmission 20-pin in-line harness connector. If TFT temperature changes by more than 36øF (20øC), go to step 7). If TFT temperature does not change by more than 36øF (20øC), go to step 8).
6) Turn ignition off. Disconnect transmission 20-pin in-line

harness connector. Turn ignition on, engine off. If scan tool displays a condition in which TFT does not change by more than 2.7øF (1.5øC) in 7 minutes since start-up, go to step 11). If scan tool does not display a condition in which TFT does not change by more than 2.7øF (1.5øC) in 7 minutes since start-up, go to step 10).

7) Check for intermittent open or short condition in TFT sensor signal circuit between control module and transmission 20-pin in-line harness connector. Repair as necessary. After repairs, go to step 12). If circuit is okay, go to step 11).

8) Check for intermittent open or short condition in TFT sensor signal circuit between transmission 20-pin in-line harness connector and TFT sensor. If circuit is faulty, go to next step. If circuit is okay, go to step 10).

9) Replace transmission wire harness assembly. After repairs, go to step 12).

NOTE: TFT sensor is part of TFP manual valve position switch.

10) Replace TFT sensor. After repairs, go to step 12).

11) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

12) Using scan tool, clear DTCs. Road test vehicle. Monitor transmission fluid temperature. Ensure rise in fluid temperature is greater than 4øF (2.25øC) within 11 seconds since start-up, and fluid temperature does not change by more than 36øF (20øC) within .2 second for a period of at least 11 seconds. Check for DTCs. If DTC P0711 does not return, system is okay. If DTC P0711 returns, repeat step 1).

Diagnostic Aids

Inspect wiring for poor connections at control module and at transmission 20-pin in-line harness connector. Check for bent, backed out or broken terminals, or misaligned connectors. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. Check for moisture and corrosion. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0712: TFT SENSOR CIRCUIT - LOW INPUT

Circuit Description

Transmission Fluid Temperature (TFT) sensor is a negative coefficient thermistor within Transmission Fluid Pressure (TFP) manual valve position switch. TFP is also referred to as Pressure Switch Assembly (PSA). TFT sensor controls signal voltage from control module. The control module provides a 5-volt reference to sensor on TFT sensor signal circuit. When transmission fluid is cold, sensor resistance is high, and control module detects high signal voltage. As transmission fluid temperature increases, sensor resistance decreases and voltage decreases. Check sensor for shifted calibration. See TFT SENSOR SPECIFICATIONS table. DTC P0712 is set if control module detects a continuous short to ground in TFT sensor signal circuit or TFT sensor.

Conditions For Running DTC P0712
DTC will run under the following conditions:

* System voltage is 8-19 volts.
* Ignition switch is in ON position.

Conditions For Setting DTC P0712
DTC will set under the following condition:

* TFT sensor indicates a voltage less than .2 volt for 10 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL after 2 consecutive trips with failure.
* Defaults transmission temperature to 275øF (135øC).
* Freezes shift adapts from being updated.
* Determines and uses a default transmission fluid temperature based on certain operating criteria.
* Records operating conditions when conditions for running DTC are met.
* DTC P0712 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Check transmission fluid level. Fill if necessary. See appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. Go to next step.
3) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Using scan tool, read TFT sensor signal voltage. If TFT sensor signal voltage is greater than .2 volt, see DIAGNOSTIC AIDS. If TFT sensor signal voltage is not greater than .2 volt, go to next step.
4) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Turn ignition on, engine off. If TFT sensor signal voltage is greater than 4.92 volts, go to next step. If TFT sensor signal voltage is not greater than 4.92 volts, go to step 7).
5) Install appropriate jumper harness on transmission side of 20-pin in-line harness connector. Measure resistance of TFT sensor circuits between terminals "L" and "M". See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is 3088-3942 ohms at 68øF (20øC), or 159-198 ohms at 212øF (100øC), see DIAGNOSTIC AIDS. If resistance is not as specified, go to next step.
6) Check TFT sensor signal circuit for short to ground between transmission 20-pin in-line harness connector and TFT sensor. If circuit is shorted, go to step 9). If circuit is okay, go to step 8).
7) Check TFT sensor signal circuit for short to ground between transmission 20-pin in-line harness connector and control

module. Repair as necessary. After repairs, go to step 11). If circuit is okay, go to step 10).

NOTE: TFT sensor is part of TFP manual valve position switch.

8) Replace TFT sensor. After repairs, go to step 11).
9) Replace transmission wire harness assembly. After repairs, go to step 11).
10) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.
11) Using scan tool, clear DTCs. Turn ignition on, engine off. Ensure TFT sensor indicates a voltage greater than .2 volt for 10 seconds. Check for DTCs. If DTC P0712 does not return, system is okay. If DTC P0712 returns, repeat step 1).

Diagnostic Aids

Inspect wiring for poor connections at control module and at transmission 20-pin in-line harness connector. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes. If DTC P0218 is also set, check transmission cooling system for possible blockage and/or restrictions.

TFT SENSOR SPECIFICATIONS

Temperature - øF (øC)	(1) Sensor Resistance (Ohms)
302 (150)	47.2
284 (140)	59.8
266 (130)	76.8
248 (120)	99.9
230 (110)	132
212 (100)	177
194 (90)	241
176 (80)	332
158 (70)	467
140 (60)	667
122 (50)	973
104 (40)	1459
86 (30)	2237
68 (20)	3515
50 (10)	5671
32 (0)	9423
14 (-10)	16176
-4 (-20)	28677
-22 (-30)	52684
-40 (-40)	100707

(1) - Resistance specification given is nominal value.

DTC P0713: TFT SENSOR CIRCUIT - HIGH INPUT

Circuit Description

Transmission Fluid Temperature (TFT) sensor is a negative coefficient thermistor within Transmission Fluid Pressure (TFP) manual valve position switch. TFP is also referred to as Pressure Switch Assembly (PSA). TFT sensor controls signal voltage from control module. The control module provides a 5-volt reference to sensor on TFT sensor signal circuit. When transmission fluid is cold, sensor resistance is high, and PCM detects high signal voltage. As transmission fluid temperature increases, sensor resistance decreases and voltage decreases. Check sensor for shifted calibration. See TFT SENSOR SPECIFICATIONS table. DTC P0713 is set if control module detects a continuous open or short to voltage in TFT sensor signal circuit or TFT sensor.

Conditions For Running DTC P0713

DTC will run under the following conditions:

* System voltage is 8-19 volts.
* Ignition switch is in ON position.

Conditions For Setting DTC P0713

DTC will set under the following condition:

* TFT sensor indicates a signal voltage greater than 4.94 volts for 7 minutes.

Action Taken By Control Module

Control module performs the following actions if DTC is set:

* Illuminates MIL after 2 consecutive trips with failure.
* Defaults transmission temperature to 275øF (135øC).
* Freezes shift adapts from being updated.
* Determines and uses a default transmission fluid temperature based on certain operating criteria.
* Records operating conditions when conditions for running DTC are met.
* DTC P0713 is recorded in history.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Check transmission fluid level. Fill if necessary. See appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. Go to next step.

3) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Using scan tool, read TFT sensor signal voltage. If TFT sensor signal voltage is less than 4.92 volts, see DIAGNOSTIC AIDS. If TFT sensor signal voltage is not less than 4.92 volts, go to next step.

4) Turn ignition off. Disconnect transmission 20-pin in-line

harness connector. Connect appropriate jumper harness to engine side of in-line harness connector. Connect a fused jumper wire between terminals "L" and "M" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. Turn ignition on, engine off. If TFT sensor signal voltage decreases to less than .2 volt, go to next step. If TFT sensor signal voltage does not decrease to less than .2 volt, go to step 8).

5) Turn ignition off. Connect appropriate jumper harness to transmission side of in-line harness connector. Measure resistance between terminals "L" and "M" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is 3088-3942 ohms at 68øF (20øC), or 159-198 ohms at 212øF (100øC), see DIAGNOSTIC AIDS. If resistance is not as specified, go to next step.

6) Check for open in TFT sensor signal and ground circuits between transmission 20-pin in-line harness connector and TFT sensor. If circuit(s) is faulty, go to step 10). If circuits are okay, go to next step.

NOTE: TFT sensor is part of TFP manual valve position switch.

7) Replace TFT sensor assembly. After repairs, go to step 12).

8) Check TFT sensor signal circuit for open or short to ground between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 12). If circuit is okay, go to next step.

9) Check for open in TFT sensor ground circuit. Repair as necessary. After repairs, go to step 12). If circuit is okay, go to step 11).

10) Replace transmission wire harness assembly. After repairs, go to step 12).

11) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

12) Using scan tool, clear DTCs. Turn ignition on, engine off. Ensure TFT sensor indicates a voltage less than 4.92 volts for 7 minutes. Check for DTCs. If DTC P0713 does not return, system is okay. If DTC P0713 returns, repeat step 1).

Diagnostic Aids

Inspect wiring for poor connections at control module and at transmission 20-pin in-line harness connector. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes. Check engine and transmission harness for open condition.

DTC P0719: BRAKE SWITCH CIRCUIT - LOW INPUT

Circuit Description

Torque Converter Clutch (TCC) brake switch is used to indicate brake pedal status to control module. The control module de-

energizes TCC solenoid when brake pedal is applied. DTC P0719 is set if control module detects an open (stuck on) brake switch during acceleration.

Conditions For Running DTC P0719
DTC will run under the following conditions:

* DTCs P0502 or P0503 are not present.
* Ignition switch is in ON position.

Conditions For Setting DTC P0719
DTC will set under the following conditions:

* Vehicle speed is less than 5 MPH.
* Then vehicle speed is 5-20 MPH for 4 seconds, and then greater than 20 MPH for 6 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Does not illuminate MIL.
* Control module disregards brake switch input for TCC scheduling.
* Records operating conditions when conditions for running DTC are met.
* DTC P0719 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Using scan tool, monitor brake switch parameter. Disconnect brake switch harness connector. Using test light connected to ground, probe brake switch ignition feed circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 4).
3) Connect fused jumper wire between brake switch ignition feed and input circuits at brake switch harness connector. If status on scan tool changes from OPEN to CLOSED, go to step 7). If scan tool status does not change, go to step 9).
4) Inspect brake switch circuit fuse. If fuse is open, go to next step. If fuse is okay, go to step 8).

NOTE: Condition affecting brake switch circuit may be caused by a fault in other circuits spliced to brake switch circuit.

5) Check brake switch ignition feed circuit for short to ground. Repair as necessary. After repairs, go to step 11). If circuit is okay, go to next step.
6) Check brake switch input circuit for short to ground. Repair as necessary. After repairs, go to step 11). If circuit is okay, go to step 10).

7) Replace brake switch. After repairs, go to step 11).

NOTE: Condition affecting brake switch circuit may be caused by a fault in other circuits spliced to brake switch circuit.

8) Check for open in brake switch ignition feed circuit. Repair as necessary. After repairs, go to step 11).
9) Check for open in brake switch input circuit. Repair as necessary. After repairs, go to step 11). If circuit is okay, go to next step.
10) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.
11) Using scan tool, clear DTCs. Turn ignition on, engine off. Apply and release brake pedal. Ensure TCC brake switch signal indicates 12 volts for 2 seconds. Check for DTCs. If DTC P0719 does not return, system is okay. If DTC P0719 returns, repeat step 1).

Diagnostic Aids
Check TCC brake switch for proper adjustment. Check control module calibration for current update. Check ABS operation. Inspect wiring for poor connections at control module. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0724: BRAKE SWITCH CIRCUIT - HIGH INPUT

Circuit Description
Torque Converter Clutch (TCC) brake switch is used to indicate brake pedal status to control module. The control module de-energizes TCC solenoid when brake pedal is applied. DTC P0724 is set if control module detects a closed (stuck off) brake switch during deceleration.

Conditions For Running DTC P0724
DTC will run under the following conditions:

* DTCs P0502 or P0503 are not present.
* Ignition switch is in ON position.

Conditions For Setting DTC P0724
DTC will set if control module detects a closed TCC brake switch for 2 seconds, and the following events occur 8 consecutive times:

* Vehicle speed is greater than 20 MPH for 6 seconds.
* Then, vehicle speed is 5-20 MPH for 4 seconds.
* And then, vehicle speed is less than 5 MPH.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Does not illuminate MIL.
* Records operating conditions when conditions for running DTC are met.
* DTC P0724 is recorded in history.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Using scan tool, monitor brake switch parameter. Disconnect brake switch harness connector. If status on scan tool changes from CLOSED to OPEN, go to next step. If scan tool status does not change, go to step 4).

3) Replace brake switch. After repairs, go to step 6).

4) Check brake switch input circuit for short to voltage. Repair as necessary. After repairs, go to step 6). If circuit is okay, go to next step.

5) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

6) Using scan tool, clear DTCs. Turn ignition on, engine off. Apply and release brake pedal. Ensure TCC brake switch signal indicates zero volts for 2 seconds. Check for DTCs. If DTC P0724 does not return, system is okay. If DTC P0724 returns, repeat step 1).

Diagnostic Aids

Check TCC brake switch for proper adjustment. Check control module calibration for current update. Check ABS operation. Inspect wiring for poor connections at control module. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for moisture and corrosion. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0740: TCC ENABLE SOLENOID CIRCUIT - ELECTRICAL MALFUNCTION

Circuit Description

In conjunction with TCC PWM solenoid, TCC solenoid is used to control fluid flow acting on TCC valve. TCC valve controls apply and release of TCC. Solenoid is a normally-open on/off device. Solenoid is attached to transmission case and extends into oil pump cover. Control module monitors TP sensor voltage, vehicle speed and other input devices in order to determine when to energize TCC solenoid. Ignition voltage is supplied directly to solenoid through fused circuit. Control module commands solenoid on or off through ground circuit. DTC P0740 is set if control module detects a continuous open or short to ground in TCC solenoid circuit.

Conditions For Running DTC P0740

DTC will run under the following conditions:

* System voltage is 8-19 volts.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.

Conditions For Setting DTC P0740
DTC will set if one of the following conditions occurs for 5 seconds:

* Control module commands solenoid on and voltage remains high (battery voltage).
* Control module commands solenoid off and voltage remains low (zero volts).

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL at second consecutive failure signal.
* Inhibits TCC engagement.
* Inhibits 4th gear if in hot mode.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0740 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. If DTCs P0753, P0758, P0785 and P1860 are not present, go to next step. If DTCs P0740, P0753, P0758, P0785 or P1860 are also present, go to next step. If none of the listed DTCs are set, go to step 4).
3) Check TCC circuit fuse. See WIRING DIAGRAMS. If fuse is open, go to step 9). If fuse is okay, go to next step.
4) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Connect appropriate jumper harness to engine side of in-line harness connector. Turn ignition on, engine off. Using test light connected to ground, probe terminal "E" at jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If test light illuminates, go to next step. If test light does not illuminate, go to step 12).
5) Connect test light between terminals "E" and "T" at jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. Using scan tool, command TCC solenoid valve on and off 3 times. If test light turns on and off as solenoid is commanded, go to step 7). If test light does not turn on and off as solenoid is commanded, go to next step.
6) If test light is always on, go to step 13). If test light is not always on, go to step 14).
7) Connect appropriate jumper harness to transmission side of

transmission 20-pin in-line harness connector. Measure resistance between terminals "E" and "T" at jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is 21-33 ohms, go to next step. If resistance is not 21-33 ohms, go to step 15).

8) Measure resistance between ground and terminal "E", and then between ground and terminal "T" at jumper harness. If resistance is greater than 250 ohms, see DIAGNOSTIC AIDS. If resistance is not greater than 250 ohms, go to step 15).

NOTE: Condition affecting TCC solenoid valve circuit may be caused by a fault in other circuits spliced to TCC solenoid valve circuit.

9) Check TCC solenoid valve ignition feed circuit for short to ground between in-line harness connector and engine wiring harness junction block. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to next step.

NOTE: Condition affecting TCC solenoid valve circuit may be caused by a fault in other circuits spliced to TCC solenoid valve circuit.

10) Check TCC solenoid valve ignition feed circuit for short to ground between in-line harness connector and TCC solenoid valve. If circuit is shorted, go to step 15). If circuit is okay, go to next step.

11) Check each solenoid for short to ground. Replace faulty solenoid as necessary. After repairs, go to next step.

NOTE: Condition affecting TCC solenoid valve circuit may be caused by a fault in other circuits spliced to TCC solenoid valve circuit.

12) Check for open in TCC solenoid valve ignition feed circuit. Repair as necessary. After repairs, go to step 17).

13) Check TCC solenoid valve control circuit for short to ground between in-line harness connector and control module. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 16).

14) Check TCC solenoid valve control circuit for open or short to voltage between in-line harness connector and control module. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 16).

15) Replace transmission wiring harness assembly (including TCC solenoid valve). After repairs, go to step 17).

16) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

17) Using scan tool, clear DTCs. Test drive vehicle with TCC on and off while monitoring TCC solenoid valve parameter. Ensure voltage decreases to zero when TCC solenoid is commanded on, and voltage increases to battery voltage when commanded off. Conditions must be met for 5 seconds. Check for DTCs. If DTC P0740 does not

return, system is okay. If DTC P0740 returns, repeat step 1).

Diagnostic Aids

Transmission may exhibit symptoms of failing to shift and/or dropping into or remaining in 3rd gear when gearshift lever is in "OD" range. This condition may set additional DTCs P0753, P0758, P0785 and P1860. This may be caused by a poor terminal crimp on transmission solenoid battery feed circuit between instrument panel fuse block and transmission solenoids. Check terminal crimp at bulkhead connector where circuit passes through firewall.

Inspect wiring for poor connections at control module and transmission 20-pin in-line harness connector. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0742: TCC SYSTEM - STUCK ON

Circuit Description

Torque Converter Clutch (TCC) solenoid valve stops converter signal oil exhaust. Control module commands solenoid on and off through ground circuit. When TCC solenoid is de-energized, solenoid will release fluid and release TCC. DTC P0742 is set if control module detects a low torque converter slip when TCC is off.

Conditions For Running DTC P0742

DTC will run under the following conditions:

* DTCs P0101, P0102, P0103, P0107, P0108, P0122, P0123, P0502, P0503, P0740, P1810 and P1860 are not present.
* Throttle position is 17-45 percent (13-99 percent on 3.8L).
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* Engine torque is 40-400 ft. lbs.
* Engine vacuum is 0-105 kPa.
* Engine speed is 1000-3500 RPM.
* Speed ratio is .65-1.30 (.95-1.70 on 3.8L).
* Commanded gear is not 1st.
* Gear range is "D4".
* Gear range does not change in 6 seconds.
* TCC is commanded off.

Conditions For Setting DTC P0742

DTC will set if the following condition occurs 3 times:

* TCC slip speed is -20-30 RPM (-20-50 RPM on 3.8L) for 5 seconds.

Action Taken By Control Module

Control module performs the following actions if DTC is set:

* Illuminates MIL at second consecutive failure signal.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0742 is recorded in history.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Test drive vehicle in "D4" range under steady acceleration, with TP sensor angle greater than 20 percent. Monitor TCC slip speed on scan tool. If TCC slip speed is -20-30 RPM (-20-50 RPM on 3.8L) while TCC enable status is NO, go to next step. If slip speed is not as specified, see DIAGNOSTIC AIDS.

3) TCC is hydraulically stuck on. Check for clogged exhaust orifice in TCC solenoid valve, converter clutch apply valve stuck in apply position, misaligned or damaged valve body gasket, restricted release passage or restricted transmission cooler line. Repair as necessary. After repairs, go to next step.

4) Using scan tool, clear DTCs. Test drive vehicle in "D4" and hold throttle angle at 25 percent. Accelerate vehicle to 55 MPH. If throttle moves more than 3 percent, stop vehicle and start again. Ensure TCC slip speed is 100-2000 RPM (2.2L, 3.8L, 4.3L, 4.8L and 5.3L) or 130-2000 RPM (5.7L) RPM for 4 seconds with TCC off. Check for DTCs. If DTC P0742 does not return, system is okay. If DTC P0742 returns, repeat step 1).

Diagnostic Aids

TCC may hydraulically stick on with parking brake applied and any gear range selected. TCC fluid will hydraulically apply TCC, which may cause engine to stall. A stuck TP sensor will set DTC P0742.

DTC P0748: PC SOLENOID CIRCUIT - ELECTRICAL MALFUNCTION

Circuit Description

Pressure Control (PC) solenoid is used to regulate transmission line pressure. Control module compares TP sensor voltage, engine RPM and other inputs to determine appropriate line pressure for given load. Control module will regulate pressure by applying varying amperage to PC solenoid. Applied amperage can vary from 0.1-1.0 amp. Control module then monitors amperage. DTC P0748 is set if control module detects a continuous open or short to ground in PC solenoid circuit.

Conditions For Running DTC P0748

DTC will run under the following conditions:

* System voltage is 8-19 volts.
* Engine is running.

Conditions For Setting DTC P0748
DTC will set under the following condition:

* PC solenoid valve duty cycle reaches high limit (about 95 percent) or low limit (about zero percent).

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Does not illuminate MIL.
* PC solenoid valve is off.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0748 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record failure records for reference, and then clear DTCs. Start engine. Using scan tool, apply 0.1-1.0 amp and observe scan tool display. If PC solenoid actual amperage reading is within 0.16 amp of desired reference amperage reading, see DIAGNOSTIC AIDS. If PC solenoid actual amperage reading is not within 0.16 amp of desired reference amperage reading, go to next step.
3) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Install appropriate jumper harness to transmission side of 20-pin in-line harness connector. Measure resistance between terminals "C" and "D" at jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is 3-7 ohms, go to step 5). If resistance is not as specified, go to next step.
4) If resistance is greater than 7 ohms, go to step 9). If resistance is not greater than 7 ohms, go to step 10).
5) Measure resistance between transmission case and terminal "C" at jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is greater than 250 k/ohms, go to next step. If resistance is not greater than 250 k/ohms, go to step 11).
6) Disconnect jumper harness. Reconnect transmission in-line harness connector. Disconnect control module harness connector associated with PC solenoid circuit. See WIRING DIAGRAMS. Measure resistance between PC solenoid valve controlled power and ground circuits at control module harness connector. If resistance is 3-7 ohms, go to step 8). If resistance is not 3-7 ohms, go to next step.
7) If resistance is greater than 7 ohms, go to step 12). If resistance is not greater than 7 ohms, go to step 13).
8) Measure resistance between ground and PC solenoid valve controlled power circuit at control module harness connector. If resistance is greater than 250 k/ohms, go to step 17). If resistance is not greater than 250 k/ohms, go to step 14).
9) Check for open in PC solenoid valve controlled power and ground circuits between in-line harness connector and PC solenoid valve. If circuit(s) is open, go to step 16). If circuits are okay, go

to step 15).
10) Check PC solenoid valve controlled power and ground circuits for short together between in-line harness connector and PC solenoid valve. If circuits are shorted, go to step 16). If circuits are okay, go to step 15).
11) Check PC solenoid valve controlled power and ground circuits for short to ground between in-line harness connector and PC solenoid valve. If circuits are shorted, go to step 16). If circuits are okay, go to step 15).
12) Check for open in PC solenoid valve controlled power and ground circuits between in-line harness connector and control module. Repair as necessary. After repairs, go to step 18).
13) Check PC solenoid valve controlled power and ground circuits for short together between in-line harness connector and control module. Repair as necessary. After repairs, go to step 18).
14) Check PC solenoid valve controlled power and ground circuits for short to ground between in-line harness connector and control module. Repair as necessary. After repairs, go to step 18).
15) Replace PC solenoid valve. After repairs, go to step 18).
16) Replace transmission wiring harness assembly. After repairs, go to step 18).
17) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.
18) Using scan tool, clear DTCs. Start engine and ensure difference in actual and desired PC solenoid valve duty cycle is less than 0.16 amp. Check for DTCs. If DTC P0748 does not return, system is okay. If DTC P0748 returns, repeat step 1).

Diagnostic Aids
Inspect wiring for poor connections at control module and at transmission 20-pin in-line harness connector. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0751: 1-2 SHIFT SOLENOID VALVE PERFORMANCE - NO 1ST OR 4TH GEAR (3.8L)

NOTE: This test applies to 3.8L only. For other engine applications, see DTC P0751: 1-2 SHIFT SOLENOID VALVE PERFORMANCE (EXCEPT 3.8L).

Circuit Description
The 1-2 shift solenoid valve is a normally open exhaust valve used in conjunction with 2-3 shift solenoid valve to allow 4 different shifting combinations. Solenoid is attached to control valve body. DTC P0751 is set if control module detects a 2-2-3-3 shift pattern, depending on mechanical failure.

Conditions For Running DTC P0751
DTC will run under the following conditions:

* DTCs P0122, P0123, P0502, P0503, P0740, P0742, P0753, P0758, P0785, P1810, P1860 and P1870 are not present.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* Gear range is "D4", "D3", "D2" or "D1".
* TP sensor angle is greater than 9 percent.
* Transmission fluid temperature is 68-266øF (20-130øC).
* System voltage is 8-18 volts.
* Engine torque is 50-400 ft. lbs.
* Transmission output speed is greater than 150 RPM.

NOTE: All criteria in either condition No. 1 or condition No. 2 must occur for DTC to set.

Conditions For Setting DTC P0751 (Condition No. 1)
DTC will set under the following conditions:

* Control module commanded 4th gear for 2 seconds.
* Engine speed is greater than 2.95 times TCC slip speed.
* Estimated gear ratio is 1.2-1.825.
* All conditions are met for .5 second.

Conditions For Setting DTC P0751 (Condition No. 2)
DTC will set under the following conditions:

* Control module commanded 4th gear for one second.
* Engine speed is greater than 2.44 times TCC slip speed.
* Estimated gear ratio is .95-1.15.
* All conditions are met for 6 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL.
* Commands "D2" line pressure.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0751 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Test drive vehicle in "D4" range and ensure control module commands 1st, 2nd, 3rd and 4th gears. If a 2-2-3-3 shift pattern is detected, go to next step. If a 2-2-3-3 shift pattern is not detected, see DIAGNOSTIC AIDS.
3) Check shift solenoids for damaged seals or internal malfunction. Repair as necessary. After repairs, go to next step.
4) Using scan tool, clear DTCs. Test drive vehicle in "D4"

range. Hold throttle at 20 percent and accelerate vehicle to 55 MPH. If throttle moves more than 3 percent, stop vehicle and start again. Drive vehicle at 55 MPH for 2 miles. Check for DTCs. If DTC P0751 does not return, system is okay. If DTC P0751 returns, repeat step 1).

Diagnostic Aids

Verify shift speeds are correct. See PERFORMANCE TESTS in HYDRA-MATIC 4L60-E OVERHAUL article. More than one shift may occur due to other internal transmission failures.

DTC P0751: 1-2 SHIFT SOLENOID VALVE PERFORMANCE (EXCEPT 3.8L)

NOTE: This test applies to all engine applications except 3.8L. For 3.8L applications, see DTC P0751: 1-2 SHIFT SOLENOID VALVE PERFORMANCE - NO 1ST OR 4TH GEAR (3.8L).

Circuit Description

The 1-2 shift solenoid valve is a normally open exhaust valve used in conjunction with 2-3 shift solenoid valve to allow 4 different shifting combinations. Solenoid is attached to control valve body. DTC P0751 is set if control module detects a 1-1-4-4 or a 2-2-3-3 shift pattern, depending on mechanical failure.

Conditions For Running DTC P0751

DTC will run under the following conditions:

* DTCs P0122, P0123, P0502, P0503, P0740, P0742, P0753, P0758, P0785, P1810 and P1860 are not present.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* TP sensor angle is 10-35 percent.
* TP sensor angle is constant at plus or minus 5 percent.
* Gear range is "D4".
* Transmission fluid temperature is 68-266øF (20-130øC).
* Control module commands 1-2, 2-3 and 3-4 shift.
* TCC is commanded on.
* Vehicle speed is greater than 5 MPH.

Conditions For Setting DTC P0751

DTC will set if the following conditions occur 3 consecutive times:

* Within 2 seconds, engine speed in 2nd gear is 80 RPM greater than last speed in 1st gear.
* Within 2 seconds, engine speed in 3rd gear is 50 RPM less than last speed in 2nd gear.
* Within 2 seconds, engine speed in 4th gear is 10 RPM greater than last speed in 3rd gear.

In addition to the above conditions, one of the following conditions must also occur.

Condition No. 1

* Speed ratio is .95-1.2 (speed ratio is engine speed divided by transmission output speed).
* TCC slip speed is 200-1000 RPM for 4 seconds.

Condition No. 2
* Speed ratio is .65-.8 (speed ratio is engine speed divided by transmission output speed).
* TCC slip speed is -20-40 RPM for 4 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL.
* Control module commands "D2" line pressure.
* Control module inhibits 3-2 downshifts if vehicle speed is greater than 30 MPH.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0751 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Test drive vehicle in "D4" range. Ensure control module commands 1st, 2nd, 3rd and 4th gears. If a 1-1-4-4 or 2-2-3-3 shift pattern is detected, go to next step. If a 1-1-4-4 or 2-2-3-3 shift pattern is not detected, see DIAGNOSTIC AIDS.
3) Check shift solenoids for damaged seals or internal malfunction. Repair as necessary. After repairs, go to next step.
4) Using scan tool, clear DTCs. Test drive vehicle in "D4" range. Hold throttle at 20 percent and accelerate vehicle to 55 MPH. If throttle moves more than 3 percent, stop vehicle and start again. Drive vehicle at 55 MPH for 2 miles. Check for DTCs. If DTC P0751 does not return, system is okay. If DTC P0751 returns, repeat step 1).

Diagnostic Aids
Verify shift speeds are correct. See PERFORMANCE TESTS in HYDRA-MATIC 4L60-E OVERHAUL article. More than one shift may occur due to other internal transmission failures.

DTC P0752: 1-2 SHIFT SOLENOID VALVE PERFORMANCE - NO 2ND OR 3RD GEAR (3.8L)

NOTE: This test applies to 3.8L only.

Circuit Description
The 1-2 shift solenoid valve is a normally open exhaust valve used in conjunction with 2-3 shift solenoid valve to allow 4 different shifting combinations. Solenoid is attached to control valve body. DTC P0751 is set if control module detects a 1-1-4-4 shift pattern,

depending on mechanical failure.

Conditions For Running DTC P0752
DTC will run under the following conditions:

* DTCs P0122, P0123, P0502, P0503, P0740, P0742, P0753, P0758, P0785, P1810, P1860 and P1870 are not present.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* Gear range is "D4", "D3", "D2" or "D1".
* TP sensor angle is greater than 9 percent.
* Transmission fluid temperature is 68-266øF (20-130øC).
* System voltage is 8-18 volts.
* Transmission output speed is greater than 150 RPM.

NOTE: All criteria in either condition No. 1 or condition No. 2 must occur 2 consecutive times for DTC to set.

Conditions For Setting DTC P0752 (Condition No. 1)
DTC will set under the following conditions:

* Control module commands 2nd gear for one second.
* Engine torque is 25-400 ft. lbs.
* Engine speed is greater than 1.36 times TCC slip speed.
* Estimated gear ratio is 2.9-3.26.
* All conditions are met for 2 seconds.

Conditions For Setting DTC P0752 (Condition No. 2)
DTC will set under the following conditions:

* Control module commands 3rd gear for one second.
* Engine torque is 50-400 ft. lbs.
* Engine speed is greater than 3.55 times TCC slip speed.
* Estimated gear ratio is .645-.895.
* All conditions are met for 2 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL.
* Commands "D2" line pressure.
* Control module inhibits 3-2 downshifts if vehicle speed is greater than 30 MPH.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0752 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for

reference, and then clear DTCs. Test drive vehicle in "D4" range and ensure control module commands 1st, 2nd, 3rd and 4th gears. If a 1-1-4-4 shift pattern is detected, go to next step. If a 1-1-4-4 shift pattern is not detected, see DIAGNOSTIC AIDS.

3) Check shift solenoids for damaged seals or internal malfunction. Repair as necessary. After repairs, go to next step.

4) Using scan tool, clear DTCs. Test drive vehicle in "D4" range. Hold throttle at 20 percent and accelerate vehicle to 55 MPH. If throttle moves more than 3 percent, stop vehicle and start again. Drive vehicle at 55 MPH for 2 miles. Check for DTCs. If DTC P0752 does not return, system is okay. If DTC P0752 returns, repeat step 1).

Diagnostic Aids

Verify shift speeds are correct. See PERFORMANCE TESTS in HYDRA-MATIC 4L60-E OVERHAUL article. More than one shift may occur due to other internal transmission failures.

DTC P0753: 1-2 SHIFT SOLENOID CIRCUIT - ELECTRICAL MALFUNCTION

Circuit Description

The 1-2 shift solenoid valve is used to control fluid flow acting on 1-2 and 3-4 shift valves. Solenoid is a normally-open exhaust valve used in conjunction with 2-3 shift solenoid valve to allow 4 different shifting combinations. See SHIFT SOLENOID COMBINATIONS table. Solenoid is attached to control valve body. Ignition voltage is supplied directly to solenoid through fused circuit. Control module commands solenoid on or off through ground circuit. DTC P0753 is set if control module detects a continuous open or short to ground in 1-2 shift solenoid circuit.

Conditions For Running DTC P0753

DTC will run under the following conditions:

* System voltage is 8-19 volts.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.

Conditions For Setting DTC P0753

DTC will set if one of the following conditions is met for 5 seconds:

* Control module commands solenoid on and voltage remains high (battery voltage).
* Control module commands solenoid off and voltage remains low (zero volts).

Action Taken By Control Module

Control module performs the following actions if DTC is set:

* Illuminates MIL at first failure signal.
* Control module commands "D2" line pressure.
* Control module inhibits 3-2 downshifts if vehicle speed is greater than 30 MPH.

* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0753 is recorded in history.

SHIFT SOLENOID COMBINATIONS

Gear	1-2 Shift Solenoid	2-3 Shift Solenoid
1st	On	On
2nd	Off	On
3rd	Off	Off
4th	On	Off

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. If DTCs P0740, P0758, P0785 or P1860 is present, go to next step. If DTCs P0740, P0758, P0785 and P1860 are not present, go to step 4).

3) Check condition of shift solenoid circuit fuse. See WIRING DIAGRAMS. If fuse is open, go to step 12). If fuse is okay, go to step 5).

4) Using scan tool, command 1-2 shift solenoid valve on and off while listening to bottom of transmission oil pan. If solenoid clicks as commanded, see DIAGNOSTIC AIDS. If solenoid does not click, go to next step.

5) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Connect appropriate jumper harness to engine side of in-line harness connector. Turn ignition on, engine off. Using test light connected to ground, probe terminal "E" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If test light illuminates, go to next step. If test light does not illuminate, go to step 15).

6) Connect test light between terminals "A" and "E" of jumper harness. Using scan tool, command 1-2 shift solenoid valve on and off 3 times. If test light illuminates with scan tool command, go to step 8). If test light does not illuminate with scan tool command, go to next step.

7) If test light is always on, go to step 16). If test light is not always on, go to step 17).

8) Connect appropriate jumper harness to transmission side of in-line harness connector. Measure resistance between terminals "A" and "E" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is 19-31 ohms, go to next step. If resistance is not 19-31 ohms, leave DVOM connected and go to step 10).

9) Measure resistance between ground and terminal "A" of jumper harness, and then between ground and terminal "E" of jumper harness. If both measurements are greater than 250 k/ohms, see DIAGNOSTIC AIDS. If both measurements are not greater than 250 k/ohms,

go to step 11).
10) Remove transmission oil pan. Disconnect transmission wiring harness assembly from 1-2 shift solenoid valve. If resistance is 19-31 ohms, go to step 18). If resistance is not 19-31 ohms, go to step 19).
11) Remove transmission oil pan. Disconnect transmission wiring harness assembly from 1-2 shift solenoid valve. Measure resistance between ground and terminals of 1-2 shift valve. If both measurements are greater than 250 k/ohms, go to step 18). If both measurements are not greater than 250 k/ohms, go to step 19).

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

12) Check 1-2 shift solenoid valve ignition feed circuit for short to ground between engine wiring harness junction block and transmission 20-pin in-line harness connector. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to next step.

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

13) Check 1-2 shift solenoid valve ignition feed circuit for short to ground between 1-2 shift solenoid valve and transmission 20-pin in-line harness connector. If circuit is shorted, go to step 18). If circuit is okay, go to next step.
14) Check each solenoid for short to ground. Repair as necessary. After repairs, go to step 21).

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

15) Check for open in 1-2 shift solenoid valve ignition feed circuit. Repair as necessary. After repairs, go to step 21).
16) Check 1-2 shift solenoid valve control circuit for short to ground between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 20).
17) Check 1-2 shift solenoid valve control circuit for open or short to voltage between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 20).
18) Replace transmission wiring harness assembly. After repairs, go to step 21).
19) Replace 1-2 shift solenoid valve. After repairs, go to step 21).
20) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.
21) Using scan tool, clear DTCs. Test drive vehicle in "D4" range. Ensure when control module commands 1-2 shift solenoid on,

feedback voltage decreases to zero, and then increases to battery voltage when commanded off. Ensure each condition is met for at least 5 seconds. Check for DTCs. If DTC P0753 does not return, system is okay. If DTC P0753 returns, repeat step 1).

Diagnostic Aids

Transmission may exhibit symptoms of failing to shift and/or dropping into or remaining in 3rd gear when gearshift lever is in "OD" range. This condition may set additional DTCs P0740, P0758, P0785 and P1860. This may be caused by a poor terminal crimp on transmission solenoid battery feed circuit between instrument panel fuse block and transmission solenoids. Check terminal crimp at bulkhead connector where circuit passes through firewall.

Inspect wiring for poor connections at control module. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0756: 2-3 SHIFT SOLENOID VALVE PERFORMANCE - NO 1ST OR 2ND GEAR (3.8L)

NOTE: This test applies to 3.8L only. For other engine applications, see DTC P0756: 2-3 SHIFT SOLENOID VALVE PERFORMANCE (EXCEPT 3.8L).

Circuit Description

The 2-3 shift solenoid valve is a normally open exhaust valve used in conjunction with 1-2 shift solenoid valve to allow 4 different shifting combinations. Solenoid is attached to control valve body. DTC P0756 is set if control module detects a 4-3-3-4 shift pattern, depending on mechanical failure.

Conditions For Running DTC P0756

DTC will run under the following conditions:

* DTCs P0122, P0123, P0502, P0503, P0740, P0742, P0753, P0758, P0785, P1810, P1860 and P1870 are not present.
* System voltage is 8-18 volts.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* Engine torque is 50-400 ft. lbs.
* TP sensor angle is greater than 9 percent.
* Vehicle speed is greater than 5 MPH.
* Gear range is "D4", "D3", "D2" or "D1".
* Transmission fluid temperature is 68-266øF (20-130øC).
* Transmission output speed is greater than 150 RPM.

NOTE: All criteria in either condition No. 1 or condition No. 2 must occur for DTC to set.

Conditions For Setting DTC P0756 (Condition No. 1)
DTC will set under the following conditions:

* Control module commands 1st gear for 2 seconds.
* Engine speed is greater than TCC slip speed.
* Transmission output speed is greater than 200 RPM.
* TCC slip speed is -3000-200 RPM.
* Estimated gear ratio is 0-.895.
* All conditions are met for one second.

Conditions For Setting DTC P0756 (Condition No. 2)
DTC will set under the following conditions:

* Control module commands 2nd gear for one second.
* Engine speed is greater than 5.26 times TCC slip speed.
* Estimated gear ratio is .9-1.2.
* All conditions are met for 2 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL.
* Commands 3rd gear only.
* Commands maximum line pressure.
* Inhibits TCC engagement.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0756 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Test drive vehicle in "D4" range and ensure control module commands 1st, 2nd, 3rd and 4th gears. If a 4-3-3-4 shift pattern is detected, go to next step. If a 4-3-3-4 shift pattern is not detected, see DIAGNOSTIC AIDS.
3) Check shift solenoids for damaged seals or internal malfunction. Repair as necessary. After repairs, go to next step.
4) Using scan tool, clear DTCs. Test drive vehicle in "D4" range. Hold throttle at 40 percent and accelerate vehicle to 40 MPH. If throttle moves more than 3 percent, stop vehicle and start again. Drive vehicle at 40 MPH for 2 miles. Check for DTCs. If DTC P0756 does not return, system is okay. If DTC P0756 returns, repeat step 1).

Diagnostic Aids
Verify shift speeds are correct. See PERFORMANCE TESTS in HYDRA-MATIC 4L60-E OVERHAUL article. More than one shift may occur due to other internal transmission failures.

DTC P0756: 2-3 SHIFT SOLENOID VALVE PERFORMANCE (EXCEPT 3.8L)

NOTE: This test applies to all engine applications except 3.8L. For 3.8L applications, see DTC P0756: 2-3 SHIFT SOLENOID VALVE PERFORMANCE - NO 1ST OR 2ND GEAR (3.8L).

Circuit Description

The 2-3 shift solenoid valve is a normally open exhaust valve used in conjunction with 1-2 shift solenoid valve to allow 4 different shifting combinations. Solenoid is attached to control valve body. DTC P0756 is set if control module detects a 1-2-2-1 or a 4-3-3-4 shift pattern, depending on mechanical failure.

Conditions For Running DTC P0756

DTC will run under the following conditions:

* DTCs P0122, P0123, P0502, P0503, P0740, P0742, P0753, P0758, P0785, P1810 and P1860 are not present.
* Vehicle speed is greater than 5 MPH.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine vacuum is 0-105 kPa.
* Engine torque is 40-400 ft. lbs.
* TP sensor angle is 10-50 percent.
* TP sensor angle is constant within plus or minus 7 percent.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* Gear range is "D4".
* Transmission fluid temperature is 68-266øF (20-130øC).
* Control module commands 1-2, 2-3 and 3-4 shift.

Conditions For Setting DTC P0756

DTC will set if the following conditions occur 3 consecutive times and are met for 1.5 seconds:

* 3rd gear is commanded for 2-6 seconds.
* Speed ratio in 3rd gear does not decrease more than .3 from last speed ratio in 2nd gear (speed ratio is engine speed divided by transmission output speed).
* TCC slip speed in 3rd gear remains 400 RPM greater than last TCC slip speed in 2nd gear.

In addition to the above conditions, one of the following groups of conditions must also occur.

Condition No. 1

* Engine torque is 0-400 ft. lbs.
* 1st gear is commanded.
* TP sensor angle is greater than 25 percent.
* Transmission output speed is 400-1500 RPM.
* Speed ratio is .7-3.0.
* TCC slip speed is -2000-0 RPM.
* All conditions are met for 1.5 seconds.

Condition No. 2

* 4th gear is commanded for 1.5 seconds.
* Transmission output speed is 1000-3000 RPM.
* Speed ratio is 1.68-3.0.
* TCC slip speed is 1000-3000 RPM.
* All conditions are met for one second.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL at first failure signal.
* Commands 3rd gear only.
* Commands maximum line pressure.
* Inhibits TCC engagement.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0756 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Test drive vehicle in "D4" range and ensure control module commands 1st, 2nd, 3rd and 4th gears. If a 1-2-2-1 or 4-3-3-4 shift pattern is detected, go to next step. If a 1-2-2-1 or 4-3-3-4 shift pattern is not detected, see DIAGNOSTIC AIDS.
3) Check shift solenoids for damaged seals or internal malfunction. Repair as necessary. After repairs, go to next step.
4) Using scan tool, clear DTCs. Test drive vehicle in "D4" range. Hold throttle at 40 percent and accelerate vehicle to 40 MPH. If throttle moves more than 3 percent, stop vehicle and start again. Drive vehicle at 40 MPH for 2 miles. Check for DTCs. If DTC P0756 does not return, system is okay. If DTC P0756 returns, repeat step 1).

Diagnostic Aids
Verify shift speeds are correct. See PERFORMANCE TESTS in HYDRA-MATIC 4L60-E OVERHAUL article. More than one shift may occur due to other internal transmission failures.

DTC P0757: 2-3 SHIFT SOLENOID VALVE PERFORMANCE - NO 3RD OR 4TH GEAR (3.8L)

NOTE: This test applies to 3.8L only.

Circuit Description
The 2-3 shift solenoid valve is a normally open exhaust valve used in conjunction with 1-2 shift solenoid valve to allow 4 different shifting combinations. Solenoid is attached to control valve body. DTC P0757 is set if control module detects a 1-2-2-1 shift pattern, depending on mechanical failure.

Conditions For Running DTC P0757

DTC will run under the following conditions:

* DTCs P0122, P0123, P0502, P0503, P0740, P0742, P0753, P0758, P0785, P1810, P1860 and P1870 are not present.
* System voltage is 8-18 volts.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* Engine vacuum is 0-105 kPa.
* Engine torque is 0-400 ft. lbs.
* TP sensor angle is greater than 9 percent.
* Vehicle speed is greater than 5 MPH.
* Gear range is "D4", "D3", "D2" or "D1".
* Transmission fluid temperature is 68-266øF (20-130øC).
* Transmission output speed is greater than 150 RPM.

NOTE: All criteria in either condition No. 1 or condition No. 2 must occur for DTC to set.

Conditions For Setting DTC P0757 (Condition No. 1)
DTC will set under the following conditions:

* Control module commands 3rd gear for one second.
* Engine torque is 50-400 ft. lbs.
* Engine speed is greater than 1.44 times TCC slip speed.
* Estimated gear ratio is 1.575-1.825.
* All conditions are met for 2 seconds.

Conditions For Setting DTC P0757 (Condition No. 2)
DTC will set under the following conditions:

* Control module commands 4th gear for one second.
* Engine torque is 0-400 ft. lbs.
* Engine speed is greater than 1.13 times TCC slip speed.
* Estimated gear ratio is 1.8-3.26.
* All conditions are met for 2 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL.
* Commands 3rd gear only.
* Commands maximum line pressure.
* Inhibits TCC engagement.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0757 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for

reference, and then clear DTCs. Test drive vehicle in "D4" range and ensure control module commands 1st, 2nd, 3rd and 4th gears. If a 1-2-2-1 shift pattern is detected, go to next step. If a 1-2-2-1 shift pattern is not detected, see DIAGNOSTIC AIDS.

3) Check shift solenoids for damaged seals or internal malfunction. Repair as necessary. After repairs, go to next step.

4) Using scan tool, clear DTCs. Test drive vehicle in "D4" range. Hold throttle at 15 percent and accelerate vehicle to 55 MPH. If throttle moves more than 3 percent, stop vehicle and start again. Drive vehicle at 55 MPH for 2 miles. Check for DTCs. If DTC P0757 does not return, system is okay. If DTC P0757 returns, repeat step 1).

Diagnostic Aids

Verify shift speeds are correct. See PERFORMANCE TESTS in HYDRA-MATIC 4L60-E OVERHAUL article. More than one shift may occur due to other internal transmission failures.

DTC P0758: 2-3 SHIFT SOLENOID CIRCUIT - ELECTRICAL MALFUNCTION

Circuit Description

The 2-3 shift solenoid valve is used to control fluid flow acting on 2-3 shift valves. Solenoid is a normally-open exhaust valve used in conjunction with 1-2 shift solenoid valve to allow 4 different shifting combinations. See SHIFT SOLENOID COMBINATIONS table. Solenoid is attached to control valve body. Ignition voltage is supplied directly to solenoid through fused circuit. Control module commands solenoid on or off through ground circuit. DTC P0758 is set if control module detects a continuous open, short to ground or short to voltage in 2-3 shift solenoid circuit.

Conditions For Running DTC P0758

DTC will run under the following conditions:

* System voltage is 8-19 volts.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.

Conditions For Setting DTC P0758

DTC will set if one of the following conditions is met for 5 seconds:

* Control module commands solenoid on and voltage remains high (battery voltage).
* Control module commands solenoid off and voltage remains low (zero volts).

Action Taken By Control Module

Control module performs the following actions if DTC is set:

* Illuminates MIL at first failure signal.
* Commands 3rd gear only.
* Control module commands maximum line pressure.
* Inhibits TCC engagement.

* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0758 is recorded in history.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. If DTCs P0740, P0758, P0785 or P1860 is present, go to next step. If DTCs P0740, P0758, P0785 and P1860 are not present, go to step 4).

3) Check condition of shift solenoid circuit fuse. See WIRING DIAGRAMS. If fuse is open, go to step 12). If fuse is okay, go to step 5).

4) Using scan tool, command 2-3 shift solenoid valve on and off while listening to bottom of transmission oil pan. If solenoid clicks as commanded, see DIAGNOSTIC AIDS. If solenoid does not click, go to next step.

5) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Connect appropriate jumper harness to engine side of in-line harness connector. Turn ignition on, engine off. Using test light connected to ground, probe terminal "E" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If test light illuminates, go to next step. If test light does not illuminate, go to step 15).

6) Connect test light between terminals "B" and "E" of jumper harness. Using scan tool, command 2-3 shift solenoid valve on and off 3 times. If test light illuminates with scan tool command, go to step 8). If test light does not illuminate with scan tool command, go to next step.

7) If test light is always on, go to step 16). If test light is not always on, go to step 17).

8) Connect appropriate jumper harness to transmission side of in-line harness connector. Measure resistance between terminals "B" and "E" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is 19-31 ohms, go to next step. If resistance is not 19-31 ohms, leave DVOM connected and go to step 10).

9) Measure resistance between ground and terminal "B" of jumper harness, and then between ground and terminal "E" of jumper harness. If both measurements are greater than 250 k/ohms, see DIAGNOSTIC AIDS. If both measurements are not greater than 250 k/ohms, go to step 11).

10) Remove transmission oil pan. Disconnect transmission wiring harness assembly from 2-3 shift solenoid valve. If resistance is 19-31 ohms, go to step 18). If resistance is not 19-31 ohms, go to step 19).

11) Remove transmission oil pan. Disconnect transmission wiring harness assembly from 2-3 shift solenoid valve. Measure resistance between ground and terminals of 2-3 shift valve. If both measurements are greater than 250 k/ohms, go to step 18). If both measurements are not greater than 250 k/ohms, go to step 19).

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

12) Check 2-3 shift solenoid valve ignition feed circuit for short to ground between engine wiring harness junction block and transmission 20-pin in-line harness connector. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to next step.

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

13) Check 2-3 shift solenoid valve ignition feed circuit for short to ground between 2-3 shift solenoid valve and transmission 20-pin in-line harness connector. If circuit is shorted, go to step 18). If circuit is okay, go to next step.

14) Check each solenoid for short to ground. Repair as necessary. After repairs, go to step 21).

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

15) Check for open in 2-3 shift solenoid valve ignition feed circuit. Repair as necessary. After repairs, go to step 21).

16) Check 2-3 shift solenoid valve control circuit for short to ground between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 20).

17) Check 2-3 shift solenoid valve control circuit for open or short to voltage between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 20).

18) Replace transmission wiring harness assembly. After repairs, go to step 21).

19) Replace 2-3 shift solenoid valve. After repairs, go to step 21).

20) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

21) Using scan tool, clear DTCs. Test drive vehicle in "D4" range. Ensure when control module commands 2-3 shift solenoid on, feedback voltage decreases to zero, and then increases to battery voltage when commanded off. Ensure each condition is met for at least 5 seconds. Check for DTCs. If DTC P0758 does not return, system is okay. If DTC P0758 returns, repeat step 1).

Diagnostic Aids

Transmission may exhibit symptoms of failing to shift and/or dropping into or remaining in 3rd gear when gearshift lever is in "OD" range. This condition may set additional DTCs P0740, P0753, P0785 and P1860. This may be caused by a poor terminal crimp on transmission

solenoid battery feed circuit between instrument panel fuse block and transmission solenoids. Check terminal crimp at bulkhead connector where circuit passes through firewall.

Inspect wiring for poor connections at control module. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P0785: 3-2 SHIFT SOLENOID CIRCUIT - ELECTRICAL MALFUNCTION

Circuit Description

The 3-2 shift solenoid is a normally-closed 3-port on/off device which controls 3-2 downshift. Ignition voltage is supplied directly to solenoid through fused circuit. Control module commands solenoid on or off through ground circuit. During 3-2 downshift, 2-4 band applies as 3-4 clutch releases. Control module varies timing between 3-4 clutch release and 2-4 band apply depending on vehicle speed and throttle position. DTC P0785 is set if control module detects a continuous open or short to ground in 3-2 shift solenoid circuit.

Conditions For Running DTC P0785

DTC will run under the following conditions:

* System voltage is 8-18 volts.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.

Conditions For Setting DTC P0785

DTC will set if one of the following conditions is met for 5 seconds:

* Control module commands solenoid on and voltage remains high (battery voltage).
* Control module commands solenoid off and voltage remains low (zero volts).

Action Taken By Control Module

Control module performs the following actions if DTC is set:

* Illuminates MIL at first failure signal.
* Commands soft landing into 3rd gear.
* Control module commands maximum line pressure.
* Inhibits TCC engagement.
* Inhibits 4th gear if transmission is in hot mode.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P0785 is recorded in history.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. If DTCs P0740, P0758, P0785 or P1860 is present, go to next step. If DTCs P0740, P0758, P0785 and P1860 are not present, go to step 4).

3) Check condition of shift solenoid circuit fuse. See WIRING DIAGRAMS. If fuse is open, go to step 12). If fuse is okay, go to step 5).

4) Using scan tool, command 3-2 shift solenoid valve on and off while listening to bottom of transmission oil pan. If solenoid clicks as commanded, see DIAGNOSTIC AIDS. If solenoid does not click, go to next step.

5) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Connect appropriate jumper harness to engine side of in-line harness connector. Turn ignition on, engine off. Using test light connected to ground, probe terminal "E" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If test light illuminates, go to next step. If test light does not illuminate, go to step 15).

6) Connect test light between terminals "E" and "S" of jumper harness. Using scan tool, command 3-2 shift solenoid valve on and off 3 times. If test light illuminates with scan tool command, go to step 8). If test light does not illuminate with scan tool command, go to next step.

7) If test light is always on, go to step 16). If test light is not always on, go to step 17).

8) Connect appropriate jumper harness to transmission side of in-line harness connector. Measure resistance between terminals "E" and "S" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is 20-32 ohms, go to next step. If resistance is not 20-32 ohms, leave DVOM connected and go to step 10).

9) Measure resistance between ground and terminal "E" of jumper harness, and then between ground and terminal "S" of jumper harness. If both measurements are greater than 250 k/ohms, see DIAGNOSTIC AIDS. If both measurements are not greater than 250 k/ohms, go to step 11).

10) Remove transmission oil pan. Disconnect transmission wiring harness assembly from 3-2 shift solenoid valve. If resistance is 20-32 ohms, go to step 18). If resistance is not 20-32 ohms, go to step 19).

11) Remove transmission oil pan. Disconnect transmission wiring harness assembly from 3-2 shift solenoid valve. Measure resistance between ground and terminals of 3-2 shift valve. If both measurements are greater than 250 k/ohms, go to step 18). If both measurements are not greater than 250 k/ohms, go to step 19).

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

12) Check 3-2 shift solenoid valve ignition feed circuit for short to ground between engine wiring harness junction block and transmission 20-pin in-line harness connector. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to next step.

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

13) Check 3-2 shift solenoid valve ignition feed circuit for short to ground between 3-2 shift solenoid valve and transmission 20-pin in-line harness connector. If circuit is shorted, go to step 18). If circuit is okay, go to next step.

14) Check each solenoid for short to ground. Repair as necessary. After repairs, go to step 21).

NOTE: Condition affecting shift solenoid valve circuit may be caused by a fault in other circuits spliced to shift solenoid valve circuit.

15) Check for open in 3-2 shift solenoid valve ignition feed circuit. Repair as necessary. After repairs, go to step 21).

16) Check 3-2 shift solenoid valve control circuit for short to ground between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 20).

17) Check 3-2 shift solenoid valve control circuit for open or short to voltage between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 20).

18) Replace transmission wiring harness assembly. After repairs, go to step 21).

19) Replace 3-2 shift solenoid valve. After repairs, go to step 21).

20) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

21) Using scan tool, clear DTCs. Test drive vehicle in "D3" or "D4" range. Ensure when control module commands 3-2 shift solenoid on, feedback voltage decreases to zero, and then increases to battery voltage when commanded off. Ensure each condition is met for at least 5 seconds. Check for DTCs. If DTC P0785 does not return, system is okay. If DTC P0785 returns, repeat step 1).

Diagnostic Aids

Transmission may exhibit symptoms of failing to shift and/or dropping into or remaining in 3rd gear when gearshift lever is in "OD" range. This condition may set additional DTCs P0740, P0753, P0758 and P1860. This may be caused by a poor terminal crimp on transmission solenoid battery feed circuit between instrument panel fuse block and transmission solenoids. Check terminal crimp at bulkhead connector where circuit passes through firewall.

Inspect wiring for poor connections at control module. Check

for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P1810: TFP MANUAL VALVE POSITION SWITCH - CIRCUIT MALFUNCTION

NOTE: Transmission Fluid Pressure (TFP) manual valve position switch assembly may also be referred to as Pressure Switch Assembly (PSA).

Circuit Description

The TFP manual valve position switch assembly consists of 5 pressure switches and a Transmission Fluid Temperature (TFT) sensor. Two switches are normally-closed. Three other switches are normally-open. Complete assembly mounts on control valve body.

The control module supplies battery voltage to each range switch. Control module grounds one or more range switch signal circuit(s) through various combinations of pressure switches. Control module monitors combinations in order to detect what manual valve position has been selected. Control module compares actual voltage combination of switches to TFP manual valve position switch combination values stored in memory. TFP manual valve position switch cannot distinguish between Park and Neutral because monitored valve body pressures are identical. DTC P1810 is set if control module detects an invalid state of TFP manual valve position switch. See TFP LOGIC table.

TFP LOGIC

Gear	Signal "A"	Signal "B"	Signal "C"
Park & Neutral	HI	LOW	HI
Reverse	LOW	LOW	HI
D4/4th	HI	LOW	LOW
D3/3rd	HI	HI	LOW
D2/2nd	HI	HI	HI
D1/1st	LOW	HI	HI
Invalid	LOW	HI	LOW
Invalid	LOW	LOW	LOW

Conditions For Running DTC P1810

DTC will run under the following conditions:

* DTCs P0502 and P0503 are not present.
* System voltage is 8-19 volts.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* Engine torque is 50-450 ft. lbs.
* Engine vacuum is 0-105 kPa.

Conditions For Setting DTC P1810
DTC will set when any one of the following groups of conditions occur.

Condition No. 1
DTC will set under the following condition:

* Control module detects an invalid TFP manual valve position switch state for one minute.

Condition No. 2
DTC will set under the following conditions:

* Engine speed is less than 100 RPM for .1 second, and then 100-600 RPM for .02 second, and then greater than 600 RPM.
* Vehicle speed is less than 2 MPH.
* Control module detects gear range is "D2", "D4" or Reverse during an engine start.
* All conditions are met for 5 seconds.

Condition No. 3
DTC will set under the following conditions:

* TP sensor angle is 10-50 percent.
* Control module commands 4th gear.
* TCC is locked on.
* Speed ratio is .65-.75 (speed ratio is engine speed divided by transmission output speed).
* Detected gear range is Park or Neutral while transmission is operating in "D4" range.
* All conditions are met for 10 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL after 2 consecutive trips with failure.
* Commands "D2" line pressure.
* Commands "D4" shift pattern.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P1810 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Check transmission fluid. Fill if necessary. See appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. Go to next step.
3) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for

reference, and then clear DTCs. Start engine and let idle at normal operating temperature. Apply brake pedal. While monitoring transmission range on scan tool, shift transmission into each gear range. If actual gear range matches transmission range switch parameter on scan tool, see DIAGNOSTIC AIDS. If actual gear range does not match transmission range switch parameter on scan tool, go to next step.

4) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Turn ignition on, engine off. Using scan tool, monitor TFP switch A/B/C parameter. If scan tool indicates HI for all transmission range signal states, go to next step. If scan tool does not indicate HI for all transmission range signal states, go to step 9).

5) Turn ignition off. Install appropriate jumper harness to engine side of transmission 20-pin in-line harness connector. Turn ignition on, engine off. Measure voltage between ground and terminals "N", "P" and "R" of jumper harness, one at a time. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If battery voltage is present at each terminal, go to next step. If battery voltage is not present at each terminal, go to step 10).

6) While monitoring TFP switch A/B/C parameter on scan tool, connect fused jumper wire between ground and terminal "N" (signal circuit "A") at jumper harness. If any other signal circuits on scan tool indicate LOW, go to step 11). If no other signal circuits on scan tool indicate LOW, go to next step.

7) While monitoring TFP switch A/B/C parameter on scan tool, connect fused jumper wire between ground and terminal "R" (signal circuit "B") at jumper harness. If any other signal circuits on scan tool indicate LOW, go to step 11). If no other signal circuits on scan tool indicate LOW, go to next step.

8) While monitoring TFP switch A/B/C parameter on scan tool, connect fused jumper wire between ground and terminal "P" (signal circuit "C") at jumper harness. If any other signal circuits on scan tool indicate LOW, go to step 11). If no other signal circuits on scan tool indicate LOW, go to step 12).

9) Check TFP manual valve position switch signal circuits which did not indicate HI for short to ground between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 16). If circuits are okay, go to step 15).

10) Check TFP manual valve position switch signal circuits which did not indicate battery voltage for open between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 16). If circuits are okay, go to step 15).

11) Check TFP manual valve position switch signal circuits for short together between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 16). If circuits are okay, go to step 15).

12) Check TFP manual valve position switch signal circuits for open or short between transmission 20-pin in-line harness connector and TFP manual valve position switch. If any circuits are faulty, go to next step. If circuits are okay, go to step 14).

13) Replace transmission wiring harness assembly. After repairs, go to step 16).

14) Replace TFP manual valve position switch. After repairs, go to step 16).

15) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

16) Using scan tool, clear DTCs. Turn ignition on, engine off for at least 2 seconds. Start vehicle and idle for 5 seconds. Drive vehicle in "D4" range until TCC locks for 10 seconds. Continue to run engine for at least one minute from start up. Check for DTCs. If DTC P1810 does not return, system is okay. If DTC P1810 returns, repeat step 1).

Diagnostic Aids

DTC P1810 refers to a problem with pressure switch assembly. This may be caused by debris shorting out the switch contacts. A new-design Pressure Switch Assembly (24215111) has been introduced by General Motors. The new switch incorporates a plastic shield to protect switch contacts from exposure to debris.

Inspect wiring for poor connections at control module and at transmission 20-pin in-line harness connector. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P1860: TCC PWM SOLENOID ELECTRICAL MALFUNCTION

Circuit Description

TCC PWM solenoid is used to control fluid flow acting on converter clutch valve. Solenoid controls TCC apply and release. Solenoid is attached to control valve body. Ignition voltage is supplied directly to solenoid through fused circuit. Control module commands solenoid on or off through ground circuit. TCC PWM solenoid provides a smooth engagement of TCC by operating during duty cycle percent of on time. DTC P1860 is set if control module detects a continuous open or short to ground in TCC PWM solenoid circuit.

Conditions For Running DTC P1860

DTC will run under the following conditions:

* System voltage is 8-19 volts.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* 1st gear is commanded.
* TCC duty cycle is less than 10 percent or greater than 90 percent.

Conditions For Setting DTC P1860

DTC will set if one of the following conditions occurs for 5 seconds:

* PCM commands solenoid on and voltage remains high (battery

voltage).
* PCM commands solenoid off and voltage remains low (zero volts).

Action Taken By Control Module
Control module performs the following action if DTC is set:

* Illuminates MIL at first failure signal.
* Inhibits TCC engagement.
* Inhibits 4th gear if transmission is in hot mode.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P1860 is recorded in history.

Diagnostic Procedure
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. If DTCs P0740, P0753, P0758 or P0785 are also present, go to next step. If DTCs P0740, P0753, P0758 and P0785 are not present, go to step 4).
3) Check condition of TCC solenoid valve circuit fuse. If fuse is open, go to step 11). If fuse is okay, go to next step.
4) Turn ignition off. Disconnect transmission 20-pin in-line harness connector. Connect appropriate jumper harness to engine side of in-line harness connector. Turn ignition on, engine off. Using test light connected to ground, probe terminal "E" at jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If test light illuminates, go to next step. If test light does not illuminate, go to step 14).
5) Connect test light between terminals "E" and "U" at jumper harness. Using scan tool, command TCC solenoid valve on and off 3 times. If test light illuminates with scan tool command, go to step 7). If test light does not illuminate with scan tool command, go to next step.
6) If test light remains illuminated, go to step 15). If test light does not remain illuminated, go to step 16).
7) Connect jumper harness to transmission side of in-line harness connector. Measure resistance between terminals "E" and "U" of jumper harness. See CONNECTOR IDENTIFICATION under DIAGNOSIS & TESTING. If resistance is 10-15 ohms, go to next step. If resistance is not 10-15 ohms, go to step 9).
8) Measure resistance between ground and terminal "E" of jumper harness, and then between ground and terminal "U" of jumper harness. If both measurements are greater than 250 k/ohms, see DIAGNOSTIC AIDS. If both measurements are not greater than 250 k/ohms, go to step 10).
9) Remove transmission oil pan. Disconnect transmission wiring harness assembly from TCC solenoid valve. Measure resistance of TCC solenoid valve. If resistance is 10-15 ohms, go to step 17). If resistance is not 10-15 ohms, go to step 18).

10) Remove transmission oil pan. Disconnect transmission wiring harness assembly from TCC solenoid valve. Measure resistance between ground and each terminal of TCC solenoid valve. If both measurements are greater than 250 k/ohms, go to step 17). If both measurements, are not greater than 250 k/ohms, go to step 18).

NOTE: Condition affecting TCC solenoid valve circuit may be caused by a fault in other circuits spliced to TCC solenoid valve circuit.

11) Check TCC solenoid valve ignition feed circuit for short to ground between engine wiring harness junction block and transmission 20-pin in-line harness connector. Repair as necessary. After repairs, go to step 20). If circuit is okay, go to next step.

NOTE: Condition affecting TCC solenoid valve circuit may be caused by a fault in other circuits spliced to TCC solenoid valve circuit.

12) Check TCC solenoid valve ignition feed circuit for short to ground between TCC solenoid valve and transmission 20-pin in-line harness connector. If circuit is shorted, go to step 17). If circuit is okay, go to next step.

13) Check each solenoid valve for short to ground. Repair as necessary. After repairs, go to step 20).

NOTE: Condition affecting TCC solenoid valve circuit may be caused by a fault in other circuits spliced to TCC solenoid valve circuit.

14) Check for open in TCC solenoid valve ignition feed circuit. Repair as necessary. After repairs, go to step 20).

15) Check TCC solenoid valve control circuit for short to ground between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 20). If circuit is okay, go to step 19).

16) Check TCC solenoid valve control circuit for open or short to voltage between transmission 20-pin in-line harness connector and control module. Repair as necessary. After repairs, go to step 20). If circuit is okay, go to step 19).

17) Replace transmission wiring harness assembly. After repairs, go to step 20).

18) Replace TCC solenoid valve. After repairs, go to step 20).

19) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

20) Using scan tool, clear DTCs. Test drive vehicle in "D4" range with TCC on. Ensure voltage feedback decreases to zero volts when TCC solenoid valve is commanded on, and voltage increases to battery voltage when commanded off. Conditions must be met for 5 seconds. Check for DTCs. If DTC P1860 does not return, system is okay. If DTC P1860 returns, repeat step 1).

Diagnostic Aids

Transmission may exhibit symptoms of failing to shift and/or dropping into or remaining in 3rd gear when gearshift lever is in "OD" range. This condition may set additional DTCs P0740, P0753, P0758 and P0785. This may be caused by a poor terminal crimp on transmission solenoid battery feed circuit between instrument panel fuse block and transmission solenoids. Check terminal crimp at bulkhead connector where circuit passes through firewall.

Inspect wiring for poor connections at control module and transmission 20-pin in-line harness connector. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

DTC P1870: TRANSMISSION COMPONENT SLIPPING

Circuit Description

The control module monitors difference between engine speed and transmission output speed. In "D3" range with TCC engaged, engine speed should closely match transmission output speed. In "D4" range with TCC engaged, TCC slip speed should be -20 to 60 RPM. DTC P1870 is set if control module detects excessive TCC slip when TCC should be engaged.

Conditions For Running DTC P1870

DTC will run under the following conditions:

* DTCs P0101, P0102, P0103, P0122, P0123, P0502, P0503, P0711, P0712, P0713, P0740, P0753, P0758, P0785, P1810 and P1860 are not present.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* TP sensor angle is 8-35 percent.
* Engine torque is 40-450 ft. lbs.
* Vehicle speed is 30-82 MPH.
* Speed ratio is .65-.98 (speed ratio is engine speed divided by transmission output speed).
* Engine speed is 1000-3500 RPM.
* Gear range is "D4".
* Commanded gear is not 1st gear.
* Transmission fluid temperature is 68-266øF (20-130øC).
* Shift solenoid performance counter is at zero.

Conditions For Setting DTC P1870

DTC will set under the following conditions:

* TCC is commanded on for 5 seconds.
* TCC is at maximum duty cycle for 8 seconds.
* TCC slip speed is 80-800 RPM for 7 seconds.

Action Taken By Control Module

Control module performs the following actions if DTC is set:

* Illuminates MIL at second consecutive failure signal.
* Commands maximum line pressure.
* Inhibits TCC engagement.
* Inhibits 4th gear if transmission is in hot mode.
* Freezes shift adapts from being updated.
* Records operating conditions when conditions for running DTC are met.
* DTC P1870 is recorded in history.

Diagnostic Procedure

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.

2) Check transmission fluid level. Fill if necessary. See appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. Go to next step.

3) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Test drive vehicle in 4th gear with TCC commanded on. Using scan tool, monitor TCC slip speed. If TCC slip speed is 80-800 RPM for 7 seconds, go to next step. If TCC slip speed is not 80-800 RPM for 7 seconds, see DIAGNOSTIC AIDS.

4) Check TCC solenoid valve for internal malfunction or damaged seals. Repair as necessary. After repairs, go to step 14). If TCC solenoid valve is okay, go to next step.

5) Check all shift solenoid valves for internal malfunctions or damaged seals. Repair as necessary. After repairs, go to step 14). If shift solenoids are okay, go to next step.

6) Check valve body for stuck regulator apply valve or scored regulator apply valve body. Repair as necessary. After repairs, go to step 13). If no problem is found, go to next step.

7) Check torque converter for worn stator shaft bushing, defective stator roller clutch or external damage and leaks. Repair as necessary. After repairs, go to step 13). If torque converter is okay, go to next step.

8) Check oil pump assembly for stuck, mispositioned or incorrectly installed valves and springs. Check for mispositioned oil pump gasket, restricted or damaged orifice cup plugs. Check for overtightened or unevenly tightened pump body-to-cover bolts. Repair as necessary. After repairs, go to step 13). If no problem is found, go to next step.

9) Check input housing and shaft assembly for restricted or damaged turbine shaft retainer and ball assembly. Check for cut or damaged turbine shaft "O" ring seal. Repair as necessary. After repairs, go to step 13). If no problem is found, go to next step.

10) Check condition of 2-4 band components (i.e., pistons, seals, band, oil passages, case piston bore, etc.). Repair as necessary. After repairs, go to step 13). If no problem is found, go to next step.

11) Check condition of forward clutch components (i.e., clutch plates, piston, seals, retainer and ball, etc.). Repair as necessary. After repairs, go to step 13). If no problem is found, go

to next step.

12) Check condition of 3-4 clutch components (i.e., clutch plates, piston, seals, orifice cup plug, etc.). Repair as necessary. After repairs, go to next step. If no problem is found, see DIAGNOSTIC AIDS.

13) Change transmission fluid. See appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. Using scan tool, clear TAPS function. See CLEARING & RESETTING TAP VALUES under DIAGNOSIS & TESTING. After repairs, go to next step.

14) Using scan tool, clear DTCs. Test drive vehicle in "D4" range with TCC on and TP sensor angle at 8-35 percent. Ensure TCC slip speed -20-60 RPM for at least 7 seconds. Check for DTCs. If DTC P1870 does not return, system is okay. If DTC P1870 returns, repeat step 1).

Diagnostic Aids

A TFP manual valve position switch malfunction could set DTC P1870. Ensure final drive ratio matches control module calibration. Bronze material found in transmission oil pan may indicate stator shaft bushing wear. Inspect stator shaft and input (turbine) shaft for damage.

DTC P1875: 4WD LOW SWITCH CIRCUIT - ELECTRICAL MALFUNCTION

Circuit Description (Active 4WD System)

The 4WD low circuit consists of a transfer case switch, front axle switch and front axle actuator. When 4WD low is engaged, voltage to control module changes from ignition voltage to zero volts. The 4WD low switch signal corrects transmission output speed signal to control module. This signal compensates for transfer case gear reduction. The control module uses transmission output speed signal to adjust shift points, line pressure and TCC scheduling. DTC P1875 is set if control module detects a continuous open or short to ground in 4WD circuit.

Circuit Description (Non-Active 4WD System)

The 4WD low circuit consists of a transfer case selector switch, Transfer Case Control Module (TCCM) and wiring. When 4WD low is selected, TCCM receives a momentary signal from selector switch. If all conditions for 4WD low are met, TCCM allows electric motor in transfer case to perform shift. When 4WD low is engaged, voltage to control module (PCM/VCM) changes from ignition voltage to zero volts. The 4WD low switch signal corrects transmission output speed signal to PCM/VCM. This signal compensates for transfer case gear reduction. The PCM/VCM uses transmission output speed signal to adjust shift points, line pressure and TCC scheduling. DTC P1875 is set if PCM/VCM detects a continuous open or short to ground in 4WD circuit.

Conditions For Running DTC P1875

DTC will run under the following conditions:

* DTCs P0122, P0123, P0502, P0503, P0740, P0742, P0751, P0753, P0576, P0758, P1810, P1860 and P1870 are not present.
* Engine speed is greater than 450 RPM for 5 seconds.
* Engine is not in fuel cutoff mode.
* Vehicle speed is greater than 7 MPH.

* TP sensor angle is 17-50 percent.
* Engine torque is 50-400 ft. lbs.
* Engine vacuum is 0-105 kPa.
* Gear range is "D4".
* Shift solenoid performance counters are zero.
* Transmission fluid temperature is 68-266øF (20-130øC).

Conditions For Setting DTC P1875
DTC will set if one of the following groups of conditions occur.

Condition No. 1
* 4WD low switch is in 4WD low.
* Transfer case is not in 4WD low.
* TCC slip speed is between -3000 RPM and -50 RPM.
* Transfer case ratio is .8-1.2 (transfer case ratio is engine speed divided by transfer case output speed).
* All conditions are met for 5 seconds.

Condition No. 2
* 4WD low switch is not in 4WD low.
* Transfer case is in 4WD low.
* TCC is commanded on.
* TCC slip speed is 100-3000 RPM.
* Transfer case ratio is 2.5-2.9 (transfer case ratio is engine speed divided by transfer case output speed).
* All conditions are met for 10 seconds.

Action Taken By Control Module
Control module performs the following actions if DTC is set:

* Illuminates MIL at first failure signal.
* Commands a normal shift pattern.
* Records operating conditions when conditions for running DTC are met.
* DTC P1875 is recorded in history.

Diagnostic Procedure (Non-Active 4WD System)
1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK under DIAGNOSIS & TESTING. After performing OBD system check, go to next step.
2) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, record freeze frame and failure records for reference, and then clear DTCs. Set parking brake and block drive wheels. Shift transmission into Neutral. While monitoring scan tool 4WD low display, select 4HI, and then 4LO on transfer case selector switch. If scan tool displays DISABLED when 4HI is selected and ENABLED when 4LO is selected, see DIAGNOSTIC AIDS. If scan tool does not display DISABLED when 4HI is selected and ENABLED when 4LO is selected, go to next step.
3) Turn ignition off. Disconnect transfer case switch harness connector or TCCM harness connector (if equipped). Turn ignition on, engine off. If scan tool indicates ENABLED, go to step 6). If scan tool does not indicate ENABLED, go to next step.

4) Using fused jumper wire, connect 4WD low signal circuit to ground. See WIRING DIAGRAMS. If scan tool indicates ENABLED, go to next step. If scan tool does not indicate ENABLED, go to step 7).

5) Replace transfer case switch or TCCM (if equipped). After repairs, go to step 9).

6) Check 4WD low signal circuit for short to ground. Repair as necessary. After repairs, go to step 9). If circuit is okay, go to step 8).

7) Check for open in 4WD low signal circuit. Repair as necessary. After repairs, go to step 9). If circuit is okay, go to next step.

8) Replace control module (PCM/VCM). After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

9) Using scan tool, clear DTCs. Operate vehicle under following conditions: Select 4LO on transfer case selector switch. Drive vehicle in "D4" range. Ensure transfer case ratio is 2.5-2.9 for 5 seconds. Select 2HI or 4HI on transfer case selector switch. Drive vehicle in "D4" range with TCC on. Ensure transfer case ratio is .8-1.2 for 5 seconds. Check for DTCs. If DTC P1875 does not return, system is okay. If DTC P1875 returns, repeat step 1).

Diagnostic Aids

Inspect wiring for poor connections at control module (PCM/VCM). Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes.

SYMPTOM TESTS

2ND GEAR START SWITCH INDICATOR LIGHT- ALWAYS ON OR INOPERATIVE

NOTE: Camaro and Firebird with 3.8L engine are equipped with a 2nd gear start switch. Switch does not set a DTC. However, this component may affect transmission performance.

Circuit Description

The 2nd gear start switch located on instrument panel, above radio, enables driver to select a 2nd gear start for increased traction during slippery driving conditions. When driver selects 2nd gear, 2nd gear start switch input signal momentarily toggles to zero volts. Control module turns on 2nd gear start mode indicator light located within 2nd gear start switch, and de-energizes 1-2 shift solenoid, enabling 2nd gear.

During light and medium acceleration conditions, vehicle starts in 2nd gear when 2nd gear is selected. However, 2nd gear starts are overridden and 1st gear starts occur if a hard acceleration condition (wide open throttle) is requested. Normal 1st gear start mode is obtained by toggling 2nd gear start switch again, or when ignition switch is cycled off, and then on.

Diagnostic Procedure

1) Connect scan tool to DLC. Turn ignition on, engine off. While monitoring 2nd gear start switch parameter on scan tool, cycle 2nd gear start switch. If scan tool displays YES when switch is first pressed, and then NO when pressed a second time, go to step 6). If scan tool display is not as specified, go to next step.

2) Disconnect 2nd gear start switch harness connector from switch. Measure voltage between ground and terminal "E" (signal circuit) at 2nd gear start switch harness connector. If voltage is 10-12 volts, go to next step. If voltage is not 10-12 volts, go to step 5).

3) Connect fused jumper wire between terminals "E" and "F" of 2nd gear start switch harness connector. See WIRING DIAGRAMS. While monitoring scan tool, connect and disconnect jumper wire from terminal "F". If scan tool status changes between YES and NO, go to step 15). If scan tool status does not change between YES and NO, go to next step.

4) Check for open in 2nd gear start switch ground circuit. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 16).

5) Check 2nd gear start switch signal circuit for open or short to ground. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 16).

6) If 2nd gear start switch indicator light illuminates when switch is first depressed, and then turns off when switch is pressed a second time, system is okay. If indicator light does not operate as specified, go to next step.

7) If indicator light is illuminated at all times, go to step 13). If indicator light is not illuminated at all times, go to next step.

8) Using test light connected to ground, probe terminal "B" (ignition feed circuit) at 2nd gear start switch harness connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 10).

9) Using test light connected to ground, probe terminal "A" (control circuit) at 2nd gear start switch harness connector. If test light illuminates, go to step 14). If test light does not illuminate, go to step 15).

10) Check condition of 2nd gear start switch circuit fuse. See WIRING DIAGRAMS. If fuse is open, go to next step. If fuse is okay, go to step 12).

11) Check 2nd gear start switch ignition feed circuit for short to ground. Repair as necessary. After repairs, go to step 17).

12) Check for open in 2nd gear start switch ignition feed circuit. Repair as necessary. After repairs, go to step 17).

13) Check 2nd gear start switch control circuit for short to ground. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 16).

14) Check for open in 2nd gear start switch control circuit. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 16).

15) Replace 2nd gear start switch. After repairs, go to step 17).

16) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

17) Monitor 2nd gear start switch parameter on scan tool, and indicator light. If ON is displayed first time switch is depressed and indicator light illuminates, and OFF is displayed second time switch is depressed and indicator light turns off, system is okay. If operation is not as specified, repeat step 1).

Diagnostic Aids

If electrical circuit is okay, and 2nd gear starts are not correct, a mechanical or hydraulic malfunction may exist. See HYDRA-MATIC 4L60-E OVERHAUL article for diagnosis.

CIRCUIT TESTS

TRANSMISSION RANGE SWITCH CIRCUIT

Circuit Description

The Transmission Range (TR) switch is part of Park/Neutral Position (PNP) and back-up light switch assembly, which is externally mounted on transmission manual shaft. The TR switch contains 4 internal switches that indicate gearshift lever position. The control module supplies ignition voltage to each switch circuit. As gearshift lever is moved, the state of each switch may change, causing circuit to open or close. An open circuit or switch indicates a high voltage signal. A closed circuit or switch indicates a low voltage signal. The control module detects selected gear range by deciphering the combination of voltage signals. The control module compares actual voltage combination of switch signals to a TR switch combination chart stored in control module memory.

Diagnostic Procedure (4.3L)

1) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, monitor TR switch parameter while selecting each transmission range with gearshift lever. If scan tool display matches actual gear range selected, see DIAGNOSTIC AIDS. If scan tool display does not match actual gear range selected, go to next step.

2) Using scan tool, monitor TR switch parameter while selecting each transmission range with gearshift lever. If scan tool displays TR switch parameter as INVALID for every transmission range, go to step 7). If INVALID is not displayed for every transmission range, go to next step.

3) Turn ignition off. Disconnect TR switch 4-pin harness connector. Turn ignition on, engine off. Using scan tool, monitor TR switch parameter while selecting each transmission range with gearshift lever. If scan tool displays TR switch parameter as INVALID for every transmission range, go to next step. If INVALID is not displayed for every transmission range, go to step 5).

4) Measure voltage between ground and terminals "A", "B", "C" and "D" of TR switch harness connector, one at a time. See WIRING DIAGRAMS. If voltage is 10-12 volts for all measurements, go to step 8). If voltage is not 10-12 volts for all measurements, go to step 6).

5) Check TR signal circuits for short to ground. Repair as necessary. After repairs, go to step 10). If circuits are okay, go to step 9).

6) Check for open in TR signal circuits that did not indicate proper voltage. Repair as necessary. After repairs, go to step 10). If circuits are okay, go to step 9).

7) Check for open in TR switch ground circuit. Repair as necessary. After repairs, go to step 10). If circuit is okay, go to next step.

NOTE: TR switch is integral with park/neutral position switch.

8) Replace TR switch. After repairs, go to step 10).

9) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

10) Turn ignition on, engine off. Using scan tool, monitor TR switch parameter while selecting each transmission range with gearshift lever. If scan tool display matches actual gear range selected, system is okay. If scan tool display does not match actual gear range selected, repeat step 2).

Diagnostic Procedure (Except 4.3L)

1) Connect scan tool to DLC. Turn ignition on, engine off. Using scan tool, monitor TR switch parameter while selecting each transmission range with gearshift lever. If scan tool display matches actual gear range selected, see DIAGNOSTIC AIDS. If scan tool display does not match actual gear range selected, go to next step.

2) Using scan tool, monitor TR switch A/B/C/P parameter. If scan tool indicates HI for all range signal states, go to step 12). If scan tool does not indicate HI for all range signal states, go to next step.

3) Turn ignition off. Disconnect TR switch 4-pin harness connector. Turn ignition on, engine off. Using scan tool, monitor TR switch A/B/C/P parameter. If scan tool indicates HI for all range signal states, go to next step. If scan tool does not indicate HI for all range signal states, go to step 9).

4) Measure voltage between ground and terminals "A", "B", "C" and "D" of TR switch harness connector, one at a time. See WIRING DIAGRAMS. If voltage is 10-12 volts for all measurements, go to next step. If voltage is not 10-12 volts for all measurements, go to step 10).

5) Using scan tool, monitor TR switch A/B/C/P parameter. Connect fused jumper wire between ground and terminal "A" (signal circuit "A") of TR switch harness connector. If scan tool indicates LOW for any circuit other than circuit "A", go to step 11). If scan tool does not indicate LOW for any circuit other than circuit "A", go to next step.

6) Using scan tool, monitor TR switch A/B/C/P parameter. Connect fused jumper wire between ground and terminal "D" (signal circuit "B") of TR switch harness connector. If scan tool indicates LOW for any circuit other than circuit "B", go to step 11). If scan tool does not indicate LOW for any circuit other than circuit "B", go to next step.

7) Using scan tool, monitor TR switch A/B/C/P parameter. Connect fused jumper wire between ground and terminal "B" (signal circuit "C") of TR switch harness connector. If scan tool indicates LOW for any circuit other than circuit "C", go to step 11). If scan tool does not indicate LOW for any circuit other than circuit "C", go to next step.

8) Using scan tool, monitor TR switch A/B/C/P parameter. Connect fused jumper wire between ground and terminal "C" (signal circuit "P") of TR switch harness connector. If scan tool indicates LOW for any circuit other than circuit "P", go to step 11). If scan tool does not indicate LOW for any circuit other than circuit "P", go to step 13).

9) Check TR signal circuits for short to ground that did not indicate HI. Repair as necessary. After repairs, go to step 15). If circuits are okay, go to step 14).

10) Check for open in TR signal circuits that did not indicate proper voltage. Repair as necessary. After repairs, go to step 15). If circuits are okay, go to step 14).

11) Check affected TR signal circuits for short together. Repair as necessary. After repairs, go to step 15). If circuits are okay, go to step 14).

12) Check for open in TR switch ground circuit. Repair as necessary. After repairs, go to step 15). If circuit is okay, go to next step.

NOTE: TR switch is integral with park/neutral position switch.

13) Replace TR switch. After repairs, go to step 15).

14) Replace control module. After replacement, program control module. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION. After repairs, go to next step.

15) Turn ignition on, engine off. Using scan tool, monitor TR switch parameter while selecting each transmission range with gearshift lever. If scan tool display matches actual gear range selected, system is okay. If scan tool display does not match actual gear range selected, go to step 2).

Diagnostic Aids

Inspect wiring for poor connections at control module and TR switch. Check for bent, backed out, deformed or damaged terminals. Check for weak terminal tension. Check for chafed wires that could short to bare metal or other wiring. Check for broken wire inside insulation. If diagnosing for intermittent short or open condition, move wiring harness while observing scan tool for value changes. For valid combinations of switch signal circuits "A", "B", "C" and "P" (Parity), see TRANSMISSION RANGE SWITCH LOGIC table.

TRANSMISSION RANGE SWITCH LOGIC (1)

Gearshift Lever Position	Signal "A"	Signal "B"	Signal "C"	Signal "P"
Park	LOW	HI	HI	LOW
Reverse	LOW	LOW	HI	HI

Neutral	HI	LOW	LOW	HI	LOW
"OD"	HI	LOW	LOW	LOW	HI
"3"	LOW	LOW	LOW	LOW	LOW
"2"	LOW	LOW	HI	LOW	HI
"1"	HI	LOW	HI	LOW	LOW

(1) - HI = ignition voltage; LOW = zero volts.

COMPONENT TESTS

COMPONENT & WIRING HARNESS RESISTANCE CHECK

1) Install Jumper Harness (J-39775) to transmission 20-pin in-line harness connector. Measure resistance between specified terminals for each component. See Fig. 21. Compare resistance reading to known-good values. See TRANSMISSION COMPONENT RESISTANCE SPECIFICATIONS table.

2) If resistance measurement is okay, go to next step. If resistance measurement is not okay, disconnect wiring harness at component and measure component resistance. Replace component if resistance is not as specified. If resistance is as specified, repair wiring harness between component and 20-pin in-line harness connector.

3) Measure resistance between ground and each terminal at transmission 20-pin in-line harness connector. See Fig. 21. Resistance should be greater than 250 k/ohms for each solenoid, and greater than 10 megohms for fluid temperature sensor and vehicle speed sensor. Resistance for fluid temperature sensor will vary with temperature. If resistance is within specification, problem is intermittent. If resistance is low, go to next step.

4) Disconnect wiring harness at component. Measure resistance between component terminals and ground. If resistance is low, replace component. If resistance is high, inspect wiring harness for short to ground. Repair as necessary.

TRANSMISSION COMPONENT RESISTANCE SPECIFICATIONS

Component	Ohms
PC Solenoid Valve	
At 68øF (20øC)	3-5
At 212øF (100øC)	4-7
TCC Solenoid Valve	
At 68øF (20øC)	21-26
At 212øF (100øC)	26-33
TCC PWM Solenoid Valve	
At 68øF (20øC)	10-11
At 212øF (100øC)	13-15
TFT Sensor	
At 68øF (20øC)	3088-3942
At 212øF (100øC)	159-198
Vehicle Speed Sensor	
Except Corvette & 4WD Applications	
At 68øF (20øC)	1377-2220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    At 212øF (100øC)  .................................  1800-3355
  Corvette & 4WD Applications
    At 77øF (25øC)  ........................................  1420
    At 302øF (150øC)  ......................................  2140
1-2 & 2-3 Shift Solenoid Valves
  At 68øF (20øC)  ........................................  19-24
  At 212øF (100øC)  ......................................  24-31
3-2 Shift Solenoid Valve
  At 68øF (20øC)  ........................................  20-24
  At 212øF (100øC)  ......................................  29-32
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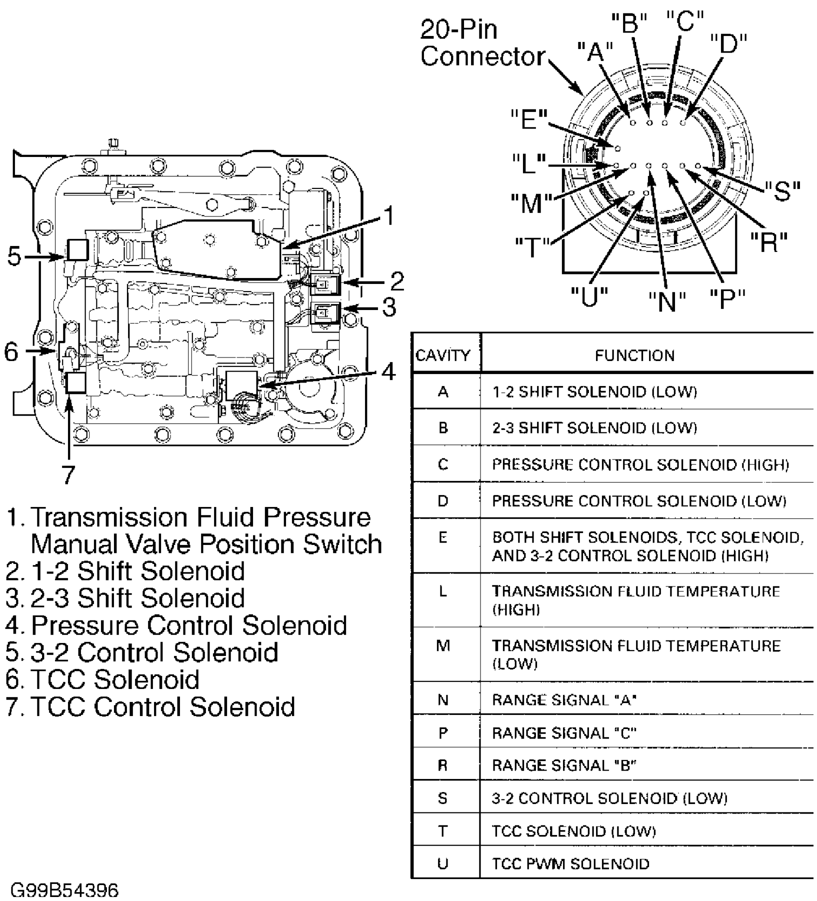

CAVITY	FUNCTION
A	1-2 SHIFT SOLENOID (LOW)
B	2-3 SHIFT SOLENOID (LOW)
C	PRESSURE CONTROL SOLENOID (HIGH)
D	PRESSURE CONTROL SOLENOID (LOW)
E	BOTH SHIFT SOLENOIDS, TCC SOLENOID, AND 3-2 CONTROL SOLENOID (HIGH)
L	TRANSMISSION FLUID TEMPERATURE (HIGH)
M	TRANSMISSION FLUID TEMPERATURE (LOW)
N	RANGE SIGNAL "A"
P	RANGE SIGNAL "C"
R	RANGE SIGNAL "B"
S	3-2 CONTROL SOLENOID (LOW)
T	TCC SOLENOID (LOW)
U	TCC PWM SOLENOID

Fig. 21: Identifying Component & Connector Terminal Locations
Courtesy of General Motors Corp.

WIRING DIAGRAMS

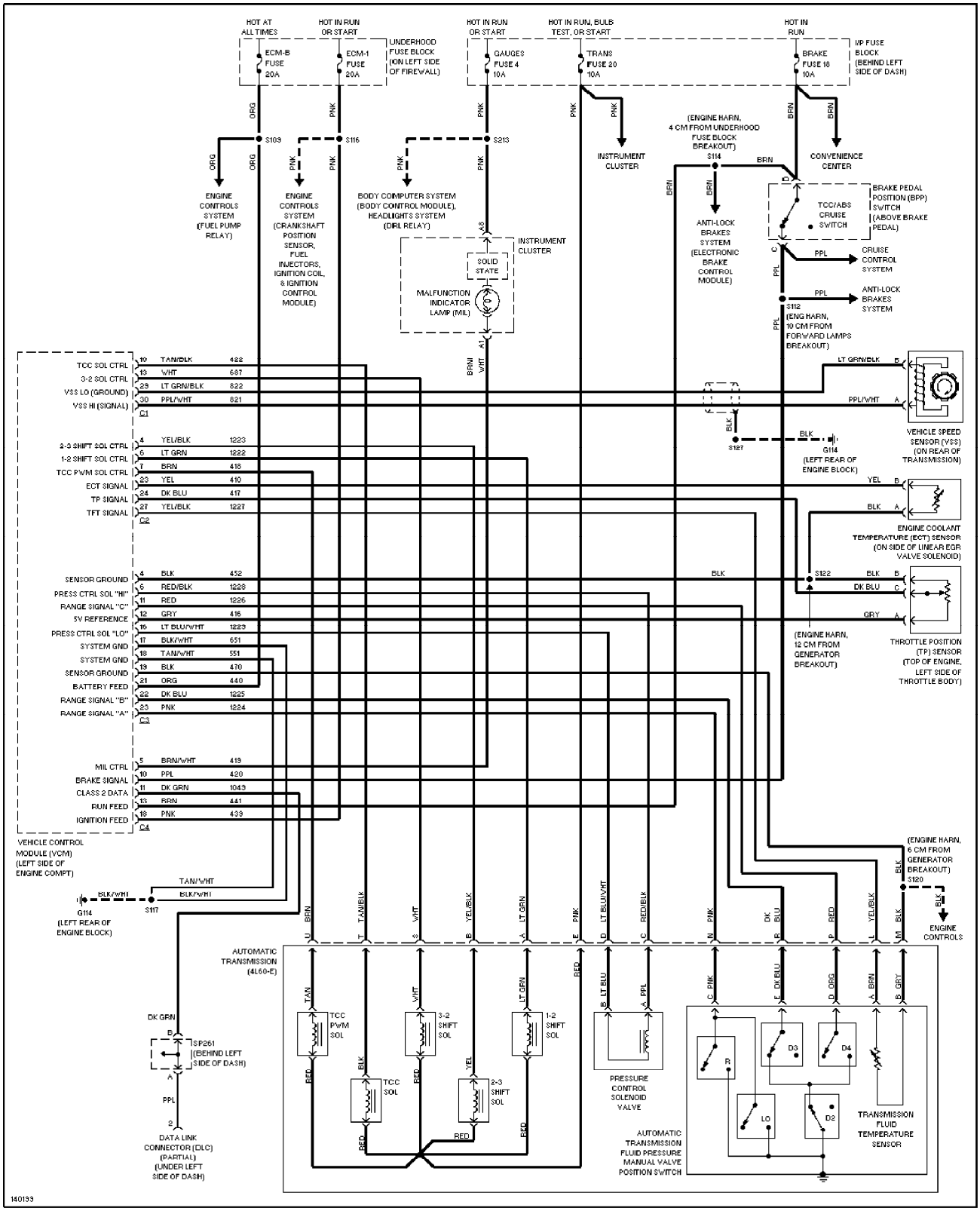

Fig. 22: Transmission Control System Wiring Diagram (Astro & Safari)

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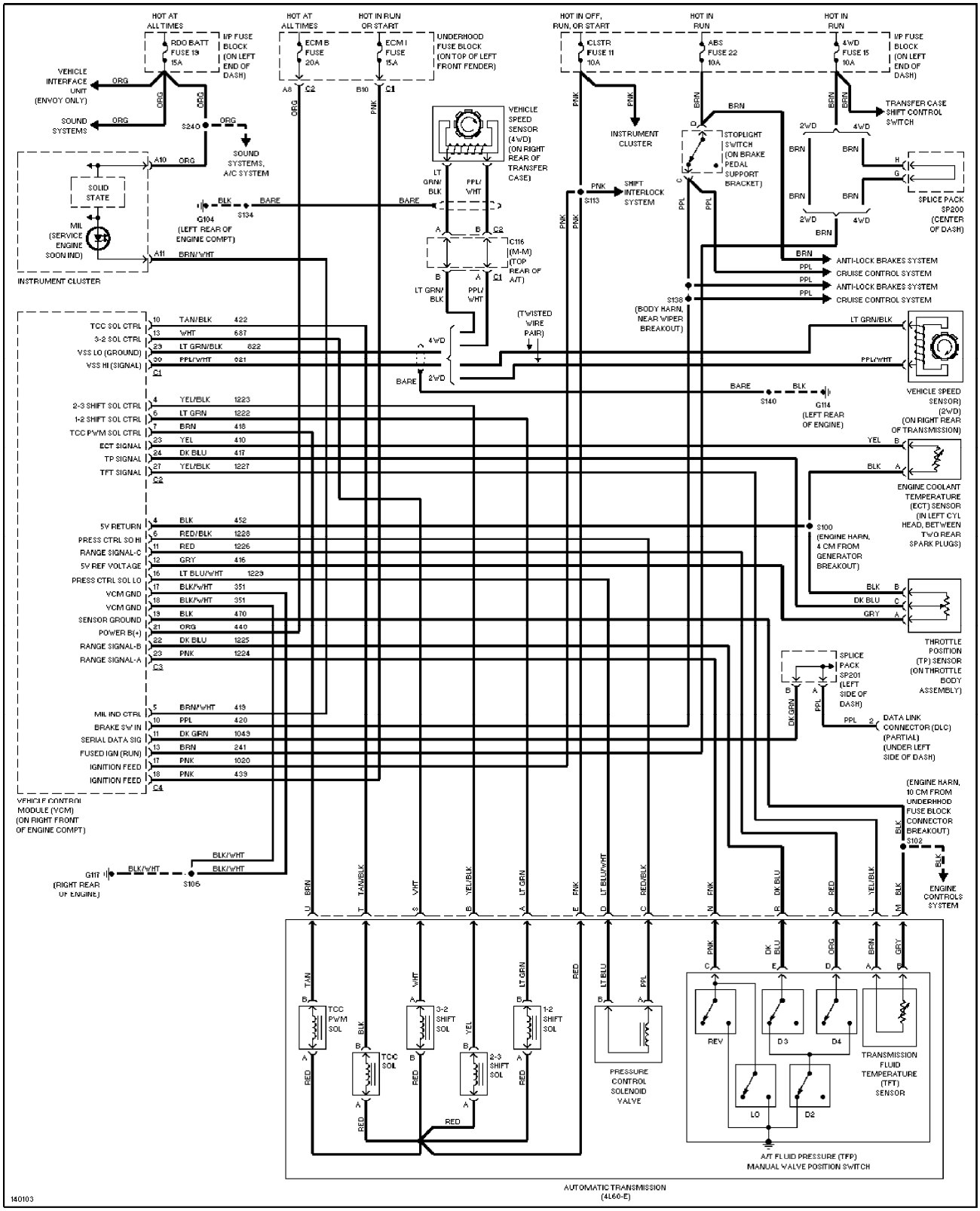

Fig. 23: Transmission Control System Wiring Diagram (Blazer, Bravada, Envoy, Hombre, Jimmy, Sonoma & S10 Pickup - 4.3L)

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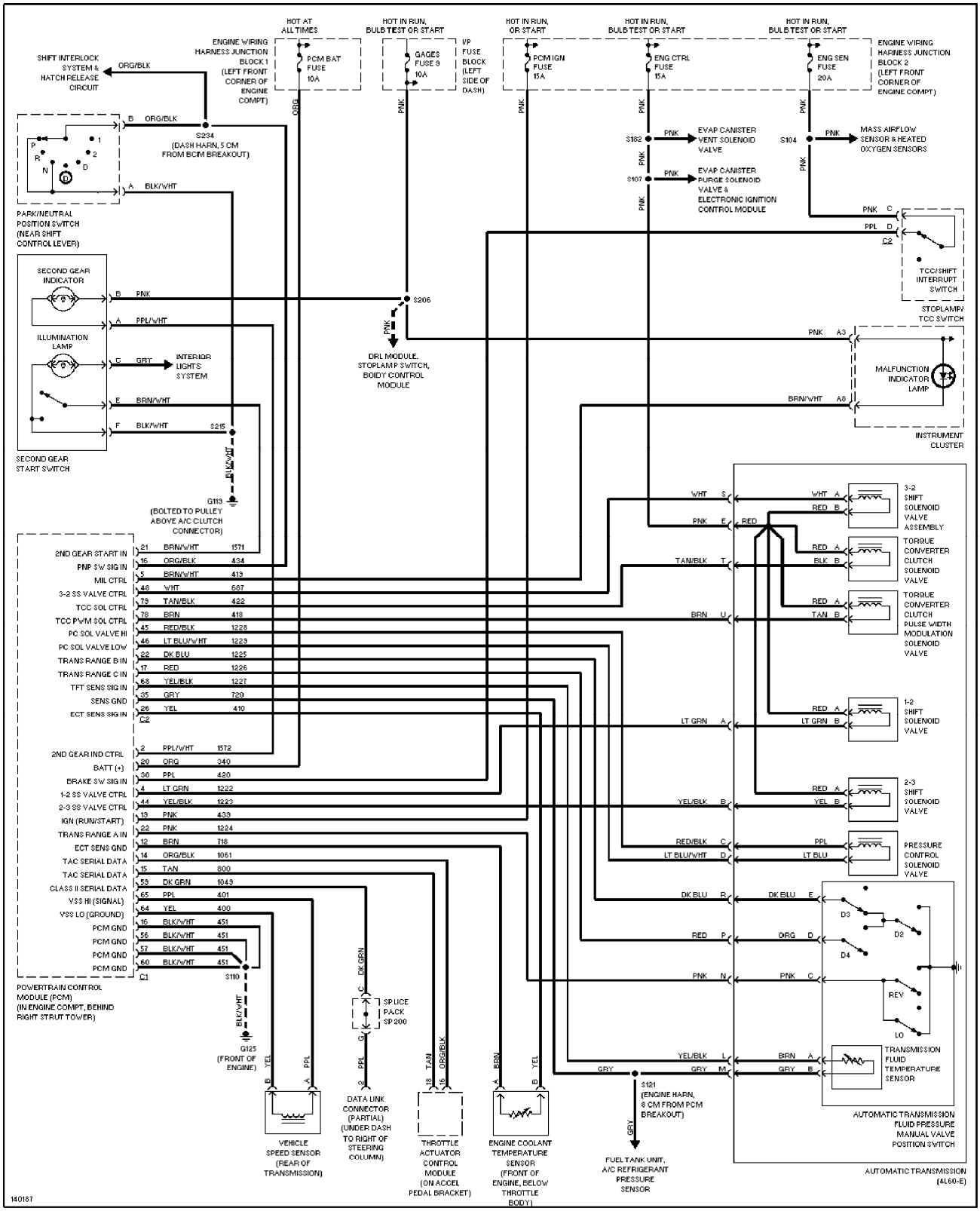

Fig. 24: Transmission Control System Wiring Diagram (Camaro & Firebird - 3.8L)

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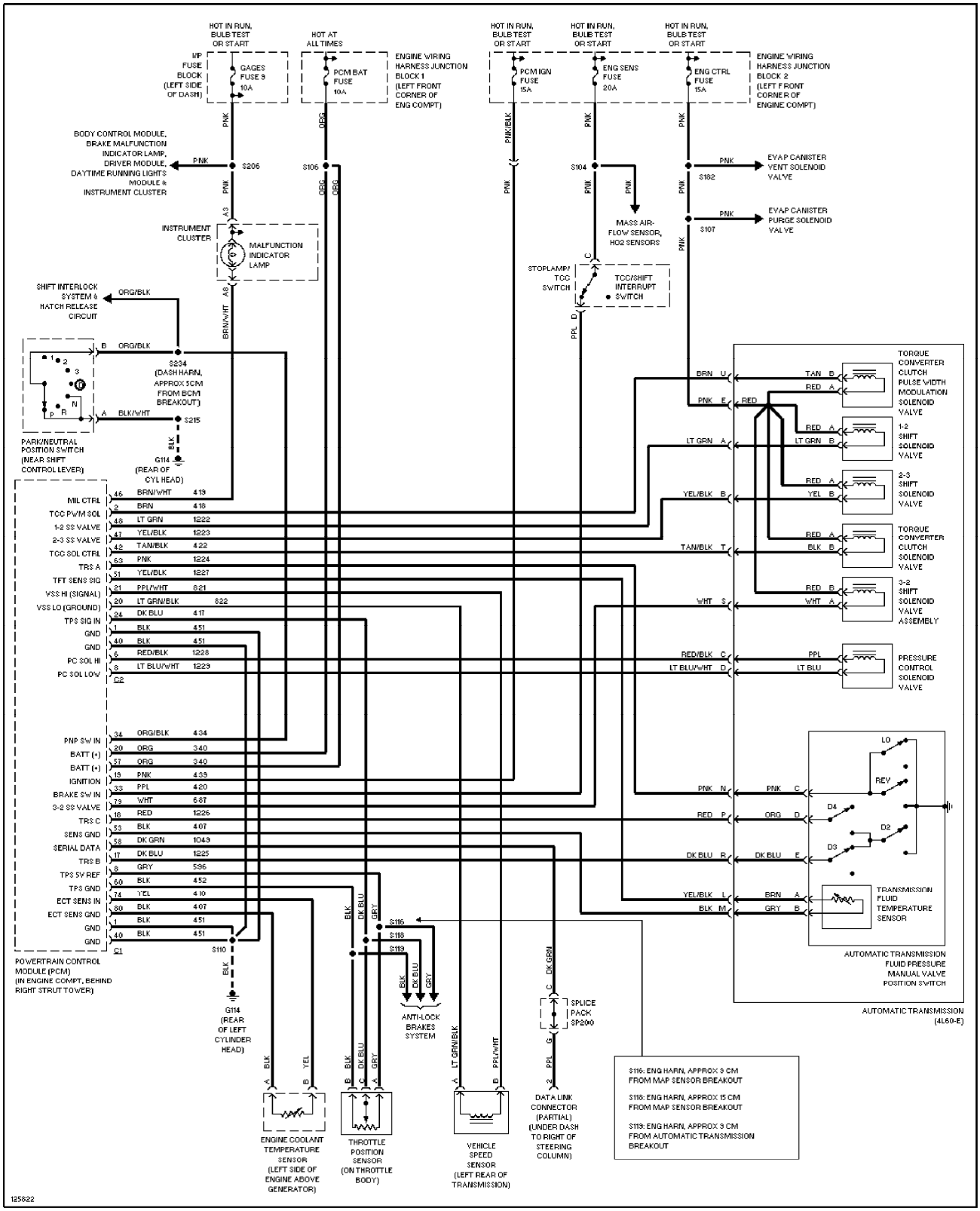

Fig. 25: Transmission Control System Wiring Diagram (Camaro & Firebird - 5.7L)

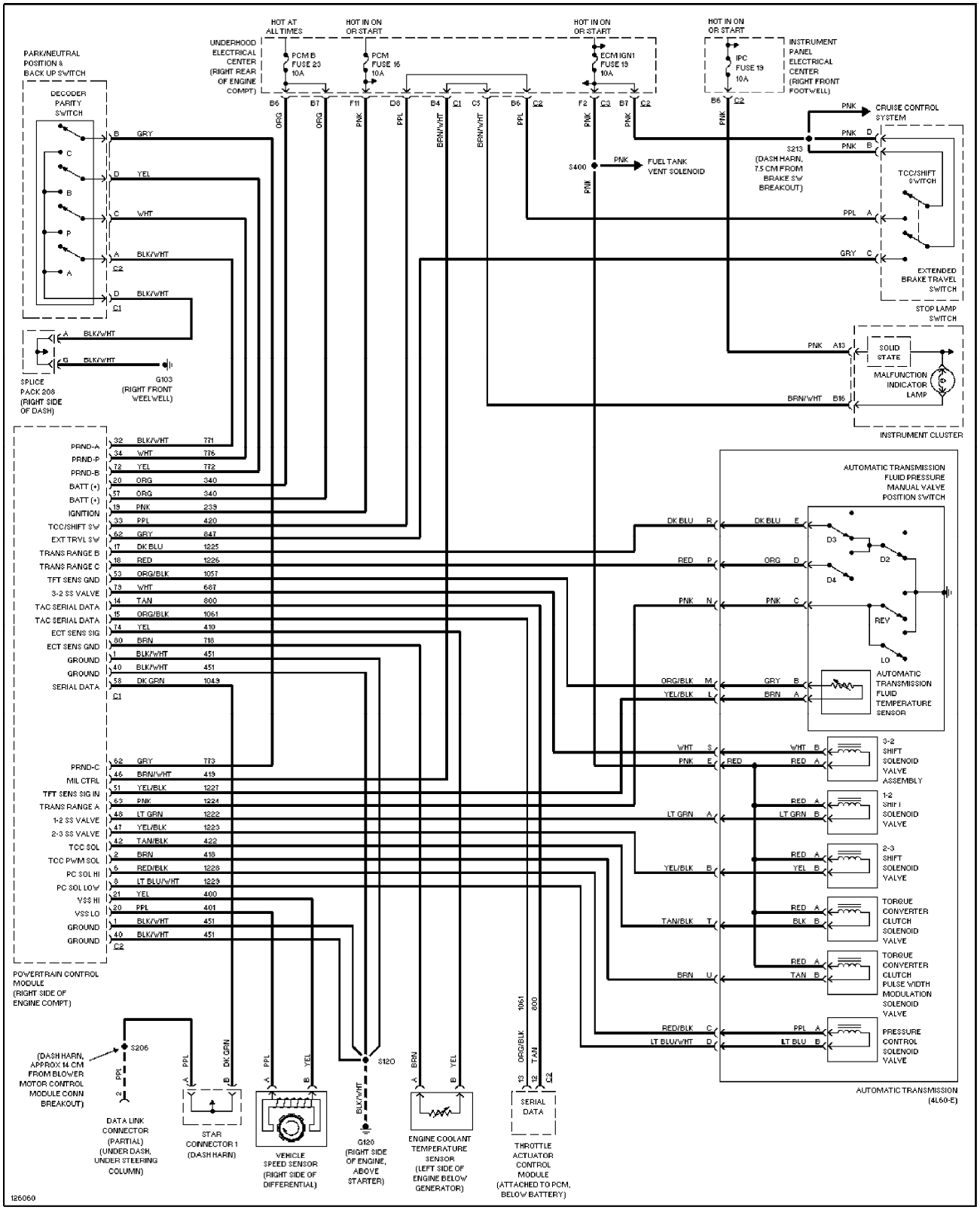

Fig. 26: Transmission Control System Wiring Diagram (Corvette)

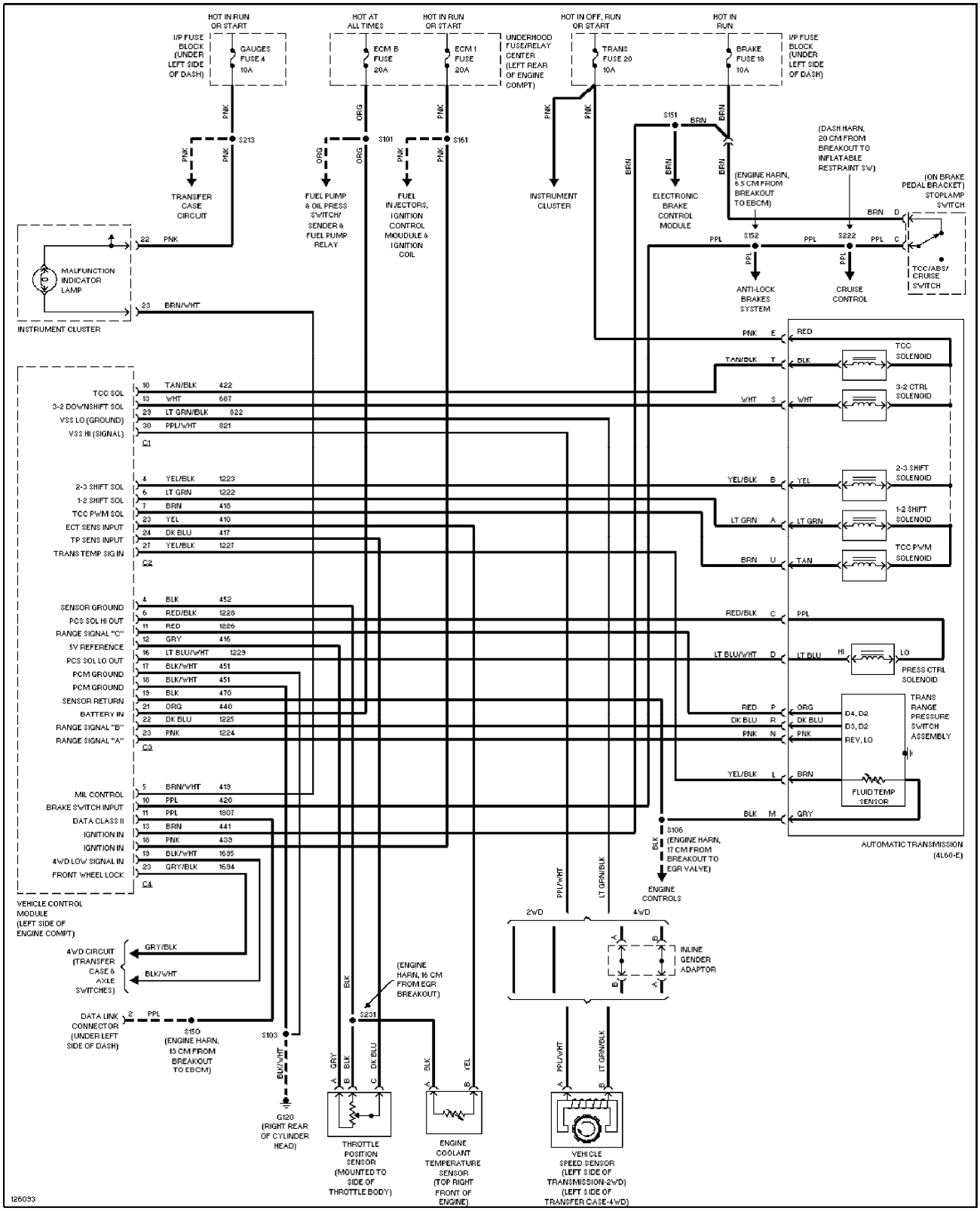

Fig. 27: Transmission Control System Wiring Diagram ("C" & "K" Pickup, Escalade, Tahoe & Yukon - 5.7L)

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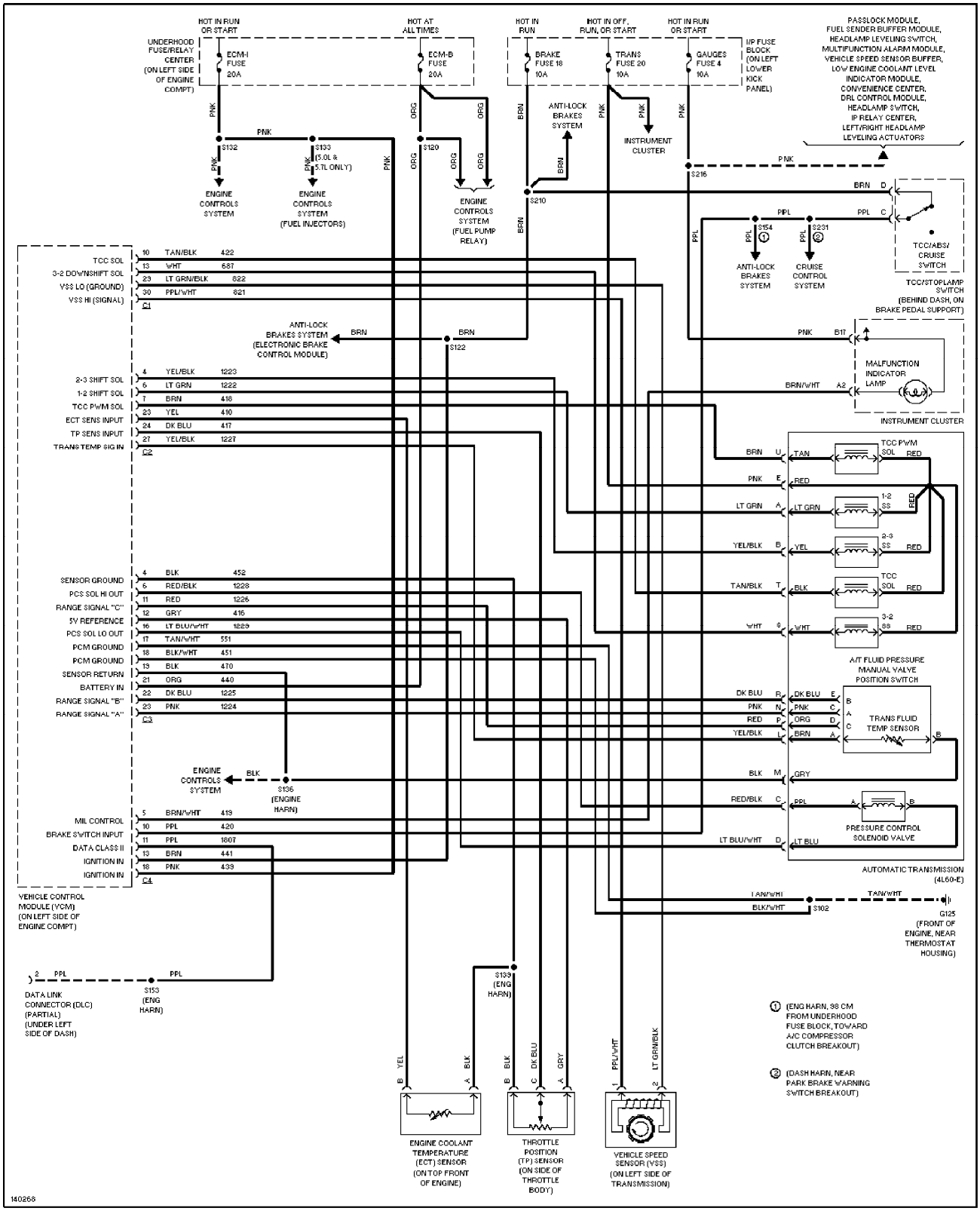

Fig. 28: Transmission Control System Wiring Diagram (Express & Savana - 4.3L, 5.0L & 5.7L)

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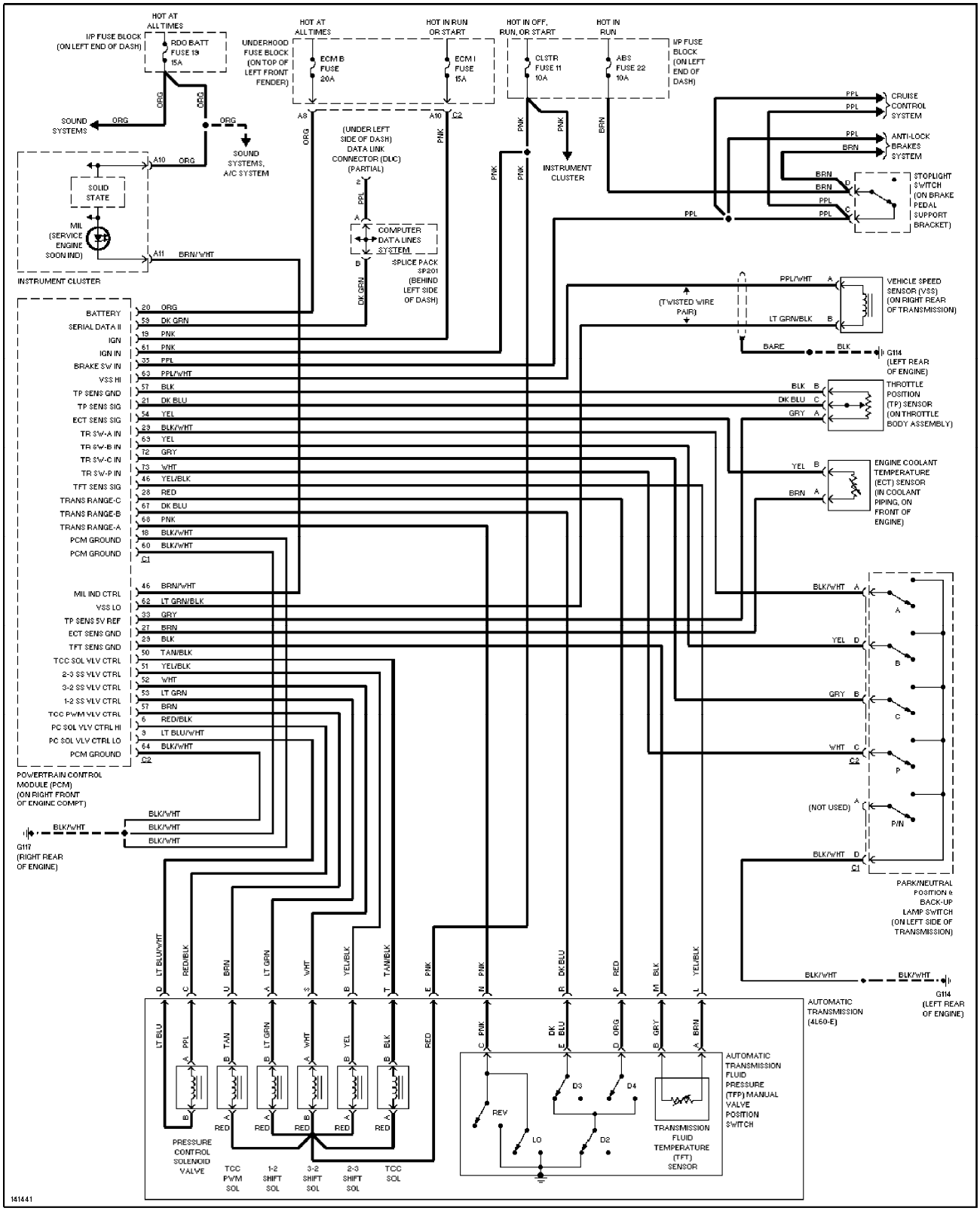

Fig. 29: Transmission Control System Wiring Diagram (Isuzu Hombre - 2.2L)

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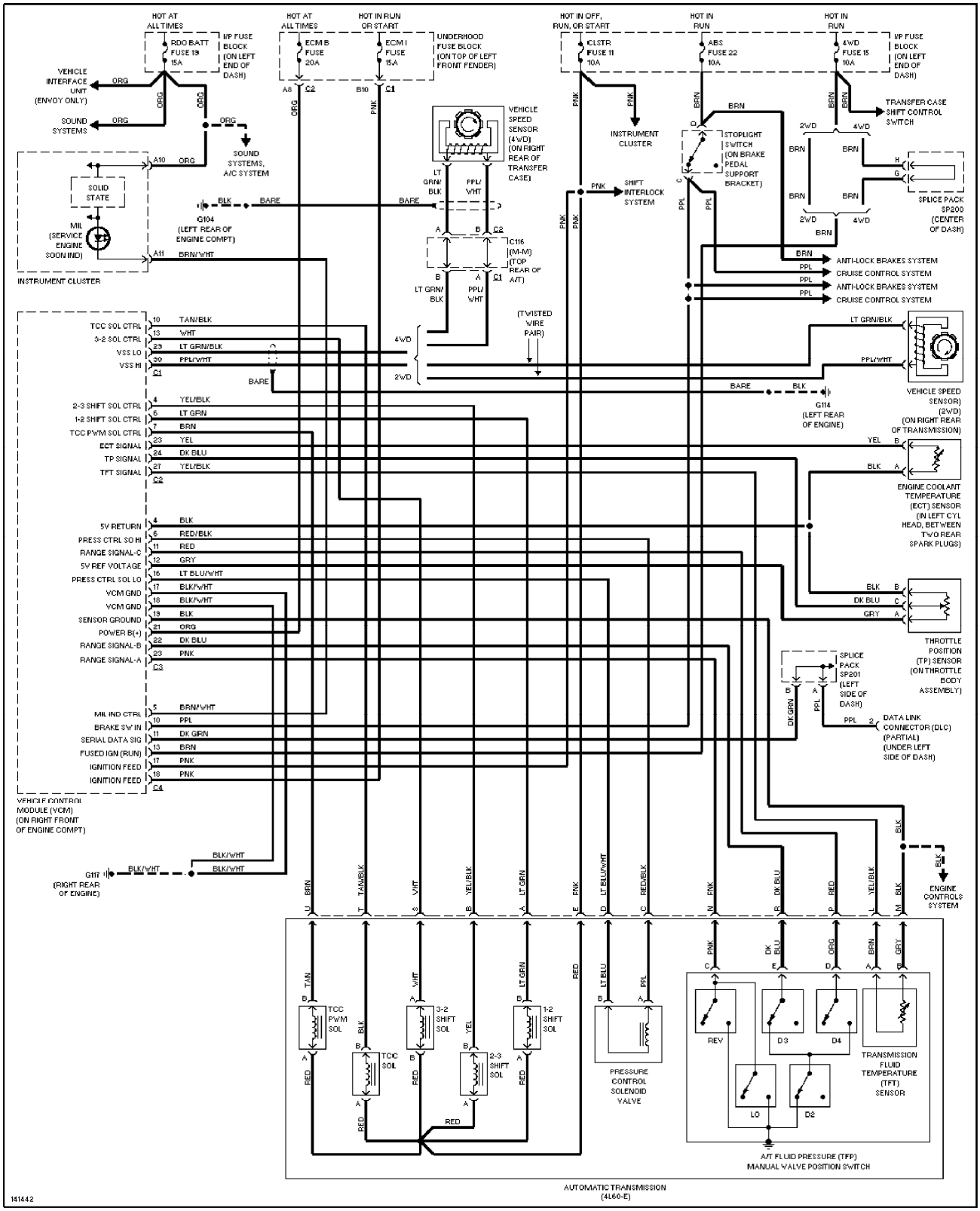

Fig. 30: Transmission Control System Wiring Diagram (Isuzu Hombre - 4.3L)

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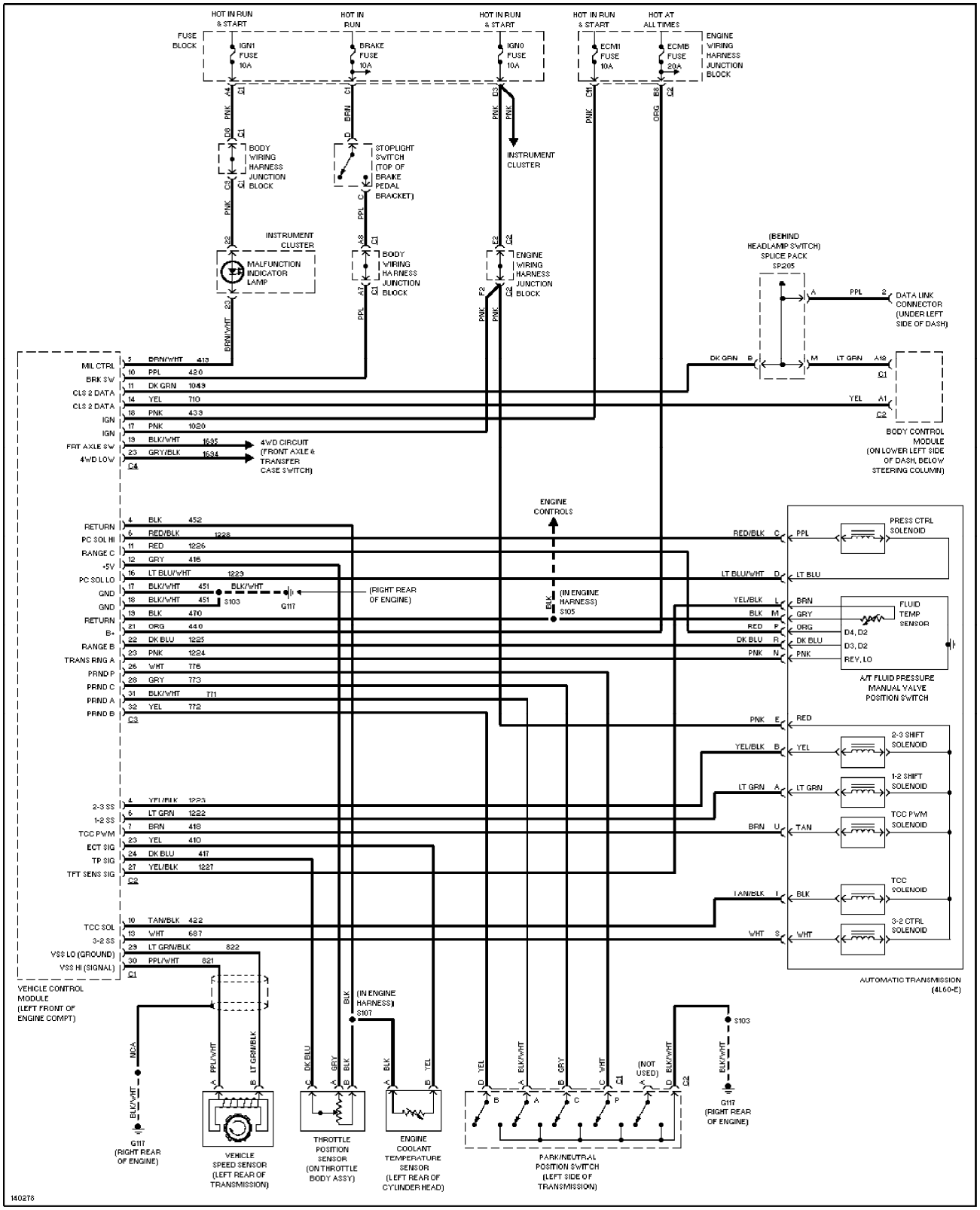

Fig. 31: Transmission Control System Wiring Diagram (Sierra & Silverado - 4.3L)

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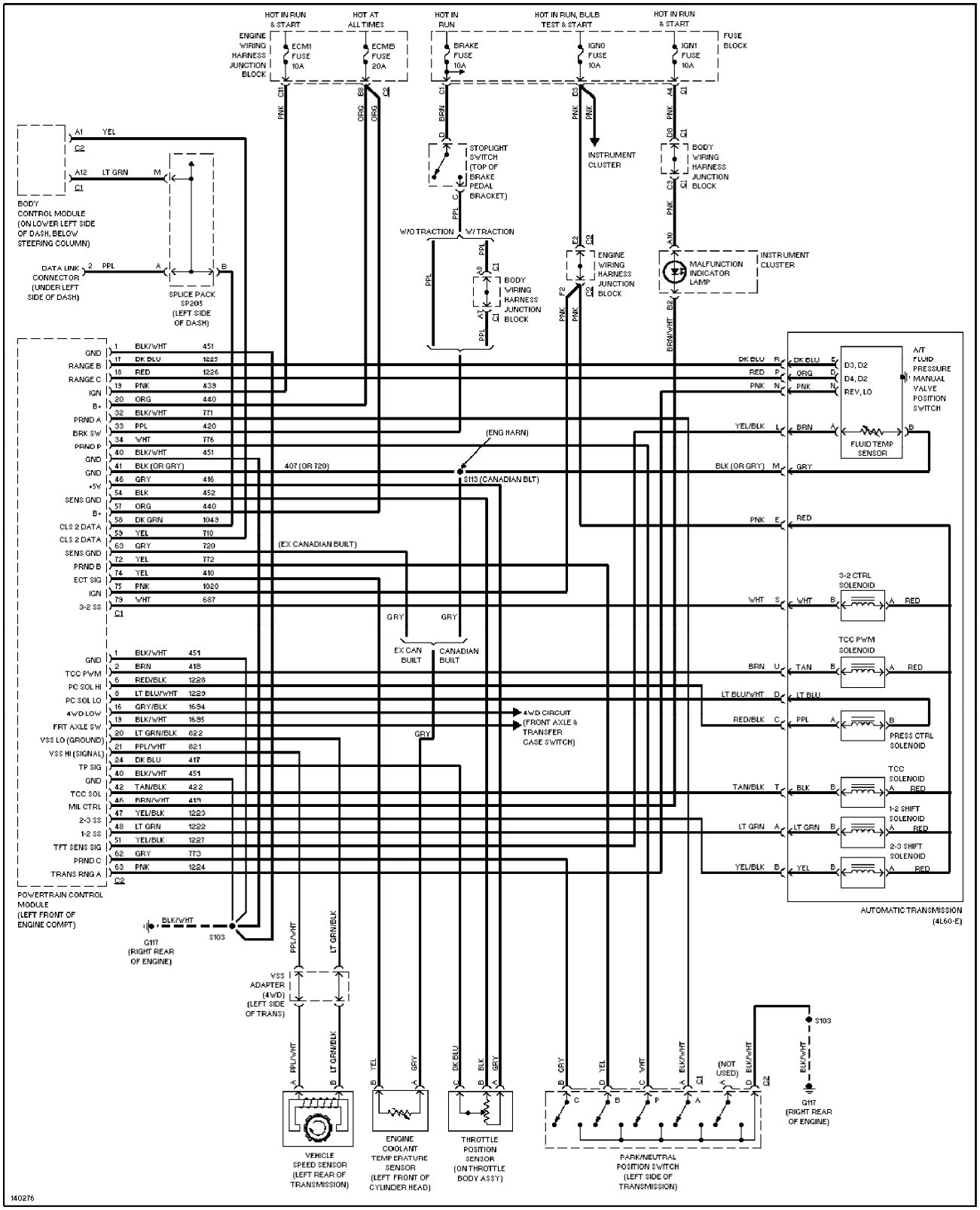

Fig. 32: Transmission Control System Wiring Diagram (Sierra, Silverado, Suburban, Tahoe, Yukon & Yukon XL - 4.8L & 5.3L)

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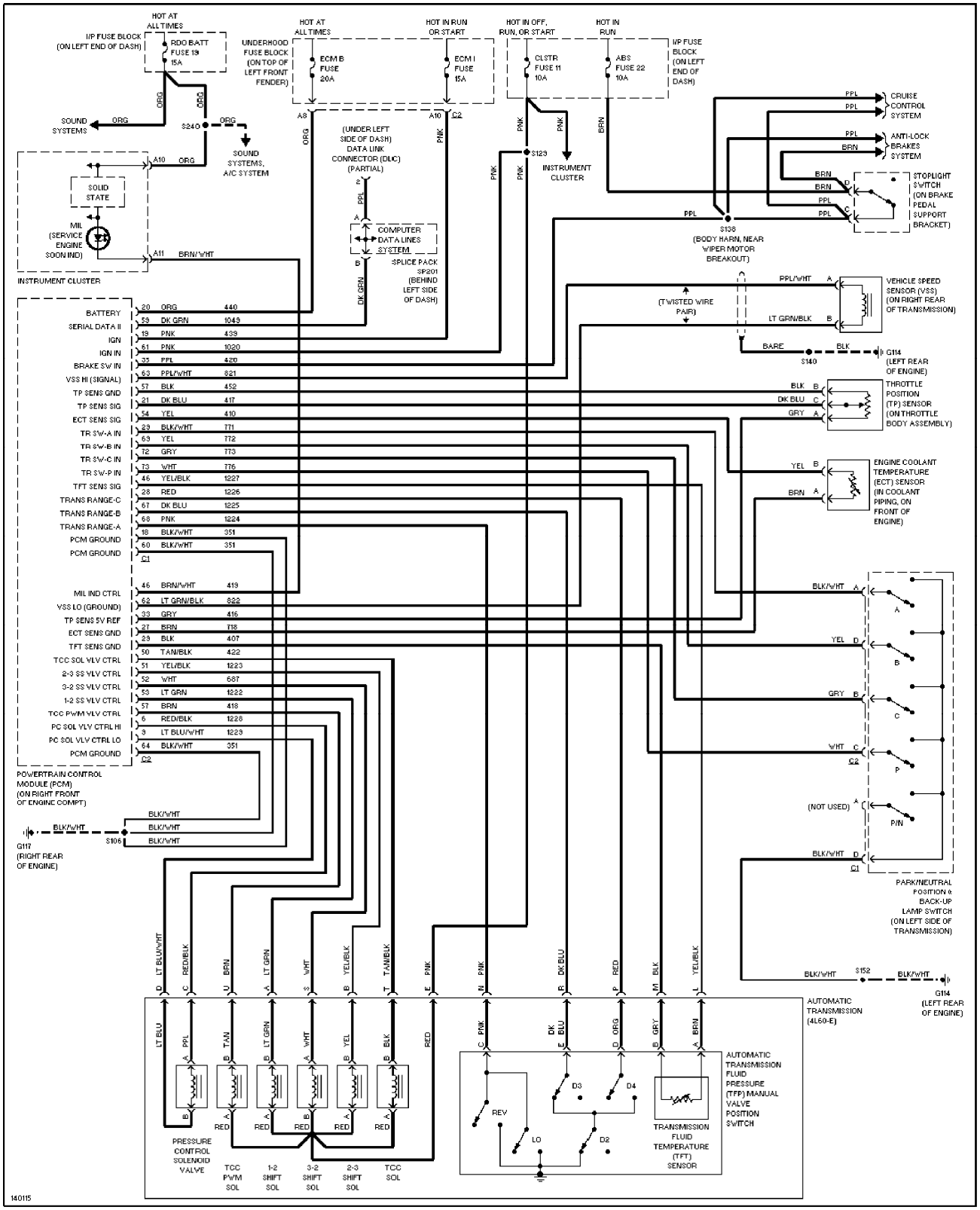

Fig. 33: Transmission Control System Wiring Diagram (Sonoma & S10 Pickup - 2.2L)

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